UNDERTAKING JT1.1

Undertaking

TO PROVIDE THE SNC/AECON JOINT VENTURE'S RISK REGISTRY FOR THE RETUBE & FEEDER REPLACEMENT CONTRACT.

Response

The SNC/AECON Joint Venture's risk register was developed during the Definition Phase and attached to the Retube and Feeder Replacement (RFR) contract as Exhibit 3.5(g) as part of Amendment 4 to the RFR contract. The risk register can be found at Ex. D2-2-3, Attachment 6, pp. 1615-1621.

There is no duplication or overlap between OPG's and the Joint Venture's risk registers. The Joint Venture's risk register contains the risks over which the Joint Venture has control and which it is managing.

OPG's risk register is primarily for OPG-managed risks. OPG, as the program owner, is responsible for managing risks for the entire Darlington Refurbishment Program (DRP). OPG recognizes that there are risks that are managed by the SNC/AECON Joint Venture which, should they arise, may impact other areas of the DRP as a result of the RFR project being critical path. These risks are included in OPG's risk register. Please see OPG's response to L-04.3-2 AMPCO-066, part d.

UNDERTAKING JT1.2

Undertaking

TO ADVISE WHAT OPG IS OVERSEEING WITHIN THE PROJECT AND TO BREAK DOWN COSTS ASSOCIATED WITH UNIT 2

Response

OPG has interpreted the question to provide oversight costs consistent with the categories listed D2-2-8 Chart 3 for both the total RQE as well as Unit 2.

Oversight costs have been defined to include those costs associated with performing oversight of vendors who are executing work in the field. This includes direct oversight of project teams as performed for each project bundle, as well as indirect oversight of project execution which includes construction, safety, and quality oversight. Contract Management performing commercial oversight, Managed Systems Oversight performing assurance activities, Planning and Controls which performs project controls including estimating, cost management, change management, and reporting, and Work Control performing scheduling and day-to-day work management are also included in oversight.

The costs which have been excluded are not considered oversight, but are instead providing support to the executing organizations. For example:

- Operations and Maintenance functional costs are considered as support costs as these costs predominantly relate to the “custodian” role, controlling authority, as well as radiation protection services.
- Engineering costs are predominantly to support design and return-to-service activities.

DRP OPG Oversight costs represent costs across the entire program (2010 – 2026), whereas Unit 2 OPG Oversight costs are related to Unit 2 including during the definition phase (2010 – 2020).

D2-2-8 Chart 3 - DRP RQE Breakdown ($M)

#	Bundle / Category	DRP OPG Oversight	U2 OPG Oversight
1	Retube & Feeder Replacement	167	106
2	Turbine Generators	41	22
3	Balance of Plant	183	98
4	Fuel Handling/Defueling	49	32
5	Steam Generators	13	6
6	**Subtotal Major Work Bundles**	**452**	**264**
7	Facility and Infrastructure Projects	-	-
8	Safety Improvement Opportunities	-	-
9	**Subtotal F&IP / SIO**	**-**	**-**
10	Project Execution	180	88
11	Contract Management	52	25
12	Engineering	-	-
13	Managed Systems Oversight	41	25
14	Planning & Controls	95	65
15	Nuclear Safety	-	-
16	Program Fees & Other Support	-	-
17	Supply Chain	-	-
18	Work Control	80	30
19	Ops & Mtce	-	-
20	Early Release 3	-	-
21	Early Release 4	-	-
22	**Subtotal OPG Functions**	**447**	**233**
23	Contingency	-	-
24	**Subtotal before Escalation**	**899**	**497**
25	Interest	**-**	**-**
26	Escalation	**-**	**-**
27	**Subtotal Interest & Escalation**	**-**	**-**
28	**Total Oversight**	**899**	**497**

UNDERTAKING JT1.3

Undertaking

TO FILE THE REMAINING CONCENTRIC REPORTS THAT WERE FILED IN THE LAST PROCEEDING THAT HAVE NOT BEEN REFILED IN THIS PROCEEDING.

Response

The referenced documents were filed in EB-2013-0321 at Ex. D2-2-1, Attachments 7-3 to 7-5.

Since the documents previously contained redactions, OPG has reviewed the documents to remove redactions that no longer require confidential treatment.

Attachment #	Document
1	Concentric Energy Advisors: Assessment of Commercial Strategies Developed for the Darlington Refurbishment Project's Fuel Handling Work Package
2	Concentric Energy Advisors: Assessment of Commercial Strategies Developed for the Darlington Refurbishment Project's Steam Generators Work Package
3	Concentric Energy Advisors: Assessment of Commercial Strategies Developed for the Darlington Refurbishment Project's Balance of Plant Work Package

CONCENTRIC ENERGY ADVISORS

ASSESSMENT OF COMMERCIAL STRATEGIES DEVELOPED FOR THE DARLINGTON REFURBISHMENT PROJECT'S FUEL HANDLING WORK PACKAGE

PREPARED FOR ONTARIO POWER GENERATION

SEPTEMBER 2013

CONCENTRIC ENERGY ADVISORS

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I. EXECUTIVE SUMMARY

On September 9, 2011, Torys LLP retained Concentric Energy Advisors, Inc. ("Concentric") to review the commercial strategies and contracts developed and implemented for the refurbishment of four CANDU heavy water reactors at Ontario Power Generation Inc.'s ("Ontario Power Generation's" or the "Company's") Darlington Nuclear Generating Station ("Darlington" or the "Plant").[1] The Darlington Refurbishment Project (the "Project") will include the removal and replacement of the reactor calandria tubes and pressure tubes from each reactor and the replacement of all feeders (*i.e.*, the "Retube & Feeder Replacement work package"), the refurbishment of the existing turbine generators (*i.e.*, the "Turbine Generators work package"), the refurbishment of the existing fuel handling facilities (referred to herein as the "Fuel Handling work package"), and the refurbishment of the existing steam generators *(i.e.,* the "Steam Generators" work package), among many other tasks. The plant modifications are currently planned to be made during overlapping 36-month outages for each of the four Darlington units between October 2016 and 2024.[2] However, the Company is currently conducting an evaluation of the business case for un-lapping the refurbishment execution of the first two units. Under this scenario, the first refurbishment outage would be conducted on Unit 2 between Fall 2016 and Fall 2019. The remaining outages will occur between Fall 2019 and Fall 2025 with approximately 17 to 19 months of overlap between each successive outage. The Company expects to reach a decision on whether to proceed with this revised Project calendar in November 2013.

Prior to commencing the execution phase work, Ontario Power Generation committed to undertaking significant planning activities, which includes working to develop and implement appropriate commercial strategies for the Project, to prepare for a project of this magnitude. Concentric was engaged to review the Company's commercial strategies and how these strategies are being implemented. This letter summarizes Concentric's review and opinion of the current Fuel Handling work package commercial strategy.

The Project is progressing within a typical megaproject lifecycle that includes the following phases: (1) project initiation; (2) definition; (3) execution; (4) commissioning; and (5) project closeout. In the project initiation phase, a project is evaluated for its initial feasibility based on the relatively high-level information that is readily available. Should a project prove feasible during the project initiation phase, it will proceed into the definition phase. During the definition phase, the project team undertakes detailed reviews of the project's anticipated scope, cost, and schedule to begin to define the activities that must be completed during the project, when those activities must be completed, and how much those activities are expected to cost. Concurrently, the project team begins to define the commercial strategies expected to be employed. Later during the definition phase, the project team is responsible for: (1) identifying, procuring and fabricating all long lead materials, components and tooling; (2) executing all of the necessary agreements to proceed with the major work packages; (3) completing the detailed scope and project schedule; and (4) developing a "release quality" cost and schedule estimate from which the project's performance can be measured. The release quality estimate and the integrated schedule available at the conclusion of the definition phase are more defined than prior iterations of the cost estimate and integrated schedule, yet both still contain uncertainty. Following the definition phase, a project enters the execution phase during which the actual plant modifications will take place. This stage is followed by the commissioning and project closeout phases.

[1] As used in this context, "commercial strategies" refers to the processes by which Ontario Power Generation will procure goods and services for the Darlington Refurbishment Project.

[2] As a practical matter, initial planning for the Project began in 2006 with the initiation of feasibility studies and plant technical assessments. Thus, from the Project's initiation to closeout, the Project will span nearly 20 years.

During those phases, the project team brings the project online and completes all of the recordkeeping associated with the project.

The initiation phase of the Project began in late 2007 with the preparation of a business case that evaluated, at a high level, the overall feasibility of completing the Project. In November 2009, the Project sought and received authorization from the Ontario Power Generation Board of Directors to proceed with the planning portion of the definition phase. In February 2010, the Ministry of Energy concurred with the Board of Director's decision. To execute the work, Ontario Power Generation intends to retain multiple contractors for discrete portions of the Project work known as work packages. Consistent with this approach, Ontario Power Generation has proposed dividing the work into multiple major work packages, of which the Fuel Handling work package is one.

As part of that process, the Company is currently pursuing contracts with qualified vendors for two separate bundles of work related to the Fuel Handling work package. The first bundle of work, the defueling of the four Darlington reactors, has been negotiated on a single-source basis with General Electric Hitachi – Canada ("GEH-C"), the Original Equipment Manufacturer ("OEM") of the Darlington fuel handling facilities and the current Design Agent for those facilities. The second bundle is the refurbishment of the fuel handling facilities, and that scope has been further divided into five sub-bundles. Three of the five refurbishment sub-bundles will be pursued through competitive contracting processes, one will be contracted on a single-source basis to GEH-C, and one will be performed under an addition to the execution phase scope of work under the Retube & Feeder Replacement contract (executed in the first quarter of 2012). Throughout the balance of this phase of the Project, the Company and its vendors will complete planning and design for the Fuel Handling work package, execute project agreements, and develop a release quality cost estimate, among many other activities.

II. SUMMARY OF CONCLUSIONS

As discussed below, Concentric concluded that, based on activities that took place between late 2009 and August 1, 2013, the commercial strategy Ontario Power Generation is employing for the Fuel Handling work package is appropriate and reasonable and meets the regulatory standard of prudence.

Concentric's opinion is not without certain caveats and limitations, which are discussed in the sections that follow. Similarly, the basis for our opinions are described throughout the remainder of this document.

III. STANDARD OF REVIEW

To conduct our review of the commercial strategy selected by Ontario Power Generation for the Fuel Handling work package, Concentric sought to answer three primary questions:

1) Is the commercial strategy selected by Ontario Power Generation for the Fuel Handling work package reasonable?

2) Is that commercial strategy being executed in a reasonable manner?

3) Do the selected commercial strategy and the execution of that strategy meet the regulatory standard of prudence?

To answer these questions, Concentric adopted a definition for the regulatory standard of prudence based on Concentric's work before provincial, state, and federal energy regulators in both Canada and the United States. The definition utilized by Concentric is consistent with decisions rendered by the Ontario Superior Court of Justice,[3] the Court of Appeal for Ontario,[4] the Ontario Energy Board,[5] and the U.S. Supreme Court,[6] among other jurisdictions. Specifically, Concentric defined the prudence standard as examining the range of actions that a reasonable manager would take given the facts or circumstances that were known or knowable at the time of the decision or action. That definition rejects the use of hindsight as a basis for determining the prudence of a decision or action. In addition, that definition relies on an evaluation of decisions or actions. Project costs are neither prudent nor imprudent; instead, costs are prudently or imprudently incurred as a consequence of the decisions and actions of management.

In this letter, Concentric provides its assessment of the Company's development and execution of its commercial strategy for the Fuel Handling work package under the standard of prudence described above. In particular, Concentric is providing its opinion on the prudence and reasonableness of Ontario Power Generation's decisions to:

1) Unbundle the Fuel Handling work package into two bundles by the scope of work: (1) defueling of the four reactors; and (2) refurbishment of the fuel handling system;

2) Proceed with negotiations and executing a contract with GEH-C on a single source basis for the defueling scope of work; and

3) Further unbundle the refurbishment scope of work into five sub-bundles, and to competitively bid the majority of that work.

Those decisions are discussed in greater detail in the sections that follow.

IV. INFORMATION SOURCES

Our review and the development of our opinions relied primarily on data gathered through multiple sets of requests for information related to the Fuel Handling work package and interviews with members of the Fuel Handling refurbishment project team. Concentric also performed outside research on topics including lessons learned and the experiences of other CANDU operators performing similar projects, the Canadian nuclear safety regime, and industry trends and practices for other large nuclear refurbishment projects. Finally, Concentric conducted on-site interviews, during which Concentric met with members of the Darlington Refurbishment Project team. Follow-up telephone conversations were used to clarify certain facts and supplement the information Concentric received during our on-site interviews.

[3] 2005 CanLII 4941 (Ont. Div. Ct.).

[4] Court of Appeal for Ontario Decision, Docket: C55602, C55641 and C55633, June 4, 2013.

[5] Decision with Reasons, RP-2001-0032, December 13, 2002. This Decision deals with Enbridge Gas Distribution Inc.'s (formerly Enbridge Consumers Gas or ECG) application for a Board Order approving rates for the 2002 Test Year.

[6] Separate, concurring opinion of Justice Louis Brandeis, Missouri ex. Rel. Southwestern Bell Telephone Co. v. Public Service Commission, 262 U.S. 276 (1923).

V. GENERAL LIMITATIONS OF CONCENTRIC'S OPINION

The following are general limitations regarding the scope of our review:

- First, our review is limited to Ontario Power Generation's actions and documents prepared between late 2009 and August 1, 2013.[7] Concentric did not review Ontario Power Generation's actions related to the Project prior to or after that time period.
- Next, Concentric did not independently verify the appropriateness, sufficiency, or correctness of the Project schedules, cost estimates, scope, or from an engineering or technical perspective, the division of labor. However, Concentric was informed of the processes used to develop those parameters.
- Concentric evaluated the sub-bundling of the fuel handling refurbishment scope of work, but is not providing an opinion on the appropriateness of that division of responsibilities from an engineering perspective. Concentric's opinion does not consider whether the sub-bundling of work is practicable from the perspective of vendors that may respond to Requests for Proposals ("RFPs") for the sub-bundles. Further, we are not opining on the execution of those RFPs or resultant contracts at this time.
- In addition, Concentric assumed Ontario Power Generation will retain adequately qualified personnel to complete the Project generally and the Fuel Handling work package specifically. Those resources are critical to the success of the project, and they may be sourced internally, hired directly, or engaged through contracts with third parties.
- Concentric did not perform a compliance audit to determine whether Ontario Power Generation and the Project were in compliance with Ontario Power Generation's internal policies, procedures, instructions and guidelines, or applicable provincial and federal regulations. Similarly, Concentric did not conduct a legal review of Ontario Power Generation's agreements or proposed agreements with any contractors. Notwithstanding that limitation, Concentric reviewed Ontario Power Generation's internal policies and procedures, and provincial and federal laws and regulations when developing our opinion.
- Finally, Concentric's review is not an assessment of the Project's likelihood of success. Successful execution of the Project generally and the Fuel Handling work package specifically will require the efforts of many entities and individuals over many years, and the development and implementation of the Project's commercial strategies is only one contributor to project success.

[7] The beginning of the period Concentric reviewed is roughly concurrent with Ontario Power Generation's completion of the Economic Feasibility Assessment of Darlington Refurbishment dated November 13, 2009. However, portions of the operational experience material reviewed by Concentric were prepared prior to this time.

VI. DEVELOPMENT OF THE FUEL HANDLING WORK PACKAGE COMMERCIAL STRATEGY

A. OVERVIEW

The scope of work for the Fuel Handling work package has been bundled by Ontario Power Generation into two distinct scopes of work: (1) defueling of the reactors; and (2) refurbishment of the fuel handling equipment.

Defueling involves removing all irradiated fuel from each of the four Darlington reactors at the beginning of each refurbishment outage to allow for the performance of other Project activities, including the Retube & Feeder Replacement work package. Defueling is on the critical path for each refurbishment outage as no other refurbishment work can be undertaken before each reactor is defueled. The defueling work incorporates the following main tasks: (1) detailed engineering; (2) manufacturing of hardware; (3) testing and commissioning; and (4) technical support. Due to the fact that the other units will be operational during the defueling process, Ontario Power Generation, as the licensed operator, is required to perform the defueling field work. The Company negotiated and executed a contract on a single-source contracting strategy basis with a third party vendor – GEH-C – to perform the non-field work required for the defuel work scope (*i.e.*, engineering, manufacturing, and technical support). The method recommended by GEH-C, the OEM of the Darlington fuel handling equipment, is called "flow defuel," in which the flow of the primary heat transfer system is used to push the fuel into the fuel handling machine assisted by flow restricting outlet bundles ("FROBS"; the current estimate requires 480 FROBS per unit). Other system components required for the defueling scope of work include an estimated 375 dummy fuel bundles per unit, 72 universal carriers, four fuel push tools, ten new fuel transfer mechanisms, and two complete sets of fuel handling software.[8] At the time of Concentric's review, the contract has an estimated value of approximately $18 million. With optional scope ($8.5 million) and contingency ($8.5 million), the total estimated cost for the defueling bundle was $35 million.

Refurbishment (*i.e.,* the second Fuel Handling work package bundle) involves the refurbishment of the fuel handling equipment installed on each unit, common equipment installed on the East and West Fuelling Facilities Areas, and equipment in the Central Service Area. The fuel handling refurbishment work has an anticipated cost of approximately $170 million and will be performed in five sub-bundles:

1. Trolley, power track, and auxiliary replacement (*i.e.,* the "Main FH Refurbishment," which is the largest of the sub-bundles in terms of scope and anticipated cost, and is planned to be competitively bid);

2. Irradiated fuel bay refurbishment, which has been further divided into two scopes of work: (1) irradiated fuel bay inspection tooling (planned to be competitively bid using the extended services master services agreements ("ESMSA")[9] with Black & McDonald ("B&M") and

[8] GEH-C was engaged by OPG to complete a study of the most effective method to defuel Darlington's reactor cores for the Project. In cases in which flow defuel is not able to defuel a fuel channel, dummy fuel bundles will be used to displace irradiated fuel.

[9] The ESMSAs are agreements that have been established with Black & McDonald ("B&M") and E.S. Fox that have pre-established terms and conditions for any purchase orders that are issued under the ESMSAs. There are differences in rates between the two vendors, but otherwise the terms and conditions are fairly uniform between ESMSAs. Through the bidding process, Ontario Power Generation has the opportunity to request changes to

E.S. Fox); and (2) irradiated fuel bay heat exchanger replacement (also planned to be competitively bid through the ESMSA);

3. Fuel handling control system refurbishment (planned to be competitively bid);

4. Reactor area bridges and carriages refurbishment (planned to be performed by the Retube & Feeder Replacement contractor (*i.e.,* a joint venture between SNC-Lavalin ("SLN") and Aecon Industrial) under an addition to the execution phase scope of work as part of the existing Retube & Feeder Replacement contract); and

5. Fuel machine head overhaul (planned to be single-sourced to the OEM, GEH-C).

Per a May 3, 2012 memorandum, the current contingency for the refurbishment work is approximately $20 million. As of the date of this letter, and as is typical of a project of this size as it becomes further developed, the contingency amount will be further refined as the work package progresses.

B. INITIAL STRATEGY DEVELOPMENT

Ontario Power Generation developed an initial contracting strategy for the Fuel Handling work package in 2011 that contemplated a non-competitively sourced contract for nearly the entire Fuel Handling work package with the OEM of the fuel handling equipment (*i.e.,* GEH-C). At that time, Ontario Power Generation analyzed the Fuel Handling work package by work type (*i.e.,* Design and Engineering, Inspection and Analysis, Procurement and Obsolescence, Replacement/Execution, and Defuel), identifying potential suppliers for each work type and documenting the rationale for each work type's contracting strategy. Of the work types, Ontario Power Generation's planned strategy was to sole source Design and Engineering, Procurement and Obsolescence, Replacement/Execution (with an EPC partner), and part of Defuel to GEH-C. Ontario Power Generation's Project and Modifications group would manage Inspection and Analysis, and the supply of dummy fuel bundles would have been competitively bid.

In 2012, however, Ontario Power Generation performed a detailed scope optimization study of the Fuel Handling work package scope of work to better define the scope and reduce the formerly large contingency scope. That study focused on the refurbishment portion of the work package (*i.e.,* the non-defueling related scopes of work). The detailed scope optimization study was part of the normal progression of the Project. The result of that study was that the Company determined that it could significantly optimize the scope of work for fuel handling refurbishment, and, in the process, increase the degree to which the scope of work could be competitively bid. This was a fundamental change to the refurbishment scope in that the optimized scope had greatly reduced levels of specialty work that would require implementation by the OEM. Specifically, through a line-by-line examination of the fuel handling scope, the Company determined that, in some instances, there was a cost savings resulting from earlier component replacement versus future inspections. In other instances, detailed engineering analyses supported the continued operation through life extension of certain components. For that latter category, contingency scope for those components' replacement was removed from the work package, significantly reducing total Fuel Handling work package contingency cost and scope. The original estimated cost for the refurbishment (*i.e.,* non-defueling) scope of work was greater than $515 million, including $450 million in contingency scope and "Station Improvement

certain of the ESMSA terms and conditions (*e.g.*, extending the warranty length). In addition, the ESMSA vendors can propose to sub-contract with other vendors as part of the bidding process.

Opportunities."[10] In total, Ontario Power Generation identified savings of $370 million through its scope optimization review, refurbishment contingency scope was reduced to approximately $20 million, and the Station Improvement Opportunities were either eliminated or reclassified to core scope. Major cost savings were identified in the areas of: (1) powertrack refurbishment (the Company determined that no large scale change in design was required); (2) fueling head machine refurbishment (the Company eliminated the purchase of additional fuel machine heads); (3) fuel handling equipment reliability (this scope item was eliminated entirely); and (4) service area bridge components (these components will now be replaced, resulting in cost savings). Ontario Power Generation also determined at that time that the procurement of dummy fuel bundles, which it formerly planned to do on a competitive basis, should be procured on a single-source basis from GEH-C, the designer of Darlington's existing fuel bundles, due to the proprietary nature of that equipment and the fuel handling facilities' design.

Based on the optimized scope, Ontario Power Generation revised its contracting strategy for the Fuel Handling work package in October 2012 to reflect the currently planned commercial strategy (*i.e.,* bundling of the work into two bundles: defueling and refurbishment), as described above.

C. DEVELOPMENT OF THE CURRENT FUEL HANDLING WORK PACKAGE CONTRACTING STRATEGY

Ontario Power Generation has made three significant decisions in its current Fuel Handling work package contracting strategy that are the focus of Concentric's review:

1. The decision to unbundle the fuel handling work package into two bundles by the scope of work: (1) defueling of the four reactors; and (2) refurbishment of the fuel handling system;
2. The decision to proceed with negotiations and execute a contract with GEH-C on a single source basis for the defueling scope of work; and
3. The decision to further unbundle the refurbishment scope of work into five sub-bundles, and to competitively bid the majority of that work.

1. WORK PACKAGE BUNDLING

Ontario Power Generation made a decision in 2012 to bundle the Fuel Handling work package into two scopes of work: (1) defueling of the reactors; and (2) refurbishment of the fuel handling facilities. Per the Company, unbundling of the work by scope allowed the Project to: (a) source and move forward with critical path defueling work while preparing the detailed scope of work and commercial arrangement for the refurbishment; (b) mitigate risks associated with a non-integrated approach to the defueling work; and (c) maximize competitive sourcing for the overall fuel handling project. In addition, Ontario Power Generation unbundled the work by scope with the recognition that the defueling and refurbishment work scopes are independent of one another and that different vendors may be able to perform different portions of the scope work, increasing competition.

[10] Station Improvement Opportunities included items such as the purchase of additional fuelling machines, replacing the powertrack with new technology, and installing a new fuel inspection facility.

2. NEGOTIATIONS WITH GEH-C FOR DEFUELING

For the defueling scope of work, Ontario Power Generation's contracting strategy was to single source the engineering, supply of hardware, and technical support to GEH-C. The Company began negotiations with GEH-C in the fourth quarter of 2012, agreeing to terms and conditions in December 2012, receiving a proposal from GEH-C in January 2013, signing a final contract on May 17, 2013, and issuing a purchase order to GEH-C on May 17, 2013.[11] GEH-C is also performing pre-engineering work for Ontario Power Generation under a separate contract. The engineering and supply portions of the contract will be performed under fixed pricing, while the technical support and commissioning work portions of the contract are planned to be performed under reimbursable cost pricing.

Contract incentives and disincentives include payments to GEH-C if each unit's defueling is completed on-time or better, warranty of procured equipment and liquidated damages for late delivery of equipment.

The main alternative to the preferred contracting strategy was to competitively bid the contract. Ontario Power Generation believes this was an inferior option, for reasons including:

- GEH-C is the designer of record for the Darlington fuel handling equipment.
- GEH-C has been retained by Ontario Power Generation to act as Darlington's sole fuel handling Design Agent for over 30 years. Ontario Power Generation currently contracts with GEH-C on an annual basis to maintain configuration management of Darlington's fuel handling documentation. In addition, GEH-C performs all current engineering work on Darlington's fuel handling facilities.
- GEH-C is the only potential supplier with trolley mounted fuel handling system design and engineering experience.
- GEH-C is the designer of the Darlington fuel bundles.
- Engagement of a supplier other than the OEM could introduce nuclear safety and integration compatibility risks.
- GEH-C completed the defueling work at Bruce Power LP, the only other CANDU plant with a trolley mounted fuel handling system (a similar method of defueling – *i.e.,* flow defuel – was also used at Bruce Power LP).[12]
- Ontario Power Generation prefers a single point of accountability to ensure proper oversight coordination, integration and flexibility of implementation.
- A Kepner-Tregoe analysis, in which the optimal solution is determined based on a weighting of each potential solution's match with the Company's "must haves" for a project, was performed for defueling. That analysis demonstrated that Ontario Power Generation's preferred approach was the highest scoring alternative.
- Due to its place on the critical path, there is a major risk to the overall Project if defueling is not completed according to schedule.

[11] Due to the delay between signing the contract and issuing the purchase order, all time-related performance clauses in the contract are based on a May 17, 2013 execution date.

[12] Concentric was advised of GEH-C's involvement in the Bruce refurbishment work by Ontario Power Generation.

3. SUB-BUNDLING OF FUEL HANDLING REFURBISHMENT

For the refurbishment scope of work, Ontario Power Generation plans to competitively bid the main fuel handling refurbishment and two other sub-bundles, and identified seven potential candidates to bid on the work. The Company plans to single source a fourth sub-bundle, the fuel machine head overhaul, to GEH-C in order to eliminate modification and integration risks.[13] The reactor area bridges and carriages refurbishment work (*i.e.,* a fifth bundle) will be completed under the Retube & Feeder Replacement contract with SLN/Aecon Industrial through an addition to the scope of work under that contract due to overlapping work and work areas.

Ontario Power Generation believes that the scope is sufficiently developed for much of the refurbishment, with the exception of reactor area bridges and carriages refurbishment and that the most appropriate contracting model is fixed/firm or target pricing.

As discussed above, up until it performed its detailed scope optimization study, Ontario Power Generation planned on single sourcing the entire Fuel Handling work package to GEH-C. The scope optimization study, however, resulted in many findings by the Company that indicated a different commercial strategy was appropriate, including:

- There are distinctions between the sub-bundles that require different expertise. For example, the Main FH Refurbishment sub-bundle is a heavy-construction related scope of work, whereas the fuel handling control system refurbishment relates to information technology and is mechanical in nature.
- The scope optimization resulted in the majority of the work being heavy construction work that is not fuel handling specialty work. Other vendors are equally or more capable than GEH-C of doing that type of work, without the required involvement of the OEM. Specifically, per the Company, the main fuel handling refurbishment and control system work is not unique to fuel handling and requires little specialty knowledge. The irradiated fuel bay inspection tool and irradiated fuel bay heat exchanger sub-bundles are also non-fuel handling specialty work that the ESMSA vendors are capable of performing. If GEH-C was to perform this work, it would likely need to partner with a construction firm to do so.
- In total, the estimated cost for the refurbishment scope of work was reduced from approximately $515 million, including $450 million in contingency scope and Station Improvement Opportunities, to approximately $170 million, including $20 million of contingency scope. This significant reduction in scope resulted in a fundamental change in the nature of the fuel handling refurbishment project from one that required large amounts of specialty work by the OEM to one comprised largely of heavy construction. Whereas a single source approach with the OEM may have been appropriate for the larger, less defined scope, that approach became less appropriate as the refurbishment work was transformed into a heavy construction project.
- The timing and location of the sub-bundles allows Ontario Power Generation to execute contracts with multiple vendors without increasing vendor-interface and project

[13] The fuel machine head overhaul involves procurement of an "off-the-shelf" parts kit that will be installed by a third party under a competitively-bid agreement.

management risks materially. In fact, due to the significant time gap between certain of the sub-bundles, and differences in the nature of work to be performed, having the entire refurbishment bundle scope of work performed under one contract might increase the contract management burden on the Company.

- Two bundles (*i.e.,* irradiated fuel bay inspection tooling and the irradiated fuel bay heat exchanger replacement) are required prior to defueling in order to allow the irradiated fuel bays to accommodate the increased amount of irradiated fuel that is defueled from the reactors. Thus, these two sub-bundles, which are planned to be performed by ESMSA vendors, will be implemented well in advance of the other four sub-bundles, which will occur during the refurbishment outages.
- For the reactor area bridges and carriages refurbishment sub-bundle, it was determined that the most appropriate action was to replace the bridges (which support the fuel machines and move vertically) and ball screws (upon which the bridges move up and down to and from the reactor) rather than re-install the existing equipment and replace them in a future year.[14] Since the Retube & Feeder Replacement vendor is going to remove the bridges and ball screws as part of its scope of work, Ontario Power Generation determined that the most efficient strategy was to have that same vendor install the new equipment under an addition to the execution phase scope of work under the Retube & Feeder Replacement contract.
- Lastly, in terms of the fuel machine head, the design changes and modifications that are required for that piece of specialty equipment are unique to the fuel machine head and GEH-C is the original designer and manufacturer of the system.

On March 12, 2013, Ontario Power Generation solicited expressions of interest ("EOIs") for the fuel handling refurbishment work that will be competitively bid. The Company received positive responses from eight potential vendors, four of whom propose to form joint ventures or sub-contract with one another.[15] Ontario Power Generation issued a RFPs in July 2013.

VII. CONCENTRIC'S FINDINGS AND RECOMMENDATIONS

A. WORK PACKAGE BUNDLING

FINDINGS

Concentric finds that the decision to unbundle the fuel handling work package into two bundles by the scope of work: (1) defueling of the four reactors; and (2) refurbishment of the fuel handling system, is reasonable and appropriate. The strategy has evolved significantly since its initial development. The decision to

[14] Ontario Power Generation operating experience review indicated that the Bruce and Point LePreau stations did not replace the ball screws during refurbishment and needed to replace them soon thereafter.

[15] Areva and B&M expressed interest in forming a joint venture, with Areva performing engineering work and B&M performing procurement and construction work. In addition, GEH-C expressed interest in performing the work as the sole proponent, sub-contracting procurement of commodities and construction to AECON, while AECON also expressed interest in performing the work as the sole proponent with an unidentified party subcontracting for engineering work.

unbundle the defueling and refurbishment scopes of work allows Ontario Power Generation to focus on the critical path defueling project while increasing competition for the larger, refurbishment project.

B. DECISION TO CONTRACT WITH GEH-C

FINDINGS

Concentric finds that the decision to proceed with negotiations and execute a contract with GEH-C for the defueling contract is appropriate and prudent. The defueling scope of work is critical to the overall success of the Darlington Refurbishment Project, both in terms of its place on the critical path and the fact that it needs to be completed before the other major work packages can proceed. Ontario Power Generation performed the aforementioned Kepner-Tregoe analysis regarding the alternatives for contracting the defueling work (*i.e.,* bundled single source to OEM, bundled competitive bid, and unbundled with a mix of OEM and competitive bid). That analysis supported the decision to bundle the defueling work and contract through a single source strategy with the OEM. In addition, Concentric finds that senior management appears to be engaged and well apprised of project activity. Regular meetings have been held with the Program Contracting Steering Committee during the commercial strategy development and negotiations with GEH-C regarding defueling. Specifically, meetings were held November 2, 2012, December 11, 2012, February 27, 2013, and April 26, 2013. The Cross Functional Sourcing Team was briefed on the fuel handling project as well (January 28, 2013 and February 22, 2013).

As the Company identified, Ontario Power Generation can use negotiations with GEH-C for the defueling work to potentially gain negotiating leverage with and/or concessions from GEH-C for the refurbishment work (as discussed above, GEH-C has been identified as a potential respondent to Ontario Power Generation's RFPs for refurbishment work). Already, according to the Company, Ontario Power Generation has been able to improve upon its terms and conditions with GEH-C, and negotiated increased transparency on pricing.

The factors supporting a single source contract are significant. Those factors include that GEH-C is the Design Agent and OEM, prepared the Component Condition Assessments for the fuel handling system as the Fuel Handling work package scope of work was being developed, has performed preliminary engineering work, and has previous knowledge of trolley-based fuel handling systems and Darlington-specific experience. Candu Energy Inc. ("Candu Energy") appears to be the only other qualified alternative vendor. Per the Kepner-Tregoe analysis performed by the Company, however, there are risks that: (1) another vendor will not understand the Project scope; (2) another vendor will increase the number of interfaces and hand-offs; and (3) there may be integration misalignments if multiple vendors are involved with this portion of the work. Given the placement of defueling on the critical path of the Darlington Refurbishment Project and the relatively small budget for defueling as compared to the overall Darlington Refurbishment Project budget, the risks to cost and schedule of involving multiple vendors in this work may outweigh the benefits, if any.

RECOMMENDATIONS

Concentric notes that Ontario Power Generation recognized that a lack of transparency on the part of GEH-C presented a challenge in developing an acceptable contract with GEH-C, and the Company has taken steps to address that problem. Nonetheless, industry experience suggests management of a contract and

controlling costs with a vendor can also be difficult later in the life of a contract due to a lack of pricing transparency, and we suggest that the Company maintain vigilance in that area.

Concentric also notes that there is a lack of disincentives for GEH-C after a certain number of days' delay in the schedule for each unit, once the incentive runs out. Concentric recognizes overall schedule disincentives may by unachievable in a contract with GEH-C because Ontario Power Generation is doing the field work, but the Company should track and evaluate the risk that GEH-C will be unmotivated economically if the overall schedule slips by more than five days.

Lastly, we note that an Ontario Power Generation Internal Audit report from May 2012 made the recommendation that the Fuel Handling and Turbine Generators work package project teams clearly establish when justifications for single-source processes would be created and approved for significant portions of the two scopes of work. We agree with the audit's findings that there is a potential gap in the sequencing of supply-chain approvals, but stress that our concern is limited to the process for SSJ development and approval, not the basis for the SSJs themselves. Nothing Concentric observed in this regard has indicated imprudence on the part of Ontario Power Generation, nor did the process as implemented affect the outcome of the supply chain activities.

We believe that it is in the Project's best interest to achieve internal alignment on a single-source approach at the outset of the development of plans to negotiate with single-source vendors. This is particularly true for agreements that will develop over the course of several months or for contractual arrangements that will exceed $10 million. This will ensure that the team is aligned on the strategic direction of the Project, and will mitigate the risk of committing significant resources to a procurement strategy that may not ultimately be approved by established Supply Chain procedures. It will also prevent unnecessary schedule extensions related to pursuing contracting strategies that are not ultimately approved. Recognizing that a structural solution may be too formal for what is an exceptionally dynamic process, we recommend that, at a minimum, clear lines of communication be established when new members of the Supply Chain organization are introduced to the Project, which will happen during a project of this scale and duration.

C. SUB-BUNDLING OF FUEL HANDLING REFURBISHMENT

FINDINGS

Concentric finds that the decision to sub-bundle the fuel handling refurbishment scope of work is reasonable. As discussed above, the Company's scope optimization study indicated that there are significant distinctions between each sub-bundle in terms of timing, location within the plant, and type of work. Such distinctions require different types of expertise that is not necessarily housed within one single vendor. In addition, the significant timing differences between the sub-bundles indicate that attempting to perform all of the fuel handling refurbishment work under one contract could be administratively burdensome and lead to project management challenges.

RECOMMENDATIONS

Concentric recommends that Ontario Power Generation revise its commercial strategy document to expand on the business case for the sub-bundling and competitive bidding approaches. Through interviews and data requests, Concentric was able to increase our understanding of the fuel handling commercial strategy

significantly, and many of the materials provided to Concentric as part of this process could be used to increase the robustness of the Company's commercial strategy documents.

Such expanded documentation should include an evaluation of how the risks that might typically be increased from a strategy that involves multiple vendors and contracts (*e.g.,* coordination challenges, technical integration of components, increased administrative burdens) are mitigated due to the timing, location, and work type of each sub-bundle.

VIII. CONCLUSION

Concentric was retained to review Ontario Power Generation's development and implementation of its commercial strategies for the Project. At a cost of $6 to $10 billion in 2009 dollars, excluding inflation and interest, and a duration of more than 18 years from the start of planning to conclusion of commissioning and project closeout activities, the Project is clearly a major undertaking for Ontario Power Generation, and it is subject to financial, economic, regulatory, political, and execution risks. While effective commercial strategies are necessary to assist the Company in mitigating these risks, no commercial strategy can fully eliminate them.

To conduct our review of the Project's commercial strategies, Concentric undertook a detailed process to determine whether the strategies selected for the Fuel Handling work package are reasonable and meet the regulatory prudence standard. Our opinion of these strategies relied on information provided by the Company in response to our data requests, interviews with key personnel, our independent research and Concentric's experience advising other megaproject sponsors. Our review confirms the reasonableness and prudence of Ontario Power Generation's selected procurement strategies, and also includes observations and recommendations.

CONCENTRIC ENERGY ADVISORS

ASSESSMENT OF COMMERCIAL STRATEGIES DEVELOPED FOR THE DARLINGTON REFURBISHMENT PROJECT'S STEAM GENERATORS WORK PACKAGE

PREPARED FOR ONTARIO POWER GENERATION

FEBRUARY 2014

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I. EXECUTIVE SUMMARY

On September 9, 2011, Tory's LLP retained Concentric Energy Advisors, Inc. ("Concentric") to review the commercial strategies and contracts developed and implemented for the refurbishment of four CANDU heavy water reactors at Ontario Power Generation, Inc's ("Ontario Power Generation's" or the "Company's") Darlington Nuclear Generating Station ("Darlington" or the "Plant").[1] The Darlington Refurbishment Project (the "Project") will include removal and replacement of the reactor calandria tubes and pressure tubes from each reactor, replacement of all feeders, refurbishment of the existing fuel handling equipment, refurbishment of the existing turbine generators, refurbishment of the existing steam generators (herein referred to as the "Steam Generators" project), and a set of supporting refurbishment projects aligned with existing station systems. The plant modifications are planned to be made during 36-month outages for each of the four Darlington units between October 2016 and 2025.[2] The first refurbishment outage will be conducted on Unit 2 between Fall 2016 and Fall 2019. The remaining outages will occur between Fall 2019 and Fall 2025 with approximately 17 to 19 months of overlap between each successive outage.

Prior to commencing the execution phase work, Ontario Power Generation has committed to undertaking significant planning activities, which include working to develop and implement appropriate commercial strategies for a project of this magnitude. Concentric was engaged to review the Company's commercial strategies and how these strategies are being implemented. This report summarizes Concentric's review and opinion of the current Steam Generators work package commercial strategy.

The Project is following a standard megaproject progression that includes the following phases: (1) project initiation; (2) definition; (3) execution; (4) commissioning; and (5) project closeout. In the project initiation phase, a project is evaluated for its initial feasibility based on relatively high-level information that is readily available. Should a project prove feasible during the project initiation phase, it will proceed into the definition phase. During the definition phase, the project team undertakes detailed reviews of the project's anticipated scope, cost, and schedule to begin to define the activities that must be completed during the project, when those activities must be completed, and how much those activities are expected to cost. Concurrently, the project team begins to define the commercial strategies expected to be employed. Later during the definition phase, the project team is responsible for: (1) identifying, procuring and fabricating all long lead materials, components and tooling; (2) executing all of the necessary agreements to proceed with the major work packages; (3) completing the detailed scope and project schedule; and (4) developing a "release quality" cost and schedule estimate from which the project's performance can be measured. The release quality estimate and the integrated schedule available at the conclusion of the definition phase are more defined than prior iterations of the cost estimate and schedule, yet both still contain some uncertainty that is a component of any undertaking of this nature, particularly projects that compare to the Refurbishment Project in magnitude. Following the definition phase, a project enters the execution phase during which the actual plant modifications will take place. This stage is followed by the commissioning and project closeout phases. During these phases, the project team brings the project online and completes all of the recordkeeping associated with the project.

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1 As used in this context, commercial strategies refer to the processes by which Ontario Power Generation will procure goods and services for the Darlington Refurbishment Project.

2 As a practical matter, initial planning for the Project began in 2006 with the initiation of feasibility studies and plant technical assessments. Thus, from the Project's initiation to closeout, the Project will span nearly 20 years.

The initiation phase of the Project began in late 2007 with the preparation of a business case that evaluated, at a high level, the overall feasibility of completing the Project. In November 2009, the Project sought and received authorization from the Ontario Power Generation Board of Directors to proceed with the planning portion of the definition phase. In February 2010, the Ministry of Energy concurred with the Board of Directors' decision. To execute the work, Ontario Power Generation will retain multiple contractors for discrete portions of the Project work known as work packages. Consistent with this approach, Ontario Power Generation has proposed dividing the work into multiple major work packages, of which the Steam Generators work package is one.

As discussed in detail below, the commercial strategy Ontario Power Generation has selected for the Steam Generators work package includes a competitively-sourced Engineering Procurement and Construction ("EPC") arrangement. The Steam Generators project team issued a Request for Expressions of Interest to potential vendors in 2011 and extended a Request for Proposals ("RFPs") to two proponents in February 2013.[3] The Company received final proposals in May, and in mid-July the Company selected a vendor for detailed negotiations. The Company executed an EPC contract with a consortium of Babcock & Wilcox Canada Ltd. ("B&W") and Candu Energy Inc. ("Candu," together referred to as "B&W/Candu") on December 30, 2013. The contract contains a combination of fixed and firm pricing for known or highly definable tasks, and target pricing for work elements that remain undefined or that are dependent on conditions that arise during execution. Throughout the balance of this phase of the Project, the Company will work with its EPC contractor to advance engineering and planning. It will also execute all necessary supplemental project agreements, and develop a release quality cost estimate, among many other activities.

II. SUMMARY OF CONCLUSIONS

As discussed below, Concentric concluded that, based on activities that have taken place between late 2009 and January 27, 2014, the commercial strategy Ontario Power Generation is employing for the Steam Generators work package is appropriate and reasonable and meets the regulatory standard of prudence.

Concentric's opinion is not without certain caveats and limitations, which are discussed in the sections that follow. Similarly, the basis for our opinions are described throughout the remainder of this document.

III. STANDARD OF REVIEW

To conduct our review of the commercial strategy selected by Ontario Power Generation for the Steam Generators work package, Concentric sought to answer three primary questions:

1) Is the commercial strategy selected by Ontario Power Generation for the Steam Generators work package reasonable?

2) Is the Company executing that commercial strategy in a reasonable manner?

3) Do the selected commercial strategy and the execution of that strategy meet the regulatory standard of prudence?

[3] The period between the Request for Expressions of Interest and the RFP for Steam Generators was planned by the Project, and is a function of variety of business considerations, including the optimal timing of the Steam Generators solicitation in the context of other Project procurement activities.

To answer these questions, Concentric adopted a definition for the regulatory standard of prudence based on Concentric's work before state, provincial and federal energy regulators in both Canada and the United States. The definition utilized by Concentric is consistent with decisions rendered by the Ontario Superior Court of Justice,[4] the Court of Appeal for Ontario,[5] the Ontario Energy Board,[6] and the U.S. Supreme Court,[7] among other jurisdictions. Specifically, Concentric defined the prudence standard as examining the range of actions that a reasonable manager would take given the facts or circumstances that were known or knowable at the time of the decision or action. That definition rejects the use of hindsight as a basis for determining the prudence of a decision or action. In addition, that definition relies on an evaluation of decisions or actions. Project costs are neither prudent nor imprudent; instead, costs are prudently or imprudently incurred as a consequence of the decisions and actions of management.

In this report, Concentric provides its assessment of the Company's development and execution of its commercial strategy for the Steam Generators work package in the context of the above-described standard of prudence review. In particular, Concentric is providing its opinion on the prudence and reasonableness of Ontario Power Generation's decisions to:

1) Elect to engage outside support for all six sub-packages of work envisioned for the Steam Generators scope of work;

2) Pursue an EPC contract with a single vendor for a bundled scope of work; and

3) Pursue a combination of fixed, firm, and target pricing for Steam Generators work.

These decisions are discussed in greater detail in the sections that follow.

IV. INFORMATION SOURCES

Our review and the development of our opinions relied on three primary information sources. First, Concentric submitted multiple rounds of data requests for information related to the Steam Generators work package. Second, Concentric performed independent research on topics including lessons learned and the experiences of other CANDU operators performing similar projects, the Canadian nuclear safety regime, and industry trends and practices for other large nuclear refurbishment projects. Third, Concentric conducted in-person and telephone interviews with members of the Steam Generators refurbishment project team.

V. GENERAL LIMITATIONS OF CONCENTRIC'S OPINION

The following are general limitations regarding the scope of our review:

4 2005 CanLII 4941 (Ont. Div. Ct.).

5 Court of Appeal for Ontario Decision, Docket: C55602, C55641 and C55633, June 4, 2013.

6 Decision with Reasons, RP-2001-0032, December 13, 2002. This Decision deals with Enbridge Gas Distribution Inc.'s (formerly Enbridge Consumers Gas or ECG) application for a Board Order approving rates for the 2002 Test Year.

7 Separate, concurring opinion of Justice Louis Brandeis, Missouri ex. Rel. Southwestern Bell Telephone Co. v. Public Service Commission, 262 U.S. 276 (1923).

- First, our review is limited to Ontario Power Generation's actions and documents prepared between late 2009 and January 27, 2014.[8] Concentric did not review Ontario Power Generation's actions related to the Project prior to or after that time period.
- Next, Concentric did not independently verify the appropriateness, sufficiency, or correctness of the project schedules, cost estimates, or scope. However, Concentric was informed of the processes used to develop these metrics, and we reviewed assessments from outside experts that were engaged by the Company specifically to evaluate whether the Project and commercial terms with key vendors are consistent with similar projects throughout the industry.
- In addition, Concentric assumed Ontario Power Generation will retain adequately qualified personnel to complete the Project generally and the Steam Generators work package specifically. Those resources are critical to the success of the project, and may be sourced internally, hired directly, or engaged through contracts with third parties.
- Concentric did not perform a compliance audit to determine whether Ontario Power Generation and the Project were in compliance with Ontario Power Generation's internal policies, procedures, instructions and guidelines, or applicable provincial and federal regulations. Similarly, Concentric did not conduct a legal review of Ontario Power Generation's agreements or proposed agreements with any contractors. Notwithstanding that limitation, Concentric did review relevant Ontario Power Generation internal policies and procedures, and relevant provincial and federal laws and regulations when developing our opinion.
- Finally, Concentric's review is not an assessment of the Project's likelihood of success. Successful execution of the Project generally and the Steam Generators work package specifically will require the efforts of many entities and individuals over many years, and the development and implementation of the Project's commercial strategies is only one contributor to project success.

VI. STEAM GENERATORS WORK PACKAGE COMMERCIAL STRATEGY

A. OVERVIEW

Ontario Power Generation's Steam Generators project team was established in early 2011 and included representation from a broad array of groups within the Company including Engineering, Execution, Supply Chain, and Contract Management. In addition, input for the Steam Generators refurbishment work was gathered from Law (internal and external), Finance, and Darlington Refurbishment Planning and Controls. The team's progress in developing a commercial strategy was communicated on a regular basis to appropriate corporate and Darlington Refurbishment executive leadership.

[8] The beginning of the period Concentric reviewed is roughly concurrent with Ontario Power Generation's completion of the Economic Feasibility Assessment of Darlington Refurbishment dated November 13, 2009. However, portions of the operational experience material reviewed by Concentric were prepared prior to this time.

To gauge the condition of the Steam Generators and associated hardware, a comprehensive Degradation Assessment was performed in 2000, and revised with additional detail in 2005.[9] These assessments were supported by a report prepared by Dominion Engineering Inc. in December 2008 that contained an exhaustive evaluation of the maintenance that will be required to extend the Plant's operation. Additional lifecycle maintenance assessments are conducted in considerable detail on a regular basis. The condition of the steam generators has consistently indicated that the concerted effort that has guided the Ontario Power Generation's steam generator maintenance program at Darlington has been beneficial, but that aggressive additional maintenance and monitoring will be necessary to ensure the units are able to operate for an additional 25-30 years. Consequently, the refurbishment of the Steam Generators work package will involve inspections and extensive physical maintenance. The project consists of six discreet components:

1. Primary Side Cleaning ("PSC"): mechanical maintenance on the inside dimension of the steam generator tubes. PSC has been selected as the approach to enhance reactor inlet header temperature and neutron over power performance and is expected to allow the current Steam Generators to continue to operate for an additional 25-30 years.

2. Primary Side Divider Plate Leakage Measurements: measure leak performance in comparison to measurements from prior maintenance outages.

3. Secondary Side Cleaning: Hydraulic lancing and visual inspection will be used to address the outer diameter of Steam Generator tubes.

4. Inspection and Maintenance work consistent with the Life Cycle Management Plan: While this work has historically been performed on a regular basis during maintenance outages, a portion of the scope to be completed during refurbishment is augmented from traditional maintenance in order to address performance degradation. Under the terms of its EPC contract, the Company may choose whether the Inspection and Maintenance work will be completed by B&W/Candu. In the alternative, this work would be performed by the Darlington Station's Inspections & Maintenance Services ("IMS") group.

5. Installation of Access Ports: New port access will permit Station Engineering staff to conduct visual inspections of Steam Generator internal components during refurbishment activities as well as in future maintenance outages. Ontario Power Generation continues to evaluate the optimal timing of the installation of access ports. This work may be completed during a post-refurbishment planned outage.

6. Lay-up work: Wet-layup requires recirculation and nitrogen cover gas for the secondary side. Lay-up of the primary side will involve circulation of dry, dehumidified air once the primary heat transport system is drained and prepared for refurbishment.

The Original Equipment Manufacturer ("OEM") of the Darlington Steam Generator sets was B&W. According to Ontario Power Generation, access to OEM support will be beneficial during maintenance and refurbishment, in particular with respect to work related to the Access Ports.

B. STEAM GENERATORS WORK PACKAGE: CONTRACTING MODEL

[9] "Darlington NGS Steam Generator Tubing and Internal Components Degradation Assessment." Darlington Refurbishment Project Document Number NK38-REP-33110-027, R001.

Ontario Power Generation completed an analysis of four contracting models for the Steam Generators work package: Self-Perform; Design-Bid-Build; Design-Build/EPC; and Turnkey. The Company's evaluation of risks and advantages of each approach indicated that the EPC approach offers the best opportunity to meet the Project's key cost, schedule and quality objectives and would avoid significant risks of each alternative approach. An EPC contract eliminates the significant coordination, oversight, integration, and administrative burden that would attend a Self-Perform or Design-Bid-Build approach. It also aligns with the Company's long-term business interest in pursuing a smaller, more efficient level of staffing at the Darlington Station. Finally, the Turnkey approach was determined not to match the overall Project commercial approach, in which Ontario Power Generation serves as the general contractor for all work. A turn-key arrangement would remove certain flexibility and oversight that the Company intends to preserve in order to ensure efficient and high-quality execution of the work packages.

C. STRATEGY WITH REGARD TO BUNDLING SUB-PACKAGES

In developing a Steam Generators commercial strategy, the Steam Generators project team conducted an analysis of risks and benefits of unbundling the elements in the scope of work. Six sub-packages were envisioned in an unbundled approach. (The project team determined that if the scope were to be split among different EPC contracts with the possibility of having a different vendor for each, layup work should be combined with the Primary Side Clean sub-package discussed above in Section VI.A.)

Unbundling the project elements would offer the ability to contract with vendors that have highly specific expertise with specific portions of the Steam Generators scope. In addition, the Company would retain the ability to use technologies and processes with which it is already familiar. (For example, using Kinectrics' Acoustic Leak Inspection System ("ALIS") technology for divider plate leakage detection and measurement would prevent any risks from employing techniques that have not been used in the Darlington units in the past.) Unbundling would also offer the potential for a more effective negotiating position for Ontario Power Generation in that more vendors would likely be qualified for particular types of work. Finally, limited-scope contracting would preserve the Company's ability to pivot to an alternative contractor for subsequent unit refurbishments if cost, scheduling, or performance expectations are not met by vendors focused on individual components of the Steam Generators work.

However, the benefits of unbundling the Steam Generators scope would be offset by significant risks to the Project. The primary risk Ontario Power Generation identified with unbundling was the integration and coordination challenges of managing the work of multiple vendors on equipment in a very constrained portion of the Darlington geography. As the general contractor for all refurbishment work, the Company is keenly aware of this risk and its impact on all Project work packages. For the Steam Generators project, a portion of which is close to being on the Refurbishment Program's critical path, this risk is particularly acute. The risk of managing the schedule for several different components of work on the Steam Generators hardware would be compounded by the need to manage the work of multiple different teams. Additionally, facilitating the work of multiple vendors on the Steam Generators eliminates the overall Refurbishment Project objective of minimizing points of accountability and would dramatically increase the level of effort and coordination required of the Company.

The alternative, *i.e.*, bundling the work in a single EPC contract, reduces Ontario Power Generation's administrative responsibilities for the scope of Steam Generators work and provides the Company with a single point of accountability. This will restrict the level of effort required of Ontario Power Generation to

coordinate the work of individual vendors, workforces, and execution timeframes. The Company also determined that a single, larger contract would be more likely to provide incentives to proponents to invest resources in necessary tooling, project development, and workforce training than a sequence of smaller contracts. Finally, combining the sub-packages may offer the possibility of creating a "partnership" relationship between Ontario Power Generation and the EPC vendor, although this type of relationship is highly dependent on the pricing structures, incentives, and opportunity for ongoing maintenance provisions that would need to be explicitly specified in a contract.

After weighing the costs and benefits of bundling and unbundling the work package elements, Ontario Power Generation reached the conclusion that the potential for interface risks and the administrative burden of managing multiple vendors did not justify the ability to seek contracts with a broader array of industry participants with specific, focused expertise. The Company determined that a single, bundled scope of work for the Steam Generators work package offered the best opportunity to achieve quality, cost, and schedule objectives for the Project.[10]

D. IDENTIFICATION OF QUALIFIED STEAM GENERATOR REFURBISHMENT VENDORS

Ontario Power Generation evaluated several contracting arrangements in development of its Steam Generators commercial strategy. In addition to the commercial principles that apply to all Darlington Refurbishment Project work, a number of priorities specific to the Steam Generators scope of work informed the evaluation and selection process, including:

- Completion of Steam Generators work on schedule and budget is crucial;
- Ontario Power Generation prefers not to own custom tools or lead the development of custom tool designs;
- The PSC component of the Steam Generators scope of work is currently very close to being on the overall Refurbishment Project critical path;
- Qualification of the PSC technology used by the vendor selected for that portion of work must be completed within a schedule that does not compromise other refurbishment activities.[11]

[10] While unbundling the work packages would allow Ontario Power Generation to engage directly with vendors that have domain expertise on a single sub-package of the Steam Generators work, the bundled EPC arrangement does not eliminate the opportunity to benefit from that expertise. Rather, it transfers execution risk and coordination responsibility to the EPC contractor. For example, the Company has historically contracted with Kinectrics to perform primary side divider plate leakage measurement using its proprietary ALIS technology. Bundled EPC proposals from both B&W and Areva indicated that the vendors would subcontract this work to Kinectrics. Consequently, this work will be completed by a vendor that is familiar with the Darlington units, while shifting the administrative and project management burden from Ontario Power Generation to its EPC contractor.

[11] PSC processes used by Areva and B&W (through its subcontract with Candu) have been qualified by Ontario Power Generation. However, both processes will require optimization and design acceptance, which is estimated to take approximately one year. Achieving "execution ready" status for the PSC technologies will take an additional year, meaning that the minimum lead-time for use of existing PSC processes at Darlington for refurbishment work is two years from Steam Generators contract execution. Qualification and optimization of altogether new PSC technologies would add a layer of complexity and substantial schedule risk to the Steam Generators work package, and the Refurbishment Project as a whole.

With these priorities in mind, Ontario Power Generation conducted an assessment of potential contractors that are capable of completing the scope of work under consideration. The Company found that AECL, Areva, B&W, and Westinghouse each possess the required capabilities for one or more of the sub-packages of the Steam Generators scope. In an effort to collect additional information regarding the various vendors' abilities to execute the scope of work, Ontario Power Generation issued a Request for Expressions of Interest to potential proponents in June 2011. On July 29, 2011, the Company received expressions of interest in participating in a formal proposal process from three proponent groups:

- Areva (with support in a subcontractor role from Promation and PHTH Logistics)
- B&W (with support from AECL and Intech as subcontractors)
- Westinghouse (with AECON, AMEC NSS, and Kinectrics as subcontractors)

Through extensive discussions with Westinghouse, Ontario Power Generation confirmed that the company and its partners did not have a qualified cleaning process for the PSC component of the Steam Generators base scope of work, which was an explicit requirement of the Company. This and other information gathered from the market, as well as the experience gained through the Company's extensive steam generators maintenance program, informed the development of Ontario Power Generation's Steam Generators pricing strategy.

E. STEAM GENERATORS WORK PACKAGE: PRICING MODEL

After deciding on a bundled, EPC approach to the Steam Generators work, Ontario Power Generation conducted an analysis of the scope of work in order to design pricing requirements the Company planned to issue with its formal RFP. Ontario Power Generation developed separate pricing strategies for each component of the Steam Generators work package.

1. *PSC*

   PSC work represents nearly 60% of the anticipated total cost of the Steam Generators work package. Much of the PSC scope (*e.g.,* tooling, mock-up, pre-execution engineering) has been defined in detail and can be completed at the vendor's facility. A fixed price has been selected for this portion of the work for the first unit, with firm pricing for the subsequent units.

   Successful execution is predicated on the EPC vendor having access to the equipment during the refurbishment outage. A target price structure is planned for the execution phase work for all four units.

2. *Primary Side Divider Plate Leakage Measurements*

   Ontario Power Generation has extensive experience with ALIS for divider plate leakage measurement at Darlington. A target price structure will be used for this portion of the work.

3. *Secondary Side Cleaning*

   Ontario Power Generation plans to use fixed pricing for the Secondary Side Cleaning (or "waterlancing") work on the first unit to be refurbished. This work on the remaining units will be completed using a firm price arrangement.

4. *Inspection and Maintenance (Optional: the Company may choose to have IMS complete this work.)*
The majority of inspection and maintenance activities has historically been completed by Ontario Power Generation and therefore, is well-known and can be planned in detail. A fixed price is planned for this work for the first unit, with target pricing for each following unit.

5. *Installation of Access Ports*
The majority of the planning and engineering work related to the Steam Generator Access Ports is well defined and can be completed at the vendor's facility. A fixed price basis is planned for the first unit planning and execution. The following units will be completed on a firm-price basis.

6. *Lay-up work*
Lay-up work design engineering will be fixed-price for the first unit, and firm for each remaining unit. Execution layup work will be completed on a target price basis.

The Steam Generators scope of work is currently estimated to cost less than $200 million. A more definitive cost estimate will be available later in the Project, at the close of the definition phase. To the degree possible, the Company plans to defer non-critical scope (*i.e.*, items that can be completed in the course of routine maintenance) discovered during refurbishment to future outages in order to control scheduling uncertainty and reduce stress on the near-critical path elements of the Steam Generators scope. To the degree that deferral is infeasible, additional scope will be developed using an appropriate pricing structure based on the nature of the additional scope.

VII. EXECUTION OF THE COMMERCIAL STRATEGY

Ontario Power Generation issued a formal RFP for the full scope of Steam Generators work in February 2013 to Areva and B&W/Candu.[12] Both proponents submitted bids on June 3, 2013. Ontario Power Generation conducted a thorough evaluation of bids between June 6 and July 4, 2013 using an established set of metrics to assess each proponent's ability to achieve technical and project management goals for the Steam Generators work. At the completion of this assessment, the Company determined that the B&W/Candu proposal was superior in terms of the technical approach, transparency, strength of the proponent organization, and cost. Ontario Power Generation commenced negotiations with B&W/Candu in mid-July, and while the Company was encouraged by the tenor of discussions with B&W/Candu throughout the process of negotiating the EPC contract, it continued to hold periodic discussions with Areva as a contingency plan.

Ontario Power Generation executed an EPC contract with B&W/Candu on December 30, 2013. Pre-refurbishment Steam Generators work is expected to begin in the first quarter of 2014.

VIII. CONCENTRIC'S OBSERVATIONS AND RECOMMENDATIONS

As stated above in the Summary of Conclusions, Concentric determined that the planning processes and activities completed by the Company between late 2009 and January 27, 2014 for the Steam Generators work

[12] Candu, a wholly-owned subsidiary of SNC-Lavalin, was formed when SNC-Lavalin purchased the commercial reactor division of AECL. This 2011 transaction included the transfer of commercial rights to the CANDU reactor technology.

package were appropriate and reasonable, and meet the regulatory standard of prudence. In addition, we have made observations and identified opportunities for improvement that can strengthen the project management and supply chain functions going forward. Those observations and opportunities include:

1. While the Company has obtained a number of external assessments of the condition of the Steam Generators (*e.g.*, the Dominion Engineering report discussed above), no external assessments of the Steam Generators refurbishment work package scope have been conducted to ensure that the scope contained in contracting documents is consistent with the condition of the system hardware. An external validation of the decision to include or remove portions of work from the refurbishment scope will enhance confidence in successful completion of the Project, and will demonstrate the comprehensiveness of scope considerations.

2. Concentric agrees with Ontario Power Generation that single point of accountability reduces the Company's integration and Project management risk. However, we believe the Company should explicitly identify (and to the degree possible, mitigate) risks that are introduced when the six components of work are packaged together. The larger scale of a bundled approach does not guarantee that work will be completed more effectively. In fact, the magnitude of the impact in the case that a single vendor struggles to complete the work to the required level of quality on budget and within schedule can be substantial. The company should begin to formulate contingency plans for the unlikely event that its selected vendor does not meet Ontario Power Generation's expectations on the first unit to be refurbished.

3. A requirement in the Company's RFP for Steam Generators explicitly specified that vendors must be able to complete base scope work without putting the Steam Generators on the Project's critical path. However, given that the Steam Generators work remains "near critical path," we suggest that Ontario Power Generation begin to plan methods of integrating additional resources into the work plan in the case that the selected Steam Generators refurbishment vendor begins to experience challenges meeting schedule, scope, or cost objectives. Having a "Plan B" contingency demonstrates prudent planning of a major work package within the refurbishment Project.

IX. CONCLUSIONS

Concentric was retained to review Ontario Power Generation's development and implementation of its commercial strategies for the Project. At a cost of $6 to $10 billion in 2009 dollars, excluding inflation and interest, and a duration of more than 18 years from the start of planning to conclusion of commissioning and project closeout activities, the Project is clearly a major undertaking for Ontario Power Generation, and it is subject to financial, economic, regulatory, political, and execution risks. While effective commercial strategies are necessary to assist the Company in mitigating these risks, no commercial strategy can fully eliminate them.

To conduct our review of the Project's commercial strategies, Concentric undertook a detailed process to determine whether the strategies selected by the Steam Generators Project team are reasonable, whether the strategies were executed in a reasonable manner and whether Ontario Power Generation's actions related to the selection and execution of those strategies meet the regulatory prudence standard. Our opinion of these

strategies relied on information provided by the Company in response to our data requests, in-person interviews, our independent research and Concentric's experience advising other megaproject sponsors. Our review confirms the reasonableness and prudence of Ontario Power Generation's selected procurement strategies.

CONCENTRIC ENERGY ADVISORS

ASSESSMENT OF COMMERCIAL STRATEGIES DEVELOPED FOR THE DARLINGTON REFURBISHMENT PROJECT'S BALANCE OF PLANT WORK PACKAGE

PREPARED FOR ONTARIO POWER GENERATION

FEBRUARY 2014

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I. EXECUTIVE SUMMARY

On September 9, 2011, Tory's LLP retained Concentric Energy Advisors, Inc. ("Concentric") to review the commercial strategies developed and implemented for the refurbishment of four CANDU heavy water reactors at Ontario Power Generation, Inc's ("Ontario Power Generation's" or the "Company's") Darlington Nuclear Generating Station ("Darlington" or the "Plant").[1] The Darlington Refurbishment Project (the "Project") will include removal and replacement of the reactor calandria tubes and pressure tubes from each reactor, replacement of all feeders, refurbishment of the existing fuel handling equipment, refurbishment of the existing turbine generators, refurbishment of the existing steam generators, and a set of supporting refurbishment projects aligned with existing station systems (herein referred to collectively as "Balance of Plant" projects[2]). The plant modifications are planned to be made during 36-month outages for each of the four Darlington units between October 2016 and 2025.[3] The first refurbishment outage will be conducted on Unit 2 between Fall 2016 and Fall 2019. The remaining outages will occur between Fall 2019 and Fall 2025 with approximately 17 to 19 months of overlap between each successive outage.

Prior to commencing the execution phase work, Ontario Power Generation has committed to undertaking significant planning activities, which include working to develop and implement appropriate commercial strategies for the Project, to better prepare for a project of this magnitude. Concentric was engaged to review the Company's commercial strategies and how these strategies are being implemented. This report summarizes Concentric's review and opinion of the current Balance of Plant work package commercial strategy.

The Project is following a standard megaproject progression that includes the following phases: (1) project initiation; (2) definition; (3) execution; (4) commissioning; and (5) project closeout. In the project initiation phase, a project is evaluated for its initial feasibility based on relatively high-level information that is readily available. Should a project prove feasible during the project initiation phase, it will proceed into the definition phase. During the definition phase, the project team undertakes detailed reviews of the project's anticipated scope, cost, and schedule to begin to define the activities that must be completed during the project, when those activities must be completed, and how much those activities are expected to cost. Concurrently, the project team begins to define the commercial strategies expected to be employed. Later during the definition phase, the project team is responsible for: (1) identifying, procuring and fabricating all long lead materials, components and tooling; (2) executing all of the necessary agreements to proceed with the major work packages; (3) completing the detailed scope and project schedule; and (4) developing a "release quality" cost and schedule estimate from which the project's performance can be measured. The release quality estimate and the integrated schedule available at the conclusion of the definition phase are more defined than prior iterations of the cost estimate and integrated schedule, yet both still contain some uncertainty that is a component of any undertaking of this nature, particularly projects that compare to the Refurbishment Project in magnitude. Following the definition phase, a project enters the execution phase during which the actual plant modifications will take place. This stage is followed by the commissioning and project closeout phases.

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1 As used in this context, commercial strategies refer to the processes by which Ontario Power Generation will procure goods and services for the Darlington Refurbishment Project.

2 The Balance of Plant work package includes Islanding, Shutdown/Layup and Services work scopes.

3 As a practical matter, initial planning for the Project began in 2006 with the initiation of feasibility studies and plant technical assessments. Thus, from the Project's initiation to closeout, the Project will span nearly 20 years.

During these phases, the project team brings the project online and completes all of the recordkeeping associated with the project.

The initiation phase of the Project began in late 2007 with the preparation of a business case that evaluated, at a high level, the overall feasibility of completing the Project. In November 2009, the Project sought and received authorization from the Ontario Power Generation Board of Directors to proceed with the planning portion of the definition phase. In February 2010, the Ministry of Energy concurred with the Board of Directors' decision. To execute the work, Ontario Power Generation will retain multiple contractors for discrete portions of the Project work known as work packages. Consistent with this approach, Ontario Power Generation has proposed dividing the work into multiple major work packages, of which the Balance of Plant work package is one. In its plans for the Balance of Plant work package, the Company is primarily relying on existing contracts with two qualified vendors for separate bundles of work within the Balance of Plant scope. Components of this scope will be allocated to the vendors under a defined methodology, and in most cases the work will be completed using an Engineering Procurement and Construction ("EPC") arrangement. Throughout the remainder of the initiation phase of the Project, the Company will complete planning, solicitation, and negotiation of supplemental contracts for specialty components of the Balance of Plant work package. The Company will also execute any necessary project agreements, and develop a release quality cost estimate for the work, among many other activities.

II. SUMMARY OF CONCLUSIONS

As discussed below, Concentric has concluded that, based on activities that have taken place between late 2009 and January 20, 2014, the commercial strategy Ontario Power Generation is employing for the Balance of Plant work package is appropriate and reasonable and meets the regulatory standard of prudence. Concentric's opinion is not without certain caveats and limitations, which are discussed in the sections that follow.

The bases for our opinions on the prudence and reasonableness of the Company's Balance of Plant commercial strategy are described throughout the sections that follow.

III. STANDARD OF REVIEW

To conduct our review of the commercial strategy selected by Ontario Power Generation for the Balance of Plant work package, Concentric sought to answer three primary questions:

1. Is the commercial strategy Ontario Power Generation is pursuing for the Balance of Plant work package reasonable?
2. Is the Company executing that commercial strategy in a reasonable manner?
3. Do the selected commercial strategy and the execution of that strategy meet the regulatory standard of prudence?

To answer these questions, Concentric adopted a definition for the regulatory standard of prudence based on Concentric's work before state, provincial and federal energy regulators in both Canada and the United States. The definition utilized by Concentric is consistent with decisions rendered by the Ontario Superior Court of

Justice,[4] the Court of Appeal for Ontario,[5] the Ontario Energy Board,[6] and the U.S. Supreme Court,[7] among other jurisdictions. Specifically, Concentric defined the prudence standard as examining the range of actions that a reasonable manager would take given the facts or circumstances that were known or knowable at the time of the decision or action. That definition rejects the use of hindsight as a basis for determining the prudence of a decision or action. In addition, that definition relies on an evaluation of decisions or actions. Project costs are neither prudent nor imprudent; instead, costs are prudently or imprudently incurred as a consequence of the decisions and actions of management.

In this letter, Concentric provides its assessment of the Company's development and execution of its commercial strategy for the Balance of Plant work package in the context of the above-described standard of prudence review. In particular, Concentric is providing its opinion on the prudence and reasonableness of Ontario Power Generation's decision-making and plans regarding the division of Balance of Plant work primarily among the Company's two Extended Services Master Services Agreement ("ESMSA") vendors. As is discussed below in Section VI, selection of the ESMSA vendors took place using a competitive process that was conducted in 2011.

IV. INFORMATION SOURCES

Our review and the development of our opinions relied on three primary information sources. First, Concentric submitted multiple rounds of data requests for information related to the Balance of Plant work package. Second, Concentric performed independent research on topics including lessons learned and the experiences of other CANDU operators performing similar projects, the Canadian nuclear safety regime, and industry trends and practices for other large nuclear refurbishment projects. Third, Concentric conducted a series of in-person and telephone interviews with members of the Balance of Plant refurbishment project team.

V. GENERAL LIMITATIONS OF CONCENTRIC'S OPINION

The following are general limitations regarding the scope of our review:

- First, our review is limited to Ontario Power Generation's actions and documents prepared for the Balance of Plant work package before January 20, 2014.[8]
- Next, Concentric did not independently verify the appropriateness, sufficiency, or correctness of the project schedules, cost estimates, scope, or, from an engineering perspective, the division of responsibilities currently assigned or envisioned for the Balance of Plant scope of work.

4 2005 CanLII 4941 (Ont. Div. Ct.).

5 Court of Appeal for Ontario Decision, Docket: C55602, C55641 and C55633, June 4, 2013.

6 Decision with Reasons, RP-2001-0032, December 13, 2002. This Decision deals with Enbridge Gas Distribution Inc.'s (formerly Enbridge Consumers Gas or ECG) application for a Board Order approving rates for the 2002 Test Year.

7 Separate, concurring opinion of Justice Louis Brandeis, Missouri ex. Rel. Southwestern Bell Telephone Co. v. Public Service Commission, 262 U.S. 276 (1923).

8 The beginning of the period Concentric reviewed is roughly concurrent with Ontario Power Generation's completion of the Economic Feasibility Assessment of Darlington Refurbishment dated November 13, 2009. However, portions of the operational experience material reviewed by Concentric were prepared prior to this time.

However, Concentric was informed of the processes used to develop these metrics, and we did review cost assessment documentation.

- We understand that the majority of the Balance of Plant scope of work has been split into a number of bundles that are being allocated primarily among the Company's two ESMSA vendors. This will allow Ontario Power Generation to balance the workload of those vendors for a large and logistically complex scope of work. The split in responsibilities will be based on vendor experience and skill set, location within the Plant, the systems being refurbished, and type of work in order to best meet the work package's objectives. While the majority of work will be allocated to the two ESMSA vendors, some specialty work elements of the work package may require separate contracting. Concentric has evaluated this approach to the division of responsibilities between the two ESMSA vendors, but has not evaluated the appropriateness of each vendor's responsibilities from an engineering perspective.

- Concentric assumes that Ontario Power Generation will retain adequately qualified personnel to complete the Project generally and the Balance of Plant work package specifically. Those resources are critical to the success of the project, and may be sourced internally, hired directly, or engaged through contracts with third parties, including the ESMSA vendors or other qualified contractors.

- Concentric did not perform a compliance audit to determine whether Ontario Power Generation and the Project were in compliance with Ontario Power Generation's internal policies, procedures, instructions and guidelines, or applicable provincial and federal regulations. Similarly, Concentric did not conduct a legal review of Ontario Power Generation's agreements or proposed agreements with any contractors. Notwithstanding that limitation, Concentric did review relevant Ontario Power Generation internal policies and procedures, and relevant provincial and federal laws and regulations when developing our opinion.

- Finally, Concentric's review is not an assessment of the Project's likelihood of success. Successful execution of the Project will require the efforts of many entities and individuals over many years, and the development and implementation of the Project's commercial strategies is only one contributor to project success.

VI. BALANCE OF PLANT WORK PACKAGE COMMERCIAL STRATEGY

A. OVERVIEW

Ontario Power Generation's Balance of Plant project team was established in mid-2011 and includes representation from throughout the Company, including Refurbishment Engineering, Execution, Supply Chain, Project Controls, and Nuclear Commercial Development. In addition, the Refurbishment Cross Functional Sourcing Team, the Refurbishment Program Executive Team, the ESMSA Contract Support function, and the Refurbishment and Darlington Operations and Maintenance Engineering groups provided input to the development of the Balance of Plant commercial strategy. As is documented in the Contracting Strategy for the Balance of Plant work package, the Project team was focused throughout this process on achieving the Company's core business objectives including safety, accountability, transparency, fairness, and

value for money.[9] In addition, the Balance of Plant team has focused on pursuing an EPC contracting approach,[10] which will minimize the risk inherent in integrating numerous vendors and prevent OPG from having to manage simultaneous tasks at various sites. As the Balance of Plant contracting strategy notes, engaging vendors under an EPC model will facilitate vendor engagement with the engineering challenges as scope continues to develop. This has been identified as a critical lesson learned from similar projects in the industry.

The Balance of Plant team began by reviewing the Darlington Component Condition Assessment ("CCA") reports in order to identify plant equipment and services that will require refurbishment or replacement, but that do not easily fit within the scope of the other work packages designated for the Darlington Refurbishment Project. This initial evaluation focused on:

- The type of work required for continued operation;
- The scheduling implications, requirements and dependencies;
- Long-lead procurement planning;
- Recommendations from the CCA reports; and
- Identification of systems that require collaboration with an Original Equipment Manufacturer ("OEM").

The Balance of Plant scope was evaluated in detail in the Fall of 2013 by a senior executive committee tasked with identifying scope elements that are best suited for lifecycle maintenance work rather than for completion within the Project.[11] The latest revision of the Balance of Plant commercial strategy integrates feedback received during this review process, and reflects changes in approach that result from the removal of approximately one third of the Balance of Plant scope requests from the Refurbishment program.

The Balance of Plant team investigated Canadian nuclear refurbishment operating experience to determine whether any high-level strategic planning principles have led to strong or weak execution performance in similar projects that have been completed at other nuclear generating stations. The team examined the refurbishments at Bruce and Pickering, in particular. Key lessons learned during those refurbishment projects include:

1. Valve replacement, which is a significant component of the Darlington Balance of Plant scope of work, must be carefully planned to ensure that the hardware installed by one vendor is not sequenced in such a way that it interferes with or must be removed by a different vendor performing other work at the site.

2. Significant value can be gained from involving the Balance of Plant vendor(s) in early planning stages. This involvement improves coordination of effort, it achieves a more comprehensive understanding of key site challenges, and it enables the vendor to secure adequate staff resources

[9] Contracting Strategy for Balance of Plant. Ontario Power Generation document number NK38-REP-09701-10102, R001.

[10] While Ontario Power Generation is planning to rely primarily on an EPC model, it has flexibility under the terms of the existing ESMSA contracts to select "E," "P," "C," or any combination thereof at its discretion based on the profile of work under consideration.

[11] Darlington Nuclear Refurbishment – Scope Review – Closure Report. Ontario Power Generation document number NK38-REP-09701-0467871, R000.

as a result of participation in and contribution to the development of refurbishment project logistics.

3. Efficiency gains can be realized by packaging work in a manner that makes optimal use of contractors with multiple areas of expertise. This not only reduces the number of contractor interfaces that must be managed from a Project and Schedule management perspective, but may reduce costs by packaging volumes of work together.

The project team determined early in its planning that the skill sets required to complete the Balance of Plant work are closely aligned with the ESMSA service providers. These vendors have been involved in traditional operations and maintenance projects at Darlington on an ongoing basis, and Ontario Power Generation plans to continue using these vendors for maintenance projects after refurbishment is complete.

The Company selected the ESMSA vendors through a competitive solicitation process designed to identify and engage firms capable of completing a broad array of maintenance and construction assignments such as the Balance of Plant work orders. This selection process initially involved 20 contractors as potential ESMSA vendors, including a number of firms with the full set of capabilities and Darlington Plant experience necessary for the range of tasks the ESMSA vendors will be required to complete.[12] The two firms that were eventually selected as ESMSA vendors (E.S. Fox and Black & McDonald), offered terms and conditions that set them apart from the other competing firms and provided significant value to the Company. In its ESMSA solicitation process Ontario Power Generation negotiated pricing and contract terms, significantly simplifying the process of engaging these vendors for defined packages of work. This process works particularly well for work packages that require limited design engineering or other highly technical requirements, but that require the ability to attract and organize a large team of skilled-trade professionals.

The Balance of Plant work package contains a variety of refurbishment activities that support essential Plant systems and services. Consistent with the lessons learned from prior refurbishment projects, the Balance of Plant bundles are designed to coordinate with station systems in order to minimize project management complexity and to restrict the number of potential interfaces that may arise during refurbishment execution.

A significant challenge facing the Balance of Plant project team is management of the work package's scope. As of the date of this report, the Company is proceeding with a Balance of Plant refurbishment scope that includes approximately 140 Darlington Scope Requests, at an estimated cost of approximately $500 million.[13] Ontario Power Generation's efforts to contain scope have already produced significant results, including a nearly 80% reduction in the number of valves requiring replacement during refurbishment. Nevertheless, the challenge of limiting "scope creep" will remain throughout the Project. As additions to Balance of Plant scope continue to materialize, the Company may determine the need to pursue contracts with specialized vendors for specific pieces of detailed work.[14]

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12 This range of activities includes, but is not limited to, the Balance of Plant refurbishment scope.

13 Of this estimated $500 million, approximately $375 million is estimated for defined elements of scope, and the remaining $125 is designated as contingency.

14 Required enhancements to the Digital Control and Monitoring Computer Systems is an example of work that does not fit easily into the structure of plant systems supported by the Balance of Plant work package. The Company plans to contract this highly technical work separately, while keeping the work within the Balance of Plant work package for project management and vendor oversight purposes.

B. INITIAL APPROACH TO BUNDLING BALANCE OF PLANT TASKS

Ontario Power Generation considered several approaches to organizing the components of the Balance of Plant work package. The first bundling approach was to divide the work into five key categories (Safety and Control Systems; Common Systems; Reactor Systems; Conventional Systems; and Special Programs) with separate contracting solicitations for each. This alternative would involve many points of accountability, would introduce the likelihood of conflicts and interference among vendors during execution, and would require considerable effort from Ontario Power Generation to manage and coordinate more vendors than may be necessary to complete the work.

The Company also considered bundling the work into a single package. This approach may offer efficiencies in terms of execution cost and scheduling, but it introduces significant risk. While it would eliminate the interfaces among multiple Balance of Plant vendors, it would fail to capture the advantage of being able to compartmentalize portions of work, would prevent the ability to balance workload between both capable vendors identified in the ESMSA solicitation process, and would eliminate the ability to respond quickly if one vendor experiences poor performance during execution. Ontario Power Generation instead chose to recast the work breakdown structure in a way that aligns with Darlington station systems, making optimal use of both ESMSA vendors. This will allow the Project to rely on the vendors that are best suited for different kinds of work.[15] This approach is designed to prevent over-extension of either vendor, while limiting the interface and project management risks the Company must bear.

C. CONTRACTING MODEL SELECTION

The Balance of Plant project team initially identified five alternatives for contracting the bundled scope of work:

1. Self-perform;
2. An open and competitive EPC process;
3. Sole-source (using the EPC model);
4. Separate Engineering, Procurement and Construction solicitations; and
5. Competitive EPC solicitation among the ESMSA vendors.

The Company selected the 5th option. Ontario Power Generation completed a Kepner-Tregoe ("KT") analysis on a single component of the Balance of Plant work in order to assess the comparative merits and risks of each of these approaches for contracting the bundled scope. The analysis indicated that seeking an

[15] For example, Black & McDonald has been designated as the vendor to refurbish Heat Transfer and Auxiliary systems because of their experience in ongoing work on these systems at Darlington. Likewise, E.S. Fox has strong experience working on Containment systems, including work on the refurbishment of units 1 & 2 at the Bruce Nuclear Generating Station.

EPC contract through a secondary-compete process restricted to approved ESMSA vendors would yield the best outcome and lowest risk to the Project.[16]

Based on the range of scope elements within the Balance of Plant work package, the Company determined that engaging both vendors for distinct packages of work allocated by system and location would provide Ontario Power Generation with a stronger ability to limit execution risk. The Company recognizes that engaging both ESMSA vendors raises interface management risk. However, as is discussed above, the method by which work is to be allocated among the vendors[17] is designed to limit this risk to the degree possible while preserving the ability to reassign packages of work if either vendor experiences challenges during the execution phase of the refurbishment Project.

VII. CONCENTRIC'S OBSERVATIONS AND RECOMMENDATIONS

As stated above in the Summary of Conclusions, Concentric determined that the planning processes and activities completed by the Company through January 20, 2014 were appropriate and reasonable, and met the regulatory standard of prudence. Concentric agrees that pursuing EPC arrangements for the Balance of Plant scope of work, using a logical separation of sub-packages between the two ESMSA vendors, will allow Ontario Power Generation to obtain value for money by preventing the over-extension of either vendor, reducing interfaces to a manageable number, and engaging qualified contractors capable of accommodating new elements of scope that may emerge as the Project progresses.

However, we note that significant risks to the Balance of Plant work package remain and must be closely monitored to ensure that they do not affect Project or work package milestones, performance, cost, or safety expectations. Our observations regarding Project risks that the Company should monitor and opportunities for commercial strategy improvement include the issues described below.

1. As of January 20, 2014, the majority of sub-bundles of Balance of Plant work have been allocated to the two ESMSA vendors or identified as specialty projects requiring separate contracting mechanisms. However, the assignment of new scope elements that emerges as the Project unfolds is likely to be a significant activity, and is likely to affect the competitive balance between and among the Company and its ESMSA vendors. To manage these contractors in these circumstances, the Company has recognized that it may need to develop a detailed, Balance of Plant-specific supplement to its ESMSA Contractor Management Plan ("CMP") to ensure the highest quality of execution of its Balance of Plant contracting strategy. We believe that the need for such a specific CMP supplement is likely enough to warrant development at the outset of this project. The magnitude of the project's budget contingency indicates that there is a reasonable likelihood of significant scope additions, and that several additional contracting

[16] Solicitation of EPC proposals from only the ESMSA vendors is considered a "secondary" compete because the ESMSA vendors already completed a rigorous and competitive selection process to achieve ESMSA designation. As is discussed in Section VI, the ESMSA process was conducted in 2011-2012, and resulted in the selection of two ESMSA vendors: E.S. Fox and Black and McDonald.

[17] As scope is defined for each Balance of Plant bundle of work, the Company determines whether to seek cost estimates from one or both ESMSA vendors based on a set of established work allocation criteria. The ESMSA vendors will then provide estimates based on the previously negotiated terms and conditions of their respective contracts. These estimates are then compared to assessments that are prepared for the Company by Faithful & Gould in order to ensure costs are reasonable.

decisions are likely to be needed as the project progresses. A project-specific CMP will also ensure that risks associated with engaging two EPC vendors for the bulk of the work package scope are well-documented and periodically reviewed.[18]

2. The ESMSA selection process was completed in order to identify industry vendors interested in and capable of completing a large and varied scope of work, including the elements that are envisioned for the Balance of Plant work package. Concentric agrees with the Company that the schedule constraints facing the project team are significant, and would render an open solicitation for an additional ESMSA vendor for the purpose of the Balance of Plant work infeasible. The time required to solicit proposals from qualified firms in the industry and to negotiate terms and conditions with another contractor would make it nearly impossible to achieve a reliable work package cost estimate on schedule.

   However, despite the elimination of approximately one third of the scope elements of the Balance of Plant work package, the magnitude of the scope may still place a strain on the non-refurbishment maintenance and capital expenditure activities the Plant currently relies on the ESMSA contractors to complete. For this reason, Concentric recommends that Ontario Power Generation prepare plans to engage a third contractor to fill a role similar to that of the ESMSA vendors if significant contingent scope arises during the execution of the Project. A third contractor would not likely be engaged for Balance of Plant work, but would relieve strain on the current ESMSA vendors by contributing to the regular plant maintenance and non-refurbishment project activities. This would free the existing ESMSA contractors to focus more resources on the Refurbishment Project without introducing an additional interface to the Balance of Plant work package. If necessary, this could be explored without impact on the Project's schedule.

3. Ontario Power Generation's Balance of Plant commercial strategy indicates that third-party assessments of vendor cost estimates will be used to ensure value for money but these cannot be completed until scope definition and design engineering are sufficiently advanced. By the time these assessments are complete, there may not be time to pursue alternative strategies without significant impact on Project schedule. Concentric recommends that, to the degree possible, Ontario Power Generation prepare for third-party assessments in advance in order to facilitate rapid turnaround of cost analyses. This will preserve the Project's ability to change course if it is determined that certain work package elements do not provide sufficient value for money.

4. The Company's Balance of Plant Commercial Strategy references established terms and conditions as a key benefit of engaging the ESMSA vendors to complete the Balance of Plant scope. However, the strategy also concedes that Ontario Power Generation will need to revisit portions of the existing ESMSA agreements for each bundle of the Balance of Plant scope in order to ensure that each agreement meets the objectives of the specific bundle of work to which it applies. This is currently managed through supplemental worksheets with details on specific requirements, which are provided to the ESMSA vendors when the Company seeks pricing for bundles of work it intends to assign. Concentric recommends that Ontario Power Generation clearly document the risks associated with requiring custom elements for each agreement under

[18] Extended Services Master Service Agreement: Contract Management Plan. Ontario Power Generation document number N-PLAN-00150-10001, R000.

the ESMSA contracts (*i.e.*, obtaining agreement from the ESMSA vendors on provisions contained in the supplemental worksheets).

5. The Balance of Plant contracting approach has evolved from the time of the KT assessment of contracting approach options. We recommend that Ontario Power Generation revise the KT Analysis that has been completed to ensure it reflects the current contracting strategy, and ensure that similar assessments are completed for each sub-bundle of Balance of Plant work in order to identify the optimal scoping approach under the ESMSA (*i.e.*, EPC or some alternative combination of engineering, procurement, and construction activities).

VIII. CONCLUSION

Concentric was retained to review Ontario Power Generation's development and implementation of its commercial strategies for the Project. At a cost of $6 to $10 billion in 2009 dollars, excluding inflation and interest, and a duration of more than 18 years from the start of planning to the conclusion of commissioning and project closeout activities, the Project is clearly a major undertaking for Ontario Power Generation, and it is subject to financial, economic, regulatory, political, and execution risks. While effective commercial strategies are necessary to assist the Company in mitigating these risks, no commercial strategy can fully eliminate them.

To conduct our review of the Project's commercial strategies, Concentric undertook a detailed process to determine whether the strategies selected by the Balance of Plant Project team are reasonable, whether the strategies were executed in a reasonable manner and whether Ontario Power Generation's actions related to the selection and execution of those strategies meet the regulatory prudence standard. Our opinion of these strategies relied on information provided by the Company in response to our data requests, in-person interviews, our independent research and Concentric's experience advising other megaproject sponsors. Our review confirms the reasonableness and prudence of Ontario Power Generation's selected procurement strategies.

UNDERTAKING JT1.4

Undertaking

TO PROVIDE EXHIBITS 9, 11, AND 12 OF THE DARLINGTON TURBINE GENERATOR EQUIPMENT SINGLE SOURCE JUSTIFICATION MEMO.

Response

Exhibits 9, 11, and 12 of the Darlington Turbine Generator Equipment Single Source Justification memo (filed at Ex. L-4.3-15 SEC-016, Attachment 1) are included as Attachments 1 to 3 (Attachments 1 to 3 contain confidential information).

Darlington Turbine Generator Equipment Single Source Justification

Exhibit 9

Faithful and Gould Class 5 Estimate

INFORMATION

Faithful+Gould ("F&G") Turbine Generator ("TG") Independent Estimate for Fixed Priced Contract

BACKGROUND & SUMMARY

An independent estimate was prepared and completed by Faithful+Gould (F&G), an independent 3rd party, on January 30, 2013 for the Turbine Generator Independent Estimate for the Fixed Priced Contract. The independent estimate was constructed to support project requirements and the contracting process and to assist the Negotiation Team in concluding discussions with the single source proponent. This included use of the independent estimate by the Pricing Team to assess the reasonableness of the pricing submission relative to the independent estimate.

The basis of estimate for the main scope areas for the fixed price contract is summarized in the *Turbine Generator (TG) Independent Estimate Basis of Estimate for Fixed Cost Contract* reference document.

REFERENCE DOCUMENTS / INFORMATION

- Faithful+Gould confirmation Memorandum for completion of Estimate for the Turbine Generator (TG) Independent Estimate for Fixed Price Contract
- Turbine Generator (TG) Independent Estimate Basis of Estimate for Fixed Cost Contract
- Summary of Excel Worksheet for Turbine Generator (TG) Independent Estimate for Fixed Priced Contract (Excel Worksheet 2012 0104 Estimate (1.01) 300114.xlsx

TURBINE GENERATION
Independent Estimate for Fixed Cost Contract

Date: 30 January 2013

This to confirm Faithful+Gould completed the Estimate for the Fixed Cost Turbine Generation Contract on 30 January 2013 and on a true independent basis free from direction, interference or falsehood.

The Independent Estimate resulted in the following overall Turbine Contract Scope Base Cost excluding Contingent Scope and Option Alternatives:-

SCOW	Work	Variability Cost	Risk Cost	UNIT 2	UNIT 3	UNIT 1	UNIT 4	TOTAL
ALL	Totals			109,782,194.43	53,381,116.79	113,717,661.92	72,608,675.56	349,489,648.70

All assumptions and caveats made in the creation of this estimate are included within the Estimate Worksheet and related tabs.

The Related Basis of Estimate (Ref **NK38-REP-41000-0455843 R000**) and Estimate (Reference "**20120104TGEstimate(1.01)300113.xlsx**" have both been uploaded to OPG SharePoint Site on 30 January 2013 as "Team Sites>Nuclear Support> Nuclear Refurb>1.3Program Control & Reporting>Estimating>Deliverables>07TGP>Gate2 Class4".

In confirmation of the above:

Independent Estimate

Prepared By:

L.M. Wright

Faithful&Gould

Technical Director

Independent Estimate

Assured By:

Trevor Green

Faithful&Gould

Senior Vice President

ONTARIO POWER GENERATION

Report

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Title:
TURBINE GENERATOR (TG)
INDEPENDENT ESTIMATE
BASIS OF ESTIMATE FOR FIXED COST CONTRACT

Turbine Generator (TG)
Independent Estimate
Basis Of Estimate
For
Fixed Cost Contract

NK38-REP-41000-0455843-R000 LOF

2013-01-30

Order Number: N/A
Other Reference Number:

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Prepared by: 01/30/2013
Ian Wright — Date
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Section Head
Project Controls

Accepted by: 01/30/2013
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Project Director
Project Execution

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BASIS OF ESTIMATE FOR FIXED PRICE CONTRACT

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Executive Summary

This is a shortened Basis of Estimate.

The objective of this Basis of Estimate (BOE) is to provide an independent detailed estimate for the planned Fixed Price Contract for Darlington Refurbishment (DR) Turbine Generation (TG) Project. In the specific, costs for subsequent Execution Scopes are not presented as these will be subject to a separate estimate due in May 2013.

The extensive detail of this Fixed Cost estimate is purposely constructed in sufficient available detail to support project requirements and the contracting process to proactively assist the OPG negotiation team in concluding or otherwise an agreement with the Single Source proponent. This Fixed Cost BOE is the result of numerous weekly and later daily validation meetings with the Project Team that facilitated open challenge to attain a quorum of understanding.

Costs for the OEM are only considered in this Fixed Cost BOE. Costs for the future Execution Phase will include OEM, appointed epC (Lead Contractor) and OPG.

The scope of this independent DR TG Estimate is detailed in the respective Scopes of Work (SOW) and related approved Darlington Scope Requests (DSR) as authorised by Technical Reviews and Scope Acceptance Reviews and Proponents Technical Documents appended to the relevant SOW's or as modified by relevant approved Darlington Refurbishment Decision Record and Analysis Summary Form (DRAS). In respect to Excel™ Worksheet, "*2012 01 04 TG Estimate (1.01) 300113.xlxs*" all SOW lines have been aligned to the relevant DSR and /or identified to a need for representation to the Scope Review Board. The current value of non approved SRB DSR's included in this BOE is [redacted].

Additional Scope items not recorded on approved DSR have been identified (e.g. Commissioning Components) to record variation to the agreed 2012 DSR Line Budget Reference 4B.

Base estimating assumptions made to collect this Independent Fixed Cost TG estimate include:

1. OEM to provide Project Management, Engineering and Manufacturing and be the main materials supplier for each of the SOW.
2. OEM based in Germany and all engineering and manufacturing (all units) complete to 2016.
3. Related Support Services and Equipment (SSE)
4. General Article costs and Allowable Cost within the calculated Indirect Cost (42%) and Disallowable Cost within the Fee
5. Travel and Expense
6. Warranty

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Summary of Fixed Cost Independent Estimate (C$)

[redacted]	Totals	109,782,194.43	53,381,116.79	113,717,661.92	72,608,675.56	349,489,648.70

This Independent Fixed Cost BOE provides an overall Estimate to Association for the Advancement of Cost Engineering (AACE) Class 4 with an accuracy range of High -30% to High +20% over all scope / non scope items.

Excel™ file "*2012 0114 TG Estimate (1.01) 300113.xslx*" documents, by content sheet, the full range of support material relied upon by the Independent Estimator.

This independent BOE is based on the Fixed Cost Scope of Work being executed by the OEM. In line with the, approved, " IP and Reverse Engineering Turbine Generators Report", dated March 2012 the use of reverse engineering performed by a non OEM vendor would give rise to a likely additional spend of [redacted] over the 4 units.

This Basis of Estimate is a true independent assessment of likely TG Fixed Cost Contract as outlined in this summary.

1.0 PROJECT MANAGMENT, PRELIMINARY ENGINEERING, DETAILED ENGINERING AND MANUFACTURING ENGINEERING

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 3.1

For each of the 5 SOW (refer to Worksheet 2012 0104 TG Estimate tab "18.1 Documents" for the full list of SOW's), an assumed Proponent Project Team was developed by identifying typical entity and number necessary to complete the identified scopes. Planned staff numbers were described as "Full Time" and "Part Time" and then applied with probability to reduce to Full Time Equivalents (FTE). The resultant FTE hours were applied to the planned schedule dates to derive SOW and Total Project Management (PM) Costs.

To provide cost sensitivity and estimate range to the assumed teams, percentage splits were taken across the 5 SOW. For example it is known that Turbine Controls (TC) and Excitation Controls (EC) will collectively assume 51% of the total PM/Engineering effort but the ratio of TC/EC will be 100/40. Similarly MSR scopes are known to be limited during Preliminary Engineering (MSR Water Separation) and thought to be less than 1% of PM / Engineering cost. This sensitivity was required to align team staffing requirements and acceptance to known estimating metrics.

Other assumptions are Unit 2 is expected to carry 100% of the estimated PM Costs. These costs will reduce to 40% by Unit 1 and to 30% for Unit 3 and to 25% for Unit 4. Engineering costs will in the same manner as Project Management have a spread of 100%, 20% 10% and 10% across the units. A further sensitivity was allowed to provide additional PM and Engineering cost to Generator and Auxiliary Scopes due to Stator Renewal and Rewinds during Units 1, 3 and 4 and costs adjusted to 30%, 40% and 60% respectively. This allows for the expected bump in costs due the additional degree of PM and Engineering effort to complete the Stator scopes.

MSR scopes have a very limited scope of work and therefore for this project element individual sensitivity was applied for Project Management, Preliminary engineering and Detailed Engineering and applied as 10%, 100% and 0% for Unit 1 and nothing beyond.

Proponent team structure was considered for grade and age and accordingly ranges for High / Median / Low were applied. Factors for Skill/Experience/Qualification were then judged for each of the 3 ranges. In the event, the "Median" range was applied given the acceptance that the OEM will structure a small core team of highly skilled individuals and supplement this with younger engineers all of whom are knowledgeable of the OEM's method of working.

On this basis, Unit costs were established and summarised (refer to Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 3.2 "PM Splits"). This later tab includes for Assessment and Vendor Owner Interface Requirements (VOIR). Examination of

current similar projects being executed at Pickering, VOIR costs for each of Preliminary Engineering, Detailed Engineering and Execution accounts for 1%, 16% and 19% of the respective PM and Engineering effort. According VOIR costs for TC and EC Scopes were maintained at these levels but adjusted down to 1%, 9% and 11% for Steam Turbine and Auxiliaries (ST&A), Generator and Auxiliaries (G&A) and Moisture Separator Re-heaters (MSR). Profit was applied at 11.1% to PM and Engineering effort.

In summary PM and Engineering cost is overall 26% of the Total Fixed Cost and the splits for the Scope of Work ST&A (37%), G&A (12%), EC (41%), MSR (94%) and TC (47%). G&A is impacted by the capital expenditure for the New Stator Mid Section and Rewinds whereas MSR have relatively lower Procurement costs. International Estimating Metrics indicate that PM and Engineering Costs to Total should be in the range of 15% for simple scopes, 20% to 25% for relatively complex and 30% to 35% for complex projects. This Fixed Cost PM and Engineering effort is deemed complex and thus the resulting % splits in total and across the SOWs is thought acceptable.

2.0 RATES AND RATE IDENTIFICATION

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab "5.2 Rates"

A wide range of engineering rates (Low / Median / High) across the specialties anticipated for each of the SOW's was analysed for the Baden-Wurttemberg area. The wage rate was taken at the relevant "High", "Median" and "Low" categories onto which Production Time burdens and Government burdens were applied to determine a Total Charge Rate.

A detailed study of Baden-Wurttemberg and related World Bank Reports 2012 confirms an area of stable high employment and high GNP. It is an area of high manufacturing base. This is relevant given the OEM's manufacturing base in the area. Research of typical High / Median / Low rates per hour were established together with impacts due to normal hours of work, holidays and vacation. The overall impression is one of low weekly working hours and high pay. Particular attention was made to the 4 Pack German Pension Provision and the impact this has on the burdened rate. The overall results are shown in Tab 5.2. A Look-Up Table was created as, "Tab 5.1 Crews" for each of the 37 entities identified. An average of rate for Engineering is [redacted] net of Assessment/VOIR, SSE, GA/Indirect and Profit. A similar average rate for the PM entities is [redacted] All hours are based on normal engineering hours of work for Germany and exclude any element for overtime.

A wide range of PM and Engineering rates (Low / Median / High) across the specialties anticipated for each of the SOW's was analysed for the Baden-Wurttemberg area. The wage rate was taken at each of the categories onto which Production Time burdens and

Government burdens were applied to determine a Total Charge Rate (TCR). The relevant TCR was applied as detailed in Item 1.0 above to determine the costs for PM and Engineering.

3.0 PROCUREMENT

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 14.1 "Mat Steam Turbine", 14.2 "Mat Generator", 14.3 "Mat Cyclic", 14.4 "Mat LO System" and 14.5 "Mat Thermocouples"

Each of the SOW's specify the need for the Material Procurement and this is recorded in Tab 4.1 'U2 Measured Works" against the SOW Clause and Sub Clause. Material measurement was conducted at OEM component level.

For EC material procurement costs, use was made of the OEM costs for similar work being planned for execution in the new fleet of UK Nuclear reactors. A similar exercise was established for TC Scopes.

With respect to ST&A, G&A and MSR material scopes the following applies. Identification to component item was established by use of Section Z of the OEM Maintenance Manuals and linking these specific component reference codes in DARWIN.

By use of DARWIN software, CATID's in were identified in PASSPORT and by use of D030 Models, component detail prices were established. In discovery during research of PASSPORT, and unless validated, prices are actually 1983 although recorded as being 1998. This is particularly important when applying PASSPORT costs to CATID's beginning with a 0, 1, 2 or 3. CATID's starting with a 4, 5 or 6 are deemed accurate and self validated.

The effect of this discovery was the need for all prices to be stabilised to a base 2012. This was accomplished by tying the PASSPORT prices to an index provided by, "The Handy-Whitman Index of Public Utility Construction Costs –Trends of Construction Costs", a speciality index that includes for Turbine Generation Plant in North America 1922 to 2011. The objectivity of this index is that deflation and inflation are tracked across the years 1922 to 2011. Thus, for this estimate, the period 1983 to 2011 was identified and applied. A final 3% escalation was applied for 2012. The result is an average of 1.0335% pa for the 30 observations taken and this result was applied to modify the PASSPORT price to a base 2012.

The OEM has submitted a detailed Technical Scope document as (ALSTOM #T530137 Machine HT320100) dated 2012-05-04 for the ST&A. This detailed component document sets down the recommended commissioning components. This estimate was used to quantify the ST&A Commissioning Components and priced by using PASSPORT Model (adjusted as required to meet alternative methods of calculation from other World Best Practice) and CATID

references as set out above. However, it is recognized that OPG Project Team intend to robustly challenge the OEM's stated recommendations and reestablish high probability of required Commissioning Components.

As similar OEM Technical Details do not exist for other SOW's, a line element was included within this Fixed Cost Estimate for Recommended Commissioning Components and is based on the proportions of ST&A.

Additional elements for Factory Testing (Level of Effort for PM and Engineering) and Freight (4% By Sea, 8% Air) were applied to relevant Procurement Costs. Testing costs were split 100%, 20%, 10% and 10% across Units 2, 1, 3 and 4.

To effect a reasonable spread of Recommended Components across the Units, the estimate assumes a 100%, 20%, 10%, 10% split from Unit 2 through Unit 1, 3 and 4.

4.0 GENERAL ARTICLE COST (INDIRECT)

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 2.1 "Allowed and Disallowed Cost", 2.2 "Contract Format", 2.3 "TG Fixed Cost Indirect Cost".

To establish in-directs percentage, reference was initially made to the Contract Format (assumed as being a combination of Fixed Cost and Reimbursable with Fee and Reimbursable).

From this, 32 items for Supplier Supplied Equipment (SSE) were identified and priced. Refer to Item 6.0 for the method of calculation. The 32 items achieve a 100% total but it is the actual line SSE item percentages that are carried to the 37 identified Contract Form lines which in turn create an identified Allowable Cost percentage onto which are added percentages for [redacted] The resultant TG Overhead and GA (i.e. Portion of the Fixed Fee) to be added to the TG Estimate DFL was established at [redacted]

5.0 PROFIT

Profit was established for the Fixed Price Cost based on similar experience observed during the Refurbishment and Feeder (RFR) Fixed Price Contract. Accordingly, Profit has been established at [redacted] across all relevant estimate lines.

6.0 SUPPLIER SUPPLIED EXPENDITURE (SSE)

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 13.1 "Incremental Dedicated IT Person", 13.2 "PO & Site Furniture", 13.3 "HO Mob & De-Mob", 13.4 "Home Office Furniture", 13.5 "PO Office & Stationary", 13.6 "HO Office & Stationary",

13.7 "Electronic Equipment Consumables", 13.8 "Computer Hardware", 13.9 "Electronic Communication Costs", 13.10 "Printing and Copying", 13.11 "Clean & Maintain Office Equipment", 13.12 "Construction Equipment", 13.13 "Site Transportation", 13.14 "Small Tools & Equipment", 13.15 "Scaffold Materials", 13.16 "PPE (Not RPPE)" and 13.17 "Company Vehicles".

Separate worksheets were established for each identified SSE element. Daily or Monthly Charge Rates were identified for the relevant tabs in consultation with Faithful+Gould's Contract Department and extended to the agreed schedule dates. Where SSE activities were identified but not thought as being applicable to a Fixed Cost Contract, resultant estimate recorded a zero cost. All worksheet tab totals were transferred and separately identified on the Estimate Summary (Tab 1.1 refers).

7.0 TRAVEL AND EXPENSES

Refer to Excel™ "Worksheet 2012 01 04 TG Estimate (1.01) 300113.xslx" Tab 12.1 "Reimbursable Expenses".

The above Reimbursable Expense worksheet identified Expense costs for Car Parking, Air-Flight Costs, Car Mileage, Per Diems, Hotels and Car Hire. Each of these expenses types had assumed rates applied from known cost for local hotels researched air flight costs, typical business mileage rates, etc. These elements are extended by assumed numbers of business trips and duration the OEM will need to make during the Fixed Cost Period.

8.0 WARRANTY

Letter of Credit (6% during Design, Manufacturing, Testing, and Delivery -Definition Phase, 10% during Field Mobilization, Installation and Commissioning of all Units - Execution Phase, and 2% during the Warranty Period) and Warranty costs were applied to the Fixed Cost estimate costs and spread across the Units 2, 1, 3 and 4.

9.0 EXCLUSIONS

This Fixed Cost BOE excludes

- OPG Oversight Cost
- Allowances for SAVH (Sickness, Accident, Vacation and Holiday) and CMO (Change Management Office) except where OPG directly execute work.
- Costs that are assumed to be captured at Program level and not Project level

- Contingency and Management Reserve
- Escalation
- Interest
- Tax throughput to OPG

- Impact of Alternative Contract Strategies

Report

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APPENDIX 1 Excel™ WORKSHEET 2012 0104 ESTIMATE (1.01) 300113.XLSX

Conf D7

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
					0.97	0.965	0.96	
ALL	Project Management	PM		42,791,604.59	11,393,849.92	8,788,459.67	8,457,771.99	71,431,686.16
ALL	Preliminary Engineering	PE		2,866,164.07	498,712.55	272,285.59	333,837.08	3,970,999.29
ALL	Definition and Manufacturing Engineering	DE		12,144,653.18	2,838,162.88	1,930,389.22	2,266,663.56	19,179,868.85
ALL	Procurement	PR		573,480.70	586,430.15	530,125.43	576,745.43	2,266,781.70
ALL	Recommended Components	PR	RS	11,166,615.66	5,583,307.83	2,233,323.13	2,233,323.13	21,216,569.76
ALL	Base Case Components	PR	SP	26,920,682.90	26,920,682.90	91,560,388.49	52,671,538.49	198,073,292.77
ALL	Verbally Advised Specified Scope	PR	VASP	33,500.00	33,500.00	33,500.00	33,500.00	134,000.00
ALL	Testing	PR	TEST	5,655,855.57	1,131,171.11	565,585.56	565,585.56	7,918,197.79
ALL	Cyclic	PR	CY	21,401.70	21,401.70	21,401.70	21,401.70	85,606.80
ALL	Special Tooling	ST		55,500.00	53,835.00	53,557.50	53,280.00	216,172.50
ALL	Freight	FREI		1,338,649.59	1,298,490.10	1,291,796.85	1,285,103.60	5,214,040.13
ALL	LOC/Warranty	WA		6,214,086.48	3,021,572.65	6,436,848.79	4,109,925.03	19,782,432.95
ALL	**Totals**			**109,782,194.43**	**53,381,116.79**	**113,717,661.92**	**72,608,675.56**	**349,489,648.70**
ALL	SSE	SSE		1,492,794.15	1,448,010.32	1,440,546.35	1,433,082.38	5,814,433.20
ALL	Training	TR		3,167,124.76	1,357,339.18	1,357,339.18	1,357,339.18	7,239,142.32
ALL	Expenses	EX		479,184.06	464,808.54	462,412.62	460,016.69	1,866,421.90
ALL	**Totals SSE, Training and Expenses**	**TR**		**5,139,102.97**	**3,270,158.04**	**3,260,298.15**	**3,250,438.26**	**14,919,997.42**
ALL	**Totals with Base, SSE, Training and Expense**			**114,921,297.40**	**56,651,274.83**	**116,977,960.07**	**75,859,113.82**	**364,409,646.12**
ALL	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ALL	Recommended Components	CONT	RS					
ALL	Base Case Components	CONT	SP					
ALL	**Totals with Contingent Scope**							
ALL	Options Specified Scope of Work	OSSW		36,271,489.20	35,183,344.52	35,001,987.08	34,820,629.63	141,277,450.43
ALL	Options on Recommended Components	PR	ORS	1,200,909.37	1,200,909.37	1,200,909.37	1,200,909.37	4,803,637.46

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
ST&A	Project Management	PM		7,604,120.87	2,103,079.46	1,613,913.23	1,332,726.48	12,653,840.04
ST&A	Preliminary Engineering	PE		687,879.38	137,575.88	68,787.94	68,787.94	963,031.13
ST&A	Definition and Manufacturing Engineering	DE		1,666,954.02	969,767.61	882,619.31	882,619.31	4,401,960.25
ST&A	Procurement	PR		-	-	-	-	-
ST&A	Recommended Components	PR	RS	7,004,115.66	3,502,057.83	1,400,823.13	1,400,823.13	13,307,819.76
ST&A	Base Case Components	PR	SP	3,523,148.75	3,523,148.75	3,523,148.75	3,523,148.75	14,092,595.02
ST&A	Verbally Advised Specified Scope	PR	VASP	-	-	-	-	-
ST&A	Testing	PR	TEST	-	-	-	-	-
ST&A	Cyclic	PR	CY	-	-	-	-	-
ST&A	Special Tooling	ST		27,750.00	26,917.50	26,778.75	26,640.00	108,086.25
ST&A	Freight	FREI		-	-	-	-	-
ST&A	LOC/Warranty	WA		1,230,838.12	615,752.82	450,964.27	434,084.74	2,731,639.95
ST&A	**Totals**			**21,744,806.81**	**10,878,299.86**	**7,967,035.37**	**7,668,830.35**	**48,258,972.39**
ST&A	SSE	SSE		-	-	-	-	-
ST&A	Training	TR		-	-	-	-	-
ST&A	Expenses	EX		-	-	-	-	-
ST&A	**Totals SSE, Training and Expenses**	**TR**		-	-	-	-	-
ST&A	**Totals with Base, SSE, Training and Expense**			**21,744,806.81**	**10,878,299.86**	**7,967,035.37**	**7,668,830.35**	**48,258,972.39**
ST&A	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ST&A	Recommended Components	CONT	RS					
ST&A	Base Case Components	CONT	SP					
ST&A	**Totals with Contingent Scope**							
ST&A	Options Specified Scope of Work	OSSW		-	-	-	-	-
ST&A	Options Specified Scope of Work	OSSW	A	-	-	-	-	-
ST&A	Option Price for Half Joint Flanges requiring offsite machining	OSSW	A1	955,025.13	926,374.38	921,599.25	916,824.12	3,719,822.88

ST&A	Option Price for Half Joint Flanges requiring modification of components as additional sealing rings for LP Blade Carriers Modification (Sealing Concept) - Note onsite machining need plus Special Tool Manufacture	OSSW	A2	885,158.40	858,603.65	854,177.86	849,752.06	3,447,691.97
ST&A	Option Price for Alignment Dowels and machining, drilling and reaming for LP Blade Carrier Modification (Sealing Concept)- Onsite and Offsite machining	OSSW	A3	191,808.00	186,053.76	185,094.72	184,135.68	747,092.16
ST&A	Option Price for One Set (3 LP's) of replacement LP, front and rear blade carriers to allow a rolling refurbishment of LP Blade Carriers to machine erosion rings	OSSW	A4	63,221.38	61,324.74	61,008.63	60,692.53	246,247.28
ST&A	Options Specified Scope of Work	OSSW	B	-	-	-	-	-
ST&A	Option Price for Replacement TL Actuators with integral EHC and modification of Servomotor to meet ST Control System Upgrade and PAC Scope 2012 09 and TL CV Actuator	OSSW	B1	119,880.00	116,283.60	115,684.20	115,084.80	466,932.60
ST&A	Option Price for Retention of existing Servomotor and replace EHC to integrate with new digital control system (Note Pricing included with TC)	OSSW	B2	-	-	-	-	-
ST&A	Options Specified Scope of Work	OSSW	C	-	-	-	-	-
ST&A	Option Price for Modification Kit to support modification on LP CV Servomotor to an individual digital electrohydraulic format (Note Within TC Price)	OSSW	C1	49,950.00	48,451.50	48,201.75	47,952.00	194,555.25
ST&A	Option Price for supply of 2 new MSR CV Actuators with individual digital electrohydraulic converters and isolating blocks (Note included with TC Price)	OSSW	C2	179,664.60	174,274.66	173,376.34	172,478.02	699,793.62
ST&A	Option Price for supply of components to modify the existing constant flow supply system to an axial piston pump demand flow system.	OSSW	D1	44,400.00	43,068.00	42,846.00	42,624.00	172,938.00
ST&A	Options on Recommended Components	PR	ORS	1,200,909.37	1,200,909.37	1,200,909.37	1,200,909.37	4,803,637.46

SOW	Name	Summary Code	Subp Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
G&A	Project Management	PM		8,667,065.17	1,071,132.07	892,610.06	1,929,167.72	12,559,975.02
G&A	Preliminary Engineering	PE		573,232.81	68,787.94	57,323.28	118,874.77	818,218.81
G&A	Definition and Manufacturing Engineering	DE		2,839,306.99	340,716.84	283,930.70	620,205.03	4,084,159.57
G&A	Procurement	PR		43,355.28	56,304.72	-	46,620.00	146,280.00
G&A	Recommended Components	PR	RS	3,885,000.00	1,942,500.00	777,000.00	777,000.00	7,381,500.00
G&A	Base Case Components	PR	SP	4,271,975.08	4,271,975.08	68,911,680.67	30,022,830.67	107,478,461.52
G&A	Verbally Advised Specified Scope	PR	VASP	-	-	-	-	-
G&A	Testing	PR	TEST	-	-	-	-	-
G&A	Cyclic	PR	CY	-	-	-	-	-
G&A	Special Tooling	ST		27,750.00	26,917.50	26,778.75	26,640.00	108,086.25
G&A	Freight	FREI		-	-	-	-	-
G&A	LOC/Warranty	WA		1,218,461.12	466,700.05	4,256,959.41	2,012,480.29	7,954,600.87
G&A	**Totals**			**21,526,146.45**	**8,245,034.21**	**75,206,282.87**	**35,553,818.50**	**140,531,282.03**
G&A	SSE	SSE		-	-	-	-	-
G&A	Training	TR		-	-	-	-	-
G&A	Expenses	EX		-	-	-	-	-
G&A	**Totals SSE, Training and Expenses**	**TR**		-	-	-	-	-
G&A	**Totals with Base, SSE, Training and Expense**			**21,526,146.45**	**8,245,034.21**	**75,206,282.87**	**35,553,818.50**	**140,531,282.03**
G&A	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
G&A	ecommended Components	CONT	RS					

G&A	ise Case Components	CONT	SP	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
G&A	**otals with Contingent Scope**			-	-	-	-	-
G&A	Options Specified Scope of Work	OSSW		-	-	-	-	-
G&A	Options Specified Scope of Work	OSSW	E					
G&A	Seal Oil Skid to replace skid at 100LVL and include for New Vacuum Oil and H2 Oil LCV's and PRV's and Level Indication on suction lines for pumps	OSSW	E1	832,988.40	807,998.75	803,833.81	799,668.86	3,244,489.82
G&A	New Extracting Fans and Motors (2 * 100%)	OSSW	E2	48,396.00	46,944.12	46,702.14	46,460.16	188,502.42
G&A	New Like for Like replacement Check Valve	OSSW	E3	61,050.00	59,218.50	58,913.25	58,608.00	237,789.75
G&A	Options on Recommended Components	PR	ORS	-	-	-	-	-

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
EC	Project Management	PM		5,347,672.40	1,688,076.00	1,286,281.05	1,065,159.52	9,387,188.97
EC	Preliminary Engineering	PE		252,222.44	50,444.49	25,222.24	25,222.24	353,111.41
EC	Definition and Manufacturing Engineering	DE		1,317,997.08	263,599.42	131,799.71	131,799.71	1,845,195.91
EC	Procurement	PR		-	-	-	-	-
EC	Recommended Components	PR	RS	-	-	-	-	-
EC	Base Case Components	PR	SP	8,846,933.97	8,846,933.97	8,846,933.97	8,846,933.97	35,387,735.89
EC	Verbally Advised Specified Scope	PR	VASP	-	-	-	-	-
EC	Testing	PR	TEST	2,093,677.19	418,735.44	209,367.72	209,367.72	2,931,148.06
EC	Cyclic	PR	CY	-	-	-	-	-
EC	Special Tooling	ST		-	-	-	-	-
EC	Freight	FREI		-	-	-	-	-
EC	LOC/Warranty	WA		1,071,510.18	676,067.36	629,976.28	616,708.99	2,994,262.82
EC	**Totals**			**18,930,013.26**	**11,943,856.67**	**11,129,580.98**	**10,895,192.16**	**52,898,643.07**
EC	SSE	SSE		-	-	-	-	-
EC	Training	TR		-	-	-	-	-
EC	Expenses	EX		-	-	-	-	-
EC	**Totals SSE, Training and Expenses**	**TR**		-	-	-	-	-
EC	**Totals with Base, SSE, Training and Expense**			**18,930,013.26**	**11,943,856.67**	**11,129,580.98**	**10,895,192.16**	**52,898,643.07**
EC	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
EC	Recommended Components	CONT	RS					
EC	Base Case Components	CONT	SP					
EC	**Totals with Contingent Scope**							
EC	Options on Recommended Components	PR	ORS	-	-	-	-	-

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
MSR	Project Management	PM		84,871.45	-	-	-	84,871.45
MSR	Preliminary Engineering	PE		143,308.20	-	-	-	143,308.20
MSR	Definition and Manufacturing Engineering	DE		-	-	-	-	-
MSR	Procurement	PR		-	-	-	-	-
MSR	Recommended Components	PR	RS	-	-	-	-	-
MSR	Base Case Components	PR	SP	-	-	-	-	-
MSR	Verbally Advised Specified Scope	PR	VASP	-	-	-	-	-
MSR	Testing	PR	TEST	-	-	-	-	-
MSR	Cyclic	PR	CY	-	-	-	-	-
MSR	Special Tooling	ST		-	-	-	-	-
MSR	Freight	FREI		-	-	-	-	-
MSR	LOC/Warranty	WA		13,690.78	-	-	-	13,690.78
MSR	**Totals**			**241,870.43**	**-**	**-**	**-**	**241,870.43**
MSR	SSE	SSE		-	-	-	-	-
MSR	Training	TR		-	-	-	-	-
MSR	Expenses	EX		-	-	-	-	-
MSR	**Totals SSE, Training and Expenses**	**TR**		-	-	-	-	-
MSR	**Totals with Base, SSE, Training and Expense**			**241,870.43**	-	-	-	**241,870.43**
MSR	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MSR	Recommended Components	CONT	RS					

MSR	Base Case Components	CONT	SP	-	-	-	-	-
MSR	**Totals with Contingent Scope**			[redacted]	[redacted]	[redacted]	[redacted]	-
MSR	Options Specified Scope of Work	OSSW		-	-	-	-	-
MSR	All components for tube bundle Retubing (Option 1)	OSSW	F1	4,843,766.93	4,698,453.92	4,674,235.08	4,650,016.25	18,866,472.17
MSR	All components for Replacement MSR (Option 2)	OSSW	F2	16,788,465.96	16,284,811.98	16,200,869.65	16,116,927.32	65,391,074.92
MSR	Options on Recommended Components	PR	ORS	-	-	-	-	-

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
TC	Project Management	PM		21,087,874.70	6,531,562.39	4,995,655.33	4,130,718.26	36,745,810.68
TC	Preliminary Engineering	PE		1,209,521.24	241,904.25	120,952.12	120,952.12	1,693,329.73
TC	Definition and Manufacturing Engineering	DE		6,320,395.09	1,264,079.02	632,039.51	632,039.51	8,848,553.12
TC	Procurement	PR		530,125.43	530,125.43	530,125.43	530,125.43	2,120,501.70
TC	Recommended Components	PR	RS	277,500.00	138,750.00	55,500.00	55,500.00	527,250.00
TC	Base Case Components	PR	SP	10,278,625.09	10,278,625.09	10,278,625.09	10,278,625.09	41,114,500.34
TC	Verbally Advised Specified Scope	PR	VASP	33,500.00	33,500.00	33,500.00	33,500.00	134,000.00
TC	Testing	PR	TEST	3,562,178.38	712,435.68	356,217.84	356,217.84	4,987,049.73
TC	Cyclic	PR	CY	21,401.70	21,401.70	21,401.70	21,401.70	85,606.80
TC	Special Tooling	ST		-	-	-	-	-
TC	Freight	FREI		1,338,649.59	1,298,490.10	1,291,796.85	1,285,103.60	5,214,040.13
TC	LOC/Warranty	WA		2,679,586.27	1,263,052.42	1,098,948.83	1,046,651.01	6,088,238.53
TC	**Totals**			**47,339,357.47**	**22,313,926.06**	**19,414,762.69**	**18,490,834.56**	**107,558,880.78**
TC	SSE	SSE		-	-	-	-	-
TC	Training	TR		-	-	-	-	-
TC	Expenses	EX		-	-	-	-	-
TC	**Totals SSE, Training and Expenses**	**TR**		-	-	-	-	-
TC	**Totals with Base, SSE, Training and Expense**			-	-	-	-	-
TC	Contingent	CONT		**47,339,357.47**	**22,313,926.06**	**19,414,762.69**	**18,490,834.56**	**107,558,880.78**
TC	Recommended Components	CONT	RS	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TC	Base Case Components	CONT	SP					
TC	**Totals with Contingent Scope**			-	-	-	-	-
TC	Options Specified Scope of Work	OSSW						
TC	For modification kits for the main HP steam CV actautors for the individual EHC's and Isolating Blocks (modification of the RS500 actuators on R1301(A-D)	OSSW	G1	199,977.60	193,978.27	192,978.38	191,978.50	778,912.75
TC	Six modification kits with individual EHC's and isolating blocks for the existing LP CV actuators (R1311-R1316)	OSSW	G2	199,977.60	193,978.27	192,978.38	191,978.50	778,912.75
TC	Two new MSR CV actuators with individual EHC's and isolatoing blocks. Replacing R1351 and R1352)	OSSW	G3	1,665,000.00	1,615,050.00	1,606,725.00	1,598,400.00	6,485,175.00
TC	4 new TL actuators to replace the common EHC (R1801) and the existing 4 HP CV actuators (R1301A-D)	OSSW	H1	761,548.80	738,702.34	734,894.59	731,086.85	2,966,232.58
TC	A new common EHC2000D to replace the common EHC (R1811) for the existing 6 LP CV actuators	OSSW	H2	857,097.60	831,384.67	827,099.18	822,813.70	3,338,395.15
TC	A new common EHC2000D to replace the common EHC (R1821) for the existing MSR CV actuators	OSSW	H3	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	4 new TL actuators to replace the common EHC (R1801) and the existing 4 HP CV actuators	OSSW	I1	1,523,097.60	1,477,404.67	1,469,789.28	1,462,173.70	5,932,465.15
TC	A new common EHC200D to replace the common EHC (R1811) for the existing 6 LP CV Actuators	OSSW	I2	299,966.40	290,967.41	289,467.58	287,967.74	1,168,369.13

TC	Two MSR CV actuators with individual EHC's and isolating blocks (Replacing R1351 and R1352)	OSSW	I3	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	4 new TL actuators to replace the common EHC (R1801) and the existing 4 HP CV actuators	OSSW	J1	1,523,097.60	1,477,404.67	1,469,789.18	1,462,173.70	5,932,465.15
TC	Six modification kits with individual EHC's and isolating blocks for the existing LP CV actuators (R1311-R1316)	OSSW	J2	299,966.40	290,967.41	289,467.58	287,967.74	1,168,369.13
TC	A new common EHC200D to replace the common EHC (R1821) for the existing MSR CV Actuators	OSSW	J3	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	4 new TL actuators to replace the common EHC (R1801) and the existing 4 HP CV actuators	OSSW	K1	1,523,097.60	1,477,404.67	1,469,789.18	1,462,173.70	5,932,465.15
TC	Six modification kits with individual EHC's and isolating blocks for the existing LP CV actuators (R1311-R1316)	OSSW	K2	299,966.40	290,967.41	289,467.58	287,967.74	1,168,369.13
TC	Two MSR CV actuators with individual EHC's and isolating blocks (Replacing R1351 and R1352)	OSSW	K3	769,274.40	746,196.17	742,349.80	738,503.42	2,996,323.79
TC	A new Common ECH2000D to replace the common EHC (R1801) for the existing 4 HP CV Actuators	OSSW	L1	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	A new Common ECH2000D to replace the common EHC (R1811) for the existing 6 LP CV Actuators	OSSW	L2	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	A new Common ECH2000D to replace the common EHC (R1811) for the existing 2 MSR CV Actuators	OSSW	L3	214,274.40	207,846.17	206,774.80	205,703.42	834,598.79
TC	Options on Recommended Components	PR	ORS	-	-	-	-	-

SOW	Name	Summary Code	Supp. Code	UNIT 2	UNIT 1	UNIT 3	UNIT 4	TOTAL
COM	Project Management	PM						-
COM	Preliminary Engineering	PE						-
COM	Definition and Manufacturing Engineering	DE						-
COM	Procurement	PR		-	-	-	-	-
COM	Recommended Components	PR	RS	-	-	-	-	-
COM	Base Case Components	PR	SP	-	-	-	-	-
COM	Verbally Advised Specified Scope	PR	VASP	-	-	-	-	-
COM	Testing	PR	TEST	-	-	-	-	-
COM	Cyclic	PR	CY	-	-	-	-	-
COM	Special Tooling	ST		-	-	-	-	-
COM	Freight	FREI		-	-	-	-	-
COM	LOC/Warranty	WA		-	-	-	-	-
COM	**Totals**			-	-	-	-	-
COM	SSE	SSE		1,492,794.15	1,448,010.32	1,440,546.35	1,433,082.38	5,814,433.20
COM	Training	TR		3,167,124.76	1,357,339.18	1,357,339.18	1,357,339.18	7,239,142.32
COM	Expenses	EX		479,184.06	464,808.54	462,412.62	460,016.69	1,866,421.90
COM	**Totals SSE, Training and Expenses**	**TR**		**5,139,102.97**	**3,270,158.04**	**3,260,298.15**	**3,250,438.26**	**14,919,997.42**
COM	**Totals with Base, SSE, Training and Expense**			**5,139,102.97**	**3,270,158.04**	**3,260,298.15**	**3,250,438.26**	**14,919,997.42**
COM	Contingent	CONT		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COM	Recommended Components	CONT	RS					
COM	Base Case Components	CONT	SP					
COM	**Totals with Contingent Scope**							
COM	Options on Recommended Components	PR	ORS	-	-	-	-	-

Darlington Turbine Generator Equipment Single Source Justification

Exhibit 11

Alstom Benchmarking Presentation

INFORMATION

ALSTOM OPG Darlington Benchmarking Analysis

BACKGROUND & SUMMARY

The Objective of the ALSTOM OPG Darlington benchmarking was to perform an analysis (normalized market pricing and project performance) of available and past Alstom projects with the current proposal for the OPG Darlington Turbine Generator ("TG") Engineering Services and Equipment Supply Project. The benchmarking considered and utilized recent historical pricing and performance data applied to OPG's scope, specifications, and pricing in the proposal. This included past pricing and performance on Alstom OPG contracts, Alstom won / executed projects for other customers, and Alstom proposed contracts for other customers. The analysis factored escalation, exchange rates and focused on Nuclear and Large Fossil Plant Alstom contracts from 2006.

The analysis reasonably verified approximately 76% of the total costs either through like projects, algorithm based or quoted and / or published data, or rates for reimbursable work. The remaining 24% used project performance metrics and summation of individual scopes. Benchmarking information for the Generator Mid-Section replacement, Stator rewind, Current Transformers, New Seal Oil Skid, Hydrogen Gas Cooling Skid, Stator Cooling Water Skid, and LP Erosion Protection Rings scope was provided. This benchmarking analysis indicated that prices were in accordance with market conditions and / or prices offered to other customers for similar scope. In the case of current transformers, prices offered by Alstom were lower than previously offered and supplied to OPG. Benchmarking information provided showed pricing for the above items was in accordance with prices offered to other customers.

The benchmarking information for technical field advisor (TFA) standard rate sheet confirmed OPG pricing was in accordance with market conditions and prices offered to other customers. Discounts to OPG rates are greater than OPG's current discount rates for TFA resources. Benchmarking of discounts showed discounts to OPG TFA rates for the TG Refurbishment Project were greater than the discounts for three other Alstom customer agreements which were either competitively bid or negotiated through an alliance agreement.

Project performance information was provided by Alstom for Turbine Controls and Excitation Controls projects for successful on-time and on-budget completion. In addition, further details which were provided on the recent Alstom press release related to the retrofit of controls

systems on EDF's 1300 MWs plants confirming the technical scope for this project was for an Alstom alarm system solution and it is not comparable to the Darlington controls scope.

REFERENCE DOCUMENTS / INFORMATION

- Presentation: OPG Darlington Benchmarking Analysis, Jim McConnell, March 1, 2013

OPG Darlington Benchmarking Analysis

Jim McConnell

March 1, 2013

ALSTOM

OPG Darlington Benchmarking Analysis - Objective

Perform a benchmarking analysis (normalized market pricing and project performance) of available past Alstom projects with the current proposal for the OPG Darlington Nuclear Generating Station Turbine Engineering Services and Equipment Supply Project.

ALSTOM

OPG Darlington Benchmarking Analysis - Methodology

- "Independent" Verification and Validation (IV and V)
  - Verification by Alstom
  - Validation by OPG/Stakeholders

- Verification – Compile recent historical pricing and performance data that is applied to your specification and pricing sheets.
- Validation – Gain assurance that the "product" meets your intended need and is acceptable and suitable for its intended purpose.

Verification – Are we building it right ?
Validation – Are we building the right thing ?

ALSTOM

Benchmarking Process/Criteria/Assumptions

- Past Pricing and Performance
  - Past OPG Contracts
  - Won/Executed Projects (Others)
  - Proposed and Under Review
  - Proposed and Lost
- Escalation Rate (OECD – 2.85% per annum) for Data Period (2010-2012)
- Exchange Rate Euro/CAD = 1.351899
- Nuclear and Large Fossil Plants
- Darlington Unit 2 Scope (w/e/o stator mid-section and rewind kit - used Darlington Unit 3)

ALSTOM

Results (with 78.2 MCAD of Reimbursable Work)

Of the 349.7 MCAD:

- 40% can be reasonably verified by like projects
- 14% can be verified by an algorithm based on quoted or published data
- 24% cannot be verified by like projects or an algorithm. Other methodologies must be employed to provided verification and validation. Project performance metrics and summation of individual scopes may be used for validation
- 22% can be verified, as it is reimbursable work

ALSTOM

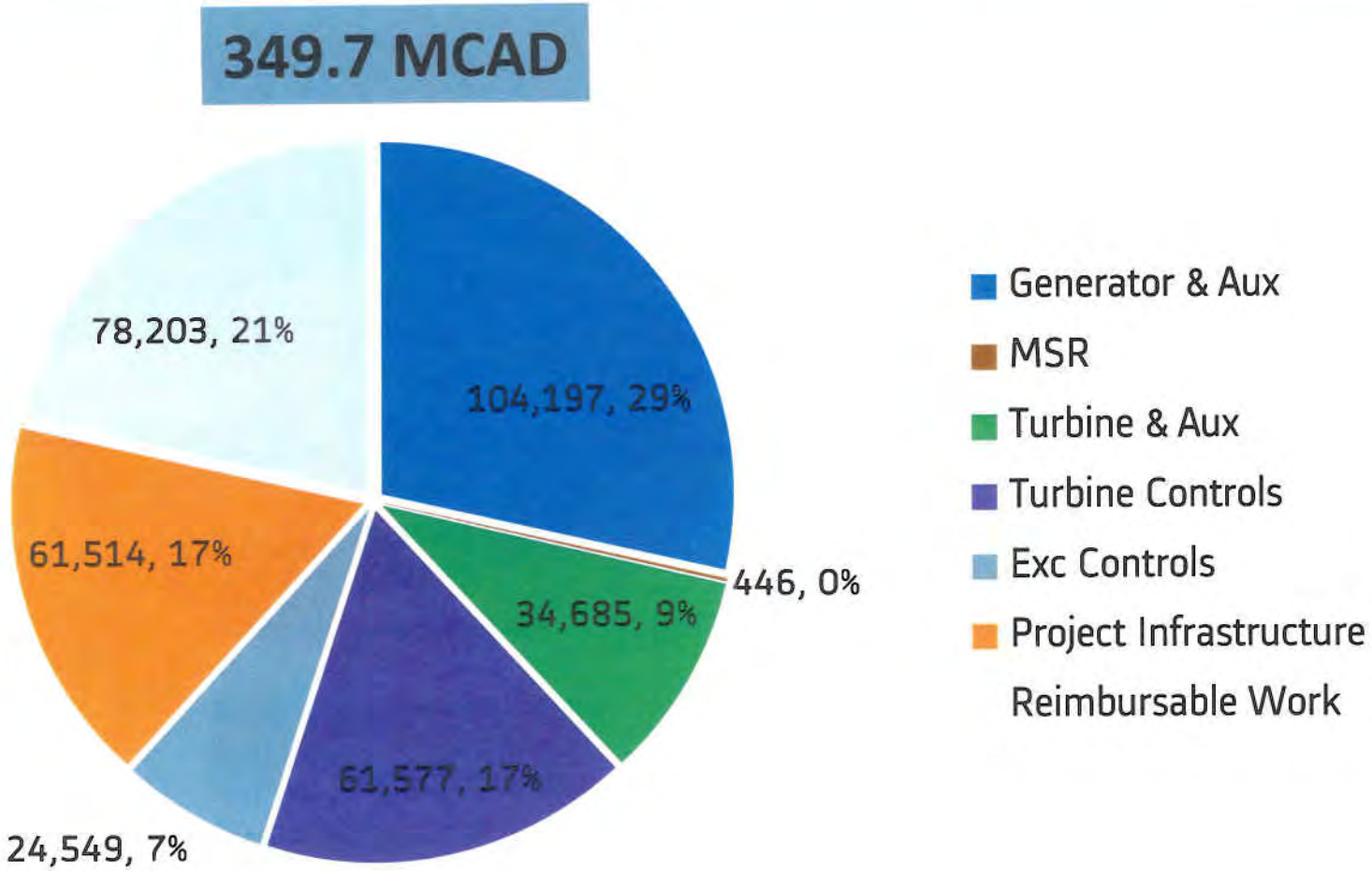
Results (without 78.2 MCAD of Reimbursable Work)

Of the 271.5 MCAD:

- 48% can be reasonably verified by like projects
- 22% can be verified by an algorithm based on quoted or published data
- 30% cannot be verified by like projects or an algorithm. Other methodologies must be employed to provided verification and validation. Project performance metrics and summation of individual scopes may be used for validation

ALSTOM

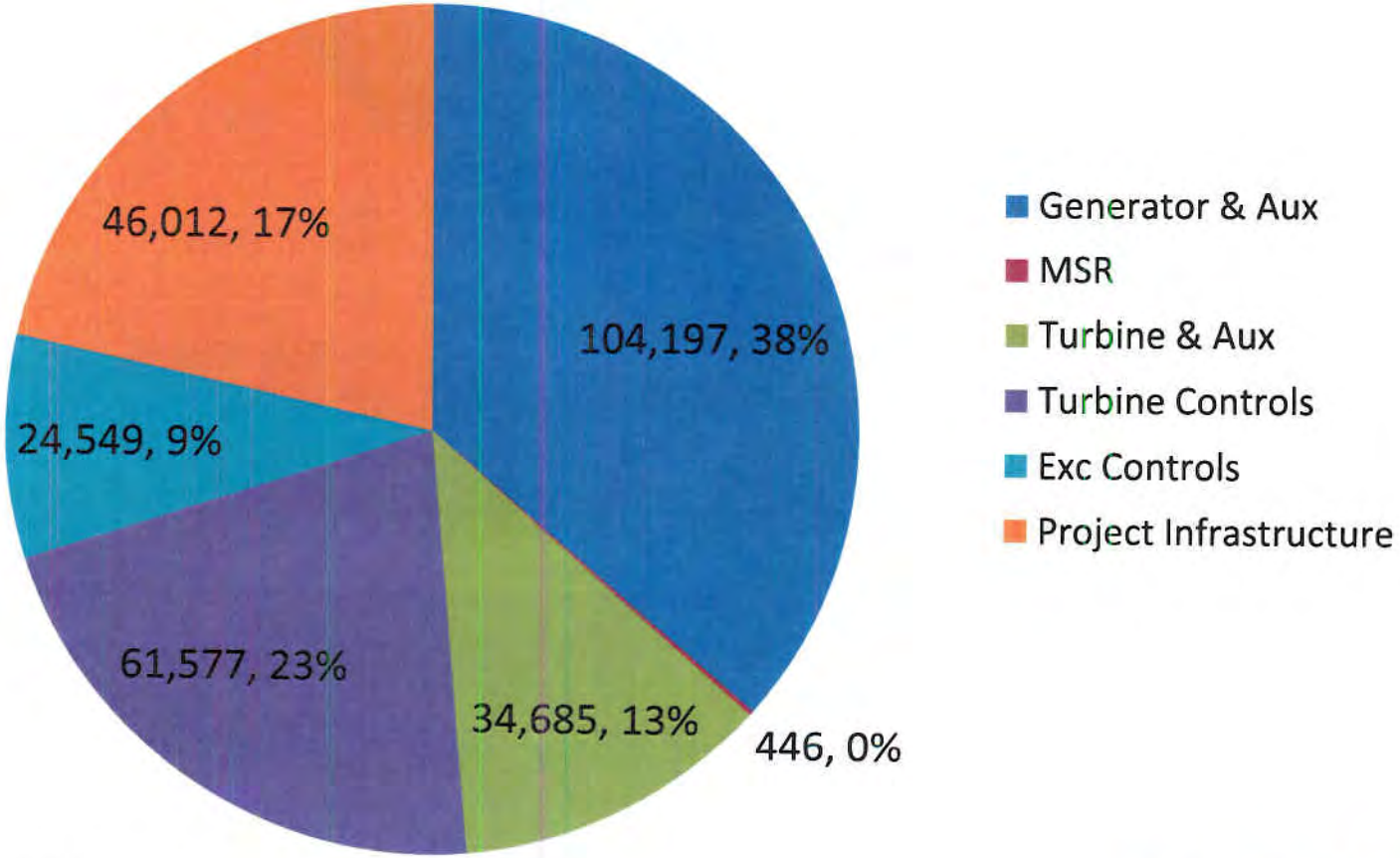
OPG DNGS TG Refurbishment Project – Main Categories Including Reimbursable Work



ALSTOM

OPG DNGS TG Refurbishment Project – Main Categories Without Reimbursable Work

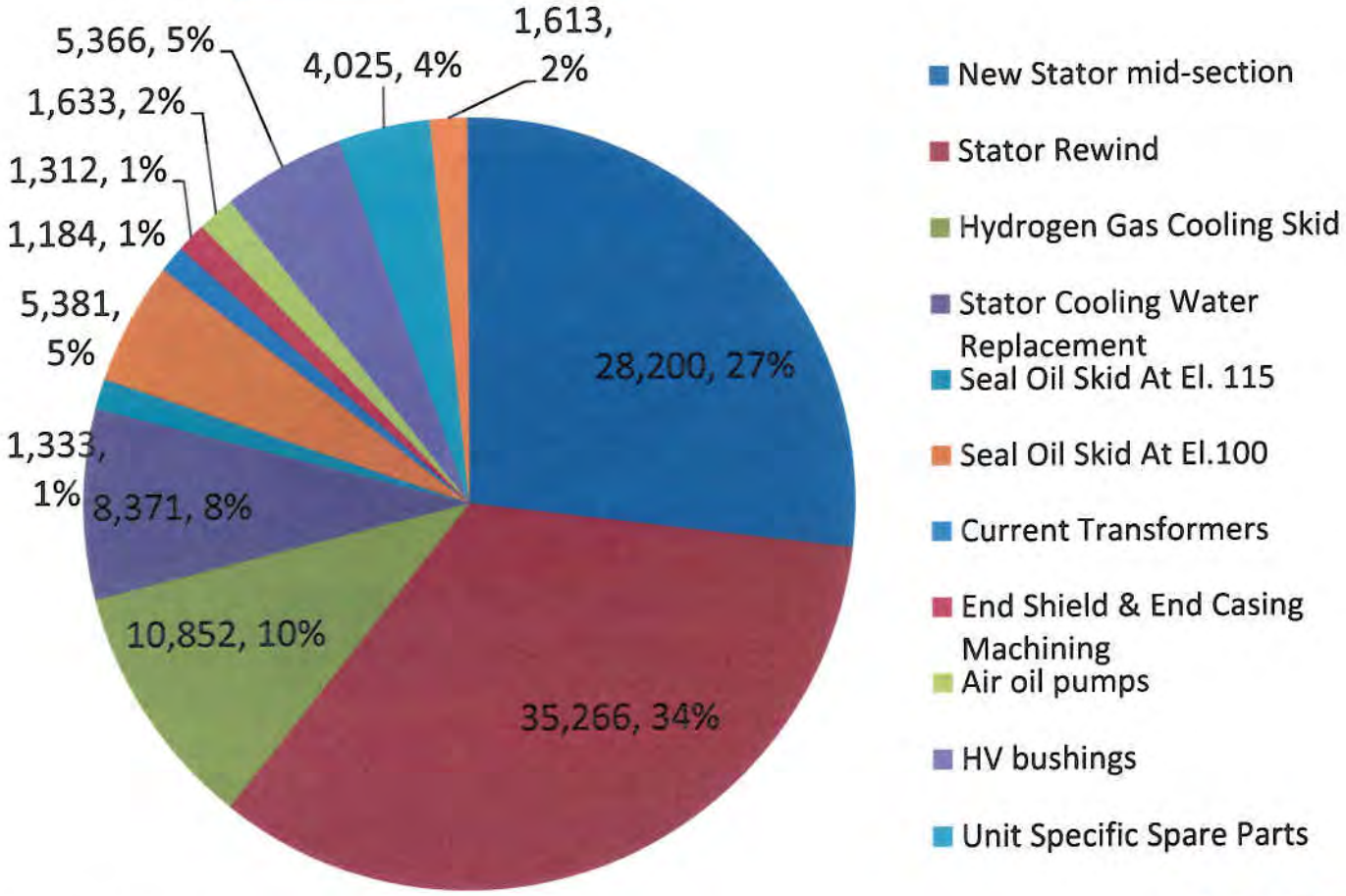
271.5 MCAD



ALSTOM

OPG DNGS TG Refurbishment Project – Generator

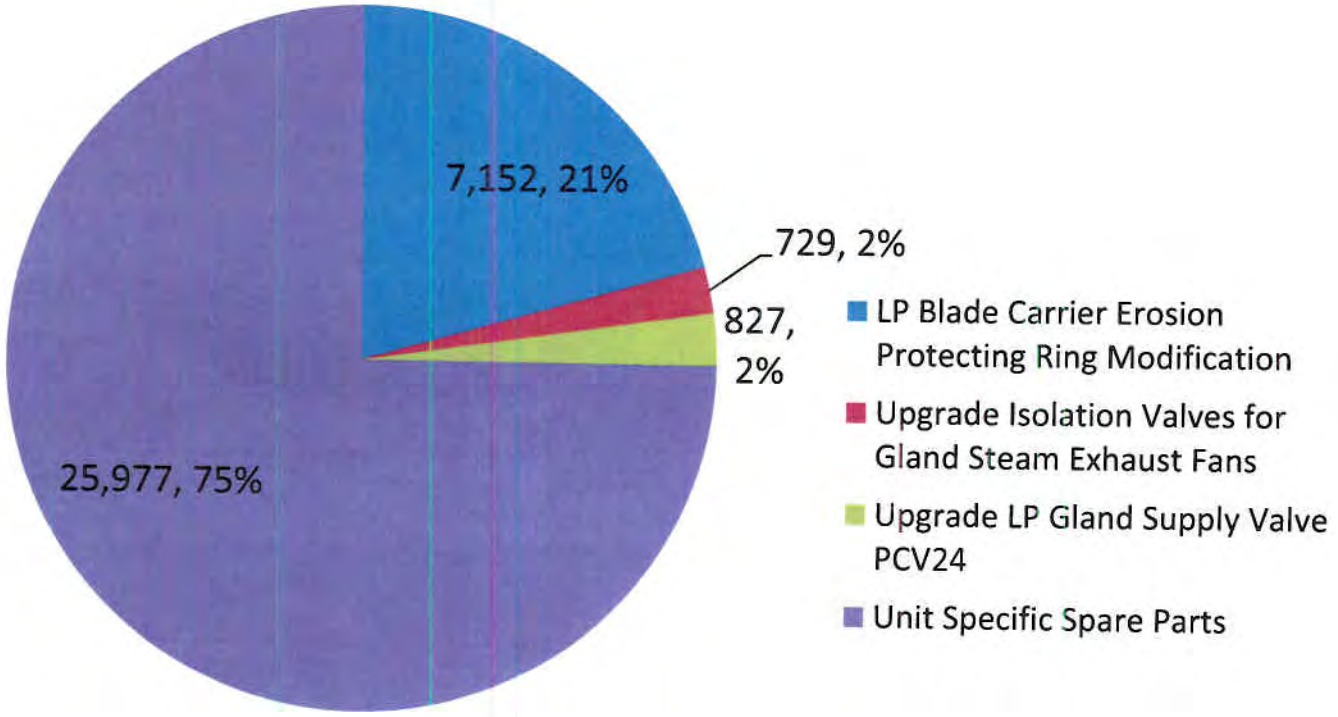
104.2 MCAD



ALSTOM

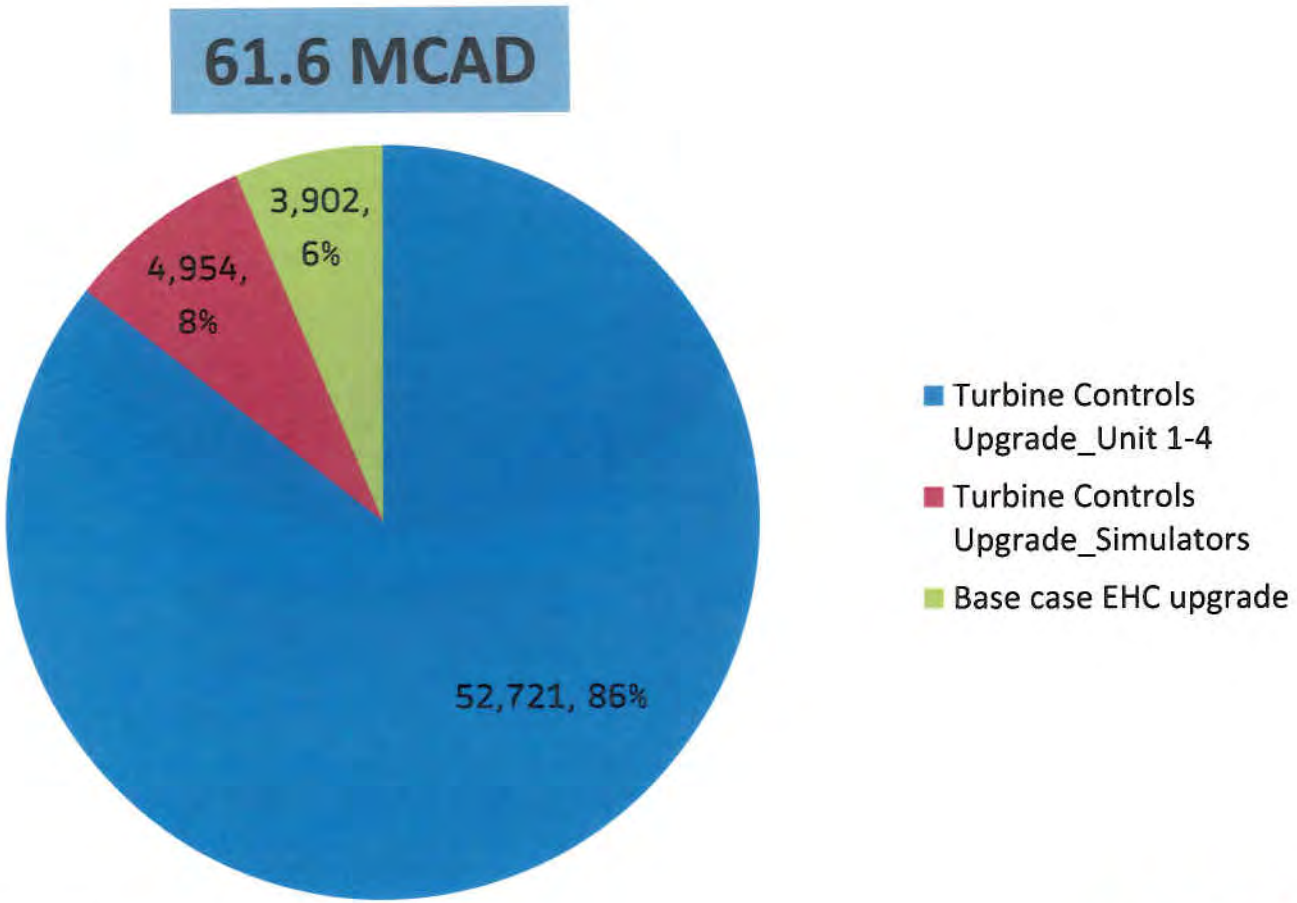
OPG DNGS TG Refurbishment Project – Turbine

34.7 MCAD



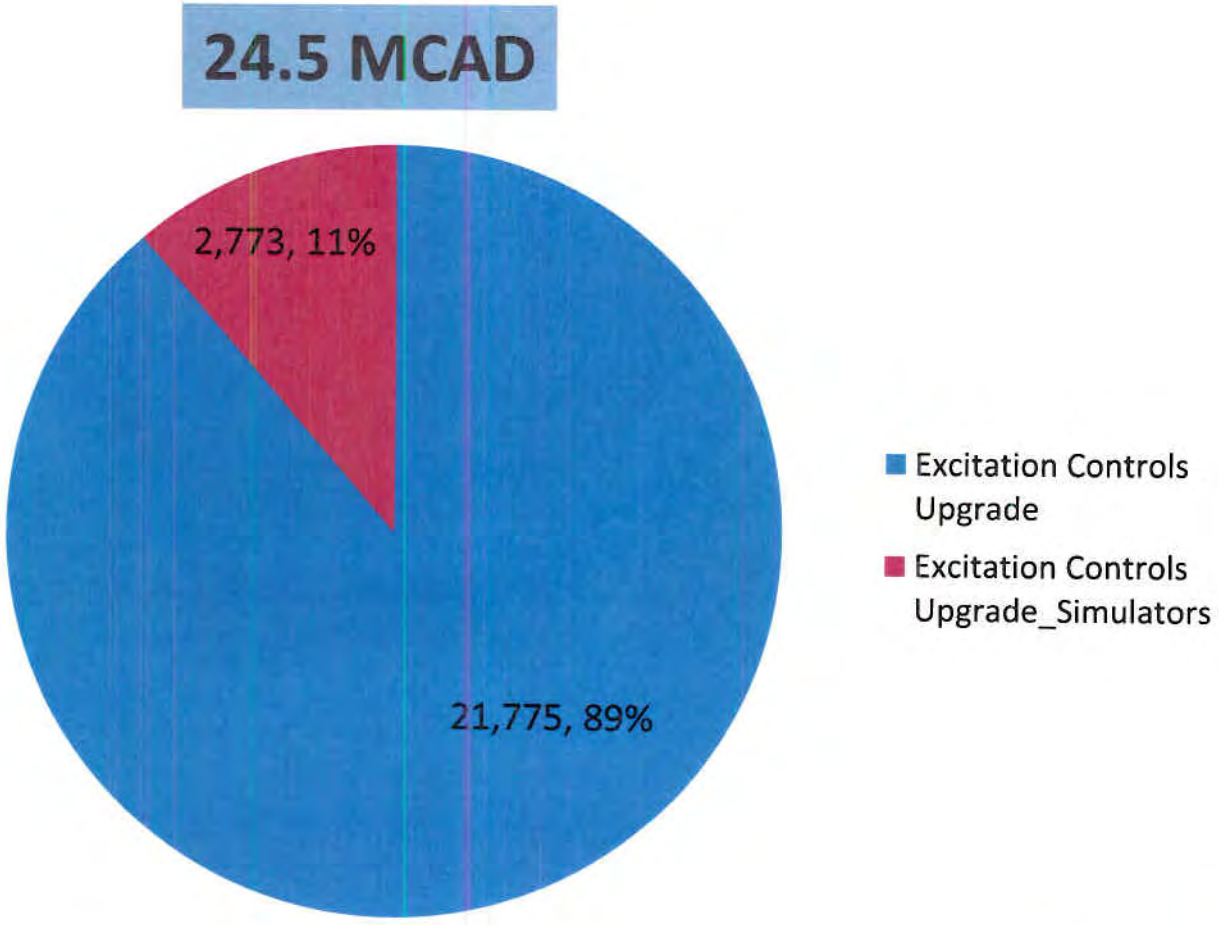
ALSTOM

OPG DNGS TG Refurbishment Project – Turbine Controls



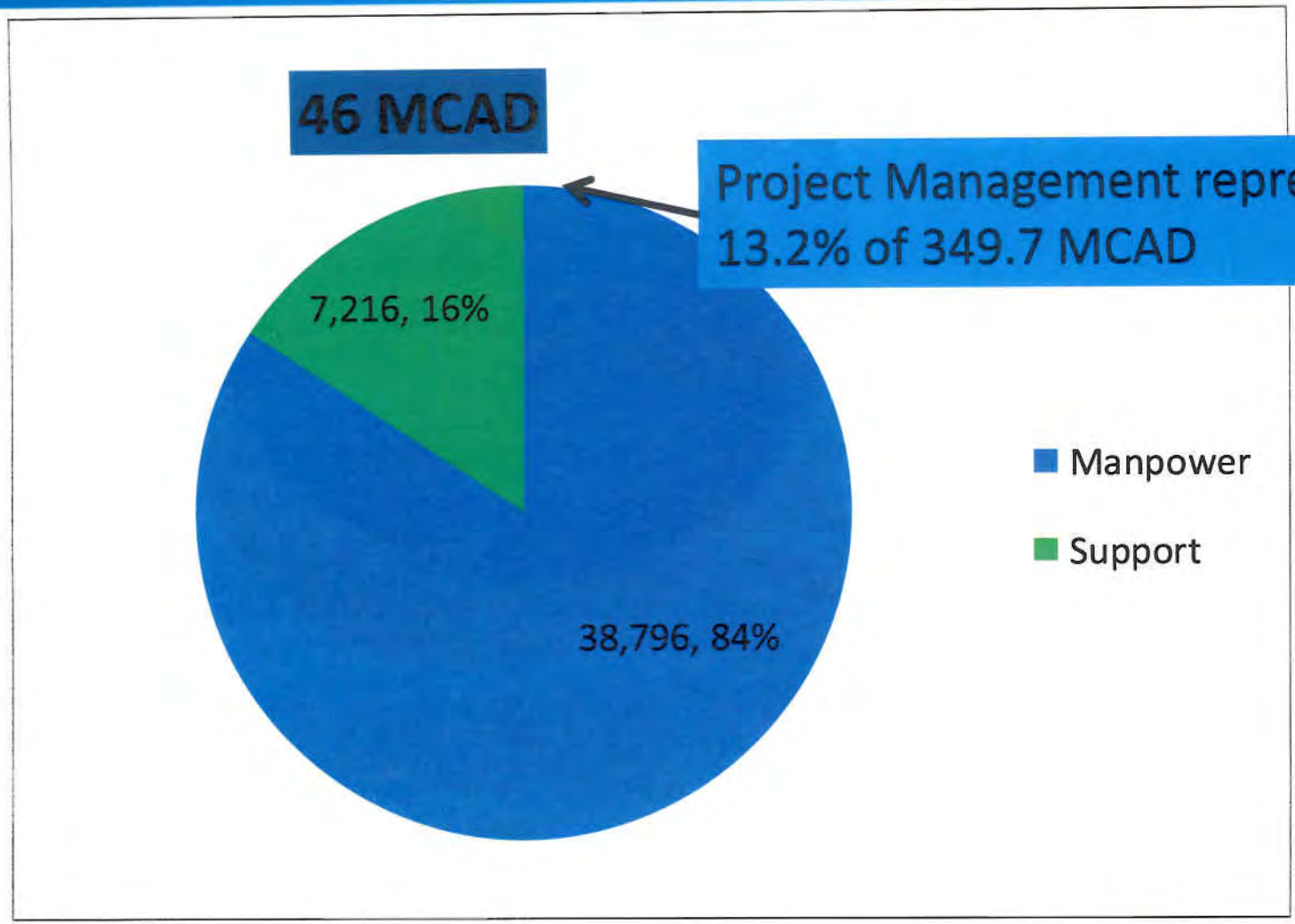
ALSTOM

OPG DNGS TG Refurbishment Project - Excitation



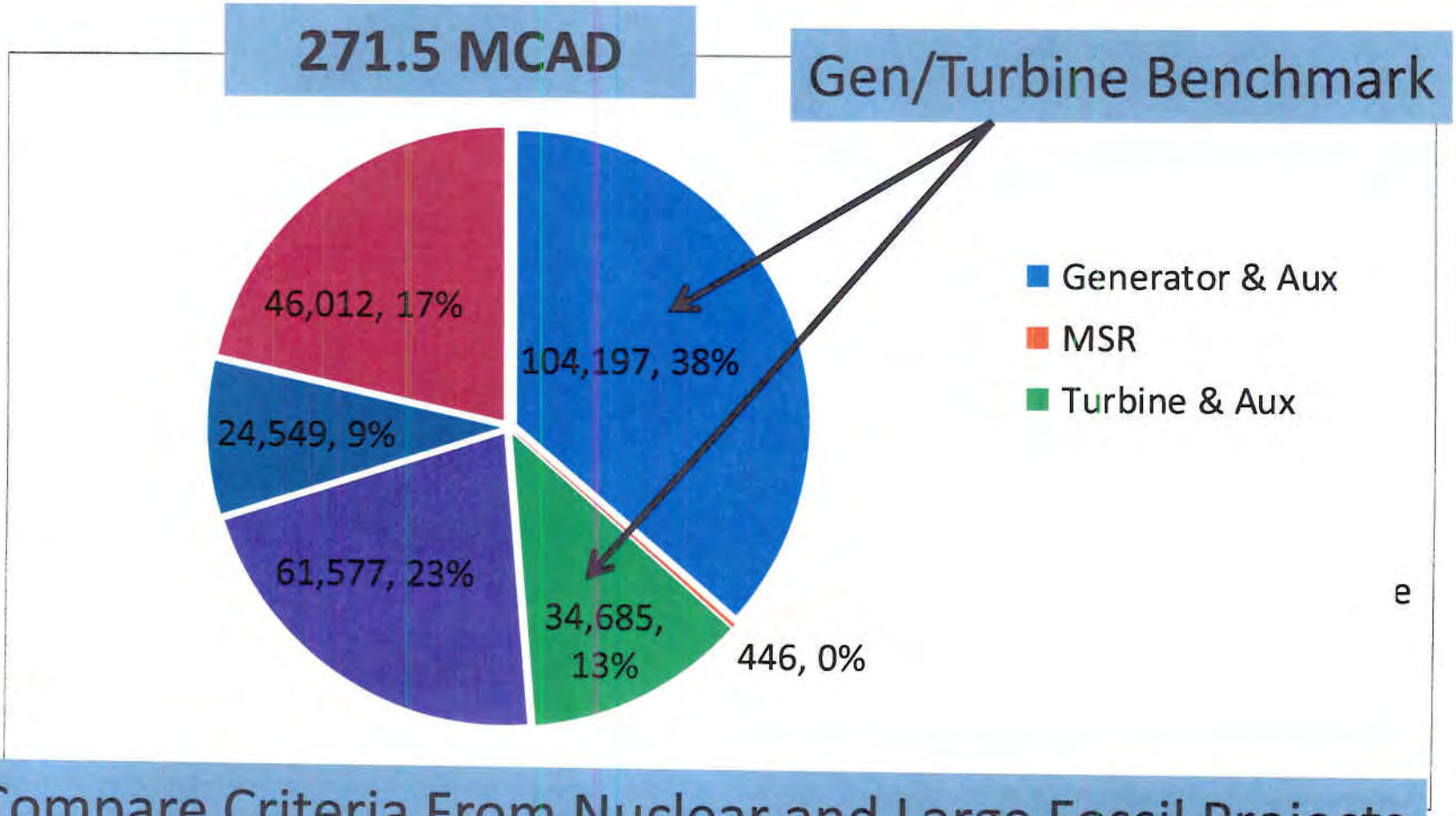
ALSTOM

OPG DNGS TG Refurbishment Project – Project Infrastructure



ALSTOM

OPG DNGS TG Refurbishment Project – Generator/Turbine Benchmark



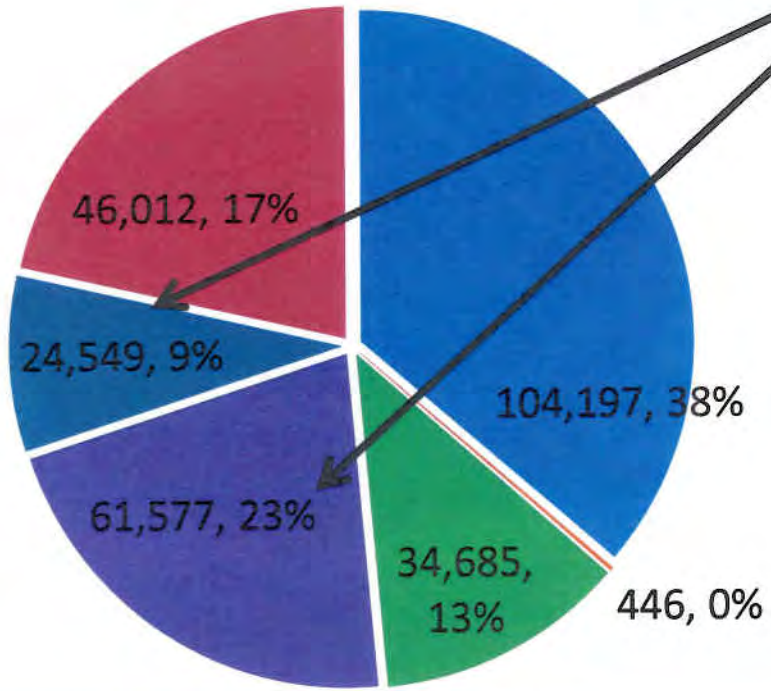
Compare Criteria From Nuclear and Large Fossil Projects

ALSTOM

OPG DNGS TG Refurbishment Project – Controls Benchmark

271.5 MCAD

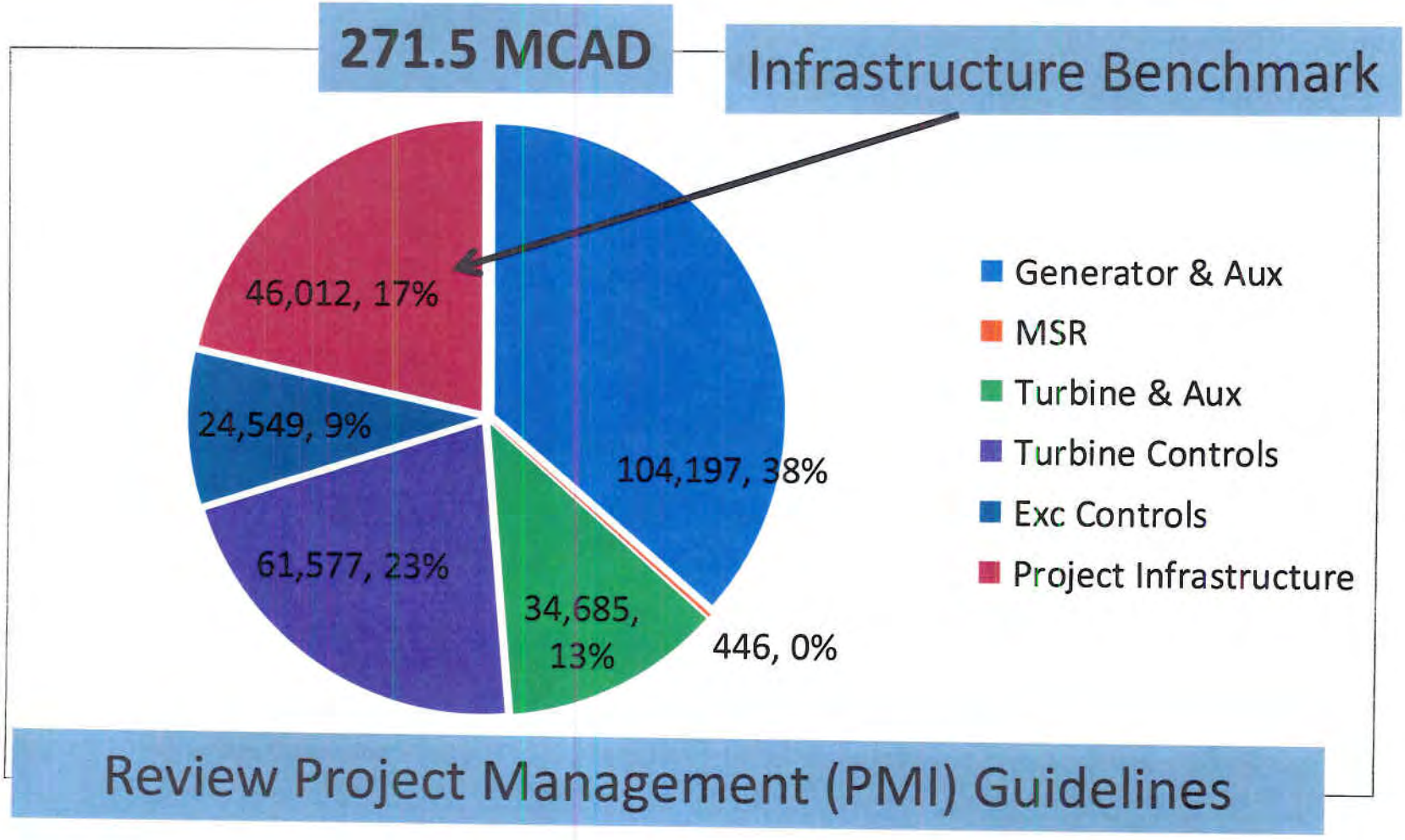
Controls Benchmark



Approach Is To Compare Like Project Performance Metrics

ALSTOM

OPG DNGS TG Refurbishment Project – Infrastructure Benchmark



ALSTOM

Benchmark Analysis – Generator and Turbine

- Generator Mid Section Replacement – Unit 3
- Stator Rewind - Unit 3
- Current Transformers
- New Seal Oil Skid – Elev. 100 (Full Replacement)
- H_2 Gas Cooling Skid – Unit 2
- Stator Cooling Water Skid – Unit 2
- LP Erosion Protection Rings – Unit 2

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Benchmark Analysis – Generator (MCAD)

Back to Guide

SOW	SOW Clause	Base Scope Summary	Unit 2		Unit 1		Unit 3		Unit 4		Total	
			Fixed	Reimbursible work	Firm	Reimbursible work	Firm	Reimbursible work	Firm	Reimbursible work	Firm	Reimbursible work
Generator & Aux	NK38-SOW-42000-10002 2.1.2 U3	New Stator mid-section					28,200				28,200	
Generator & Aux	NK38-SOW-42000-10002 2.1.2 U3	Transportation of new stator mid-section - Estimated Cost						2,834				2,834
Generator & Aux	NK38-SOW-42000-10002 2.1.2 U4 & Spare	Stator Rewind (includes transportation of rewind kit to shop)					18,250		17,017		35,266	
Generator & Aux	NK38-SOW-42000-10002 2.1.2 U4 & Spare	Transportation costs of stator mid-section for offsite rewind - estimated Cost						3,717		3,734		7,451
Generator & Aux	NK38-SOW-42000-10002 2.3 (c)	Hydrogen gas cooling skid including Generator Core monitor, Dew Point Purity Monitor, H2 Flow Monitor/Integrater	3,004		2,616		2,616		2,616		10,852	
Generator & Aux	NK38-SOW-42000-10002 2.4 (c&d)	Stator Cooling Water Replacement including De-Oxidizing Heating, N2 Flow Monitor, Integrator, Conductivity	2,385		1,995		1,995		1,995		8,371	
Generator & Aux	NK38-SOW-42000-10002 2.5 (c)	Seal Oil Skid At El. 115	392		314		314		314		1,333	
Generator & Aux	NK38-SOW-42000-10002 2.5 (d&j)	Seal Oil Skid At El.100 Base Frame modification and Level Gauges	1,690		1,230		1,230		1,230		5,381	
Generator & Aux	NK38-SOW-42000-10002 2.1.6	Current Transformers	296		296		296		296		1,184	

Seal Oil Skid – Used Optional Complete Replacement Elevation 100 for comparison purposes

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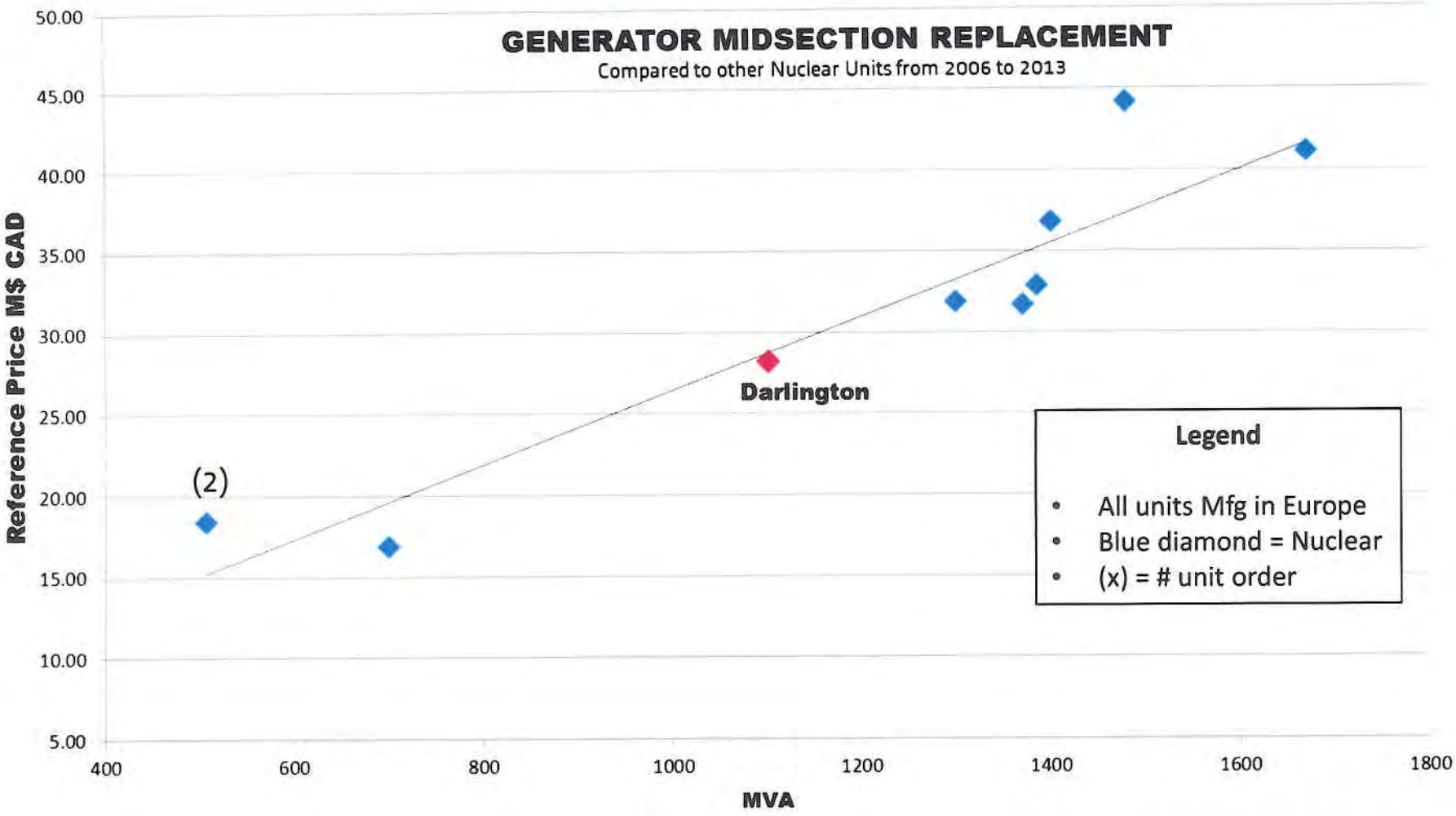
Benchmark Analysis – Generator Midsection Replacement



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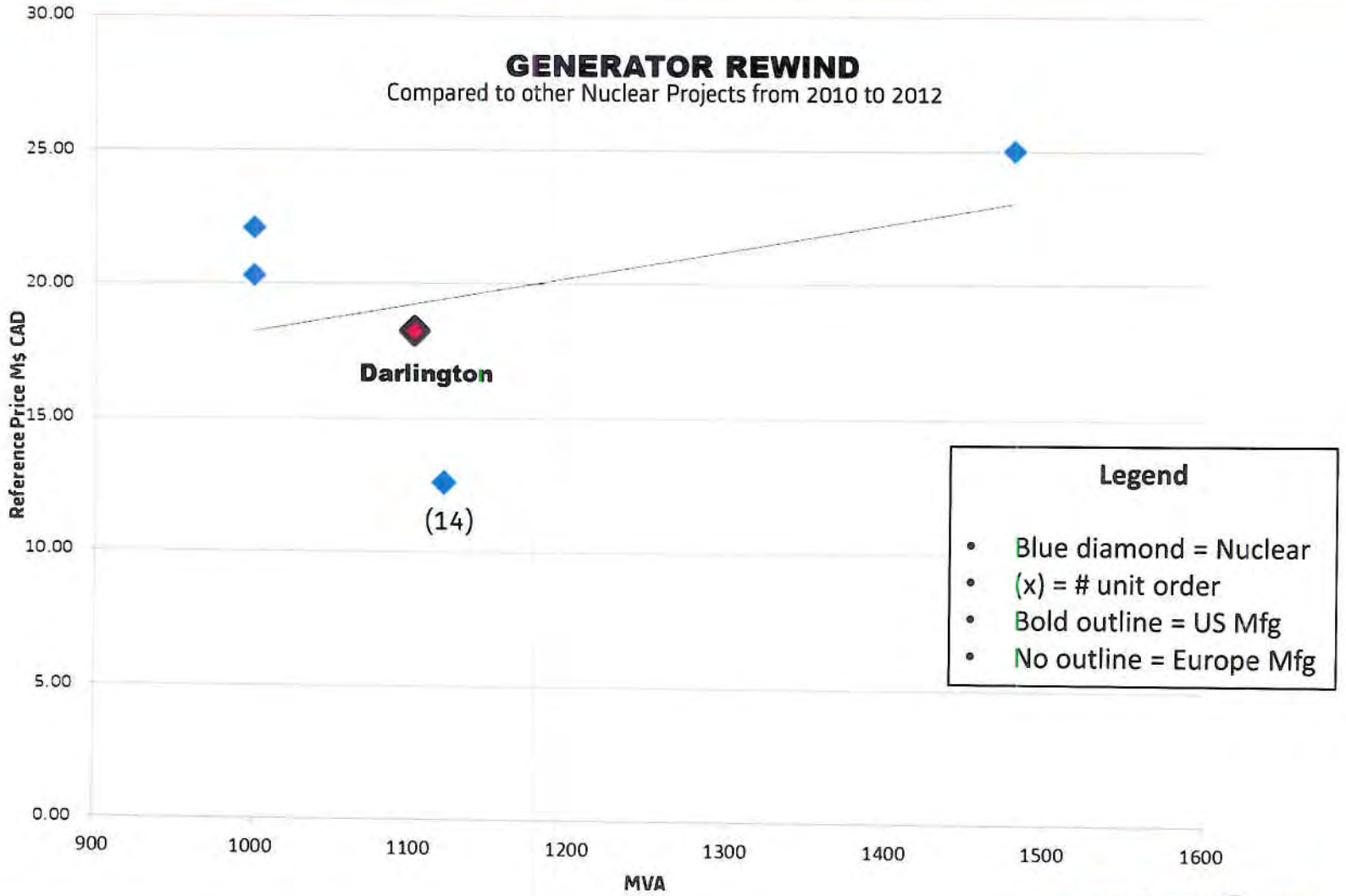
Benchmark Analysis – Generator Rewind



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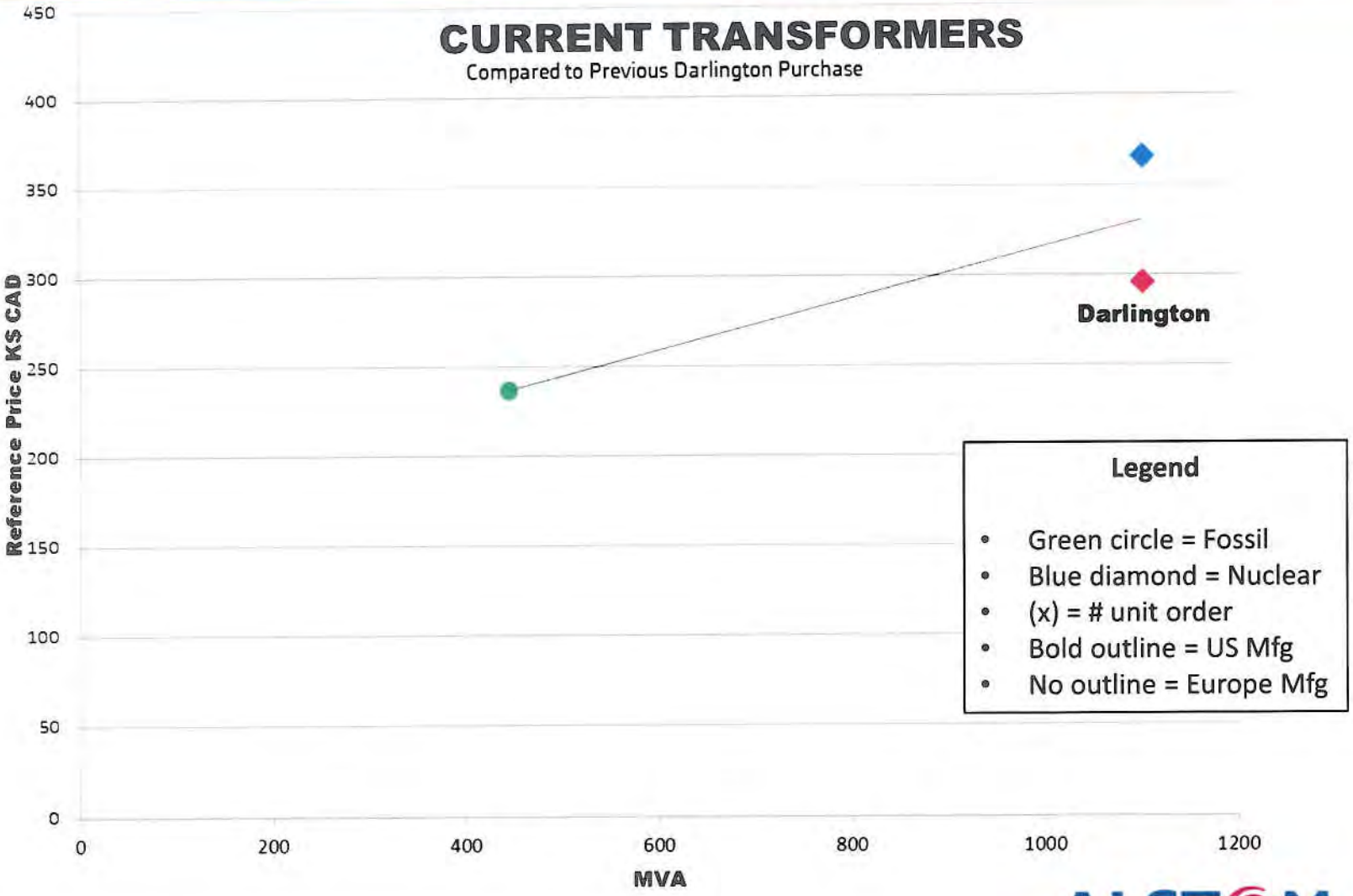
Benchmark Analysis – Current Transformers



Benchmarking Analysis - Current Transformers

- Comparison is made against a previous Darlington Purchase Order from 2007 (309 KCAD)
- Both CT's are the same size and rating
- The 2007 Order was normalized using OECD @ 2.85%/annum
- Previous Contract — This Darlington Contract

366 KCAD — 296 KCAD

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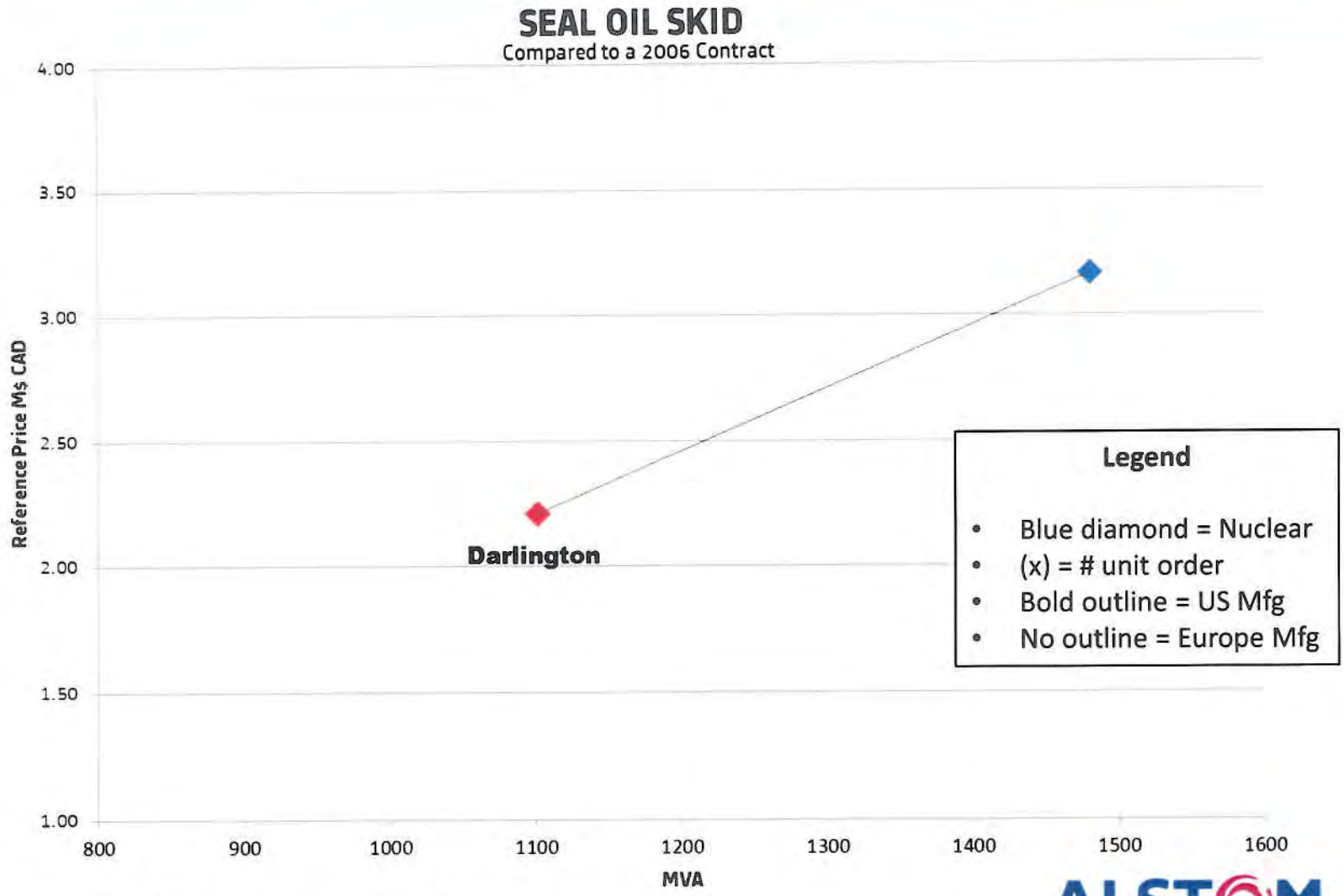
Benchmark Analysis – Seal Oil Skid



Benchmark Analysis – Seal Oil Skid I Scope Comparable to Nuclear Unit X

Darlington	Nuclear Unit X
Seal-oil Skid II at 115m (2.5 c)): 2x Differential pressure regulator air oil / hydrogen Pressure transmitter Vacuum pump Valves and ancillary Terminal box on skid **Seal-oil skid I at 100m (5.0 a)):** 2x Gas oil pump with AC motor Vacuum oil pump with AC motor 2x Gas oil column regulator Supply regulator (air oil / vacuum oil) 3x Level transmitter Valves and ancillary Terminal box on skid	**New seal oil modules in stainless steel with following main components:** - 2 x 100% air oil cooler, tube bundle - 1 x temperature control valve - 2 x dp regulator seal oil/H2 - 2 of 4 diff. pressure measurement air seal oil/H2 **Vacuum oil system** - 1 x vacuum oil pump - 1 x oil column level measurement - 1 x vacuum oil tank level controller - 1 x vacuum pump - 1 x vacuum regulator - 1 x vacuum pressure **Gas oil system** - 2 x oil pumps for DE and NDE - 2 x oil column regulator for DE and NDE - 2 x oil column level measurement for DE and NDE - Internal cabling and piping - All membrane valves outside the module - Function plan (FUPs) acc. to ALSTOM standard
Oil mist blowers on syphon (5.0 b)): 2x Blowers with AC motor Pressure transmitter Valves and ancillary Loose components Check valve	-
Seal-Oil Skid III at 107m (5.0 d)): - Gas oil discharge regulator - Valves and ancillaries	1 x oil discharge regulator for DE and NDE & valves
Air Oil Pumps (2.5 f)): - 2x pumps with AC motor - 1x pump with DC motor	**Air oil system** - 2 x 100% air oil pump - 1 x 100% emergency air oil pump

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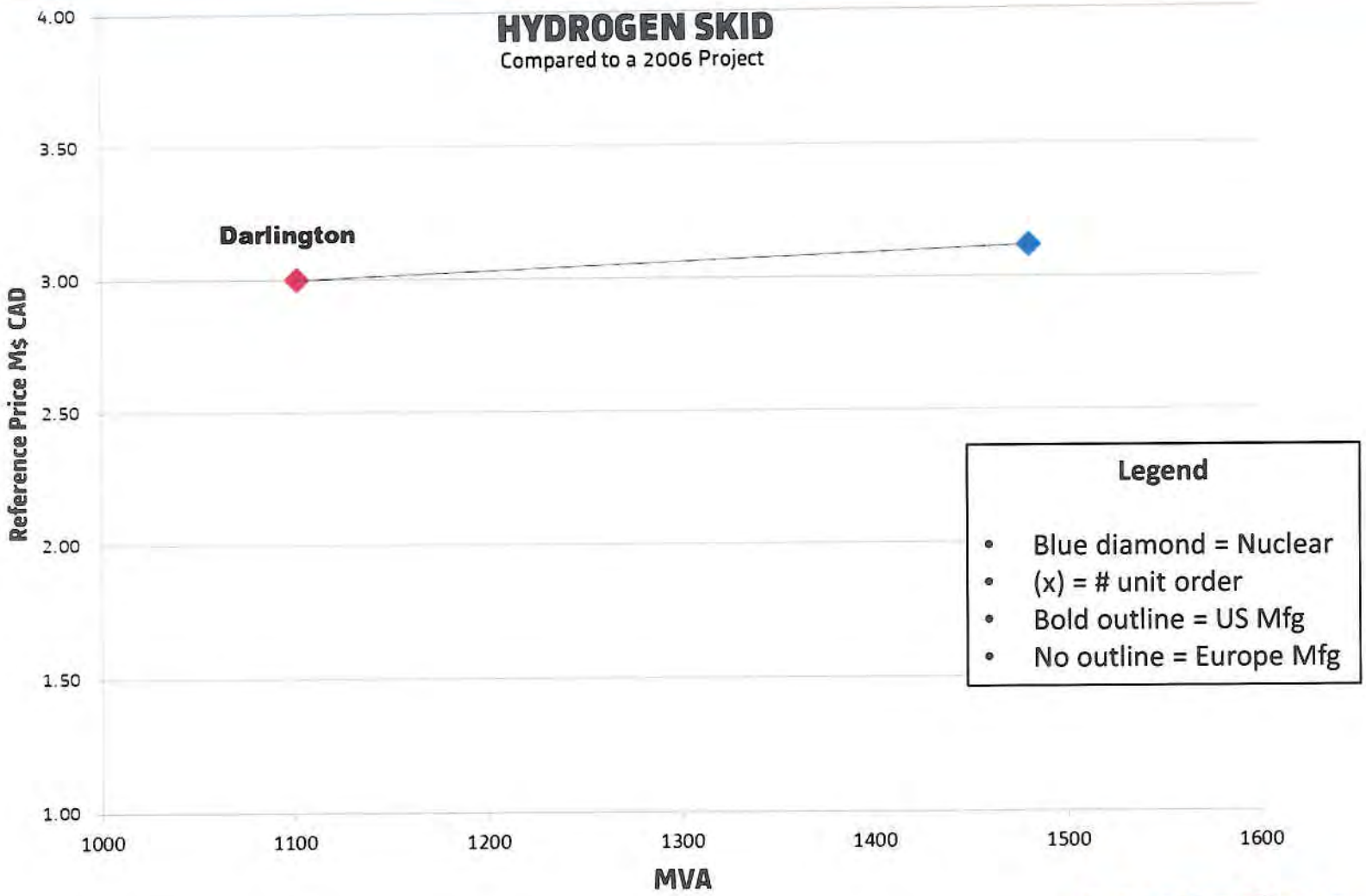
Benchmark Analysis – Hydrogen Skid



Benchmark Analysis – Hydrogen Skid Scope for Darlington Exceeds Nuclear Unit X

Darlington	Nuclear Unit X
Gas distribution skid with: - Flow measurement, pressure transmitters, valves and local indicators incl. terminal box on skid - Gas purity measurement device with 2 purity meters, suited for CO2 as purging medium - Coolant type dryer including instrumentation and terminal box - Leakage detection skid with three liquid detectors for alarm and one 2oo3 trip stage including terminal box on skid - H2 consumption measurement device for stator water tank	**Gas distribution skid with:** - 1 x H2 dryer - 2 x humidity measurement - 1 x H2 standstill fan - 2 x H2 purity meters - 1 x H2 consumption - 1 x H2 pressure - 1 x quick discharge of H2 and emergency CO2 purging - 1 x leakage measurement generator - 2 x CO2 evaporator - 1x H2 discharge device stator water tank - 1 x stator water tank pressure - internal cabling and piping - Function plan (FUPs) acc. to ALSTOM standard
Core monitor	-
Measuring interface panel	-

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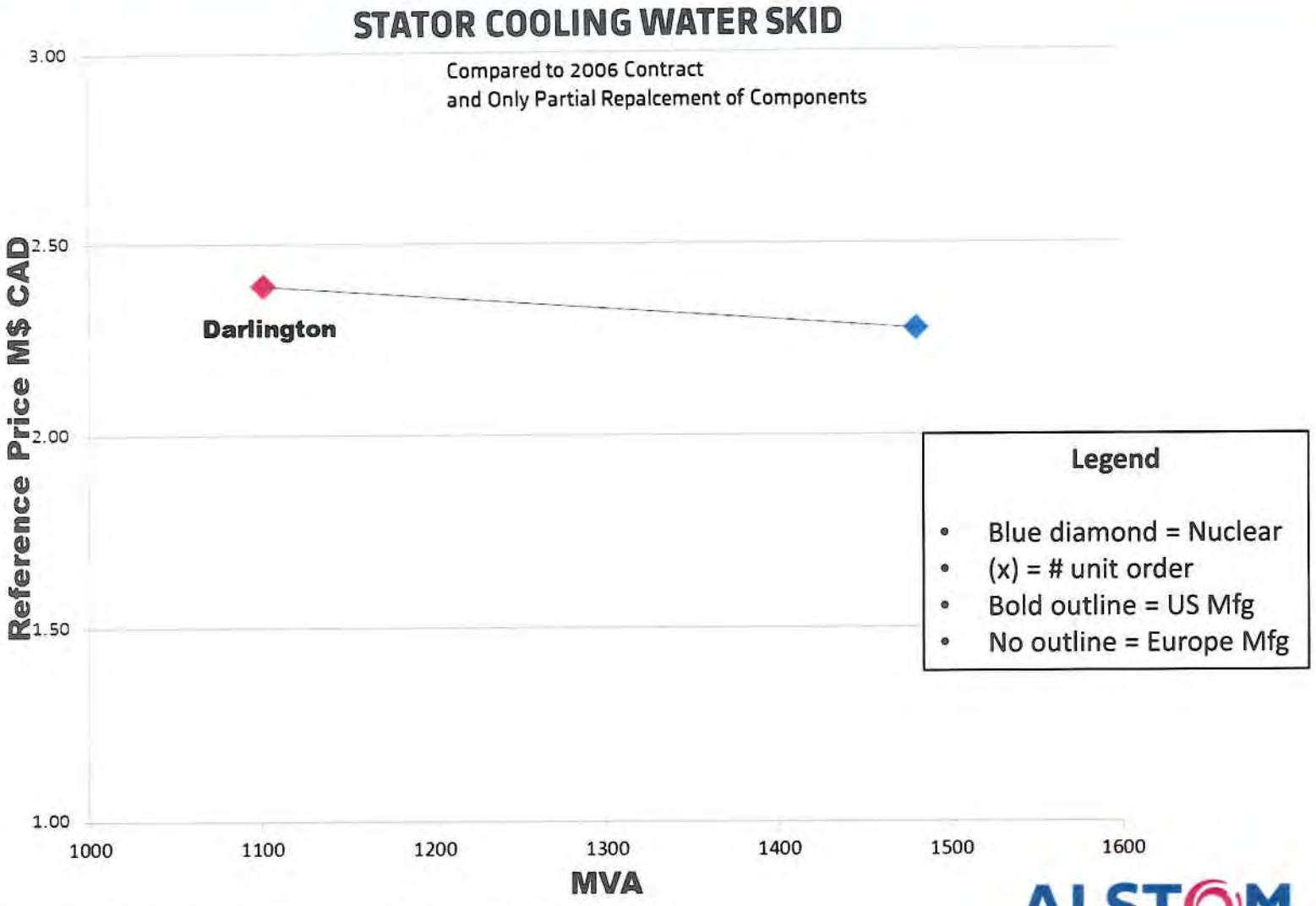
Benchmark Analysis – Stator Cooling Water Skid



Benchmark Analysis – Stator Cooling Water Skid Scope for Darlington Exceeds Nuclear Unit X

Darlington	Nuclear Unit X
Stator cooling water skid: -2 Cooling water pumps with AC motor,	**Parts for replacement at Stator-winding cooling water system with following main components:** - 2 x 100% stator cooling water pump - All membrane valves
- Double filter with differential pressure indicator - 3 – Way temperature control valve - Ion exchanger, 5x Conductivity measurement, valves and ancillary - Integration of an heating device for de-oxytank - Terminal box on skid	-

Nuclear Unit X only partial replacement of pumps and valves. In Darlington entire skids will be replaced plus integration of existing de oxy-tank and additional heating device.

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Benchmark Analysis – Turbine (MCAD)

Turbine & Aux	NK38-SOW-41000-10002 2.2.1 (c)	LP Blade Carrier Erosion Protecting Ring Modification	1,928		1,741		1,741		1,741		**7,152**	
Turbine & Aux	NK38-SOW-41000-10002 2.5.3.1 (b)	Upgrade Isolation Valves for Gland Steam Exhaust Fans	218		170		170		170		**729**	
Turbine & Aux	NK38-SOW-41000-10002 2.5.3.2 (a)	Upgrade LP Gland Supply Valve PCV24	235		197		197		197		**827**	
Turbine & Aux	Misc.	Unit Specific Spare Parts	6,771		6,402		6,402		6,402		**25,977**	
Turbine & Aux	Misc.	Turbine Customer Training		488		488		488		488		**1,954**
Turbine & Aux	Misc.	Technical Advisor and Specialist support - Initial Target cost		4,013		4,013		4,013		4,013		16,054
		Subtotals	**9,152**	**4,502**	**8,511**	**4,502**	**8,511**	**4,502**	**8,511**	**4,502**	**34,685**	**18,007**

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Competitive Analysis – Steam Turbine/Aux (In MCAD)

Steam Turbine/Aux						
Scope	Basis (Sold/Offered/In Neg./Lost/Under Review/Past Contract OPG)	Data Points	Confidenece Level High/Low	Correlation High/Low	Derived Result/Bid	Delta
1. LP Erosion Protection Rings	S/O	3	High	High	~2.01/1.96	-2.50%
TOTAL					.....	

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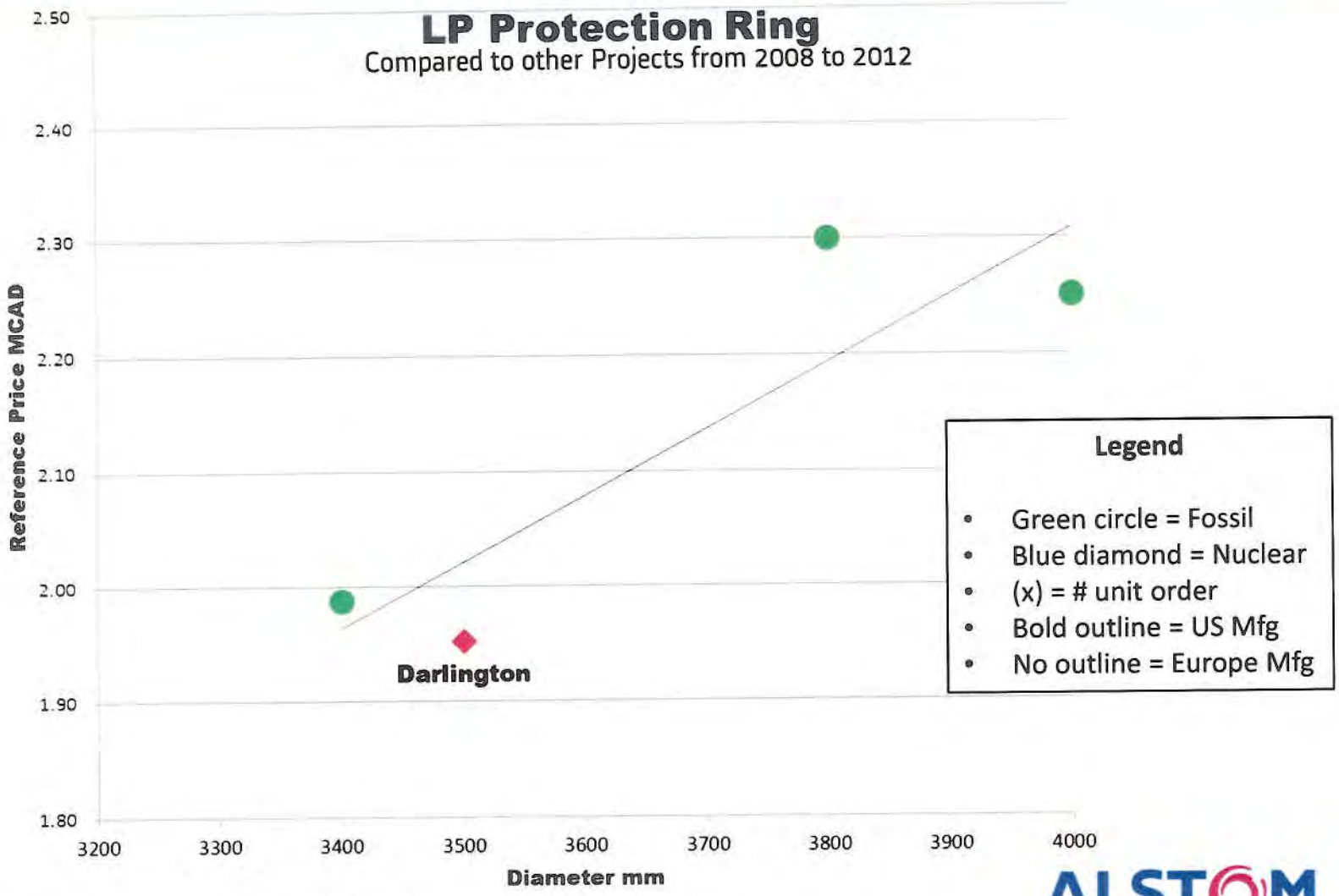
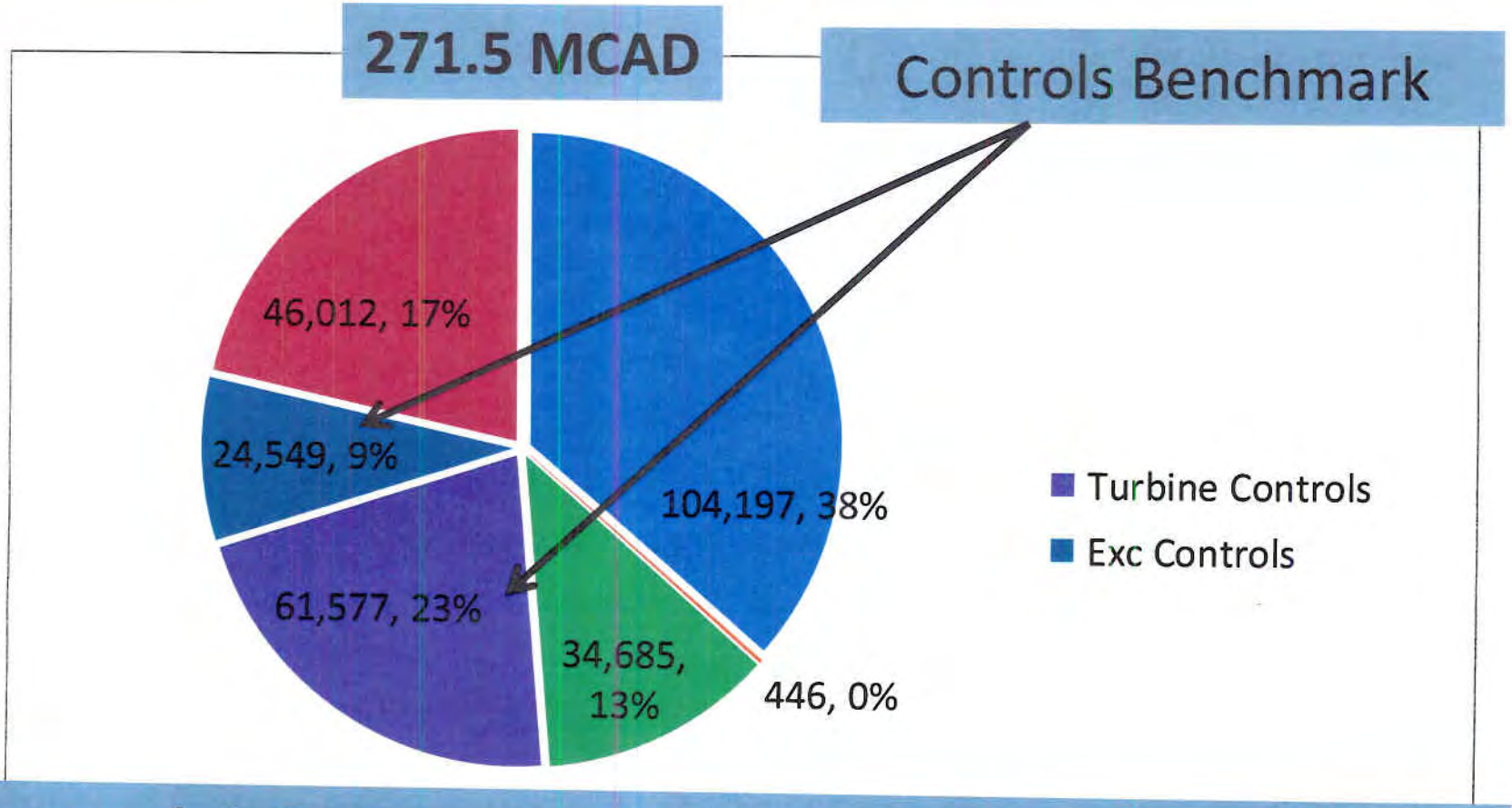
Benchmark Analysis – LP Protection Ring



OPG DNGS TG Refurbishment Project – Controls Benchmark



Approach Is To Compare Like Project Performance Metrics

ALSTOM

Press article dated 04/09/2012

Alstom to retrofit the control systems of EDF 1300 MW nuclear power plants

04/09/2012

Alstom has been awarded a contract worth over €50 million to retrofit the Contrôbloc N20 units for the 1300 MW nuclear power plants of Electricité de France (EDF). All of the twenty 1300 MW nuclear units in France are equipped with Alstom control system, installed during the construction of the power plants Alstom has been servicing it ever since.

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Press article dated 04/09/2012 - CONTROBLOC

- Alstom signed a contract with EDF in September 2012 regarding a NEW alarm management / processing system covering 20 NPPs, each 1300 MW.
- Main subjects of this Contract is the retrofit of the Controbloc units. The Controbloc units are 25 year old technology specifically designed for the EdF fleet.
- Controbloc is the brand name of the Alstom alarm system.
- Alstom will supply, design, erect and commission various new alarm system functionalities into the existing I & C environment of the NPPs.
- Nuclear safety is excluded from this contract as well as any modification on the control logics of the NPP. Hence the Darlington scope of Turbine control (Controsteam) and the Excitation control (Controgen) is not included in the EdF contract.
- A scope comparison between both projects (OPG Darlington vs EDF) is not possible.

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Controls: Benchmark Analysis – Project Performance

Project	# Units	OEM	MW's	AVR/TGC	New/Rehab	On Time Completion/ Schedule	FAT or Commissioning Issues	Commissioned /Current Status	Overall Customer Satisfaction
Laguna Verde (Mexico)	1	Yes	855	Both	Rehab	Yes	No	2010	Good
Oskarsham 5 (Sweden)	1	Yes	1500	AVR	Rehab	Yes	No	2010	Good
Taishan 1&2 (China)	2	Yes	1760	AVR	New	Yes - 2013	No	2013	TBD
Flamanville 3 (France)	1	Yes	1700	Both	New	Yes	No	Under FAT	TBD
Lingao 3&4 (China)	2	Yes	1000	Both	New	Yes	No	2011	Good
Forsmark 3 (Sweden)	1	Yes	1500	AVR	Rehab	Yes	No	Under FAT	TBD
St. Laurent 1&2 (France)	2	Yes	1090	AVR	Rehab	Yes - 2013	No	2013	TBD
Koeberg 1&2 (South Africa)	2	Yes	900	TGC	Rehab	Yes	Yes - Corrected	2009	Good
Hong Yan He (China)	1	Yes	1000	TGC	New	Yes	No	2012	Good

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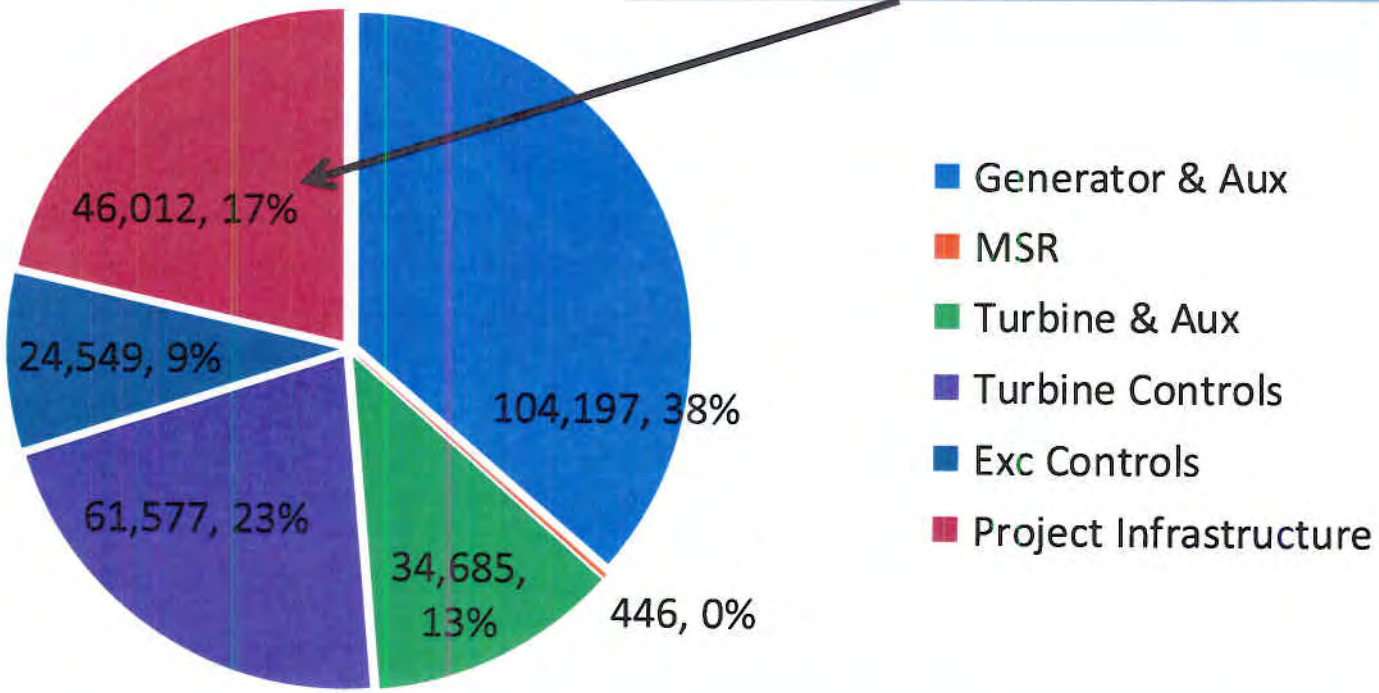
OPG DNGS TG Refurbishment Project – Infrastructure Benchmark

271.5 MCAD

Infrastructure Benchmark



Review Project Management (PMI) Guidelines

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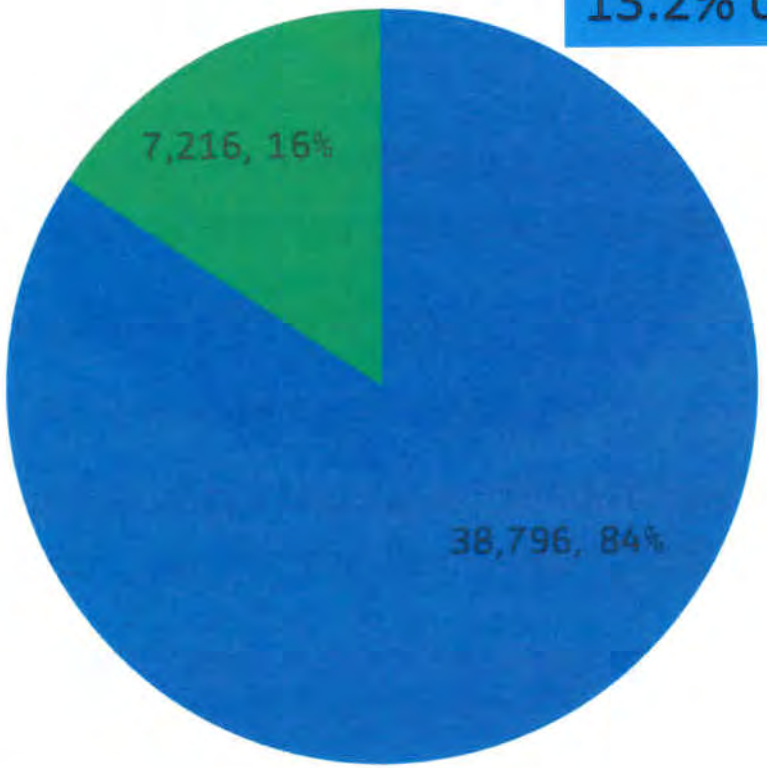
OPG DNGS TG Refurbishment Project – Project Infrastructure

46 MCAD

Project Management represents 13.2% of 349.7 MCAD



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Core Project Management Team

Project Management: This value is comprised of the burdened hours associated with the Core Project Management team (see Organization charts)

- The burdened rates include office allocations
- IT and communication infrastructure
- All personal benefits associated with the identified individuals including Costs for Sickness, Health, Personal Development Training and Vacation

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Core Project Management Team

- Core Project Management team consists of 3 FT representatives as indicated in the histogram
- The remaining team members will have part time engagement as forecasted in the preliminary histogram
- See PM plan for more detail on the roles and responsibilities within the team
- Core Team Members appear in red boxes on organization charts. Note Lead Resident Technical Advisor Costs are not included in Core Team Project Management Costs

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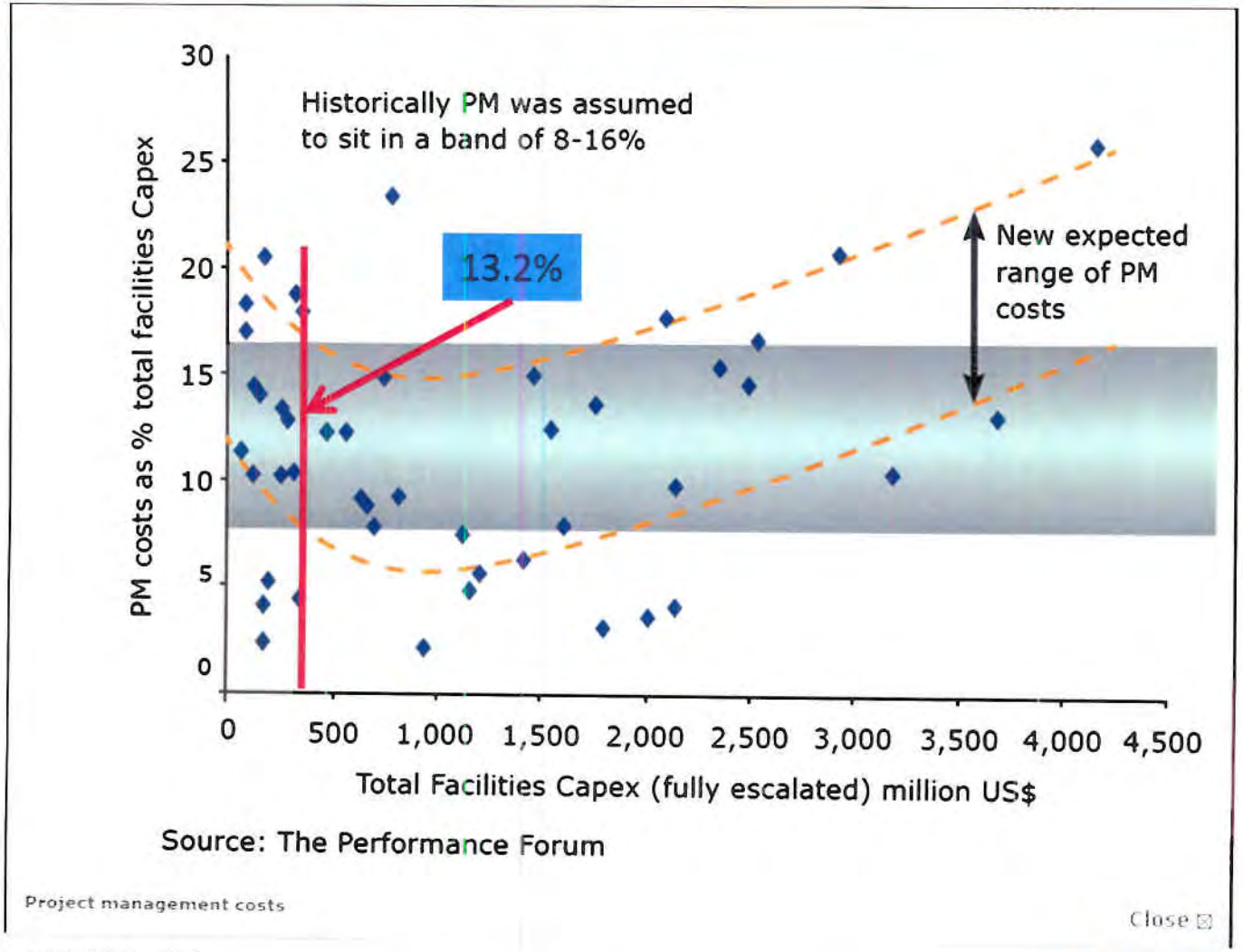
Infrastructure: Project Management Benchmarking



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Core Project Management Team- Canada

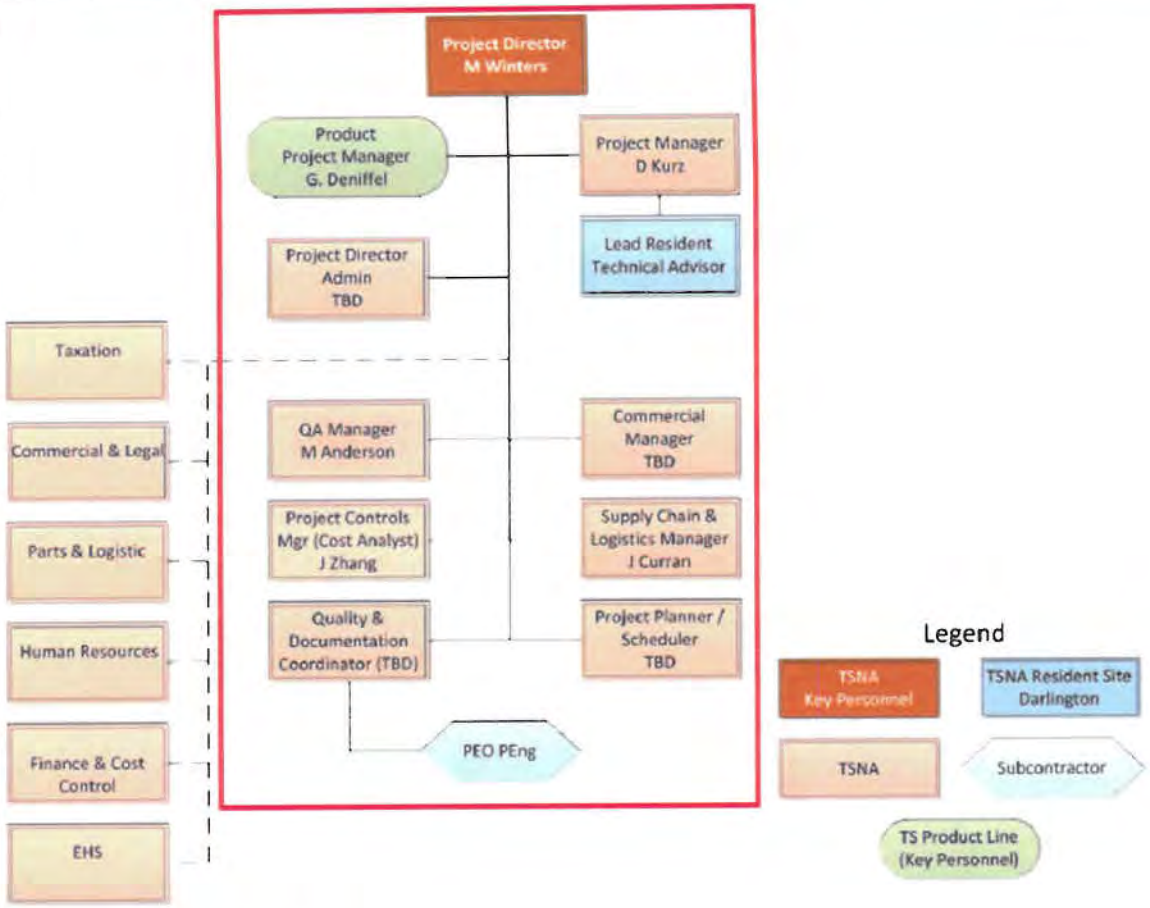

Figure 1 General Project team

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Core Project Management Team - Mannheim

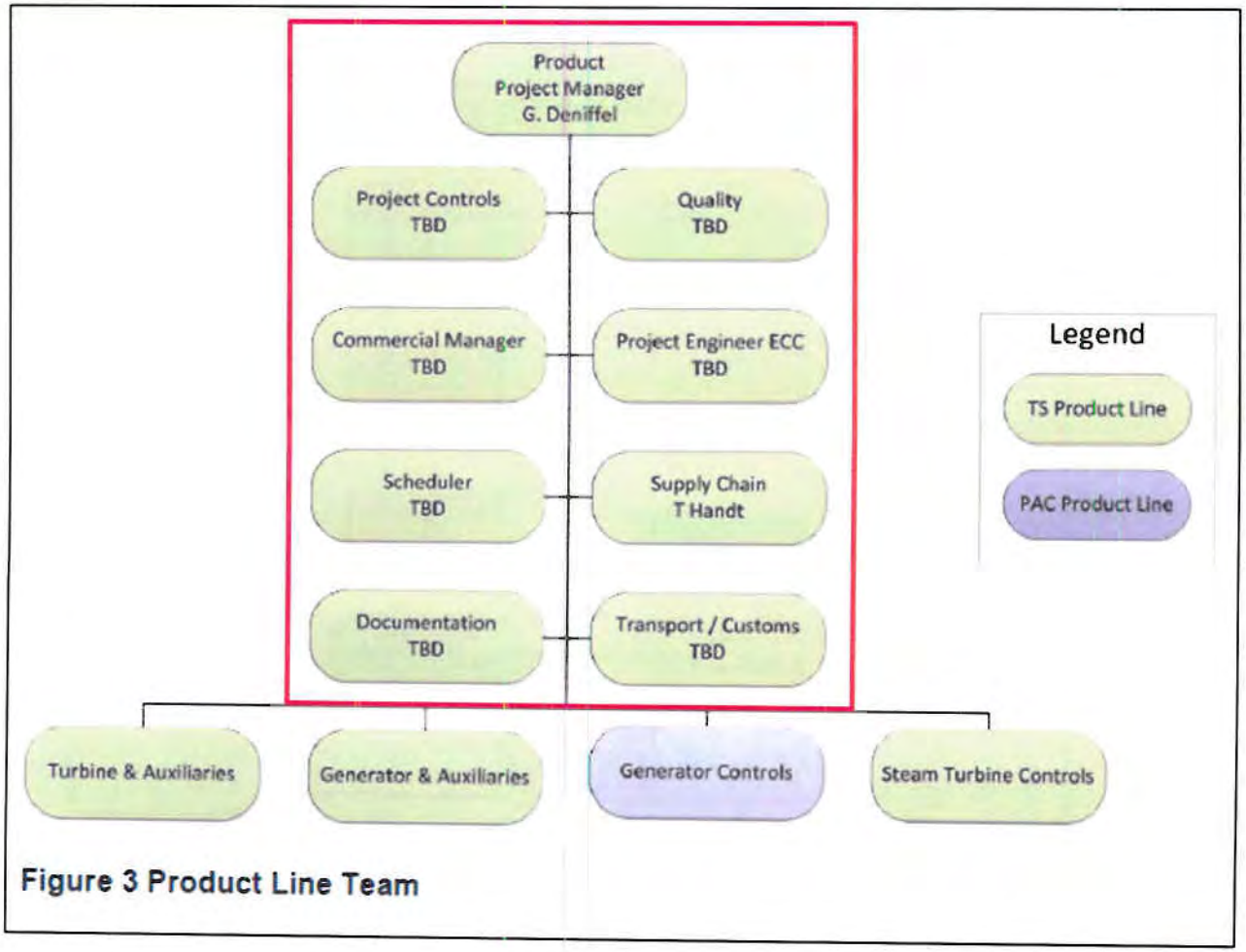

Figure 3 Product Line Team

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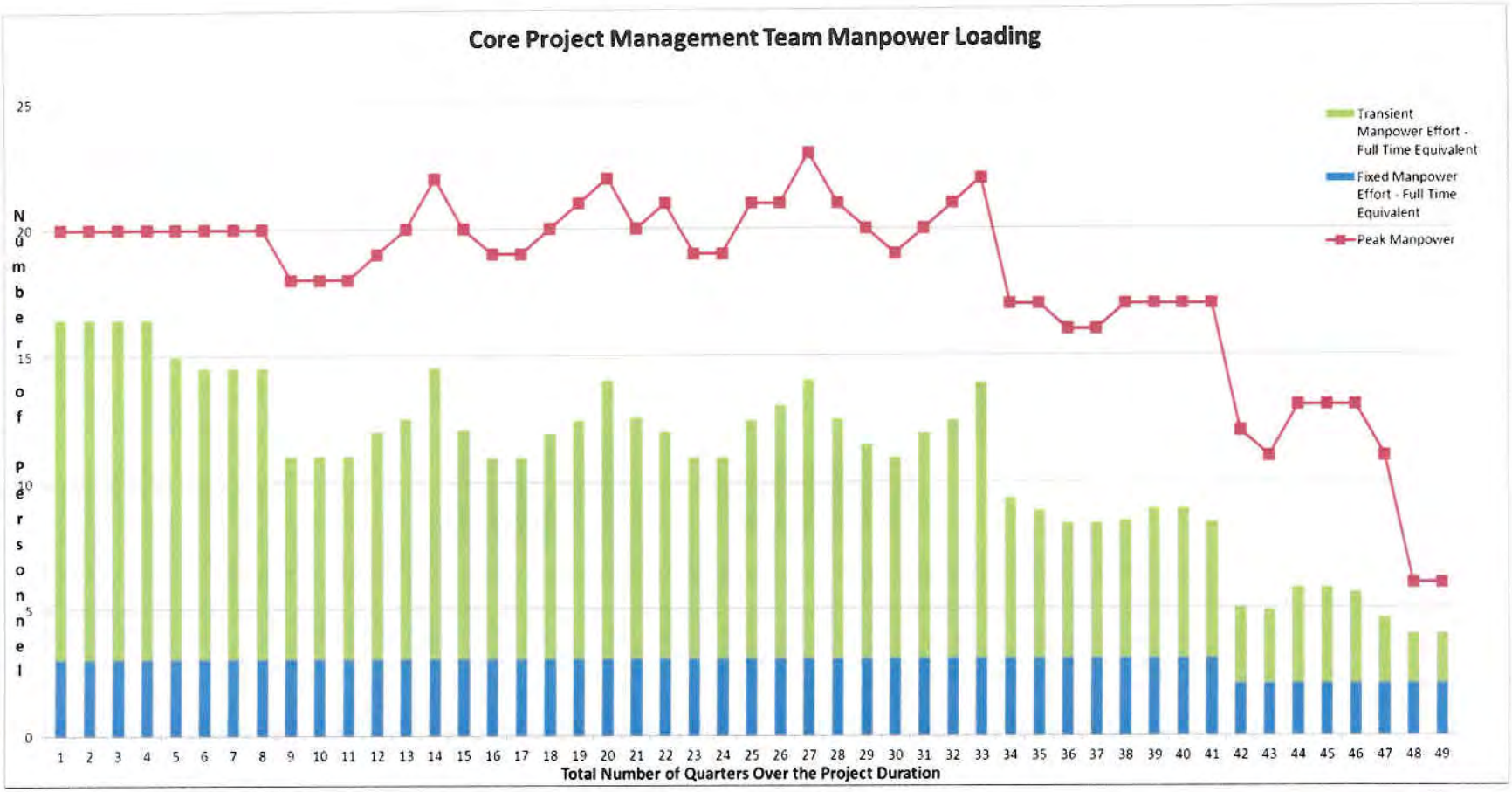
Core Project Management Team Manpower Loading



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Resident Technical Advisor Team- Canada

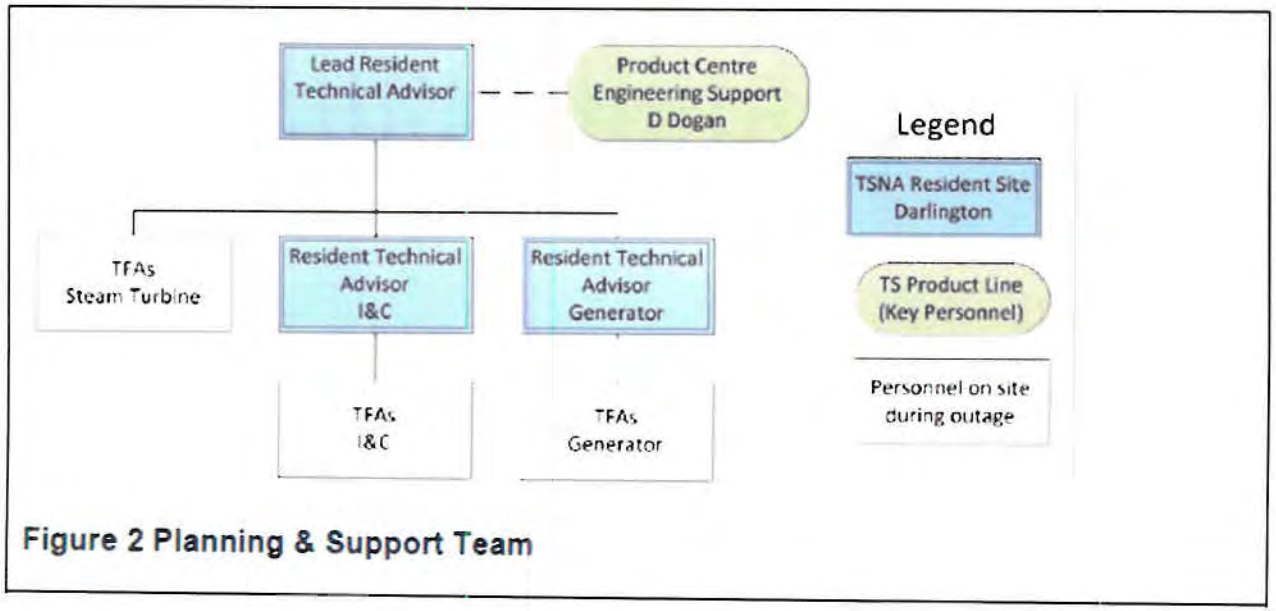

Figure 2 Planning & Support Team

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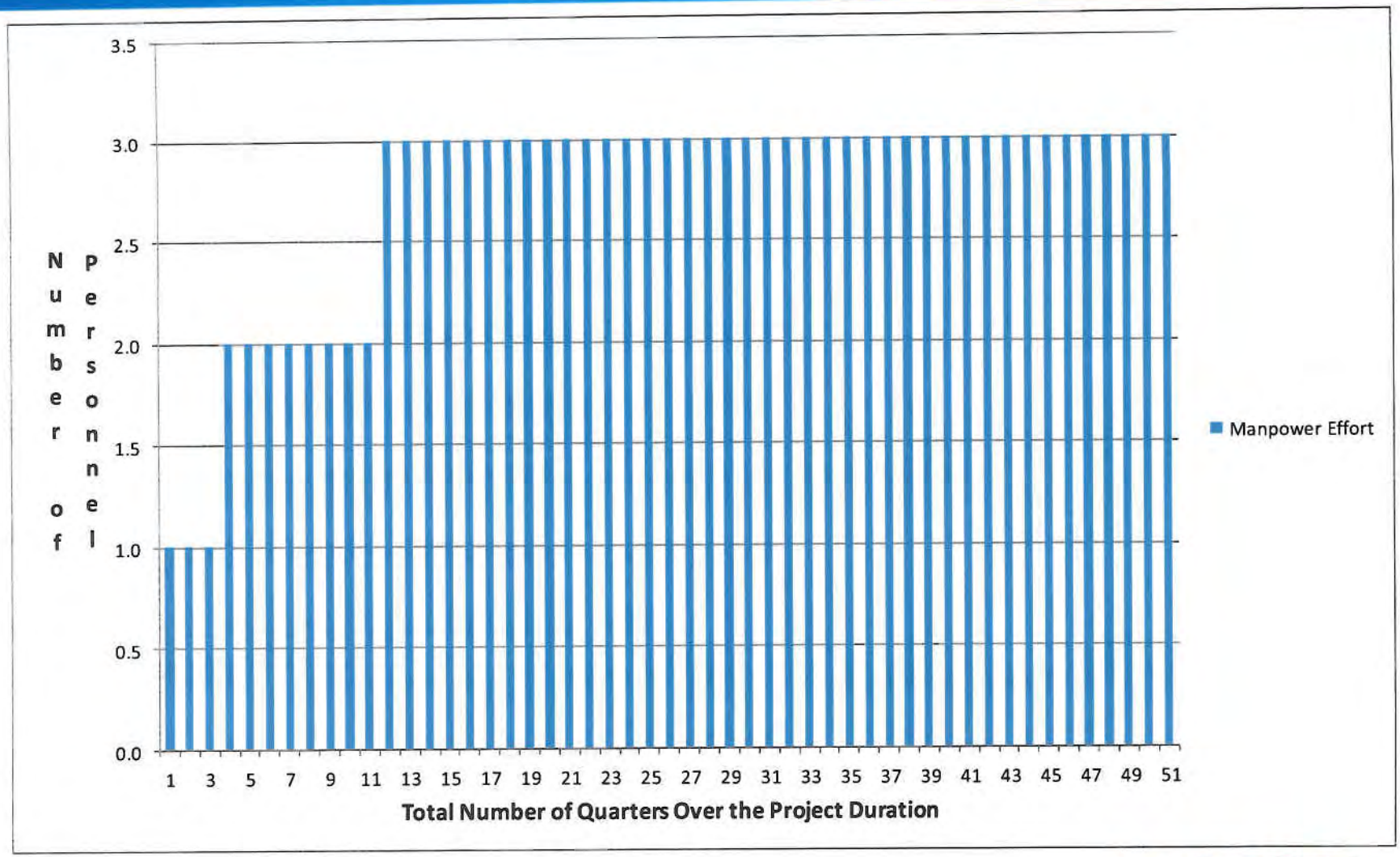
Core Technical Advisors Manpower Loading



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Project Support Costs

Project Support Costs: This all inclusive value includes the following as associated with the Core Project Management Team:

- Travel and personal expenses for Core Team
- Relocation and accommodation expenses for Core Team
- Project specific training costs for Core Team
- Immigration and security clearance expenses
- Overheads

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Benchmarking - Technical Field Advisors (50 hr work week)

Customer Agreement	Discount versus Alstom Canada Standard Rate Sheet	Key Details
OPG STD Rate Sheet 2013	[redacted]	Transactional – No Alliance agreement in place
OPG Refurbishment Core Resident Technical Advisors		Comparison based on Core resident manpower loading
OPG Refurbishment Rates 2013		Based on volume of [redacted] of Technical field advisors within the 12 year project
Customer A Agreement		- Starting second year of exclusive alliance on Third party machines - [redacted] volume to date
Customer B Agreement		- In fifth year of exclusive alliance on OEM machines - Competitively bid, - Average [redacted] total product volume over past 5 years
Customer C Agreement		- In third year of exclusive alliance - Negotiated bid - Average [redacted] volume per annum total product volume for past 6 years

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Benchmarking Analysis – Spare Parts Sampling

Sample Size	41 Items
Percent of Unit 2 SP Price	8.51%
Highest percent increase on item	19%
Highest percent reduction	75%

Supporting price analysis data provided to OPG in MS Excel format

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Darlington Turbine Generator Equipment Single Source Justification

Exhibit 12

OPG Benchmarking

The prices for parts included in Alstom's proposal that OPG has previously purchased were compared to the prices in OPG's nuclear parts database. Results are shown in the attached report and spreadsheet. The analysis shows a [redacted] discount below OPG's historical pricing. The comparison was limited to parts that OPG has purchased since 2006. The historical database prices were escalated using inflation factors recommended by F&G. The comparison did not include the volume discounts for parts ordered during the term of the Darlington TG contract, which will result in even further discounts below historical pricing.

The Hydro/Thermal Division parts database was also investigated to determine if any proposed parts had been purchased outside of the nuclear division. The SAP database contained 756 parts that had been purchased from Alstom. The 315 parts with a value over $100 were subject to further analysis. None of the 315 parts matched the parts that were proposed for the Darlington project.

Alstom's Technical Field Advisor (TFA) rates are high compared to most service providers retained by OPG. However, they are comparable to rates that are charged by similar engineered equipment manufacturing companies. The TFA rates for the Darlington TG project are lower than rates that Alstom has charged OPG for similar work.

OPG Nuclear

Powering our future with operational and project excellence

OPG Parts Benchmarking Refurbishment Supply Chain

Gary Paterson, Director

PEOPLE POWERING THE FUTURE

Safety Human Resources Reliability Value for Money

ONTARIO POWER GENERATION

TG Project Price Comparison for Parts

Total Unique Parts Identified included in Alstom proposal: **1269**

Total Unique OPG Cat Ids found in Passport: **433**

Total Unique OPG Cat Ids found with comparative Alstom price: **391**

Total Unique OPG Cat Ids purchased since 2006 and considered for comparison: **244**

Total Unit Price for **244** Unique OPG Cat Ids: **$ 1,590,865**

Total Unit Price for **244** Unique Alstom Parts: [redacted]

Total Percentage Cost Variance: [redacted]

Assumptions:

- Average Escalation Factor was used for calculating OPG Prices based on Passport PO dates.
- Highest Alstom Unit Price used from proposal.
- Compared Cat Ids purchased after 2006.

Benchmarking Comparison of OPG Historical Pricing with Alstom TG Project Proposed Pricing

Tab	SOW Doc #	SOW Reference	Description of higher level item	Description	Material number	Nomenclature Dwg	Nomenclature ITEM	OPG CAT ID's	Q Level	PO YEAR	OPG UNIT Price with Escalation Factor (1.0335	Highest Alstom Price	Difference	single price ea part. U 1/3/4	single price ea part. U 2	Item Price
6	NK38-SOW-42000-10002	2.1.5 d	TERMINAL	GENERATOR TERMINAL	HMGT405532P0001	HTGG90848	2	201343	3	2006	$172,549	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10	NK38-SOW-41000-10002	2.3.1 c	EGMENTAL JOURNAL BEARIN	SUPPORT SEGMENT	HTGD013198R0002	HTGD90300	4	201295	4	2009	$195,807					
11	NK38-SOW-41000-10002	2.5.4.1 _d	MAIN LUBE OIL PUMP	TOOTHED PISTON	HTGR103824P0001	HTGD690084	5	203557		2012	$185,743					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	BARRING GEAR	ELCO COUPLING	HTGD334794R0001	HTGD 90489		657813		2008	$185					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	NONRETURN VALVE	NONRETURN VALVE	HTGR203879R0006	HTGD690129		689642		2012	$8,637					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	AUXILIARY OIL PUMP	CHECK VALVE	HTGR001856R0005	HTGD690085		204324		2007	$47,794					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	CONTROL FLUID CONTAINER	PRESSURE RELIEF VALVE	HTGR003218P0035	HTGR90069		688881		2011	$29,006					
11	NK38-SOW-41000-10002	3.2.1 _d or 2.2.1 _e	SUPPORTING PLATE	SLIDING PAD	HTGD226506P0001	HTGD690194	5	637504	3	2012	$1,270					
7	NK38-SOW-42000-10002	2.1.5 d	TERMINAL-CASING COMP.	TEFLON HOSE	HTGG129440R0001	HTGG90848	8	687385	3	2011	$3,206					
10	NK38-SOW-41000-10002	2.4.2 c & d	PIVOTED FLAP	SHAFT JOURNAL, LONG	HTGR104592P0001	HTGD690226	5	485812	3	2011	$29,080					
10	NK38-SOW-41000-10002	2.4.2 c & d	PIVOTED FLAP	SHAFT JOURNAL, SHORT	HTGR104643P0001	HTGD690226	6	485817	3	2011	$26,843					
11	NK38-SOW-41000-10002	4		GUIDE PIECE	HTGR309079P0001	HTGR90069		204796	4	2011	$21					
11	NK38-SOW-41000-10002	4		PILOT PISTON	HTGR309084P0001	HTGR90069		204792	3	2011	$3,094					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG129655R0002	HTGG 90854	58	203911	3	2012	$312					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG129655R0004	HTGG 90854	86	203913	3	2011	$230					
11	NK38-SOW-41000-10002	4		BUSH	HTGR308344P0001	HTGR90069		204775	3	2013	$408					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG129655R0001	HTGG 90854	86	203910	3	2012	$267					
11	NK38-SOW-41000-10002	3.2.1_b	LP LONGITUDINAL FRAME	SPECIAL SCREW	HTGD331026P0001	HTGD690157	47	660545	4	2010	$42					
11	NK38-SOW-41000-10002	2.2.1_i	LP-BLADE CARRIER	SEALING RINGS COMPL	HTGD017094R0001	HTGD690193		699194		2012	$14,286					
10	NK38-SOW-41000-10002	2.4.2 c & d	PIVOTED FLAP	SOCKET LS	HTGR205923P0002	HTGD690226	14	485833	3	2012	$18,702					
11	NK38-SOW-41000-10002	4		MAIN CONTROL PISTON	HTGR308345P0001	HTGR90069		204786	3	2013	$2,579					
4	NK38-SOW-42000-10002	2.1.1.d	MEASUREMENT FLANGE ASS.	EARTH SHAFT COMPL.	HTGG214743R0001	HTGG90997	74	684218	3	2011	$8,277					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG129655R0005	HTGG 90854	87	203914	3	2012	$387					
11	NK38-SOW-41000-10002	4		STANDARD PRESSURE SPRING	NB 434441P0568	HTGR90069		204775		2013	$408					
4	NK38-SOW-42000-10002	2.1.1.d	MEASUREMENT FLANGE ASS.	EARTH SHAFT COMPL.	HTGG214743R0001	HTGG90997	74	684218	3	2011	$8,277					
11	NK38-SOW-41000-10002	3.2.1 _b	INLET CASING	MEASURING STUD	HTGD327249R0007	HTGD690157		203641	1	2008	$1,002					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0006	HTGG90988	141	201334	3	2010	$2,088					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0007	HTGG90988	142	201337	3	2010	$2,088					
11	NK38-SOW-41000-10002	3.2.1 _d or 2.2.1 _e	BEARING BOLT	SLIDING PIECE	GMD2217128P0001	HTGD690194	21	637504	3	2012	$1,270					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0003	HTGG90988	76	201335	3	2010	$2,105					
8	NK38-SOW-42000-10002	2.4.e)	STATOR WATER COOLER	ELECTRODE	HTGW300986R0001		W32	203691	4	2007	$2,310					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	WASHER	W 402199P0009	HTGG 90515	33	203854	4	2011	$35					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0001	HTGG90988	74	201331	3	2010	$2,150					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0002	HTGG90988	75	201332	3	2010	$2,084					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0005	HTGG90988	78	201336	3	2010	$2,084					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	TEFLON HOSE	HTGG129342R0004	HTGG90988	77	201333	3	2010	$2,088					
11	NK38-SOW-41000-10002	2.2.1_i	LP-BLADE CARRIER	EXPANSION STUD	TGD 218965P0001	HTGD90167	1	203743	3	2006	$43					
10	NK38-SOW-41000-10002	2.4.2 f	ACCUMULATOR	DAMPER	HTGR417700P0001	HTGD690216	8	203542	3	2011	$164					
5	NK38-SOW-42000-10002	2.1.2 recom.	SUPPORT PIPE DE F. DIFF.	INSULATING WASHER	W 402727P0009	HTGG 90515	56	203857	3	2012	$201					
10	NK38-SOW-41000-10002	2.4.1 c	MAIN CLOSURE INSTALLATIOI	WELDING RING	HTGR412631P0002	HTGD690215	9	203428	4	2010	$1,310					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	GASKET	GMD0924487P0031	HTGD690139	42	197441	3	2007	$653					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	INSULATING RING HALVE	W 208913P0003	HTGG691511	16	203901	3	2010	$407					
10	NK38-SOW-41000-10002	2.3.1 d	EARING TEMP.MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305018P2020	HTGD690108	TO16	203180	3	2012	$1,082					

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4	NK38-SOW-42000-10002	2.1.2.h Unit 1&2	EXPENDABLE MATERIAL	INSULATION MATERIAL	NBT 401122P0114	HTGG90984	12	684839	3	2011	$14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
4	NK38-SOW-42000-10002	2.1.7 d	PIPE ASSEMBLY	GASKET	HTGW404242P0001	HTGW 90519	-	203683	3	2011	$118					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	TWO-STAGE FILTER	O-RING	HTGZ400206P0044	HTGD690259	11	163677	4	2013	$292					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	INSULATING RING HALVE	W 208913P0004	HTGG691511	17	203902	3	2010	$325					
4	NK38-SOW-42000-10002	2.1.7 d	PIPE ASSEMBLY	GASKET	HTGW404242P0001	HTGW 90519		203683	3	2011	$118					
10	NK38-SOW-41000-10002	2.5.2 c	SERVOMOTOR	SCRAPER RING	R 405420P0003	HTGD690291	36	203777	4	2013	$335					
11	NK38-SOW-41000-10002	2.5.5.3_d	VACUUM RELIEF VALVE	SLIDE RING	HTGR204625P0135	HTGR 90028	17	163077	3	2013	$125					
11	NK38-SOW-41000-10002	3.2.1_b	GUIDE CONE	SECHSKANTSCHRAUBE	NB 312331P0721	HTGD690157		660545	4	2010	$42					
5	NK38-SOW-42000-10002	2.1.2 recom.	IR GAP BUFFLE PRE INSTALLE	DOWEL PIN	HTGG305264P0004	HTGG 90937	12	652748	4	2007	$6					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	SLIDING PLATE	GMD2217129P0001	HTGD690194	22	581157	3	2012	$2,052					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	CROSSHEAD GUIDE	GMD2125270P0001	HTGD90333	1	463463	3	2007	$574					
11	NK38-SOW-41000-10002	2.2.1_i	BLADE CARRIER CASING,MACH	EXPANSION STUD	TGD 218966P0003	HTGD90167	1	482506	3	2006	$311					
4	NK38-SOW-42000-10002	2.1.7 d	PIPE ASSEMBLY	GASKET	HTGW302938P0002	HTGW 90519	-	372715	3	2013	$532					
4	NK38-SOW-42000-10002	2.1.2 j Unit 1&2	STATOR WIND. INSTALL	END WEDGES	GME8136081R0001	HTGG90988	11	695517	4	2011	$60					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	AUXILIARY OIL PUMP	GASKET	R 502393P0001	HTGD690085		204779	4	2008	$69					
11	NK38-SOW-41000-10002	4		SPRING	NB 434441P0056	HTGR90069		204774		2012	$635					
11	NK38-SOW-41000-10002	3.1.1_g	ADJUSTING BOLT	GASKET	HTGD447722P0001	HTGD90140	8	665645	4	2008	$131					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	INSULATING RING HALVE	W 208913P0005	HTGG691511	18	203903	3	2010	$325					
11	NK38-SOW-41000-10002	4		GASKET	NBT 400289P0015	HTGR90069		204795	4	2010	$4					
11	NK38-SOW-41000-10002	4		GASKET	NBT 400111P0010	HTGR90069		204794		2012	$16					
10	NK38-SOW-41000-10002	2.1.2 c NK38-41800-1000	SERVOMOTOR	WIPER	R 405420P0005	HTGD690291	36	578215	3	2011	$142					
5	NK38-SOW-42000-10002	2.1.2 recom.	EXPENDABLE MATERIAL	ROUND RUBBER SEAL	GME0944241R0001	HTGG 90853	7	649199	3	2012	$61					
5	NK38-SOW-42000-10002	2.1.2 recom.	BUSHING CASING	ROUND RUBBER SEAL	GME0944241R0001	HTGG 90848	45	649199	3	2012	$61					
5	NK38-SOW-42000-10002	2.1.2 recom.	END HOUSING NDE MACH.	ROUND RUBBER SEAL	GME0944241R0001	HTGG 90984	16	649199	3	2012	$61					
4	NK38-SOW-42000-10002	2.1.7 d	PIPE ASSEMBLY	GASKET	HTGW302938P0002	HTGW 90519		372715	3	2013	$532					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	INSULATING WASHER	W 402727P0014	HTGG 90515	38	486956	3	2009	$32					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	INSULATING WASHER	W 402727P0014	HTGG 90515	38	486956	3	2009	$32					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	TOOTHED LOCK WASHER	NB 336180P0118	HTGG 90854	67	661458	4	2008	$6					
10	NK38-SOW-41000-10002	2.4.2 c & d	PIVOTED FLAP	GASKET	NBT 400289P0052	HTGD690226	53	203987	4	2008	$19					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	O-RING	R 403028P0035	HTGG 90854	24	163071	3	2011	$8					
10	NK38-SOW-41000-10002	2.4.2 f	ACCUMULATOR	GUIDE BAND	HTGR307852P0049	HTGD690216	17?	203540	4	2009	$147					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	LUBE OIL COOLER	GASKET	HTGW001904P0015	HTDM600104	250	203657	4	2008	$14					
10	NK38-SOW-41000-10002	2.4.4 d	PILOT CONTROL	O-RING	R 403028P0046	HTGR 90113	42	163034	3	2009	$45					
4	NK38-SOW-42000-10002	2.1.2. i Unit 1&2	STATOR WIND. INSTALL	GLASS CORD	NBT 401134P0005	HTGG90988	55	668641	4	2009	$15					

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7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	CONICAL SPRING WASHER	W 402199P0017	HTGG90848	34	654141	3	2009	$94	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10	NK38-SOW-41000-10002	2.4.4 d	SERVOMOTOR	O-RING	R 403028P0069	HTGR 90111	412/ 104	163031	4	2010	$102					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	HEXAGONAL NUT	NB 332600P0515	HTGG90848	16	654139	3	2009	$2					
4	NK38-SOW-42000-10002	2.1.1.d & 2.1.3 c	MEASUREMENT FLANGE ASS.	ROUND RUBBER RING	W 402978P0002	HTGG90997	77	684221	4	2011	$52					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	WOVEN GLASS TAPE	NBT 401126P0014	HTGG90848	27	654166	3	2009	$4					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	WOVEN GLASS TAPE	NBT 401126P0014	HTGG90848	27	654166	3	2009	$4					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	CONICAL SPRING WASHER	W 402199P0010	HTGG90848	21	649540	4	2007	$24					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	WOVEN GLASS TAPE	NBT 401126P0014	HTGG90988	79	654166	3	2009	$4					
10	NK38-SOW-41000-10002	2.4.4 d	PILOT CONTROL	O-RING	R 403028P0016	HTGR 90113	76	163032	4	2010	$10					
10	NK38-SOW-41000-10002	2.4.4 d	SERVOMOTOR	O-RING	HTGR204625P0082	HTGR 90111	318	163025	4	2010	$31					
4	NK38-SOW-42000-10002	2.1.1.d & 2.1.3 c	MEASUREMENT FLANGE ASS.	ROUND RUBBER RING	W 402978P0002	HTGG90997	77	684221	4	2011	$52					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	O-RING	R 403028P0012	HTGD690136	53	163020	4	2011	$12					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	CONICAL SPRING WASHER	W 402199P0010	HTGG 90515	34	649540	4	2007	$24					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	CONICAL SPRING WASHER	W 402199P0010	HTGG 90515	34	649540	4	2007	$24					
11	NK38-SOW-41000-10002	3.2.4_d	LP-ROTOR	O-RING	R 403028P0029	HTGD 90203	2	163064	3	2013	$91					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	SERVO VALVE	O-RING	R 403028P0029	HTGR 90040	217	163064	3	2013	$91					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	SERVO VALVE	O-RING	R 403028P0029	HTGR 90041	315	163064	3	2013	$91					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	INSULATING WASHER	HTGG406306P0002	HTGG691511	35	203897	4	2012	$12					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	BARRING GEAR	HEXAGON HEAD SCREW	NB 312333P0306	HTGD 90489		684098	4	2010	$1					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	WASHER	W 402199P0012	HTGG 90515	32	654137	3	2009	$8					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	WASHER	W 402199P0012	HTGG 90515	32	654137	3	2009	$8					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	WASHER	W 402199P0012	HTGG 90515	35	654137	3	2009	$8					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	WASHER	W 402199P0012	HTGG 90515	32	654137	3	2009	$8					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	WASHER	W 402199P0012	HTGG90848	22	654137	3	2009	$8					
11	NK38-SOW-41000-10002	3.2.1_b	COVER LP OUTER CASING	HEXAGON HEAD SCREW	NB 312331P0725	HTGD690157	39	660545	4	2010	$42					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	CONICAL SPRING WASHER	W 402199P0007	HTGG 90515	35	654145	3	2009	$96					
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	CONICAL SPRING WASHER	W 402199P0007	HTGG 90515	33	654145	3	2009	$96					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	LUBE OIL COOLER	GASKET	C 202480P0001	HTDM600104	244	203658	4	2012	$608					
10	NK38-SOW-41000-10002	2.4.4 d	PILOT CONTROL	O-RING	R 403028P0023	HTGR 90113	310	163033	4	2010	$9					
4	NK38-SOW-42000-10002	2.1.2.h Unit 1&2	EXPENDABLE MATERIAL	INSULATION MATERIAL	NBT 401122P0106	HTGG90984	12	684843	4	2011	$4					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P0058	HTGD690109	105	203178	4	2012	$1,457					
4	NK38-SOW-42000-10002	2.1.2.h Unit 1&2	EXPENDABLE MATERIAL	INSULATION MATERIAL	NBT 401122P0102	HTGG90984	12	201329	4	2013	$6					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	GASKET	GMD0924483P0023	HTGD690139	46	460128	3	2006	$33					
10	NK38-SOW-41000-10002	2.2.1 e	LP-FIXATION DEVICE	LOCKING PLATE	HZN 451341P0560	HTGD690198	13	203743	3	2006	$43					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	INSULATING TUBE	HTGG405623P0002	HTGG90848	37	654134	3	2009	$140					
10	NK38-SOW-41000-10002	2.4.2 f	ACCUMULATOR	GUIDE BAND	HTGR307744P0025	HTGD690216	16	203541	4	2012	$263					

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5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSOR DE	HEXAGON HEAD SCREW	NB 312350P0412	HTGG 90515	24	654144	3	2009	$14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
5	NK38-SOW-42000-10002	2.1.2 recom.	DIFFUSER NDE	HEXAGON HEAD SCREW	NB 312350P0412	HTGG 90515	25	654144	3	2009	$14					
10	NK38-SOW-41000-10002	2.4.2 c & d	PIVOTED FLAP	SOCKET FS	HTGR205922P0002	HTGD690226	11	485830	3	2012	$16,278					
10	NK38-SOW-41000-10002	2.1.2 c NK38-41800-1000	NONRETURN VALVE	EXPANSION STUD	TGD 218950P0002	HTGD690291	19	575226	3	2013	$94					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	OIL FILTER	SET OF GASKETS	HTGD337435P5100	HTGD690175		690274	4	2011	$216					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	HEXAGON HEAD SCREW	NB 312350P0412	HTGG90848	16	654144	3	2009	$14					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	OIL FILTER	OIL FILTER CARTRIDGE	HTGD337435P0009	HTGD690175	19	203666	4	2011	$3,247					
11	NK38-SOW-41000-10002	3.2.1_b	LP LONGITUDINAL FRAME	O-RING	R 403028P0033	HTGD690157	48	163047	3	2011	$23					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	SAFETY RELAY	O-RING	R 403028P0033	HTGR 90042	27	163047	3	2011	$23					
10	NK38-SOW-41000-10002	2.1.2 c NK38-41800-1000	PILOT RELAY	O-RING	R 403028P0015	HTGD690291	60	163021	4	2010	$16					
10	NK38-SOW-41000-10002	2.4.1 d	INLET VALVE	HEXAGON HEAD SCREW	NB 312333P0465	HTGD690215	20	203453	3	2012	$21					
10	NK38-SOW-41000-10002	2.5.2 c	SERVOMOTOR	LOCK NUT	NB 336570P0022	HTGD690291	41	575409	3	2007	$25					
10	NK38-SOW-41000-10002	2.4.4 d	ERVOMOTOR BASIC ELEMENT	O-RING	R 403028P0045	HTGR308410	41	163049	3	2013	$46					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	O-RING	R 403028P0014	HTGD690136	55	163042	4	2011	$35					
10	NK38-SOW-41000-10002	2.4.4 d	DISC ORIFICE	O-RING	R 403028P0014	HTGR 90113	TO 73	163042	4	2011	$35					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	INSULATION WASHER	W 402727P0054	HTGG90848	84	654146	3	2009	$62					
5	NK38-SOW-42000-10002	2.1.2 recom.	IR GAP BUFFLE PRE INSTALLE	DOWEL PIN	HTGG305264P0001	HTGG 90937	13	652749	4	2007	$40					
8	NK38-SOW-42000-10002	2.4.e)	STATOR WATER COOLER	GASKET	HTGW404883P0001		W22	203690	4	2011	$530					
10	NK38-SOW-41000-10002	2.4.4 d	ERVOMOTOR BASIC ELEMENT	O-RING	R 403028P0027	HTGR308410	O67	163043	4	2011	$47					
11	NK38-SOW-41000-10002	2.1.1_i	HP-SHAFT SEAL	STOP SCREW	D 430470P0002	HTGD90143	7	674259	4	2009	$75					
11	NK38-SOW-41000-10002	2.1.1_i	HP-SHAFT SEAL	STOP SCREW	D 430470P0002	HTGD90143	7	674259	4	2009	$75					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	INSULATING WASHER	NBT 400048P0613	HTGG 90854	40	203925	4	2011	$52					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	INSULATING WASHER	NBT 400048P0613	HTGG 90854	40	203925	4	2011	$52					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	O-RING	R 403028P0038	HTGD690136	56	161144	4	2011	$60					
10	NK38-SOW-41000-10002	2.4.4 d	PILOT CONTROL	O-RING	R 403028P0038	HTGR 90113	81	161144	4	2011	$60					
10	NK38-SOW-41000-10002	2.1.2 c NK38-41800-1000	NONRETURN VALVE	GASKET	GMD0924481P0011	HTGD690291	28	623222	4	2011	$52					
10	NK38-SOW-41000-10002	2.5.2 c	NONRETURN FLAP	ROLLING MEMBRANE	R 405400P0004	HTGD690291	29	203776	4	2012	$1,534					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	INSULATING WASHER	W 402727P0009	HTGG90848	36	203857	3	2012	$201					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690109	TO14	203177	3	2012	$1,587					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690109	TO16	203177	3	2012	$1,587					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690110	TO14	203177	3	2012	$1,587					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690110	TO16	203177	3	2012	$1,587					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690110	TO14	203177	3	2012	$1,587					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305019P5660	HTGD690110	TO16	203177	3	2012	$1,587					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	WASHER	NB 335050P0615	HTGG90848	32	654143	3	2009	$110					
10	NK38-SOW-41000-10002	2.4.4 d	SERVOMOTOR	O-RING	R 403028P0066	HTGR 90111	213	163030	4	2010	$110					
11	NK38-SOW-41000-10002	2.4.2_h	VALVE	O-RING	R 403028P0010	HTGR 90116	22	161144		2011	$60					
10	NK38-SOW-41000-10002	2.3.1 d	EARING TEMP.MEASUREMEN	DOUBLE THERMOCOUPLE	HTGA305018P2028	HTGD690108	TO14	203181	3	2012	$1,270					
11	NK38-SOW-41000-10002	4		GASKET	NBT 402537P0070	HTGR90069		204797		2013	$75					

Benchmarking Comparison of OPG Historical Pricing with Alstom TG Project Proposed Pricing

Tab	SOW Doc #	SOW Reference	Description of higher level item	Description	Material number	Nomenclature Dwg	Nomenclature ITEM	OPG CAT ID's	Q Level	PO YEAR	OPG UNIT Price with Escalation Factor (1.0335	Highest Alstom Price	Difference	single price ea part. U 1/3/4	single price ea part. U 2	Item Price
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	AUXILIARY BARRING GEAR	O-RING	R 403028P0041	HTGD 90414	85	163027	4	2013	$109	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10	NK38-SOW-41000-10002	2.4.4 d	SERVOMOTOR	SLIDE RING	HTGR204625P0081	HTGR 90111	319	203738	3	2013	$297					
10	NK38-SOW-41000-10002	2.3.1 d	EMPERATURE MEASUREMEN	GASKET	NBT 400289P0015	HTGD690109		578221	4	2006	$102					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	CONICAL SPRING WASHER	W 402199P0007	HTGG90848	68	203853	4	2011	$157					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG305603P0004	HTGG 90854	114	486964	3	2012	$108					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG305603P0004	HTGG 90854	114	486964	3	2012	$108					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	CLAMPING DISC	W 402199P0004	HTGG90988	37	203853	4	2011	$157					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	CLAMPING DISC	W 402199P0004	HTGG90988	37	203853	4	2011	$157					
5	NK38-SOW-42000-10002	2.1.2 recom.	EXPENDABLE MATERIAL	GASKET	NBT 400289P0023	-		197443	3	2006	$89					
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	O-RING	R 403028P0041	HTGD690136	52	163027	4	2013	$109					
10	NK38-SOW-41000-10002	2.2.1 e	WEDGING	SHIM	HTGD449310R0001	HTGD690195		605528	3	2012	$802					
10	NK38-SOW-41000-10002	2.4.1 d	INLET VALVE	LOCK WASHER	NB 336850P4075	HTGD690215	21	203454	4	2012	$115					
10	NK38-SOW-41000-10002	2.1.1.d	BALANCING HOLE COVER	STANDARD PRESSURE SPRING	NB 434441P1050	HTGD690153	26	204775	3	2013	$408					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	WASHER	W 402199P0018	HTGG90848	33	654140	3	2009	$156					
10	NK38-SOW-41000-10002	2.4.1 c	MAIN CLOSURE INSTALLATIO	WELDING RING	HTGR413938P0002	HTGD690215	10	203427	4	2013	$759					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	HEATING STEAM VALVE	SOCKET HEAD NUT	TGD 432471P0001	HTGD690211		482506	3	2006	$311					
11	NK38-SOW-41000-10002	2.3.1_f	OIL WIPER BAFFLE	VENTILATION PLATE	BBHD228257R0001	HTGD690110	46	680613	3	2012	$6,782					
11	NK38-SOW-41000-10002	2.3.1_f	OIL WIPER BAFFLE	VENTILATION PLATE	BBHD228257R0001	HTGD690110	46	680613	3	2012	$6,782					
11	NK38-SOW-41000-10002	AP recom. Parts C-Inspec	TWO-STAGE FILTER	ROUND SEALING RING SET	HTGZ400206P0042	HTGD690259	52	203760	4	2012	$1,970					
11	NK38-SOW-41000-10002	2.3.1_f	SINGLE DISC-TYPE THRUST B	INTERMEDIATE SHIM	D 503971P0002	HTGD90222	7	655233	3	2007	$350					
10	NK38-SOW-41000-10002	2.4.4 d	PILOT CONTROL	O-RING	R 403028P0048	HTGR 90113	304	163035	4	2009	$242					
10	NK38-SOW-41000-10002	2.5.2 c	SERVOMOTOR	DU-BUSH	R 302530P0158	HTGD690291	35	115232	3	2013	$217					
4	NK38-SOW-42000-10002	2.1.2. i Unit 1&2	STATOR WIND. INSTALL	HARDENER 103	HIFE450021P0001	HTGG90998	64	685221	4	2012	$231					
4	NK38-SOW-42000-10002	2.1.2. i Unit 1&2	EXPENDABLE MATERIAL	INSULATION MATERIAL	NBT 401122P0114	HTGG90984	12	671002	4	2009	$343					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	CROSSHEAD GUIDE	GMD2125269P0001	HTGD90333	1	471261	3	2007	$517					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	CROSSHEAD GUIDE	GMD2125269P0001	HTGD90333	1	471261	3	2007	$517					
5	NK38-SOW-42000-10002	2.1.2 recom.	EXPENDABLE MATERIAL	T-PIECE	GME2944028R0001	HTGG 90853	8	203907	3	2011	$419					
10	NK38-SOW-41000-10002	2.4.4 d	ERVOMOTOR BASIC ELEMENT	O-RING	R 403028P0048	HTGR308410	16	163035	4	2009	$242					
5	NK38-SOW-42000-10002	3.1.2 c	STATOR END SCREWING	ROUND RUBBER SEAL	GME0944241R0001	HTGG90848	87	654678	3	2013	$325					
10	NK38-SOW-41000-10002	2.2.1 e	KEY WAY	SET OF SHIMS	HTGD336814R0003	HTGD690192	10	605519	3	2012	$965					
10	NK38-SOW-41000-10002	2.2.1 e	KEY WAY	SET OF SHIMS	HTGD336814R0003	HTGD690192	11	605519	3	2012	$965					
6	NK38-SOW-42000-10002	2.1.5. e	BUSHING CASING	ROUND RUBBER SEAL	GME0944241R0001	HTGG90848	45	654678	3	2013	$325					
10	NK38-SOW-41000-10002	2.1.2 c NK38-41800-1000	PILOT RELAY	ROLLING MEMBRANE	R 405400P0001	HTGD690291	66	203781	3	2010	$1,590					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	WEDGING	CROSSHEAD GUIDE	GMD2217135P0001	HTGD690196	2	462862	3	2007	$637					
10	NK38-SOW-41000-10002	2.4.3 d	INSERT BUSH, COMPLETE	WIPER	R 405420P0020	HTGD690136	9	203466	3	2007	$465					

Benchmarking Comparison of OPG Historical Pricing with Alstom TG Project Proposed Pricing

Tab	SOW Doc #	SOW Reference	Description of higher level item	Description	Material number	Nomenclature Dwg	Nomenclature ITEM	OPG CAT ID's	Q Level	PO YEAR	OPG UNIT Price with Escalation Factor (1.0335	Highest Alstom Price	Difference	single price ea part. U 1/3/4	single price ea part. U 2	Item Price
10	NK38-SOW-41000-10002	2.4.3 d	SERVOMOTOR	WIPER	R 405420P0020	HTGD690139	67	203466	3	2007	$465	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
11	NK38-SOW-41000-10002	P recom. Parts C-Inspec	HEATING STEAM VALVE	EXPANSION SLEEVE	HTGR415995P0001	HTGD690211		482505	3	2006	$427					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	SLIDING PIECE	GMD2125275P0001	HTGD90333	3	471255	3	2007	$799					
10	NK38-SOW-41000-10002	.1.2 c NK38-41800-100	NONRETURN VALVE	EXPANSION STUD	TGD 218935P0004	HTGD690291	87	460623	3	2006	$420					
10	NK38-SOW-41000-10002	2.5.2 c	PILOT RELAY	ROLLING MEMBRANE	R 405400P0001	HTGD690291	66	203781	3	2010	$1,590					
11	NK38-SOW-41000-10002	3.2.1 _c or 2.2.1 _e	LP CASING SUPPORT	SLIDING PIECE	GMD2125268P0001	HTGD90333	3	471255	3	2007	$799					
10	NK38-SOW-41000-10002	2.4.1 d	VALVE BONNET COMPL.	WELDING RING	HTGR412631P0003	HTGD690215	34	203437	4	2010	$995					
10	NK38-SOW-41000-10002	2.1.1.a	HP OUTER CASING	SUPERBOLT NUT CPL.	GMD2914029P0016			527611	4	2009	$613					
8	NK38-SOW-42000-10002	2.5.k)	SEALOILCOOLER	O-RING	C 400662P0009		W20	203696	4	2008	$1,261					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG305603P0003	HTGG 90854	45	203916	3	2012	$865					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	GASKET	HTGG305603P0003	HTGG 90854	45	203916	3	2012	$865					
5	NK38-SOW-42000-10002	3.1.3 b	SLIP RING SHAFT COML.	BASIC RESIN EP 03	NBT 401839P0003			328923	4	2011	$1,116					
5	NK38-SOW-42000-10002	3.1.3 b	SLIP RING SHAFT COML.	HARDENER 30	NBT 401842P0006			328923	4	2011	$1,116					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	HARDENER 30	NBT 401842P0006	HTGG691511	25	328923	4	2011	$1,116					
5	NK38-SOW-42000-10002	2.1.2 recom.	AIR GAP ORIFICE CPL.	HARDENER 30	NBT 401842P0006	HTGG 90937	17	328923	4	2011	$1,116					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	HARDENER 30	NBT 401842P0006	HTGG90848	16	328923	4	2011	$1,116					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	HARDENER 30	NBT 401842P0006	HTGG90848	14	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.h Unit 1&2	EXPENDABLE MATERIAL	HARDENER 30	NBT 401842P0006	HTGG90984	12	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2 j Unit 1&2	DOUBLE SHAPED WEDGE	HARDENER 30	NBT 401842P0006	HTGG90988	155	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	HARDENER 30	NBT 401842P0006	HTGG90988	44	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	HARDENER 30	NBT 401842P0006	HTGG90988	44	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	HARDENER 30	NBT 401842P0006	HTGG90988	44	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	HARDENER 30	NBT 401842P0006	HTGG90988	44	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2. i Unit 1&2	STATOR WIND. INSTALL	HARDENER 30	NBT 401842P0006	HTGG90988	55	328923	4	2011	$1,116					
4	NK38-SOW-42000-10002	2.1.2.d Unit 1&2	THERMOCOUPLE INSTALLED	HARDENER 30	NBT 401842P0006	HTGG90998	78	328923	4	2011	$1,116					
10	NK38-SOW-41000-10002	.1.2 c NK38-41800-100	PILOT RELAY	DU-BUSH	R 302530P0125	HTGD690291	71	578209	3	2011	$1,033					
10	NK38-SOW-41000-10002	.1.2 c NK38-41800-100	PILOT RELAY	DU-BUSH	R 302530P0092	HTGD690291	62	578209	3	2011	$1,033					
11	NK38-SOW-41000-10002	3.1.1_g	SUPPORT	SCREW W.HEXAGONAL REC.HOL	NB 315857P0414	HTGD90381	19	665643	4	2008	$1,079					
11	NK38-SOW-41000-10002	3.1.1_g	HP CASING SUPPORT	SCREW W.HEXAGON.REC.HOLE	NB 315857P0416	HTGD90381	20	665643	4	2008	$1,079					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	RUBBER LIP SEAL	W 403350P0001	HTGG 90854	64	203928	4	2010	$1,897					
5	NK38-SOW-42000-10002	2.1.2 recom.	SHAFT SEAL HOUSING ASS.	RUBBER LIP SEAL	W 403350P0001	HTGG 90854	64	203928	4	2010	$1,897					
11	NK38-SOW-41000-10002	P recom. Parts C-Inspec	NONRETURN VALVE	STANDARD PRESSURE SPRING	NB 434440P4808	HTGD690129	13	203712	4	2006	$1,633					
11	NK38-SOW-41000-10002	2.3.1_f	OIL WIPER BAFFLE	OIL WIPER BAFFLE	HTGD229762R0001	HTGD690109		680613	3	2012	$6,782					
5	NK38-SOW-42000-10002	2.1.2 recom.	SLIP RING COVER ASSE.	BASIC RESIN EP 03	NBT 401839P0003	HTGG691511	25	328922	4	2012	$1,774					
5	NK38-SOW-42000-10002	2.1.2 recom.	AIR GAP ORIFICE CPL.	BASIC RESIN EP 03	NBT 401839P0003	HTGG 90937	17	328922	4	2012	$1,774					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	BASIC RESIN EP 03	NBT 401839P0003	HTGG90848	16	328922	4	2012	$1,774					
7	NK38-SOW-42000-10002	2.1.5 f	TERMINAL-CASING COMP.	BASIC RESIN EP 03	NBT 401839P0003	HTGG90848	14	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.h Unit 1&2	EXPENDABLE MATERIAL	BASIC RESIN EP 03	NBT 401839P0003	HTGG90984	12	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2 j Unit 1&2	DOUBLE SHAPED WEDGE	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	155	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	44	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	44	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	44	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.L Unit 1&2	END WIND. A. HOSE ORDERS	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	44	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2. i Unit 1&2	STATOR WIND. INSTALL	BASIC RESIN EP 03	NBT 401839P0003	HTGG90988	55	328922	4	2012	$1,774					
4	NK38-SOW-42000-10002	2.1.2.d Unit 1&2	THERMOCOUPLE INSTALLED	BASIC RESIN EP 03	NBT 401839P0003	HTGG90998	78	328922	4	2012	$1,774					
11	NK38-SOW-41000-10002	4		GASKET	GMD0924483P0016	HTGR90069		204793	3	2013	$2,107					
11	NK38-SOW-41000-10002	P recom. Parts C-Inspec	PRESSURE RELIEF VALVE	GASKET	NBT 400289P0039	GT 401372	5943	204800		2013	$2,186					
10	NK38-SOW-41000-10002	2.1.1 e	HP-SHAFT SEAL	SUPPORT RING 2 HALVES	HTGD017620P0006	HTGD90143	15	674258	4	2009	$34,133					
10	NK38-SOW-41000-10002	2.1.1 e	HP-SHAFT SEAL	SUPPORT RING 2 HALVES	HTGD017620P0006	HTGD90143	15	674258	4	2009	$34,133					
10	NK38-SOW-41000-10002	2.4.1 c	INLET VALVE	SEALING ELEMENT 2 PIECES	HTGR341026R0001	HTGD690215	16	203423	3	2011	$26,098					

Benchmarking Comparison of OPG Historical Pricing with Alstom TG Project Proposed Pricing

Tab	SOW Doc #	SOW Reference	Description of higher level item	Description	Material number	Nomenclature Dwg	Nomenclature ITEM	OPG CAT ID's	Q Level	PO YEAR	OPG UNIT Price with Escalation Factor (1.0335	Highest Alstom Price	Difference	single price ea part. U 1/3/4	single price ea part. U 2	Item Price
11	NK38-SOW-41000-10002	2.3.1_f	OIL TEST VALVE	GASKET	NBT 400289P0030	HTGD690148	4	680615	3	2012	$6,782	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
11	NK38-SOW-41000-10002	2.3.1_f	OIL TEST VALVE	GASKET	NBT 400289P0030	HTGD690148	4	680615	3	2012	$6,782					
10	NK38-SOW-41000-10002	2.4.1 d	INLET VALVE	SEALING ELEMENT 2 PIECES	HTGR341025R0001	HTGD690215	40	203445	3	2006	$31,314					
11	NK38-SOW-41000-10002	2.5.4.1 _d	MAIN LUBE OIL PUMP	TOOTHED PISTON	HTGR103822P0001	HTGD690084	4	203556		2012	$175,621					
11	NK38-SOW-41000-10002	2.3.1_f	TRANSMITTER ATTACHMENT	SEALING PROFILE	NBT 400212P0004	HTGD690094		203961	3	2008	$53,255					
10	NK38-SOW-41000-10002	2.5.4.2 c	LUIBE OIL TANK	NONRETURN VALVE	HTGR001517R0002	HTGD690129		204321	3	2007	$151,348					
10	NK38-SOW-41000-10002	2.5.4.2 c	NONRETURN VALVE	VALVE	R 102522P0002	HTGD690129	3	204321	3	2007	$151,348					
											$1,590,865	[redacted]				

Darlington Nuclear Generating Station
Turbine Generator Refurbishment

ONTARIO POWER GENERATION

Rates Comparison

CONTRACTOR Rate Source		Services [$/hr] A	B	C	D	E	Comments/Observations
ALSTOM 2012 Rates	Job Classification / Working Schedule	Specialized Hands-on support services:Turbine Bladders, Generator winders,Machinists	Advisors, Site Managers and technicians, with a high level of experience and training	Lead or specilized Advisors and Technicians	Senior Technical Advisors, Site Engineers for administering of O&M contracts, mechanical and electrical EI&C	Factory based engineers for Performance Evaluation, Engineering Evaluation , Condition Assessment	
	Straight time(10 hrs)						
	Overtime(over 10 hours-Mon-Fri)						
	Overtime-(Sat, Sun and holidays)						
	Job Classification / Working Schedule						
	Working Day(8hours)						
	Job Classification / Working Schedule						
	Working Day(8 hours)						
	Overtime(over 8 hours)						
	Holiday						
	Holiday Overtime(over 8 hours)						
	Job Classification / Working Schedule						
	Straight time(first 3000hours/year)						
	Overtime(>3000hours)						
	Straight time						
	Job Classification / Working Schedule						
	Straight time						
	Job Classification / Working Schedule						
	Straight time(8 hrs)						
	Overtime(over 8 hours)						
	Job Classification / Working Schedule						
	Straight time(8 hrs)						
	Overtime(over 8 hours)						
	Straight time(40 hrs/week)						
	Overtime(over 40hrs/week)						
	Overtime-(second shift)						
	Straight time(40 hrs/week)						
	Job Classification / Working Schedule						
	Straight time						
	Job Classification / Working Schedule						
	Straight time(40 hrs/week)						
	Overtime(over 40hrs/week)						
	Overtime-(Sundays and holidays)						

CONTRACTOR Rate Source		Services				
		A	B	C	D	E
	Job Classification / Working Schedule	Specialized Hands-on support services:Turbine Bladders, Generator winders,Machinists	Advisors, Site Managers and technicians, with a high level of experience and training	Lead or specilized Advisors and Technicians	Senior Technical Advisors, Site Engineers for administering of O&M contracts, mechanical and electrical EI&C	Factory based engineers for Performance Evaluation, Engineering Evaluation , Condition Assessment
ALSTOM 2012 Rates	Straight time(10 hrs)					
	Overtime(over 10 hours-Mon-Fri)					
	Overtime-(Sat, Sun and holidays)					
ALSTOM 2013 TFA Rates	Straight time(10 hrs)					
	Overtime(over 10 hours-Mon-Fri)					
	Overtime-(Sat, Sun and holidays)					
ALSTOM TFA Rates with 4.5% Discount ($35M to $45M volume)	Straight time(10 hrs)					
	Overtime(over 10 hours-Mon-Fri)					
	Overtime-(Sat, Sun and holidays)					
ALSTOM TFA Rates with 7.5% Discount ($45M to $60M volume)	Straight time(10 hrs)					
	Overtime(over 10 hours-Mon-Fri)					
	Overtime-(Sat, Sun and holidays)					
ALSTOM TFA Rates with 9% Discount (Greater than $60M	Straight time(10 hrs)					
	Overtime(over 10 hours-Mon-Fri)					
	Overtime-(Sat, Sun and holidays)					

UNDERTAKING JT1.5

Undertaking

TO PRODUCE THE KEPNER-TREGOE ANALYSIS REFERENCED IN THE REPORT FILED AT L-4.3-15 SEC-016, ATTACHMENT 2.

Response

The Executive Summary Report for the Kepnor-Tregoe Analysis referred to in Concentric Energy Advisor's Assessment of Commercial Strategies Developed for the Darlington Refurbishment Project's Turbine Generators Work Package (filed at Ex. L-4.3-15 SEC-016, Attachment 2) is provided in Attachment 1, and the full Kepner-Tregoe analysis report is provided in Attachment 2.

Decision Analysis Executive Summary Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Decision Background

As part of the Refurbishment Project at Darlington there will be number of work packages prepared and executed to ensure that the turbine generator sets (TG) operate efficiently and effectively until end of life (additional 30 years). The original company is no longer servicing the industry but the original design basis information and associated intellectual property has passed through an intermediary company and is now resident with a single vendor which currently provides engineering and maintenance support to Darlington.

Decision Analysis Team

Name	Company	Team Member Role	Team Member Expertise
neill allen	KT	Facilitator	Commercial Strategy
Chatterjee, Deepa		Content expert	Commercial Strategy
Craig, Dale		Content expert	Engineering
Josifovski, Todd		Owner	Project Manager
Woodward, Nancy		Content expert	Commercial Strategy
Nelson, Andrew		Content expert	Supply Chain
Stancu, Silviu		Content expert	Supply Chain
Prokopeiva, Evguena		Content expert	Legal Issues
Chatterton, Ron		Content expert	Ops and Maintenance
Allen, Neill		Facilitator	Commercial Strategy

Decision Statement

Select the best contracting option to implement (engineer, procure, construct) the identified scope of work for the Darlington turbine generator sets.

Must Objectives	Measures
Must not compromise current OPG policy for procurement	Meet OPG governance
Meet Technical Requirements	As per OPG approved technical specifications
Meet Quality Requirements	As per PO (tech specs plus source surveillance etc. to satisfy that vendor application of their Quality Program satisfies OPG requirements for permanent plant components. Vendor must be (or capable of qualifying) on OPG Approved Supplier List.

Decision Analysis Executive Summary Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Want Objectives	Measures	Weights
Minimize risk to project execution and schedule(three phases of engineering, procurement and manufacturing and field execution and commissioning.)	Development of engineering requirements Duration of procurement process Complexity of execution phase. Ability to integrate with other work.	10
Maximise value for money (cost element)	Total cost for refurbishment to OPG (internal and external expenditures)	9
Make decision transparent	Demonstrate open and fair process	8
Minimise risk to ongoing operability after refurbishment	Vendor ability to minimize/manage changes	7
Ensure accountability for deliverables is clear (risk element)	Minimize number of hand offs and interfaces	7
Enable contractor procurement	Remove any impediments from contractor process	6
Allows OPG to maintain oversight	By monitoring quality program, project task completion	5
Maximize transfer of risk to vendor	Clarity on EPC accountabilities	5
Maximize value for money (pre refurb outages impact for inspection by non OEM)	Pre refurbishment outage impact for additional inspections and preparations due to lack of access to original design information.	4
Minimise changes to maintenance, training practices post refurbishment,	Vendor ability to minimize/manage changes .	4
Demonstrate open process for selection of vendors	Provides sufficient records, documents to support an audit,	3
Minimise future dependancy on single sourcing	Develops alternative supply sources	3
Minimise level of resources (staff) required by OPG	Number of interface points in processes and deliverables	2

Alternatives Considered

Unbundled scope (5 packages), competitive bid process.

Bundled scope, sole source process (OEM).

Bundled scope, competitive bid process.

Unbundled scope, selective sole source and competitive processes

Recommended (or Selected) Alternative

Bundled scope, sole source process (OEM).

Decision Analysis Executive Summary Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Risks Associated with the Recommended (or Selected) Alternative(s)

Alternative: **Bundled scope, sole source process (OEM).**

Risks (If...)	Probability	Adverse Consequences (Then...)	Seriousness
The single source vendor goes out of business	L	Delay to project while new procurement process is entered into. Possible higher costs.	H
OPG cannot negotiate an acceptable contract with vendor	L	Delays to award of contract and project schedule. Potential to have to repeat procurement process with new vendors. There would be some internal cost increases and potential project cost issues if work has to be expeditied.	H
Risks (If...)	**Probability**	**Adverse Consequences (Then...)**	**Seriousness**
The vendor refuses to transfer intellectual property	H	Future maintenance and modification options are limited unless OPG future needs are captured in contract terms and conditions.	M
We do not use a competitive bid process then there could be a challenge to OPG's contracting strategy by external stakeholders. (supply chain process challenged)	M	There could be delays to award of contract if process review requested.	M
The vendor increases the contingency scope (due to their influence over the entire project).	L	Schedule and cost increase above estimate	M
Risks (If...)	**Probability**	**Adverse Consequences (Then...)**	**Seriousness**
We do not use a competitive bid process then there could be a challenge to OPG's contracting strategy by external stakeholders. (cost recovery allowance challenged)	H	Rate approval and full cost recovery may be denied at a future date.	L
OPG's reputation for open and fair treatment of vendors is challenged	L	Increased scrutiny of OPG Supply Chain processes.	L

Decision Analysis Executive Summary Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Actions and their Status

Best Choice Alternative: **Bundled scope, sole source process (OEM).**

Action	Who	By When	Status	Notes
Prepare recommendation cover letter to go with Contracting Strategy and KT analysis to executive team	Woodward, Nancy	2/29/12	In Progress	

Summary

Record Name

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Knowledge Management Code

OPG

Record Created

02/02/2012

Benefits

Lessons Learned

Closeout Notes

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Decision Analysis Background

As part of the Refurbishment Project at Darlington there will be number of work packages prepared and executed to ensure that the turbine generator sets (TG) operate efficiently and effectively until end of life (additional 30 years). The original company is no longer servicing the industry but the original design basis information and associated intellectual property has passed through an intermediary company and is now resident with a single vendor which currently provides engineering and maintenance support to Darlington.

Decision Analysis Team

Name	Company	Team Member Role	Team Member Expertise
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Prokopeiva, Evguena		Content expert	Legal Issues
Chatterton, Ron		Content expert	Ops and Maintenance
Allen, Neill		Facilitator	Commercial Strategy

Decision Statement

Select the best contracting option to implement (engineer, procure, construct) the identified scope of work for the Darlington turbine generator sets.

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objectives and Measures

Objectives	Measures	Classification
Meet Quality Requirements	As per PO (tech specs plus source surveillance etc. to satisfy that vendor application of their Quality Program satisfies OPG requirements for permanent plant components. Vendor must be (or capable of qualifying) on OPG Approved Supplier List.	Must
Meet Technical Requirements	As per OPG approved technical specifications	Must
Must not compromise current OPG policy for procurement	Meet OPG governance	Must
Maximize value for money (pre refurb outages impact for inspection by non OEM)	Pre refurbishment outage impact for additional inspections and preparations due to lack of access to original design information.	Want
Maximize transfer of risk to vendor	Clarity on EPC accountabilities	Want
Ensure accountability for deliverables is clear (risk element)	Minimize number of hand offs and interfaces	Want
Minimise future dependancy on single sourcing	Develops alternative supply sources	Want
Make decision transparent	Demonstrate open and fair process	Want
Enable contractor procurement	Remove any impediments from contractor process	Want
Minimise changes to maintenance, training practices post refurbishment,	Vendor ability to minimize/manage changes .	Want
Minimise risk to ongoing operability after refurbishment	Vendor ability to minimize/manage changes	Want
Minimise level of resources (staff) required by OPG	Number of interface points in processes and deliverables	Want
Allows OPG to maintain oversight	By monitoring quality program, project task completion	Want
Maximise value for money (cost element)	Total cost for refurbishment to OPG (internal and external expenditures)	Want
Minimize risk to project execution and schedule(three phases of engineering, procurement and manufacturing and field execution and commissioning.)	Development of engineering requirements Duration of procurement process Complexity of execution phase. Ability to integrate with other work.	Want
Demonstrate open process for selection of vendors	Provides sufficient records, documents to support an audit,	Want

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Weight of Want Objectives

Want Objectives	Measures	Weights
Minimize risk to project execution and schedule(three phases of engineering, procurement and manufacturing and field execution and commissioning.)	Development of engineering requirements Duration of procurement process Complexity of execution phase. Ability to integrate with other work.	10
Maximise value for money (cost element)	Total cost for refurbishment to OPG (internal and external expenditures)	9
Make decision transparent	Demonstrate open and fair process	8
Minimise risk to ongoing operability after refurbishment	Vendor ability to minimize/manage changes	7
Ensure accountability for deliverables is clear (risk element)	Minimize number of hand offs and interfaces	7
Enable contractor procurement	Remove any impediments from contractor process	6
Allows OPG to maintain oversight	By monitoring quality program, project task completion	5
Maximize transfer of risk to vendor	Clarity on EPC accountabilities	5
Maximize value for money (pre refurb outages impact for inspection by non OEM)	Pre refurbishment outage impact for additional inspections and preparations due to lack of access to original design information.	4
Minimise changes to maintenance, training practices post refurbishment,	Vendor ability to minimize/manage changes .	4
Demonstrate open process for selection of vendors	Provides sufficient records, documents to support an audit,	3
Minimise future dependancy on single sourcing	Develops alternative supply sources	3
Minimise level of resources (staff) required by OPG	Number of interface points in processes and deliverables	2

Alternatives

Unbundled scope (5 packages), competitive bid process.

Bundled scope, sole source process (OEM).

Bundled scope, competitive bid process.

Unbundled scope, selective sole source and competitive processes

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Alternatives Screened through Must Objectives

Must Objective and Measure	Unbundled scope (5 packages), competitive bid process.		Bundled scope, sole source process (OEM).		Bundled scope, competitive bid process.	
	Supporting Data	Go/No Go	Supporting Data	Go/No Go	Supporting Data	Go/No Go
Must not compromise current OPG policy for procurement Meet OPG governance	Will satisfy OPG procurement governance.	Go	Will satisfy OPG governance	Go	Will satisfy OPG governance	Go
Meet Technical Requirements As per OPG approved technical specifications	Only qualified bidders on vendor list. OPEX and references reviewed.	Go	Only qualified bidders on vendor list. OPEX and references reviewed.	Go	Only qualified bidders on vendor list. OPEX and references reviewed.	Go
Meet Quality Requirements As per PO (tech specs plus source surveillance etc. to satisfy that vendor application of their Quality Program satisfies OPG requirements for permanent plant components. Vendor must be (or capable of qualifying) on OPG Approved Supplier List.	All potential vendors would be on ASL	Go	All potential vendors would be on ASL	Go	All potential vendors would be on ASL	Go

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Must Objective and Measure	**Unbundled scope, selective sole source and competitive processes**					
	Supporting Data	**Go/No Go**	**Supporting Data**	**Go/No Go**	**Supporting Data**	**Go/No Go**
Must not compromise current OPG policy for procurement	Will satisfy OPG governance	Go		Go		Go
Meet OPG governance						
Meet Technical Requirements	Only qualified bidders on vendor list. OPEX and references reviewed.	Go		Go		Go
As per OPG approved technical specifications						
Meet Quality Requirements	All potential vendors would be on ASL	Go		Go		Go
As per PO (tech specs plus source surveillance etc. to satisfy that vendor application of their Quality Program satisfies OPG requirements for permanent plant components. Vendor must be (or capable of qualifying) on OPG Approved Supplier List.						

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Alternatives Scored Against Want Objectives

Objective:	Measure:	Weight:
Minimize risk to project execution and schedule(three phases of engineering, procurement and manufacturing and field execution and commissioning.)	Development of engineering requirements Duration of procurement process Complexity of execution phase. Ability to integrate with other work.	10

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Many interfaces and many packages. Limited access to IP, increased time and effort to develop requirements. Multiple contracts. Field implementation potential schedule delays due to integration issues.	2
Bundled scope, sole source process (OEM).	Minimizes interfaces and process steps.	10
Bundled scope, competitive bid process.	Need to put proponents on a level playing field (not sure we can do this!) Potential impact with exisiting installations. (potential high Engineering effort)	5
Unbundled scope, selective sole source and competitive processes	Some interfaces, more than one contract. IP issues still in play.	4

Objective:	Measure:	Weight:
Maximise value for money (cost element)	Total cost for refurbishment to OPG (internal and external expenditures)	9

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Potential costs associated with IP and integration issues. Drives to more competitive cost through rates and burdens.Maximises opportunity for innovation.	10
Bundled scope, sole source process (OEM).	Difficulty in negotiation with single source. Limited opportunity to challenge cost. Reduces potential for innovations.	6
Bundled scope, competitive bid process.	Fewer potential bidders. Lower integration issues. Still issues with background data. Introduces opportunity for innovation.	8

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Maximise value for money (cost element)	Total cost for refurbishment to OPG (internal and external expenditures)	9

Alternative	Supporting Data	Score
Unbundled scope, selective sole source and competitive processes	Still integration issues, reduces IP threat, improves competitve drivers	7

Objective:	Measure:	Weight:
Make decision transparent	Demonstrate open and fair process	8

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Very fair and open	10
Bundled scope, sole source process (OEM).	Closed process. Intellectual Property access supports rational for scoring.	4
Bundled scope, competitive bid process.	Fair and open	9
Unbundled scope, selective sole source and competitive processes	Hybrid of processes, some potential challenge for the sole source portion	7

Objective:	Measure:	Weight:
Minimise risk to ongoing operability after refurbishment	Vendor ability to minimize/manage changes	7

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	High risk (all changes introduce risk). More interfaces, technical and process differences between companies. Access to IP issues.	2
Bundled scope, sole source process (OEM).	Lowest risk not zero (all changes introduce risk)	10

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Minimise risk to ongoing operability after refurbishment	Vendor ability to minimize/manage changes	7

Alternative	Supporting Data	Score
Bundled scope, competitive bid process.	Medium (all changes introduce risk). Potential access to IP issues	5
Unbundled scope, selective sole source and competitive processes	Medium to low (all changes introduce risk). Some interface,technical and process challenges.	6

Objective:	Measure:	Weight:
Ensure accountability for deliverables is clear (risk element)	Minimize number of hand offs and interfaces	7

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Lots of interfaces	4
Bundled scope, sole source process (OEM).	Fewest interfaces	10
Bundled scope, competitive bid process.	Fewer interfaces	7
Unbundled scope, selective sole source and competitive processes	Medium level of interfaces.	6

Objective:	Measure:	Weight:
Enable contractor procurement	Remove any impediments from contractor process	6

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	no impediment to purchasing ability, however potentially more interface with OPG (hi)	6
Bundled scope, sole source process (OEM).	least number of impediments (low)	10

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Enable contractor procurement	Remove any impediments from contractor process	6

Alternative	Supporting Data	Score
Bundled scope, competitive bid process.	medium	8
Unbundled scope, selective sole source and competitive processes	medium/hi with potential for more OPG interfaces	7

Objective:	Measure:	Weight:
Allows OPG to maintain oversight	By monitoring quality program, project task completion	5

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	(OPG level of effort) high. Several Quality Programs to monitor.	4
Bundled scope, sole source process (OEM).	low. Allows for well defined interfaces.Need to negotiate open book access to contract.	10
Bundled scope, competitive bid process.	low to medium. Need to negotiate open book access to contract.	8
Unbundled scope, selective sole source and competitive processes	medium	6

Objective:	Measure:	Weight:
Maximize transfer of risk to vendor	Clarity on EPC accountabilities	5

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Interfacing issues may transfer some risk back to OPG	5
Bundled scope, sole source process (OEM).	EPC accountabilities can be captured in single contract.	10

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Maximize transfer of risk to vendor	Clarity on EPC accountabilities	5

Alternative	Supporting Data	Score
Bundled scope, competitive bid process.	EPC accountabilities can be captured in contract.	10
Unbundled scope, selective sole source and competitive processes	Several contracts with potential EPC variations	7

Objective:	Measure:	Weight:
Minimise changes to maintenance, training practices post refurbishment,	Vendor ability to minimize/manage changes .	4

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Additional risk introduced through multiple vendors and their prefered equipment, processes and documentation	7
Bundled scope, sole source process (OEM).	Should have more consistent equipment, processes and documentation.	10
Bundled scope, competitive bid process.	Should have consistent equipment but still interface issues with original equipment,processes and documentation.	9
Unbundled scope, selective sole source and competitive processes	Somewhat better than fully unbundled	8

Objective:	Measure:	Weight:
Maximize value for money (pre refurb outages impact for inspection by non OEM)	Pre refurbishment outage impact for additional inspections and preparations due to lack of access to original design information.	4

Alternative	Supporting Data	Score

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Maximize value for money (pre refurb outages impact for inspection by non OEM)	Pre refurbishment outage impact for additional inspections and preparations due to lack of access to original design information.	4

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Individual contractors will need to establish their "as built" understanding of the systems	5
Bundled scope, sole source process (OEM).	OEM has access to existing design basis information.	10
Bundled scope, competitive bid process.	Information requirments would be managed by a single point but still extensive	6
Unbundled scope, selective sole source and competitive processes	OPG may need to manage information.	7

Objective:	Measure:	Weight:
Demonstrate open process for selection of vendors	Provides sufficient records, documents to support an audit,	3

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Hi (competitive bidding is currently considered to reflect open process)	10
Bundled scope, sole source process (OEM).	low (Significant oversight and challenge incorporated into OPG process).	5
Bundled scope, competitive bid process.	hi	9
Unbundled scope, selective sole source and competitive processes	medium	6

Objective:	Measure:	Weight:
Minimise future dependancy on single sourcing	Develops alternative supply sources	3

Alternative	Supporting Data	Score

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Objective:	Measure:	Weight:
Minimise future dependancy on single sourcing	Develops alternative supply sources	3

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	Would improve future options by greater exposure to new potential vendors.	10
Bundled scope, sole source process (OEM).	Restricts options (requires better contract Terms and conditions to protect OPG future needs.)	7
Bundled scope, competitive bid process.	Improves options, limits vendors to those capable of full scope	9
Unbundled scope, selective sole source and competitive processes	Improves options	8

Objective:	Measure:	Weight:
Minimise level of resources (staff) required by OPG	Number of interface points in processes and deliverables	2

Alternative	Supporting Data	Score
Unbundled scope (5 packages), competitive bid process.	# of OPG staff involved (Hi)	2
Bundled scope, sole source process (OEM).	# of OPG staff involved (low)	10
Bundled scope, competitive bid process.	# of OPG staff involved (somewhat dependent on vendor selection) (low)	9
Unbundled scope, selective sole source and competitive processes	low to medium	4

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Total Weighted Scores for Alternatives

Alternative	Total Weighted Score
Unbundled scope (5 packages), competitive bid process.	425
Bundled scope, sole source process (OEM).	622
Bundled scope, competitive bid process.	548
Unbundled scope, selective sole source and competitive processes	460

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Making the Decision

Tentative Choice	Total Score	Best Choice?	Risks	P	Adverse Consequences	S
Bundled scope, sole source process (OEM).	622	X	The vendor refuses to transfer intellectual property	H	Future maintenance and modification options are limited unless OPG future needs are captured in contract terms and conditions.	M
			We do not use a competitive bid process then there could be a challenge to OPG's contracting strategy by	H	Rate approval and full cost recovery may be denied at a future date.	L
			external stakeholders. (cost recovery allowance challenged)			
			We do not use a competitive bid process then there could be a challenge to OPG's contracting strategy by	M	There could be delays to award of contract if process review requested.	M
			external stakeholders. (supply chain process challenged)			
			OPG cannot negotiate an acceptable contract with vendor	L	Delays to award of contract and project schedule. Potential to have to repeat procurement process with new vendors. There would be some internal cost increases and potential project cost issues if work has to be expeditied.	H

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Tentative Choice	Total Score	Best Choice?	Risks	P	Adverse Consequences	S
			The single source vendor goes out of business	L	Delay to project while new procurement process is entered into. Possible higher costs.	H
			The vendor increases the contingency scope (due to their influence over the entire project).	L	Schedule and cost increase above estimate	M
			OPG's reputation for open and fair treatment of vendors is challenged	L	Increased scrutiny of OPG Supply Chain processes.	L
Bundled scope, competitive bid process.	548	☐	The vendor increases the contingency scope. (because they are not knowlegeable enough during definition phase.	H	Impact on schedule and cost	M
			There is lack of access to intellectual property/design basis (existing IP) for some vendors to bid successfully	H	Some vendors bids are much less certain due to limited information. This results in higher contingency values and greater project definition uncertainty.	H
			Vendors may complain process is unfair (if incumbent is part of process).	H	Alternative supplier chose not to bid or their response is not a comprehensive proposal. Increased scrutiny.	L-
			New designs may not integrate well with existing components	M		

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Tentative Choice	Total Score	Best Choice?	Risks	P	Adverse Consequences	S
					Project completion, reliability, re-work, cost and schedule, liability concerns post project.	H
			OPG cannot negotiate an acceptable contract with vendor	L	Delays to award of contract and project schedule. Potential to have to repeat procurement process with new vendors. There would be some internal cost increases and potential project cost issues if work has to be expeditied.	H
			The successful vendor goes out of business	L	Impact on schedule and cost	H
			There is a risk the new vendor will not agree to transfer IP	L	Continued problems with OPG ability to develop alternate vendors.	M
Unbundled scope, selective sole source and competitive processes	460	☐		H		H
Unbundled scope (5 packages), competitive bid process.	425	☐		H		H

The Best Balanced Choice

Bundled scope, sole source process (OEM).

Decision Analysis Worksheet Report

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Actions and their Status

Best Choice Alternative: **Bundled scope, sole source process (OEM).**

Action	Who	By When	Status	Notes
Prepare recommendation cover letter to go with Contracting Strategy and KT analysis to executive team	Woodward, Nancy	2/29/12	In Progress	

Summary

Record Name

Select the best contracting option to implement (engineer, procure and construct) the Turbine Generator Refurbishment Project identified scope of work.

Knowledge Management Code

OPG

Record Created

02/02/2012

Benefits

Lessons Learned

Closeout Notes

UNDERTAKING JT1.6

Undertaking

FOR EACH OF THE MAJOR CONTRACTS, OPG TO ADVISE WHAT PERCENTAGE OF THE CONTRACT IS OVERHEAD, WHAT PERCENTAGE IS PROFIT, THE COMBINED AMOUNT OF PROFIT AND OVERHEAD, AND WHAT PERCENTAGE IS AT THE CONTRACTOR'S RISK IF IT CAN BE DONE, AND IF IT CAN'T, EXPLAIN IT. BUT IF IT CAN BE DONE, TO PROVIDE HOW THE CALCULATION WAS ARRIVED AT.

Response

Based on the estimated amounts included in each contract, the breakdown of overheads and profits for the major Darlington Refurbishment Program contracts are as follows:

1) Retube and Feeder Replacement (RFR) Engineering, Procurement and Construction (EPC) Contract

This contract consists of elements of fixed price, target cost, and cost reimbursable (with and without markup) pricing models. OPG does not have visibility into the profit and overhead associated with the fixed price and certain components of the contract, and as a result, cannot provide the profit and overhead as a percentage of total contract costs. A breakdown of each contract component is below:

- For the fixed price elements of work, profit and overhead margins are not disclosed in the contract.
- For the cost reimbursable with markup elements of work, the contractor is paid actual costs for labour and materials plus a percentage specified in the contract (10% for owner-specified materials and 5% for goods). The allocation of the percentage fees are not disclosed in the contract, but include any profit and overhead for the cost reimbursable with markup work. The markup for the cost reimbursable with markup work is estimated to be $54.9M, or 1.6% of the overall contract value.
- For cost reimbursable without markup, the overhead and profit is 0% as the costs are a direct pass-through.
- For the target cost elements of the contract, the total profit and overhead amount is estimated to be [redacted]. Overhead for the target cost elements represent [redacted] of the overall contract value. Profit for the target cost elements represent [redacted] of the overall contract value. For simplicity, Definition Phase target cost elements of work and Execution Phase target cost elements of work have been aggregated.

Under the cost and schedule disincentives mechanisms in the RFR EPC, 80% of the contractor's Fixed Fee (comprised of the contractor's profit, overhead and a risk amount) is at risk (see section 8.6(a) of the RFR EPC filed at Ex. D2-2-3, Attachment 6).

2) Turbine Generators (TG) EPC

This contract consists of elements of target cost and cost reimbursable (with and without markup) pricing models. OPG does not have visibility into the specific breakdown of certain components of the contract, and as a result, cannot provide the profit and overhead as a percentage of total contract costs. A breakdown of each contract component is below:

- For the cost reimbursable with markup elements of work, the contractor is paid actual costs for labour and materials plus a percentage specified in the contract (20% for dynamic commissioning trades work and 5% for goods). The allocation of the percentage fees are not disclosed in the contract, but include any profit and overhead for the cost reimbursable with markup work. The markup for the cost reimbursable with markup work is estimated to be $604K, or 0.2% of the overall contract value.
- For cost reimbursable without markup, the overhead and profit is 0% as the costs are a direct pass-through.
- For the target cost elements of the contract, the total profit and overhead amount is estimated to be [redacted]. Overhead for the target cost elements represent [redacted] of the overall contract value. Profit for the target cost elements represent [redacted] of the overall contract value. For simplicity, Definition Phase target cost elements of work and Execution Phase target cost elements of work have been aggregated.

Under the cost and schedule disincentives mechanism in the TG EPC, 80% of the contractor's Fixed Fee (comprised of the contractor's profit, overhead and a risk amount) is at risk (see section 8.5 of the TG EPC filed at Ex. D2-2-3, Attachment 8).

3) TG Engineering Services and Equipment Supply (ESES) Contract

This contract consists of elements of fixed/firm price, target cost and cost reimbursable (without markup) pricing models. The majority of this contract is fixed/firm price. OPG does not have visibility into the profit and overhead associated with certain components of the contract, and as a result, cannot provide the profit and overhead as a percentage of total contract costs. A breakdown of each contract component is below:

- For the fixed price and target cost elements of work under the TG ESES contract, profit and overhead margins are not disclosed in the contract.
- For cost reimbursable without markup, the overhead and profit is 0% as the costs are a direct pass-through.

There are no fees at risk under the TG ESES as it is primarily a fixed/firm price contract. However, cost disincentives are in place for the target cost components of work (50% of any overruns are payable to OPG as a disincentive). In addition, schedule disincentives are in place equal to a maximum of 10% of the value of the contractor's fixed/firm priced work per unit for delays to agreed timelines for delivery of services (see section 8.2(b) of the TG ESES filed at Ex. D2-2-3, Attachment 7).

4) Steam Generators (SG) EPC

This contract consists of elements of fixed price, target cost and cost reimbursable (without markup) pricing models. OPG does not have visibility into the profit and overhead associated with the fixed price components of the contract, and as a result, cannot provide the profit and overhead as a percentage of total contract costs. A breakdown of each contract component is below:

- For the fixed price elements of work, profit and overhead margins are not disclosed in the contract.
- For cost reimbursable without markup, the overhead and profit is [redacted] as the costs are a direct pass-through.
- For the target cost elements of the contract, the total profit and overhead amount is estimated to be [redacted]. Overhead for the target cost work represents [redacted] of the overall contract value. Profit for the target cost work represents [redacted] of the overall contract value.

Under the cost and schedule disincentive mechanism in the SG EPC, [redacted] of the contractor's Fixed Fee for reimbursable work (comprised of the contractor's profit, overhead and a risk amount) is at risk (see section 8.5(a) of the SG EPC filed at Ex. D2-2-3, Attachment 9). In addition, for a subset of schedule disincentives, [redacted] of the contractor's price for fixed/firm price work is also at risk (see section 8.5(b) of the SG EPC filed at Ex. D2-2-3, Attachment 9).

5) Extended Services Master Services Agreement (ESMSA)

OPG has three ESMSA-type contractors with respect to work at its nuclear facilities. All ESMSA contracts include a total of [redacted] for profit and overhead. [redacted] The total contract value for each of the ESMSA contractors also differ and can change pursuant to purchase orders issued under each ESMSA from time to time.

Under the ESMSAs, [redacted] of the contractors' profit and overhead (i.e. [redacted] of each purchase order) is at risk.

UNDERTAKING JT1.7

Undertaking

TO PROVIDE A RESPONSE RELATED TO INTERROGATORY 4.3 SEC 28, PART A.

Response

OPG has contacted the Association for the Advancement of Cost Engineering (AACE) and requested approval to provide a copy of the AACE International Recommended Practice No. 18R-97 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries.

Per Attachment 1, AACE has granted permission for OPG to provide a confidential copy of AACE International Recommended Practice No. 18R-97, as provided in Attachment 2.

AACE International Permission to Use Agreement

To: Gary Rose, CGA/CPA, PMP, B.Comm.
Vice President, Project Planning & Control/Nuclear Projects
Ontario Power Generation Darlington Energy Complex (DEC)
1855 Energy Drive, Room #312, Courtice, Ontario L1E 0E7
Date: November 15, 2016

In response to your e-mail request received Nov. 15, 2016, permission is hereby granted by AACE International for you to:

Include a copy of AACE International Recommended Practice 18R-97, Cost Estimate Classification System: As Applied in Engineering, Procurement, and Construction for the Process Industries (Rev. June 19, 1998) to the Ontario Energy Board as part of its proceedings to assess the planning effort undertaking for the Darlington Refurbishment Program for use in case EB-2016-0152 related to the determination that the in-service amount for the Darlington Refurbishment Unit 2 of $4.8 Billion is reasonable.

AACE understands that OPG has applied to the Ontario Energy Board (OEB) for approval of new payment amounts (case number EB-2016-0152). OPG's application is currently being considered by the OEB through a public regulatory hearing. As part of the hearing process, OPG has been requested to provide AACE Recommended Practice No. 18R-97, which underpins the work OPG has undertaken for the Darlington Refurbishment Program.

AACE understands that OPG will submit AACE Recommended Practice No. 18R-97 indicating it should only be disclosed through the OEB's process for the filing of confidential information. This means that only those who sign a non-disclosure agreement in this proceeding can view it. Ultimately, the OEB will decide on whether confidential protection is afforded to the document. Personal use download copies of AACE Recommended Practices are free of charge to AACE members. Non members can purchase a copy from the AACE website (web.aacei.org) for a nominal $25 fee.

This permission is granted with the understanding that:

1. The following credit line must be printed/posted on the copy filed with the Ontario Energy Board. I have attached a PDF of the requested RP with the following permission note included:

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Sincerely,

Marvin Gelhausen
Managing Editor
AACE International

JT1.7 ATTACHMENT 2

IS CONFIDENTIAL IN ITS ENTIRETY

UNDERTAKING JT1.8

Undertaking

TO PROVIDE THE DOCUMENTS LISTED IN KT 1.1, OR TO INDICATE WHY OPG WON'T PROVIDE THEM

Response

Please see below and attached for the requested documents listed in KT 1.1:

Item	Reference	Document	Filed Location
1	L-4.3-1 Staff-072, Chart 1, Item 2014-012	Nuclear Oversight Audit - Human Performance	Attachment 1
2	L-4.3-1 Staff-072, Chart 1, Item 2015-022	Nuclear Oversight Audit - Project Management	Attachment 2
3	L-4.3-1 Staff-072, Chart 1, Item 2016-002	Nuclear Oversight Audit - Corrective Action Program	Attachment 3
4	L-4.3-1 Staff-072, Chart 1, Item 2016-004	Nuclear Oversight Audit - Equipment Reliability	Attachment 4
5	L-4.3-1 Staff-072, Chart 1, Item 2016-013	Nuclear Oversight Audit - Risk and Reliability	Attachment 5
6	L-4.3-1 Staff-072, Chart 1, Item 2016-016	Nuclear Oversight Audit - Records and Documentation	Attachment 6
7	L-4.3-1 Staff-072, Chart 1, Item 2016-020	Nuclear Oversight Audit - Work Management	Attachment 7
8	L-4.3-1 Staff-072, Chart 2, Item 2015-321	Nuclear Oversight Assessment - Follow-up to Human Performance Audit NO-2014-012	Attachment 8
9	L-4.3-1 Staff-072, Chart 3, Item 14-17	Finance's Control Over Darlington Refurbishment	Attachment 9
10	L-4.3-1 Staff-072, Chart 3, Item 14-26	Darlington Station Readiness for Refurbishment	Attachment 10
11	L-4.3-1 Staff-072, Chart 3, Item 15-17	EPC Contractor Procurement Review – Darlington Nuclear Refurbishment Project	Attachment 11
12	L-4.3-1 Staff-072, Chart 3, Item 15-47	ES MSA Recovery Negotiations Audit - Follow-up on 2013 Auditor General Findings	Attachment 12
13	L-4.3-1 Staff-072, Chart 3, Item 16-07	Darlington Nuclear Refurbishment Project Management Audit	Attachment 13

14	L-4.3-1 Staff-072, Chart 3, Item 16-08	Darlington Nuclear Refurbishment – Contractor Invoicing Audit	Attachment 14
15	L-4.3-1 Staff-072, Chart 3, Item 16-13	Darlington Nuclear Refurbishment Contractor and Subcontractor Management Audit	Attachment 15
16	L-4.3-1 Staff-072, Chart 3, Item 16-39	DNR Contractor Procurement – R&FR Project Audit	Attachment 16
17	L-4.3-1 Staff-072, Chart 5, Item 2	DNR Project Management	Same as Item 13
18	L-4.3-1 Staff-072, Chart 5, Item 4	DNR Contractor and Subcontractor Management	Same as Item 15
19	L-4.3-1 Staff-072, Chart 5, Item 7	DNR Integrated Database for Project Reporting	Attachment 17
20	L-4.3-1 Staff-072, Chart 5, Item 9	DNR Engineering, Procurement and Construction Contractor Procurement Oversight Audit	Attachment 18
21	L-4.3-1 Staff-072, Chart 5, Item 10	DNR Project Revisions & Rework	In progress; audit report not yet available.
22	L-4.3-1 Staff-072, Chart 5, Item 11	DNR Contractor Procurement - R&FR Project	Same as Item 16
23	L-4.3-15 SEC-022, Attachment 1, Item 48	Retube & Feeder Replacement Project RFP Submission Evaluation Plan (NK38-09701-10009)	Attachment 19
24	L-4.3-15 SEC-022, Attachment 1, Item 49	RFR Project RFP Submission Negotiation Plan (NK38-09701-10011 Rev000)	Attachment 20
25	L-4.3-15 SEC-022, Attachment 1, Item 62	Contract Management Process Manual (FIN-MAN-CM-001)	Attachment 21
26	L-4.3-15 SEC-022, Attachment 1, Item 108	Staffing plan activities (CEA 2-30)	Attachment 22
27	L-4.3-15 SEC-022, Attachment 1, Item 118	Nuclear Instruction: Gated process (for phase progression) (N-INS-09701-10005)	Attachment 23
28	L-4.3-15 SEC-022, Attachment 4, Item 1	Appendices to OPG Board Report (period ending 31-Mar-2016)	Attachment 24
29	L-4.3-15 SEC-022, Attachment 4, Item 2	Appendix 2 - DRP 4-Unit Estimate and Economic Summary Nov 2015	L-4.5-5 CCC-022, Attachment 1, pp. 86-109
30	L-4.3-15 SEC-022, Attachment 4, Item 3	Appendix 3 - DRP 4-Unit Resource Histogram	L-4.5-5 CCC-022, Attachment 1, p. 110

31	L-4.3-15 SEC-022, Attachment 4, Item 4	Appendix 4 - 4-Unit OPG Owner's Resource Histogram	L-4.5-5 CCC-022, Attachment 1, p. 111
32	L-4.3-15 SEC-022, Attachment 4, Item 5	Appendix 5 - Unit 2 Critical Path Schedule Overview	L-4.5-5 CCC-022, Attachment 1, p. 112
33	L-4.3-15 SEC-022, Attachment 4, Item 6	Appendix 6 - Summary of Release Amount for Unit 2 Mobilization Activities	L-4.5-5 CCC-022, Attachment 1, p. 113
34	L-4.3-15 SEC-022, Attachment 4, Item 8	Basis of Schedule	L-4.3-15 SEC-022, Attachment 3, Tab 14
35	L-4.3-15 SEC-022, Attachment 4, Item 10	Concentric: Assessment of Commercial Strategies Developed for the Darlington Refurbishment Project's Balance of Plant Work Package	JT 1.3, Attachment 3
36	L-4.3-15 SEC-022, Attachment 4, Item 14	Concentric: Assessment of Commercial Strategies Developed for the Overall Darlington Refurbishment Project and the Retube & Feeder Replacement Work Package	Ex. D2-2-2, Attachment 1
37	L-4.3-15 SEC-022, Attachment 4, Item 16	Darlington Refurbishment Charter	Ex. D2-2-2, Attachment 2, pp. 13-30
38	L-4.3-15 SEC-022, Attachment 4, Item 17	Darlington Refurbishment Program 4-Unit Cost and Schedule Estimate and Economic Update	L-4.5-5 CCC-022, Attachment 1, pp. 86-109
39	L-4.3-15 SEC-022, Attachment 4, Item 24	DRP Internal Planning Assumptions for RQE and 2016-2018 Business Plan	Attachment 25
40	L-4.3-15 SEC-022, Attachment 4, Item 30	Email containing the 'Top 10' DRP issues (as of 25-May-2016)	Attachment 26
41	L-4.3-15 SEC-022, Attachment 4, Item 65	NK38-NR-PLAN-09701-10001, Sht: 0016, Rev: 002; Darlington Refurbishment Staffing Program Management Plan	Attachment 27 See: L-4.3-1 Staff-048, Attachment 69 for new revision.
42	L-4.3-15 SEC-022, Attachment 4, Item 67	NK38-NR-PLAN-09701-10001, Sht: 0018, Rev: 001; Darlington Refurbishment Radiation Protection Program Management Plan	Attachment 28 See: L-4.3-1 Staff-048, Attachment 71 for new revision.

43	L-4.3-15 SEC-022, Attachment 4, Item 90	Nuclear Construction Supervisor Academy - Feedback Summary	Attachment 29
44	L-4.3-15 SEC-022, Attachment 4, Item 92	Nuclear Projects Risk Management	L-4.3-1 Staff-048, Attachment 24
45	L-4.3-15 SEC-022, Attachment 4, Item 93	Nuclear Projects Schedule Management	L-4.3-1 Staff-048, Attachment 25
46	L-4.3-15 SEC-022, Attachment 4, Item 94	Nuclear Projects Scheduling Requirements From EPC Contractors	Attachment 30
47	L-4.3-15 SEC-022, Attachment 4, Item 98	OPG Board Memo (comparison to Bruce Power Refurbishment Agreement)	Attachment 31
48	L-4.3-15 SEC-022, Attachment 4, Item 105	Project Controls	L-4.3-1 Staff-048, Attachment 33
49	L-4.3-15 SEC-022, Attachment 4, Item 106	Project Oversight Standard	L-4.3-1 Staff-048, Attachment 37
50	L-4.3-15 SEC-022, Attachment 4, Item 112	RCRB Recommendations Matrix (who/what/when)	Attachment 32 Note: This was an early working document. The final RCRB recommendations and actions undertaken can be found at JT 1.15, Attachment 1.
51	L-4.3-15 SEC-022, Attachment 4, Item 113	Refurbishment Construction Review Board Binder (25-29-Apr-2016)	Attachment 33
52	L-4.3-15 SEC-022, Attachment 4, Item 117	RQE Contingency Development (presentation)	L-4.3-2 AMPCO-076, Attachment 6

Some of the above attachments are marked “confidential”. However, OPG has determined that these attachments are non-confidential, except where specifically identified, and in which case OPG is filing the applicable attachments confidentially pursuant to the Ontario Energy Board’s Practice Direction on Confidential Filings.

ONTARIO POWER GENERATION

Nuclear Oversight - 889 Brock Road, Pickering, ON L1W 3J2

MEMORANDUM

Internal Use Only

March 27, 2014

File No: N-REP-01070-0409278 T06 R001

B. Duncan
Senior Vice President
Darlington
D08-ES

Audit OPGN NO-2014-012
OPGN Human Performance Program Audit

Nuclear Oversight conducted a performance based audit of the Hu (Human Performance) Program from January 20 to February 21, 2014 The objective of the Audit was to determine the effectiveness of the OPGN Hu Program across the fleet.

The audit identified potential fleet and site contributing factors for the increasing trend of EFDRs in 2013. These included lack of a fleet level Hu Peer Team to maximize improvements to the Hu Program across the fleet and ineffective line management engagement in site Hu program processes.

CONCLUSIONS: OPGN's Human Performance Program managed system controls are not effective. This audit is rated Red.

The audit identified 2 findings and 2 insights. The findings are;

Finding 1: Program Effectiveness Contributing to Declining Trend in Human Performance.

Finding 2: Ineffective Site Hu Committees (Repeat – Related).

There was also 1 SCR raised during the audit to address governance misalignment.

A copy of the audit report is attached. Please contact either me at 702-5430 or Tony Kim at 702-5265 if you have any questions.

Regards,

B. Morrill

Brent Morrill
Director
Nuclear Oversight
P82-6

BM/
Enc

ONTARIO POWER GENERATION

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Nuclear Oversight Audit Report – Human Performance

OPGN NO-2014-012 T6

Objective and Scope

Nuclear Oversight conducted a performance based audit of the OPGN Human Performance (Hu) Program. The objective of this performance based audit was to determine whether the Hu program is effectively managed and implemented across OPGN. The scope of the audit included field observations for use of Hu event free tools, program compliance to governance and legal requirements, effectiveness of corrective actions for 2011 Hu audit findings, and Hu training.

The audit was conducted at Pickering, Darlington, Nuclear Waste Management, IMS and Darlington Refurbishment from January 20 – February 21, 2014.

Overall Assessment

The audit team identified potential fleet and site contributing factors for the increasing trend of EFDRs in 2013. These included lack of a fleet level Hu Peer Team to maximize improvements to the Hu program across the fleet and ineffective line management engagement in site Hu program processes.

As a result, the audit has concluded that the managed systems controls for the OPGN Human Performance Program are not effective (Red).

During the course of this performance based audit the team completed field observations to gauge awareness of Hu Event Free Tools such as:

- Pre/Post Job Debriefs
- Situational Awareness
- Procedural Use and Adherence (Place Keeping) and
- Verification Practices.

The audit team observed that there is awareness of Hu Event Free Tools but this has not translated into reduced EFDRs in 2013.

The audit identified two findings and two insights.

1. Finding #1: Program Effectiveness Contributing to Declining Trend In Human Performance.
2. Finding #2: Ineffective Site Hu Committees (Repeat - Related).

Additionally, SCR N-2014-08000 was raised to address governance misalignment.

Audit Title: Human Performance Program Audit	Page: 2 of 26

1.0 Findings

1.1 Finding 1: Program Effectiveness Contributing to Declining Trend In Human Performance

OPGN's Hu program was not effective in 2013 where 14 EFDRs were documented versus a target of 6. This is a declining trend from the previous 2 years when 8 (2012) and 6 (2011) EFDRs were documented against targets of 7 (2012) and 17 (2011).

Factors impacting program effectiveness exist at both fleet and site levels and are likely contributors to the increasing trend of EFDRs across the fleet in 2013.

Supporting Facts (Additional supporting facts are shown in Appendix 2.1)

1. Fleet and site contributors impacting on Hu program effectiveness.

   Fleet Contributors:
   - There is no fleetwide Hu Strategy to coordinate and ensure consistent application of the Hu program at all sites (DNG, PNG, NWMD, IMS & Darlington Refurbishment) as required by governance (N-PROG-AS-0002 sections 2.1, 2.2 & N-PROG-AS-0001 section 2.17).
     a. No Hu Fleet Plan.
     b. Lack of fleet OPGN Peer Team.
     c. Misalignment of activities between sites.
     d. Lack of Hu training for individuals in specialized Hu roles.
     e. No fleetwide Hu Trend analysis.
     f. No fleetwide Hu self-assessments.

   Site Contributors:
   - Inadequate support from line organizations in implementation of site Hu Working Committees.
   - Late Site Hu Plans – 2014 plans are also late (not finalized as of Mar-2014).
   - Ineffective Trending of Hu events.

2. There was no OPGN Hu Strategic Plan and Peer Team in place for 2013 to identify and monitor common Nuclear wide Hu initiatives. This has resulted in misaligned fleetwide Hu requirements/initiatives. Examples include;
   - Departmental EFDR targets are implemented at Darlington but not at Pickering.
   - Differing Hu event analysis forms implemented at each site. Darlington uses the Human Performance Lessons Learned (HULL) form whereas Pickering uses Rapid Anatomy of Event form Rev02 (see supporting fact #7).
   - Refocusing of Hu paired O&Cs at Darlington with results being reported to Darlington site senior management. This is not implemented at Pickering.

3. Although site Hu Working Committees were in place at both Pickering and Darlington neither committee met on a regular basis to review site emerging Hu trends (see Finding #2). In addition, Nuclear Waste, IMS and DNG Refurbishment do not have Hu WC (Working Committee) and are not quorum members of either Pickering or Darlington's Hu WC.
4. Both Pickering & Darlington Site Hu Plans were issued late in 2013 (PNG Apr-2013, DNG Aug-2013). As of 01-Mar-2014, the 2014 Hu Plan has not been issued, delaying implementation of program improvements.
    - A review of Hu WC actions identified that the Darlington Hu Manager had an action to develop the 2013 Darlington Hu Strategic Plan. This action was extended 4 times (Nov 2012, Dec 2012, Mar 2013, May 2013 & July 2013). The Strategic Hu Plan was issued August 2013.
5. There are no formal Hu training (initial & continuing) requirements for Hu personnel (i.e. Hu SPOCs, Hu Managers, etc…) even though Job Task Analysis (N-JTA-400-00197) identifies a PEL (PEL67462).

    N-PROG-AS-0002 Section 2.2.8 requires the development of initial and continued training for management and staff to acquire Hu knowledge and skills.
6. Trend Analysis and Trend Coding is not effectively managed.

    - A review of Darlington's Q3-2013 Performance Improvement reports (trend reports) for Hu, Corrective Action and Operations found that analysis of SCR data do not specifically include Hu trend analysis.
    - At WWMF trend analysis does not incorporate Hu trends in the trend analysis report.
    - 6 of 12 Pickering EFDRs reviewed with Hu elements did not identify Hu trending code in the SCR. SCRs reviewed were P-2013-00748, P-2013-02377, P-2013-06928, P-2013-04117, P-2013-10636 & P-2013-07576).

    Pickering has a reduced number of SCRs that have been coded as a Hu event compared to that of other sites.

Number of SCRs with Hu Code

Station	4th Qtr 2012	1st Qtr 2013	2nd Qtr 2013	3rd Qtr 2013	4th Qtr 2013	Total
Darlington	3,029	3,377	3,078	3,230	3,741	16,455
Nuclear	1,326	1,155	1,476	1,326	1,387	6,670
Pickering	**1,064**	**499**	**597**	**405**	**595**	3,160
Total	5,419	5,031	5,151	4,961	5,723	26,285

The 2013 Q3 PNGS Maintenance Department Performance Improvement Report identified the following.

> "*For the first time in this Q3-2013 PI Report, Human Performance Trend Codes (HPTCs) are being applied to SCRs at a level to*

perform a review and analysis. In the past two years, there were very few SCRs with Human Performance Trend Codes applied."

7. N-INS-09030-10001 Section 1.2.1d and Section 1.5 require N-FORM-10944 AofE (Anatomy of an Event) is to be utilized to analyze EFDRs. Some examples of non-compliance are listed below.

   - **NWMD:** 3 of 13 2013 EFDRs had an AofE form completed. A variety of methods were used to analyze 2013 & 2014 EFDRs including AofE form, HULL template (not approved in governance), and the barrier analysis worksheet N-Form-10134.
   - **DNG:** 16 of 20 department EFDRS reviewed did not have an N-FORM-10944 completed and filed in the PJB database. Events reviewed are: SCRs D-2013-04035, D-2013-12031, D-2013-00843, D-2013-03482, D-2013-22821, D-2013-07816, D-2013-07532, 06495, D-2013-01252, D-2013-03549, D-2013-21994, D-2013-02911, D-2013-05901, D-2013-15914, D-2013-04951, & D-2013-01715.
   - **PNG:** N-FORM-10944 R002 is being used to as part of a pilot program at Pickering. The pilot program was initiated in 2012. The pilot program was to run for 6 months. Results of the pilot were to be completed/implemented by June 25, 2012 (reference OPG-FORM-0001) and communicated to peer team by October 2012. The pilot is still on-going at Pickering and the form is in use at Pickering but not at other nuclear sites. Agreement to use N-FORM-10944 R002 across nuclear has not been reached

SCR N-2014-09909 has been initiated for this finding. The Hu Program Owner (DNG DOM) has agreed to be the EO for this SCR at Significance level 2.

1.2 Finding 2: Ineffective Site Hu Committees (Repeat - Related)

Site Hu Working and Steering Committees have not been meeting as required across the fleet throughout 2013. As a result, there was ineffective monitoring and a lack of coordinated effort at sites to maximize improvements to the Hu program.

This is a 'repeat related' finding from the previous Hu Audit (NO-2011-023).

Supporting Facts:

1. Repeat finding from previous Hu program audit NO-2011-023.

   NO-2011-023 Finding #2 documented that Hu Working Committees were not meeting on a consistent basis as required by governance (see Section 3.1.1).

Pickering

2. The Hu WC is required to meet 12 times a year (monthly) per P-GUID-01900-00001 (Pickering Site Human Performance Program Guideline).

   The Hu WC met 5 times in 2013 (twice in April). Quorum was not met in any meeting.

3. The following was not completed as required by P-GUID-01900-00001.

   - Department manager's formal causal analyses of the previous year's Dept Level Event Free Day Resets have not been reviewed at the Hu WC.
   - Hu SPOCs prepare Department Self Evaluation Hu Summary and present to the WC.
   - Status of Department Hu plans is not reviewed.
   - Concerns raised during WC meetings are not being addressed. Some examples include;
     1. Better Hu coding of SCRs.
     2. Better quality and more intrusive O&Cs.

Darlington

4. The Hu WC is required to meet 24 times a year per WC TOR (Terms of Reference).

   The Hu WC met 11 times in 2013. Quorum was not met in any meeting.

5. RP Hu SPOCs (quorum member) attended 1 of 11 WC meetings in 2013.

   Darlington Radiation Protection performance for 2013 was reported as red for unplanned radiation exposure. Many events that drove this performance indicator red were attributed to Hu events.

6. The TOR requires that recommendations from the WC are to be tabled at the Site Hu Oversight Committee (equivalent to PNG Steering Committee). This Oversight Committee is to meet quarterly – they met only once in 2013.

SCR N-2014-09911 has been initiated for this finding. The Hu Program Owner (DNG DOM) has agreed to be the EO for this SCR at Significance level 3 with EOER & CARB review.

Audit Title: Human Performance Program Audit	Page: 6 of 26

2.0 SCRs Initiated During the Audit

SCR N-2014-08000 was raised to address change management gaps and misalignments in governance.

3.0 Learning Behaviours and Insights

3.1 Learning Behaviours

3.1.1 Corrective Action Program

Finding #2 is a repeat finding from the previous Hu Audit (NO-2011-023 Finding #2). SCRs D-2011-07294, P-2011-12138 & P-2011-12140 was raised to address the previous finding did not effectively address the issue of site implementation of the Hu program.

SCRs are not being coded consistently for Hu events. At all sites (PNG, DNG & NWMD) there was evidence of incorrect or inadequate coding of Hu events - this brings to question the accuracy of Hu Trend analysis results.

3.1.2 Self-Assessments

There was no fleetwide self-assessment carried out for the Hu program since 2011.

No sitewide Hu self-assessments were carried out on effectiveness of the Hu plan in 2013 (see Finding #1). However, there were self-assessments carried out on elements of the Hu program at departmental levels.

NWMD conducted a comprehensive Hu self-assessment NWM3-000696 (NWMD Implementation of the OPGN Hu Program as per N-PROG-AS-0002) in 2013. Findings from this self-assessment are being incorporated into the NWMD site integrated Hu strategy plan to be issued by 31-mar-2014.

3.1.3. Operating Experience

OPEX for is well represented at PJBs, POD meetings and POND meetings at all sites. In all instances there were observations of OPEX being incorporated in PJBs to highlight potential hazards or error likely situations or OPEX was brought up as discussion points in POD and POND meetings.

External OPEX on Hu is received from COG on a weekly basis and the information is reviewed prior to being dispositioned and/or distributed to OPEX SPOCs for information.

3.1.4 Dispositioning of Previous Audit Findings

There was one related repeat finding from the previous Hu audit NO-2011-023.

Finding #2 documents the ineffectiveness of site Hu Working and Steering Committees. This is a repeat of NO-2011-023 Finding #2 where Hu Working Groups were identified as not meeting on a consistent basis.

Audit Title: Human Performance Program Audit	Page: 7 of 26

3.2 Audit Insights

Management AR #28165947 has been initiated by the Darlington Hu Manager to address audit insights.

3.2.1 Potential Increased Risk of Unplanned Work

Additional consideration should be given to address potential increased risk arising from unplanned work (emergent/breakplan/injected).

Without a mechanism to check and mitigate Hu risks for unplanned work, workers may be moved from Skill-based and Rule-based modes to Knowledge-based mode.

When a worker is placed in Knowledge-based mode, likelihood of a Hu event is increased when one or more of the following contributing factors exist.

- Worker is not aware of that he/she is in Knowledge-based mode.
- Worker progresses with the work under Knowledge-based mode.
- Worker encounters production pressure.

Analysis conducted by sites on their site EFDRs identified unplanned work as a key contributor to some events.

See Appendix 2.2 for supporting facts.

3.2.2 Hu Program Ownership Review

The Hu program owner is the DNG DOM. Given that OPGN encompasses multiple sites (DNG, PNG, NWMD – including the Bruce site, IMS & DNG Refurbishment) it is recommended that a review be conducted to determine whether program ownership is better served at a different location (i.e. fleet level).

Industry best practice has Hu program ownership at a corporate level (i.e. CFAM) to help ensure fleetwide program monitoring and consistent implementation of program changes.

4.0 Signatures

Prepared by: Tony Kim Date: 27-MAR-2014

Tony Kim
Audit Team Leader
Nuclear Oversight – Nuclear Support

Approved by: Date: 27-MAR-2014

Peter Robson
Senior Manager
Nuclear Oversight – Nuclear Oversight

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APPENDICES

Appendix 1

Audit Plan

1.0 RATIONALE

A performance based audit of the Human Performance (Hu) program is to be conducted for OPGN in accordance with N-PROC-RA-0048 (Conducting Performance Based Audits & Assessments). The current mandate is to conduct audits on a 3-year cycle.

A Hu audit was previously conducted in 2011 (NO-2011-023).

2.0 OBJECTIVE

The objective of this performance based audit is to determine whether the Hu program is effectively managed and is in compliance with regulatory and OPGN governance requirements

3.0 SCOPE

3.1 Audit Scope

- *Program Governance - implemented, effective, and compliant*
- *Legal / Regulatory Requirements – compliance – Reg C/M/O, projects or initiatives*
- *Training / Qualification - definition / compliance*
- *Management Oversight / Learning Organization / Corrective Action Program – Findings, SA, O&C, RCA, Fleetview reporting, System Health reporting, CAP effectiveness, and OPEX*
- *Interface - with other programs / organizations*
- *External Insights - WANO, NSRB, CNSC and any applicable SOERs*

3.2 Additional Scope items

The additional scope includes, but not limited too, the following topics.

- Field observations of PJB/PJD, PU&A, Self-Check.
- Effectiveness review of corrective actions from previous Hu audit NO-2011-023.

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4.0 REFERENCE STANDARDS

The standards for the audit will include, but not be limited to:

N-CHAR-AS-0026 R17	Nuclear Management System
N-LIST-08130-10023 R03	CSA N286-05 to OPGN Governance Cross Matrix
N-PROC-RA-0022 R31	Processing Station Condition Records
N-PROC-RA-0048 R16	Conducting Audits
N-PROG-AS-0002 R14	Human Performance

5.0 AUDIT PERSONNEL

The team consists of:

Audit Team Leader:	Tony Kim – Nuclear Oversight
Audit Team Members:	Rob Berthelot – Nuclear Oversight
	David Flowitt – Nuclear Oversight
	Anders Li - Nuclear Oversight
	Grant Gibson – Nuclear Oversight
	Diane Baum – Nuclear Oversight
	George Tsakiris – Nuclear Oversight (added during audit conduct)
Technical Specialist:	[redacted]
Subject Matter Expert:	Kelly Grove – Refurbishment
	Karen Paplinskie – DNG Hu
	Tina Denis – PNG Hu (added during audit conduct)
	Boris Vulanovic – IMS
	Bruce Brennan – NWMD (Used Fuel DNG)
	John Culligan – NWMD (Used Fuel PNG)
	Jan Balut – NWMD (Used Fuel PNG) (added during audit conduct)
	David Van Ooteghem – WWMF (added during audit conduct)
Senior Manager:	Peter Robson – Nuclear Oversight

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6.0 INDIVIDUALS/ORGANIZATIONS NOTIFIED

Don Jones	Deputy VP (NWMD)
Steve Ramjist (program owner)	Director, Ops & Mtce (DNG)
Boris Volanuvic	Director, Ops & Mtce (IMS)
Ken Gilbert	Director, Ops & Mtce (PNG)
Francesco Guglielmi	Director, Ops & Mtce (Refurb)
Dave Stiers	Director, Management System Oversight (Refurb)
Jamie Lawrie	Director, Projects (Prods & Mods)
Brad Sinclair	Manager, Human Performance (DNG) - acting
Stephanie Smith	Assistant Ops Manager (PNG)
Pat Keenan	Manager, Used Fuel Operations (NWMD-DNG)
Kelly Grove	Section Manager, Ops & Mtce Strategies (Refurb)

7.0 SCHEDULE

Preparation:	06-Jan-2014 to 17-Jan-2014
Entrance Meeting:	17-Jan-2014
Audit Fieldwork:	20-Jan-2014 to 21-Feb-2014
Pickering:	*20-Jan-2014 to 29-Jan-2014*
Darlington:	*30-Jan-2014 to 07-Feb-2014*
NWMD:	*10-Feb-2014 to 14-Feb-2014*
Follow-up:	*17-Feb-2014 to 21-Feb-2014*
Draft Audit Report (for review):	28-Feb-2014
Review Draft Audit Report:	03-Mar-2014 to 07-Mar-2014
Issue Audit Report for Challenge Meeting:	10-Mar-2014
Challenge Meeting:	12-Mar-2014
Exit Meeting:	19-Mar-2014
Issue Audit Report:	21-Mar-2014

8.0 REQUIRED FACILITIES AND EQUIPMENT

ATL to arrange as required for each facility.

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Appendix 2

Other Audit Details

Appendix 2.1

Additional supporting facts for the Findings

Audit Finding 1: OPGN Hu Program Was Less Then Effective Throughout 2013

8. A review of the O&C reports submitted for PNGS during 2013 that had a Hu performance Element selected revealed that the Hu elements occur at a similar rate. There is no evidence/indication that Hu O&C's are focusing or targeting problematic Hu behaviours (see table below).

Hu Element	**# of O&C's**
Human Nature	366
Individual Capability	399
Peer Review/Verification	395
PJB-Pre-job Briefing (PJB)	475
Place-Keeping	265
Precision in Communications/Signature	398
Procedure Use and Adherence	483
Questioning Attitude/Conservative Decision Making	531
Self Checking/Stop-Think-Act-Review (STAR) Verification	399
Situational Awareness/Two-Minute Job-Site Drill	186
Task Demands	362
Team Errors	284
Three Way Communications/Phonetic Alphabet	350
Validate Assumptions	371
Work Environment	356
Totals	**5620**

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A similar observation was made for Nuclear Waste (see table below).

Hu Performance Elements selected in 2013	# of O&C's
FME - Foreign Material Exclusion	1
Antidotes to Team Error	4
Place-Keeping	6
Material Use Practices	8
Leadership Practices	9
Team Errors	15
Equipment Use Practices	16
Housekeeping	19
PPE	20
Barriers and Signage	22
Validate Assumptions	22
Human Nature	24
Precision in Communications/Signature	24
Task Demands	24
Peer Review/Verification	26
Three Way Communications/Phonetic Alphabet	32
Self Checking/Stop-Think-Act-Review (STAR) Verification	33
Supervisory Methods	34
Work Environment	41
Individual Capability	50
PJB-Pre-job Briefing (PJB)	51
Questioning Attitude/Conservative Decision Making	53
Procedure Use and Adherence	57
Situational Awareness/Two-Minute Job-Site Drill	104

9. Annual quality and effectiveness review of O&Cs has not been completed since 2011 (NO-2011-000306).

   N-STD-OP-0015 Section 2.1.4 identifies Nuclear Senior VPs & VPs to accountable for annual review of O&Cs (quality & effectiveness).

10. N-INS-09030-10001 S. requires the A of E form to be posted in the pre-job brief database under event. 13 of 13 NWMD event free day resets in 2013 had no completed A of E form in the PJB database. 1 of 13 EFDRs in 2013 had an A of E form attached to the SCR.

11. NWMD: SCR Coding of Event free day resets in 2013 not performed per N-INS-09030-10002: Site & department level event free day resets.

    - 6 of 14 event free day resets (site or department) did not have line defined code as required per N-INS-09030-10002 Section 1.11.3. (SCRs N-2013-02447, 02836, 20660, 21349, 11529, 03111) .

- 4 of 14 event free day resets (site or dept) that had a human performance element did not have a human performance element code identified (SCRs N-2013-01072, 20660, 01397, 03111).
- 3 of 14 event free day resets did not have the reviewed for EFDR field completed (SCRs N-2013-02386, 11529, 03111).
- 0 of 2 site EFDRS for 2013 were not coded with the MFA code EFDR. CACG is to code Site EFDRS using the SCR management focus area codes 'EFDR" per N-INS-09030-10002 Section 1.11.2).

12. NWMD: Reporting of EFDRs and Anatomy of Events

- Data for event free day resets is not being entered into EPR database for nuclear waste. This is contrary to N-INS-09030-10002 Section 1.13.1.
- A review of 2013 Performance Improvement reports found that NWMD EFDR & AofE data has not been included by Performance Improvement in their quarterly reports . A summary list or report of all the NWMD station and department event free day resets for 2013 could not be found (i.e. Various sources were consulted to formulate the list: FLMs, manager, cost & scheduling analyst, site communications officer; NWMD website). Event free day reset information was posted on individual NWMD department sites in 2013 but these were subsequently removed in 2014.

  N-INS-09030-10002 Section 1.13.1 states: Performance improvement should provide oversight for application of the program & periodically perform a roll-up of fleet wide Site & Department EFDR performance. N-INS-09030-10001 Section 1.5.1 requires 'Senior Officer HP' to trend Anatomy of event data and document reset data in a quarterly report

13. DNG: Inconsistencies between practices at Darlington & Pickering station with respect to anatomy of event analysis and process followed. Darlington is procedurally non-compliant with N-INS-09030-10001 Section 1.2.1 d which requires the use of the anatomy of the event form for human performance events.

- Pickering uses R2 anatomy of an event form. Pickering is using R002 which is a draft not currently in asset suite. Routing requirements are different from R001 which is the issued form. (R2 requires attachment to SCR).
- Darlington uses HULL form to report Hu events, an uncontrolled document. A of E form was used infrequently in 2013 and 2012.
- The Human Performance Anatomy of an Event Form follows the process outlined in the Human Performance Reference Manual INPO 06-003 while the HULL template focuses mainly on Worker Behaviours (Flawed Defences) as identified in INPO 06-003.

- The Human Performance Anatomy of an Event Form provides an opportunity to capture the Initiating Actions, Error Precursors, Flawed Defences and Latent Organizational Weaknesses. This form is not well utilized at Darlington. The HULL template is the primary tool currently in use at Darlington.

- The Darlington HULL template identifies 10 error precursors or flawed defenses for event analysis while N-FORM-10944 R002 identifies 92 error precursors or flawed defenses. Not utilizing N-FORM-10944 may result in inaccurate identification of error precursors or flawed defenses.

14. DNG: Procedural Non-compliances with N-INS-09030-10001 R3 Rapid Human Performance Event Analysis and Communication were found at Darlington GS.

    N-INS-09030-10001 R 3 Section 1.2.1 d and Section 1.5 require N-FORM-10944 Anatomy of an Event to be utilized to analyze human performance events and event free day resets. The FLM is to ensure the form is used and the Senior Performance Improvement Officer is to ensure that it is checked for completeness. They are to be filed in the PJB database under 'events'.

    - 0 of 4 station event free day resets in 2013 had N-FORM-10944 filed In the PJB database or attached it to the SCR. (Reviewed station event free day resets D-2013-04718; D-2013-22676; D-2013-11886; D-2013-15812).
    - 15 of 16 dept EFDRS that did not have an AofE in the PJB database did not have one attached to the SCR.
    - SCR D-2012-01124 was filed identifying that the AofE form was not being utilized for Dept EFDRs. Of 26 SCRs that identified department EFDRs only 1 was documented in the PJB/AofE database. CAP was not effective as the form is still not consistently used.

    - Self assessment NO13-000503 identified that Darlington uses the HULL form to report Human performance events not the AofE form.

15. DNG: Inconsistent use of HULL form

    - 3 of 4 station event free day resets did not complete the HULL template. This is inconsistent with Darlington's own established process.

    - 4 of 8 department EFDRs did not have the completed Darlington HULL template on rapid response archives on HULL web link or attached to SCR.

    - 13 of 52 HULL forms issued from August 2013 to December 2013 used the incorrect revision of the HULL form (June 2012 revision). The Hull form was revised in July 2013 with addition of the culpability assessment.

    - 17 of 25 HULL forms (July 2013) revision were not initialed by the manager as required.

- The HULL form is not a controlled document in asset suite. No governance exists supporting its use.

16. N-INS-09030-10001 Section 1.3.1 states FLM is to "Develop compensatory actions, which shall be implemented to reduce probability of re-occurrence pending a complete *event* investigation for site and event EFDRs. N-FORM-11097, Initial Investigation Checklist provides guidance and considerations during initial data gathering and investigation.
    - 3 of 8 dept EFDRS reviewed at Darlington were assigned a D4 trend category with no evaluation and no lessons learned or N-form-10944 or N-form-11097 attached/completed to SCR, PJB, or supervisors toolkit. HULL form was also not completed. (SCRs D-2013-04035; D-2013-12031; D-2013-00843.
    - The filing instruction for N-form-11097 states as per N-INS-09030-10001 Section 3.1. N-INS-09030-10001 Section 3.1 does not have filing requirements for this form.

17. DNG - Trending:
    - 2 of 17 dept EFDRs did not have a line defined code identified as required by N-INS-09030-10002 Section 1.11.3.
    - No site EFDRS for 2013 were coded with the MFA code EFDR. CACG is required to code Site EFDRS using the SCR management focus area codes 'EFDR". (N-INS-09030-10002 Section 1.11.2).

18. PNG: N-FORM-10944 Rapid Anatomy of Event Analysis Tool is not being used as required per N-INS-09030-10001.
    - N-FORM-10944 R002 (Anatomy of Event Analysis Tool) is being used at Pickering to analyze event free day resets. This form is not issued in governance. It has 92 human performance elements to be used to analyze a human performance event and event free day resets. In contrast, N-FORM-10944 R001 has 116 human performance elements.
    - The filing requirements specified for N-Form-10944 R1 in N-INS-09030-10001 R3 are the PJB database. Different versions of Rev 2 exist at Pickering. The distribution requirements differ between the two. One form specifies that the form be attached to the SCR while the other version does not.
    - N-INS-09030-10001 R003 Section 1.2.1 d requires N-form-10944 (A rapid anatomy of event analysis tool) to be utilized for event free day reset analysis. The FLM is to ensure the form is used and the Senior Performance Improvement officer is to ensure that it is checked for completeness.
        - There were 10 Pickering Station event free day resets in 2013. For 4 of 10 station event free day resets there was no documentation that N-form 10944 was completed as required. A completed form was not attached to the PJB database as required by procedure or SCR as required by R2 filing specifications or posted on other websites searched (Hu website maintenance; supervisor tool-kit; pre-job brief). SCRS were P-2013-09118; P-2013-20870; P-2013-23057; P-2013-24460.

  - o 12 Department event free day resets from 2013 were examined. 4 of 12 SCRs for dept EFDRs did not have N-form 10944 completed as required. (not attached to SCR not posted on website or PJB database) (SCRs P-2013-05829;P-2013-19582,P-2013-13238;P-2013-23122)

- 0 of 18 event free day resets from 2013 were filed in the PJB database as required by N-INS-09030-10001 R 3. (N-2013-00748; 02003; 02377; 02459; 02892; 04279; 06928; 02471; 04117; 06284; 10636; 01795; 12053; 14998; 09938; 07576; 09342).

19. PNG: Department Event free day resets are not being consistently reported or identified.

- 2 of 2 Station event free day resets in 2013 (P-2013-08126 & P-2013-09188) that were attributed to engineering were not identified as department event free day resets for engineering in 2013. There were 3 department event free day resets identified for engineering in 2013 (SCR P-2013-09688; P-2013-13238; P-2013-23122).
- 2013 station event free day reset was attributed to 3 departments including the chemistry department. This SCR was not identified as a department event free day reset by chemistry. 2013 station event free day reset was attributed to 3 departments including the chemistry department. This SCR was not identified as a department event free day reset by chemistry. 4 department event free day resets were identified SCR 2013-01795, 2013-12053; 2013-14998, 2013-24051.

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Appendix 2.2

Additional supporting facts for the Learning Behaviours and Insights

Insight 3.2.1 – Lack of Sensitivity to Address Increased Risk for Unplanned Work

1. New work injected into plan on day of gland supply filter work. WO#2692547-01, 23 & 25 were injected into the plan on the same day when the MA was to review & accept WPP for 33340-FR2. According to the presiding FLM, there needs to be at least a 72-hour wait period to allow old filter to dry out prior to replacement yet the schedule is showing for the work to be carried out 24-hours after permitry.

   P-A-MMP-33345.01 Rev-29 "Replacement of Heat Transport (HT) Gland Supply Filter" Prerequisite Section 2.1.6 states the following.

   "Filter drained, and dried for three to five days as required ..... "

   This event was self-identified in a recent morning outage meeting.

   NOTE: As a result of this observation, an SCR database search was conducted for additional incidents of unplanned work – see supporting facts below.

2. Site EFDR Event.

   P-2013-05982 (Unit 1 Turbine Tripped on Loss of Condenser Vacuum) documents a turbine trip resulting from failure of Vacuum Pump 1 Suction MV (1-42120-MV7) to close allowing airflow backwards from Moisture Separator check valve (1-42120-NV2026) resulting loss of condenser vacuum.

   Rapid Anatomy of Event Analysis (N-FORM-10944) documents the following.

   - "Due to familiarity with the task at hand, technician was working in skills-based mode and failed to realize that they moved into knowledge-based mode when in fact the work at hand required that they be in 'rule-based' mode. As a result, they did not utilize the correct procedure and maintenance practices to receive the desired results."
   - Technician was conducting 'Emergent' work.

3. Site EFDR Event.

   SCR D-2012-10031 (NOP AMP Hu Event) documents a SDS2 impairment resulting from a missed step in a CMP. Supervisors were not effective in ensuring tasks were properly planned, prioritized, organized and coordinated amongst their staff. The appropriate performance standards were not identified prior to assignment of the work.

   Rapid Anatomy of Event Analysis (N-FORM-10944) identifies that 'Emergent' work was being conducted.

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4. Site EFDR Event.

   SCR P-2012-16004 (2 Employees Obtained High Tritium Dose While Cleaning Up Moderator D2O). Two operators obtained high tritium dose while cleaning up D2O from the 254el Moderator & Moderator purification rooms in Unit 1 following an unsuccessful test isolation covered under SCR P-2012-15911 "Execution of Test Isolation Results in D20 Spill in Containment".

   Rapid Anatomy of Event Analysis (N-FORM-10944) documents the following.

   - The most significant error precursor was inadequate radiological work planning.
   - Technician was conducting ‘Emergent’ work.

5. Work Authorization obtained prior to PJB P-2013-08368

   Valve Crew was asked to support a breakplan task to investigate indication issue on 4-33410-MV12 via work request 900126. Technicians went to gather information and discuss with the Unit ANO, and at that time took out work authorization. When discussing access control to Boiler Room with the Shift Manager it was noted to the Shift Manager that the Technicians had not had a PJB, yet were given work authorization.

   Parallel with this the FLMa was working with Radiation Protections for details of the REP 32398 to be used to prepare for his PJB.

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Appendix 3

Audit Meetings

ENTRANCE MEETING:

Location: 889 Brock Road, Room 618

Date & Time: 17-Jan-2014 @ 10:30 – 11:30

Attendees: Steve Ramjist, John Thompson, Pat Keenan, Dan Therrien, Boris Vulanovic, Brad Sinclair, Kelly Grove, Karen Paplinskie, Kerry Turcotte, Glen Pringle, Bruce Brennan, Brent Morrill, Peter Robson, Grant Gibson, Diana Baum, George Tsakiris, David Flowitt, Rob Berthelot, Tony Kim

Items Addressed: Presented audit scope & schedule

BRIEFING MEETINGs (SPOCs & Managers):

Briefing Meeting #1: Pickering Debrief #1

Location: Pickering ESB II Boardroom A

Date & Time: 22-Jan-2014 @ 14:00 – 15:00

Attendees: Dan Therrien, Tina Denis, Boris Vulanovic, Kelly Grove, Peter Robson, Anders Li, Diana Baum, Dave Flowitt, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #2: Pickering Debrief #2

Location: Pickering ESB II Boardroom A

Date & Time: 24-Jan-2014 @ 13:00 – 14:00

Attendees: Dan Therrien, Tina Denis, Boris Vulanovic, Anders Li, Diana Baum, Rob Berthelot, George Tsakiris, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #3: Pickering Debrief #3

Location: Pickering ESB II Boardroom A

Date & Time: 29-Jan-2014 @ 12:00 – 13:00

Attendees: Dan Therrien, Tina Denis, George Tsakiris, Diana Baum, Dave Flowitt, Rob Berthelot, Grant Gibson, Tony Kim

Items Addressed: Present audit observations

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Briefing Meeting #4: Darlington Debrief #1

Location: Darlington ESSB RM112

Date & Time: 03-Feb-2014 @ 13:00 – 14:00

Attendees: John Thompson, Peter Robson, Diana Baum, Rob Berthelot, Dave Flowitt, Grant Gibson, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #5: Darlington Debrief #2

Location: Darlington ESSB RM112

Date & Time: 05-Feb-2014 @ 13:00 – 14:00

Attendees: John Thompson, Kelly Grove, Karen Paplinskie, Stacey Mcneill, Peter Robson, Diana Baum, Rob Berthelot, Dave Flowitt, Grant Gibson, George Tsakiris, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #6: Darlington Debrief #3

Location: Darlington ESSB RM112

Date & Time: 07-Feb-2014 @ 13:00 – 14:00

Attendees: John Thompson, Karen Paplinskie, Stacey Mcneill, Boris Vulanovic, Peter Robson, Diana Baum, Dave Flowitt, Grant Gibson, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #7: NWMD (Pickering Facility - PWMF) Debrief #1

Location: 889 Brock Road RM629

Date & Time: 11-Feb-2014 @ 13:00 – 14:00

Attendees: Pat Keenan, Glen Pringle, Nick Mahalic, John Culligan, Anders Li, Diana Baum, Dave Flowitt, Rob Berthelot, Grant Gibson, George Tsakiris, Tony Kim

Items Addressed: Present audit observations

Briefing Meeting #8: NWMD (Darlington Facility - DWMF) Debrief #2

Location: 889 Brock Road RM619

Date & Time: 13-Feb-2014 @ 13:00 – 14:00

Attendees: Pat Keenan, Nick Mahalic, Boris Vulanovic, Kelly Grove, Anders Li, Diana Baum, Dave Flowitt, Rob Berthelot, Grant Gibson, Tony Kim

Items Addressed: Present audit observations

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Briefing Meeting #9: NWMD (Darlington Facility - WWMF) Debrief #3

Location: 889 Brock Road RM631

Date & Time: 21-Feb-2014 @ 13:00 – 14:00

Attendees: Pat Keenan, Don Jones, Pauline Witzke, Darren Howe, Peter Robson, Anders Li, Rob Berthelot, George Tsakiris, Tony Kim

Items Addressed: Present audit observations

DRAFT AUDIT REPORT MEETING:

PDS Review

Location: 889 Brock Road RM429

Date & Time: 24-Feb-2014 @ 11:00 – 12:00

Attendees: John Thompson, Dan Therrien, Pat Keenan, Lise Morton, Don Jones, Val Bevacqua, Tina Denis, Bruce Brennan, Peter Robson, George Tsakiris, Anders Li, Diana Baum, Grant Gibson, Dave Flowitt, Tony Kim

Items Addressed: Review PDSs (Problem Development Sheets)

Draft Audit Report Review #1

Location: 889 Brock Road RM618

Date & Time: 28-Feb-2014 @ 15:00 – 16:00

Attendees: Steve Ramjist, John Thompson, Dan Therrien, Zar Kansaheb, Tina Denis, Pat Keenan, Boris Vulanovic, Peter Robson, George Tsakiris, Anders Li, Grant Gibson, Tony Kim

Items Addressed: Review draft audit report #1

Draft Audit Report Review #2

Location: 889 Brock Road RM419

Date & Time: 05-Mar-2014 @ 09:00 – 10:00

Attendees: Steve Ramjist, John Thompson, Dan Therrien, Pat Keenan, Boris Vulanovic, Peter Robson, George Tsakiris, Tony Kim

Items Addressed: Review draft audit report #2 – Red Colour rating proposed & accepted

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Pre-Challenge Meeting

Location: 889 Brock Road Brent Morrill's Office

Date & Time: 07-Mar-2014 @ 10:00 – 11:00

Attendees: Brent Morrill, Mike Delong, George Tsakiris, Tony Kim

Items Addressed: Draft audit report cold body review by Director, Nuclear Oversight and Senior Manager, Ops & Mtce Nuclear Oversight

Challenge Meeting

Location: 889 Brock Road RM502

Date & Time: 12-Mar-2014 @ 13:30 – 14:30

Attendees: Brent Morrill, George Tsakiris, Mile Delong, Tony Kim, Diana Baum, John Thompson, Dan Therrien, Kelly Grove

Items Addressed: Final review of audit report for concurrence of findings and colour rating

EXIT MEETING:

Location: 889 Brock Road Main Boardroom

Date & Time: 26-Mar-2014 @ 09:00 – 10:00

Attendees: Brent Morrill, Peter Robson, Tony Kim, Mike Allen, Steve Ramjist, Glenn Jager, John Thompson, Ken Gilbert, Pat Keenan, George Tsakiris

Items Addressed: Audit exited to senior management (CNO & DNG Deputy VP) by audit ATL & DNG Hu Senior Manager.

ONTARIO POWER GENERATION

Appendix 4- Completed Audit Rating Criteria Sheet

AUDIT RATING FOR 2014 Hu PROGRAM AUDIT (RED)

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.	MANAGED SYSTEM CONTROLS ARE EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.		OVERALL AUDIT RATING IS RED
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**		**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	Program	1)Finding 1 & 2. 2)No fleetwide Hu trend analysis or self-assessments, and inadquate support from line organizations. 3)Ineffetive site committees.
	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.		Finding 1 (NWMD, IMS, Refurb not incorporated into site Hu WC)
	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.		Lack of Fleet Hu Peer Team and Fleet Hu Plan
	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.		Finding 1: Training
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	CAP/OPEX	Finding 2 (Repeat - Related Finding). Previous Hu audit NO-2011-023 Finding #2 documents site Working Committees not meeting consistently to monitor and provide oversight as required by governance.
	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.		
	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.		
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	Performance	Site EFDR performance for 2013
	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.		Insight 3.2.1 on increasing sensitivity to adress risks arising from unplanned work (emergent/breakplan/injected).
	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.		1)Finding 1 & 2. 2)No fleetwide Hu trend analysis or self-assessments, and inadquate support from line organizations. 3)Ineffetive site committees.
	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie, not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.		Site EFDR performance for 2013
	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.		Site EFDR performance for 2013
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Oversight	Site EFDR performance for 2013
	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.		No fleetwide Hu self assessment completed
	No significant adverse trends are evident.	Limited performance adverse trends are evident and action plans are in place to improve performance.	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.		Ineffective coding of SCRs with Hu codes for trending purposes
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		

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Appendix 5

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ONTARIO POWER GENERATION

Nuclear Oversight - 889 Brock Road, Pickering, ON L1W 3J2

MEMORANDUM

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Audit OPGN NO-2015-022
Project Management

Nuclear Oversight conducted a performance based audit of the Project Management program implemented by the Projects and Modifications organization at Darlington, Pickering and Nuclear Waste over the period from January 26 to February 12, 2015. The objective of this performance based audit was to determine whether the project management requirements defined in governance have been met and effectively implemented to support safe and reliable operation. The focus areas of the audit were project oversight including contract management and field engineering.

CONCLUSIONS: The audit determined that performance of the managed system controls for the Project Management Program is not fully effective (audit rated Yellow). The audit identified 3 Findings.

Finding 1: Deficiencies in the Execution of Project Management Oversight

Finding 2: Deficiencies in Projects & Modifications Staff Qualifications and Requirements

Finding 3: Deficiencies in Project Management Program Governance and Supporting Documents

One audit insight was provided and 3 SCRs were initiated during the audit.

A copy of the audit report is attached. Please contact either me at 702-5400 or Russ Gomme 702-5452 if you have any questions.

Regards,

Art Maki
Director
Nuclear Oversight
P82-6

AM/

Enc

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Nuclear Oversight Audit Report – Project Management

OPGN NO-2015-022 T6

Objective and Scope

Nuclear Oversight conducted a performance based audit of the Project Management program implemented by the Projects and Modifications organization at Darlington, Pickering and Nuclear Waste over the period January 26 to February 12, 2015. The objective of this performance based audit was to determine whether the project management requirements defined in governance have been met and effectively implemented to support safe and reliable operation. The focus areas of the audit were project oversight including contract management and field engineering.

Overall Assessment

This performance based audit of the Project Management Program has identified that the managed system controls are not fully effective (audit rated Yellow). The rating for this audit is based on the ongoing issues related to project oversight execution and the lack of mandatory training and qualifications for the Project Managers which are among the contributing factors to performance deficiencies and projects being overspent and behind schedule. In addition, inconsistent work practices were evident which can be attributed to a simplified program governance structure and a perceived optional application of supporting desktop documents.

Project Management program execution is not in alignment with INPO Performance Objective and Criteria CO.5:9: "*Corporate managers establish, communicate, and implement a structured project management process to select, plan, and implement projects with predictable quality, scope, schedule, and cost performance.*"

With respect to the Nuclear Safety Traits, program performance reflected weakness in "*Leadership Safety Values and Actions*" in the area of "*Resources*" (i.e. procedures and personnel training) and strength in "*Problem identification & resolution"* in the area of *"Trending*".

The audit identified the following three findings:

- Finding 1: Deficiencies in the Execution of Project Management Oversight
- Finding 2: Deficiencies in Projects & Modifications Staff Qualifications and Requirements
- Finding 3: Deficiencies in Project Management Program Governance and Supporting Documents

One audit insight was provided based on feedback from the Nuclear Industry Exchange Program audit Subject Matter Expert from [redacted] who supported the audit for one week during the conduct.

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1.0 Findings

1.1 Finding 1: Deficiencies in the Execution of Project Management Oversight

The Projects and Modifications (P&M) organization is not effectively executing key project management oversight activities. These deficiencies are evident in the Project Management, Contract Management Organization (CMO), and Field Engineering organizations at PNGS, DNGS, and Nuclear Waste. Unclear guidance (Finding 3) and deficiencies in project management training (Finding 2) are some of the causes of these deficiencies. These deficiencies are among the contributors to project delays, cost over-runs, quality issues, and some safety concerns.

Supporting facts: (Additional supporting facts are shown in Appendix B)

1) Project Management oversight is not fully effective at controlling costs, schedule, quality, and potential safety issues.

a) Safety:

i) Project 10-73164 DR Irradiated Fuel Bay Heat Exchanger Replacement: OPG's Design Engineering review was not obtained for the engineered scaffolding and lifting beam as required per the Contractor/Owner Interface agreement.

b) Cost and Schedule Quality:

i) Project 13-40985, Replacement of Obsolete Online Chemistry Analyzers: Key performance indicators are red, (Cost Performance Indicator (CPI) is 0.47 and Schedule Performance Indicator (SPI) is 0.64). Cost has increased significantly from 2.5M to 15M. There are many SCRs for schedule delays and missed milestones as well as significant issues with vendor quality, which led to contract termination.

ii) Project 16-34000 DN Auxiliary Heating Steam: The scope was expected to be complete in April 2015 per the PMP NK38-PLAN-73110-0495234 at a cost of $28.5M; however, the new projected completion date is October 2015 with an estimated completion cost of $85M.

2) Some Project Management oversight activities are not performed as required per the Project Oversight Plan (POP) and N-INS-09701-10007 R000*, Project Oversight Planning and Implementation* and other supporting documents (N-MAN, N-GUID).

a) Project Management Plan (PMP) Issues: The PMP was not revised to reflect changes to contract strategy which affects adherence to QA requirements. (e.g. Project 10-73164)

b) POP Issues:

i) Some POPs only contain general guidelines for the required activities without providing specific oversight activities for critical evolutions, project milestones, or strategic oversight (i.e. higher risk elements), with the appropriate frequency. For example in Project 13-49140, the activities for lifting and hoisting the trash screen in-place, were not captured in the POP as a "strategic" oversight requirement during the Execution Phase. However, the lift did require the completion of a Complex Lift Plan (NK30-REF-71120-0507806) during actual execution.

ii) The POP is not treated as a living document and revised to include additional oversight as the project evolves or negative trends appear that indicate risks or poor performance. Revisions were not implemented following changes to contractor,

contracting strategy, scope changes, repeat design quality issues, significant cost increases, changes to risks and recurring schedule delays (most projects reviewed).

iii) The POP is not utilized as a tool to manage the project since some POP activities are not performed. Examples are actions to control costs, no oversight reports for relevant in-line/in-process, routine and oversight activities (most projects reviewed).

iv) The POPs are approved by the Section Manager and not the Project Manager (PM) as required by the N-INS. POPs are usually prepared by the person acting in the PM role. There is some hesitation from staff to embrace the role of PM and the responsibility that goes with it.

c) Oversight reports for activities in the POP are not prepared by all work groups and stored in a common data base per N-INS; consequently, the PM may not be aware and subsequently may miss issues that could impact the project (all projects reviewed).

i) Only Field Engineering is using the Oversight Reporting System (ORS) database. Although, ORS has the capability, it is not used by other organizations identified in the POP (project management, contract management, engineering/design, procurement / warehousing, safety compliance). No oversight reports were found for these groups.

d) Project Kick-Off/Orientation Meeting with the Contractors and other applicable OPGN stakeholders, for development of the oversight plan and review of Human Performance and Work expectations, are not consistently performed. (e.g. 16-34000, 13-49116)

e) Documentation Issues: Documents required per the PMP have not been issued, PMPs and POPs are only in draft form, some documents were not filed in Asset Suite and some do not show OPG acceptance (most projects reviewed).

f) Other issues:

i) The PMP identified Risk Monitoring and Control activities which were not performed. (e.g. Project 10-73398)

ii) Software qualifications for project 16-33258 were not requested and therefore may not meet the required QA requirements.

iii) The Contractors alert group was not set up to allow input of SCRs to document issues related to safety, configuration management, delays etc.. (e.g. 16-33258)

3) Some Contract Management Oversight activities are not being completed or performed effectively.

a) Activities not performed:

i) Project 13-49140: Safety Certification of Contractors Equipment – N-FORM-11482, was not utilized to document OPG acceptance of Vacuum Trucks brought on site by the contractor. In response to the audit the CMO initiated SCR N-2015-03616.

ii) Contractor qualifications are not checked as described in Section 4.1.1 of N-GUID-00120-10008. CMO Line stated "*there is a robust process in place for ES MSA contract staff that ensures that qualifications for all contract staff are properly maintained,…";* however, it is not documented in N-GUID. (most projects reviewed)

iii) Construction Quality Assurance (QA) Plan is missing OPG's acceptance signature as required by the Contractor Owner Interface agreement (Project 13-40985).

iv) Per review of the completed Daily Logs in the Contract Management SharePoint site, there are numerous records of project delays that were not escalated through the SCR program. Per the Contract Administrator, the contractor is accountable to submit SCRs but none were found. (e.g. Project 13-40985)

b) Records:
   i) Contract Management Plans (CMP) do not exist (most projects reviewed).
   ii) Daily Logs do not contain oversight records for activities defined in the POP (most projects reviewed).
   iii) The Contract Management forms for the project are not consistently used and not issued in Asset Suite as required (e.g. Contract management template, Contractor work release, Contract Inspection Check list, Safety Certification of Contractors equipment). (e.g 16-33258, 13-4910)

c) Meetings:
   i) The Mark-Up meeting which is used to determine jurisdiction of building trades union work is not consistently performed and/or there is no evidence that the meeting took place. (e.g. 13-49140, 16-34000)
   ii) Contract Administrators are not always invited to or take part in any oversight strategy meetings as required in N-STD-AS-0030 to ensure stakeholder input and buy-in to project objectives. (e.g. 13-40985)

4) Some Field Engineering (FE) Oversight activities are not completed or performed effectively as documented in requirements. As a result, the completion of oversight activities and frequencies are left to the discretion of FE staff and what they consider to be adequate.

a) Construction oversight:
   i) Project 13-49140: Some of the applicable construction oversight elements applicable to FE (per Appendix D of N-INS-09701-10007) were not performed by OPG.
      (1) Prior to fabrication and installation:
         (a) Review and acceptance of Work Plans, Vendor's QA/QC staff training and qualification, Foreign Material Exclusion (FME) plan reviews, tooling / rental equipment (e.g. a vacuum truck and spreader bar for hoisting the screen into place).
         (b) Welding procedures reviewed by OPG welding engineering. Per feedback from FE line, FE staff from Pickering (and DNGS) do not provide any oversight on welding activities as none of the FE staff are qualified to perform oversight / Quality Surveillance functions in that specialty area. In addition, Project Oversight Plans do not provide enough clarity on the accountability to perform oversight on welding/Non-destruction Examination activities.
      (2) Off-site fabrication: Oversight reports applicable to off-site fabrication of guardrail and base plates were not identified or completed.

b) Deficiencies identified in the FE oversight reports are not documented and addressed per the process required by N-INS-09701-10007-R000, *Project Oversight Planning and Implementation*. It is difficult to know how, or if, these deficiencies were addressed.

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c) No documentation exists to show that the Design Engineering organization has verified the welding packages. There is no design weld detail for the rewelding of the 4" guard pipe fittings that are being cut. (Project 10-73360)

SCR N-2015-06123 was initiated to identify the finding. Director, Pickering & NWMD Projects agreed to be the EO for this SCR at significance level 2. Supported by other P&M Directors.

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1.2 Finding 2: Deficiencies in Project and Modifications Staff Qualifications and Requirements

Qualification requirements and documentation of qualifications (i.e. TIMSII) for staff performing in Project Management roles are not clearly defined and established. The condition is related to issues identified in a 2012 audit (NO-2012-009). As a result, P&M staff performing Project Management oversight activities do not have sufficient training and familiarity with good project management practices and fundamentals, which may have contributed to project cost increases, schedule delays, quality and safety concerns (see Finding 1). In addition, critical qualifications were not completed for the Contract Manager role.

A major contributor to this gap is the designation of Project Manager training as "Supplemental" qualification. These deficiencies can pose a risk to OPGN since the P&M organization is currently managing a project portfolio valued close to one billion dollars (estimate based on P&M Program CPI SPI Report data).

Note: The organization is generally aware of roles and qualification issues (per SA NO14-000400); however, the related SCR action completions are still pending (Q4 2015).

Supporting facts: (Additional supporting facts are shown in Appendix B)

1) "Project Manager" (PM) Qualification and Role Assignment: Qualification requirements and documentation of qualifications for staff performing in the "PM" role have not been established. The assignment of the PM role to project staff is at the discretion and experience of individual Management staff and is not dependent on completion of the "supplemental" qualifications (QID).

a) Currently, there are no comprehensive means (i.e. TIMSII) to identify P&M staff (including some Section Managers (SM)) being assigned work who are deemed to be qualified and competent for the "PM" role. The record of qualification, criteria used and determination applied prior to assigning a P&M individual (particularly non-SM) to the "PM" role, currently resides within P&M Management staff's memory.

b) QIDs identified for the PM role are designated as "Supplemental" training only, rather than "Critical" or "task limiting"; consequently, there are no required PM specific qualifications for the PM role. P&M Management stated that the decision was to not have P&M staff obtain PMI certification as a process to qualify or to select staff for the PM role.

   i) There is reliance on each P&M Manager's knowledge of the PM "qualification" for their P&M staff, which can be a risk when Management staff either move to other positions or leave OPGN. New Managers may not have the same level of knowledge of the pool of P&M staff and/or may apply different criteria when assigning individuals to the PM role.

c) Per TIMSII, 19 of 19 PMs and 9 of 12 SMs P&M staff assigned to selected projects have not completed the two "PM" related "Supplemental" qualifications (QIDs 11832 (Project Manager) and 32144 (Project Fundamentals)). 12 of 13 projects had both the assigned PM persons and SMs who were not approved in the QIDs. Most of the projects reviewed were overspent, behind schedule and have quality issues (see Finding 1).

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d) The "PM" role is not being consistently applied within the P&M organization. This inconsistency in the use of the PM title is indicative of an organizational misalignment and has resulted in a lack of clarity on who is performing the "PM" role.

i) Some also explained that the Project template signature line title reads Project Manager. The PM signed this box but expressed concerns about the title "Project Manager" as they have little or no training in project management. Some PM's previous training were as MTLs where the process was well defined.

e) The previous audit NO-2012-009 in Finding 2 stated that "*some Project Managers identified for active projects are not fully qualified ...".* The action taken in response to the audit has not fully resolved the qualification related issues.

2) Contract Manager (CM) Role Qualification: The majority of P&M staff (non-CMO) performing the CM roles were not qualified in the two "critical" CM related qualifications. For the projects sampled in this audit, a designated CM was not specifically identified; consequently, the understanding for the audit was that the PM designated person for the projects fulfilled both the PM and CM roles.

a) Per TIMSII, 19 of 19 PM and 8 of 12 SM project staff assigned to the selected projects were not qualified for the two CM role related qualifications (QIDs 32904 (Critical) and 32905 (Critical)). All projects had both the assigned PM persons and SMs who were not qualified in 32904 and 32905.

3) Contract Administrator Qualification (for Contract Management Office (CMO) staff): Training governance (i.e. N-TQD) has not yet been updated to reflect the currently applied qualification requirements for contract management related work performed by CMO staff. In addition, 1 of 8 CMO staff assigned to Contract Administrator activities did not meet all qualification requirements (i.e. one was in progress).

a) Qualification requirement and contract management role changes were implemented prior to reflecting the changes in N-TQD-510-00001 R007, Supplemental BTU Direct Hire and Contract Management Training and Qualification Description (issued Jan. 5, 2015). Based on the current version of the N-TQD, it was not clear whether the four listed QIDs in Appendix B were required for some of these personnel.

i) CMO Management confirmed that currently only QID 30285 is required for CMO staff performing contract management activities, which includes PEL 3594, Contract Administration. The other three QIDs (30805, 30264, and 9819) are no longer required for this role.

Note: In response to this Audit, the CMO organization input AR# 28174530 to "*Review Training governance/documents (i.e. N-TQD-510-00001) and revise as necessary to reflect the qualification requirements for contract management related activities performed by CMO staff*" (Target Completion Date (TCD) Dec. 15, 2015).

SCR N-2015-06125 was initiated to identify the finding. Project Director, Contract Management & Project Control Office agreed to be the EO for this SCR at significance level 2.

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1.3 Finding 3: Deficiencies in Project Management Program Governance and Supporting Documents

Deficiencies exist in Project Management governance and supporting documents and in how they are being maintained to ensure that clear, consistent, and up-to-date direction is provided for the performance of required activities. Projects and Modifications (P&M) management viewed the Project Management Program as being different from other OPGN programs under the Charter; consequently, simplified governance and desktop documents were established to define a more flexible risk based and graded process. This approach resulted in misalignments with OPG governance requirements and resulted in inconsistent Project Management program implementation (see Finding 1).

Supporting facts: (Additional supporting facts are shown in Appendix B)

1) Project Management governing documents are not fully aligned with the requirements in OPG-STD-0001 R004, Requirements for Administrative Governance Documents in the areas of documentation of performance requirements, bases, references, roles and accountabilities, and records.

a) P&M management has taken a different approach for structuring Project Management program governance as this program was deemed to be different from other programs under N-CHAR-AS-0002, Nuclear Management System. As a consequence of this P&M management interpretation, some elements of OPG-STD-0001 R004 were not considered to be applicable to the Project Management program. However, the audit team did not identify any exceptions for the Project Management program in OPG-STD-0001.

b) While N-PROG-AS-0007 R008, Project Management makes reference to Desktop Guides and Manuals in general terms it does not identify specific documents. The N-STD documents listed under N-PROG-AS-0007 also do not provide a comprehensive link or direction to these supporting documents which provide the specific performance requirements (i.e. who, what, how, when, and where). There are no N-PROC documents associated with the Project Management program.

c) The CSA N286-05, Management System Requirements for Nuclear Power Plants clauses are identified in Section 4.1; however, they are not specifically tied to any activity areas of the program to be able to demonstrate alignment. A single basis identifier (i.e. [B1]) is noted on the N-PROG cover page under the scope section and no other parts of the document show any of the bases references. The “bases” represent the licensing, legal and regulatory requirements that are being complied with by the program areas.

d) Interfacing documents are not identified and discussed in N-PROG-AS-0007 R008, Project Management. Only the implementing standards are identified in Section 1.2, Figure 1. There are key interfacing programs which reference the Project Management program.

e) Roles and Accountabilities are not consistently identified in the Project Management governance, suggesting that there are no Manager level (Band G) or higher position holders of roles with responsibilities for the output of others.

f) Records are not consistently identified in the program governance and supporting documents.

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g) The P&M organization does not consider Project Management program supporting documents (N-INS, N-MAN, & N-GUID) as governance and they are not part of the governance framework. However, the documents do provide specific direction and expectations typical of governing documents (i.e. shall and should). As noted in Finding 1 on execution of project oversight activities, PM staff have indicated that the documents are not governance as a reason for not performing required activities.

2) Project Management program governing and supporting documents were found to contain examples of errors, inconsistencies, and incorrect references. Examples included reference to superseded documents, incorrect document references, etc.

3) Project Management program documents (N-PROG, N-GUID, & N-MAN) are not consistently reviewed to ensure that they are current and up-to-date as some have reviews past due (3 of 11) and others do not have any review cycles specified (7 of 18).

4) Lack of clear direction or guidance in governance or supporting documents for Project Management process activities. For example, there is no supporting manual that describes the Oversight Reporting System (ORS) tool and provides the user or maintainer with any guidance (See Finding 1).

SCR N-2015-06127 was initiated to identify the finding. Project Director, Contract Management & Project Control Office agreed to be the EO for this SCR at significance level 3, with CARB review.

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2.0 SCRs Initiated During the Audit

The following Station Condition Record(s) were initiated during the audit on conditions that required immediate correction action(s).

SCR No.: N-2015-03221

Title: Project 10-60183 DWMF SB#2 - PMP not filed in Asset Suite

Description of Condition: Project Management Plan (PMP) for Project 10-60183 was not filed in Asset Suite following approval. This was discovered during the Project Management audit in January 2015.

Resolution Category and Significance: D4 for trending

SCR No.: N-2015-03371

Title: Project MPTP-SF Project 10-60152; Delay in Issuance of History Document Record

Description of Condition: The history documents (HDOC) for the Multi-Purpose Transportation Project – Shielded Flask (Project 10-60152; PO 222418) was not issued by Records as thought by the project team. Confirmation of initial receipt of the HDOC by OPG was obtained by the project but subsequently returned to the vendor without the project team knowing. A recent audit of the Master EC Closure of the MPTP-SF (Project Management audit NO-2015-022) found the HDOC missing from issuance.

Resolution Category and Significance: D4 NFE. Condition corrected

SCR No.: N-2015-03616

Title: Project 13-49140 Trash Bar Screen Replacement - Failure to Obtain Safety Cert. for Contractors Equipment

Description of Condition: During installation of new 056 trash bar screen ES MSA Vendor had a Vacuum Truck on site to remove water/debris from trough area. It was noted during a Project audit that Projects CMO failed to obtain a "Safety Certification of Contractor Equipment" N-FORM-11482 for the Vacuum Truck.

Resolution Category and Significance: D4

3.0 Learning Behaviours

(Additional supporting facts for each of the learning behaviours are shown in Appendix B)

3.1 Corrective action program

A large volume of SCRs are being reviewed and trended per P&M Quarterly Trend Reports (see Section 4.1 positive audit insights). In addition SCR CAPs resulting from self assessments were reviewed (see section 3.2).

3.2 Self-Assessments

The P&M Division has completed many Self-Assessments (SAs) over the review period of the last 3 years (2013-2015) and while they generally meet SA requirements, the following are two areas for improvement:

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(1) Deficiencies were noted in the disposition (AR / SCR) or documentation of the disposition of recommendations for 8 of 21 P&M SAs reviewed. In some examples, findings or conclusions were noted but no recommendations were identified.

(2) Secondly, the outcome of all these assessments have not fully addressed or recognized the issues identified by the current audit. This may be due to some assessments of process areas and activities not being sufficiently self-critical or follow-up may not have been fully effective.

SCR **N-2015-06116** was initiated to document these 2 deficiencies.

3.3 Benchmarking

Benchmarking activities are being performed and documented in the self-assessment database. Three recent activities are;

i) D14-000228 [Approved and Closed]: Project Managers Industry Working Group Meeting (Dec. 2013)
ii) D13-000219 [Approved and Closed]: Project Managers Industry Working Group Meeting (May. 2013)
   (1) Conclusions stated that it is important that OPG stay involved with the working group. D14-000228 confirms that this involvement has continued.
iii) P13-000083 [Approved and Closed]: INPO FME Working Group Meeting (Jan. 2013)

3.4 Dispositioning of Previous Audit/Assessment Findings

The CAPs from the most recent Project Management Audit (NO-2012-009) and Project Management Assessment (NO-2013-315) were reviewed. While all the CAP actions were completed, there are some recurring issues:

1) Audit NO-2012-009: There were two findings from this audit which resulted in 2 SCR's.
   a) Finding 1: The resulting SCR N-2012-02709 included 3 assignments which have been completed. This audit review has identified that the first 2 assignments have been satisfactorily completed. Assignment #3 required "Prepare/issue briefing card re OPEX/Lesson Learned (LL)/SA expectations". The LL and SA expectations were to present LL and SA to PMOC Review Meetings prior to issuance. This audit has found that only some LLs are presented at PMOC and no SAs are presented at the PMOC.

      SCR **N-2015-06116** was initiated to document this deficiency.

   b) Finding 2: The resulting SCR N-2012-02710 (C-3 CARB review) included one completed assignment to "Revise N-QG-403-00023 to address the training need for project managers and project staff, including one specific aspect to change Project Manager's Qualification from Critical to Supplemental. Link employees to the related qualifications and ensure that they complete training requirements on time. This Assignment is considered complete when all related documents have gone through approval process and PM qualification has been changed to supplemental." This action was not presented to the CARB and did not effectively resolve the Project Manager's qualification issue and a new finding (Finding # 2) has been issued in this audit.

2) Assessment NO-2013-315 – Two SCRs resulted from this assessment:
   i) SCR N-2013-23458 relates to the Oversight Reporting System (ORS). Five actions were initiated which focused on the development and testing of the Project Oversight Database. All five actions have been completed and the database is in use and workshops were presented to P&M staff. However, this audit has identified some gaps in the usage/effectiveness of the ORS which are documented in Finding 1.
   ii) SCR N-2013-23460 relates to procedural gaps. The resulting assignment is complete; however, this audit has identified similar and other procedural gaps included in Finding 3.

4.0 Audit Insights

4.1 Positive Audit Insights:

(1) The project folder for project 13-49140, Screenhouse Pickering B Trash Bar Screen Replacement, was very well maintained with up-to-date information, and effort was made to ensure QA records were issued in Asset Suite.

(2) The P&M organization prepares and issues comprehensive Quarterly Trend Reports which include an executive summary highlighting significant adverse trends, performance indicators (e.g. reportable events, SA, EOERs, SOERs, training health index, etc), SCR trending, status on previous trends, focus on gaps to excellence, etc. In the case of the adverse trends, the action (e.g. SCR initiated) taken is identified in the report. There is also evidence of follow-up actions being taken such as EOERs to check effectiveness of actions taken.

4.2 External SME observations and OPEX

As part of the Nuclear Industry Exchange Program (NIEP), [redacted] joined the audit as an external Subject Matter Expert (SME) from February 9 - February12. [redacted] The following areas of improvement are provided for consideration by OPG's Nuclear Projects.

The SME identified the following gaps:

i) There is an overall lack of defined roles and responsibilities in documentation.
ii) People performing the role of Project Manager are unclear as to their role.
iii) Project team members appear to not understand and value a defined process.
iv) Insights from the portfolio review indicate what PM's need assistance and/or training as they are consistently over cost and behind schedule.
v) The Project Management guide is a job aid and there is no requirement to use the guide.
vi) There was no training required for multiple roles within a project.
vii) There were no clear expectations for Project Managers and how they are held accountable.

viii) There is no evidence that PM's are trained to develop a POP and follow the POP process.

ix) PMI training and PMP qualifications could be utilized, even though OPG's Project Program is defined and does not include common PMBOK terminology (i.e. Project Process Groups).

x) There is no evidence that there is a person or team who trains and mentors the project team.

There was no Action Tracking assignment required for this insight since similar observations are captured in Findings 1 to 3.

4.3 OPEX from External SME

Lesson Learned from STPNOC

In preparation for an INPO Corporate Eval, a Formal Self-Assessment was performed. See INPO Performance Objective and Criteria CO.5:9.

"*9. Corporate managers establish, communicate, and implement a structured project management process to select, plan, and implement projects with predictable quality, scope, schedule, and cost performance."*

An Opportunity for Improvement was identified in the area of Project Management: "*Uniform guidelines for Project Manager candidate selections are not utilized to ensure projects are executed with consistent and predictable quality, scope, control, schedule adherence and cost performance."*

Immediate actions were taken to assure that PMs were trained, qualified and mentored. Part of the training included sending PMs to a training focused on PMI processes, some have received their Project Management Professional (PMP) certification. PMs are required to follow a guide that was developed by the Projects department. Job Descriptions were reviewed and updated to ensure proper PM selection. A Project Manager mentoring program has been established.

5.0 Signatures

Prepared by: _____ Date: Mar. 13, 2015

Russ Gomme, P. Eng.
Audit Team Leader
Nuclear Oversight - Engineering

Approved by: _____ Date: March 13, 2015

Herminia Román, MSc., Ph.D.
Senior Manager
Nuclear Oversight - Engineering

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APPENDICES

Appendix A

Audit Plan

1.0 RATIONALE

N-PROC-RA-0048, Conducting Performance Based Audits and Assessments has a requirement to perform periodic audits of the Project Management Program. This program was last audited in the first quarter of 2012. Based on the review of previous audits, contract management and field engineering program elements have not been specifically reviewed by Nuclear Oversight.

2.0 OBJECTIVE

The objective of this performance based audit is to determine whether the project management requirements defined in governance have been met and effectively implemented to support safe and reliable operation.

3.0 SCOPE

The scope for the Project Management Audit will include a review of program requirements and execution of program activities at Darlington, Pickering and Nuclear Waste with a focus on contract management and field engineering. In addition, the audit will include the Nuclear Oversight's Model Audit Scope described below.

3.1 Model Audit Scope

i) Program Governance - implemented, effective, and compliant

ii) Legal / Regulatory Requirements – compliance – Reg C/M/O, projects or initiatives

iii) Training / Qualification - definition / compliance

iv) Management Oversight / Learning Organization / Corrective Action Program – Findings, SA, RCA, Fleetview reporting, System Health reporting, CAP effectiveness, and OPEX

v) Interface - with other programs / organizations

vi) External Insights - WANO, NSRB, CNSC and any applicable SOERs

i) Applicable Nuclear Safety Traits for some sampled activities.

3.2 Additional Scope items

Review project oversight of selected projects.

4.0 REFERENCE STANDARDS

The standards for the audit will include, but not be limited to:

N-CHAR-AS-0002 R17A	Nuclear Management System
N-LIST-08130-10023 R03	CSA N286-05 to OPGN Governance Cross Matrix
N-PROC-RA-0022 R32	Processing Station Condition Records
N-PROC-RA-0048 R17	Conducting Performance Based Audits and Assessments
CSA N286-05	Management System Requirements for Nuclear Power Plants
N-PROG-AS-0007 R08	Project Management
N-STD-AS-0028 R01	Project Management Standard
N-STD-AS-0029 R00	Contract Management Standard
N-STD-AS-0030 R00	Project Oversight Standard
N-STD-AS-0031 R00	Field Engineering Standard

5.0 AUDIT PERSONNEL

The team consists of:

Audit Team Leader:	Russ Gomme – Nuclear Oversight
Auditor:	Emeric Schoen – Nuclear Oversight
Auditor:	Maher Ghannam – Nuclear Oversight
Auditor:	Murali Komaragiri – Nuclear Oversight
Auditor:	Ghaman Kaulessar – Nuclear Oversight
Auditor-in-Training:	Jack Bastermaji – Nuclear Oversight
Subject Matter Expert:	Rod MacPherson – Field Engineering
Subject Matter Expert:	[redacted] (external)
Senior Manager:	Herminia Román – Nuclear Oversight

6.0 INDIVIDUALS/ORGANIZATIONS NOTIFIED

Art Rob, Vice President, Projects and Modifications
Riyaz Habib, Director, Contract Management & Project Control Office
Nahil Rahman, Director, Pickering & NWMD Projects
Dragan Popovic, Director, Darlington & Refurb Projects
Terry Chong, Section Manager, Governance & Improvement

7.0 SCHEDULE

Preparation:	Jan. 5 to 23, 2015
Entrance Meeting:	Jan. 23, 2015
Audit Fieldwork:	Jan. 26 to Feb.12, 2015
Prepare report and review with line owners:	Feb. 27, 2015
Challenge Meeting:	Mar. 5, 2015
Exit Meeting:	Mar. 11, 2015
Issue Report:	Mar. 13, 2015

8.0 REQUIRED FACILITIES AND EQUIPMENT

Work locations at the Darlington ESSB have been reserved for the audit. Activities related to PNGS and Decommissioning & NWMD will be conducted from 889 Brock Road.

Appendix B

Other Audit Details

Additional Supporting Facts for the Findings

Finding 1: Deficiencies in the Execution of Project Management Oversight

1) Project Management oversight is not fully effective at controlling costs, schedule quality, and potential safety issues.

a) **Project 13-40985, Replacement of Obsolete Online Chemistry Analyzers**

i) Key performance Indicators are Red, (CPI is 0.47 and SPI is 0.64). Cost has increased significantly from 2.5M to 15M. Reference SCR N-2014-17624, "Adverse Trend - Projects cost significantly exceed original estimates".

ii) There were significant issues with vendor quality, which led to contract termination.

iii) This project impacts a WANO finding (Pickering's hours out of chemistry specification has been identified as a repeat area for improvement), and was also tracked by CNSC through action item #2012-8-3201. To date, only 3 of 64 analyzers have been installed in the field.

iv) In the June 2014 PAC meeting, a presentation on the status of Project 13-40985 was delivered which included the stop work recommendation against the prime contractor. Slide 4 of the presentation, titled "*Recommended Path Forward*", included a recommendation to improve project oversight, "*P&M to revise the Project Oversight plan to increase design/field engineering oversight*" which to date has not been completed. Project Management Line feedback stated "*a draft plan was prepared and Rev 02 will be issued with new EPC contract as required*".

v) The Lessons Learned Report NK30-LLD-63660-00001 R000, PNGS Chemical Analyzer Replacement Project – Lessons Learned Document (LLD), cites examples where weaknesses in project oversight affected project execution. Some of the applicable statements from the LLD relating to project oversight weaknesses include:

(1) Poor communication practices between the EPC contractors and OPG staff was identified as the most significant challenge during the project. Recommendation #1 states the need for "*Continuous improvement and communication between EPC vendors and OPG stakeholders. Creation and distribution of project contact lists including all critical stakeholders."* (Section 4.0, Page 9 of 18)

(2) Recommendation #2 is stated as follows: "*At various stages in the project, the project team should have sat down and discussed the project deliverables and revised the schedule based on the information obtained. Additional communication was required between EPC vendor and OPG staff familiar with task durations as well as a better understanding of the MA-13 requirements*." (Section 4.0, Page 10 of 18)

(3) A statement related to the contractor not familiar with OPG processes was made, with the cause identified as: "*SPOCs within the OPG interfacing groups were not*

identified and time-lines for activity duration were not clearly identified or known. This resulted in rushed and delayed activities." (Section 4.0, Page 10 of 18)

(4) Recommendation #6 states: "*When the schedule issues were identified, the entire project team should have re-base-lined the schedule. With no schedule to follow, it was not easy to monitor progress or plan ahead*." (Section 4.0, Page 12 of 18).

(5) Feedback from Project Management Line indicated the following: The LLD report was generated by the design agency at OPG's request due to design issues. The examples above were the vendor's reason for the design quality issues which led to delays/overruns; OPG challenged this document and the document was changed significantly from its original draft; however, we were not able to get cooperation from the vendor to remove some of the items listed here (mainly due to our contractual dispute over the cost of re-work).

b) **Project 13-49140 Pickering B Screenhouse Trash Bar Screen Replacement**

i) As of January 19, 2015, the CPI indicator was 0.84 (overspent) and the SPI measure was 0.74 (behind schedule). The original total PO value for this project was $2.1M (PO 227351 dated August 23, 2013); however, the latest project performance reports show the planned budget to be $6.1M.

(1) Note: This cost includes installation of 056-71120-SC1 in 2012 which failed prematurely and was replaced a second time in the current phase of the project. As such, the project is approximately $1M overspent since 2013.

ii) PO 227351 Line 1 (Engineering) base value was $667K; however, $994K has been invoiced (approximately 50% increase) against this project thus far due to design quality and engineering re-work.

c) **Project 13-49116, Pickering B SG EPG Fire Detection Upgrade & CO_2 Suppression Removal Project**

i) As of February 2, 2015, the CPI indicator was 0.58 (overspent). The actual amount spent is $6.24M against a control budget of $5.08M.

ii) Numerous schedule delays and resulting cost impact were attributed to unavailability of back-up batteries for testing on 056-SG1 (CID 683348) due to a failed batch received per SCR # N-2014-34147. There were many SCRs documenting this issue but they were all D4 (trend only).

d) **Project 10-73164 DR Irradiated Fuel Bay Heat Exchanger Replacement**

i) OPG's Design Engineering review was not obtained for the engineered scaffolding and lifting beam as required per N-COI-00120-00001, Contractor/Owner Interface Requirements for Nuclear, Section 4.65 "Installation Field Technical Support."

(1) The Vendor's Civil Design team provided approved drawings for scaffolding.

(2) The scaffolding tag was inspected and signed off by the CMO.

ii) The CPI and SPI indicators are RED.

(1) A continuing adverse trend impacting the schedule is not resolved. There have been 7 SCRs (N-2014-31945, 34504, 34603, N-2015-00547, 00572, 00702, 00598) for this project that relate to night-shift fuel handling (issuing authority) not available to sign work permits resulting in work stoppages. The SCRs noted "*this is a known issue by Station Management*". All of the SCRs were D4 and there is no documented action to remediate the adverse condition. Feedback from Project Management line stated "*the impact of this issue is being mitigated and managed within the contract*."

e) **Project 10-73398 DR SIO ESW Buried Services**

i) Construction cost for this project has nearly doubled without the necessary Project Change Authorization (PCA). CPI is RED at 0.43. The POP NK38-PLAN-72800-10001 R001, elements for cost control were not performed as written.

(1) Cost Control, per the POP, required the Project Manager (PM) to have weekly detailed review meetings to review cash flow and forecasts; however, these were not performed.

(2) Invoicing reconciliation, per the POP, required the PM to hold monthly invoice reviews for reimbursable costs per contract; however, these were not performed.

(3) Cost Management, per the POP, required the PM to review on a bi-weekly basis that the PO line spending is within the approval and mismatch is not occurring; however, any discrepancies are not documented and tracked.

(4) Cost Increases, per the POP, required the PM to review the weekly contractor spending forecasts. Also, PCAs and CTPs were to be reviewed and input within the 2 week period; however, this was not being performed.

(5) Per Line feedback:

(a) PCA / CTP(Consent to Proceed) submissions are difficult to process within 2 weeks especially when OPG and the vendor do not agree on the facts around the PCA / CTP submission.

(b) The PM reviews PO spending weekly through Oncore invoice processing.

(c) The Line also noted, with respect to the cost increases, the vendor has the ability to submit accruals through Oncore (invoicing system) for costs OPG has not yet approved. These accruals are then counted into the project's spending. If cost disputes between the contractors arise, these accruals can negatively affect project CPI as the disputed cost will be counted into the overall project spending. This has happened on this project; however, it is acknowledged that the disputed costs may actually be realized which would adversely impact the CPI.

f) **Project 16-34000 DN Auxiliary Heating Steam**

i) The scope was expected to be complete in April 2015 per the PMP NK38-PLAN-73110-0495234 at a cost of $28.5M; however, the new projected completion date is October 2015 with an estimated cost of $85M.

(1) The main reason for delay is the scope was not fully understood at inception (August 2007) causing the design requirements to be revised 4 times; the latest

revision was in July 2014. Consequently, Design Engineering has not yet completed the Design Change Packages and as a result the October completion date may also be at risk.

(2) There have been about 170 SCR's on this project thus far and about 40% relates to the Design Engineering performance. All of the SCR's were D-4.

(3) The person acting in the PM role expressed concerns over lack of training in project management, expectations to be in the field on a daily basis, expectation to review 2,000 invoices per week, responsible for 2 to 3 ongoing projects and CA responsible for 5 to 6 ongoing projects.

(a) The team did not clearly understand this new role as oversight while EPC manages the work.

(b) There was not a clear understanding (what needs to get entered and where) of the multiple applications required to track and monitor project documents including RADAR, Asset Suite, SCR database, accounting system, ORS and others.

(4) The PM's Section Manager noted that he selects his PM based on his assessment of their competence; however, this assessment was not documented; there is a PEL 62659 to document the assessment.

g) **Project # 10-60183 DUFDS Storage Building #2**

i) As of February 3, 2015, CPI, SPI, and the Risk Register are Red.

(1) The AFS date has been delayed 2 times during the installation phase. The EPC contractor ([redacted]) exceeded the controlled budget during the fence installation.

(2) There is a high turnover of project managers on this project. The current Project Manager is leaving in 2 weeks and he only took charge of this project in June 2014. Also, the Section Manager only recently took over this project in June 2014.

(3) Nuclear Waste organization was new to ECC and [redacted] was new to OPG design process for preparing the modification packages.

(4) The Risk Register entries for the project have not been updated since September 2014. 18 of 20 of these registers have passed their TCD. The SM "*stated these design risks identified on the Risk Register will be updated as part of the new BCS and don't impact project schedule.*"

h) **Project # 10-60162 Darlington Retube Waste Storage Building**

i) As of February 3, 2015, CPI and SPI are Red and the Risk Register is Yellow.

(1) Several SCRs have been initiated for lack of timely response by the vendor to multiple OPG requests for quality of the vendor supplied products (N-2014-11869, N-2014-01160, N-2014-13264, and N-2014-30209).

(2) The Risk Register entries for the project have not been updated since August 2014. 6 of 10 of these registers have passed their TCD. Most of these risks are

threats to design related activities. The SM stated "*these design risks identified on the Risk Register will be updated as part of the new BCS and don't impact project schedule.*"

i) **Project # 10-60152 Pickering MPTP Replacement**

i) The CPI is Red; however, the PM said this was due to inaccurate reporting. The SPI is Yellow.

(1) This project, Multi Purpose Transportation Package (MPTP) was on the 2014 CNO milestone with an AFS TCD of July 31, 2014 which was achieved on July 15, 2014.

j) **Project # 10-60063 BHWP Decommissioning Phase 2**

i) The CPI is Red (Value = 1.29) and the SPI is YELLOW (Value = 0.94).

k) **Project 16-31542 Transformer multi Gas Analyzer Installation**

i) The CPI is Red (Value= 0.84) and SPI is Green (Value=0.96).

l) **Project 10-73360 DR - SIO - 3RD EPG**

i) The CPI is Yellow (Value=1.06) and SPI is Red (Value=0.88).

m) **Project 16-33258 - DN Replacement of EPS Uninterruptible Power Supply**

i) The CPI is Red (Value=0.84) and SPI is Yellow (Value=0.92).

2) Some Project Management oversight activities are not being performed as required per the Project Oversight Plan (POP), N-INS-09701-10007 R000, Project Oversight Planning and Implementation and other supporting documents (N-MAN, N-GUID).

a) **Project 13-40985, Replacement of Obsolete Online Chemistry Analyzers**

i) The POP requirements are outlined in NK30-PLAN-01804-10001 R001, Replacement of Obsolete Chemistry Analyzers Project 13-40985 Oversight Plan; however, they are only general guidelines for the required activities without specific oversight activities of key or critical evolutions and project milestones, or strategic oversight (i.e. higher risk elements), with the appropriate frequency.

(1) The oversight activities are not broken down into in-line/process, routine, or strategic oversight categories with associated frequency requirements for each given activity.

(a) Per feedback from the Project Management Line, the routine oversight activities are monitored and tracked in weekly meetings, strategic oversight performed through COMS, design reviews of ECs (Comments and Dispositions), work plan and CWP reviews, walk downs during execution. This mod was deemed as a low risk mod, strategic oversight was captured through the ECC process, design reviews, C&D sheets, work-plan reviews.

(2) Risk Register items as shown in RMP-40985-1 (page 56 of 109 in Project Execution Plan document N-PEP-01804-10000 R000, Replacement of Chemistry Online Analyzers) are not specifically identified as oversight activities in the POP.

(a) Per feedback from the Project Management Line, there is no direct link between the oversight plan and the risk register, but as a whole, the oversight

plan addresses the risk elements. Risks are monitored and tracked in weekly meetings. During execution risks are monitored and tracked using the project controls center.

(3) There are no specific quality surveillance activities listed in the POP to be implemented by Field Engineering (FE) staff. Only a reference is made to the applicable governance in effect at the time: "Quality oversight as per N-PROC-AS-0074, Contractor Quality Surveillance", but the actual specific or required duties are not outlined.

(a) Per feedback from the Project Management line, FE oversight has been conducted by reviewing WPLs and CWPs, also FE have conducted materials oversight at the vendor facility and attended project meetings.

(4) For Engineering oversight (section 5.2 of POP), the requirements state "*Refer to the ES-MSA provisions covering Engineering Work and COIR*", but the actual specific or required duties are not outlined.

(a) Per feedback from the Project Management line, engineering oversight was performed through review of engineering packages, DTL attended weekly meetings and actions were taken and tracked through weekly meeting minutes.

ii) The POP (Section 11.0, Roles and Responsibilities) did not include all the organizations with responsibilities identified in the plan (e.g. Procurement, Warehousing, Contract Management, and Field Engineering). Per feedback from the line these organizations were captured in the body of the oversight plan in the applicable sections discussing "Resources required".

iii) The POP was approved by the Section Manager; however, there is no signature on the POP identifying the person that is in role as the Project Manager. This is required by both N-MAN-09701-10002 R000 (document in effect at the time) and N-INS-09701-10007 R000 (current document in effect). The line stated the Project Manager function was fulfilled by the Mod Team Leader (MTL) who signed on the POP as a reviewer.

iv) Oversight records are not being maintained as per requirements.

(1) Documented results of all oversight activities as required by the POP could not be found.

(2) Only Field Engineering is using the Oversight Reporting System (ORS) database; however, it has the capability to be used by other organizations identified in the POP (e.g. project management, contract management, engineering/design, procurement/warehousing, safety compliance). No oversight reports were found for these groups.

(3) Oversight reports for Project 13-40985 could not be found in the Projects & Modifications SharePoint site.

(a) Per feedback from the Project Management Line, oversight was tracked in weekly meetings. These were loaded into SharePoint after the Audit requested the oversight reports.

(4) As per POP (Section 10), summary of results for the overall oversight effectiveness was planned to be documented in the self-assessment database

before each year-end; however, self-asseesments were not completed for 2013 or 2014.

(a) Per feedback from the Project Management Line, work has stopped since May 2014 and no oversight was required since that time. Effectiveness of the oversight was reviewed routinely by the PM. Discussion with previous Section Manager deemed that entry of a self-assessment in 2013 was not required; however, this was not reflected in the POP.

v) The Lessons Learned Report from vendor NK30-LLD-63660-00001 R000, PNGS Chemical Analyzer Replacement Project – Lessons Learned Document, identified schedule issues which were not recognized in the project risk registers RMP-40985-1 (embedded within N-PEP-01804-10000, *Project Execution Plan*) or the POP.

(1) The Line stated the LLD was generated by the vendor at OPG's request due to the quality issues, the accelerated schedule was the vendor's reason for the design quality issues.

vi) Evidence of an oversight planning kick-off meeting (as being held or input being received from key functional groups for development of the plan), could not be found for this project.

(1) Feedback from Project Management Line is that although an oversight kick-off meeting was not held, the author of the plan did seek stakeholder input as required to produce the document.

vii) The POP is not treated as a living document and revised to include additional oversight as the project evolves or negative trends appear that indicate risks or poor performance.

(1) The POP NK30-PLAN-01804-10001 remains at R001 (issued in May 2013). The plan has not been revised during the lifecycle of the project as required by both N-MAN-09701-10002 R000, Sections 6.10 and 7.0 (in effect when POP was written) as well as the current guidance N-INS-09701-10007 per Sections 2.0, 3.0, and 4.0. Several opportunities and events occurred which required a revision of the POP as follows:

(a) Several SCRs were written for contractor not meeting schedule (N-2013-22430, P-2013-11459, N-2013-12895, N-2013-17350, N-2013-19633).

(b) Numerous other examples (at least 17) of missed or incomplete milestones by the Contractor have been recorded in the SCR Database for Project 13-40985.

(i) N-2015-01331, PNGS Project 13-40985, ECs 122150, 122060, 122162: Closeout Drawings Not Approved and Submitted for OPG Acceptance by Due Date (2015/01/20)

(ii) N-2014-31711, ES-MSA contractor missing the Action tracking assignments due date (2014/11/14)

(iii) Additional SCRs: P-2014-28513, N-2014-25452, N-2014-23495, N-2014-22469, N-2014-16538, N-2014-14172, N-2014-13859, N-2014-08883, P-2014-03887, P-2014-01502, P-2014-00328, N-2013-23258, P-2013-19299, N-2013-12895, and P-2013-11459.

(c) The POP (Section 2.0), references [redacted] as the prime contractor; however, on December 2, 2014, the prime contractor was changed to [redacted] for 7 of 64 analyzers. Per feedback from the Project Management Line: "*the POP is in the process of being revised, oversight is being provided by weekly meetings, the current contract is only for construction and adequate oversight is in place by the CMO and FE (who are doing the assessing in-house).The contractor job is reduced to construction only. The POP revision will be in place prior to the PO rev with* [redacted] *to give them more scope*."

(d) The POP was not revised based on findings and conclusions from the lessons learned report NK30-LLD-63660-00001 R000, PNGS Chemical Analyzer Replacement Project – Lessons Learned Document dated October 8, 2014. A number of the findings, deficiencies, and recommendations made in this report can be related to deficiencies in oversight.

(e) A revision of the oversight plan did not take place when new procedural requirement for execution of oversight took effect as per N-INS-09701-10007 R000, issued on August 14, 2013.

(f) The vendor scorecards maintained by OPG Projects Design Engineering were trending in the negative direction through the project life cycle. At the front end, results were in 83-84% range at the end of 2013, degrading to 75% in May 2014, 64% in August 2014, and finally to 47% in January 2015. Per feedback from OPG Design Project lead, virtually all submitted ECs had significant deficiencies. The scorecards capture quality and schedule performance of the Design Agency as measured by OPG Projects Design. Per feedback from the Project Management Line, changes were implemented to increase oversight, but these were not captured in the POP. Some examples of deficiencies include:

  (i) SCR N-2014-07593, "Project 40985, Liquid Zone Control Analyzer probe not supplied with CRN".

  (ii) Materials were purchased without the correct Pressure Boundary requirements and SCR P-2014-07270, "Project 40985 (Chem Analyzer): Material issue for installation of 4-64123-C1-CT501 in P1441". Materials were purchased without the correct inter-connecting fittings for installation in the systems.

(g) Per feedback from the Project Management Line, oversight was performed through the weekly meetings, the schedule was a standard component of the weekly meeting, SCRs are part of oversight, the POP is in process of being revised since contractor job is reduced to construction only. The LLD report was issued by the design agency who under-performed and had many quality issues. The current contract (with [redacted]) does not include any design activities.

b) **Project 13-49140 Pickering B Screenhouse Trash Bar Screen Replacement**

i) Some requirements outlined in the POP P-PLAN-71120-00001 R000, Project Oversight Plan – Pickering B Screenhouse Trash Bar Screen Replacement Project 13-49140 were not clearly specified.

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(1) The oversight activities outlined for construction oversight by Field Engineering (FE) are high level, general requirements and have some missing information. In addition, the actual oversight completed by FE did not encompass all the requirements of the oversight plan. This is evident from the following:

(a) The POP (Appendix A) refers to a Quality Surveillance Plan (per N-FORM-10814) which was supposed to capture all details for quality surveillance; however, per discussion with FE staff and Project Manager, this document does not exist.

(b) The POP (Appendix A) required FE to "*Review, monitor Contractor's procurement of materials, class, grade of material*." The Risk level for this element is identified as "Medium" and it is stated that "*increased QS*" review is required for activities such as pressure tests, PB materials, traceability; however, it does not include the required frequencies.

(2) The POP (Appendix A) outlines the oversight requirements during Execution Phase for Contract Administrators and Contract Monitors to be completed as per N-FORM-11473, *Contract Management Template.* The implementation of this oversight is not clear based on the following:

(a) N-FORM-11473 was prepared and signed off in August 2013 which is well before the Execution Phase of this project. The completed N-FORM for this project is essentially blank under Stage IV – Contract Execution.

(b) It is not clear how the Contract Management Template is to be used when conducting oversight as most elements of the CMO oversight were completed via the Daily Logs maintained by the CMs.

(c) The POP (Section 4.4) references the existence of a Contract Management Plan which "*will provide responsibilities among CA, CM and Contractor or Sub-Contractors*"; however, an actual Contract Management Plan does not exist.

(3) The POP (Section 4.0) states: "*As outlined in the Project Management Plan, the risk level pertaining to technical execution has been considered to be high, therefore more frequent and intrusive oversight will be provided for the following project elements*"; however, none of the oversight elements in Appendix A are defined with a "high" risk level.

(a) It is not clear how more frequent and intrusive oversight is to take place based on contents of the oversight plan.

ii) The POP is not treated as a living document and revised to include additional oversight as the project evolves or negative trends appear that indicate risks or poor performance.

(1) The POP remains at R000 per original issue. The POP was not revised as necessary to manage emerging risk elements as required by both N-MAN-09701-10002 R000, Sections 6.10 and 7.0 (the procedure in effect when POP was written) as well as the current guidance N-INS-09701-10007 per Sections 2.0, 3.0, and 4.0. Examples which required a revision to the oversight plan include:

(a) The Project Management staff maintained a risk register up to date through the execution of the project, with over 60 risk elements identified. Many of the open risk register items are yellow or red (medium to high risk); however, the POP was not revised to capture the additional oversight that may have been necessary. Some risk register items include:

(i) R020: QA Level of Vendor may not meet Modification Design Requirement (MDR) requirements.

(ii) R034: Delays in Vendor Information comment response, quality of documents requiring multiple review cycles.

(iii) R002: Project costs might be higher than anticipated.

(b) Although project oversight caught some cost over-runs and actions were taken as a result, the oversight that was applied did not prevent the cost issues from arising in the first place. Examples of cost related issues for the project include:

(i) N-2014-11828 (D4), Project 13-49140. EPC Engineering cost is forecasted to exceed Project PO 00227351 Line 1 performance fee by >40%, which documents inaccurate Oncore charges were being applied.

(ii) N-2014-06667, Project 13-49140. Project EPC contract PO ONCORE charges review findings.

(iii) N-2014-23816, Project 13-49140. Cost of spare parts for the project is higher than assumed cost at the estimating stage.

(c) Design quality and engineering re-work also contributed to delays and cost increases. PO 227351 Line 1 (Engineering) base value was $667K; however, $994K has been invoiced (approximately 50% increase) against this project thus far.

(i) Many SCRs were filed relating to this issue: P-2013-17456, N-2013-17458, N-2013-23954, N-2013-21286, N-2014-12444, N-2014-15156, SCR N-2014-15754, N-2014-17306, N-2014-19208, and N-2014-23594.

iii) Evidence of a kick-off meeting being held or input being received from key functional groups for development of the POP, could not be found.

(1) The current Project Manager was not in this role when the POP was written and thus could not confirm if these activities took place.

iv) N-TMP-10292 was not used to develop the oversight plan.

v) The POP was approved by the Section Manager in Pickering Projects; however, there is no signature on the POP identifying the person in role as the “Project Manager” as required by N-INS-09701-10007, Section 3.7.

vi) The activities associated with lifting and hoisting the trash screen in place, were not captured in the oversight plan as a “strategic” oversight requirement applicable during the Execution Phase; however, the lift did require the completion of a Complex Lift Plan (NK30-REF-71120-0507806, *Complex Lift Plan Equipment: 056 Screenhouse Trash Conveyor USI/SCI 056-71120 OPG PO 227351 Project 13 49140 MEC 111849).*

vii) The only group utilizing the ORS database for submission of oversight reports is Field Engineering. There are no oversight reports submitted in the ORS database

from Projects or Design Engineering. There is currently no expectation for CMO staff to utilize the ORS database for oversight reporting.

c) **Project 13-49116, Pickering B SG EPG Fire Detection Upgrade & CO_2 Suppression Removal Project**

i) The only group utilizing the ORS database for submission of oversight reports is Field Engineering. There are no oversight reports in the ORS database from Projects or Design staff. As a result, it is not evident how all remaining oversight elements, required by POP, are being completed and documented (NK30-PLAN-75220-0478909 R000, Pickering B SG/EPG Fire Detection Upgrade and CO_2 Removal Project Oversight Plan).

ii) Evidence of a POP kick-off meeting taking place was not found based on review of the project folder. Per feedback from the Project Management Line, although a kick-off meeting was not held, the intent of N-STD-AS-0029 was met by obtaining feedback with all stakeholders.

iii) The POP is not treated as a living document since it has not been revised to manage poor performance.

(1) Per review of the oversight plan criteria, the weekly project status meetings is credited for schedule and cost control elements. Cost control on this project has not been achieved based on the following examples:

(a) CPI rating for this Project is 0.58 as of February 2, 2015, indicating that the project is overspent. Actual amount spent is $6.24M against a control budget of $5.08M.

(b) SCR N-2014-26481, Contract Issue – Contract increase of greater 20% during construction. This was attributed to underestimation of labour (discovery work) and increase scoped of work. The SCR was a D4 closeout.

(c) Other examples are N-2014-03164, Project cost increase - PCA for change in strategy for 056SG2 and 056SG3 causing increased costs and N-2014-02006, Project cost increase - PCA night shift premium for 056SG2 and 056SG1 scaffolding costs.

(d) Per feedback from the PM Line, the SCRs listed above were written with the primary aim of documenting the issues so that the vendor claims for the PCA/CTP could be validated. Furthermore, the issues were well understood and documented in the SCRs. The Line does not believe that additional oversight or revision to the oversight plan would have improved cost control, based on the nature of the issues causing cost over-runs for this project.

(2) Numerous schedule delays and resulting cost impact were attributed to unavailability of back-up batteries for testing on 056-SG1 due to failed batch received per SCR # N-2014-34147. Additional SCR's (D4) documenting this issue include: N-2014-32690, N-2014-32710, N-2014-33070, N-2014-33348.

(a) As of February 2, 2015, the SPI measure was 0.72 behind schedule.

(b) Many delays were due to work authorization related issues (e.g. SCRs N-2014-10821, N-2014-10477, N-2014-16368, N-2014-16294, N-2014-17637,

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N-2014-17753, N-2014-18126, and N-2014-23603). All SCRs were D4 closeouts.

iv) The POP was approved by the Section Manager and not the Project Manager as required (N-INS-09701-10007, Section 3.7). In addition, the title of the preparer's signature was modified to read "MTL". The standard template N-TMP-10292 for oversight plans has the "Project Manager" as the preparer's signature. Per feedback from the Project Management Line, the document was prepared by the MTL performing the role of the Project Manager and was approved by the Section Manager. As such, from the Line's perspective, this met the intent of N-STD-AS-0030.

d) **Project 10-73164 DR Irradiated Fuel Bay Heat Exchanger Replacement**

i) There are no oversight reports documenting results for in-line/in-process activities, routine oversight activities or strategic oversight activities indentified in the POP as required by N-INS-09701-10007 Section 4.1. The POP is D-PLAN-34410-498216 R00.

(1) The consequence of not documenting and collecting all the required oversight activities in a common database is that the PM may not be aware or subsequently miss issues that can impact the effective execution of the project.

(2) The Oversight Reporting System (ORS) is not being used to document oversight activities.

(3) Feedback from Project Management Line stated they consider the Contract Monitor logs, [redacted] logs, e-mails, and project meeting minutes as documentation of the required activities.

ii) The POP was not revised when changes were made to the contracting strategy which changed from owner only to OPG constructor.

(1) Some of the oversight activities were now redundant because of the new work arrangement, while others written off as "NA" are now required.

(2) Section 3.7 of N-INS-09701-10007, Project Oversight Planning and Implementation requires that each time changes are made to the POP a revision must be prepared, approved and issued following the same process as the original.

iii) The POP was not revised when the scope of work changed that required an engineering scaffold and lifting beam. Ref SCR N-2015-00471 "NK38-012-34410-HX 2 : Work Delay Project 10-73164 due to Rigging Scaffold Injection".

iv) The POP was not approved by the Project Manager as required by Section 3.7 of N-INS-09701-10007. The POP was prepared by the MTL (acting in PM role) and approved by the Section Manager.

v) The Project Management Plan (PMP), NK38-PLAN-34410-0501709, was not revised to reflect the revised strategy which affects performing QA requirements. The PMP identified this project as a Construction ES MSA Project and that work plans would be prepared by the contractor; however, OPG prepared the work plans.

e) **Project 10-73398 DR SIO ESW Buried Services**

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i) Cost control activities as described in the POP NK38-PLAN-72800-10001 R001 were not performed.

ii) The oversight database is not used as required to document oversight reports (N-INS-09701-10007).

(1) There are no oversight reports for relevant in-line/in-process, routine and oversight activities identified in the POP.

(2) COMS minutes, C&Ds and third party results have not been transferred to the oversight database.

(3) Line feedback indicated that the project team does provide oversight; however, it is not consistently documented in oversight logs or the ORS system.

iii) Field Engineering (FE) was the only resource group inputting oversight reports to the ORS database.

iv) The Project Management Plan, NK38-PLAN-72800-0490514, identified Risk Monitoring and Control activities which were not performed.

(1) The Risk Register shall be formally reviewed/updated on a bi-monthly basis. If new risks arise, they will be added to the risk register and communicated to the management team. Risks are monitored in real time using the RADAR database. RADAR risks have action plans with assignment dates to help ensure risk management plans are carried out; however, bi-monthly review of risks were not performed and when the project implementation strategy changed due to changing project constraints, the risk register was not updated.

(2) The current risk register for this project identifies all the risks to have low (Green) financial impacts; however, this does not line up with the fact that the CPI for this project is Red (i.e. it has overspent its budget and it is still incomplete).

(3) Per Line feedback, major risks are identified to the Project Control Centre (PCC). The PCC monitors and helps the project manage field implementation issues/risks.

f) **Project 16-34000 DN Auxiliary Heating Steam**

i) POP NK38-PLAN-731110-10001 R03, has no reference to the project team.

ii) The POP is not being used as a tool for managing the project, since there are no oversight reports for the required oversight activities identified in the POP.

iii) The ORS is only used by Field Engineering to document their oversight activities. Line feedback identified that based on workload it is difficult to find time to enter oversight reports into the reporting system.

iv) Per Section 4.1.3 of N-GUID-00120-10008 Contractor Management Process, the PM or Contract Manager will conduct a Project Kick-Off/Orientation Meeting with the Contractor and other applicable OPGN stakeholders including review of Human Performance and Work expectations; however, this meeting was not performed.

v) Per Section 4.14 of N-GUID-00120-10008, the PM or Contract Manager will ensure that the Contractor has conducted a Mark-up Meeting to determine jurisdiction for Building Trades Union work. The PM confirmed The Mark-up Meeting was held; however, there was no record of the meeting in the project file.

vi) Some required activities were not completed.

(1) Per N-STD-AS-0029, Contract Management Standard, Section 1.1 (9) (b) and (e), effective contract administration includes cost monitoring work order and payment control; however, as per PO, these are the PM Duties.

(2) Per section 1.2.4 (b), contract management activities include “timely and accurate review and approval of supplier invoices to ensure payments reflect agreed terms and conditions, and completed work”. As per PO, this is shown as the PM Duties, not Contract Administrators (CA).

(3) Per Section 4.11 of N-GUID-00120-10008, Contractor Management Process, the Project/Contract Manager will ensure that the assigned work supervisor is qualified per as per OHSA Section 14 of O. Reg. 213. Per Line feedback, the CA is not responsible for this assurance and it is not clear who checks for this qualification.

g) **Project # 10-60183 DUFDS Storage Building #2**

i) The original POP 00044-PLAN-08130-00001 R0, Darlington Waste Management Facility Storage Building 2 Project Oversight Plan (DWMF SB2) issued on March 27, 2013 was used only for the design phase; however, instead of revising this POP for the execution phase, a second POP 00044-PLAN-20500-0504916 R0, DWMF SB2 POP was issued on January 27, 2015.

ii) Both POPs were approved by the Section Manager (SM) and not by the Project Manager as required (N-MAN-09701-10002 R00, Section 6.4).

iii) The following project related documents were not issued in Asset Suite.

(1) The Project Management Plan (PMP) 00044-PLAN-20500-0463999. The signed copy was provided by the Project Manager.

(2) List of Deviation N-FORM-11070 which has a controlled document # 00044-DAI-20500-00001.

(3) The Comments & Dispositioning forms (N-FORM-11109).

(4) In response to this observation the Line initiated SCR N-2015-03221, Project 10-60183 DWMF SB#2 - PMP was not filed in Asset Suite.

iv) The List of Deviation from the COIR provided by the PM, 00044-DAI-20500-00001 R01, was not signed and accepted by the Design Agency (vendor) as required by Section 3.7 of the N-COI-00120-00001. The SM indicated that the list becomes part of the contract when the contractor accepts the contract.

v) Routine walkdowns are conducted weekly by the project team; however, these are not documented. The SM indicated that if issues are observed, they will be addressed during the weekly project meetings.

vi) The Commissioning Management Plan, a project deliverable by the vendor, was not prepared as required by the PMP. The SM indicated that OPG is responsible for commissioning as per the COIR.

vii) The POP 00044-PLAN-08130·00001 R0 (Design Phase) had the following issues:

(1) No description was recorded for the project oversight team as required by Section 2 of N-INS-09701-10007.

(2) The TCD for the project was exceeded without revising the POP to reflect the new TCD.

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(3) There was no evidence found to confirm the designs submitted by the vendor were reviewed and approved at the 95% hold point as required per Section 2 and 3 of the POP (Design Phase).

(4) Project oversight is conducted by the CMO & FE organizations; however, the required project oversight form, as listed in Appendix A of the POP, is not being used to document these activities. As per Line feedback, the CMO use their logs to track the oversight activities.

(5) There was no Self Assessment (SA) performed during the life cycle of the project. The SM indicated that there is a SL2 SCR that has been evaluated as a result of a SA; however, no entries were recorded into the SA database.

viii) The POP was not revised to adjust oversight based on repeat cost and schedule issues. Examples include:

(1) ES MSA Vendor cost overrun.

(2) Vendor risks over expenditure on Engineering Budget without OPG approval.

(3) ES MSA Vendor stops work on engineering due to over expenditure on Engineering Budget.

(4) The vendor overspent the approved PO budget without CTP/PCA approval. This is a repeat event with the vendor on lack of timely submission of PCA/CTPs and exceeding the approved budget (Reference SCRs: N-2013-15845, N-2014-01160, and N-2014-13264).

(5) There were extended project delays and rework required on the security installation and commissioning work plans.

(6) The SM indicated stated "*these issues were recorded by the previous project team, and since 09/2014 weekly cost and schedule review meetings are held to document and change orders and process timely PCA and CTP, and since then there has been no unapproved cost overruns*".

ix) A "Lessons Learned" table with a date stamp of January 8, 2015 was provided by the PM as a "Lessons Learned" report; however, the document is not in the format of a report, is missing names/signatures and there are no actions listed to address the issues.

(1) The SM stated "*that the lessons learned will be consolidated at the end of the project and the OPEX related to the lessons learned are being incorporated into the Work Plan for TMOD fence removal*".

h) **Project # 10-60162 Darlington Retube Waste Storage Building**

i) The Project Management Plan (PMP) for Project 10-60162 was not issued as of February 2, 2015. The PM provided a working draft copy numbered 00044-PLAN-00120-0526799; however, the draft copy has insufficient information to be useful.

ii) The vendor failed to provide marks-ups/updates for the quality issues OPG identified on the following documents prepared by the vendor:

(1) Owner-Constructor Safety Plan

(2) Owner-Owner Safety Plan

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(3) Procurement Plan and Material Management
(4) Project Quality Plan

iii) Project related documents normally required per the PMP have not been issued. As noted above the PMP is not complete. Scope of Work Section 3.2.3 of SOW 00044-SOW-20500-00001 (Section 3.2.3) states that the following documents "shall" be prepared:
(1) The Engineering Management Plan (EMP)
(2) The Construction Management Plan
(3) The Commissioning Management Plan
(4) The Turn Over/AFS Plan

iv) As of February 2, 2015 an approved POP has not been issued. There is a reserved POP # 00044-PLAN-01830-00002 in Asset Suite.

i) **Project # 10-60152 Pickering MPTP Replacement**

i) Factory Acceptance Testing (FAT) records were not available in Asset Suite as required per Section 6.2.1.1 of the Project Execution Plan TRAN-REF-00120.TR25-0434302 ,MPTP Replacement. The PM indicated that OPG has reviewed and accepted these records, and they were forwarded to Control Documents for processing; however, they were retrieved back by the vendor in error. SCR N-2015-03371 was initiated by the PM to document this error and have the records input to Asset Suite.

ii) The POP TRAN-PLAN-03459-.TR25-00001 R0 was not revised after the transition from NWMD design governance to the nuclear governance; however, there are activities in the POP impacted by this change (required per N-MAN-09701-10002 R0, N-INS-09701-10007).

iii) The Design Requirements document TRAN-DR-01900.TR24-00001R01, MTPT Replacement at Pickering RFTP for this project was 'Prepared' and 'Approved' by the same individual. This is contrary to Section 1.2.6 (C) of N-PROG-MP-0007 Conduct of Engineering and previous governance Section 4.2.3 & Table 4.2.3-1 of W-EN-PROC-0001.

j) **Project # 10-60063 BHWP Decommissioning Phase 2**

i) The Project Management Plan (PMP) 0124-PLAN-00960-00006 was written on April 4, 2014; however, it has not been signed and issued as of February 6, 2015.

ii) The POP 0124-PLAN-00960-00007 is still a DRAFT document.

iii) Requirements listed in the PMP were checked off as not required; however, there was no explanation why they were not required in the PMP.
(1) Section 1.3 (Value Engineering) was checked as "*not required*".
(2) Section 1.4 (PDRI) was checked as "*not required*".
(3) Section 2.1 (Specific Nuclear Safety Plan) was checked as "*not required*".
(4) Section 2.2 (Radiological Management Plan) was checked as "*not required*".
(5) During the audit the SM provided the rationale that justifies why these documents were not required.

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k) **Project 16-31542 Transformer Multi Gas Analyzer Installation**

i) Two documents listed in the PO (request for purchasing, approved on November 1, 2012) and ES-MSA worksheet, which are required before the contract is awarded, are still in reserved status.

(1) D-DAI-51000-10001, List of Deviation and NK38-SOW-51000-10002, Install multi-gas analyzers on MOT\SST. The Line has stated that SOW has been signed and approved, but not issued in Asset Suite.

(2) Acceptance record by the contractor on the COIR List of Deviations N-FORM-11583 or the previous version N-FORM-11070-R005 is unavailable as required per Section 3.7 of the N-COI-00120-00001.

ii) Contract Management Plan (CMP) was not issued as required per N-MAN-09701-10003-R00, Nuclear Contract Management Manual, Section 5.2. The PMP has also not covered the key aspects of the CMP.

iii) POP document**s** are not approved by the PM as required per N-MAN-09701-10002, Section 6.4 (i.e. NK38-PLAN-51000-10004-R00 was approved by the Section Manager and revised POP D-PLAN-31542-01-R00 was approved by the Manager, Design Projects).

l) **Project 10-73360 DR-SIO - 3RD EPG**

i) The Project Oversight Plan (POP) NK38-PLAN-09701-10153-R02 was approved by the SM and not by the PM as required per N-MAN-09701-10002 R002, and N-INS-09701-10007-R000).

m) **Project 16-33258 - DN Replacement of EPS Uninterruptible Power Supply**

i) Software qualifications as required by Scope of Work and the Technical Specification was not requested as part of the Request for Purchasing and therefore may not meet the required QA requirements.

(1) PMP document NK38-PLAN-50390-0450424, Section 7.1 OPG QA program, N286.7 for all engineering tools and analytical software applies and “Material manufacturer to meet CAN3/CSA Z299.2 requirements as well as all codes and standards as required by NK38-TS-50390-10001, Software to be Category II (Per Section 3.2)”.

(2) Per NK38-SOW-50390-10002, Section 5.0 quality assurance CSA N286.7-99 is a requirement for software.

(3) For this project, Request for Purchasing (N-FORM-10029-R010) did not specify the required software qualifications.

ii) The Contractor is required to input SCRs to document issues related to safety, configuration management, delays; however, the contractor specific alert group was not set up for the SCR Program or Asset Suite as required per N-COI-00120-00001 (issued on September 13, 2013), Section 3.4 or N-DAI-00150-10000, Section 3.4. Corrective Action Plans are also done by OPG since the contractor has no qualified staff.

iii) The revision number on the List of Deviation document D-DAI-53590-10001-REV00 was hand marked up from R00 to R01, a month after the plan was accepted by the vendor.

(1) This deviation document was based on the draft version of the inteface agreement N-DAI-00150-10000. It was not updated to reflect the revised interface document N-COI-00120-00001-R00, Contractor /Owner Interface Requirements for Nuclear, issued on September 13, 2013.

iv) The PMP NK38-PLAN-50390-0450424 was not issued Asset Suite. A signed copy of the PMP was provided by the line.

v) The Contract Management Plan was not completed as required by N-MAN-09701-10003-R00, Section 5.2 and N-STD-AS-0029, Section 1.2.

3) Contract Management Issues: Some Contract Management Oversight activities are not being completed or performed effectively.

a) **Project 13-40985, Replacement of Obsolete Online Chemistry Analyzers**

i) A Contract Management Plan (CMP) does not exist for Project 13-40985.

(1) Per N-MAN-09701-10003 R001, Nuclear Contract Management Manual, Section 4.3, a CMP must be produced at Stage III - Post Award of the contract. Per feedback from CMO, this accountability lies with the PM. Per discussion with the Project Manager and Contract Administrator (CA) the CMP does not exist.

(2) Per feedback from the Line, the CMP is included under the current revision of the Project Management Plan template. For this project, a CMP is found within the draft PMP available in the shared drive in support of the new Business Case Summary (BCS). The PMP has not been issued yet, but will be available prior to the PO issuance to [redacted]. At the time of this contract was issued with [redacted], there was a PEP in place (which was issued prior to the issuance of N-MAN-09701-10003).

ii) Certain elements of contract management oversight as outlined in N-GUID-00120-10008 R001, Contract Management Process, have not been done or have not been documented:

(1) As per Step 4.1.4 of N-GUID, the Contract Manager must ensure a Mark-Up meeting is held; however, per the Contract Administrator (CA), a Mark-up meeting was not held for this work as determined by the Contractor Superintendent.

(a) Per feedback from CMO, this accountability lies with the PM and for ES MSA contracts; the contractor is responsible to hold the mark-up meeting; however, in some cases a mark-up meeting may not be required and this is being captured through revision of N-GUID-00120-10008 under SCR N-2014-21559, "*NO-2014-310 Contract Administration - PDS#1 Project Management Program guidance is less than adequate*".

(2) Checking contractor qualifications is not performed as described in of N-GUID-00120-10008 R001, Contractor Management Process, Section 4.1.1 which states that the PM/CM must ensure the following is completed: "*Assign a qualified supervisor, as per OHSA Section 14 of O. Reg. 213*", and N-GUID Section 4.1.5, requires to "*Verify Contractor qualifications and provide OPGN-based training as required.*"

(a) The CA confirmed that qualifications are checked for all ES MSA contractor staff; however, a documented record that lists (i.e. in SharePoint file or project binder maintained by CMO) the names of all qualified contractors and supervisors for this job does not exist.

(b) Per feedback from CMO, this is not the practice for ES MSA contracts since a robust process that ensures qualifications of all ES MSA contractor staff is in place. In addition, this requirement is taken from a guide document and as such is not considered non-compliance with governance.

(c) Per feedback from the CA, he is not always informed as to who the assigned workers are on a given day. The contractor foremen/supervisors assign the qualified workers.

(d) More thorough verification of qualifications is applied by the CA if a new name, not previously assigned to a project, is encountered.

(e) Per feedback from CMO Line, there is a robust process in place for ES MSA contract staff that ensures that qualifications for all contract staff are properly maintained, and is considered to be redundant to the verification steps above.

(i) "*OPG uses contract staff, acting as training coordinators, to manage the execution of this work. We own the responsibility to ensure that this is executed correctly. We use a team approach on this to make sure the staff that ends up being looked after by the CA's are all trained. The CA is the last line of defense and also looks at Quals at the on boarding time of a new hire associated with the contractor they support. In addition, tools used to manage this are; SQL mail as staff exist in Tempus gangs owned by the CA's; Regular training communication on pending qualification/training requirements; Quarterly review of N-TQD-510-00001 R007, Supplemental BTU, Direct Hire, and Contract Management Training and Qualification Description; Foreman & GF Oral Review Board's to discuss contractor supervision accountability associated with recognized OPG qualifications*."

(f) Per feedback from CMO Line, the requirements outlined in N-GUID-00120-10008 R001, *Contractor Management Process,* can be managed at the discretion of Project organization, as long as the process expectations and requirements of N-STD-AS-0029 R000, Contract Management Standard are met. N-GUID-00120-10008 is utilized purely as a process guide.

iii) Although Daily Logs were maintained by Contract Management staff in the CMO SharePoint site, the log reports were generally limited to providing current field work progression status, contractor resource logs, and work delays. Some logs also discussed PJB activities; however, the Daily Logs did not contain oversight records for some activities defined by the POP NK30-PLAN-01804-10001 R001, Replacement of Obsolete Chem Analyzers Project 13-40985 Oversight Plan. These include oversight activities outlined in Section 7.0 of the oversight plan, for example:

(1) Periodic communication with the Contractor's Safety Officer to ensure appropriate site presence and awareness of safety issues, oversight of safe work planning is being undertaken appropriately, check that the Contractor is performing Sub-contractor oversight as per the Sub-contractor Management

Plan, assess knowledge of Flash Reports, periodically checking contractor's radiological qualifications.

(a) Per feedback from the CMO, there is no requirement or expectation to include oversight activities from a project oversight plan in the daily log forms. CMO conducts additional oversight in ES MSA projects using the PCC, Quarterly Nuclear CMO meetings and daily interface between CMO Manager, Section Manager and CAs and the Contractor management team to ensure appropriate site presence and awareness of safety issues. Project Managers are in attendance at this meeting. International Suppliers Network (ISN) is also used to review subcontractor and contractor status. Any deltas are identified in an SCR or the issue is escalated through appropriate channels.

(2) The need to "*Monitor adherence with the Contractor's Project Site Specific Safety Plan (PSSSP) and Site Specific Environmental Plan (SSEP)*"; however, as per the CA, these specific plans were not produced for this project. As per ES MSA Worksheet #WS-ES-MSA-DL-2012-2026b, Schedule 1, a Project Site Specific Safety Plan (Item 39) is required. Per feedback from CMO, for ES MSA contracts these plans exist in generic form and are not produced for each specific project.

(3) As per ES MSA Worksheet #WS-ES-MSA-DL-2012-2026b, Schedule 1, a Procurement Plan (Item 41) is also required. There is no record of a procurement plan in Asset Suite; however, Project staff did provide a copy of the procurement plan which was produced by the contractor via email (contractor document number 48060054-PQP).

(4) The signature for OPG acceptance on the front page of the plan is blank.

(5) The document does not have an OPG controlled document number and therefore is not in Asset Suite.

iv) Per discussion with the CA, he was not invited to or took part in any oversight strategy meetings for this project. Per feedback from CMO, this accountability lies with the PM.

(1) Feedback from Project Management Line is that although an oversight kick-off meeting was not held, the author of the plan did seek stakeholder input as required to produce the document.

v) Construction Quality Assurance (QA) Plan: The Contractor is accountable to submit an approved Construction QA Plan to OPG for acceptance as per the COIR document N-DAI-00150-10000 R000, Contractor/Owner Interface Requirements for Nuclear, Item 5.1 (this was the document in effect at the time). Per feedback from CMO, this accountability lies with the PM.

(1) Evidence of QA Plan for Construction activities was not found under the original contract/PO with [redacted]. Per feedback from CMO, this accountability lies with the PM.

(2) Project Management staff did provide a Project Quality Plan produced by the contractor via email (contractor document number 48060054-PQP).

(a) The signature for OPG acceptance on the front page of the plan is blank.

(b) The document does not have an OPG controlled document number and therefore is not in Asset Suite.

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vi) Per review of the completed Daily Logs for this Project in the Contract Management SharePoint site, there are numerous records of project delays that were not reported through the SCR program. Examples of these include:
   (1) Report dated 2014-02-12 documents a contractor delay of 7 hrs.
   (2) Report dated 2014-02-13 documents a contractor delay due to unavailability of a FIC.
   (3) Reports dated 2014-02-20 and 2014-02-21 both document delays due to unavailability of a calibrated analyzer from Control Maintenance.
   (4) Report dated 2014-02-26 documents an 8hr delay due to a Design issue.
   (5) Report dated 2014-03-04 documents contractors not being able to perform any work on that day.
   (6) Report dated 2014-04-08 (Areva) documents a delay impact of 13.5hrs.
   (7) Report dated 2014-04-09 documents a 10hr delay due to Control Maintenance.
   (8) Per the CA, the contractor is accountable to submit SCRs. All 58 SCRs relating to Project 40985 as listed in the Oversight Database were reviewed; however, only two SCR's were initiated by the vendor ([redacted]): neither P-2014-12443 nor P-2014-12609 were for delays.

vii) The Contract Management forms for the project are not issued in Asset Suite as required by Section 5.1 in N-GUID-00120-10008 R001, Contractor Management Process. These include:
   (1) Contract management template - N-FORM-11473
   (2) Contractor work release - N-FORM-11470
   (3) Contract inspection Check list – N-FORM-11479
   (4) Daily logs – N-FORM-11487
   (5) Per feedback from CMO Line, the QA records are uploaded into Asset Suite when the PO is closed and all documentation has been gathered. N-GUID-00120-10008 is being revised under SCR N-2014-21559, "*NO-2014-310 Contract Administration - PDS#1 Project Management Program guidance is less than adequate*" to capture this.

viii) There are some quality issues with contract management records that are being maintained for this project. For example:
   (1) Contractor work release N-FORM-11470: The completed form was not signed off by the Project Manager.
   (2) Contract inspection Check list N-FORM-11479: The completed form does not identify the applicable Project number, name, or description. The completed form is located in the binder maintained by the CA; however, if read by itself, it would not be known which project is being evaluated.
   (3) There are some deficiencies in the quality of the completed Daily Logs (N-FORM-11487) that were reviewed in the CMO SharePoint site for this project under PO #222304. Examples include:
      (a) All the completed forms are embedded with a "DRAFT" watermark.
      (b) The forms are completed with the name of a preparer but none have been signed by the preparer. Per feedback from the CMO Line, the PDF is

considered to be an electronic signature as per agreement with the OPG legal counsel.

(c) The applicable tick boxes at the bottom of the form under the headings of "Plan", "Pre-Job Brief", and "Ensure" are not checked.

(d) Per feedback from the CMO line, this form is currently under revision and will address some of the issues above as per SCR N-2014-21559.

b) **Project 13-49140 Pickering B Screenhouse Trash Bar Screen Replacement**

i) A Contract Management Plan (CMP) does not exist as required per N-MAN-09701-10003, Section 4.3.

(1) Per discussion with the CA, to his knowledge, a CMP has not been produced for any project since the days of the previous governance under FIN-MAN-CM-001, Contractor Management Process.

(2) The POP for this project, P-PLAN-71120-00001 R000, *Project Oversight Plan – Pickering B Screenhouse Trash Bar Screen Replacement Project 13-49140*, references the existence of a Contract Management Plan in Section 4.4 (Page 7 of 11), which "*will provide responsibilities among CA, CM and Contractor or Sub-Contractors*".

ii) Certain elements of contract management oversight as outlined in N-GUID-00120-10008 R001, Contract Management Process, have not been performed or have not been documented:

(1) A Mark-Up meeting was not held as required. See Project 13-40985 for CMO feedback as the same discussion applies.

(2) Checking contractor qualifications is not performed as described in N-GUID-00120-10008 R001, Section 4.1.1. See Project 13-40985 for CMO feedback as the same discussion applies.

(a) Per the CA for this project, only spot checks are done on occasion since there is a robust process in place for ES MSA contractors that ensure qualification of staff. The CA is not always made aware of assigned workers since the contractor foreman assigns the qualified staff as required.

(3) The Safety Certification of Contractors Equipment (N-FORM-11482) was not utilized as required by N-GUID-00120-10008 R001 for this project to document OPG acceptance of some major equipment brought on site by the contractor. For example:

(a) The contractor brought in a Vacuum Truck on a number of occasions (as per applicable workplan NK30-WPL-71120-0499372); however, a Safety Certification acceptance per N-FORM-11482 was not completed. In response to the audit the CMO initiated SCR N-2015-03616, "*Project 13-49140 Trash Bar Screen Replacement - Failure to Obtain Safety Cert. for Contractors Equipment*".

(4) A Contractor Work Release (N- FORM-11470) and a Contract Inspection Check List (N-FORM-11479) were not completed for this project.

(a) Per discussion with the CA, the completion of these forms is an optional requirement and, in general, is considered redundant to the Contract Management Template N-FORM-11473.

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(5) Contract Management Template - N-FORM-11473 was prepared for this project; however, the form is not issued in Asset Suite as a record as required by N-GUID-00120-10008 R001, Section 5.1. Per feedback from CMO line, the QA records are uploaded into Asset Suite when the PO is closed and all documentation has been gathered.

iii) There are some deficiencies in the quality of the completed Daily Logs (N-FORM-11487) that were reviewed in the CMO SharePoint site for this project under PO #227351. Some examples include:

(1) All the completed forms are embedded with a “DRAFT” watermark.

(2) The forms are completed with the name of a preparer but none were signed by the preparer. Per feedback from the CMO, the PDF is considered to be an electronic signature as per agreement with the OPG legal counsel.

(3) The applicable tick boxes at the bottom of the form under the headings of “Plan”, “Pre-Job Brief”, and “Ensure” are not checked.

(4) Per feedback from the CMO Line, this form is currently under revision and will address some of the issues above as per SCR N-2014-21559, “*NO-2014-310 Contract Administration - PDS#1 Project Management Program guidance is less than adequate”.*

c) **Project 10-60183 DUFDS Storage Building #2**

i) There was no Contract Management Plan prepared as required by N-MAN-09701-10003 R001, Nuclear Contract Management Manual,Section 4.3 .

(1) The PM provided a Contract Management template N-FORM-11473 as the “Contract Management Plan” for the project.

d) **Project 10-60063 BHWP Decommissioning Phase 2**

i) There was no Contract Management Plan prepared as required by N-MAN-09701-10003 R001, Section 4.3.

e) **Project 16-31542 Transformer multi Gas Analyzer Installation**

i) There is no evidence that the Contractor has assigned a qualified supervisor as per OSHA, Section 14 of O. Reg. 213 as required per N-GUID-00120-10008 R000, Section 4.1.1.

(1) There is no documentation to indicate that the training records of the contractor staff were verified and an assessment done to review the requirements if any additional training was required.

(2) The Line stated that the training and qualification of the contractors were reviewed but not documented and there is no record on file.

ii) The following records are either missing or could not be found in the folders as required per N-GUID-00120-10008-R000, Section 5.1. The Line stated that most of the contract management and work was captured in the ITP and CWP.

(1) N-FORM-11473, Contract Management template

(2) N-FORM-11470, Contractor work release

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(3) N-FORM-11487, Daily Log. A different format was used for the Contract Monitor Daily Log.

f) **Project 10-73360 DR - SIO - 3RD EPG**

i) The N-FORM-11487, Daily Log was not used for completing the daily activities as required per N-GUID-00120-10008 R000. The daily logs are in a different format.

g) **Project 16-33258 - DN Replacement of EPS Uninterruptible Power Supply**

i) The following contract management forms were not completed as required by N-GUID-00120-10008 R001, Section 5.1:

(1) N-FORM-11473, Contract Management template

(2) N-FORM-11470, Contractor work release

(3) N-FORM-11479, Contractor inspection check list

(4) N-FORM-11482, Safety Certification of Contractors equipment.

(5) N-FORM-11487 , Daily Log. A different format was used for the Contract Monitor daily Log.

4) <u>Field Engineering issues:</u> Some Field Engineering Oversight activities are not being completed or performed effectively as documented in requirements.

a) **Project 40985 and Project 49140**

i) As a result of the structure of the current guidance documents for Field Engineering (FE) oversight, in combination with a lack of detailed oversight activities in the applicable oversight plan for Project 40985 and Project 49140, there are unclear expectations and requirements for FE staff conducting quality surveillance activities. As a result, the completion of oversight activities and frequencies are left to the discretion of FE staff and what they consider to be adequate.

(1) After the roll-out of the first version of ORS data base a year ago, this data base had gone though several enhancements (and it is still being upgraded with more features). FE staff that generated Oversight Reports last year for the referred project, had used most of the features/elements available at the time. The latest enhanced version 1.36 of the ORS data base observed during Audit has more features/elements. FE has plans to do a roll-out of this enhanced version 1.36 of the ORS Database to all FE staff at Pickering and Darlington during this first quarter.

b) **Project 13-40985, Replacement of Obsolete Online Chemistry Analyzers**

i) FE oversight activities were not consistently applied or were not completed per N-INS-09701-10007 R000, Project Oversight Planning and Implementation, as well as by N-GUID-09701-10120 R000, Guideline for Construction Oversight. This is evident based on the following:

(1) Per the oversight plan for this project NK30-PLAN-01804-10001 R001, Replacement of Obsolete Chem Analyzers Project 13-40985 – Oversight Plan, the only oversight element related to Field Engineering is listed under Section

7.2, Construction Oversight Method, which simply states to perform "*Quality oversight as per N-PROC-AS-0074, Contractor Quality Surveillance".*

(a) This references only the applicable governance which was in place at the time the oversight plan was issued (May 2013), without providing any specific or detailed oversight activities for FE staff.

(b) N-PROC-AS-0074 was superseded in October 2013 by N-STD-AS-0030 R000, *Project Oversight Standard*. The oversight plan for this project, NK30-PLAN-01804-10001, was not revised when the new governance became applicable in October 2013.

(2) The actual field installation and oversight activities for this project occurred in February, April, and May 2014. The applicable governance at that time was N-INS-09701-10007 R000; however, the minimum construction related oversight activities, as shown in N-INS-09701-10007, Appendix B, Item ID #4.1 to #4.14, were not completed based on a review of the reports in the ORS database:

(a) Oversight reports were observed in the ORS database for CWP, ITP, workmanship and FME.

(b) No oversight reports exist for reviews of Project Quality Plan (Item ID #4.2), Vendor Project Safety Plan (Item ID #4.3), Vendor Compliance to Safety Requirements (Item ID #4.4 and #4.5), Vendor Material Storage (Item ID #4.10), or Vendor field personnel training and qualifications (Item ID #4.11).

(c) An oversight report for CWP readiness prior to field implementation (Item Id #4.1) was completed for one work package (WO 2751083 under oversight report P-OR-40985-C-6-001); however, it was not completed for other work packages associated with this project.

(3) Execution of FE oversight is inconsistent between the three analyzer replacement jobs that have been completed thus far in the project. For example, the oversight reports in the ORS database that have been submitted for each of the completed ECs, have varied activities documented (see table below for further clarity):

(a) For EC 122060/WO 2838518, the oversight reports completed for this WO cover the following elements: ITP reviews, workmanship review, workplan review and FME review. These are documented per P-OR-40985-C-005, P-OR-40985-C-8-004, and P-OR-40985-C-8-003.

(b) For EC 122162/WO 2751187, the oversight reports completed for this WO cover the following elements: ITP reviews, workmanship review, FME review and On-Line Wiring process. These are documented by P-OR-40985-C-8-006, P-OR-40985-C-8-001, and P-OR-40985-C-8-002.

(c) For EC 122150/WO 2284636, the only oversight report covers the Adherence to Procedures and Instructions element, which documented the closeout of the work under the history docket P-HDOC-64511-0514514. This is documented by P-OR-40985-C-4-003.

(i) Previous oversight reports relating to workplan review, ITP review, workmanship and FME were not submitted in the ORS database for WO 2284636.

Completed Work Package	ITP oversight report	Workmanship oversight report	Workplan oversight report	FME oversight report	On-Line Wiring oversight report	Work Order Closeout oversight report
EC 122060/WO 2838518	✓	✓	✓	✓		✓
EC 122162/WO 2751187	✓	✓		✓	✓	✓
EC 122150/WO 2284636						✓

(4) In the ORS database, a number of construction oversight elements have been loaded for this project. Some examples are: M&TE control, FIC process followed, Material Quality, Conformance/Traceability and Passport (Asset Suite) package review prior to execution.

  (a) These oversight activities appear to be additional requirements not mentioned in the oversight plan for this project; however, none of the submitted oversight reports by FE covered any of the above elements.

  (b) FE staff do not appear to be familiar with this feature in the ORS database and its applicability when conducting oversight.

(5) Some construction oversight elements as required by N-INS-09701-10007 R000, Appendix B.4 (4.1-4.14), applicable to FE staff are not being done since it is assumed that Contract Management Office staff are accountable for these.

  (a) Vendor safety plan submitted: As per the FE SPOC, a vendor safety plan was not known to exist. The safety issues are usually directed by CMO staff.

  (b) Vendor compliance to safety requirements: As per the FE SPOC, oversight of safety aspects of the work is not reviewed by FE staff as this accountability resides with CMO staff.

(6) Per the FE SPOC, oversight of close-out activities and completeness of work is accomplished through review and sign-off of the final history docket containing all the QC/QA records in the CWP for [redacted] activities (for example P-OR-40985-C-4-003 for history docket P-HDOC-64511-0514514); however, this requirement does not exist for [redacted] work activities. It is not known why this discrepancy exists.

(7) Per discussion with the FE FLM for this Project, he was not invited to any meetings related to oversight strategy, including the POP kick-off meeting for this project.

(8) In some cases, the Design Agency Field Initiated Change (FIC) form was used as well as the OPG N-FORM-11128 for Field Initiated Changes. Use of the form is not consistent and the following examples were found in EC Folders associated with this project (\\corp.opg.com\Pickering\Modifications - Pickering A\Master ECs\MASTR-120677\Working files):

(a) For EC 122060, FICREQ01 and FICREQ02 utilized OPG N-FORM-11128, but FIC #3, 4, and 5 utilized RCM Field Change form
(b) For EC 122162, FICREQ01 utilized OPG N-FORM-11128
(c) For EC 122056, OPG N-FORM-11128 was utilized for all three FICREQs
(d) For EC 122057, FICREQ01 utilized OPG N-FORM-11128
(e) For EC 122059, both FICREQ01 and 02 utilized the RCM Field Change form
(f) There were no FIC related oversight reports written against this project.

c) **Project 13-49140, PB Screenhouse Trash Bar Screen Replacement**

i) There are unclear requirements and inconsistent implementation of Field Engineering oversight activities for the project. This is evident based on the following:

(1) Some of the applicable construction oversight elements applicable to FE as shown in N-INS-09701-10007 R000 Appendix D, did not have OPG FE oversight, including:

(a) Prior to fabrication and installation:

(i) Work Plans reviewed and accepted
(ii) Vendor's QA/QC staff training and qualification
(iii) FME plan reviews
(iv) Welding procedures reviewed by OPG welding engineering (welding as per WO 3203384, Task 07). Per feedback from FE Line, FE staff from Pickering (and DNGS) do not provide any oversight on welding activities as none of the FE staff are qualified to perform oversight/QS functions in that specialty area. POPs also do not provide enough clarity on the accountability to perform oversight on welding/NDE activities.
(v) Tooling / rental equipment (for this project this is included a vacuum truck and spreader bar for hoisting the screen into place).

(b) Off site fabrication.

(i) Oversight reports applicable to off-site fabrication of guardrail and base plates was not identified or completed (WO 3203384, Tasks 05,06).

(2) The oversight plan, P-PLAN-71120-00001 R000, Project Oversight Plan – Pickering B Screenhouse Trash Bar Screen Replacement Project 13-49140, in Appendix A (Page 8 of 11) required FE (during the execution phase) to "*Review, monitor Contractor's procurement of materials, class, grade of material" with "All details captured in N-FORM-10814, Quality Surveillance Plan*":

(a) None of the oversight reports in the ORS database are related to materials.
(b) The oversight plan for this project referenced the use of a Quality Surveillance Plan; however, per discussion with FE staff, this was not provided to or prepared by FE for this project.

(3) Some of the minimum routine oversight requirements per N-INS-09701-10007 R000, Appendix B.4 (4.1-4.14) are incomplete:

(a) CWP readiness: None of the oversight reports in the ORS database for Project 49140 involved CWP readiness verification.

(b) Project Quality Plan submitted: None of the oversight reports in the ORS database for Project 49140 involved Project Quality Plan review; however, P-OR-49140-E-058-001 does involve some review of detail design quality and project schedule.

(c) Vendor Safety Plan submitted: None of the oversight reports in the ORS database for Project 49140 involved Vendor Safety Plan review.

(d) Vendor compliance to safety requirements: Only one of the oversight reports in the ORS database for Project 49140 involved vendor safety compliance related to Housekeeping, P-OR-49140-C-056-009.

(4) The ORS database reference the oversight plan number to be P-POP-49140-001 for this project; however, the actual document number is P-PLAN-71120-00001.

d) **Project 10-73164 DR Irradiated Fuel Bay Heat Exchanger Replacement**

i) Required document surveillance is not being performed as required per N-MAN-01983-10000 R000, Field Engineering Quality Control Manual, Appendix G 1.0.

ii) The ORS is not being used to document oversight activities. FE provides oversight by strictly monitoring ITPs.

(1) Per OPG Project Management feedback, quality oversight is typically performed on EPC projects where the work is completed under the vendors QA program. The project being reviewed is under OPG QA program and documenting of field work is through the ITP and work reports in Asset Suite.

e) **Project 16-34000 DN Auxiliary Heating Steam**

i) A number of the FE reports documented conditions representing adverse conditions, but SCRs were not initiated. In addition, it was not clear if they were dispositioned and the PM was not aware of some of these issues. For example:

(1) On July 18, 2014, FE documented the following in the ORS: "*I observed that piles had not been installed and was advised by the contractor that an RFI was obtained from Design approving the removal of the piles. A copy of the approved RFI was not available in the contractor's documentation at site. Since the latest documentation shows the piles to be installed, I advised the contractor that the sign-off in their check sheet for the installation of this part of the design should reference the RFI and a copy should be attached to the check sheet*."

(2) On Nov 14, 2014, in D-OR-34000-C-Ph1-034, FE identified that "*No oversight activities from the field engineering have been performed prior to Hydrostatic pressure testing. No WO number has been assigned to the ITP.*"

(3) On Nov 06, 2014, in D-OR-34000-C-Ph1-031, FE identified "*Materials provided were not aligned with documentation during time of inspection. FE and TSSA asked for clarity and alignment with material provided with documentation. Items were not individually identified. PO number and Job number did not match the numbers on the ITP.*"

f) **Project # 10-60183 DUFDS Storage Building #2**

i) Minor difficiencies were noted in some of the seven Oversight Reports reviewed. Some examples:

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(1) 3 of 7 OR records did not document the hours spent (W-OR-60183-C-0-006, W-OR-60183-C-0-005, and W-60183-C-0-003).

(2) 3 of 7 OR records did not document System USI number (W-OR-60183-C-0-007, W-OR-60183-C-0-006, W-OR-60183-C-0-003).

(3) 1 of 7 OR records was missing ITP discipline (W-OR-60183-C-0-001).

(4) 1 of 7 OR records was missing the reference WO number (W-OR-60183-C-0-007).

(5) 5 of 7 ORs were found to have difeciencies (minor or major); only 1 of these 5 reports had an SCR to document the adverse condition. The remaining 4 did not have any refrences to SCRs or ARs (W-OR-60183-C-0-005, W-OR-60183-C-0-004, W-OR-60183-C-0-003, W-OR-60183-C-0-002).

g) **Project 10-60162 Darlington Retube Waste Storage Building**

i) Some Field Engineering oversight activities are not being performed as required.

(1) There was only one oversight report by FE listed in the ORS database. The SM stated the “Field Engineering database” will be utilized as the project progresses. The database is not only intended for FE.

h) **Project 16-31542 Transformer multi Gas Analyzer Installation**

i) Deficiencies identified in FE oversight report are not documented and addressed per the process required by N-INS-09701-10007-R000. There is an inconsistent method of storing and addressing the deficiencies and each PM is addressing them differently. In this case, the PM has stored these issues in the Master EC file and addressed them. It is difficult to know from a review of the ORS database if these issues have been resolved. FE is identifying these gaps on contractor work or documentation. Examples are:

(1) D-OR-31542-C-2-021: D/November 6, 2013,Vendor ITP: 5032-7000-1/2/3 5032-7003;

(a) Comment # 7: Additional conduit supports have been installed outside power house north wall. Some conduit clamps still required to be installed (parts on order).

(b) Comment #10: Approved OLW for new cable, new JB and changes for GFCI is not available. Electricians need to have approved OLW to complete installation.

(2) D-OR-31542-C-1-002 D/January 30, 2014: Vendor ITP: 5032-7005-E1: Comments were on repeat Findings. Comments from #7 to 11 are of repeat finding.

(a) Comment # 8: The revision number of the drawing NK38-D3S-65354-5039-U1 is listed incorrectly on ITP reference document list. Should read R004 that is in the package.

(b) Comment # 9: The following customer approved procedures listed on ITP reference document list has the incorrect revision number listed. N-MAN-

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08965-10001-SEC-A5.1, N-PROC-OP-0034, N-INS-09100-10012 & NK38-CMP-500000-01.

(3) Some minor quality issues were identified with FE oversight reports in the ORS system:

(a) 8 of 14 OR records reviewed had no hours spent documented.

(b) 12 of 14 OR records does not document System USI number.

(c) 2 of 14 OR records did not record the Vendor ITP number.

(d) 5 of 14 OR records were missing ITP discipline for e.g 5032-7003-1 Vs 5032-7005-E1.

i) **Project 10-73360 DR - SIO - 3RD EPG**

i) There is no documentation to show that design has verified the welding packages. There is no design weld detail for the rewelding of the 4" guard pipe fittings that are being cut. There was no SCR initiated to document this adverse condition.

(1) D-OR-73360-C-0-005 d/28-Oct-2014; [redacted] was subcontracting out the prefabrication of piping spool pieces at an outside pipe fabrication shop. The ITP does not indicate the prefab is being performed off-site.

ii) Project Oversight Plan also does not provide enough clarity on the accountability to perform oversight on welding/NDE activities.

(1) With respect to the welding/NDE activities currently performed by ESMSA contractors (either offsite or Onsite), FE staff from Pickering and DNGS do not provide any oversight (on welding activities) as none of the FE staff are qualified to perform oversight/QS functions in this specialty area.

(2) Hence for all the welding/NDE activities currently performed by ESMSA contractors, Project had to rely only on the QA checks performed by Contractor's Inspectors with no oversight performed by OPG staff. This gap was also identified in a recent audit conducted on [redacted] in 2014 ([redacted]).

iii) Deficiencies identified in FE oversight report are not documented and addressed per the process required by N-INS-09701-10007-R000. It is difficult to know from a review of the project oversight database if these issues have been resolved. Field Engineering is identifying these gaps on the contractor work or documentation. Items may be addressed outside the ORS data base. For example:

(1) Work Plan showing cables that are not listed in the design drawings. D-OR-73360-C-0-006 D/November 3, 2014; Work plan review indicated cable A,B,C listed in the table but there is no reference to those cables in the EC drawing list. This is a deviation from the design and FIC should be the basis for documenting the correction.

(2) Activites noted which do not align with the design drawings released for this project. D-OR-73360-C-0-010 d/05-Jan-2015; There is no SCR to document this condition.

(a) Mismatch between BOM and EC126624; BOM, "*NK38-BOM-65329-10004 has marked for only 2 cables, while EC afftect 4*."

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(b) Step 90 and 100 of ITP "*Wire designation in operation description incorrect*"- Note is incorrect "*EC 126624 OLW shows all wires terminated. Should only state to terminate only 2 wires*."

(c) Step 140 of ITP Mismatch between work completion status and actual work "*Only 2 cables installed, EC lists 4. There is also wiring to be done per OLW*".

iv) Oversight Report D-OR-73360-M-0-018, D/August 26, 2014, triggered SCR N-2014-25299, "*Oncore Work and Rate Changes (Escalation) without Notification to the Project*" on vendor changing chargeable rates in the middle of the projects without prior approval of OPG; however, the SCR was assigned D4 for trending.

(1) The recommended resolution to this SCR was not implemented; "*PMO or someone with Oncore expertise should conduct an extent of condition assessment to establish if this condition is unique to EPG3 or all ESMSA contracts. A notification process should be established to advise OPG of pending rate increases, rather than just making them in Oncore without advising the PM first. PMO should provide clear direction to the PMs on how to handle these types of increases, with clear criteria outlining what constitutes acceptable justification for rate increases*."

j) **Project 16-33258 - DN Replacement of EPS Uninterruptible Power Supply**

i) The deficiencies identified in the oversight reports are not documented and addressed per the process defined per N-INS-09701-10007-R000. There is an inconsistent method of storing and addressing them. Each PM is addressing them separately. It is difficult to know from the review of the project oversight database if these issues have been resolved. Examples are:

(1) Gaps between the design documentation and inspection test plans and work order task instructions. D-OR-33258-C-1-003, Prepared on August 27, 2013 for ITP-2251316-ITP-052 commented on the following errors:

(a) ITP has no mention of removal of cable 1-5359-09055 as mentioned in the DWG NK38-D0S-65359-006.

(b) Doc 2A work order task instruction, section C, does not mention the disconnection or removal of this cable.

(2) The ITP was signed off without meeting the test criteria. D-OR-33258-C-1-007, Prepared on October 13, 2013 for ITP-2251216-ITP-012 commented on the following errors:

(a) ITP was signed off by the QC personnel stated in QS report 85 without meeting the acceptance criteria

(b) OLW binder has incorrect wiring information. OLW was revised and changes were not incorporated in field binder. Wires affected are 01-5000-721, 722, 9061.

(3) There is lack of QC work reports as required by N-PROC-MA-0006, Work Performance. D-OR-33258-C-1-012, Prepared on October 16, 2013 for ITP-2251316-ITP-001. There was no SCR initiated against this adverse condition.

(a) There is lack of QCIV task work reports in the [redacted] QC process. [redacted] are using OPG M&TE and will result in OPG losing tracability that Asset Suite provides. It is also a non-compliance against the requirements to enter daily work reports as per N-PROC-MA-0006, Section 1.4.1.

(4) There are unapproved changes without prior review and approval. D-OR-33258-C-1-033, prepared on July 25, 2014 for ITP-02703119-ITP-05/15 commented on the following errors:

(a) ITP steps 15 to 18 have been crossed out and marked N/A, but there is no change control noted or signatures stating who initiated this or approved this action.

(b) ITP does not cover the splicing of any cables; however, a cable has been spliced with no supporting documentation to verify the splice and its location. There is no proof as to who inspected this splice and if it was approved.

(c) ECC process was not followed with regard to splicing of cable 1-5359-5035. No FIC documented.

(d) SCR N-2014-21970, "*Project# 16-33258 EPS/UPS Quality Surveillance Findings was initiated*" was D3 with no corrective actions.

Finding 2: Deficiencies in Project Management Staff Qualifications and Requirements

1) "Project Manager" (PM) Role Qualification and Role Assignment: Qualification requirements and documentation of qualifications for Project staff performing in the "Project Manager" role have not been established. The related Qual IDs in TIMSII, which ensure some consistency in fundamental project management knowledge, have not been completed by many staff currently performing in PM roles as the QIDs are only designated as "supplemental" qualifications. The assignment of the PM role is at the discretion and experience of individual Management staff and is not dependent on completion of the "supplemental" QIDs. Similar issues were identified in a 2012 Nuclear Oversight Audit NO-2012-009 and the action taken from the previous audit has not fully resolved this condition.

a) Currently there are no comprehensive means in TIMSII to identify project staff (including some Section Managers) being assigned work who are deemed to be qualified and competent for the "Project Manager" role (Ref. N-PROG-TR-0005 R015 Training, Section 1.17.2). The record of qualification, criteria used and determination applied prior to assigning a project individual (non-SM) to the "Project Manager" role currently resides within Management staff's memory and this has essentially become the repository for staff qualification information.

i) N-PROG-TR-0005 R015, Training, Section 1.17.2 states that the TIMS II is a tool for (a) "*Line Management to document subordinate staff training requirements and to assign work based on completed qualifications*".

b) Qual IDs identified for PM staff are designated as "Supplemental" training only, rather than "Critical" or "task limiting". Line Management confirmed that the two Qual IDs related to the "Project Manager" role are not required (i.e. not task limiting) for staff assigned to the role. The "Project Manager" role is identified in PM governance including N-PROG-AS-0007 R008, N-STD-AS-0030 R000, and N-STD-AS-0029 R000.

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While a Self-Assessment in 2014 has identified issues in this area and an SCR (N-2015-00285) was input and evaluated, the corrective actions are not due until Q4 2015.

i) PM Related Qualifications identified in N-QG-403-00023 R004, Nuclear Project Staff Qualification Guide:

Note: For Nuclear Project staff there is currently no specific N-TQD document and the Qual IDs are listed in the N-QG document. NO14-000400 also notes that there is no official training for Nuclear Project personnel, previously referred to as MTL/Project Engineers.

Note: P&M Management stated that the decision was to not have Project staff obtain PMI certification as a means to qualify or to select staff for the PM role.

(1) QID 11832 – P&M – Project Manager (Supplemental): This QID consists of PEL 62659, Project Management Evaluation – Project Management Role, which is a 2 hour OJT. This is the PEV used to evaluate the candidate for the Project Manager role.

(2) QID 32144 – Project Fundamentals, which includes two PELs related to Project Management (Supplemental).

(a) The following description is provided for PEL 68891 Project Management, a 3 hour CAL: "*This PEL has been converted from a five day classroom training course to a CAL with a self-study component and a checkout. This course is intended as a review and measure of knowledge and not initial skills training. Completion of a self-study component is advised to successfully conclude the training. Recommended self-study material includes 'INPO 09-002 Excellence in Nuclear Project Management' and the P&M 'Nuclear Project Management Manual'. The material is available on the Projects & Modifications - Project Management Compendium website and should be reviewed prior to beginning the CAL*."

(b) The following description is provided for PEL 67538, a 2 hour CAL: "*NUCLEAR PROJECT LIFE CYCLE PROCESS - CAL Continuing Training - not fully SAT compliant. Associated with N-QG-403-00023 Nuclear Project Manager / Leader. Upon completion of this PEL, the trainee will identify the Project Life Cycle Decision Gates, and Points of Convergence between the processes of, Project Management, Work Control, Supply Chain, Design Engineering, per N-PROC-AS-0039 Project and Portfolio Management."* Note: N-PROC-AS-0039 has been superseded.

(3) QID 35624 Projects and Mods – Overall Project Accountability – Tracking QID. This qual includes a four hour CBT on Project Management. TIMSII description provides the following additional description: "*This tracking QID represents PELs useful for staff in the Projects and Modifications group which are given overall project accountability. This QID was created by the managers in P&M for tracking purposes only and is not task limiting.*"

ii) There is reliance on individual Manager's knowledge of Projects staff PM "qualification", which can be a risk when Management staff move to other positions or leave OPGN. New Managers may not have the same level of knowledge of the

pool of project staff and may apply different criteria when assigning individuals to the PM role.

(1) Management also indicated that Project staff are assigned to the "Project Manager" role based on an individual's experience and competence (i.e. "experiential" qualification). It was also noted that having the supplemental qualifications completed does not necessarily mean that the individuals are competent and that PMs develop their skills through experience and this experience (i.e. qualification) is known by the individual's Manager.

iii) The organization is generally aware of the identified issues based on the results of SA NO14-000400; however, the related SCR action completions are still pending (Q4 2015). One element of the proposed solution is to create a new N-TQD-902-00001 for Nuclear Project Personnel. The following actions were identified in the SCR:

(1) Create a training committee. TCD May 21, 2015.

(2) Develop a training description governed document for Nuclear Projects personnel (N-TQD-902-00001) TCD Sept. 30, 2015.

(3) Develop one or more qualifications for Nuclear Projects Personnel. TCD Sept. 30, 2015.

c) Based on TIMSII review of P&M staff assigned to selected projects, the majority of assigned staff have not completed the "supplemental" PM related Qual IDs 11832 and 32144 which provide some basic level of training on project management fundamentals. Line Management feedback stated that these staff are deemed to be "qualified" based on their Manager's assessment.

i) Overall Summary of Qualifications

(1) Project Manager - QID 11832

(a) 19 of 19 staff assigned to "Project Manager" roles were not approved. None of the 19 staff were linked to this QID.

(b) 9 of 12 Section Managers, who may be fulfilling the "Project Manager" role were not approved. 5 of the 9 were in progress.

(c) There is a PEV document associated with QID 11832, which is the only item for the QID. If the "Project Manager" designated individual is linked to this QID and has been "Approved", then TIMSII would reflect completion of the PEV. The only staff that had this link were the Section Managers. Since not all SMs were "approved" they would not have had the PEV completed. In the case of non-SMs who were assigned as "Project Managers", none were linked to the QID so they would not have the PEV either. Line feedback did not identify any other means to document qualification and competency for staff assigned to the "Project Manager" role.

(2) Project Fundamentals - QID 32144

(a) 14 of 19 staff assigned to projects were not approved. All remaining staff were "In Progress", with the exception of a contractor who was not linked.

(b) 8 of 12 Section Managers were not approved. 4 of 8 were in progress and 4 were not linked.

(c) This QID includes two PELs related to project management. The following is a summary of staff completions for the two PELs:
(i) PEL 67538 Nuclear Project Life Cycle Process:
1. 5 of 19 PM staff have not completed.
2. 3 of 12 Section Manager staff have not completed.
(ii) PEL 68891 Project Management Overview:
1. 5 of 19 PM staff have not completed.
2. 2 of 12 Section Manager staff have not completed

(3) Only one Section Manager had both QID 11832 and 32144.
(4) QID 35624 – P&M Overall Accountability Tracking QID:
(a) 2 of 19 Project Management staff (non-Section Manager) were not approved.
(b) 2 of 12 Section Managers were not approved.

ii) Examples of projects for which both the assigned PM persons and Section Managers were not approved in 11832 and 32144:
(1) Nuclear Waste Management: 60183, 60152, and 60162 (3 of 4 projects)
(2) Pickering: 40985, 49140, and 49116 (3 of 3 projects)
(3) Darlington: 31542, 33258, 73476, 73360, 73164, and 34000 (6 of 6)

d) The “Project Manager” role while identified in the N-PROG and N-STDs is not being consistently applied within the organization. This inconsistency in the use of the Project Manager role is indicative of an organizational misalignment and has resulted in a lack of clarity in identifying who is the “Project Manager”.

i) Some also explained that the Project template signature line title reads “Project Manager”. The PM signed this box but expressed concerns about the title “Project Manager” as they have little or no training in project management. Some PM’s previous training were as MTLs where the process was well defined.

ii) Line Management feedback indicated that the “Project Manager” is a role and anyone can be in the role, and their Managers assign appropriate level of work based on experience, knowledge, and strengths.

iii) Line feedback has indicated that only Section Managers can be Project Managers since they are the only ones who can be accountable.

iv) Section Managers who have assigned projects to Project staff have also referred to these personnel as Project Managers. In the case of project 16-34000, the following feedback was noted:
(1) The selection of the Project Lead/PM is based on the SM’s assessment of his competence and experience for the role. The practical evaluation (PEV) of personnel for the PM’s role was not completed for this project.
(2) The PMs are selected from the senior technical engineers (STE) based on their competency assessment by the SM and may be responsible for 2 to 3 projects. The STEs had little or no formal PM training or experience.

v) Project staff who are not Section Managers have signed off on project documents (e.g. POPs) as Project Managers.

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vi) The "*Projects and Modifications - Portfolio Projects Report*" listings identify project personnel and/or Section Managers in the "Project Manager" column.

e) The previous audit NO-2012-009 in Finding 2 stated that: "*some Project Managers identified for active projects are not fully qualified as required by N-QG-403-0023 R002, Nuclear Project Staff Qualification Guide"*. The staff qualifications finding also stated that: "*some staff in the P & M organization do not have job description document and consequently are not linked to any qualification requirement*". The action taken in response to the audit has not fully resolved the qualification related issues.

i) The following specifics were noted in the previous audit:

(1) 5 of 11 Project Managers have not completed the PM qualification (i.e. shown "in progress").

(2) The five PMs were managing 37 projects at Pickering and Darlington.

ii) For audit NO-2012-009 Finding 2, one corrective action was developed and completed per SCR N-2012-02710 and the following action (AR# 28144705) description.

(1) *"Revise N-QG-403-00023 to address the training need for project managers and project staff, including one specific aspect to change Project Manager's Qualification from Critical to Supplemental. Link employees to the related qualifications and ensure that they complete training requirements on time."*

(2) Three key items are noted:

(a) The Projects staff (non-Section Manager) in the PM role checked in the current audit were not linked to the Project Manager QID. (see section above) Line feedback indicated that currently only Section Managers will be linked to the PM role for document signoffs.

(b) Project Manager's Qualification was changed from "*Critical*" to "*Supplemental*". No specific rationale is provided in the SCR evaluation for this change. Line feedback indicated that this was an EO Manager decision.

(c) The completion note only states that the N-QG has been revised and issued, but there is no mention of linking staff to qualifications.

2) Contract Manager (CM) Role Qualification: The majority of Projects staff (non-CMO) performing the Project Manager/Contract Manager role was not qualified in the two "critical" Contract Management related qualifications. Management oversight was not applied effectively to ensure that Project Management Staff, assigned to the Project Manager role and performing elements of contract management (i.e. Contract Manager); have completed their "critical" qualifications. In addition, N-QG-403-00023, Nuclear Project Staff Qualification Guide does not provide instruction on who should be linked to the stated qualifications and does not specifically identify the Contract Manager role. Staff performing contract management related and oversight activities may not be fully aware of contract management fundamentals which may lead to errors, inconsistencies, delays, and cost overruns for projects.

a) Based on a review of Nuclear Project staff assigned to selected projects in the Project Management role, most of these staff were not qualified in TIMSII for the CM related Qual IDs 32904 (Critical) and 32905 (Critical) per N-QG-403-00023 R004, Nuclear Project Staff Qualification Guide.

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i) For the projects sampled in the audit a designated Contract Manager was not identified; consequently, the understanding for the Audit was that the PM designated person for the projects fulfilled both the PM and CM role defined in N-STD-AS-0029 for the five stages of contracting process. N-MAN-09701-10003 R001 Nuclear Contract Management Manual also states the following:
   (1) Section 1.0: States that the "*manual is intended for Project Managers and employees involved in contract management activities*".
   (2) Section 4.3: States that for large multi-year contracts a PM and a CM should be assigned.

ii) QID 32904 - Contract Owner
   (1) 19 of 19 Project staff were not qualified. Only two were linked to the QID and both were currently "in progress".
   (2) 8 of 12 Section Managers were not qualified. Four others were currently "in progress".

iii) QID 32905 – Contract Administrator
   (1) 17 of 19 Project staff were not qualified. Five were "in progress" and the rest were not linked.
   (2) 10 of 12 Section Managers were not qualified. No others were linked.

iv) Examples of projects for which both the assigned PM persons and Section Managers were not qualified in 32904 and 32905:
   (1) Nuclear Waste Management: 60063, 60183, 60152, and 60162 (4 of 4 projects)
   (2) Pickering: 40985, 49140, and 49116 (3 of 3 projects)
   (3) Darlington: 31542, 33258, 73476, 73360, 73164, and 34000 (6 of 6)

v) Some of the above project management (non-CMO) staff also had an additional qualification which was related to Contract Management. These QIDs are identified in N-TQD-510-00001 R007, Supplemental BTU, Direct Hire and Contract Management Training and Qualification Description.
   (1) 5 of 12 Section Managers were qualified for QID 30264 Contract Management Owner. Three of these 5 SMs were also ones that did not have QID 32904 Contract Owner. It was not known whether QID 30264 is equivalent to QID 32904. Line feedback indicated that there are some similarities, but the two QIDs are not the same. The QID 30264 was developed for CMO staff and is focused on knowledge of Maintenance. QID 32904 was based on FIN-MAN-CM-001 (Superseded).
   (2) For the non-SM staff in the PM/CM role, 2 of 19 had qualification in QID 30285 Contract Administrator. Line feedback indicated that there are some similarities, but the two QIDs are not the same. QID 32905 was based on FIN-MAN-CM-001 (Superseded).
   (3) N-TQD-510-00001 R006 provided some guidance and definition with respect to the "Contract Manager" role; however, there is no direction in N-QG-403-00023 R004 for non-CMO staff who are assigned to the PM role and also performing the CM role. N-TQD R007 no longer identifies the Contract Manager role.

(a) Section 1.7 identifies requirements for the "Contract Manager" and "Contract Management Owner" roles; however, it is not clear whether these also apply to non-CMO Nuclear Project staff.

(b) Appendix B identifies four QIDs related to Contract Management.

(c) Section 2.1 defines the "Contract Manager" performing in a similar role to past Contract Management – Administrator/Monitor roles.

b) N-PROG-TR-0005 R015, Training, Section 1.17.2 states that the TIMS II is a tool for (a) "*Line Management to document subordinate staff training requirements and to assign work based on completed qualifications*".

3) Contract Administrator Qualification (for Contract Management Office staff): Training governance (i.e. N-TQD) has not yet been updated to reflect the currently applied qualification requirements for contract management related work performed by CMO staff. Applying changes to qualification requirements prior to reflecting the changes in the N-TQD document can lead to inconsistent implementation. In addition, 1 of 8 CMO staff assigned to Contract Administrator activities did not have all qualification requirements met (i.e. in progress).

a) Qualification requirement and contract management role changes were implemented prior to reflecting the changes in N-TQD-510-00001 R007, Supplemental BTU Direct Hire and Contract Management Training and Qualification Description (issued Jan. 5, 2015). Based on the current version of the N-TQD, it was not clear whether the four listed QIDs in Appendix B were required for some of these personnel as the N-TQD was not revised to reflect ongoing changes.

Note 1: In response to the Audit, the CMO organization input AR# 28174530 to "*Review Training governance/documents (i.e. N-TQD-510-00001) and revise as necessary to reflect the qualification requirements for contract management related activities performed by CMO staff".* (TCD Dec. 15, 2015)

Note 2: CMO Line feedback indicated that ongoing changes are occurring to N-TQD-510-00001 and also in response to addressing issues identified by NO Assessment NO-2014-310 (Note: All actions have been completed for SCR N-2013-23460). A DCR was not found for the removal of the three QIDs.

i) CMO Management confirmed that currently only QID 30285 is required for CMO staff performing "Contract Management" is 30285, which includes PEL 3594, Contract Administration.

ii) The other three QIDs (30805, 30264, and 9819) are no longer required for this role. N-TQD-510-00001 R007 was just recently issued on Jan. 5, 2015. A DCR was not found for the N-TQD to remove the three QIDs from the document. Line feedback also noted the following:

(1) QID 30805 was considered required for all P&M FLMs performing duties associated with the role of contract management staff – formerly administrator.

(2) QID 30264 is superseded by 30285. The QID was related to the obsolete FIN-MAN-CM-001.

(3) QID 9819 only applies to maintenance contracts and is not applicable to P&M CMO.

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iii) The terms contract administrator/monitor in reference to qualifications are no longer being used, based on Line Management feedback. This change is reflected in R007 of the document as these roles are not indicated.

b) A review of QIDs for CMO staff, identified for the audited projects, the following based on the currently active N-TQD-510-00001 R007 (issued Jan. 5, 2015 - the Qual IDs have not changed for the latest version), Appendix B. As noted above, QIDs 30805, 30264, and 9819 are no longer being used per CMO feedback.

i) 1 of 8 CMO staff assigned to Contract Administrator activities did not have all qualification requirements met based on the currently issued N-TQD. It was also not clear whether all the listed QIDs were required for these personnel or just the two (QID 30285 and 30805) for which they were linked.

(1) QID 30285: Contract Management – Administrator

(a) 1 of 8 FLM staff was not qualified. Project 60162 - the FLM was "in progress", but has completed PEL 3594, Contract Administration.

(2) QID 30805: P&M/Maintenance Contract Administrator FLM/ORB

(a) 1 of 8 FLM staff was not qualified. Project 60162 - the FLM was in progress (same individual as above).

(3) QID 30264: Contract Management Owner

(a) 8 of 8 FLMs did not have this QID.

(4) QID 9819: Contract Administrator - Maintenance

(a) 8 of 8 FLMs did not have this QID.

ii) All 12 CMO staff noted to be in the "Contract Monitor" role were qualified to QID 30285, Contract Management Administrator; however, none of these staff had qualifications in QID 9819, 30264, and 30805. It was not clear based on the N-TQD whether these three QIDs were required for this role.

c) N-TQD-510-00001 R007 states that "*prior to being assigned work within one of the Contract Management Roles, personnel shall complete the required training in accordance with Appendix B and be deemed competent by their Line supervision*."

d) N-PROG-TR-0005 R015, Training Section 1.17.2 states that the TIMS II is a tool for (a) "*Line Management to document subordinate staff training requirements and to assign work based on completed qualifications*".

Finding 3: Deficiencies in PM Program Governance and Supporting Documents

1) Project Management governing documents are not fully aligned with the requirements in OPG-STD-0001 R004, Requirements for Administrative Governance Documents.

a) P&M Management has taken a different approach for structuring Project Management governance as the Project Management Program was deemed to be different from other programs that are under N-CHAR-AS-0002, Nuclear Management System. As a consequence of this Management interpretation, some elements of governance direction were considered to not apply to the Project Management Program; however, the Audit team did not identify any exceptions for the Project Management Program in OPG-STD-0001.

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i) Project Management is considered to be different from other programs that are under N-CHAR-AS-0002, Nuclear Management System.

ii) The more detailed directions in superseded procedures (N-PROCs and N-INS) are in the new desktop guides and manuals which are not governing documents, but are controlled documents and are by design not directly linked in the N-PROG and the N-STD documents. Project Management indicated that the intention was to allow other organizations which execute project management functions, to implement guides and manuals that allow them to manage, control and execute their project activities in the most efficient and cost effective way yet meet the intent of the Program (principles) and Standards (expectations).

iii) In the case of Roles and Responsibilities, the PM roles and responsibilities are in the Project Management Plan (PMP) and therefore, the perspective was that these should not be in governance. Project Management should utilize the experience and knowledge of the PMs and therefore, should allow for PM's and Manager's experience to set out how the project should be managed, controlled and executed and not prescribed in only one approach.

iv) It was recognized that the issues noted with respect to alignment with requirements was previously noted. Line management indicated that the Project Management organization had worked with Nuclear Oversight (NO) and governance team to converge on a solution and an agreement was reached as to what would be done with the program document.

   (1) Follow-up by the audit with prior NO senior management and related e-mail communications confirmed that discussion on governance alignment had taken place in 2012-2013 and the recommendation was that misalignments need to be addressed (e.g. role and responsibilities, etc.).

   (2) Some e-mail communication information was provided by the Line on the documentation of interfaces. A review by the audit of the communication from Governance staff supported inclusion of interfaces.

v) The intent was to have Project Management governance focus on Project Management principles and expectations and have the more specific process details in the supporting documents (N-INS, N-MANs and N-GUIDs) which allowed for risk based approach and allowed organizations such as Minor Mods manage, control and execute projects in the most efficient and cost effective manner.

vi) The approach taken with governance was to follow a risk based approach through the use of the lower level supporting documents, rather than a one size fits all prescriptive process defined in governance (i.e. N-PROCs). The graded approach relies on the project complexity and staff experience.

vii) There is an understanding by the organization that there may a be large number of supporting documents (N-MANs and N-GUIDs) which may be produced by various organizations managing projects to address unique project needs; consequently, the decision was to not specifically make links to these types of documents, even those that outlined core project management elements that may be common to most projects.

viii) N-PROG-AS-0007 R009, Project Management revision is in progress and a draft copy was reviewed. Based on the observed copy, changes are evident in the

deficiency areas of Bases, References, Roles and Accountabilities. The changes may address some of the conditions noted.

b) While N-PROG-AS-0007 R008, Project Management makes reference to Desktop Guides and Manuals in general terms (no specific documents are identified), the N-STD documents also do not provide a comprehensive link or direction to these supporting documents which provide the specific performance requirements. There are no N-PROC documents associated with the Project Management Program. The Line indicated that there was no intention to link the lower level documents to the program document as these may vary from organization to organization and may be time dependent; however, some of the N-INS, N-GUID, and N-MAN documents may define common elements to most projects and may not be organization dependent.
   i) The N-STD documents typically describe in general higher level principles, expectations and requirements, but do not get into the specifics of who, what, how, when and where for the activities to be performed. These details are described in a large suite of N-INS, N-MAN, and N-GUID documents, but there are no specific references or links throughout the N-STD documents where the PM personnel performing process activities should be referring to for requirements and guidance.
      (1) OPG-STD-0001 R004 Section 1.6.10 provides expectations for procedures establishing the who, what, how, when, and where for program related activities. Line Management indicated that Project Management is using manuals and guides instead of procedures where QA program are not impacted.
   ii) Documentation of Performance References and Developmental References were not consistent with requirements in OPG-STD-0001 R004:
      (1) N-STD-AS-0030 R000:
         (a) The following was incorrectly referred to as "*Performance References*":
            (i) N-PROG-AS-0007, Project Management
         (b) A suite of N-MANs and N-GUIDs are not referenced as performance references and there are no DCRs related to these documents:
            (i) N-INS-09701-10007, Project Oversight Planning and Implementation
            (ii) N-GUID-09701-10120, Guideline for Construction Oversight
            (iii) N-GUID-01920-10000, Guideline For Engineering Oversight
      (2) N-STD-AS-0029 R000:
         (a) The following was incorrectly referred to as "*Performance References*":
            (i) N-PROG-AS-0007, Project Management
         (b) A suite of N-MANs and N-GUIDs are not referenced as performance references and there are no DCRs related to these documents:
            (i) N-GUID-00120-10008, Contractor Management Process
            (ii) N-MAN-09701-10003, Nuclear Contract Management Manual
            (iii) N-COI-00120-00001, Contractor/Owner Interface Requirements for Nuclear
            (iv) N-GUID-00120-10009, Guide for the Contractor/Owner Interface Requirements (COIR)
      (3) N-STD-AS-0031 R000:

(a) The following were incorrectly referred to as "*Performance References*":
  (i) N-CHAR-AS-0002, Nuclear Management System
  (ii) N-PROG-AS-0007, Project Management
  (iii) CSA N286-05, Management System Requirements for Nuclear Power Plants
(b) N-INS and N-GUID documents were incorrectly identified as "*Developmental References*".
(c) A suite of N-MANs and N-GUIDs are not referenced as performance references and there are no DCRs related to these documents:
  (i) N-MAN-01983-10000, Field Engineering Quality Control Manual
  (ii) N-GUID-01493-10002, Guide to Field Engineering Design Interface and Support
  (iii) N-GUID-01983-10003, Field Engineering Quality Control Civil
  (iv) N-GUID-01983-10005, Field Engineering Quality Control Electrical and Control
  (v) N-GUID-01983-10004, Field Engineering Quality Control Mechanical
  (vi) N-GUID-01983-10001, Excavation Concrete Drilling and Anchoring Processes

(4) OPG-STD-0001 R004 provides the following to describe:
(a) Section 1.6.14(c)(1) Performance References: "… *documents a user needs to obtain for use in conjunction with the document.*"
(b) Section 1.6.14(c)(2) Developmental References: "... *documents … that may provide the user with additional information or were used in the preparation of the document*."

c) The CSA N286-05, Management System Requirements for Nuclear Power Plants clauses are identified in Section 4.1; however, they are not specifically tied to any activity areas of the program to be able to demonstrate alignment. A single basis identifier (i.e. [B1]) is noted on the N-PROG cover page in the scope and no other parts of the document show bases references. The "bases" represent the licensing, legal and regulatory requirements that are being complied with by the program areas.

i) It is not readily evident which parts of the program addresses the specific clauses which are noted in the current active version of N-PROG-AS-0007 R008, Section 4.1:
  (1) Clause 6.1 Design
  (2) Clause 6.4, Purchasing and Materials Management
  (3) Clause 6.7, Construction and Installation
  (4) Clause 6.8, Commissioning
  (5) Clause 6.9, Turnover
  (6) Clause 6.10, Completion Assurance

ii) Given the lack of detail in the N-PROG on the activities related to the four implementing standards, it is not evident which specifically address the above clauses. For comparison purposes only, other programs reviewed typically include

basis references in the applicable sections. Some typical examples of program documents which reference specific sections/activities to the CSA standards (examples are the interfacing N-PROGS programs for the Draft R009 version):

(1) N-PROG-MA-0019 R009, Production Work Management
   (a) Section 1.4.2 On-Line Work Schedule – for Clause 5.5 Work is planned.
   (b) Section 1.5.1 Planned Outage Management – for Clause 5.8 The performance of work is controlled.

(2) N-PROG-MA-0013 R008, Welding
   (a) Section 1.3.8(e) … performed in accordance with approved procedures ….. - for Clause 5.8 The performance of work is controlled.

(3) N-PROG-TR-0005 R015, Training
   (a) Section 1.1.6 Qualified staff shall be skilled and knowledgeable … - for Clause 5.3 Personnel are competent at the work they do.

(4) N-PROG-MM-0001 R006, Materials Management
   (a) Section 1.2 Core Processes – for Clause 6.4 Purchasing and materials management.
   (b) Section 1.3.1 Requisitioning - for Clause 6.7(b) Contract administration provisions and interfaces.

(5) N-PROG-MP-0001 R014: Engineering Change Control
   (a) Section 1.9.1.2, Scope Definition ((a)(5))
   (b) Section 1.9.1.6, Installation (c)

iii) The condition was previously identified via DCRs and an SCR (N-2012-03948 (D4)). DCR# 119990 was input to address these concerns in November 2012; however, it has not been implemented to date. DCR# 118944 also notes similar concerns. The draft R009 version of the N-PROG is currently reviewing the allocation of the bases references and some feedback was provided to Project Management Staff.

d) Interfacing documents are not identified and discussed in N-PROG-AS-0007 R008, Project Management. Only the implementing standards are identified in Section 1.2 Figure 1. There are key interfacing programs which reference the Project Management Program. These include the following:

Note: The draft R009 version of the N-PROG is currently incorporating interfacing programs.

i) N-PROG-MP-0001 R013, Engineering Change Control, Section 1.1, Figure 2.

ii) N-PROG-AS-0005 R005, Business Planning, Section 1.3.3.

iii) N-PROG-MA-0026 R001, Equipment Reliability, Section 1.1 Figure 2 and Section 1.4.7.

iv) Other N-PROGs that interface with the Project Management Program include examples such as:

(1) N-PROG-AS-0006, Records and Document Control

(2) N-PROG-RA-0003, Corrective Action Program

(3) N-PROG-MP-0004, Pressure Boundary

(4) N-PROG-AS-0001, Managed Systems

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e) Roles and Accountabilities are not consistently identified in Project Management governance, suggesting that there are no Manager level (Band G) or higher position holders or roles with responsibilities for the output of others.

Note: The draft R009 version of the N-PROG is currently incorporating some Roles and Responsibilities. Line Management feedback indicated that Roles and Responsibilities are in role documents for managers; consequently, the understanding was that these do not need to be stated in the N-PROG. Also noted was that the Project Managers and other required roles are in the PMPs and Oversight Plans.

i) N-PROG-AS-0007 R008, Project Management. The Project Manager accountability is identified in Section 1.1, but no other roles and accountabilities are identified in Section 2.0.

ii) N-STD-AS-0030 R000, Project Oversight Standard states “none” under Roles and Accountabilities. The Project Manager is the only position mentioned in Section 1.1 (Key Oversight Elements).

iii) N-STD-AS-0029 R000, Contract Management Standard identifies roles and accountabilities for the Project Manager (Section 1.0 & 1.2.1) and Contract Manager (Section 1.2.1). “None” are identified under Roles and Accountabilities (Section 2.0).

iv) Other Engineering program governance reviewed identify these roles and responsibilities for their program areas (e.g. N-PROG-MP-0001 R014, N-PROG-MA-0026 R001, N-PROG-MA-0017 R007, N-PROG-MP-0007 (Conduct of Engineering), etc). Non-Engineering programs also identify Roles and Accountabilities.

v) OPG-STD-0001 R004, Section 1.6.11 requires to “*identify and provide a high-level summary of accountabilities (responsibilities for the output of others) for Manager level (Band G) or higher position holders or roles concerning the accomplishment of activities related to the implementation of the document.*”

f) Records are not identified in the program governance and supporting documents. The following are examples of documents generated by the processes and no “records” are indicated by the procedure.

i) N-INS-09701-10007 R000:

(1) Section 3.1 makes reference to template N-TMP-10292, Project Oversight Plan (POP). Section 3.7 also states that the POP is approved and issued and revisions must follow the same process. Section 4.4 also states that the POP should be filed in the Project files.

(2) Sections 3.5 and 4.1 and Appendix E identify the use Project Oversight Log. The N-INS states that the log should be accessible to the project team members.

(3) While no specific records are identified in the N-INS, many of these plans are issued in Asset Suite (NK38-PLAN, NK30-PLAN, P-PLAN, 0125-PLAN, 8690-PLAN).

g) The PM organization does not consider PM supporting documents (N-INS, N-MAN, and N-GUID) as governance and are not part of the governance framework; however, the documents do provide specific direction and expectations typical of governing documents. As noted in some feedback included with Finding 1, Project Management

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Staff have indicated that the documents are not governance as a reason for not performing required activities. Examples of direction in supporting documents are provided:

i) Use of the term "*shall*" or emphasis on "*minimum requirements*" in PM "desktop" manuals and guides.
   (1) N-MAN-01983-10000 R000, Field Engineering Quality Control Manual has **289** instances of the word "*shall*" being used in the document. One example:
      (a) Section 1.1: "*Quality Control activities to be performed by Field Engineering and Waste Management **shall** be planned and executed in accordance with this manual and associated guide.*"
   (2) N-INS-09701-10007 R000, Project Oversight Planning and Implementation.
      (a) "*This instruction provides practical, consistent and **minimum requirements** for preparation, implementation and formatting of the POP. Reference will be made to N-TMP-10292, Project Oversight Plan. This interactive template **must** be used to create the POP for all Projects & Modification projects.*"
   (3) N-GUID-01983-10002 R000, Guide To Field Engineering Design Interface and Support.
      (a) Section 4.3: "*The use of WARR process requires approval of the Design Authority (DA) and the Director of Operations and Maintenance (DOM) via a Memorandum. The request for approval to use the WARR process **shall** be supported with a rationale of why it is necessary, how the work will be carried out and how the work will be controlled. Quality hold points for the field work **shall** also be specified.*"
   (4) N-MAN-09701-10002 R003, Nuclear Refurbishment Project Oversight, Section 8.0 states the following: "*The Oversight Logs may be used for legal purposes in the future and therefore factual information **shall** be documented including the specifics around the identified deficiency/non-compliance, location, date, names of individuals involved, immediate action taken (if any) and all other relevant information and if applicable photographs and contractor responses. The Project Manager is accountable to **ensure** that the oversight record is accurate and the appropriate follow up action(s) initiated.*"

ii) Extensive use of the term "*should*" in PM "desktop" manuals and guides.
   (1) N-INS-09701-10007 R000, Project Oversight Planning and Implementation, the term should is used extensively to define requirements for the project oversight. Some examples:
      (a) Section 3.4: "*Routine Oversight activities **should** be specified in the POP. Refer to Appendix B, Minimum Routine Oversight Requirements for the suggested minimum routine oversight activities that **should** be performed for all projects.*"
      (b) Section 3.5: "*All project risks including those identified in Risk Management Plan **should** be reviewed to determine whether Strategic Oversight is required as a mitigating strategy.*"
   (2) N-MAN-09701-10003 R001, Nuclear Contract Management Manual, the term should is used 15 times in the document.

(a) Section 2.0: "*The execution of work and work practices should be consistent with the agreed contract terms and conditions*."

(b) Section 4.3: "*In large, multi-year contracts, a Contract Manager should be assigned for the duration of the contract. The Contract Manager is engaged exclusively with the management of the contract in support of the Project Manager.*"

(3) N-MAN-09701-10002 R003, Nuclear Refurbishment Project Oversight, the term "should" is used extensively to define requirements for the project oversight. Some examples:

(a) Section 4.3: "*Prior to approving the POP, the Project Manager **should** ensure inputs from the appropriate functional organizations have been integrated into the plan.*"

(b) Section 4.4: "*The Project Manager **should** review and approve the oversight recommendations to be included in the Project Oversight Plan (POP)*".

2) Errors, inconsistencies, incorrect references, etc. in documents:

a) N-INS-09701-10007 R000, Section 1.0 refers to N-MAN-09701-10002 using an incorrect title which has the word "Refurbishment" missing. The title should read as Nuclear *Refurbishment* Project Oversight as per the issued document in Asset Suite. The error may suggest that the N-MAN is applicable non-refurbishment projects as well. The N-MAN in Section 2.0 specifically states that the N-INS is the document which provides instruction for the Projects and Modifications organization for the development of the Project Oversight Plan (POP). For Refurbishment, it is the N-MAN which provides this direction for developing POPs. There is no DCR for the N-INS for this item.

i) N-MAN-09701-10002 R001, Nuclear Refurbishment Project Oversight was issued on May 09, 2014. The title was changed from the previous (R000) revision. The revision comments state that the name of the N-MAN was changed to reflect that the document describes how Nuclear Refurbishment satisfies N-STD-AS-0030, Project Oversight Standard.

ii) N-INS-09701-10007 R000, Project Oversight Planning & Implementation was issued on August 14, 2013 which is prior to the Rev. 001 change of the N-MAN.

b) N-STD-AS-0029 R000, Section 4.2.2 refers to N-INS-00120-10023, Contractor Management Process. The document was superseded February 5, 2013 by N-GUID-00120-10008, Contractor Management Process. DCR# 120901 has been initiated but not implemented.

c) N-STD-AS-0031 R000, Section 4.2.2 refers to:

i) N-PROC-AS-0069, Field Engineering Quality Control Process. The document was superseded on September 11, 2013 by N-MAN-01983-10000, Field Engineering Quality Control Manual. DCR# 123088 has been initiated but not implemented.

d) N-GUID-01983-10002 R000, Guide to Field Engineering Design Interface and Support. The N-GUID Section 4.9 refers to N-INS-1983.1-10005, Field Engineering Change Control Process. The N-INS document could not be found in Asset Suite or in the list of references in the N-GUID.

e) N-MAN-09701-10003 R001, Nuclear Contract Management Manual (issued June 19, 2014) refers to templates. The documents were also identified as N-REFs rather than N-TMPs:
   i) Section 4.3.1 and 5.0 to N-REF-00150-0497674 Contract Management Plant Template which was not found to be issued in Asset Suite.
   ii) Section 4.1 and 5.0 to N-REF-00150-049673 Contracting Strategy Template which was issued in Asset Suite with a Draft watermark on the document.

f) N-MAN-01983-10000 R000, Field Engineering Quality Control Manual has some inconsistencies as follows:
   i) In the "Foreword" section on Page 6 of 69 as well as Section 1.2, references to document N-INS-01983-10001, Excavation, Backfill, Drilling, and Chipping are made, but this document is at "RESERVED" status since January 16, 2003.
   ii) In Section 1.5, it is stated that the overall FE QC process is described in Section G.1 of Appendix G. However, Appendix G.1 describes document surveillance requirements only. The correct appendix appears to be Appendix H as H.1.0 provides the flowchart for the Overall QC Process.

g) N-INS-09701-10007 R000, Project Oversight Planning and Implementation (Note: No DCRs)
   i) Sections 4.1, makes reference to Oversight report N-FORM-019701-00001, which does not exist in Asset Suite. The correct form number is N-FORM-09701-00001, Construction Oversight Report (COR) as indicated in Section 6.0; however, the document is at "RESERVED" status in Asset Suite since May 9, 2013. Note also that in Section 6.0 the form has a different title Oversight Report.
   ii) Section 3.1 makes reference to template N-TMP-10292 which has been set-up to "HISTORY" on July 3, 2014 in Asset Suite. The template should be used to document specific information per Section 3.1 to produce the POP (Project Oversight Plan).

h) N-GUID-01983-10000 R001, Field Engineering Guide to Planning and Assessing Work, is written with references to and screenshots of Passport database, rather than the current Asset Suite program.

i) N-GUID-01983-10000 R001, Guideline for Engineering Oversight, Section 3 refers to N-MAN-09701-10002 as Nuclear Projects Oversight. The correct title is "Nuclear Refurbishment Oversight". In addition, this reference is not correct since N-INS-09701-10007 provides instruction on project oversight for the Projects and Modifications organization.

j) Inconsistencies identified in qualification related documents and information:
   i) N-TQD-510-00001 R007, (Supplemental BTU, Direct Hire and Contract Management Training and Qualification Description) Section 1.0 has an incorrect reference to Appendix B for Contract Management – Nuclear Training. Section 1.0 refers to "*Appendix C*" instead of Appendix B.
   ii) N-TQD-422-00001 R009, (Nuclear Field Engineering Training and Qualification Description) Section 3.2.2 has an incorrect title for N-PROG-MP-0004. The correct title is "*Pressure Boundary*" and not "*Pressure Boundary Fieldwork*".

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iii) Qual ID # 32905, Contract Administrator refers to N-PROC-AS-0081, Technical Contractor Management Process which is it at “History” status in Asset Suite since November 15, 2013.

iv) PEL ID 67538 Nuclear Project Life Cycle Process – CAL, refers to two documents which have changes or have been superseded:

(1) N-PROC-AS-0039, Project and Portfolio Management. The N-PROC was superseded on December 5, 2012 by N-STD-AS-0028, Project Management Standard.

(2) N-QG-403-00023, Nuclear Project Manager/Leader. The correct document title for the current revision (R004 - Dec. 6, 2012) is Nuclear Project Staff Qualification Guide. The quoted title is for R001 and the title changed in October 2010 (R002).

k) There are two active N-FORMS for COIR List of Deviations: N-FORM-11583 and N-FORM-11070. It appears that N-FORM-11583 is the generic contractor interface deviations list and N-FORM-11070 is specific to Engineering oversight activities/COIR deviations of design agencies. Examples were found where N-FORM-11070 was used by Project staff instead of N-FORM-11583.

i) Examples where N-FORM-11070 was used instead of N-FORM-11583:

(1) For project 40985 replacement of obsolete online chemical analysers, N-FORM-11070 was used to list all the general COIR deviations (i.e. it was not specific to Engineering/design agency).

(2) For project 49140 EPC new trash removal system screens for P058, N-FORM-11070 was used.

ii) N-FORM-11583 is referenced in N-GUID-00120-10009 R000 (Aug. 16, 2013) Guide For The Contractor/Owner Interface Requirements (COIR) Document and N-COI-00120-00001 R000, Contractor Owner Interface Requirements for Nuclear.

iii) N-FORM-11070 R005, List of Deviations is not referenced in current N-GUIDs or N-STDs (i.e. Project Management or Engineering). The form was last issued on October 11, 2011 and has a two-year review cycle in Asset Suite. The N-FORM refers to two documents which have since changed and do not refer to the N-FORM. The document owner for the N-FORM is identified as P&M Director, Miscellaneous Projects.

(1) N-GUID-01920-10000 title changed to Guideline for Engineering Oversight (from Guideline for Managing the Design Agency Interface). Current revision is R003 on March 26, 2013.

(2) N-STD-MP-0009 R003 title changed to Contractor/Owner Engineering Interface and Oversight (from Design Agency Control) on Feb. 7, 2012. Current revision is R005 on August 5, 2014.

3) PM documents are not consistently reviewed to ensure that they are current and up to date as some have reviews past due (3 of 11) and others do not have any review cycles specified (7 of 18).

a) 3 of 11 PM document with assigned review cycles identified have reviews past due.

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i) N-PROG-AS-0007 has a 2-year review cycle. The document was last reviewed on June 25, 2012. Currently in "CHANGE" status.

ii) N-GUID-01983-10002 R000, Guide to Field Engineering Design Interface and Support has a 2-year review cycle. The document was last reviewed was on September 20, 2011.

iii) N-GUID-01983-10000, Field Engineering Guide to Planning and Assessing Work has a 2-year review cycle. The document was last reviewed on April 20, 2011.

b) 7 of 18 PM documents (N-INS, N-GUID, and N-MAN, and N-COI) do not have review cycles identified to ensure that periodic and timely document reviews and revisions are performed. The following documents do not have review cycles identified in Asset Suite:

i) N-INS-09701-10007, Project Oversight Planning and Implementation. The document was last reviewed/revised on August 14, 2013.

ii) N-COI-00120-00001, Contractor/Owner Interface Requirements for Nuclear. The document was last reviewed/revised on September 13, 2013.

iii) N-GUID-00120-10009, Guide for the Contractor/Owner Interface Requirements (COIR). The document was last reviewed/revised on September 13, 2013.

iv) N-MAN-01983-10000, Field Engineering Quality Control Manual. The document was last reviewed/revised on October 2, 2012.

v) N-GUID-01983-10003, Field Engineering Quality Control Civil. The document was last reviewed/revised on October 2, 2012.

vi) N-GUID-01983-10005, Field Engineering Quality Control Electrical and Control. The document was last reviewed/revised on September 26, 2012.

vii) N-GUID-01983-10004, Field Engineering Quality Control Mechanical. The document was last reviewed/revised on September 25, 2012.

c) NOTE:

i) N-STD-AS-0031, Field Engineering Standard has a 3-year review cycle. The document was last reviewed on June 25, 2012. Not due until June 2015.

ii) N-STD-AS-0030, Contract Management Standard has a 3-year review cycle. The document was last reviewed on June 25, 2012. Currently in "CHANGE" status. Not due until June 2015.

iii) N-STD-AS-0029, Contract Management Standard has a 3-year review cycle. The document was last reviewed on June 25, 2012. Currently in "CHANGE" status. Not due until June 2015.

4) Lack of clear direction or guidance in governance or supporting documents for PM process activities.

a) The Oversight Reporting System (ORS) which has been rolled out in training sessions and is currently in use is not defined in PM governance or supporting documents. There is no supporting manual that describes the ORS tool and provides the user or maintainer with any guidance.

i) N-INS-09701-10007 R000, Project Oversight Planning and Implementation (issued Aug 14, 2013), has limited reference to the Oversight Reporting System (ORS) which has been rolled out in training sessions in 2014 (Ref. P&M Project Oversight Session II - April 2014). The ORS system provides a centralized data location for oversight

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information (i.e. Project Oversight Plans (POP), oversight reports, vendor data, and project related SCRs.). Section 4.1 refers to an oversight database but it is not referred to as ORS.

ii) ORS is a local database developed within Proj. & Mods and is not supported by corporate IT. There is currently no manual or instructions for use. The April 2014 training session slides are the only instructions available. Development knowledge of the ORS tool resides with the developer and one other individual.

b) N-MAN-09701-10003 R001 Section 4.1 refers to N-REF-00150-0497673 (Contracting Strategy Template) and states that it "*may be used to document accepted contracting strategy for a project*". The direction suggests that use of the form is optional.

c) N-COI-00120-00001 R000, Contractor/Owner Interface Requirements for Nuclear, Item #3.7 requires the Contractor to Review & Accept the COIR List of Deviations as part of Contract Award process; however, the applicable N-FORM-11583 List of Deviations does not have a signature line available for the contractor to indicate acceptance. Note that the other List of Deviations form (N-FORM-11070), has a location for Contractor (Design Agency) acceptance.

i) Contractor Accountability is for the Contractor to Review and Accept COIR List of Deviations as part of the Contract Award process.

(1) There is no signature block for the contractor acceptance.

(2) Line Management feedback stated that acceptance of the PO represents approval from the contractor, so the interpretation is that the form does not require approval from the contractor; however, this is not clear based on the direction in the N-COI document.

ii) OPG Accountability is to provide an approved List of Deviations to the COIR as part of the RFP/Work Request. In contrast, signature blocks for OPG staff functions (Submitted by and Approved) are provided on the form.

Additional Supporting Facts for the Learning Behaviours

3.0 Learning Behaviors

3.2 Self-Assessments, additional details

1) While many SAs have been completed by the P&M organization, the outcome of all these assessments have not fully identified or addressed the issues identified by the current audit. This may be due to some assessments of process areas and activities not being sufficiently self-critical or follow-up may not have been fully effective. See item 2 below pertaining to disposition of recommendations as one contributor to SA effectiveness.

a) The audit identified issues related governance alignment and deficiencies, performance of oversight, process implementation, and staff qualifications.

b) SAs were performed in the following areas; however, these have not prevented some of the issues noted by the audit:

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i) Compliance to contractor management procedures (NO13-000183 and NO14-000552 (planned)).

ii) Project areas such as PM tools, resources, reports, lack of PM knowledge (NO13-000167).

iii) Comparison of OPGN practices to INPO PM recommended practices (NO13-00414). Line feedback stated that NR P&C should review the recommendations for action as there are gaps that need to be addressed.

iv) NO14-000260 identified that some Project Managers are not formally updating POPs and keeping them current.

v) Follow-up to previous audit (NO14-000082). While this SA indicated additional follow-up via NO14-000400 on training, there was a lack of critical analysis on the effectiveness of the SCR actions from the 2012 audit (NO-2012-009).

c) Quarterly reports have also identified issues with project related activities:

i) Project oversight (SA is planned for 2015 (NO15-000004)).

ii) Contract Management. SAs were performed or planned in this topic area (NO13-000183 and NO14-000552).

iii) P&M knowledge enhancement due to removal of MTL and lack of training committee. (NO14-000400)

2) Deficiencies were noted in the disposition or documentation of the disposition of recommendations for 9 of 21 self-assessments reviewed. In some examples findings or conclusions were noted but no recommendations were identified which could be missed opportunities. N-PROC-RA-0097 R008 Section 1.6.1 (f) and (g) provides guidance on disposition of SA recommendations (i.e. SCR/ AR / rationale if not implemented). Note: R007 included the same recommendations in Section 1.6.1 (c) and (f).

a) NO14-000400 [Approved and Closed]: The SCR initiated to disposition the recommended actions was not identified in the SA. The SA was not updated when it was approved and closed. This example represents a documentation issue only since follow-up was actually taken via an SCR.

b) D14-000228 [Approved and Closed]: Project Managers Industry Working Group Meeting (Dec. 2013)

i) Conclusions: Stated that sharing OPEX and best practices is critical to ensure OPG can move forward with the large number of upcoming projects.

ii) The Recommendations/Actions field was left blank.

c) D13-000219 [Approved and Closed]: Project Managers Industry Working Group Meeting (May. 2013) [Approved and Closed]

i) The benchmarking activity identified some key industry topic areas such as:

(1) Fast track projects result in increased risk, cost, and schedule. They need to be minimized through effective advanced planning. They must be very closely monitored.

(2) Vendor quality continues to be a concern. It is important to communicate regularly with vendors and track work.

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d) NO14-000070 [Approved and Closed]: Review use of Line Defined Codes based on results from Q3 2013 Trend Report recommendations. No ARs or disposition comments were documented; consequently, it is not evident whether any action was taken.

e) NO14-000220 [Approved and Closed]: Perform a follow-up of review of risk management, including Risk Update and Monitoring. Three recommendations were noted but no specific reference to any actions or disposition. A quality review was completed for this SA. In response to the Audit, the Line organization input AR# 28174691.

   i) One of the recommendations was to perform a follow-up self-assessment in 6 months to a year to ensure compliance and Risk Management effectiveness.

   ii) The referenced AR 28163614 was not related to the three recommendations.

f) NO14-000991 [Approved and Closed]: P&M Lessons Learned D1411. Not evident whether action taken since no AR # noted.

   i) Recommendation: Share SA with P&M organization so that the Project Engineers can incorporate this OPEX into developing their plans for future outage work.

   ii) The referenced AR 28163013 was not related to the one recommendations.

g) NO13-000118 [Approved and Closed]: P&M FME Self-assessment. Four recommended actions are identified but no ARs are referenced. A quality review was completed for this SA. Line feedback indicated that no ARs were initiated; however, the actions were completed. There was not a clear understanding of AR process.

h) P13-000083 [Approved and Closed]: INPO FME Working Group Meeting (Jan. 2013). Not evident whether the three recommendations were dispositioned and no indication of an AR#. Note: the referenced AR# 28162966 is not related to the specific recommendations. Line feedback indicated that no ARs were initiated; however, the actions were completed. There was not a clear understanding of AR process.

3.4 Dispositioning of Previous Audit/Assessment Findings additional details

1) NO Audit NO-2012-009: Deficiencies were found in the completion of some corrective actions for the previous Nuclear Oversight audit (NO-2012-009) for both audit findings. While all the audit related SCR actions have been completed in 2012, the P&M follow-up SA referred to additional SCRs and an SA which are in progress.

   a) Finding 2: Staff Qualifications

      i) The completion of SCR N-2012-02710 (C3 – CARB Review) action has not fully resolved the condition.

         (1) Issues related to Project Management staff qualification are still outstanding as documented in Finding #2 of this audit..

         (2) The required CARB review was not performed for the Finding 2 SCR CAP since the MFA code category was not flagged for a CARB review.

         (3) The completion notes did not provide any indication whether staff have been linked to the PM quals.

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b) Finding 1: Deficiencies in Project Management Execution

i) Some deficiencies were identified for Assignment 3 and the two other actions were completed. There were also only a three project Lessons Learned presented to the PMOC in 2014; however, there were additional LLs found. Although not a deficiency, it was also noted that the SAs are not being presented to the PMOC as per the action description, instead they are being presented to the P&M CARB.

ii) The previous audit NO-2012-009 in Finding 1 stated that "*some deficiencies in the execution of project management activities were identified in the areas of value engineering, lessons learned, and project risk management*".

(a) SA Presentations to PMOC:

(i) Follow-up with the PMOC facilitator confirmed that SAs are not being presented to the PMOC. Further follow-up confirmed that the SAs are being presented at the P&M CARB meeting when SA recommendation generates a SCR/CAP.

(ii) The PMOC TOR issued July 25, 2012 does not include any reference to presenting SAs to the PMOC. The TOR was not updated to incorporate the direction in the action description requiring SAs to be presented to the PMOC.

3) NO Assessment NO-2013-315: While actions have been completed, some issues still remain in the areas of project oversight and procedures.

a) N-2013-23458: While Oversight Reporting System has been implemented, the current audit identified examples of deficiencies in the execution of project oversight. Guidance for the use and maintenance of database has not yet been incorporated into Project Management governance or supporting documents.

b) N-2013-23460: To address Procedural Gaps

(i) The following issues were noted:

(1) N-INS-09701-10007 R000 (initial issue) has not been revised since the assessment. So any gaps identified have remained. Some examples:

(a) "*N-INS-09701-10007 is silent on when the POP is to be prepared / issued.*"

(b) "*There is no explicit link between N-INS-09701-10007 … and …N-GUID-09701-10120 …*"

(c) In Section 4.1 reference is made to N-FORM-019701-00001 and the form is not in Asset Suite.

(2) Not evident whether "*the definition of the risk-based approach is not available in any of the executing procedures*" has been addressed.

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Appendix C

Audit Meetings

ENTRANCE MEETING:

Location: 889 Brock Road, Room 618
Date & Time: Jan 23, 2015, 10:00am
Attendees:

Riyaz Habib – Project Director, Contract Management and Project Control Office
Nahil Rahman - Project Director, Pickering & NWMD Projects
Terry Chong – Section Manager, Process and Scheduling
Gary Varsava – Section Manager, Projects
Ravi Srinivas – Section Manager, Field Engineering
Dion Lewis - Section Manager, Field Engineering
Scott Ritzie - Section Manager, Projects
Leila Nadimi - Cost and Schedule Analyst, Project Control Office

Herminia Roman – Senior Manager, Nuclear Oversight - Engineering
Emeric Schoen- – Audit team, Nuclear Oversight - Engineering
Maher Ghannam – Audit team, Nuclear Oversight - Engineering
Ghaman Kaulessar – Audit team, Nuclear Oversight - Engineering
Murali Komaragiri – Audit team, Nuclear Oversight - Engineering
Jack Bastermaji – Audit team, Nuclear Oversight - Engineering
Russ Gomme- Audit Team Leader, Nuclear Oversight - Engineering

Items Addressed:

Audit basis, objective, scope and schedule were reviewed. Audit SPOCs were confirmed. Nuclear Safety pause to review weekly trait and relevance to the audit completed.

BRIEFING MEETINGs (SPOCs & Managers):

Briefings were held on Tuesdays and Thursdays during the 3 week conduct with the SPOCs. Managers and Directors also attended some of the briefings. The bases for the briefings were an e-mailed attachment with all the Problem Development Sheets and their status.

DRAFT AUDIT REPORT MEETING:

Location: 889 Brock Road, Room 618
Date & Time: February 27, 2015, 9:00 am
Attendees:

Riyaz Habib – Project Director, Contract Management and Project Control Office
Nahil Rahman - Project Director, Pickering & NWMD Projects
Dragan Popovic - Director, Darlington & Refurb Projects

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Terry Chong – Section Manager, Process and Scheduling
Gary Varsava – Section Manager, Projects
Daniel Simone – Manager, Strategic Contract Management

Art Maki – Director, Nuclear Oversight
Herminia Roman – Senior Manager, Nuclear Oversight - Engineering
Emeric Schoen – Audit team, Nuclear Oversight - Engineering
Maher Ghannam – Audit team, Nuclear Oversight - Engineering
Ghaman Kaulessar – Audit team, Nuclear Oversight - Engineering
Murali Komaragiri – Audit team, Nuclear Oversight - Engineering
Jack Bastermaji – Audit team, Nuclear Oversight - Engineering
Russ Gomme – Audit Team Leader, Nuclear Oversight - Engineering

Items Addressed: The draft audit report was presented. Findings, overall assessment and insights were reviewed. Agreement on findings with some minor changes to Finding #1 and Finding #2 problem statements were obtained. Line management suggested some minor edits to the overall assessment.

EXIT MEETING:

Location: 889 Brock Road, Room 618
Date & Time: March 11, 2015, 1:00 pm
Attendees:

Riyaz Habib – Project Director, Contract Management and Project Control Office
Dragan Popovic - Director, Darlington & Refurb Projects
Amar Sood for Nahil Rahman - Project Director, Pickering & NWMD Projects
Art Rob – VP, P&M
Mark Elliott – SVP, Nuclear Engineering & Chief Nuclear Engineer

Art Maki – Director, Nuclear Oversight
Herminia Roman – Senior Manager, Nuclear Oversight - Engineering
Emeric Schoen – Audit team, Nuclear Oversight - Engineering
Ghaman Kaulessar – Audit team, Nuclear Oversight - Engineering
Murali Komaragiri – Audit team, Nuclear Oversight - Engineering
Jack Bastermaji – Audit team, Nuclear Oversight - Engineering
Russ Gomme – Audit Team Leader, Nuclear Oversight - Engineering

Items Addressed:
Audit findings, insights, overall assessment and audit colour rating were presented. All items were discussed and agreement on audit rating and Finding SCRs was confirmed.

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Appendix D - Completed Audit Rating Criteria Sheet

NO-2015-022 Project Management Audit Rating Criteria

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES **The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.**	MANAGED SYSTEM CONTROLS ARE EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.**	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.**	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.**		**Overall Colour rating is YELLOW**
	Attributes: (Highlight appropriate items)	Attributes: (Highlight appropriate items)	Attributes: (Highlight appropriate items)	Attributes: (Highlight appropriate items)		Supporting Fact, Example or Finding Reference
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps in regulatory or code requirements are evident.	Program	Finding 3: deficiencies in Program Management Governance & supporting Documents - Controls are in desktop guides/manuals which are not mandatory. Contributing factor to Finding 1.
Program	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.	Program	Finding 3: Interfaces not established.
Program	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.	Program	Finding 3: Roles & accountabilities are not in governance Finding 2: PM role training and accountability issues
Program	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	A widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.	Program	Finding 2: No quals required for Project Managers. Contract Managers are not qualified. Contract Administrators Qual Guide is out of date. Contributing factor to Finding 1.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	CAP/OPEX	Learning Behaviours: Self Assessments - recommendations are not being dispositioned. Some self assessments are not self critical or there is insufficient follow-up based on issues identified by this audit.
CAP/OPEX	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.	CAP/OPEX	Learning Behaviours: (SCRs), see above.
CAP/OPEX	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.	CAP/OPEX	Finding 2: PM qualification issues identified in NO-2012-009 audit.
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	Performance	Finding 1: Concerns with performing oversight requirements.
Performance	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.	Performance	Finding 2: Concerns with lack of training affecting implementation of oversight.
Performance	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.	Performance	Finding 1: POPs and supporting N-MAN, N-INS, N-GUID requirements are not consistently implemented. These are contributing factors negatively affecting quality, cost and schedule on most projects reviewed.
Performance	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie, not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.	Performance	N/A
Performance	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.	Performance	Finding 1: Performance gaps.
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Oversight	Finding 1: CPI and SPI are red or yellow for projects reviewed.
Oversight	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.	Oversight	See Learning Behaviours under CAP/OPEX
Oversight	No significant adverse trends are evident.	Limited performance adverse trends are evident and action plans are in place to improve performance.	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.	Oversight	Finding 1: Performance Gaps
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		N/A
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		N/A

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Appendix E

Distribution

TO:

VP, Projects & Modifications	A. ROB

CC DISTRIBUTION LIST

Chief Nuclear Officer	G. JAGER
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Senior VP	P. PASQUET
Senior VP, Nuclear Projects	D. REINER
Senior VP, Business Transformation Project	S. MARTIN
Senior VP, Decomissioning & NW Mgmt	L. SWAMI
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Director, L&IL Waste Operations	L. MORTON
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Sr. Manager, Business Systems Integration	R. REYNS
Sr. Manager, Training – PNGS & DNGS (Acting)	L. HASTIE
Sr Manager, Training Planning & Design	G. CORNETT
Manager, Operations Training	R. URJAN
Manager, Outage Programs (Acting)	R. HALL
Manager, Stakeholder Relations (Acting)	R. ARODA
Manager, Site Perf. Improvement, Pickering	J. CHAPIN
Manager, Site Perf. Improvement, DNGS (Acting)	M. BOSLEY
Manager, Darlington Human Performance	J. THOMPSON
Manager, Pickering Human Performance	VACANT
Manager, Reg. Affairs Darlington	D. COLEMAN
Manager, Reg. Affairs, Pickering	K. DEHDASHTIAN
Manager, Reg. Affairs, Reg. Prog., Strat. & Supp.	L. MITCHELL

Directors Audited:

Project Director, Cont. Mgmt. & Project Control	Riyaz Habib
Project Director, Pickering & NWMD Projects	Nahil Rahman
Director, Darlington & Refurb Projects	Dragan Popovic

ONTARIO POWER GENERATION

INTERNAL USE ONLY

Nuclear Oversight

Audit: NO-2016-002 Corrective Action Program

Record Number: N-REP-01070-0588511 T06

Date: 31-Mar-2016

Report Rating: WHITE

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

This performance based audit of the Corrective Action ("CA") program has identified that the managed system controls are (White).

Ref #	Finding	Significance Level		
		SL1	SL2	SL3
1	Nuclear Waste and Projects & Mods organizations are producing inadequate causal analyses and unsustainable Recurrence Control actions in some C2 SCRs.			X
2	Some departments in Pickering and Nuclear Support are not consistently producing quarterly trend reports as required or not addressing the trends identified through SCRs or Self-Assessments.			X

The audit team found that the causal analyses performed by some organizations as part of their corrective action plans for significant level ("SL") 2 Station Condition Records ("SCRs") category C do not have the required quality and depth, and the actions created to avoid reoccurrence are ineffective to sustain correction to the issues identified. These corrective action plans were approved by the Evaluating Organization's ("EO") Manager and in some cases they were also accepted by the Corrective Action Review Board ("CARB").

There is a fleetwide initiative driven by the 2015 PNGS assessment (SCR P-2015-18454) to address the quality of corrective actions. This initiative is supported by a Technical Support Mission (P16-000107) which validates and identifies gaps to the solution implemented in the PNGS assessment.

The Performance Improvement ("PI") application of learning behaviours were found to be effective with a minor deficiency in the conduct of Observation and Coaching ("O&Cs") which has been documented in SCR# N-2016-08091.

One audit insight is summarized in Section 4.

One SCR was raised during audit and is listed in Section 5.

2.0 BACKGROUND

The purpose of the Corrective Action Program, N-PROG-RA-0003 is to ensure deficiencies, non-conformances, weaknesses with a process, document, or service, or conditions that adversely impact, or may adversely impact plant operations, personnel, nuclear safety, the environment and component reliability, are promptly identified and corrected or dispositioned.

N-PROC-RA-0048, Conducting Performance Based Audits and Assessments, requires periodic audits of all programs under the Nuclear Management System Charter. This audit fulfills that requirement for the CA Program. The previous audit was conducted in Q4-2013.

2.1 Audit Objective & Scope

The objective of this audit was to determine whether the CA Program requirements defined in governance are met and effectively implemented to support safe and reliable operation.

The following four program specific items were reviewed:

- Management Review Meetings (“MRM”);
- CARB meetings;
- SCR Screening Meetings; and
- CANDU Owner’s Group (“COG”) Weekly Screening Meetings.

Standard audit scope is also listed in Appendix F.

The audit was conducted from February 1 to 26, 2016 at the following locations:

- PNGS;
- DNGS;
- Nuclear Support;
- Decommissioning and Nuclear Waste Management Division (“DNWMD”),
- Inspection and Maintenance Services (“IMS”);
- Supply Chain;
- Darlington Nuclear Refurbishment (“DNR”); and
- Projects and Modifications (“PM”).

3.0 AUDIT FINDINGS

1. Nuclear Waste and Projects & Mods organizations are producing inadequate causal analyses and unsustainable Recurrence Control actions in some C2 SCRs.	SL3

SCR related governance requires that evaluations should have at least one Recurrence Control ("RC") action to reduce the risk of recurrence for resolution category C evaluations. All actions are required to meet Specific, Measureable, Achievable, Reasonable & Timely ("SMART") principles in developing and documenting completion and success criteria. In addition, a causal analysis is required to determine the appropriate level of 'why' when conducting evaluations.

A review of 15 Nuclear Support C2 evaluations between Jan 1, 2015 to Mar 1, 2016 found the following gaps:

- Five of 15 causal analyses reviewed for significant level 2 SCRs did not have sufficient depth for identifying the cause of the undesired behaviours (see below):
  - Using obsolete procedures was identified as Procedure Use and Adherence ("PU&A") and did not address why personnel were using the wrong procedure; and
  - Causal analysis "misinterpretation of work protection" does not address why the misinterpretation occurred.
- Four of 15 SCRs did not have sustainable RC actions to address the apparent cause (see below):
  - Conducting an Observation and Coaching ("O&C") and issuance of an expectation document are one-time initiatives and are not sustainable actions.
- Four of six corrective action plans identified as having deficiencies in causal analyses and/or unsustainable recurrence control actions were accepted by CARB.

Potential Contributing Cause & Impact

Potential Contributing Cause:

- EO Managers may not be aware of the analysis required to address C2 SCRs.
- There may be a knowledge gap in addressing C2 evaluations by DNWMD and PM.
- SCR Evaluators may not be aware of the different causal analysis tools and how to apply them effectively to evaluations (see insight #1).

Impact:

- By not conducting a deep enough causal analysis or ensuring sustainability of RC assignments, there is a potential for recurrence of the event;
- CARB is being challenged as the last line of defence; and
- Rework by EO Manager and Evaluator in addressing the Corrective Action Plan.

Management Action Plan

SCR N-2016-08146 has been raised to address the finding for PM. The Director, Contract Management & Project Control Office has agreed to be the EO Manager for this SCR at SL3.

SCR N-2016-08150 has been raised to address the finding for DNWMD. The Manager, Business Support for Low & Intermediate Level Waste has agreed to be the EO Manager for this SCR at SL3.

2. Some departments in Pickering and Nuclear Support are not consistently producing quarterly trend reports as required or are not addressing the trends identified through SCRs or Self-Assessments.	**SL3**

N-INS-01966.1-10000,"Trending and Analysis Instruction and Performance Improvement Reporting", has quarterly trend reporting requirements for identified departments. In addition, the identified trends are required to be addressed through SCRs or Self Assessments ("SAs").

- Five of 15 departments sampled did not consistently produce quarterly trend reports;
  - PNGS Engineering, PNGS Chemistry, PNGS Fuel Handling, DNWMD, and Nuclear Support Engineering.
- Four of 15 departments with self-identified trends did not address them with SCRs or SAs.
  - Nuclear Support Engineering, Environment Operations Support, Operations Training and DNWMD.

Potential Contributing Cause & Impact

Potential Contributing Cause:

Move to center-led trending has resulted in confusion amongst some departments with their trending requirements.

Impact:

Potential for missed opportunities to prevent an event when trends from lower level events are not identified in a timely manner.

Management Action Plan

SCR P-2016-08170 has been raised to address the finding. The Manager, Site Performance Improvement at Pickering has agreed to be the EO Manager for this SCR at SL 3.

4.0 AUDIT INSIGHTS

Insight #1: Performance Improvement ("PI") should improve guidance to evaluators on use of evaluation tools listed in N-STD-RA-0008 Sections 1.5.7.2 & 4.3.1.

Condition:

Guidance is not clear on which evaluation methodologies are best suited for differing resolution categories of SCRs.

N-STD-RA-0008 Sections 1.5.7.2 & 4.3.1 includes reference to 44 documents which refer to differing evaluation methodologies and their supporting documents. The document types range from forms, guides, lists, manuals, procedures, Job Task Analysis, Practical Evaluation, Training and Qualification Description and overhead presentations.

Recommendation:

The PI organization should consider improving guidance on the methodology required to be followed for a given evaluation to help the evaluator understand which evaluating methodologies might be best suited for differing resolution categories.

Management Action:
The Section Manager, PI Support has agreed to consider this recommendation via AR#28187640.

5.0 SCRS INITIATED DURING THE AUDIT

SCR	Owner (Position)	Title
N-2016-08091	Director PI	Shortfalls in O&C at PNGS, DNGS & Nuclear Support

Note: Scoping Sheet #750 was generated by audit to assess the quality of C3 SCRs for evaluation quality and governance adherence.

6.0 LIST OF ACRONYMS

ACE	Apparent Cause Evaluation
AIP	Approved Isolation Procedure
ATI	Advance Trending Initiative
CAP	Corrective Action Plan
CARB	Corrective Action Review Board
CANDU	Canadian Deuterium Uranium
CIGAR	Channel Inspection and Gauging Apparatus for Reactors
CNO	Chief Nuclear Officer
COG	CANDU Owner's Group
DNGS	Darlington Nuclear Generating Station
DNWMD	Decommissioning and Nuclear Waste Management Division
E-ACE	Equipment Apparent Cause Evaluation
IMS	Inspection and Maintenance Services
JTA	Job Task Analysis
MRM	Management Review Meeting
NEC	Nuclear Executive Committee
NSOC	Nuclear Support OPEX Coordinator
O&C	Observation and Coaching
OPEX	Operating Experience
PI	Performance Improvement
PM	Projects and Modifications
PEV	Performance Evaluation
PNGS	Pickering Nuclear Generating Station
PU&A	Procedure Use and Aherence
RC	Recurrence Control
EO	Evaluating Organization
SA	Self Assessment
SCR	Station Condition Record
SMART	Specific Measurable Achievable Reasonable Timely
SOO	Senior Officer - OPEX
SPOC	Single Point Of Contact
TQD	Training and Qualification Description
VOT	Validation Of Trend

7.0 AUDIT TEAM

The team consists of:

Audit Team Leader:	Tony Kim – Nuclear Oversight
Auditor:	Diana Baum – Nuclear Oversight
Auditor:	Grant Gibson – Nuclear Oversight
Auditor:	Dave Flowitt – Nuclear Oversight
Technical Specialist:	[redacted]
Subject Matter Expert:	Andrew Masters – Nuclear Oversight
	Stuart Harris – Manager Design Projects
SME/SPOC	*Kendra Flagler – Refurbishment*
	Sonia Bennett – PI (NOSS)
	Taunya Masse – PI (DNWMD)
	Terry Chong – PM
	Reema Agarwal – IMS
Senior Manager:	Sarah Wood – Nuclear Oversight

Prepared by: _____ Date: 31-MAR-2016

Tony Kim
Audit Team Leader
Cross Functional Programs
OPG Nuclear Oversight

Approved by: _____ Date: March 31, 2016

for

Sarah Wood
Senior Manager (acting)
Cross Functional Programs
OPG Nuclear Oversight

Appendix A1-Additional Supporting Facts for Finding #1

Fifteen of 17 C2 Nuclear Support evaluations (approved or completed) on SCRs initiated between January 1, 2015 and March 1, 2016 were reviewed for depth of analysis and sustainability of RC actions. One DNGS SCR was also included in the review as it has a PM EO and CARB acceptance.

Table A1.1. Six C2 SCRs reviewed had weaknesses in the depth of causal analysis and/or unsustainable RC assignments.

SCR	Risk Area	Inadequate depth of causal analysis	RC assignments that are Unsustainable or non-specific (i.e. SMART)	CARB acceptance data/status
N-2015-02957	Work Protection	The apparent cause identified was PU&A. However, it did not address why personnel did not use the correct AIP for the past 2.5 years. It only states that they were comfortable in their duties and felt they were knowledgeable in their work (this resulted in a workplace violation).	One-time initiatives to conduct a focused O&C and rollout of an expectation document are one time initiatives to influence performance and are not sustainable.	IMS/CNO 16-Jun-2015
N-2015-26963	Work Protection	PU&A, competing priorities and time pressure were identified as apparent causes for inadequate turnover leading to process and procedural implementation.	OK	DNWMD Pending
N-2015-00834	Electrical Safety	An EOER determined that actions to address an adverse condition were ineffective. Causal analysis concluded that action to mitigate an adverse condition was ineffective but it does not address determine why it was ineffective.	OK	DNWMD 29-Apr-2015
N-2015-29437	Electrical Safety	OK	An expectation document is a one-time initiative to influence performance and is not sustainable in addressing why isolation conditions were not established per AIP.	DNWMD Pending
N-2015-17608	Outage Scope Stability	The causal analysis identified 'frequent scope changes" as affecting the schedule and cost without addressing why the frequent scope changes were happening.	The RC assignment to review processes and documents and affect change as required is not a specific action.	PM 29-Oct-2015

SCR	Risk Area	Inadequate depth of causal analysis	RC assignments that are Unsustainable or non-specific (i.e. SMART)	CARB acceptance data/status
D-2015-18210	Work Protection	Work was performed to install a new component which was not identified in the work protection permit. Causal analysis identifies misinterpretation of work protection with no reason given for why the misinterpretation took place.	The RC action is to update a guideline document is not a specific action to address the issue as there is no understanding of why the misinterpretation took place.	PM 29-Jan-2015

Appendix A2 –Additional Supporting Facts for Finding #2

A random review of 15 trend reports in 2014 and 2015 was carried out.

PNGS

Departments that did not have up-to-date quarterly trend reports;

- Station Engineering: last available report in Asset Suite -Q2/2015 (P-REP-01966-0543516 Station Engineering Department Performance Improvement Report – Q2/2015); and
- Chemistry: last available report in Asset Suite-Q4/2014 (NK30-REP-01966-0534615 Chemistry Department Performance Improvement Report Q4/2014).

Identified trends are not addressed through a trend SCR or SAs;

- Fuel Handling: NK30-REP-01966-0569841 (Q3/2015).

Nuclear Support

Departments that did not have up-to-date quarterly trend reports;

- Engineering: N-REP-01966-0569143 (Q1-Q2 2015); and
- DNWMD: W-REP-01966-00029 (Q2-2015).

Identified trends are not addressed through a trend SCR or SA;

- N-REP-01966- 0569143 'Q1-Q2 2015 Nuclear Engineering Performance Improvement Report';
- N-REP-01966-0527309 '2014 Environment Operations Support Nuclear Fleet Annual Performance Improvement Report';
- N-REP-08920-10009 'Operations Training Performance Improvement Report (Q3 2014 - Q3 2015)'; and
- W-REP-01966-00029 'DNWMD Q2 2015 Performance Improvement Report'.

Appendix B - Learning Behaviors

The audit evaluated the PI organization's application of performance improvement programs. It was found to have minor deficiencies. These deficiencies are being addressed through the Corrective Action process.

Corrective Action Program

The ATI has been recently implemented at both PNGS and DNGS sites. This initiative is to improve the effectiveness of trending by identifying predictive trends to help prevent events from occurring. To facilitate this initiative, a new functionality Validation Of Trend ("VOT") has been incorporated into the O&Cs and SA database interface.

The VOT requires input from dedicated trend analysts at the departmental level to identify potential trends from low level events. These potential trends are reviewed at the responsible manager level where they are validated. If the trend is considered valid, mitigating actions are taken to address the trend. The department manager then presents the finding at the MRM. Further rollup of validated trends are presented at station CARBs, the Chief Nuclear Officer CARB and the Nuclear Executive Committee meetings.

In 2015 PNGS received favourable feedback from an external party during the pilot phase. ATI has been implemented at PNGS in Q1-2016 and at DNGS in Q3-2015.

Self-Assessments

Fifteen random SAs (five from DNGS, five from PNGS & five from Nuclear Support) conducted and completed in 2014 & 2015 by PI were reviewed. There were no quality issues found in the sample set. The SAs addressed all had well defined scoping and objective statements. Where actions were required from findings, SCRs or ARs were raised per SA and Benchmarking governance.

Observation & Coaching:

At DNGS and Nuclear Support (889 Brock Road) locations, documentation of O&C by PI personnel has not been carried out on a regular basis. Dedicated managers to DNGS and Nuclear Support have been in place since Q4-2015 and regular O&Cs have commenced as per governance.

At PNGS, routine O&Cs are being conducted by the Section Manager. These O&Cs are rolled up with the department manager on a weekly basis. However, there is no documentation of rolled up O&Cs for review as recommended in governance (N-INS-09030-10004 Observation & Coaching).

SCR#2 N-2016-08091 has been raised to document this adverse condition (accepted by program owner).

Fleetview Program Reporting:

The Fleetwide Program Health and Performance reporting is showing improvement from 2014 to 2015. Program Execution & Performance Indicators have improved from being red in 2014 to yellow while Program Action Plan has improved from yellow to white.

In the last 2 reporting periods (Q4-2014 → Q2-2015 and Q2-2015 → Q4-2015) there was continued focus on INPO Industry Cumulative Impact short-term actions to reduce the number of SCRs. This has resulted in a 15% reduction of SCRs.

Operating Experience:

External OPEX
External Operating Experience ("OPEX") information is effectively managed through weekly screening meetings held at PNGS, DNGS & Nuclear Support sites to review and disseminate OPEX to the departmental levels. Through this process OPEX is identified by COG and its members to produce a weekly package which is reviewed by the Nuclear Support OPEX Coordinator ("NSOC"), Site Senior Officer - OPEX ("SOO") and departmental level OPEX Single Point of Contacts ("SPOCs") for disposition.

Internal OPEX
The process for sharing of internal OPEX is well established.

For sharing of OPEX within OPGN all Sig level 1 & 2 SCRs are automatically identified for sharing to non-incident sites through the 'fleetwide' flag. This facilitates a dialogue between the incident site and non-incident sites. The dialogue requires an EO manager (equivalent to the incident site EO manager) at the non-incident site to review the event and raise an SCR at the non-incident site if applicable.

Disposition of Previous Audit Findings:

Previous audit findings from NO-2013-023 Corrective Action Program

Finding	Disposition
Finding 1 Managers Are Not Reinforcing corrective action program Expectations for Self Assessments and Benchmarking.	**Effective** A software interlock has been implemented to the SA database which prompts the evaluator or FLM to ensure SCR or AR will be raised to address outstanding issues. During the audit a review of 15 SAs throughout OPGN found that when SCRs or ARs weren't being initiated in SAs, rationale was documented. Management AR numbers have been raised for annual self assessment reviews and an EOER has been carried out which found the actions effective.
Finding 2 MRMs Are Not Providing Oversight to Ensure the Timely Dispositioning of SCRs. There was lack of oversight in SCR disposition timeliness.	**Effective** Since 2014 the overall trend of SCRs dispositioned > 9 days has been decreasing. It was attributed to the mitigating actions of this finding which was to improve CARB oversight of SCR disposition timeliness.

Finding	Disposition
Finding 3 Non-Compliance with Trending and Analysis Instruction	**Effective** The ATI and VOT tools have been implemented to focus on early detection, identification and prompt disposition of early trends.
Finding 4 Management is not Monitoring Their Staff Training Qualifications To Ensure They are Linked and Trained. As a result, there were PI Senior Officers who were not qualified. Additionally, the Job Task Analysis was not updated since changes to Apparent Cause Evaluation ("ACE") and RC training changes.	**Effective** Mitigating actions to address the finding were effective. JTAs have been revised and issued for RC and ACE evaluators. Additionally, records indicate that performance measures for PI personnel qualification are on target. All required qualifications for PI are met.

Appendix C - Audit SCR Significance Level

Significance Level	Definition as per N-LIST-01966-10000 Section 11.0 Audit Finding
SL1	**A highly significant event** or adverse condition or programmatic implementation deficiency that causes a major reduction in the margin of safety to the public or to station personnel and/or which has a major impact on the environment or on production or on other business deliverables.
SL2	An issue identified and reported to management during the audit / assessment for which there was Nuclear or Conventional Safety risks and the issue was not handled with appropriate response. Significant organizational and / or programmatic deficiencies are identified: • A program is not fully or effectively implemented. • High impact or chronic performance problems exist with the execution of the program. • There is a relatively high risk of a breakthrough event, due to organizational or programmatic issues. Note that this means that breakthrough events may not have occurred yet. • Evidence of lack of management oversight of key program areas. • The organization was reliant on Nuclear Oversight to identify program deficiencies (i.e. line organizational barriers are ineffective). • Management oversight efforts have been ineffective at identifying and/or correcting performance concerns. A significant issue that supports escalation of the audit / assessment; (i.e., a program deficiency that is cross-functional in nature or has substantially reduced the effective execution of a program or element of a program). Related findings: • The audit / assessment team identifies that actions taken to correct a previous finding were not effective and cause it to reappear as a finding which contains the most fundamental aspects of the previous finding. • This should normally increase the SL from a 3 to a 2 since there is an aspect of ineffectiveness of Corrective Actions or Management Oversight, as well as lack of response to the Nuclear Oversight organization.
SL3	All other findings not meeting the criteria above. Programmatic implementation deficiencies, which have the potential to be more significant or may be the precursor for more significant events, are identified by the finding. The audit / assessment team identifies that the problem(s) associated with a previously identified finding still exists." (Continued Next Page)

SL3 cont'd	The finding is considered as a "continued" finding, if the following are true: • Mitigating actions are in place and considerable progress is being made in resolving the problem(s). • Long term plan is established and appropriate actions are in progress on a reasonable schedule for completion. • Some improvement in performance is evident. Learning Behaviours: • Deficiencies in use of the Corrective Action Program to self-identify and resolve adverse conditions. • Self-assessments are not timely, not self-critical, and/or recommendations are not dispositioned. • OPEX not used effectively (i.e. internal and external).

Appendix D– Overall Audit Report Rating Scale

An overall report rating has been assigned as an indication of the overall implementation, performance and risk management practices for the program that was subject to the Nuclear Oversight audit. Ratings are derived through professional judgment by the audit team and discussion with management.

- *(Green) Demonstrates Industry Best Practice:* The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrates pro-active self-critical learning behaviours with a focus on continual improvement.
- *(White) Effective*: The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.
- *(Yellow) Not Fully Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.
- *(Red) Not Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.

Appendix E- Completed Audit Rating Criteria Sheet

AUDIT RATING CRITERIA

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES	MANAGED SYSTEM CONTROLS ARE EFFECTIVE	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE		
	The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.**	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.**	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.**		
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**		**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	**Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.**	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	Program	Governance Documents were found to be reviewed and updated within their review cycles. Minor inconsistencies were found in governence which are being addressed by the program owner.
	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	**Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.**	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.		The peer interfaces between PI managers are recognized and managed through PI peer team meetings. Performance Improvement ("PI") managers provide oversight to SCR Screening Meetings, MRMs & CARB to interface with program peers and provide oversight.
	Organization is clearly established to support requirements on a sustainable basis.	**Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.**	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.		The PI organization is actively recruiting new personnel to replace staff lost through attrition and staff movement.
	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	**No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.**	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.		Two instances of apparent cause evaluations performed by personnel showing as not qualified in TIMS. However, the ACE was entered by a fully ACE qualified individual. This meets program intent per the program owner.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	**CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.**	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	CAP/OPEX	Finding #1 Six of 15 reviewed Nuclear Support C2 evaluations were found to be deficient with respect to depth of causal evaluation and specificity and sustainability of actions, 4 of which had been CARB accepted. The deficiencies were found in Decommissioning & Nuclear Waste Management, and Projects & Mondifications.
	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	**Use of OPEX to improve performance is evident in most areas.**	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.		The OPEX process is effectively managed.
	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.		
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	**Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.**	**Concerns still exist in some areas which are adversely affecting performance.**	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	Performance	Findings 1 and 2 indicate deficiencies adversely affecting performance: - C/2 evaluation quality - Non -compliance with trending and analysis requirements
	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	**Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.**	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.		Finding 1 indicates that self revealing events are occurring in risk intensive areas such as work protection and evaluations are being conducted with insufficient depth of causal analysis and insufficient specificity and sustainability of actions.
	No significant issues exist with the implementation of OPGN requirements.	**Limited issues exist with the implementation of OPGN requirements.**	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.		Implementation issues are occurring such as findings 1 and 2. - C/2 evaluation quality - Non -compliance with trending and analysis requirements
	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	**No significant consequential events but challenges to barriers exist.**	Risk of a significant consequential event is relatively high or has occurred but was identified internally, i.e., not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.		Findings 1 and 2 indicate deficiencies adversely affecting performance. - C/2 evaluation quality - Non -compliance with trending and analysis requirements
	No events, low level or otherwise, are evident that challenge barriers.	**Self revealing events are few and are being dealt with appropriately.**	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.		Finding 1 indicates that self revealing events are occurring in risk intensive areas such as work protection and evaluations are being conducted with insufficient depth of causal analysis and insufficient specificity and sustainability of actions.
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	**Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.**	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Oversight	Q4 2015 program execution performance indicators show worse than taget by more than 5%, but less than or equal to 10%.
	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	**Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.**	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.		Self Assessments are conducted per governance
	No significant adverse trends are evident.	**Limited performance adverse trends are evident and action plans are in place to improve performance.**	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.		Performance metrics on quality & effectiveness of evaluations & SCRS limited to Significance 1& 2 SCRS. There are no quality or effectiveness metrics for C/3 evaluations
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		

Appendix F - Standard Audit Scope

The standard audit scope included a review of the following areas to assess compliance, implementation and performance effectiveness:

- Program Governance (N-PROG-RA-0003 R010, Corrective Action, and implementing procedures and standards);
- Management Oversight / Learning Organization / Corrective Action Program – Findings, SA, O&C, Root Cause Analysis ("RCA"), Fleetview reporting, System Health reporting, CAP effectiveness, and OPEX;
- Line Management interfaces with other programs, organizations, and Centre-Led Functional Area Management ("CFAM"); and
- External insights – World Association of Nuclear Operators ("WANO"), Nuclear Safety Review Board ("NSRB"), Canadian Nuclear Safety Commission ("CNSC"), and any applicable Significant Operating Experience Reports ("SOER").

Appendix G - Distribution

TO:

VP Assurance & Chief Audit Executive	P. KAY
VP, Fleet Operations & Maintenance	F. GUGLIELMI
VP, Projects & Modifications	A. ROB
Director, Nuclear Oversight	A. MAKI
Director, Fleet Improvement Project	A. SULLIVAN
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Manager, Site Perf. Improvement, DNGS	M. BOSLEY
Manager, HU (IMSD)	T. HARDUWAR
SM, Perf. Improvement Support	S. CAKE

ONTARIO POWER GENERATION

INTERNAL USE ONLY

Nuclear Oversight

Audit: Equipment Reliability, NO-2016-004

Record Number: N-REP-01070-0603211 T06

Date: June 30, 2016

Report Rating: **YELLOW**

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Nuclear Oversight conducted an audit of the Equipment Reliability ("ER") Program at Pickering, Darlington, Darlington Nuclear Refurbishment ("DNR"), and the corporate Nuclear Engineering organization from May 16 to June 3, 2016.

The objective of this performance based audit was to determine whether the ER Program requirements defined in Ontario Power Generation Nuclear ("OPGN") governance have been met and effectively implemented to support safe and reliable operation.

The audit determined that performance of the Managed System Controls for sustaining the ER program is not fully effective (audit rated YELLOW).

The audit identified three findings which are described in Section 2:

Ref #	Finding	Significance Level		
		SL1	SL2	SL3
1	Not fully qualified staff are performing the role of System Engineer without evidence of oversight by fully qualified mentors.			X
2	System performance monitoring activities including the collection, recording, and trending of system performance indicator data as well as the completion of system documentation and records are not fully implemented per requirements.			X
3	Deficiencies exist in the Preventive Maintenance technical basis at Pickering.			X

Positive Observations

The audit found evidence of extensive program oversight in the application of a dedicated program owner, regular ER Peer team and station meetings such as Plant Health Committee with cross-functional participation.

Improvements have been achieved in some ER indicators due to station initiatives such as development of the PM review board, Nuclear Fleet (station implemented) Initiatives such as NFI-07 and ongoing NFI-04, ER Improvement Initiative. Indicator improvements include areas such as "age of red and yellow systems" and in maintaining late Preventative Maintenance ("PM") activities to a live zero;

The DNR plans for ER implementation including ownership transfer, schedule, activities and responsibilities, metrics and indicators to be monitored and reported appear to be on track for the start of refurbishment.

Findings

Despite improvements, the execution of PM continues to be a challenge at both Pickering and Darlington. PM deferrals are significantly over target at both sites.

Attrition and frequent turnover of System Engineers ("SEs") has contributed to not fully qualified staff performing the SE role. This, in combination with response to emergent station issues and duties related to improvement initiatives are impacting the execution of core system engineering duties such as proactive trending, system performance monitoring, system health reporting, maintenance of system notebooks and system turnovers. Deficiencies in PM technical basis records were also observed at Pickering.

Similar issues were identified in the 2013 ER program audit.

Learning Behaviors

The audit team found the application of Learning Behaviours as applicable to the ER program activities to be generally effective with some weaknesses identified in the use of the Corrective Action Program ("CAP"). These CAP issues may have contributed to Finding 2. (See details in Appendix B).

Insights

Seven Audit Insights are described in Section 3.

Station Condition Records

Three Station Condition Records ("SCRs") raised during the audit are listed in Section 4.

1.2 Background

The purpose of the "Equipment Reliability" program, N-PROG-MA-0026, is to ensure ongoing high levels of reliable performance of components important to nuclear safety, production, and environmental protection so that very low numbers of component failures occur, degraded equipment condition is minimized and redundancy is maintained on key systems.

N-PROC-RA-0048, "Conducting Performance Based Audits and Assessments", requires periodic audits of all programs under the Nuclear Management System Charter. This audit fulfills that requirement for the ER program.

Nuclear Oversight previously audited this program in 2013. NO-2013-002 was rated Yellow and found performance deficiencies in the following three areas:

- Finding 1: Deficiencies in Preventive Maintenance Implementation
- Finding 2: Deficiencies in System Surveillance Activities
- Finding 3: Deficiencies in Predictive Maintenance Implementation and Health Reporting

1.3 Audit Objective & Scope

The objective of this performance based audit was to determine whether the ER program requirements defined in OPGN governance have been met and effectively implemented to support safe and reliable operation.

The following program specific items were reviewed:

- System performance monitoring activities, plans and turnover;
- System notebook, health reporting and trending;
- Functional failure evaluations and trending;
- Preventative maintenance technical basis, deferral and improvement initiatives; and
- Improvement initiatives related to ER.

The standard audit scope was also included and is listed in Appendix F.

The audit was conducted from May 16 to June 3, 2016 at Pickering, Darlington, DNR, and the corporate Nuclear Engineering organization.

Nuclear Waste organization was excluded from the scope of this audit as an assessment which included elements of the ER Program was conducted of that organization in late 2015.

2.0 AUDIT FINDINGS

1. Not fully qualified staff are performing the role of System Engineer without evidence of oversight by fully qualified mentors.	**SL3**

INPO 12-016, "System Engineering Effectiveness", states: "*Managers also ensure capable and qualified individuals are assigned to perform the role of system engineer and that appropriate training is provided to ensure timely qualification of new engineers as well as maintaining knowledgeable and skilled engineers."*

N-PROG-TR-0005, "Training", provides expectations for training and qualifications, and states: *"Only qualified staff shall be assigned to work on tasks independently."*

- The audit found examples of not fully qualified staff performing the SE role:
  - In two of three examples at Darlington and one of three examples at Pickering, it was not evident that products such as SHRs prepared by unqualified staff were reviewed/co-prepared by qualified staff;
  - At Darlington, 15 of 79 Performance Engineering staff are not linked to Qualification ID ("QID") 8568: SE core training and/or QID 8570: SE common duty areas; and
  - Six of the 25 System Performance Monitoring Plans ("SPMP") for DNR were prepared by staff who are not fully qualified and were not co-signed by qualified co-preparers or reviewers.
- In addition, two Performance Engineering Section Managers ("SMs") at Darlington and one acting SM at Pickering had not completed the minimum supervisory qualification.

(Additional details are provided in Appendix A1).

Potential Contributing Cause & Impact

Potential Contributing Cause:

- Attrition has been higher than expected. Interim mitigating measures include hiring temporary staff and interns until staffing levels reach the business plan.
- Recently hired staff have not been in role long enough to be fully qualified as "SE Core Training" requires classroom training that has been offered infrequently, and several qualifications ("SE Common Duty Areas" and "System Performance Monitoring") require SEs to be in position for minimum 3 – 6 months.

Impact:

Less than adequate numbers of qualified staff and unqualified staff performing work independently affect the quality of engineering work. The audit found issues with the quality and frequency of core duties such as trending, preparation of SHRs, SPMPs, Notebook Maintenance, and System Turnover. (See Finding 2).

Management Action Plan

SCR D-2016-16951 has been raised to address the finding. The Manager, Performance Engineering at Darlington has agreed to be the Evaluating Organization Manager for this SCR at SL 3.

SCR P-2016-16954 has been raised to address the finding. The Sr. Manager, Plant Reliability at Pickering has agreed to be the Evaluating Organization Manager for this SCR at SL 3.

SCR N-2016-17113 has been raised to address the finding. The Sr. Manager, Plant Reliability at DNR has agreed to be the Evaluating Organization Manager for this SCR at SL 3.

2. System performance monitoring activities including the collection, recording, and trending of system performance indicator data as well as the completion of system documentation and records are not fully implemented per requirements.	**SL3**

N-PROC-MA-0024, "System Performance Monitoring", and its implementing instructions, provides requirements for the collection, recording, and trending of system performance indicator data, and for preparation of SPMPs, System Health Reports (SHRs), and system notebooks.

N-PROC-MA-0023, "System Turnover", provides the requirement for turnover of system responsibility between SEs including the requirement to file completed turnover forms in Asset Suite.

The audit team sampled three systems at Pickering and three at Darlington and found the following:

- For five of six systems sampled, trending of system performance indicator ("PI") data was either not completed or not filed per requirements;
- For six of six systems sampled, the system performance walkdowns were not performed at the specified frequency or filed consistent with the requirements;
- Six of six SPMPs sampled have omissions (such as lack of interfacing systems) and misalignment within the SPMP and between the SPMP and SHR PIs;
- Six of six SHRs sampled contained errors (such as scorecard rating not aligned with supporting data), lack of clarity and direction in the action plans, missing performance indicator summaries;
- Three of six systems sampled had alignment issues between component health reports ("CHRs") and SHRs for pumps and/or motors;
- Five of six system notebooks sampled had missing and/or outdated information; and
- Six of six system turnovers performed by SEs had deficiencies such as: no formal turnover completed, and turnover forms not prepared or filed.

  (Additional details are provided in Appendix A2).

Potential Contributing Cause & Impact

Potential Contributing Cause(s):

- At times, emergent issues and other priority station/fleet initiatives have been prioritized ahead of system walkdowns, trending and core duties such as SHR, SPMP and system notebook maintenance;
- Attrition and frequent turnover of SEs and SMs is challenging the consistency and quality of SPMPs, SHRs and notebooks and contributes to poor turnover activities;
- SEs interviewed said that they were not always clear on the bounds of their role and believed that they are performing work that should be done by others; and
- SEs stated that they do not always understand the value to be obtained by performing the system walkdown at the prescribed frequency.

Impact:

- Adverse System PI trends may not be observed in a timely manner to allow for the initiation of remedial actions to prevent equipment or component failure.
- Long-term proactive improvements may not be achieved.
- Gaps and inconsistencies in SHRs may provide an inaccurate picture of system health and proactive management support of critical issues and actions may not be timely.

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Management Action Plan
SCR D-2016-17023 has been raised to address the finding. The Manager, Performance Engineering at Darlington has agreed to be the Evaluating Organization Manager for this SCR at SL 3 with Engineering CARB Review. SCR P-2016-17043 has been raised to address the finding. The Sr. Manager, Plant Reliability at Pickering has agreed to be the Evaluating Organization Manager for this SCR at SL 3 with Engineering CARB Review.

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3. Deficiencies exist in the Preventive Maintenance technical basis at Pickering.	**SL3**

N-PROC-MA-0026*,* "Preventative Maintenance Technical Specifications" establishes the process accountabilities for development, management, maintenance, and specification requirements for contents of the technical basis of PM tasks and templates. It also specifies that: "*the IQ Review software database shall be the authorized location for all documented PM templates and technical basis for PM predefined."*

The audit found that there are missing or incomplete records for PM technical basis. In some cases, the PM technical basis is stored in several places IQ Review, PM Living Program ("PMLP") and Asset Suite. The information is not always consistent or current requiring the SE to search in several locations for required information. Examples include:

- For 22 Emergency Water Supply ("EWS") heat tracing heaters (criticality code ("CC1")), no PM template or technical basis is recorded in IQ Review as the information was not transferred from PMLP, nor are these components identified in the Performance Monitoring Equipment List ("PMEL") in the SPMP
- Fourteen of 26 Emergency Storage Water ("ESW") heat tracing heaters (CC2) had no PM template, technical basis, or maintenance strategy for PMs to prevent failure of electrical cable heaters in IQ Review, AS7 or PMLP; Four of the fourteen had no record at all in IQ Review;
- Sixteen of 20 Emergency Coolant Injection ("ECI") components sampled and three ESW components had an incorrect PM template applied in IQ Review;
- Two ESW components had no criticality code and no PM template applied; and
- Five ESW components have not been designated as safety related, although they provide the same function as the other heat tracing cables.

(Additional details are provided in Appendix A3).

Potential Contributing Cause & Impact

Potential Contributing Cause:

- Less than adequate rigour in validation of technical basis for PMs;
- IQ review was instituted as the authorized location for PM technical basis in 2009; however, N-PROC-MA-0026 acknowledges that data may still reside in other databases: "*until migration to IQ Review is complete the "legacy" (PMLP, Asset Suite) locations of the technical basis should be accessed in order to ensure that PM predefineds are based on all available technical basis information*";
- Migrating PM data to IQ Review is seen as time consuming and low priority; and
- There is no formal guide or instruction for how and when to update the technical basis in IQ Review.

Impact:

- Inconsistent/incomplete PM technical basis data may prevent effective PM program implementation; and
- Lack of PM program for some critical components may lead to degraded equipment condition.

Management Action Plan

SCR P-2016-17017 has been raised to address the finding. The Senior Manager, Plant Reliability, at Pickering has agreed to be the Evaluating Organization Manager for this SCR at Significance level 3.

3.0 AUDIT INSIGHTS

Insight 1: Distribution of Unit Weight for System Colour Score Determination

Condition:

System IQ score weight factor is evenly distributed to all units including the common units to arrive at an overall system colour. This can lead to inaccurate representation of the unit health and overall system health. This is known to be hard coded into the System IQ application. Any change in representation would require the SE to manually override the final score and support it with customized weighted calculations. Bruce Power uses and displays customized unit weight in their System IQ.

For example:

- Pickering ECI in System IQ currently has U1, U4, U5, U6, U7, U8, U056, U058 and U078 tabs (nine individual unit tabs) which are assigned equal unit weight of 11.1% each. In reality, there are six reactor units at the Pickering station that require core cooling water from ECI. Assigning common units equal weighting in System IQ can lead to misrepresentation of the actual unit performance. Failures on 058 equipment impact the four Pickering B units, but the calculation in System IQ would not show this impact.

Recommendation:

Consider examining if the even unit weight distribution is adequate for accurate system health colour determination and suggest alternate methodology if needed.

AR#: 28190719-01 has been accepted by Manager, Engineering Programs Integration.

Insight 2: System IQ Improvement

Condition:

The audit team found that the user interface in the System IQ application was difficult to navigate. Both Pickering and Darlington end users had expressed their concerns that limitations of the application may contribute to the performance gaps identified in SHR preparation and System IQ notebook maintenance. System IQ full capabilities and functions may not be fully realized and utilized by the end users. Areas for improvement include:

- Simplify the SHR structure limiting the main sections to: score card, executive summary, indicator summary, action plan, and sign-offs, so that the printed version, especially the action plan, is clear and concise and directs the reader to important information.
- Maintain details such as lists of work orders, cat IDs and supporting data (attachments, OPEX, etc.) in appendices.
- Eliminate sections that contain duplication of information (printed SHR indicator summary vs. individual indicator summary).

Recommendation:

Consider a System IQ revision to improve the overall SHR structure and use of the application. Consultation with end users is recommended prior to revision to assess their needs and address their concerns. Include a rollout to improve consistent usage with focus on what “good” looks like.

AR#: 28190719-02 has been accepted by Manager, Engineering Programs Integration.

Insight 3: Governance Clarification

Condition:

The audit found a few minor examples of ambiguity and inconsistencies in ER governance.

1) N-PROG-MA-026 lists N-STM-08130-10000**,** Plant Thermal Performance, as an implementing document but it is not in ER governance framework. The document states that there are local station instructions, but none could be found in Asset Suite. Consider updating for consistency.
2) N-PROC-MA-0024 System Performance Monitoring:
    - This procedure contains instructions for calculating Plant Condition Index which is no longer actively used by the stations. It is replaced by ERI. Consider removing instructions and discontinuing.
    - Consider identifying that the SPMP has a section 7.0 for Routine Field Walkdown Plan and section 8.0 for Outage walkdown Plan for clarity.
    - Appendix A describes the System Notebook Tabs in System IQ. This description does not align with the actual tabs in the System IQ software application.
3) N-INS-01071-10000, Appendix B, describes the Indicator: Predefineds-Total of Late and Deferred. Consider clarifying ambiguity on whether to report “interim deferrals” or “limited deferrals” in the PM late and deferred PIs.
4) Consider referencing SPV guidance (N-GUID-03640-10000-R00, SPV Management and N-GUID-03611-10006, SPV Mitigation Guide) in ER governance.

Recommendation:

Consider updating ER governance to address the items noted.

AR#: 28190719-03 has been accepted by Manager, Engineering Programs Integration.

Insight 4: External SME Insight on Single Point of Vulnerability

An external subject matter expert from [redacted] participated in the audit and provided insights on the Single Point Vulnerability (“SPV”) mitigation process for line consideration based on Electric Power Research Institute (“EPRI”) guidance document EPRI 3002005419, SPV Process Guide August 2015.

Condition:

Section 3.8 of the EPRI Guide discusses selection of elimination or mitigation as the correct strategy. Cost-effective elimination is described as the preferred strategy, because it eliminates known and unknown failure modes.

Section 3.9 discusses design changes plus elimination methods that are not limited to design changes. If elimination is not cost-effective, mitigation may be the correct choice. However, the full cost of this strategy must also be considered, especially in light of the potential impact on maintenance resources. Mitigation strategies that are not fully implemented have resulted in scrams.

Passive components are normally excluded from classification as SPV. However, many utilities have included passive components with a known, active degradation mechanism. Examples include vibration of piping or electrical connections.

Mitigation strategy is intended to prevent future SPV failure. PM templates do not necessarily address all probable failure mechanisms, and therefore should not be the only source of information

for assessing the adequacy of the mitigation strategy. There is insight contained in the informal Unmitigated SPV Review Guide provided to SEs which could be included. Additional reference to vendor documents or industry operating experience could add value.

Recommendations:

1) Consider including assessment of elimination first in SPV guidance N-GUID-03611-10006, SPV Mitigation Guide, as described in EPRI guidance.
2) Consider including passive components in the component classification guidance of N-PROC-MA-0077, Component Criticality.
3) Consider updating Section 3 of N-GUID-03611-10006 to include more information on identifying all potential failure modes for a component.

AR#: 28190719-04 has been accepted by Manager, Engineering Programs Integration.

Insight 5: DNR System Engineering Participation in Monthly ER Peer Meetings

Condition:

The audit noticed that there was no representation of DNR System Engineering at the ER Peer team meeting held on April 28th 2016 or earlier meetings. Given the significance of the DNR project activities, there may be potential impacts on the ER program for systems and equipment within the islanded area.

Recommendation:

Line organization is to consider inclusion of a STRAT IV manager from the DNR System Engineering (or delegate) to attend the monthly ER Peer Team meetings.

Management Action:

AR# 28190720-01 has been accepted by Director, Equipment Reliability to consider this insight.

Insight 6: Walkdown and Trending Improvement

Condition:

Inefficiency within the existing SE walkdown activities may be contributing to performance gaps identified for system trending and system walkdown, for example:

- Some poised systems may not require as frequent a walkdown and should focus on testing or modifications in progress. Consider a graded approach in specifying walkdown scope and frequency.
- Consider utilizing data that is already collected by other means (via operator rounds or PI).

Recommendation:

Consider incorporation of a graded approach to SPMPs (including walkdown checklist) by reviewing system SPMPs to identify key activities that are mandatory and activities that are optional and identify alternative means of obtaining data.

AR#: 28190721-01 has been accepted by Senior Manager, Plant Reliability Pickering to consider this insight.

AR#: 28190723-01 accepted by Manager, Performance Engineering Darlington to consider this insight.

AR#: 28190724-01 accepted by Senior Manager, Plant Reliability DNR to consider this insight.

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Insight 7: PM Metrics

Condition:

PM metrics in the PM Health Report are not reported to show actual value per unit, for example:

- Deferral of Critical PMs measures the performance by average per unit;
- Timely Completion of ER PMs measures the performance by percentage of Station's PMs not completed within the first half of grace period; and
- CR backlog measures the performance by count per Station.

PM metrics used in the stations' PM health report are defined in the N-GUID-09180-10000, "Preventive Maintenance Review Process". PM indicators are defined differently in the Candu Owners Group ("COG") ERI guideline COG-GL-2010-02. Also, the colour thresholds are different between the two documents.

Recommendation:

Consider evaluating and discussing at ER Peer team meeting whether the PM metrics reported in the PM health report should align with the PM indicators reported as part of the ERI and if there is value in showing the actual value per unit instead of average per unit, percentage of station total or station totals.

AR# 28190719-05 has been accepted by Manager, Engineering Program Integration.

4.0 SCRS INITIATED DURING THE AUDIT

SCR	Owner (Position)	Title
P-2016-14572	P-PECM	Training required prior to be stepped up as a Section Manager.
D-2016-14443	D-SEPEM	Two Performance Engineering Section Managers not fully qualified.
N-2016-14248	N-NRENGERM	Some training gaps in Nuclear Refurbishment System Engineering.

5.0 LIST OF ACRONYMS

CCA	Component Condition Assessment
CAP	Corrective Action Program
COG	Candu Owners Group
DNR	Darlington Nuclear Refurbishment
ECI	Emergency Coolant Injection
EO	Evaluating Organization
EPRI	Electric Power Research Institute
ER	Equipment Reliability
ERI	Equipment Reliability Index
ESW	Emergency Service Water
ESP	Engineering Support Personnel
ESW	Emergency Storage Water (Pickering) / Emergency Service Water (Darlington)
EWS	Emergency Water Supply
FFE	Functional Failure Evaluation
NFI	Nuclear Fleet Initiative
OPEX	Operating Experience
OPGN	Ontario Power Generation Nuclear
OP&P	Operating Policies and Principles
PI	Performance Indicator
PMEL	Performance Monitoring Equipment List
QID	Qualification Identification
SA	Self-Assessment
SCR	Station Condition Record
SE	System Engineer
SHR	System Health Report
SMART	Specific, Measurable, Achievable, Reasonable, and Timely
SRST	Safety Related System Test
SME	Subject Matter Expert
RC	Recurrence Control
TCD	Target Completion Date
TRF	Tritium Removal Facility
WANO	World Association of Nuclear Operators

6.0 AUDIT TEAM

The team consisted of:

Audit Team Leader:	Terri Walsh – Nuclear Oversight
Auditor	Alex Visan – Nuclear Oversight
Auditor	Maher Ghannam – Nuclear Oversight
Auditor-in-Training:	Bruce Crewe – Nuclear Oversight
Auditor-in-Training:	Evan Davidge – Nuclear Oversight
Auditor-in-Training:	Jane Liu – Nuclear Oversight
Subject Matter Expert:	[redacted]
Senior Manager:	Herminia Román – Nuclear Oversight

Prepared by: _____ Date: June 29, 2016

Terri Walsh
Audit Team Leader
OPG Nuclear Oversight - Engineering

Approved by: _____ Date: June 29, 2016

Herminia Román
Senior Manager
OPG Nuclear Oversight - Engineering

Appendix A1- Additional Supporting Facts for Finding #1

Performance Engineering staff qualifications in TIMS II

Table A1.1. List of SEs performing work independently without being qualified in TIMS II:

Facility	System	Preparer ID	Incomplete QIDs
Pickering	EWS (P58)	[redacted]	8568, 8570
Pickering	Reactor Building Dryers		8570
Pickering	Service Water		6168, 8568, 8570
Darlington	Boiler Feedwater/Condensate		8570, 6501
Darlington	Low Tritium Cold Box & Refrigeration		8568, 8570

QID 6168: Core Engineering Qualification
QID 8568: System Engineer core training
QID 8570: System Engineer common duty areas
QID 6501: System Engineer Qualification for Boiler Feedwater

Table A1.2. List of SEs not fully qualified in TIMS II (Total staff: 79):

Facility	Employee IDs	Incomplete QIDs
Darlington	[redacted]	6168 (linked)
Darlington		8568 (linked)
Darlington		8570 (linked)
Darlington		Not linked to 8568 and/or 8570

Table A1.3. List of six SEs at DNR who performed work while not qualified in TIMS II and no co-preparer or reviewer:

Product Prepared SPM #	System	Preparer ID	Missing QID
NK38-NR-SPM-72300-10001	Service Water System	[redacted]	8570
NK38-NR-SPM-72100-10001	LP Service Water System		8570
NK38-NR-SPM-50340-10001	Class IV Power System		6168, 8568, 8570

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Product Prepared SPM #	System	Preparer ID	Missing QID
NK38-NR-SPM-38300-10001	Vapour Recovery	[redacted]	8568, 8570
NK38-NR-SPM-33410-10001	Shutdown Cooling System		8570
NK38-NR-SPM-33100-10001	Primary Heat Transport System		8568, 8570

Table A1.4. List of SMs not meeting the minimum legal qualification requirements to supervise staff:

Facility	Title	Preparer ID	Missing/ Incomplete QIDs
Pickering	Section Manager (acting) – Electrical Systems	[redacted]	36738, 4103 (not linked)
Darlington	Section Manager – Primary Systems		36738, 4103 (linked)
Darlington	Section Manager – Fuel Handling		36738, 4103 (linked)

QID 36738: Health & Safety Law
QID 4103: Stepped-Up supervisor

Table A1.5. List of non-qualified SEs performing work with back-up provided by their SMs, who have been de-linked in TIMS II from the required QIDs to provide technical reviews:

Facility	Employee IDs	Incomplete QIDs
Pickering	[redacted]	8568, 8570

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Appendix A2 – Additional Supporting Facts for Finding #2

1) Trending

Table A2.1. Deficiencies in trending system PI data in System IQ for systems sampled:

System	Deficiency
Darlington Boiler Feedwater	Performance data recorded on walkdown sheets such as pressure and temperature data recorded from the Main and Auxiliary Boiler Feed pumps is not being trended and documented in System IQ or the system notebook.
Darlington ESW	Safety Related System Test (SRST) results are not trended. The data can be retrieved as required but is not actively trended in System IQ or the System Notebook.
Darlington Tritium Removal Facility ("TRF")	Up-to-date graphical trends of performance indicators for critical components are not included in the SHR. The data is tracked in a Microsoft Excel file which is not linked to System IQ.
Pickering Emergency Water Supply	Trending of some SRSTs are performed by the SE and stored in the electronic system notebook; however, SRST trends are not attached to the SHR or link provided in System IQ.
Pickering Screenhouse	Performance data recorded on walkdown sheets, such as the pressure drop across travelling screens, is not being trended and documented in System IQ or the system notebook. As per the SE, there are limitations to the use of the trended data from walkdowns and performance indicators data is being utilized to support day to day activities and functional failure evaluations.

2) Walkdowns

Table A2.2. Deficiencies in frequency and documentation of system walkdown data

System	Deficiency
Darlington Boiler Feedwater	Walkdowns are not being consistently performed as required by NK38-SPM-43000-10001. Walkdown sheets could not be found in the System Notebook for 12 of 20 weeks samples from 2016. The SPMP requirement is to walkdown a different unit each week to meet the requirement to walkdown all units once per month. The line has stated that this section was challenged with staff turnovers and supporting the D1641 outage.
Darlington TRF	Formal walkdowns are not regularly completed at the required weekly frequency. Documentation shows walkdowns are typically performed once per month at best. The SE goes in the field often, but not for a complete walkdown. The line stated that the TRF has been in outage since August 7, 2015. The SM can approve an exception to the walkdown schedule which was performed for the outage but not formally documented. Line concurred that an outage walkdown sheet should be used during those periods, since the regular walkdown sheet is not applicable.
Darlington ESW	SE indicated that informal system walkdowns are conducted two or three times a week. However, SPMP walkdown checklist is lower priority compared to other urgent station needs and is often not utilized to record field observations. There was no evidence of recorded walkdown sheets in the electronic system notebook.

System	Deficiency
Pickering Screenhouse	Walkdowns are currently being executed biweekly. SPMP P-SPM-71100-0466317 requires a weekly walkdown. SE field walkdowns are completed multiple times during any given week to interact with maintenance, assessing, work control and operations personnel and identify emergent equipment issues and resolution path forward. This is not reflected in the walkdown, since not every piece of data on the trending sheets is gathered during these routine walkdowns. The current frequency of walkdowns and walkdown-specific activities has Section Manager's approval. Also, the SE has adopted a customized Walkdown Sheet and is not using the SPMP Walkdown sheet. This customized sheet is more detailed; the SPMP should be updated to reflect this.
Pickering ECI	Walkdown sheets not available in the system notebook. Walkdowns are being performed and walkdown sheets completed; however, they have not been uploaded to the electronic system notebook to date.
Pickering EWS	Walkdowns have been conducted. Completed walkdown sheets are not consistently scanned into the electronic system notebook. Trending of walkdown results is not evident. The line response is that for a poised system, there is no value is added in trending of walkdown results.

3) SPMPs

Table A2.3. Gaps and inconsistencies in SPMPs for systems sampled.

System & SPMP #	Deficiencies
Pickering Screenhouse, P-SPM-71100-0466317 R003	• System performance goals do not align with the PI targets. • Two of 23 PI do not align between SMPM and SHR.
Pickering EWS, NK30-SPM-71380-00001 R010	• System performance goals and targets are exhaustive and some do not align with indirect PIs from Section 5.0. • Some SPMP PIs do not line up with SHR.
Pickering ECI, P-SPM-33350-0559027 R03	• Many misalignments between the Functional Failure Evaluation ("FFE") section and the PMEL. • Performance target is equal to OP&P limit. Targets should be more conservative than OP&P limit.
Darlington Boiler Feedwater, NK38-SPM-43000-10001 R009	• Seven of eight system performance goals do not align with the PI targets of the SHR. • An indirect PI list was provided in Section 5.0. However, it did not include a grading scale/acceptance bands. • A list interfacing systems was not provided in the SPMP.
Darlington ESW, NK38-SPM-72800-10001 R005	• Section 5.0 Indirect PI predefines indicator definition needs to be revised from "due date" to "late date" for consistent reporting. • Indirect PI colour criteria for System Unique Indicators "Station Condition Records", "Forced Loss Rate", and "Leaks" stated as "Green, White, Yellow, Red, as per system team discretion. Team discretion is not a quantifiable acceptance band.
Darlington TRF, NK38-SPM-39000-10001 R006	• FFE contains issues in the first five failure modes (only the first five failure modes out of 20 sampled).

4) SHRs

Table A2.4. List of deficiencies in quality of SHRs for systems sampled.

System & SHR #	SHR Deficiency Areas									
	Scorecard data not aligned with supporting data	**Executive summary not aligned with supporting data**	**PI summary missing write-ups**	**Missing information in Reviews and Assessments**	**Action plans lacked clear TCDs and resolution**	**Outdated or missing OPEX**	**SHR past status not shown**	**Errors and out of date information in supporting data**	**External reviews not documented**	**Alignment issues with CHR or CCA**
Darlington Boiler Feedwater	√			√	√	√			√	√
Darlington TRF				√	√	√		√	√	
Darlington ESW	√	√	√	√	√	√	√		√	
Pickering Screen house	√			√	√			√	√	
Pickering ECI						√		√	√	√
Pickering EWS	√		√	√	√	√		√	√	√

5) System Notebook

a) In the System IQ software application, the tabs for System Notebook do not align with the description in Appendix A of N-PROC-MA-0024 R015.

b) Six of six systems sampled do not use System IQ as the main repository to provide system related information or provide necessary links in System IQ for information retrieval.

c) If not stored in System IQ, governance states that a link should be provided to the electronic system notebook. Links to the electronic system notebooks were not provided in System IQ, but electronic system notebooks were available. Deficiencies were found in five of six electronic system notebooks sampled.

Table A2.5. List of deficiencies in system notebooks

System	Deficiencies
Darlington Boiler Feedwater	• Hard copies of walkdown sheets are not uploaded into notebook • a comprehensive list related to system configuration and modifications was not included • No detailed information regarding critical spares • No system procedures folder • Contacts folder empty
Darlington ESW	• Turnover documents started, but were incomplete and not signed or filed. • No folder created for critical spares • No maintenance procedures listed in procedures folder • Contacts folder empty
Pickering Screen house	• A comprehensive list related to system configuration and modifications was not included • No detailed information regarding critical spares • Outdated contact list
Pickering ECI	• No completed turnover checklists • No detailed information regarding critical spares • Outdated contact list
Pickering EWS	• No turnover documents for the current system engineer • Contacts folder empty

6) System Turnover:

d) In six of six systems sampled, Turnover Records (N-FORM-10356 and 10377) were not filed in Asset Suite in accordance with Section 4.2 of N-PROC-MA-0023.

e) Two of six current SEs (Pickering ECI and Darlington TRF systems) did not receive any turnover. Experienced engineers were near, but no turnover conducted.

Appendix A3 – Additional Supporting Facts for Finding #3

Table A3.1. List of components with deficiencies in technical basis of PM tasks and PM templates

System	Component ID (Unit-SCI-Device)	Deficiency
Pickering EWS	5/6/7/8-67138-HTR01	• Components with no PM template and technical basis in IQ Review – not transferred over from PMLP
	5/6/7/8-67138-HTR02	
	5/6/7/8-67138-HTR03	
	5/6/7/8-67138-HTR04	
	5/6/7/8-67138-HTR07	
	058-67138-HTR04	
	056-67138-HTR05	
Pickering ESW	056-71330-HTR501	• Components with no PM template and technical basis • Components with no PM Setup to prevent failure of the heaters Note: PMs exist to place and remove the heat tracing in/from service
	056-71330-HTR502	
	056-71330-HTR503	
	056-71330-HTR504	
	056-71330-HTR505	
	056-71330-HTR506	
	078-71330-HTR507	
	078-71330-HTR508	
	078-71330-HTR509	
	078-71330-HTR510	
	0-71330-HTR501A	• Components with no record or technical basis in IQ Review • Components with no PM Setup
	0-71330-HTR501B	
	0-71330-HTR501C	
	0-71330-HTR501D	
	0-71330-HTR502	• Components not designated as Safety Related
	0-71330-HTR503A	
	0-71330-HTR503B	• Components with incorrect PM template applied in IQ Review • Components not designated as Safety Related
	0-71330-HTR505A	
	0-71330-HTR505B	
	0-71330-HTR509A	• Components with no criticality code and no PM template applied
	0-71330-HTR509B	
Pickering ECI	5/6/7/8-33350-MV35	• Components with incorrect PM template applied in IQ Review
	5/6/7/8-33350-MV36	
	5/6/7/8-33350-MV54	
	5/6/7/8-33350-MV55	

Appendix B - Learning Behaviors

The audit team evaluated the application of Learning Behaviours as applicable to ER Program activities which were found to be generally effective. However deficiencies and weaknesses were identified in the application of the CAP.

Corrective Action Program:

The effectiveness of the CAP implementation was considered to be not fully effective.

Gaps were found in the two of four SL2 SCRs sampled. Also, issues were identified in a Recurrence Control ("RC") corrective action of a third SCR where the CAP was considered not effective.

Also, two of the six previous audit findings SCR CAPs were found to be not effective, and another two had some gaps in the completion of their corrective actions. (See assessment of previous audit findings below.)

Table B.1. List of SCR CAPs reviewed with gaps.

SCR Number	Resolution Category, Significance Level, Evaluation Type	Action Tracking	RC action with SMART criteria not defined	EOER indeterminate with no follow-up
P-2015-18445	C2 – ACE required	28181965-01	X	
		28181965-04	X	
D-2014-01152	C2 – ACE required	28165238-08		X
		28165238-12	X	

Self-Assessments:

Self-assessments ("SA") were conducted by the line organizations (Pickering, Darlington, and Corporate Nuclear) and overall use of the tool was considered generally effective with some minor weaknesses found in two of the six SAs that were reviewed. Examples include: untimely completion, missing dispositions, and incomplete tabs in the SA database.

DNR has not yet conducted SA of ER program activities as they are not yet implemented.

There were two comprehensive SAs (P15-000242 and D15-000727) completed, one divisional and one departmental. SAs were self-critical and identified issues that were noted by the audit or reported by the ER program Fleetview report.

Benchmarking is being performed and recorded in the SA database as required.

Observation & Coaching:

The use of Observation and Coaching ("O&C") was considered generally effective. The audit team found inconsistencies on how each line organization has been implementing the new requirement particularly on whether the Field Observation Notebook is being literally used; how management supervisors trend the issues identified in the observations; and how they communicate these issues to the rest of the organization. Line organizations are crediting their managers' personal notebooks, department direct report meetings, SCRs that they are initiating, and their regular day to day interaction with their direct reports. The use of the Field Observation Notebook as required by governance N-INS-09030-10004 has not been consistently followed in DNR and the Corporate

Nuclear organization to a larger extent than Pickering and Darlington. However, the audit concludes that the intent of utilizing the O&C process to drive Human Performance improvement is met.

Fleetview Program Reporting:

The Fleetview program health reporting was considered generally effective. Fleetview reports and the associated action plans were reviewed for Q3 2015, Q4 2015, and Q1 2016. The full reports are issued annually while sections B & C (performance analysis and action plan) are issued quarterly. All the actions plans reviewed have actions with ARs for tracking, action owners identified and completion due dates. Normally actions are closed out within the due dates with closure notes in the AR. Some actions that are closed out without being fully and effective as similar actions re-appear in SAs. Long standing items were identified throughout the reports reviewed with new improvement or recovery initiatives in place, such as NFI-04 AM2 to AM9 to improve ERI Performance. No reference to Darlington Refurbishment was found in the reports reviewed.

Operating Experience:

The use of Operating Experience ("OPEX") was considered effective. OPEX activities are performed consistently across the line organizations. WANO areas for improvement were dispositioned through the SCR process (two samples reviewed).

Internal OPEX is demonstrated by the ER program Peer Team meeting consisting of Performance Engineering managers from Darlington, Pickering, Nuclear Waste Management, and Nuclear Support (Corporate). DNR was not present – see Insight 5.

These meetings are held monthly with an established quorum to discuss the program improvement action plans, station metrics, fleet initiatives, OPEX from industry working groups, and station action plans. External OPEX is demonstrated by benchmarking other utilities. For example, OPG was the first COG utility to implement new ERI sub-indicators in Q1/2016.

Disposition of Previous Audit Findings:

The 2013 ER audit (NO-2013-002) found performance deficiencies in the following three areas:

- Finding 1: Deficiencies in Preventive Maintenance Implementation;
- Finding 2: Deficiencies in System Surveillance activities; and
- Finding 3: Deficiencies in Predictive Maintenance and System Health Report

The audit reviewed the areas related to Findings 1 & 2 and recognize that considerable effort has been made and is still ongoing to improve these deficient areas, including, the PM deferrals, unmitigated Single Point Vulnerability ("SPV"), equipment failure trending, and system performance monitoring; by implementing a recovery initiative under NFI-04 Equipment Reliability Excellence Plan has just started in Q1/2016. However, this audit identified related issues that still exist from the 2013 audit findings:

- The PM deferral backlogs are still problematic; and
- Some weaknesses still exist in system performance monitoring activities.

Two of the six previous audit findings SCR CAPs (SL2) were found to be not effective, and another two had some gaps in the completion of their corrective actions.

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Table B.2. List of previous audit finding SCR CAPs reviewed with gaps.

SCR Number	Resolution Category, Significance Level, Evaluation Type	Action Tracking	RC action with SMART criteria not met or specified	EOER indeterminate with no follow-up	Barrier Analysis not attached to SCR CAP
P-2013-07134	C2 – ACE required	28157812-01	X		
		28157812-04	X		
		28157812-05		X	
D-2013-05089	C2 – ACE required	28157624-01	X		
		28157624-04	X		
D-2013-05085	C3 – ACE required	28157108-01	X		X
P-2013-07138	C3 – ACE required	28157094			X
P-2013-05086	C3 – ACE required	28157109-02	X		

Appendix C - Audit SCR Significance Level

Significance Level	Definition as per N-LIST-01966-10000 Section 11.0 Audit Finding
SL1	**A highly significant event** or adverse condition or programmatic implementation deficiency that causes a major reduction in the margin of safety to the public or to station personnel and/or which has a major impact on the environment or on production or on other business deliverables.
SL2	An issue identified and reported to management during the audit / assessment for which there was Nuclear or Conventional Safety risks and the issue was not handled with appropriate response. Significant organizational and / or programmatic deficiencies are identified: • A program is not fully or effectively implemented. • High impact or chronic performance problems exist with the execution of the program. • There is a relatively high risk of a breakthrough event, due to organizational or programmatic issues. Note that this means that breakthrough events may not have occurred yet. • Evidence of lack of management oversight of key program areas. • The organization was reliant on Nuclear Oversight to identify program deficiencies (i.e. line organizational barriers are ineffective). • Management oversight efforts have been ineffective at identifying and/or correcting performance concerns. A significant issue that supports escalation of the audit / assessment; (i.e., a program deficiency that is cross-functional in nature or has substantially reduced the effective execution of a program or element of a program). Related findings: • The audit / assessment team identifies that actions taken to correct a previous finding were not effective and cause it to reappear as a finding which contains the most fundamental aspects of the previous finding. • This should normally increase the SL from a 3 to a 2 since there is an aspect of ineffectiveness of Corrective Actions or Management Oversight, as well as lack of response to the Nuclear Oversight organization.
SL3	All other findings not meeting the criteria above. Programmatic implementation deficiencies, which have the potential to be more significant or may be the precursor for more significant events, are identified by the finding. The audit / assessment team identifies that the problem(s) associated with a previously identified finding still exists. The finding is considered as a “continued” finding, if the following are true:

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Significance Level	Definition as per N-LIST-01966-10000 Section 11.0 Audit Finding
SL3 cont'd	• Mitigating actions are in place and considerable progress is being made in resolving the problem(s). • Long term plan is established and appropriate actions are in progress on a reasonable schedule for completion. • Some improvement in performance is evident. Learning Behaviours: • Deficiencies in use of the Corrective Action Program to self-identify and resolve adverse conditions. • Self-assessments are not timely, not self-critical, and/or recommendations are not dispositioned. • OPEX not used effectively (i.e. internal and external).

Appendix D– Overall Audit Report Rating Scale

An overall report rating has been assigned as an indication of the overall implementation, performance and risk management practices for the program that was subject to the Nuclear Oversight audit. Ratings are derived through professional judgment by the audit team and discussion with management.

- *(Green) Demonstrates Industry Best Practice:* The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrates pro-active self-critical learning behaviours with a focus on continual improvement.
- *(White) Effective*: The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.
- *(Yellow) Not Fully Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.
- *(Red) Not Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.

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Appendix E- Completed Audit Rating Criteria Sheet

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.	MANAGED SYSTEM CONTROLS ARE EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.		YELLOW
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**		**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	**Program**	
	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or **not well understood.** Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.		Finding 2: Some interface issues noted between system and component monitoring and health reporting.
	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and **challenges exist to effectively support OPGN requirements on a sustainable basis**.	Organizational roles and accountabilities are not established and/or are not sustainable.		Finding 1 &2 : Performance engineering staffing levels are challenging the execution of the Equipment Reliability Program core activities
	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	**Isolated examples of persons performing activities for which they are not shown as qualified within TIMS.** Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.		Finding 1: In isolated examples, it was not evident that products prepared by unqualified staff were reviewed/co-prepared by qualified staff.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. **Adverse trends are self identified and addressed via the CAP process**.	CAPs or plans to correct performance issues are n**ot consistently effective or well executed**.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	**CAP/OPEX**	Learning Behaviours - previous audit findings not effectively resolved. Contributing to Findings 2 & 3.
	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.		
	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	**Responsive to independent organizations** (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	**Repeat issues identified by independent organizations** (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.		WANO and NSRB have identified unresolved issues with PM and ER
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	**Performance**	Findings 2 and 3
	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.		N/A
	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.		Finding 2 - for six of six systems sampled, issues exist with the implementation of the core program activities.
	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie, not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.		Finding 2 - Adverse System trends may not be observed in a timely manner to allow for the initiation of remedial actions to prevent equipment or component failure.
	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.		Finding 2
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	**Oversight**	Finding 3 - PM Indicators and Fleetview / ERI show performance not meeting expectations.
	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.		While SA's are identifying issues and are self-critical some performance issues exist.
	No significant adverse trends are evident.	Limited performance adverse trends are evident and **action plans are in place to improve performance.**	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.		Finding 2 - Less than adequate proactive trending and preventative maintenance
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		NA
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		NA

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Appendix F - Standard Audit Scope

The standard audit scope included a review of the following areas to assess compliance, implementation and performance effectiveness:

- Program Governance (N-PROG-MA-0026 R02, Equipment Reliability, and implementing procedures and standards);
- Management Oversight / Learning Organization / Corrective Action Program – including previous audit findings, Root Cause Analysis, SA, O&C, Fleetview reporting, and OPEX;
- Line Management interfaces with other programs, organizations, and CFAM; and
- External insights – WANO, Nuclear Safety Review Board, Canadian Nuclear Safety Commission, and any applicable Significant Operating Experience Reports.

ONTARIO POWER GENERATION

INTERNAL USE ONLY

Nuclear Oversight

Audit: Risk and Reliability Program, NO-2016-013

Record Number: N-REP-01070-0606747 T06

Date: August 12, 2016

Report Rating: | **WHITE** |

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Nuclear Oversight conducted an audit of the Risk and Reliability ("R&R") Program at Pickering, Darlington, Darlington Nuclear Refurbishment ("DNR"), and the Corporate Nuclear Engineering organization from June 27 to July 15, 2016.

The objective of this performance based audit was to determine whether the R&R Program requirements defined in governance have been met and effectively implemented to support the safe and reliable operation of Ontario Power Generation ("OPG") nuclear reactors.

The audit acknowledged that considerable improvements have been made in the areas of on-line and outage risk assessments, fault monitoring and recording, maintaining the Probabilistic Safety Assessments ("PSA") as well as cost saving efforts and improved efficiencies as noted in the positive observations. However the audit also recognized weaknesses in the implementation of some elements such as the Probabilistic Risk Assessment Issues Database ("PRAID"), mission time testing, timely updates of Systems Important to Safety ("SIS") & Components Important to Safety ("CIS") lists and documenting deferral assessments. In addition some gaps were identified with training qualifications and alignment of training documents.

This performance based audit of the R&R program has identified that the managed system controls are effective (WHITE).

The audit identified two findings which are described in Section 3.

Ref #	Finding	Significance Level		
		SL1	SL2	SL3
1	Some Risk and Reliability Program requirements were not effectively implemented as evidenced by non-compliances and performance gaps such as managing the PRAID and mission time testing.			X
2	Reactor Safety staff were performing work independently for which they were not fully qualified in TIMS II. In addition, there are misalignments in the qualification requirements between the required training documents.			X

Positive observations

i) Pickering Reactor Safety Program Support staff conducted a strategic initiative to evaluate the impact of reducing the frequency of Safety Related System Tests ("SRST") and License Preventive Maintenance activities at Pickering. The evaluation resulted in cost savings and backlog reductions without adversely impacting risk or system availability.

ii) Risk reduction initiatives drove the implementation of a new Guaranteed Shutdown State ("GSS") at Darlington: moderator drained-rod based GSS. First trialled in D1641, this GSS results in a reduction of severe core damage risk. In addition to the risk reduction, this will

allow future outages to benefit from enhanced maintenance window flexibility. Pickering also implemented a similar rod based GSS with the moderator drain during P1561.

iii) The Nuclear Safety and Technology Department ("NSATD") has recently developed and issued revised PSA models with world-leading methodologies and has received recognition from the Canadian Nuclear Safety Commission ("CNSC") and industry such as Electric Power Research Institute's ("EPRI") Technology Transfer Award.

iv) Pickering Reactor Safety Program Support staff are revising the new SIS unavailability models in-house. Completion of this work in-house resulted in cost savings for OPG and broadens Reactor Safety Engineering Department ("RSED") staff knowledge.

v) The Nuclear Safety Analysis Department at DNR has proactively started an interim update to the Darlington A Risk Assessment ("DARA") 2016 to reflect the major safety improvements to plant design as well as the operating configurations prior to and during Unit 2 Refurbishment.

Learning Behaviours

The application of Learning Behaviours by the R&R Program organization was found to be not fully effective in the use of Recurrence Control ("RC") actions in Corrective Action Plans ("CAP"), dispositioning Self-Assessments ("SA") recommendations and with Fleetview Program reporting.

Audit Insights

There were two Audit Insights which are summarized in Section 4. The first insight relates to establishing an internal working group or peer team to enhance synergies between the stations. The second is for performing trending of internal program related Station Condition Records ("SCR").

Station Condition Records

Six SCRs were raised during the audit and are listed in Section 5.

2.0 Background

The purpose of N-PROG-RA-0016, "Risk and Reliability Program", is to provide organizational accountabilities, interfaces, and key program elements to ensure that risks from nuclear accidents are identified, monitored and controlled.

N-PROC-RA-0048, "Conducting Performance Based Audits and Assessments", requires periodic audits of all programs under the Nuclear Management System Charter. This audit fulfills that requirement for the R&R Program.

2.1 Audit Objective & Scope

The objective of this performance based audit was to determine whether the R&R Program requirements defined in governance have been met and effectively implemented to support safe and reliable operation of OPG nuclear reactors.

The following program specific items were reviewed:

- Management of the PRAID;
- Assessing and managing risk for Equipment Out of Service ("EOOS");
- Reliability monitoring and reporting;
- Preparation and revision of Probabilistic Risk Assessment ("PRA") / PSA per requirements; and
- Preparation/planning of DNR PSA for the refurbishment outage.

Standard audit scope is also included and is listed Appendix F.

3.0 AUDIT FINDINGS

1. Some Risk and Reliability Program requirements were not effectively implemented as evidenced by non-compliances and performance gaps such as managing the PRAID and mission time testing.	**SL3**

N-PROG-RA-0016 R009, "Risk and Reliability Program" establishes requirements for the development and use of PSA as a means to manage radiological risk and contribute to safe operation of nuclear reactors. It requires the PSAs to be developed and maintained current, performance of SISs and CISs monitored, assessed and reported in order to meet applicable CNSC regulatory requirements.

The audit team found:

a. Non-compliances and lack of rigour in managing the PRAID process:
   i) Six "Level 1" issues (most significant) were not documented in the SCR database;
   ii) Verification, approval and closure of some issues were not meeting required timelines (14 of 30 samples);
   iii) Some database fields such as the name of the initiator or verifier were not populated;
   iv) Some longstanding issues remained open, e.g. PRAID IDs 488-498 at pending for approximately 2 years;
   v) No database fields for PRA methodology;
   vi) A PRAID administrator/SPOC not assigned;and
   vii) The PRAID registry was not kept up to date and annual peer meetings were not conducted.
b. Mission time testing program reports had outdated documents and changes to the documented maintenance strategy had not been assessed and dispositioned. In our sample of the three mission time reports:
   - All three reports were not updated following PRA updates;
   - All three reports referenced retired Preventive Maintenance Identifications ("PMID") and declined Change Requests ("CR"); and
   - Two of the three reports have some additional requirements which were not implemented (Work Orders not performed and CRs not implemented).
c. Performance gaps in SIS and CIS implementation:
   - SIS and CIS lists were not updated timely to reflect the latest PSAs at Pickering; and
   - One SIS had a miscalculated unavailability target (in the less conservative direction) at Darlington.
d. Deficiencies in documenting risk assessments when processing licensing deferrals at Darlington.

See Appendix A1 for additional details.

Potential Contributing Cause & Impact

Potential Contributing Causes:

- Less than adequate management oversight of implementing governance requirements; and
- Lack of guidance on governance requirements with respect to PRAID management, licensing deferral processing, and/or mission testing.

Impact:

- The aggregate impact of ineffective implementation of program requirements may lead to inaccurate categorization of station radiological risk conditions and reliability of SIS. This ultimately impacts how the station prioritizes and plans work based on assessed risk; and
- Changes to maintenance strategy to support mission testing may impact mission time.

Management Action Plan
SCR N-2016-20257 has been raised to address the finding. The Manager, NSATD, has agreed to be the EO Manager for this SCR at SL 3 to address issue a). SCR P-2016-20258 has been raised to address the finding. The Manager, RSED at Pickering has agreed to be the EO Manager for this SCR at SL 3 to address issues b) and c). SCR D-2016-20259 has been raised to address the finding. The Manager, RSED at Darlington has agreed to be the EO Manager for this SCR at SL 3 to address issues b) and d).

2. Reactor Safety staff were performing work independently for which they were not fully qualified in TIMS II. In addition, there are misalignments in the qualification requirements between the required training documents.	**SL3**

The R&R Program states: *"Staff preparing, applying or interpreting risk models and implementing the risk and reliability program shall be appropriately trained and qualified."*

N-PROG-TR-0005, "Training", provides expectations for training and qualifications, and states: *"Only qualified staff shall be assigned to work on tasks independently."*

The audit identified examples of OPG staff performing work for which they were not fully qualified in TIM II. In our sample of 9 staff at Pickering and 12 staff at Darlington the audit found:

- Two of 21 staff prepared Data Collection and Analysis Tool ("DCAT") entries without Qualification Identification ("QID") 22853;
- Four of 21 staff verified DCAT entries without QID 22854;
- Two of 21 staff reviewed Design Changes without QID 8955; and
- Two of 21 staff processed licensing PMID deferrals without QID 8952.

The audit identified misalignments in Program Element ("PEL") qualification requirements between N-QG-403-00001 R004 "Nuclear Safety Division Qualification Guide and N-TTM-400-00022 R001, "Initial Training - Task to Training Matrix – Nuclear QG for Reactor Safety". For example:

- Task to Training Matrix ("TTM") Task #1 & #2 includes PELs 67438 and 67439, but are not in QID 7669 or 8953 in the Qualification Guide; and
- The TTM is out of date and has not been updated since 2009. It is not clear what the qualification requirements are to perform certain required tasks.

See Appendix A2 for additional details.

Potential Contributing Cause & Impact

Potential Contributing Cause:

- Supervisors were not consistently checking the qualifications of staff members in TIMS II before assigning work.
- There is a significant amount of training, time and experience needed in order to have qualified and capable staff available in NSATD and RSED for support and implementation of the Risk and Reliability program, and there are challenges to maintain this capability and qualification.
- The program is dependent on Training for updating the TTM.

Impact:

There is potential for impact on the quality of products when performing work without the required qualifications. No adverse quality was noted by the audit team for the examples cited in this report.

Management Action Plan

SCR N-2016-20262 has been raised to address the finding. The Manager, NSATD has agreed to be the Evaluating Organization Manager for this SCR at SL 3.

4.0 AUDIT INSIGHTS

Insight #1: Establish an Internal Peer Team/Working Group

Condition: An internal Peer Team or Working Group is not currently in place. Participation in external working groups, such as the Candu Owner Group ("COG") is apparent based on the latest Fleetview; however, there is no team internally to OPG. This is a missed opportunity for review of internal OPEX, identification of improvement initiatives and adverse trends as well as sharing lessons learned. The forum would also allow an additional means for providing management oversight of the program.

During the audit, there were observations of inconsistent practices between the sites. An internal team, if in place, could identify and take action where required. Examples of these include:

- Mission time test reporting format is inconsistent across the fleet; and
- Darlington Station RSED should consider adopting the Pickering RSED's component fault review (DCAT) process which includes; 1) daily meeting to review shift logs, SCRs and WRs, and 2) tracking and recording of potential faults to be input into DCAT database.

Recommendation:

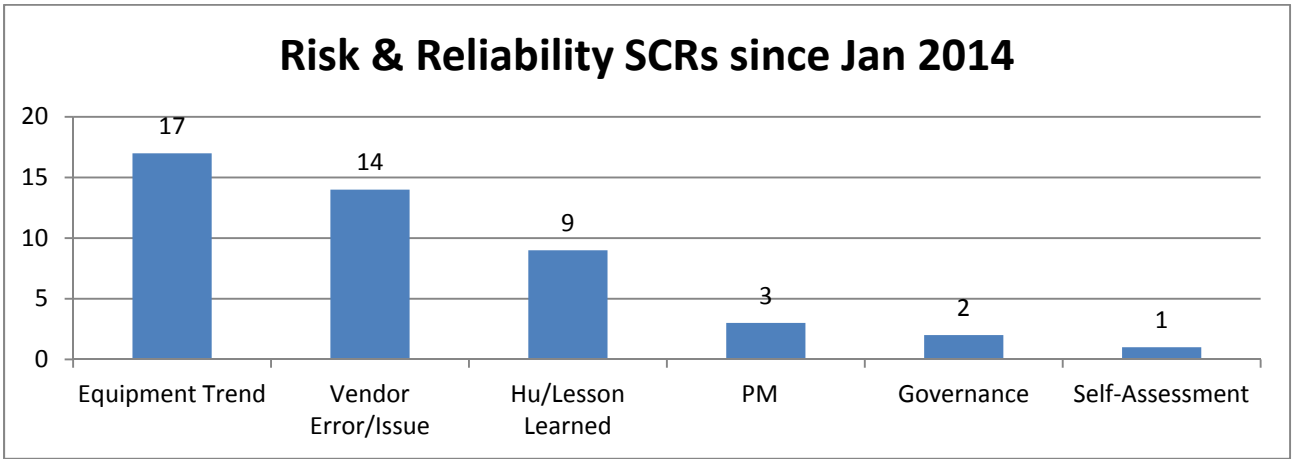
Consideration should be given for establishing an Internal Peer Team/Working Group for the R&R program. Membership should include Reactor Safety staff from Pickering, Darlington, DNR and NSATD, and any other work groups such as Operations.

The Manager, NSATD, has agreed to evaluate this recommendation via AR# 28191997-01.

Insight #2: Perform SCR Trending

Condition: Although high level SCR trending is performed under the Nuclear Engineering quarterly trend reports, trending of SCRs at the program level is not performed. This would provide more detailed and specific results, and potentially result in actions to improve performance.

For example, an SCR query was performed by Nuclear Oversight to search for SCRs relevant to the R&R program since January 1, 2014. A total of 46 SCRs were found using keyword searches with acronyms PRA, PARA, PBRA, PRAID, PSA, DARA, and SIS with results as shown in the table below:



Recommendation:

Consideration should be given for performing trending of internal program related SCRs at an appropriate frequency (recommend yearly).

The Manager, NSATD has agreed to evaluate this recommendation via AR# 28191997-01.

5.0 SCRS INITIATED DURING THE AUDIT

SCR	Owner (Position)	Title
N-2016-16697	N-NSATD	Procedure Non-Compliance – N-PROC-RA-0131: PRA Issues Database Management.
P-2016-16938	P-RSED	Not complying with N-PROC-RA-0131 R00.
D-2016-17839	D-RSED	Unavailability target for Shutdown Cooling System incorrect in Annual Reliability Report.
N-2016-20029	NSATD	Deficiencies in Risk & Reliability program governance and supporting documents.
N-2016-20033	NSATD	Weaknesses identified in Risk & Reliability program learning behaviors related to CAP and SA.
N-2016-20032	NSATD	Weakness identified in Risk & Reliability program Fleetview reporting.

6.0 LIST OF ACRONYMS

ACE	Apparent Cause Evaluation
AR	Action Request
CAP	Corrective Action Program
CIS	Components Important to Safety
CNSC	Canadian Nuclear Safety Commission
COG	Candu Owners Group
CR	Change Request
DARA	Darlington A Risk Assessment
DCAT	Data Collection and Analysis Tool
DCR	Document Change Request
DN	Darlington Nuclear
DNR	Darlington Nuclear Refurbishment
EOOS	Equipment Out of Service
EPRI	Electric Power Research Institute
GSS	Guaranteed Shutdown State
IAEA	International Atomic Energy Agency
NFE	No Further Evaluation
NSATD	Nuclear Safety and Technology Department
O&C	Observation & Coaching
OPEX	Operating Experience

OPG	Ontario Power Generation
PARA	Pickering A Risk Assessment
PBRA	Pickering B Risk Assessment
PEL	Program Element
PM	Preventive Maintenance
PMID	Preventive Maintenance Identification
PN	Pickering Nuclear
PRA	Probabilistic Risk Assessment
PRAID	Probabilistic Risk Assessment Issues Database
PSA	Probabilistic Safety Assessment
QID	Qualification Identification
RC	Recurrence Control
RSED	Reactor Safety Engineering Department
R&R	Risk & Reliability
SA	Self Assessment
SCR	Station Condition Record
SIS	Systems Important to Safety
SL	Significance Level
SMART	Specific-Measurable-Achievable-Reasonable-Timely
SRST	Safety Related System Test
TIMS II	Training Information Management System
TTM	Task to Training Matrix

7.0 AUDIT TEAM

The team consists of:

Audit Team Leader:	Russ Gomme – Nuclear Oversight
Auditor:	Maher Ghannam – Nuclear Oversight
Auditor:	Jack Bastermaji – Nuclear Oversight
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Senior Manager
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Appendix A1-Additional Supporting Facts for Finding #1

Full details for this finding are attached to SCRs associated with Finding #1.

a. PRAID Process Non-compliances

Additional performance criteria:

N-PROC-RA-0131 R000 “Probabilistic Risk Assessment Issues Database Management” specifies the process elements and requirements for managing the PRAID. As a minimum, PRA shall be updated at a frequency required to satisfy regulatory requirements, or when warranted, such as a major design change that significantly affects the overall plant risk.

In-between station PRA updates any issues which may impact the PRA are documented for assessment in the PRAID. Table A1.1 identifies some compliance gaps with managing the PRAID. Ten samples were selected for review from each station.

Table A1.1. List of deficiencies identified in managing the PRAID process.

Item #	PRAID Process Deficiencies	PARA (P014) Issue ID #	PBRA (P058) Issue ID #	DARA (D014) Issue ID #
i)	“Level 1” issues (most significant) were not documented in the SCR database.	542	516, 521, 561, 562	357
ii)	Verification and approval of issues not meeting required timeline	571, 564, 565, 541	539, 575, 574, 568	I577, 575, 570, 563, 559, 560
iii)	Issues with some database fields not being populated (not counting PRA methodology)	579, 576, 573, 571, 564, 565, 540, 535, 558, 555	539, 536, 532, 533, 531, 575, 569, 568	577, 578, 575, 572, 570, 563, 559, 560, 552, 553
iv)	Closure of implemented issues and long standing issues not completed	None found	None found	530 488-498
v)	PRA methodology selected	Not available in database	Not available in database	Not available in database
vi)	PRAID administrator/SPOC assigned	No administrator since May 2016	No administrator since May 2016	No issues

b. Performance Gaps in Mission Test Program Documents

The mission time test reports at each station identify additional requirements to support the mission time of specific equipment which was not implemented at the time the reports were issued. Table A1-2 includes the status of the reports and the status of a sample of outstanding actions from each report.

Table A1.2. Deficiencies in mission time testing program reports.

Mission Test Program Deficiencies	Pickering A NA44-REP-03611-00008 R000 (Sampled 4 outstanding actions)	Pickering B NK30-REP-03611-00018 R001 (Sampled 4 outstanding actions)	Darlington NK38-REP-03611-10060 R000 (Sampled 5 outstanding actions)
Reports not updated following PRA updates.	Report issued in 2012. Not updated to reflect 2014 PARA.	Report issued in 2013. However it was not updated to reflect the 2012 PBRA.	Report issued in 2011. Not updated to reflect 2015 DARA.
Reference outdated information	• Changes in PMID-RQ for E-014 and E-015 tests. • Class III LPSW pump and pump motor one time boroscope results available, but not incorporated into the report.	PMID 18630-08 and PMID 18631-07 were retired for LPECI pumps 056,078-33350-P1,2,3 and PM1,2,3	• HP ECIS Pumps PMID 119996-01 was retired. • ECIS sump pumps 0-34320-P10/P11 changes in strategy for baker testing. • Standby Generator three PMIDs 27133-04/13/15 were retired. • Auxiliary Boiler Feed Pumps one PMID 119999-01 was retired. • LPSW pumps 72100-P1 to P4 PMID 119819-01 was retired and CR2011-00928 was declined.
Additional activities specified but not implemented	• D2O Recovery Pumps and Motors (1,4-33910-P1/PM1, P2/PM2) replacement work orders had not been performed • Standby Generators (012, 034-54600-SG1, SG2, SG3) CR2011-02994 for oil sample frequency increase had been pending approval.	N/A	TPAR 9928 pending for HP and LP ECIS pumps

Notes:
LPSW = Low Pressure Service Water
LPECI = Low pressure Emergency Coolant Injection
HP ECI = High Pressure Emergency Coolant Injection
ECIS = Emergency Coolant Injection System

c. Performance gaps in SIS and CIS updates

Table A1.3. Performance gaps in SIS and CIS implementation.

Document # and Title	Gaps in SIS	Gaps in CIS
Pickering A NA44-REP-03611-00004 R001, Pickering A Systems Important To Safety	• SIS list issued in 2008 is out of date. Pickering has an action to revise SIS which is due in 2017. • Approved document did not contain signatures from Director of Station Engineering and CNE.	No CIS list included in the SIS document.
Pickering B NK30-REP-03611-00024 R000, Pickering B Systems Important To Safety	• SIS list issued in 2014, but based on a 2005 PRA instead of the updated PSA from 2012. • Approved document did not contain signatures from Director of Station Engineering and CNE.	No CIS list included in the SIS document.
Darlington NK38-REP-03611-10100 R000, Darlington NGS Systems And Components Important To Safety	No issues	SDC unavailability target incorrect (separate SCR filed to document this deficiency).

d. Deficiencies in processing licensing deferrals

N-STD-RA-0033 R002 “Reliability Monitoring and Reporting of Systems Important to Safety” specifies that any late tests to verify the reliability of a SIS shall be identified and the impact on system unavailability shall be assessed to ensure that system unavailability targets are met.

The audit team found the following issues at Darlington:

- There was no documented evidence of quantitative risk assessments completed to support conclusion of the risk statements in SRST deferrals (i.e. evaluating the unavailability models to determine margin reduction or referencing a bounding case analysis to demonstrate risk acceptability);
- Qualitative risk levels (low, moderate or high) with respect to licensing deferrals were not defined and determination of risk levels was said by line organization to be based on staff experience and judgment; and
- Licensing predefined maintenance deferrals were approved by the RSED Section Manager without documented evidence of risk assessments (quantitative or qualitative) from RSED technical staff members for 10 samples reviewed (DR 2016-00784, DR 2016-00698, DR 2016-00694, DR 2016-00541, DR 2016-00502, DR 2016-00412, DR 2016-00406, DR 2016-00400, DR 2016-00358 and DR 2016-00339).

Appendix A2 –Additional Supporting Facts for Finding #2

Full details for this finding are attached to SCRs associated with Finding #2.

Some staff were not fully qualified in TIMS II as shown in Table A2.1. Nine staff were sampled at Pickering and 12 staff were sampled at Darlington.

Table A2.1. List of unqualified staff in TIMS II performing R&R related work.

Item	Required Qualifications for assigned RS work	Pickering RSED Employee ID	Darlington RSED Employee ID
1	QID 22853 DCAT basic user	[redacted]	[redacted]
2	QID 22854 DCAT advanced user		
3	QID 8955 RS Design Change Reviews		None Found
4	QID 8952 Processing Licensing Deferrals		None Found

QID and PEL requirements idendified in the Qualification Guide and the task to training Matrix are not aligned for similar tasks as shown in Table A2.2. These misalignments may be a contributing cause to staff performing work without all the required QIDs or PELs.

Table A2.2. Misalignment between training documents.

Qualifications	Qualification Guide N-QG-403-00001 R004	Task to Training Matrix N-TTM-400-00022 R001
QID 7669 Operability Evaluations	Missing PEL 67438 and 67439	
QID 8952 SRST and Licensing PMID deferral and frequency	Missing PEL 28446, 67438 and 67439	
QID 8953 Outage and Online Maintenance Assessment	Missing PEL 67438 and 67439	
QID 8954 SRST Preparation and Revision (DND)	Missing QID 8954	
QID 8955 Design Change Reviews	Missing PEL 67437, 67438, and 67439	
QID 22853 DCAT basic user	Missing PEL 67438	
QID 22854 DCAT advanced user		Missing PEL 67438
QID 23063 Procedure Review	Missing PEL 67438	
QID 27286 Revision of SIS and PRA models	Missing PEL 67439	Missing PEL 67438
QID 27287 Annual Reliability Report	Missing PEL 67437	Missing PEL 28447 and 67438
QID 27288 Procurement & Review of Nuclear Safety Services		Missing QID 27288
QID 33244 PRA Seismic		Missing QID 33244
QID 33245 PRA Fire		Missing QID 33245
QID 33246 PRA Flood		Missing QID 33246
QID 33247 PRA Outage Assessment		Missing QID 33247

Appendix B - Learning Behaviours

Learning Behaviours as applicable to R&R Program were found to be not fully effective. Deficiencies and weaknesses were identified in the application of the CAP, SA and Fleetview reporting.

Corrective Action Program

A review was performed of four SL3 SCR evaluations relevant to the R&R program and it was determined that implementation of the CAP process was not fully effective.

Use of the CAP in R&R is limited mainly to C3 No Further Evaluation ("NFE") evaluations. It should be noted that at this time, there are no staff under R&R who are linked and approved for Qual 4441, "Apparent Cause Evaluator" ("ACE"). Deficiencies were found in four of four SCRs reviewed related to effectiveness of RC actions. In two cases, a RC action was not specified at all and in the other two cases, the RC actions did not meet the Specific-Measurable-Achievable-Reasonable-Timely ("SMART") criteria as defined in the Nuclear Standard N-STD-RA-0008, "Incident Investigation". See the Table below for details.

Table B.1. Gaps identified in the SCRs reviewed during the audit.

SCR Number	SCR Title	Evaluation Type	Deficiencies
D-2015-14316	Two Impairments on Systems Important to Safety were not reported in the Annual Reliability Report	C3 NFE	No RC action was entered. A justification is not documented for why it was not required.
D-2014-24280	Missing Files in DARA PSHA CNSC submission	C3 ACE	For assignment 2, SMART criterion was not specified. The action was to issue a roll-out, which are not effective they will not prevent recurrence.
N-2014-18001	Requirement for annual average risk not included in N-PROC-RA-0132	C3 NFE	No RC action was entered. A justification is not documented for why it was not required.
D-2016-0881	D1641 Reactor Safety Probabilistic Risk Assessment Discovered Conflict with IPG work	C3 NFE	For assignment 1, SMART criterion was not specified.

SCR N-2016-20033 was filed to document deficiencies for RC actions and accepted by the Manager, NSATD to establish corrective actions at all applicable sites. It is recommended that qualification of staff for Qual 4441 be included as part of the corrective action plan.

Self-Assessments

SAs were performed at all sites (DN, PN, and NSATD) which were comprehensive and critical in nature. The three most recently completed SAs for the R&R program were reviewed during the audit.

Table B.2. Gaps identified in the three SAs reviewed by the audit.

Self- Assessment # and Title	Gaps
P16-000253, NO Audit 2016-013 Risk & Reliability - Self-Assessment (PN Departmental)	Not all recommendations had a corresponding disposition or traceable action. This included no action for a gap identified in EOOS training requirements and reference to Document Change Request ("DCR") numbers were not included in the report. Furthermore, the identified issues, including misalignment of requirements between different documents, inadequate mission time failure reporting, as well as the training gap, appear to be adverse conditions for which an SCR is the more rigorous and appropriate approach for dispositioning the issues.
D16-000777, Risk & Reliability Program Implementation Self Assessment (DN Snapshot)	Recommendations were made based on findings; however, it would have been more effective to create Management ARs to track the three DCRs that were generated to ensure timely implementation. In addition, a Management AR was not created to track the fourth recommendation that is tied to the 2016 Annual Reliability Report.
NO14-000591, OPG Risk and Reliability Program - Station and Procedural Alignment (NSATD Divisional)	The issues identified by this SA were related to training, knowledge sustainability, and qualifications in TIMS II. There are indications that these issues still exist as documented in Finding #2 of this report. The recommendations were not effectively dispositioned as the SCR N-2014-34451 that was raised was set to D4 although the conditions identified were significant and considered to be an adverse condition. Although actions were tracked under a Management AR, the SCR process provides a more rigorous approach to ensure implementation of actions to prevent recurrence. It was also noted that for this Divisional SA, an external industry peer was not utilized as required by N-RPOC-RA-0097 R008, "Self-Assessment and Benchmarking", Section 1.2.1 (a) (2).

Although the NSATD department in general, and the R&R section in particular, are actively involved in external Benchmarking activities and industry peer exchanges, these activities are not being entered into the SA database as required by Section 1.6.1 of N-PROC-RA-0097 R008.

SCR N-2016-20033 (same SCR as CAP) was filed to document these deficiencies and accepted by the Manager, NSATD to establish corrective actions at all applicable sites.

Observation & Coaching ("O&C"):

O&Cs were generally effective with some minor weaknesses. NSATD R&R section did not perform O&Cs in 2015 per the requirement of the revised governance N-INS-09030-10004 R000, "Observation and Coaching", which took effect on January 1, 2015. However, NSATD line management indicated that the expectation for their department was to start performing O&Cs per the new standard from Q1 2016 onward. Although limited, evidence of the use O&Cs in 2016 was observed.

Fleetview Program Reporting:

Fleetview reporting was found to be not fully effective. The most recent Fleetview report N-REP-08130-0553418 for the Q1 2014 to Q2 2015 period was reviewed. The deficiencies identified in the report should be reviewed and considered during the preparation of the next reporting period. In addition, some performance improvement recommendations were identified.

The following summarizes the more significant deficiencies:

- The colour rating for six of 13 performance indicators were evaluated more favourably than the program conditions indicate;
- Benchmarking or SAs for program performance indicators in Part B had not been conducted;
- Previous improvement actions have not resulted in improvement of the Overall Program rating for Execution from Yellow. The main contributor to this has been the untimely completion of SIS updates (see Finding #1); and
- Not all actions in Part C have a traceable reference that can be checked to confirm completion status.

These conditions could impact on Senior Management oversight of program health and associated risks as the necessary actions for program improvement may not be identified.

Although N-GUID-08130-10002 R004, “Guide and Instructions for Fleetview Program Health and Performance Report” is a guide, the objective criteria provided in Appendix A for determining colour ratings for indicators should be adhered to or dispositioned if more favourable ratings are chosen.

Furthermore, although the volume of activities at DNR was limited at the time the Q2 2015 Fleetview was issued, DNR R&R activities should be explicitly captured in future Fleetview reports. Additional performance indicators, such as timely and quality updates of the PSAs, should be considered as part of the determination for the overall rating in Part B, Program Execution.

SCR N-2016-20032 was filed to document these deficiencies in Fleetview reporting and accepted by the Manager, NSATD to establish corrective actions and any improvement opportunities. An attachment has been provided in the SCR containing additional details and supporting facts.

Operating Experience (“OPEX”):

The use of OPEX is deemed to be generally effective with one recommendation for improvement. There is evidence of strong external peer team involvement, including participation of the R&R department staff in PSA program related activities with the Candu Owners Group (“COG”), the International Atomic Energy Agency (“IAEA”), and the Electric Power Research Institute (“EPRI”). This includes the exchange of information on R&R practices for harmonization of PSA methodologies and to help steer alignment within the industry. Furthermore, a repository of OPEX reviews is maintained by OPEX coordinators and is reviewed consistently on a weekly basis.

However, there is no internal fleet working groups or peer team in place. This is a missed opportunity for review of internal OPEX and identification of improvement initiatives and sharing of lessons learned between Pickering, Darlington, DNR and NSATD. **Insight #1** has been written for considering the establishment of an internal peer working group.

Disposition of Previous Audit Findings:

The last audit which focused specifically on the R&R program was performed in 2008 under NO-2008-008, “Pickering A Reactor Safety”. Out of the five findings, only Finding #2 captured by SCR P-2008-08750, “Deficiencies in Rigour in the Risk and Reliability Program”, was relevant for this audit. Since the audit took place eight years ago and since then changes have been made to R&R program, a detailed review of the effectiveness of the corrective actions was not considered meaningful; however, based on a review of the completed actions it can be noted that they were implemented as intended. Furthermore, the main issues from the previous finding related to DCAT entries and flagging of Licensing PMIDs were not a significant concern in this current audit in terms of being a repeat occurrence.

Appendix C - Audit SCR Significance Level

Significance Level	Definition as per N-LIST-01966-10000 Section 11.0 Audit Finding
SL1	**A highly significant event** or adverse condition or programmatic implementation deficiency that causes a major reduction in the margin of safety to the public or to station personnel and/or which has a major impact on the environment or on production or on other business deliverables.
SL2	An issue identified and reported to management during the audit / assessment for which there was Nuclear or Conventional Safety risks and the issue was not handled with appropriate response. Significant organizational and / or programmatic deficiencies are identified: • A program is not fully or effectively implemented. • High impact or chronic performance problems exist with the execution of the program. • There is a relatively high risk of a breakthrough event, due to organizational or programmatic issues. Note that this means that breakthrough events may not have occurred yet. • Evidence of lack of management oversight of key program areas. • The organization was reliant on Nuclear Oversight to identify program deficiencies (i.e. line organizational barriers are ineffective). • Management oversight efforts have been ineffective at identifying and/or correcting performance concerns. A significant issue that supports escalation of the audit / assessment; (i.e., a program deficiency that is cross-functional in nature or has substantially reduced the effective execution of a program or element of a program). Related findings: • The audit / assessment team identifies that actions taken to correct a previous finding were not effective and cause it to reappear as a finding which contains the most fundamental aspects of the previous finding. • This should normally increase the SL from a 3 to a 2 since there is an aspect of ineffectiveness of Corrective Actions or Management Oversight, as well as lack of response to the Nuclear Oversight organization.
SL3	All other findings not meeting the criteria above. Programmatic implementation deficiencies, which have the potential to be more significant or may be the precursor for more significant events, are identified by the finding. (Continued Next Page)

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SL3 cont'd	The audit / assessment team identifies that the problem(s) associated with a previously identified finding still exists. The finding is considered as a "continued" finding, if the following are true: • Mitigating actions are in place and considerable progress is being made in resolving the problem(s). • Long term plan is established and appropriate actions are in progress on a reasonable schedule for completion. • Some improvement in performance is evident. Learning Behaviours: • Deficiencies in use of the Corrective Action Program to self-identify and resolve adverse conditions. • Self-assessments are not timely, not self-critical, and/or recommendations are not dispositioned. • OPEX not used effectively (i.e. internal and external).

Appendix D - Overall Audit Report Rating Scale

An overall report rating has been assigned as an indication of the overall implementation, performance and risk management practices for the program that was subject to the Nuclear Oversight audit. Ratings are derived through professional judgment by the audit team and discussion with management.

- *(Green) Demonstrates Industry Best Practice:* The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrates pro-active self-critical learning behaviours with a focus on continual improvement.
- *(White) Effective*: The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.
- *(Yellow) Not Fully Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.
- *(Red) Not Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.

Appendix E - Completed Audit Rating Criteria Sheet

AUDIT RATING CRITERIA: Risk & Reliability Audit NO-2016-013

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES	MANAGED SYSTEM CONTROLS ARE EFFECTIVE	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE		
	The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.**	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.**	**The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.**		**The overall audit rating is WHITE**
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**		**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	Program	
	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.		SCR N-2016-20029 some minor deficiencies in governance.
	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.		
	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.		Finding 2: staff working without quals. Misalignment between training documents.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	CAP/OPEX	
	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.		SCR N-2016-20033 weaknesses in R&R CAP and SA activities.
	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.		
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	Performance	Finding 1: Some elements not effectively implemented.
	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.		
	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.		Finding 1: Some elements not effectively implemented.
	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie, not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.		
	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.		
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Oversight	
	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.		SCR N-2016-20032 Fleetview Reporting weakness.
	No significant adverse trends are evident.	Limited performance adverse trends are evident and action plans are in place to improve performance.	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.		
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		NA
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		NA

Appendix F - Standard Audit Scope

The standard audit scope included a review of the following areas to assess compliance, implementation and performance effectiveness:

- Program Governance (N-PROG-RA-0016 Rev 008, “Risk and Reliability Program”, and implementing procedures and standards);
- Training / Qualification – definition / compliance;
- Management Oversight / Learning Organization / Corrective Action Program – Findings, Self-Assessment, Observation and Coaching (“O&C”), Root Cause Analysis, Fleetview reporting, CAP effectiveness, and Operating Experience;
- Line Management interfaces with other programs, organizations, and Centre-Led Functional Area Management (“CFAM”); and
- External insights – World Association of Nuclear Operators (“WANO”), Nuclear Safety Review Board (“NSRB”), CNSC, and any applicable Significant Operating Experience Reports (“SOER”).

Appendix G - Distribution

TO:

SENIOR VP, NUCLEAR ENGINEERING & CNE	S. WOODS

CC:

DIRECTOR, NUCLEAR SAFETY	C. LORENCEZ
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MANAGER, NUCLEAR SAFETY REFURBISHMENT	G. MARTIN

ONTARIO POWER GENERATION

INTERNAL USE ONLY

Nuclear Oversight

OPGN 2016-016 Records and Documentation Audit

Record Number: N-REP-01070-0604390 T06

Date: July 28, 2016

Report Rating: **GREEN**

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

This performance based audit of the Records and Documentation (now *Information Management* – "IM") Program has identified that the managed system controls are fully effective (GREEN). There are no findings and 3 insights - opportunities for improvement ("OFI").

In all areas observed, IM was found to meet (or exceed) its requirements. The purposes of the IM Program were found to be met for the Nuclear business, within the scope of this audit.

Based on input from an external nuclear Subject Matter Expert ("SME") and the audit team's observations, this report documents strengths of the IM organization which warrants a "green" rating, meaning it meets Industry Best Practices. These strengths and best practices are: self-critical learning behaviours, compliance with governance requirements, good use of operating experience and benchmarking, thorough planning and risk management of changes, updated governance and providing detailed performance metrics.

Assessment of Learning Behaviors

The IM Department's application of learning behaviors was found to be fully effective. Details are in *Appendix B*.

Three insights/OFI's and one Station Condition Record ("SCR") were identified during the audit (see details in Section 4.0 and 5.0 of this report, respectively). Insights are related to recommendations for QA Vault improvement, records surveillance improvement and tracking of records returned to originator under Smartform.

2.0 Background

The purpose of the *Information Management* Program (OPG-PROG-0001) is to:

(a) Establish a set of standards and procedures for the management of Ontario Power Generation's ("OPG's") information throughout its life-cycle, regardless of media, including electronic systems such as e-mail, SharePoint, and the Intranet to ensure consistent and appropriate use;

(b) Describe requirements for a managed system of activities related to information;

(c) Establish uniform and efficient processes for the management, maintenance, and final disposition of records and documents throughout OPG; *and*

(d) Establish the overall process for governance including electronic filing, approval, distribution, and maintenance of the Governance Framework.

N-PROC-RA-0048, *Conducting Performance Based Audits and Assessments,* requires periodic audits of all programs under the Nuclear Management System Charter. This audit fulfills that requirement for the Information Management (formerly Records and Documentation) Program. A previous audit was carried out in 2012.

2.1 Audit Objective & Scope

The objective of this audit is to ensure that OPG-PROG-0001 *Information Management* meets its requirements, as listed above.

The performance based audit has been based upon Risk Analysis, input from the program owner, review of previous Nuclear Oversight Audit results and Self-assessments performed.

a) Model Audit Scope is provided in *Appendix F*.

b) Restrictions:

- This audit excludes Pressure Boundary ("PB") as the team is not PB qualified and Confidential/Security documents as these are covered in other audits.
- Audit excludes most aspects of document creation. This audit will generally not assess the document creation process or any errors made during this process. The audit will focus on records from when they are sent or input into the records system.

c) Scope removed: VenDM (Vendor Document Management system, used for Projects including Darlington Refurbishment) was originally included in scope but reduction in resourcing and increased reporting requirements required its removal (documentation in working files).

The audit was conducted from June 6 to June 25, 2016 at the following locations:

- Nuclear Support,
- Darlington ("DN"),
- Pickering ("PN") *and*
- Western Waste Management site (remotely).

3.0 AUDIT FINDINGS

None.

4.0 Insights

4.1 Best Practices

The following is a listing of areas perceived as strengths / best practices observed during the audit for supporting a Green rating ("fully effective") for the audit.

A Green rating, per the Audit Rating Criteria, means "*Managed System Controls demonstrate Industry best practices. The audit identified that implementation, performance and risk management practices for managed systems demonstrate proactive, self-critical learning behaviours with a focus on continual improvement*".

a) Industry best practices - High rating by External Subject Matter Expert

Part of the audit team for one week was [redacted]. He participated as part of the Nuclear Information Exchange Program ("NIEP"). His feedback was very positive and he indicated he had himself learned from OPG e.g. flooding assessments. His detailed comments are available in *Appendix A.* He also found the IM staff very knowledgeable.

b) Best Practice - Proactive safety focus (Examples)

i. IM consistently demonstrated a strong safety focus. At [redacted] and other sites, records staff leave vault/Controlled Access Storage Area ("CASA") doors open while working inside for safety and make sure a fellow employee is aware of where they are working. A final walk-down of all 26 vaults/CASA's at [redacted] is done at day's end to ensure no one is remaining.

ii. IM staff at all sites were aware of the fire protection in place for their locations and appropriate actions on alarm.

iii. In the vaults with special fire protection (e.g. Inergen), staff knew to evacuate the vault immediately on fire alarm.

iv. The Quality Assurance Vault ("QAV") in the [redacted] has not yet been fully turned over to IM after the building was refurbished. IM management is actively meeting with Facilities to gain clarity on certain issues such as fire protection system operation. IM has prohibited QAV access by their staff until all issues are resolved during turnover.

c) Best Practice - Self-critical learning behaviours (Examples)

i. In preparation for this audit, IM did a thorough self-assessment (NO15-001722). All 44 vaults and CASA were visited and inspected, and their relevant documentation examined. An SCR review was very thorough. 90 documents were sampled for legibility, completeness and other parameters. Training and Security classified documents were reviewed.

ii. An SCR was raised which contained 30 actions to correct the deficiencies found during the self-assessment. The actions were all completed by early April 2016.

iii. Staff were clearly very knowledgeable and dedicated. This was noted by both the audit team and the external NIEP SME (see *Appendix A*).

iv. Clear notices were posted to remind staff of procedural requirements (see photo 1) in *Appendix C*.

d) Best Practice - Good use of Operating Experience ("OPEX") and Benchmarking-continual improvement

IM sends staff to the "ARMA" (Association of Records Managers and Administrators) Canadian conferences, has staff with "NIRMA" (Nuclear Information Records Management Association) memberships and regularly solicits feedback/input from industry professionals via NIRMA, participate in learning opportunities presented by "AIIM" (Association for Information and Image Management). IM shares feedback and OPEX relating to Records and Information Management from Candu Owners Group ("COG") members such as Point Lepreau, etc.

A benchmarking study was completed in 2015 regarding Records Management Training. IM went to the Electric Utility Cost Group ("EUCG") IT/ IM committee - North American Utilities which includes BC Hydro, Pt. Lepreau, Bruce Power, Hydro One, etc. IM has reviewed and will be introducing the ARMA RIM (Records Information Management) Competency Model into the Chief Information Officer ("CIO") IM Function. These Core Competencies define the knowledge and skills needed to perform successfully in the RIM profession.

IM has reviewed and will be introducing the ARMA "RIM" (Records Information Management) Competency Model into the CIO IM Function. These Core Competencies define the knowledge and skills needed to perform successfully in the RIM profession.

e) Best Practice - Thorough Planning and Implementation of changes – risk management (Examples)

i. A previous assessment of IM's Vault Optimization project was complimentary and had no findings. [NO-2015-323] The digitizing of documents is a positive move for OPG as it not only reduces storage costs for paper, but increases ease of retrievability of documents and prevents degradation of records in storage.

ii. One part of IM's recent Records and Vault Optimization project was to reduce quality checks of documents as a corporate cost saving measure. To ensure no undue negative impact of this, IM performed 2 self-assessments [BS14-000576-SA and BS14-000806-SA]. The first checked the impact of the first stage of quality check reductions and when this was found acceptable, the second stage of reductions went ahead. The second self-assessment checked impact and again found it acceptable.

iii. Smartform is another critical corporate initiative to both reduce costs and also to move OPG forward to its goal of having all records electronic. IM first piloted this process in their own department and then systematically rolled out the process to each department. A roll-out schedule was generated, "super users" were set up at each site and given early and in-depth training to support their groups. A myriad of communication methods were generated to train staff in using Smartform: WebEx, a detailed training Guide, videos available on the intranet, computer-aided learning, personal sessions, etc. A web site dedicated to Smartform provides multiple tools for users to learn about Smartform.

iv. In addition, IM is collecting comprehensive statistics (ref. *Smart Form Reporting* CIO-MAN-08133-0001) and is keeping track of progress of Smart Form implementation.

v. For changes affecting IM staff, IM uses tracked roll-outs and communication bulletins to ensure all staff are reached.

vi. Internal self-assessment and a CNSC Type II assessment (2012) noted that non-standard media was not being checked every 5 years as required to ensure it was readable (e.g. CD's, VHS tapes, etc.). In response, IM has established a comprehensive program to systematically check readability/accessibility of all stored non-standard media, which comprises many thousands of records.

f) Best Practice - Updated Governance (Examples)

Information Management department reports through the CIO to Corporate management, not Nuclear. The Nuclear Program document *Records and Document Control* (N-PROG-AS-0006) was superseded on 30 Sep 2015 by OPG-PROG-0001 *Information Management*. All the IM governance has now been converted to OPG governance. For example, *Nuclear QA Records* procedure is OPG-PROC-0179.

IM has made this conversion while still maintaining necessary focus on Nuclear requirements including Pressure Boundary. The purpose of their pre-audit Self-assessment (15-001722) states: "*In preparation for the 2016 Nuclear Oversight audit on the Nuclear Records and Document Control program, this comprehensive Self-assessment (SA) will evaluate compliance with* ***CSA N286-05, CSA N286-12 and NQA-1-***

2008. *This will be done by reviewing current processes and governance to determine their effectiveness*". This self-assessment also led, through its Corrective Action plan ("CAP"), to further updates/corrections of governance.

In addition, governance has been updated to incorporate a major new initiative – Smartform - changes.

For 2105, IM incorporated new Canadian Nuclear Safety Commission RegDoc 3.1.1 Reporting requirements into OPG-PROC-0019 *Records and Document Management* and local procedures and authorization forms were updated.

g) Best Practice - Detailed Performance Measures

Certain performance measures are mandated by the IM program document (OPG-PROC-0001 s. 1.5). However, IM maintains very detailed performance measures in the monthly CIO Dashboard (about 35 measures). Also, IM provides Smartform performance measures in their Smartform Dashboard on the web and collects data per their *Smart Form Reporting* CIO-MAN-08133-0001-R001, which is also comprehensive. Reports can be generated of almost any combination of ~20 parameters, some parameters with 20 to 30 options, for example "status". In addition, Fleetview report is prepared annually for Nuclear and Quarterly Nuclear governance review compliance metrics are submitted to "NEC" (Nuclear Executive Committee).

h) Best Practice - Responsive to Audit – learning organization

Both auditors and NIEP SME noted that IM was very responsive to the audit, both in arranging visits and in answering questions and following up on discussions. Any questions or observations requiring a response were answered quickly, efficiently and comprehensively. IM contacted facilities or other groups to quickly address any outstanding questions or issues. It is clear that IM expended effort and diligence to respond well to audit and embraced any audit insights, thus exemplifying a learning organization.

4.2 Opportunity for Improvement ("OFI")

There were three OFI's. Additional details are provided in *Appendix C.*

a) QA Vault Improvements

i. Plastic bags wrapped around radiograph boxes

In several vaults, radiograph boxes were seen to be wrapped in plastic. The NIEP Subject Matter Expert advised that this was not an advisable practice as bags could collect moisture (See his comments in *Appendix A*). However, records staff indicated that the bags were there to provide protection.

RECOMMENDATION: IM determine best practice to either retain or remove bags.

ii. Actions to protect records in [redacted] storage

After the visit to [redacted] on June 7, audit came across a preservation assessment for the records at [redacted] N-REF-08133-0274206. This is dated June 2008. It is a 25 page document which provides many recommendations for the CASA/Vaults at [redacted] and is part of a series carried out in 2008 for various records locations.

This report lists issues which need to be prioritized. An example is provided in *Appendix A*. No further reference to this report or any actions taken from this could be located, or any prioritization for document checks. Note that much of this report covers old, legacy records such as photographs of early hydraulic plants that are primarily non-nuclear.

RECOMMENDATION: IM should evaluate the recommendations of this report to determine which still need to be carried out to protect OPG records.

iii. Confidential Records received at [redacted]

As noted in NIEP Subject Matter Expert's comments (ref. *Appendix A*), Records staff at [redacted] do not open boxes marked "confidential" which are sent to them. This means that boxes are stored which have not been examined and could contain inappropriate or unsafe materials.

RECOMMENDATION: IM should either open boxes to examine contents or establish a verification process with sender.

iv. [redacted] Potential Flooding

The [redacted] QAV is heated by hot water or steam system with the insulated pipes running through the vault and with wall mounted radiators. Records staff are in the vault everyday on working days but a leak in this system might cause flooding which on a weekend may not be detected and there is no floor drain.

RECOMMENDATION: A water on floor detector system (similar to Nuclear beetle) could be installed which would, for example, text an alarm to someone. IM should evaluate if such a precaution can be implemented.

b) Records Surveillance Process Improvement

R01 of the form "Secure Storage Surveillance" (OPG-FORM- 0204 March 2016) updated section 5 from: "*Select a random document in each row, aisle, or grouping of filing cabinets*" to "*Select a random 10 documents throughout each location (QAV/CASA), the random sampling should include a variety of media types*". Since this is a key method of detecting deterioration of physical documents in storage, audit suggests that rules for checks could be improved. Some suggestions are:

- Utilize a marking system so that the same boxes are not 'randomly' sampled each time and that checks are spread throughout the records area over time;
- Attempt to sample records which are in boxes and whose deterioration would not be evident from a quick glance;
- Prioritize those records which have been indicated in Preservation Assessments (see Insight 1b) as vulnerable; *and*
- Have QA group generate a list for checking.

RECOMMENDATION: IM to evaluate above recommendations for adoption.

c) Tracking hardcopy records returned for submission via Smartform

Although IM is keeping thorough statistics on Smartform usage, their practice for Departments which have been "onboarded" is to return to senders any hard copy records which should be digitized, with a note to re-submit via Smartform. IM is not currently tracking these returns or if the records are later submitted via Smartform.

RECOMMENDATION: IM to determine if document returns should be included in Smartform statistics and their re-submission via Smartform monitored, if resources allow.

IM has agreed to review these recommendations under **AR # 28191380.**

5.0 SCRS initiated during the audit

SCR	Owner (Position)	Title
N-2016-17477	Shelley Tucker, Senior Manager, IM, CIO	Potential Issue at [redacted] - INERGEN Fire Suppression System Warning Signs

6.0 List of acronyms

CAP	Corrective Action Plan
CASA	Controlled Access Storage Area
CIO	Chief Information Officer
DN	Darlington Nuclear
DNWMD	Decommissioning and Nuclear Waste Division
FLM	First Line Manager
NO.	Number
OPG	Ontario Power Generation
O.REG.	Ontario Regulation
PN	Pickering Nuclear
QAV	Quality Assurance Vault
SCR	Station Condition Record
SME	Subject Matter Expert
VESDA	Very Early Smoke Detection Apparatus
WWMF	Western Waste Management Facility

7.0 Audit team

The team consisted of:

Audit Team Leader:	David Flowitt – Nuclear Oversight
Auditor:	Anders Li – Nuclear Oversight
NIEP Subject Matter Expert (first week):	[redacted]
Senior Manager:	Leonard Erb – Nuclear Oversight

Prepared by: D.F. Flowitt Date: Aug 8, 2016

David Flowitt
Audit Team Leader
Cross-functional Dept
OPG Nuclear Oversight

Approved by: Date: Aug 8, 2016

Leonard Erb
Senior Manager
Cross-functional Dept
OPG Nuclear Oversight

Appendix A – Additional Supporting Information for Best Practices Insights

Observations by [redacted] External SME from [redacted]:

1. Credentials provided for NIEP Subject Matter Expert:

"I have been the Supervisor of [redacted] for the past nine years. [redacted]. My duties have included overseeing a staff that processes over 3.7 million documents into electronic records scanning each year while also managing one records vault and three records centers which store over 82,000 boxes of hard copy records. My staff also are involved in all Legal e-discoveries and all aspects of records management from the inception to the final disposition. I also am involved in keeping our Records Policies current and up to date as well as being part of the Records Management Team that reviews all of our NOPS [Nuclear Operating Procedures] and BP's [Business Plans] for [redacted]. I have also spent quite a bit of time at [redacted] serving as a back up in the Supervisor role.

"I last served as a Quality Assurance Programs and Records Management Auditor for [redacted]"

2. Sample notes from [redacted] for QAV and CASA Tours – [redacted] – 3 CASA's and QA Vault 30 and 143

"Upon arrival at [redacted], we were greeted by [2 IM staff]. Both staff were very knowledgeable and gave a sense that they have a passion for what they do. All questions were answered fully without hesitation."

No issues were found in the following areas:

- Electronic Document Management OPG-STD-0057 R04 1.8.6 – USB, CD's, DVD's and Blue-Ray discs storage (in individual cases, shielded from sunlight, etc.; no USB's seen). 1.8.6.3 Legacy Media – No floppy discs found.
- OPG-PROC-0019 Records & Document Management: 1.2.9 Records Destruction – viewed Transfer/destruction form. Form was filled in correctly and file accordingly. All compliance is met.
- Controlled Document Management OPG-PROC-0178 R01, 1.4 Quality Checks – All Quality Checks that arrive to [redacted] are performed accurately per the QC Process. Surveillance check sheet that was posted outside the locked door was reviewed.
- Nuclear QA Records OPG-PROC-0179 R01 Requirements for storage of QA Records (1.9 a) – Radiographs are stored in acid-free envelopes and water resistant boxes. Vinyl binders are not accepted and thus not stored to house sole source permanent QA records. Documents were stored in folders and or boxes on steel shelving. No pressure sensitive tapes were noticed. Elastic bands were not observed being utilized. Blue prints are stored in approved steel closed drawer cabinets. No self-adhesive labels were observed being directly attached to any sole-source QA records.
- Magnetic media (VHS, beta tapes, etc.) are stored separately in CASA 23 and 17. Project currently is to get with the business owners and convert over to acceptable media. Due to quantity, this project will take a while for completion.
- 1.9.1.1 – Removal / sign out of QA records – QA Records are not removed from QA Vault or CASA except in special circumstances. When a request comes in, a just-in-time ("JIT") scan will be performed. If the request comes from the owner, the request will be granted. If the request comes from a non-business owner the request will be denied until proof of acceptance is gained by the record owner.

- QA Vault and CASA Construction 1.9.3.1 to .3 – Vault construction requirements were observed to be met.Temperature and Humidity Control for QA Vaults 1.9.3.7 – Temperature and humidity are monitored twice daily in 4 CASAs. All requirements were observed to be met. Sprinkler Protection 1.9.3.8(a)(1) – Open shelves were not under sprinkler units. Fire extinguishers, emergency exit signs, sprinkler system were all observed to have been inspected and all inspection tags are current and up to date.
- Quality Checks 1.10 – Minimum of 5% of QA documents were checked and properly reported.
- All work in progress is stored in vault at the end of the work day. Nothing is kept outside the vault area when work day in completed.
- All CASAs are equipped with glow in the dark stickers in case of power outage. When team member is working in vault the door is left open. Late worker does a complete walk about at the end of the day insuring that no worker is left in a CASA overnight.
- Access Controls – All guests are met and escorted thru which vaults / CASAs are of interest. Before entering any CASA or Vault, guest must sign in on security log sheet. Staff member then signs off when guest leaves the particular vault or CASA.
- Records stored in [redacted] are indexed in Vault View. Vault View is backed up nightly and also backed up nightly by OPG Governance. Currently only available for records staff but there are plans to implement this system to all users. This will be a positive process improvement.
- For new records request, client uses the OPG 0218 form and fills in the bin# and the item # that is needed. For new records storage, client sends in an itemized list of what is requested to be stored, once the list is approved by the records center, a ship date will be sent to requestor, at this time the records delivery will take place.
- Records marked “Confidential” are not opened by the records staff thus not ensuring what is actually being stored. *[See OFI a iii)]*
- All CASA and QA Vaults have door codes and check in sheets. Small red alarm lights are also outside the doors.

3. Tours of [redacted]

Notes from [redacted] on these tours were similar to those provided above with no findings. He again complimented IM staff he met on their “knowledge sharing and their hospitality” and stated **“** They are all well skilled and dedicated to their job *functions.*

Appendix B – Learning Behaviours

B.1 Corrective Action Program

The Corrective Action program ("CAP") was effective as indicated by the following:

1. Previous audit findings were addressed (see section B.5 below)

2. An SCR (N-2016-01450) was raised to address the pre-audit SA (see B.2 below).

3. Action 23 of the above SA was an SCR Effectiveness Review. This 96 page review of SCR's was thorough and any gaps were addressed via the SCR raised for the SA.

4. SCR's are raised for adverse Nuclear conditions (Note: IM is a Corporate department). . Examples:

    a. N- 2016-02288 *Findings Identified Through Self-assessment on Records and Document Control, SA#15-001722 in* [redacted] *CIRR Controlled Access Storage Area (CASA)*

    b. In 2016 alone, IM has raised 32 SCR's on records non-compliances in Nuclear, the large majority being related to Contractors and Refurbishment. Two of the three level 3 SCR's originated from IM's own Self-assessments, one from a Smartform issue and the rest were D4. In these cases, IM returned the deficient submissions with instructions and provided coaching to the clients.

5. Although trending is not required due to a low number of SCR's (ref. Fleetview), detailed performance measures provide a good indication of potential problem areas. For example: Smartform dashboard reports document rejections (returned to document owner for correction), bi-ennial self-assessment reports compliance by business unit (last was 100%), and IM monthly performance metrics which measure rejection rates, quality check %, and others.

B.2 Self-assessments

SAs performed were effective and self-critical. Examples:

1. 2014 Records Management Self-assessment from IM web page

This noted that response rate was an "unprecedented 100%" across OPG Business Units. It also noted that as the SA involved Nuclear, the SA would follow N-PROC-RA-0097 and filed as a Nuclear Self-assessment (NO14-001236). 2 SCR's were raised from this SA. One was completed by revising Governance. The other concerning non-standard media refresh is still in progress.

2. BS14-000576-SA

The purpose of the self-assessment was to determine the effectiveness, compliance and potential risk of the recently implemented change to Nuclear Records and Controlled Documents "reduced acceptance criteria" prescribed in OPG-PROC-0019 Records and Document Management R005.

The SA was thorough and concluded that the error rate was sufficiently low that the next phase could proceed.

3. BS14-000806-SA

This was the second and final of two self-assessments completed to assess each phase. Phase I prescribed a 20 percent reduction acceptance criteria for non Pressure Boundary Quality Assurance document checks. Implementation of Phase I was deemed successful as per SA BS14-000576. Therefore, reduced acceptance criteria Phase II, prescribing a 50% reduction for non Pressure Boundary Quality Assurance document checks was implemented. SA activities were led by the Information Management Program Authority with support from IM Services.

This SA indicated the reduced criteria led to acceptable results and the Governance was accordingly updated to reflect the reduced acceptance criteria.

4. NO15-001722-SA

In preparation for the 2016 Nuclear Oversight Audit on the Nuclear Records and Document Control Program, this comprehensive Self-assessment evaluated compliance with CSA N286-05, CSA N286-12, ASME and NQA-1-2008. This was done by reviewing current processes and governance to determine their effectiveness.

All 44 vaults and CASA's were inspected and any corrections required flagged. Findings were raised in the following areas: Vault/CASA tours, Sampling of records (90 sampled), Governance, SCRs/AR's, Training, Security Protected Access and Quality Checks. Multiple DCR's were raised to correct governance.

Conclusions to the SA listed both strengths and Improvements. There were 30 Recommendations/Actions which were implemented via SCR N-2016-01450. All are complete.

The SA was thorough, self-critical and comprehensive.

B. 3 Benchmarking/OPEX

1. Current audit had NIEP SME who reviewed the program favourably.
2. Internal OPEX:
    - Program performance indicators were updated and aligned during the merger of N-PROG-AS-0006 and OPG-PROG-0001. Quarterly Nuclear governance review compliance metrics have been submitted to NEC starting in Q1 2015.
    - Records Management Self-assessments were completed by Records Officers in Q4 2014.
    - Signed SLA with Nuclear, including Performance Measures, in Q4 2014.
    - Reviewed storage requirements under Pressure Boundary code for Nuclear QA records and took step to reduce requirements when vaults are in refurbishment or when they are decommissioned without compromising integrity of stored information.
3. See section 4.1 d) in the body of the report for further examples.

B.4 Fleet view Program Reporting:

Fleetview reports met requirements. Some Performance Indicators were reported in other locations. Details of IM reporting are covered in the main report section 3.1 #6.

Overall Fleetview (from Nov 2015) rating is White. The following areas are marked Green: Governance, OPEX, level 1& 2 SCR's (0), Self-assessments. There is one yellow area related to CNSC finding on refresh of non-standard media which now has a full CAP in place.

B.5 Disposition of Previous Audit Findings:

Actions planned and taken to address the audit findings were satisfactory.

Finding	Comments
Finding No. 1 – Deficient Quality Assurance (QA) Vaults. Deficiencies were identified with some of the QA Vaults that challenge the ability of these structures to carry out their intended function. Deficient QA Vaults could result in Records not being protected from long term damage, loss or deterioration.	**N-2012-02873 (C2)** was raised to identify the finding. Manager Nuclear Business Services (N-NIRCDM). The Corrective Action plan resulted in eight assignments under AR# 28145032. **Conclusion:** All assignments have been completed. SCR follow-up (2012-012-AO-01) completed by Nuclear Oversight confirmed the Corrective Action Plan adequately address the identified deficiencies. The SCR Follow-up completed by Nuclear Oversight concluded the effectiveness of CAP and has eliminated the adverse conditions with no repeat events.
Finding No. 2 – Improper Storage of Vital Media Records. The Process Control Library ("PCL") media have been stored in facilities that do not meet the requirements for Single Source QA Permanent Records (software) as defined in OPG governance. The media includes software that run some of the vital systems within OPGN Stations and is still used when the original system configuration re-installment is required. Loss of media poses a risk to system operations.	**N-2012-02874 (C3)** was raised to identify the finding. Manager Nuclear Business Services (N-NIRCDM). The Corrective Action plan resulted in two assignments under AR# 28145033. **Conclusion:** All assignments have been completed. SCR Follow-up (2012-012-KS-03) completed by Nuclear Oversight concluded the Corrective Action Plan adequately address the identified deficiencies. The actions planned and taken to address the audit finding were satisfactory.

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Finding No. 3 – [redacted]	[redacted]
Finding No. 4 - Records & Controlled Document Information in PassPort is not consistently updated or accurate. A lack of administrative rigour related to record information has resulted in errors, omissions and discrepancies in PassPort. Multiple instances where records information given in PassPort, which is the official records indexing system for Nuclear records, is not consistently accurate. Although the identified deficiencies do not pose any immediate consequences, they do increase the chance that documents may not be retrievable when required or lost.	**SCR N-2012-02876 (C3 NFE)** was raised to identify the finding. Manager Nuclear Business Services (N-NIRCDM).). The Corrective Action plan resulted in two assignments under AR# 28145034. **Conclusion:** All assignments have been completed. SCR Follow-up (2012-012-KS-01) completed by Nuclear Oversight concluded the Corrective Action Plan adequately address the identified deficiencies. The actions planned and taken to address the audit finding were satisfactory.

Appendix C - Additional Details for Insights

OFI a ii)

1. Example from report: [Note: photos here are old, archive photos of early hydro development, not Nuclear]

   "Bin 79 has albums containing photos ...these are more deteriorated, than the ones described above, some with discolouration and fading. There is physical damage to some photos glued close to the spine of album, as turning and flexing the pages has resulted in cracks in some photos. Some pages are detached from ..... albums. **These albums should all be inspected and any in similar condition should be stored within protective archival acid free boxes to prevent pages becoming separated from the album it belongs to and to prevent further physical damage.**

   "Boxes will also protect the photographs from dust. Bin 55 and several others have very thick albums and the pages are quite cockled and buckled, resulting in damage to the images. Rehousing these albums should be a priority as staff time permits, starting with the oldest albums and those already in poor physical condition. This concern was previously noted in the 2004 assessment."

2. Sample notice posted by IM in a QAV:


ONTARIO POWER GENERATION

PN 889 QAV

INFORMATION MANAGEMENT – EXECUTION

ACCOUNTABILITIES FOR MAINTENANCE OF:
QA VAULTS AND CONTROLLED ACCESS STORAGE AREAS

REFER TO OPG-PROC-0179, NUCLEAR QA RECORDS

ACCESS RULES:

ENSURE YOU ARE ON THE APPROVED ACCESS LIST BEFORE ENTERING (OPG-FORM-0237)

UNAUTHORIZED STAFF MUST OBTAIN RECORDS FLM OR DELEGATE OR THE RECORDS OFFICER APPROVAL FOR ENTRY

UNAUTHORIZED STAFF MUST BE ESCORTED BY A DOCUMENT CUSTODIAN AND MUST SIGN IN AND OUT USING OPG-FORM-0205 (MUST SHOW VALID OPG IDENTIFICATION)

NO FOOD OR DRINKS PERMITTED IN QA VAULT OR CASA

BORROWING RECORDS:

DO NOT SIGN OUT RECORDS UNTIL RECORDS FLM OR DELEGATE APPROVAL IS OBTAINED

DOCUMENT MUST BE SIGNED OUT USING OPG-FORM-0205

MINIMUM MONTHLY FOLLOW UPS ON BORROWED RECORDS

*** JUST IN TIME SCANNING OF RECORDS IS PREFERRED OVER REMOVAL ***

PRESERVATION CONTROLS:

RECORD THE QA VAULT TEMPERATURE AND HUMIDITY READINGS DAILY USING OPG-FORM-0206

DO NOT STORE QA RECORDS IN BINDERS OR BIND WITH ELASTICS

DO NOT STORE RECORDS BELOW THE APPROVED FLOOD LEVEL PER THE QA VAULT FLOOD ASSESSMENT – N-CORR-08133-0148347

MINIMIZE RISK OF WATER DAMAGE

KEEP CABINET DOORS CLOSED AND POSITION LUNDIA UNITS WHEN NOT IN USE (OPEN SHELVES NOT DIRECTLY UNDER THE SPRINKLER UNITS)

PERFORM QUARTERLY SURVEILLANCES FOR ALL VAULTS AND CASAS USING OPG-FORM-0204

EMERGENCY ASSISTANCE – CALL 911

CALL POLYGON RESTORATION AT 1-888-702-4782 FOR RECOVERY OF DAMAGED DOCUMENTATION DUE TO WATER, SMOKE OR FIRE.

RECORDS INVENTORIES:

RECORDS INVENTORY MUST REMAIN CURRENT AND COMPLETE AT ALL TIMES.

P-LIST-08133-0589555 PB2 QA Vault Inventory

2016-02-24

Picture 1

Appendix D – Overall Audit Report Rating Scale

An overall report rating has been assigned as an indication of the overall implementation, performance and risk management practices for the program that was subject to the Nuclear Oversight audit. Ratings are derived through professional judgment by the audit team and discussion with management.

- *(Green) Demonstrates Industry Best Practice:* The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrates pro-active self-critical learning behaviours with a focus on continual improvement.
- *(White) Effective*: The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.
- *(Yellow) Not Fully Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.
- *(Red) Not Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.

Appendix E- Completed Audit Rating Criteria Sheet

AUDIT RATING CRITERIA

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES **The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.**	MANAGED SYSTEM CONTROLS ARE EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.**	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.**	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE **The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.**		
						OVERALL RATING **GREEN**
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**		**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	Program	Governance is up to date and successful transition made to OPG level governance. Some minor non-compliances flagged by IM via SCR's and metrics.
Program	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.	Program	Detailed reporting and effective SA's
Program	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.	Program	Positive innovations via move to electronic documents and minimizing of hard copies. Potential resource concern with legacy archive (non-nuclear) records at Kipling
Program	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.	Program	Training recently updated. One Records Officer incorrectly linked - minor admin error - only 1 small CAL difference.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	CAP/OPEX	CAPs effective. Formal trending not required but detailed perfromance measures allow close tracking of trends and targets.
CAP/OPEX	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.	CAP/OPEX	OPEX use, v. good Benchmarking
CAP/OPEX	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.	CAP/OPEX	Limited external findings are addressed throughly e.g. non-standard media refresh via CNSC.
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	Performance	NIEP SME provided a high rating
Performance	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.	Performance	IM very proactive wrt safety
Performance	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.	Performance	Some minor records non-conformances particularly with contractors are identified.
Performance	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie, not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.	Performance	Good benchmarking.
Performance	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.	Performance	Some minor records non-conformances particularly with contractors are identified.
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Oversight	Very detailed metrics
Oversight	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.	Oversight	Self Assessments particularly pre-audit was exemplary.
Oversight	No significant adverse trends are evident.	Limited performance adverse trends are evident and action plans are in place to improve performance.	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.	Oversight	Some minor records non-conformances particularly with contractors are identified.
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.		
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.		

Appendix F - Standard Audit Scope

The standard audit scope included a review of the following areas to assess compliance, implementation and performance effectiveness:

- Program Governance (OPG-PROG-0001 Information Management, and implementing procedures and standards);
- Management Oversight / Learning Organization / Corrective Action Program – Findings, Self-assessment (SA), Observation and Coaching (O&C), Root Cause Analysis (RCA), Fleet view reporting, System Health reporting, Corrective Action Plan (CAP) effectiveness, and Operating Experience (OPEX);
- Line Management interfaces with other programs, organizations, and Centre-Led Functional Area Management (CFAM); and
- External insights – World Association of Nuclear Operators (WANO), Nuclear Safety Review Board (NSRB), Canadian Nuclear Safety Commission (CNSC), and any applicable Significant Operating Experience Reports (SOER).

Appendix G- Distribution

Chief Nuclear Officer	**G. Jager**
Chief Information Officer	**I. Roberts**
VP, Assurance & Chief Audit Executive	**P. Kay**
Director, Nuclear Oversight	**M. Knutson**
Senior Manager Information Management, CIO	**S. Tucker**

ONTARIO POWER GENERATION

INTERNAL USE ONLY

Nuclear Oversight

Audit: NO-2016-020 Fleet Work Management

Record Number: N-REP-01070-0599294 T06

Date: June 24, 2016

Report Rating: Yellow

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Nuclear Oversight conducted an audit of the Work Management ("WM") Program at Pickering, Darlington, Darlington Nuclear Refurbishment ("DNR"), May 2 to May 27, 2016

The objective of this performance based audit was to determine whether the WM Program requirements defined in Ontario Power Generation Nuclear ("OPGN") governance have been met and effectively implemented to support safe and reliable operation.

This performance based audit of the Fleet Work Management program has identified that the managed system controls are not fully effective (Yellow).

Ref #	Finding	Significance Level		
		SL1	SL2	SL3
1	Refurbishment prerequisite work completion is not meeting target.		X	
2	Deficiencies in learning organization requirements at Pickering and Darlington.			X
3	Work Management quality and milestone adherence gaps at Pickering Nuclear Generating Station ("PNGS").			X

Positive Observations

At the start of some meetings the What It Looks Like ("WILL") sheet from the previous meeting was read out to identify the previously recorded Areas for improvement ("AFIs").

Findings

1. Darlington Nuclear Refurbishment ("DNR") prerequisites work completion was averaging less than 50% of the work scheduled compared to a target of 90%.
2. Learning organization gaps exist at Pickering Nuclear Generating Station ("PNGS"), Darlington Nuclear Generating Station ("DNGS") which included:
    - Observation and Coaching ("O&C") implementation;
    - Corrective Action Program ("CAP") quality issues including failed effectiveness reviews requiring undue Corrective Action Review Board ("CARB") intervention;
    - Self-assessment ("SA") process non-adherence as recommendations were not always corrected with tracked actions, and;
    - Performance Improvement reports not occurring at the required frequency;
3. Gaps in process and milestone adherence were identified for PNGS.

Insights

Audit Insights are summarized in Section 3 with details provided in Appendix A4. Insights are;

- Report issue dates and scheduled review meeting timelines;
- Refurbishment WILL Sheet use for T- meeting process; and
- Work Request Cancellation rationale and details

Station Condition Records

Station Condition Records ("SCRs") raised during the audit are listed in Section 4.

Learning Behaviours

Learning Behaviors are not fully effective, as described in Finding #2.

1.2 Background

The purpose of N-PROG-MA-0019, ("Production Work Management Program"), is to specify the requirements for identifying, prioritizing, planning, scheduling, and performing work in support of the operation, maintenance, and modification of Ontario Power Generation nuclear power stations. This program also establishes safe, uniform, and efficient work control practices for nuclear sites.

N-PROC-RA-0048, ("Conducting Performance Based Audits and Assessments"), requires periodic audits of all programs under the Nuclear Management System Charter. This audit fulfills that requirement for the Work Management Program.

1.3 Audit Objective & Scope

The objective of this audit was to determine whether the Production Work Management Program requirements defined in governance are met and are effectively implemented to support the safety and reliability of the assets.

The following program specific items were reviewed;

- N-PROC-MA-0008 – ("Work Initiation, Approval and Prioritization")
    - New work meeting conduct and quorum;
    - Work request processing; and,
    - Backlog work orders.
- N-PROC-MA-0022 – ("Integrated On-Line Work Schedule")
    - Cycle plan coding and metrics;
    - T meeting conduct and milestones;
    - Carry-over disposition;
    - What It Looks Like ("WILL") sheet completion; and,
    - Schedule metrics.
- Standard Audit Scope was also included (Sites: PNGS, DNGS, Refurbishment). Details in Appendix G.

The audit conduct was from May 2 to May 27, 2016 at the following locations:

- Pickering Nuclear Generation Station;
- Darlington Nuclear Generation Station; and,
- Darlington Nuclear Refurbishment.

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2.0 AUDIT FINDINGS

1. Refurbishment prerequisite work completion is not meeting target.	SL2

"Nuclear Refurbishment Planned Outage Management" governance requires that; prerequisite work which must be performed before Unit two breaker open, and does not require a unit or units to be in a shutdown state; will be identified in Asset Suite and will follow normal station requirements per N-PROC-MA-0022.

Due to the nature of the project, a Memorandum of Understanding between DNGS and Nuclear Refurbishment supersedes some of this requirement and documents agreed to variances from N-PROC-MA-0022. Specifically, The agreement directs that the abovementioned prerequisites should not be treated as normal outage prerequisites and provides an allowance for bundled T-meetings.

"Nuclear Refurbishment Planned Outage Management" governance also requires the Nuclear Refurbishment Work Control team to monitor all NR work and any station on-line work that is required for, or related to, the Darlington Nuclear Refurbishment Outage. N-PROC-MA-0022 defines a suite of reporting metrics to drive schedule and completion improvements.

Completion of Nuclear Refurbishment prerequisite work prior to the Unit two breaker open has averaged less than 50% compliance to schedule. Recent performance of up to 78% completion notes a trend toward the 90% compliance target.

- Standard reporting of Metrics for completions and T+1 Metrics are not being produced for the prerequisite projects. The only online process metric being used to measure the T process is T-0 weekly completions percentage.
- Agreed-to T milestone requirements are not being met by the project bundles with up to 50% loss of scheduled tasks form T-8 to T-0 due to various project issues.

Potential Contributing Cause & Impact

Potential Contributing Cause:

Reporting and communication of Refurbishment indicators, data metrics for prerequisite completions, cause codes and other T+1 reporting was not fully developed prior to initiation of the work program.

Impact:

Awareness of schedule completion status and total tasks completed each week, is not reaching organisations external to Darlington Nuclear Refurbishment, which oversee or can help support the success of the mega-project. A bow-wave of prerequisite work may impact breaker open preparation milestone, with associated cost and schedule risks. In the 19 weeks reviewed, 706 of 1404 (50%) scheduled task instances were not completed.

Additional details are provided in Appendix A1.

Management Action Plan

SCR N-2016-16818 has been raised to address the finding. The Manager, Work Control at Refurbishment has agreed to be the Evaluating Organization Manager for this SCR at Significance level two.

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2. Deficiencies in learning organization requirements at Pickering and Darlington.	**SL3**

Observation And Coaching ("O&C") must focus primarily on staff behavior. Observers shall compare observations against documented standards and coach to improve worker effectiveness.

Corrective actions are developed with "Specific, Measurable, Achievable, Reasonable and Timely" ("SMART") criteria. Recurrence control ("RC") actions must specify completion and success criteria.

An associated follow-up action reference number must be noted beside each Self-Assessment recommendation to ensure that appropriate performance improvement occurs. Work Management is required to perform quarterly Station Condition Record ("SCR") trend analysis and issue a quarterly Performance Improvement Report.
Learning organization non-compliances were identified in Observation and Coaching, Corrective Action Program quality, Self-Assessment quality and Performance Improvement Reporting.

- Implementation of the O&C program in Work Management has not occurred at DNGS and PNGS. The sites have a What It Looks Like ("WILL") program to improve their meeting behaviours and this was thought to cover the O&C requirement;
- SCR CAP reviews noted examples of RC actions missing completion and/or success criteria. Some completion notes were incomplete, missing details or reference incomplete deliverables;
- Six of the 12 Pickering Work Control Self-Assessments ("SAs") completed since 2014 did not reference an Action Request ("AR") or SCR to address the actions and recommendations raised by the assessment; and,
- Performance improvement trending of SCRs is less than the required two per year.

Additional details are provided in Appendix A2.

Potential Contributing Cause & Impact

Potential Contributing Cause:

There was a misunderstanding that "What It Looks Like" ("WILL") sheets and the associated processes covers O&C requirements.

Impact:

Organizational learning is challenged and at risk of repeat events.

Management Action Plan

SCR N-2016-16820 has been raised to address the finding. The CFAM Director, Work Management has agreed to be the Evaluating Organization Manager for this SCR at Significance level three.

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3. Work Management Quality Gaps and Milestone Adherence at Pickering Nuclear Generating Station ("PNGS").	**SL3**

- A logic driven schedule must be issued prior to T-9 Scope Freeze meeting, this did not occur. A checklist has been recently implemented to drive quality and compliance to the sequencing milestone.
- T-0 Meeting guidance allows carryover for work that was delayed and can now be completed as the issues have been resolved. During two observed Daily Status Meetings, while carry-over was being discussed, resources was the primary driver and no discussion occurred as to whether the necessary resources would be available in the next "Work Week" ("WW"). Additionally, the use of "FLM / Coordinator approved changes in resource supply after T-19" ("TR") cause code was applied very broadly.
- Work Initiation Approval and Prioritization procedure requires that the team should ensure that walk downs are initiated for safety issues and to validate the Unit Condition Required ("UCR").Behaviours related to the New Work Meeting are not always meeting governance requirements

Potential Contributing Cause & Impact

Potential Contributing Cause:

- Meeting behaviours are not being reinforced to meet targets and quality gates; and
- Discussions and questions that occurred during the meeting should have been resolved outside of and prior to the T-9 meeting.

Impact:

- Scope stability is not meeting target; and
- The potential consequences of an incorrect UCR are that work may be stopped at the work authorization stage or after it is scheduled adding to schedule instability and taking up resources on a schedule thereby displacing other work.

Management Action Plan

SCR P-2016-16822 has been raised to address the finding. The Manager, Work Control at Pickering has agreed to be the Evaluating Organization Manager for this SCR at Significance level Three.

3.0 AUDIT INSIGHTS

Insight #1: The time between report issue dates and scheduled review meetings does not always allow sufficient time for review and feedback.

Condition:

The quality of T- meeting reviews and preparation may be affected by short turnaround time between report issue and report reviews. This may be due to an accumulation of process changes and meeting time changes.

The chart of PNGS meetings below shows that some of the scheduled meetings do not allow much time between report issue and meeting times

Frequency	Meetings	Plan issued	Meeting Day
Weekly	T-19	Friday by noon	Monday morning
Weekly	T-3 Risk	Tuesday by noon	Wednesday Afternoon

Recommendation:

Perform a holistic review of the T- Process and the Work Control and station meeting schedule to re-optimize the T-meeting and report process.

Management Action:
The DNGS and PNGS Work Control Managers have agreed to consider this insight via AR#: 28190326 and 28190325

Insight #2: WILL Sheets not used for DNR T- meeting process

Condition:

The audit team reviewed a series of Darlington Refurbishments “T-” meetings and noted that the WILL sheet program has not been adapted and implemented for the suite of T-meetings developed to manage IOP RFB interfaces

Recommendation:

Recommend that DNR work control consider creating adapted WILL sheets based on the IOP program templates to drive behaviors supporting their T- process.

Management Action:

The DNR Refurbishment Manager has agreed to consider this insight via AR#:28190330

Insight #3: WR Cancellation rationale and details at PNGS, DNGS & Refurbishment

Condition:

The audit team identified an opportunity to improve the process for informing Operations to remove cancelled work requests ("WR's"). Currently, a message is automatically generated in AS7 to inform the initiator of the WR but based on previous assessment and internal and external audits looking at plant status, this is not fully effective.

During discussion, the PNGS SPOC provided the following background information; "In 2011/2012 058 Operations had initiated an SCR based on the results of a CNSC walk-down that found WRs tags still remained in the field after the resultant WOs were cancelled. To address that gap, an informal process was developed. A list of all WOs cancelled was created each week and sent to Operations for follow up to verify and confirm tag removals. This continued into 2013 and then due to staff movements that did not seem to proceed." Subsequent plant status assessments have also found tags linked to cancelled WRs still in the field. The SPOC suggested that an automatic query could be run every business day and sent to Operations to lift the tags associated with cancelled work requests.

Recommendation:

Recommend that a collaborative review of this insight with Work Management and Operations in order to create a simple and sustainable process to support the removal of cancelled WR tags, improve plant status control and reduce the likelihood of future findings in this area.

Management Action:

The CFAM Director Work Management, has agreed to consider this insight via AR#: 28190329

4.0 SCRS INITIATED DURING THE AUDIT

SCR	Owner (Position)	Title
D-2016-15536	DNGS WC Manager	NO-2016-020 DNGS New Work Meeting Coding and Attendance
N-2016-15537	WC CFAM Director	NO-2016-020 Cancellation of duplicate WR's
P-2016-15539	PNGS WC Manager	NO-2016-020 Backlog Review Frequency - PNGS
D-2016-15540	DNGS WC Manager	NO-2016-020 Backlog Review Frequency - DNGS
N-2016-16044	WC CFAM Director	NO-2016-020 Cycle Plan Coding 52W Consistency
N-2016-16046	WC CFAM Director	NO-2016-020 Cycle Plan work is not consistently meeting targets for Completion, Purchase and Holds.

5.0 LIST OF ACRONYMS

AS7	Asset Suite 7
CAP	Corrective Action Program
CARB	Corrective Action Review Board
CFAM	Centre-Led Functional Area Management
CNSC	Canadian Nuclear Safety Commission
DNGS	Darlington Nuclear Generating Station
NFE	No Further Evaluation
NR	Nuclear Refurbishment
NSRB	Nuclear Safety Review Board
O&C	Observation and Coaching
OPEX	Operating Experience
PI	Performance Improvement
PNGS	Pickering Nuclear Generating Station
RC	Recurrence control
SA	Self-assessment
SCRs	Station Condition Records
SMART	Specific, Measurable, Achievable, Reasonable and Timely
SOER	Significant Operating Experience Reports
SPOC	Single Point of Contact
WANO	World Association of Nuclear Operators
WILL	What It Looks Like
WR	Work Request

6.0 AUDIT TEAM

The team consists of:

Audit Team Leader-in-Training:	Doug Ounjian – Nuclear Oversight
Audit Team Leader:	Jay Cuthbertson – Nuclear Oversight
Auditor:	Scott Bell – Nuclear Oversight
Auditor:	Fred Drepaul – Nuclear Oversight
Auditor:	Andrew Masters – Nuclear Oversight
Auditor:	Marianna Musat – Nuclear Oversight
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Appendix A1-Additional Supporting Facts for Finding #1

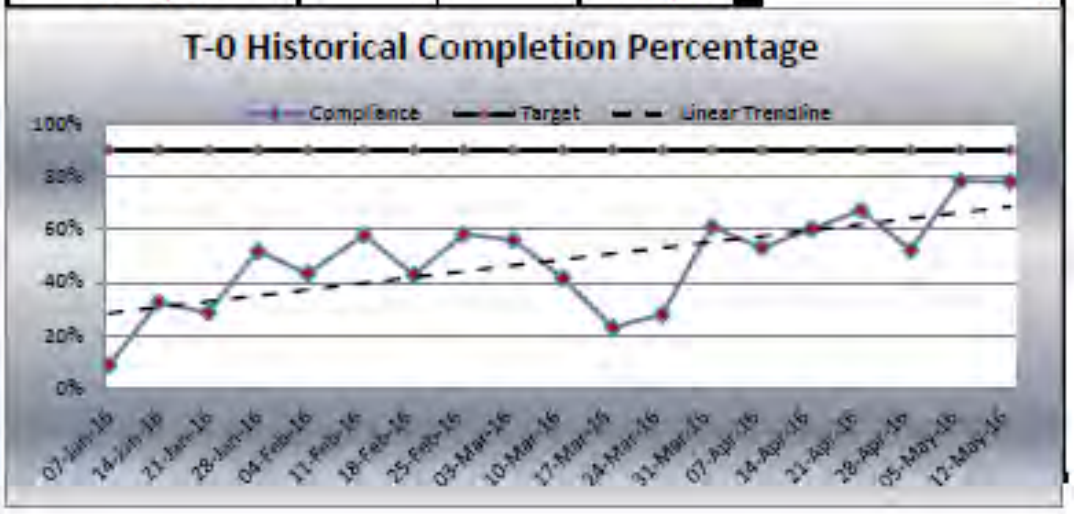
Figure 1. DNR work completion chart

DARLINGTON REFURBISHMENT
Repowering Ontario

Date Refresh:	15-May-16
Data Date	13-May-16

T-0 Compliance Schedule - Historical

Snapshot Date	Planned	Total Completed	Period	Completion Percentage
07-Jan-16	57	5	07-Jan-16	9%
14-Jan-16	37	12	14-Jan-16	32%
21-Jan-16	49	14	21-Jan-16	29%
28-Jan-16	160	83	28-Jan-16	52%
04-Feb-16	113	49	04-Feb-16	43%
12-Feb-16	38	22	12-Feb-16	58%
19-Feb-16	35	15	19-Feb-16	43%
26-Feb-16	55	32	26-Feb-16	58%
04-Mar-16	75	42	04-Mar-16	56%
11-Mar-16	89	37	11-Mar-16	42%
18-Mar-16	100	23	18-Mar-16	23%
25-Mar-16	50	14	25-Mar-16	28%
01-Apr-16	64	39	01-Apr-16	61%
08-Apr-16	64	34	08-Apr-16	53%
15-Apr-16	98	59	15-Apr-16	60%
22-Apr-16	61	41	22-Apr-16	67%
29-Apr-16	117	61	29-Apr-16	52%
06-May-16	83	65	06-May-16	78%
13-May-16	59	46	13-May-16	78%



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Appendix A2-Additional Supporting Facts for Finding #2

Facts:
PNGS Summary:

- Eight of 12 reviewed SCRs: RC actions were not specific regarding required deliverables.
- Seven of 12 reviewed SCRs: Completion notes were incomplete, missing details or referencing incomplete deliverables.
- Five of 12 reviewed SCRs: RC actions missing completion and/or success criteria.
- Three of 12 reviewed SCRs: Elements from the stated apparent cause not addressed in the CAP.
- Two of 12 reviewed SCRs: Analysis not performed (C/2 SCR P-2014-20542) or not supported by critical facts and data.
- Three of 12 reviewed SCRs: Weakness in use of OPEX.

Also Found:

- A completion note referenced a future deliverable.
- Timeliness: an action TCD 8 months after a CAP completion date
- Unsustainable action: Use of a briefing card for an RC action.

Pickering SCRs Reviewed

SCR#	Analysis met governance requirements	OPEX used in CAP	Recurrence control actions met SMART Criteria	Completion Notes met governance requirements
P-2016-00094 C/3 NFE	NA	NA	X	X
P-2015-20089 C/3 NFE (NO-2015-305)	N/A	N/A	X	X
P-2015-20745 C/3 NFE (NO-2015-304)	N/A	N/A	N/A	X
P-2015-20081 C/3 NFE (NO-2015-305)	N/A	N/A	X	X
P-2015-17465 C/3 NFE	N/A	N/A	X	X
P-2015-12977 C/3	a	X	X	X
P-2014-21576 C/3	a	X	a	a
P-2014-34069 C/3 NO-2014-007	X	X	X	X
P-2014-15445 C/3	a	a	X	X

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P-2015-18439 C/2 Station Assessment	a	X	X	X
P-2014-20542 C/2	X	X	X	X
P-2014-03902 C/2	a	a	X	X

Tickmarks

(a) Met requirements
(X) Did not meet governance requirements
(NA) Not Applicable

DNGS Summary:

There are weaknesses with respect to recurrence control assignments not specific (i.e. SMART), or missing completion and/or success criteria. There were also a recurrence control assignments that were compete at time of CAP completion which lacked necessary details as to what was done (i.e. by who, when and what was the outcome?).

Additionally the following were noted:

- Two SCRs with no apparent cause statements (required by process) to disposition the SCRs as NFE.
- Two complete RC actions crediting open actions.
- One C/NFE SCR with no recurrence control action.
- One incomplete completion note for an RC action.
- One RC action not timely.
- One RC action that does not address the stated cause (provided per process for NFE disposition).
- One SCR (D-2015-07952) was dispositioned by the MRM as C/3 ACE to the Work Control Manager, but was processed to complete status in an apparent error within the Performance Improvement (“PI”) department. The PI department was not aware of this issue when contacted.

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Darlington SCRs Reviewed

SCR#	Analysis met governance requirements	OPEX used in CAP	Recurrence control actions met SMART Criteria	Recurrence control action extension compliant	Completion Notes met governance requirements
D-2016-02166 C/3	a	a	X	NA	NA
D-2015-07952 C/3	X	X	X	X	X
D-2014-25024 C/3	a	a	X	a	X
D-2014-09620 C/3	a	a	X	a	a
D-2014-00267 C/3	a	a	X	a	X
D-2016-11500 NFE	NA	NA	X	a	a
D-2016-07321 NFE	NA	NA	X	a	X
D-2016-00986 NFE	NA	NA	X	a	a
D-2015-21464 NFE	NA	NA	X	a	a
D-2015-21127 NFE	NA	NA	X	a	X
D-2015-16097 NFE	NA	NA	X	a	X
D-2015-15998 NFE	NA	NA	X	a	a
D-2015-06712 NFE	NA	NA	X	a	X
D-2015-16097 NFE	NA	NA	X	a	X

Tickmarks

(a) Met requirements
(X) Did not meet governance requirements
(NA) Not Applicable

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Self Assessments:
PNGS:

Self-Assessment#	Tabs Completed	Facts documented	SCR/AR Referenced
P15-001253	A	A	X
P15-000860	A	A	X
P14-000183	A	A	X
P14-000200	X	X	X
P14-000606	X	X	X
P14-000612	A	A	X

Tickmarks:
A: Met requirements.
X: Requirements not met.
NA: Not Applicable

DNGS:

Self-Assessment #	Tabs Completed	Sufficiently Critical	Facts Documented	Recommendations Listed	SCR/AR Referenced
D16-000318	A	A	X	A	X
D15-001260	A	A	A	A	X
D15-000151	A	X	X	NA	NA
D15-001125	X	A	A	A	A
D14-000320	A	A	A	A	X
D14-000470	A	A	A	A	X
D14-000549	A	A	X	A	X
D14-000889	X	X	X	NA	NA
D14-001054	A	A	A	A	X

Tickmarks:
A: Met requirements.
X: Requirements not met.
NA: Not Applicable

Performance Improvement Reporting:

- Pickering and Darlington Work Management Performance Improvement reports were not issued in Asset Suite 7 (“AS7”) for 2015 and 2016. Reporting had occurred in 2014, however an informal decision was made to only conduct one per year instead of the two required by governance. Subsequently, the single 2015 reports were found to have been completed but not issued in AS7. CFAM is aware of the issue and based on high resource requirements and historical low value, will be reducing the requirement to one assessment per year.

Appendix A3 –Additional Supporting Facts for Finding #3

Requirement or Performance Expectation:

T-0 Meeting for carryover in N-GUID-06931-10001 2.3.4 is that "...delays have occurred, but issues have been resolved and maintenance can be completed".

N-GUID-06931-10001 Section 2.3.3 requires a bi-weekly "Integrated Weekly Look- ahead meeting during an outage" mandated to support and validate adherence to committed resource allotment.

Facts:

At the May 6 meeting, the following observed behaviors:

- When asked whether a job should be carried over a rep stated “Ya carry it over to next week and if we don’t get it done we will carry it over to the week after”

The May 9 (Monday) meeting was attended and the following were observed:

- No attendance sheet was used;
- The execution WWL commented in a few instances "They were too busy to get it done (so) TR". TR is "FLM/Coord approved change in resource supply after T-19 resource availability commitment". There was no challenge on this cause code despite many other codes applicable to resource balancing and diversion of resources.

When work was carried over due to TR, no discussion occurred as to whether the necessary resources would be available after carry over.

Requirement or Performance Expectation:

N-PROC-MA-0022 - 1.7.18 - By End of Week T-9

Objectives:

Review Material Exceptions report in preparation for scope freeze.

Issue a “logic driven” scope list for review one week prior to the Scope Freeze meeting.

- Work Control Manager should ensure the following are performed:
- A logic driven, resource balanced Scope List is issued one week ahead of the Scope Freeze meeting which is held by the end of T-8.
- Tasks not set to ready, or at approved with a hold code (i.e. ITP, PH, MPA, MPB or MPD) are expected to be resolved beyond this milestone as per the scheduling process, are removed from scope.

Facts:

The T-09 (WW #28) report contained several examples where the work that was not logic driven or had less than adequate developed logic for the work:

- Five pages of work for Unit 5 low pressure service water work was not logically sequenced out, approximately 100 pre and post requisite tasks included in the week. WWL stated “Too much work for a week”. Participants identified significant demand for pump crew work resources and a significant number of duplicate jobs. WWL agreed and stated that he would remove the duplicates.
- Two month of contractor work in one work week, as a result of not having been sequenced.

- Boiler level control valve work not properly tied together in the schedule logic..
- End shield cooling pump work was not in order, removal task before prerequisite work.
- Several instances where containment box-up requirements could be planned such that work could be done in parallel to minimize the number of box-up events.

During the T-2 meeting on May 11th, the following logic and sequencing errors were identified by the meeting participants:

- Logic issue with work alignment for Process-70 test;
- Late injected work not logically sequenced;
- Pump removal scheduled before disconnect electrics;
- Pre and Post test sequencing reversed;
- Conflict with Filtered air discharge system filters 101/102;
- Bar Screen work scheduled at the same time; and,
- QC weld checks scheduled the week after the permit is removed.

Requirement or Performance Expectation:

N-PROC-MA-0008 APP-K.2.0 mandates that it is a New Work Meeting function to arrange for a field walkdown to verify adequate compensatory actions and to confirm the Safety Department has been informed.

Facts:

Lighting deficiencies identified in the agenda packages. The SPOC Delegate did not request any of the lighting issues to be walked down. He stated that unless additional information is provided in the WR, lighting issues are not assumed to be safety issues and so generally, no walk downs are requested.

The SPOC Delegate views requirements like ensuring a Shift Manager/FLM informed, ensuring a walkdown, and ensuring an SCR is filed as redundant to responsibilities of the WR originator and plant supervision and indicated that he generally does not ensure an SCR has been filed.

Informing the Safety Department: Interview with the SPOC Delegate identified that the current practice is to notify one of the JHSC (Joint Health and Safety Committee) representatives of identified safety issues (such as the asbestos WR) and that the Safety Department is not considered the appropriate contact.

Appendix B - Learning Behaviors

During the Audit, Nuclear Oversight evaluated the Work Management organization's application of performance improvement programs was found to be not fully effective. The following is a summary of the results:

Corrective Action Program

See finding number two for learning behaviours information.

Self Assessments

See finding number two for learning behaviours information.

Observation & Coaching:

See finding number two for learning behaviours information.

Fleetview Program Reporting:

See finding number two for learning behaviours information.

Operating Experience:

Review of operating experience occurs as required and no issues were noted, deficiencies in OPEX use within CAPs was captured in finding two.

Disposition of Previous Audit Findings:

Previously completed audit was NO-2013-012 Feb-2013, two SCRs were raised as a result of this audit, subsequently the EOER for the second finding, a significance level three CAP was rolled into the first finding a level two. This SCR P-2013-03748 C/2 was deemed ineffective by EOER - SCR P-2014-20542 was raised in response. Deficiencies in this CAP are noted in the learning behaviours finding.

Previous Performance Assessments:

NO-2015-103 was conducted at Pickering during July 2015. A SCR was raised to capture shortfalls in planning and executing online and outage maintenance activities. This was dispositioned by crediting the NFI-07 initiatives designed to address shortfalls. No additional issues were noted in the completion of the related corrective actions.

NO-2015-305 for Nuclear fleet initiative six occurred in September 2015, deficiencies in the related SCRs are noted in the learning behaviours SCR analysis.

NO-2015-304 looking at another component of Nuclear fleet initiative six occurred in September 2015. Related corrective actions have been completed.

Appendix C – Not Used

Audit: NO-2016-020 Fleet Work Management

Appendix D - Audit SCR Significance Level

Significance Level	Definition as per N-LIST-01966-10000 Section 11.0 Audit Finding
SL1	**A highly significant event** or adverse condition or programmatic implementation deficiency that causes a major reduction in the margin of safety to the public or to station personnel and/or which has a major impact on the environment or on production or on other business deliverables.
SL2	An issue identified and reported to management during the audit / assessment for which there was Nuclear or Conventional Safety risks and the issue was not handled with appropriate response. Significant organizational and / or programmatic deficiencies are identified: • A program is not fully or effectively implemented. • High impact or chronic performance problems exist with the execution of the program. • There is a relatively high risk of a breakthrough event, due to organizational or programmatic issues. Note that this means that breakthrough events may not have occurred yet. • Evidence of lack of management oversight of key program areas. • The organization was reliant on Nuclear Oversight to identify program deficiencies (i.e. line organizational barriers are ineffective). • Management oversight efforts have been ineffective at identifying and/or correcting performance concerns. A significant issue that supports escalation of the audit / assessment; (i.e., a program deficiency that is cross-functional in nature or has substantially reduced the effective execution of a program or element of a program). Related findings: • The audit / assessment team identifies that actions taken to correct a previous finding were not effective and cause it to reappear as a finding which contains the most fundamental aspects of the previous finding. • This should normally increase the SL from a 3 to a 2 since there is an aspect of ineffectiveness of Corrective Actions or Management Oversight, as well as lack of response to the Nuclear Oversight organization.
SL3	All other findings not meeting the criteria above. Programmatic implementation deficiencies, which have the potential to be more significant or may be the precursor for more significant events, are identified by the finding. (Continued Next Page) The audit / assessment team identifies that the problem(s) associated with a previously identified finding still exists. The finding is considered as a “continued”

Audit: NO-2016-020 Fleet Work Management

SL3 cont'd	finding, if the following are true: • Mitigating actions are in place and considerable progress is being made in resolving the problem(s). • Long term plan is established and appropriate actions are in progress on a reasonable schedule for completion. • Some improvement in performance is evident. Learning Behaviours: • Deficiencies in use of the Corrective Action Program to self-identify and resolve adverse conditions. • Self-assessments are not timely, not self-critical, and/or recommendations are not dispositioned. • OPEX not used effectively (i.e. internal and external).

Appendix E– Overall Audit Report Rating Scale

An overall report rating has been assigned as an indication of the overall implementation, performance and risk management practices for the program that was subject to the Nuclear Oversight audit. Ratings are derived through professional judgment by the audit team and discussion with management.

- *(Green) Demonstrates Industry Best Practice:* The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrates pro-active self-critical learning behaviours with a focus on continual improvement.
- *(White) Effective*: The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.
- *(Yellow) Not Fully Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.
- *(Red) Not Effective:* The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization

Appendix F- Completed Audit Rating Criteria Sheet

AUDIT RATING CRITERIA

	MANAGED SYSTEM CONTROLS DEMONSTRATES INDUSTRY BEST PRACTICES The audit/assessment identified that implementation, performance and risk management practices for managed systems, demonstrate pro-active self-critical learning behaviours with a focus on continual improvement.	MANAGED SYSTEM CONTROLS ARE EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are effective, with acceptable levels of risk to the organization and few areas of concern.	MANAGED SYSTEM CONTROLS ARE NOT FULLY EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not fully effective. Business process objectives and/or requirements are not consistently met posing moderate levels of risk to the organization.	MANAGED SYSTEM CONTROLS ARE NOT EFFECTIVE The audit/assessment identified that implementation, performance and risk management controls for managed systems are not effective. Significant or chronic performance or implementation problems exist that may pose unacceptable levels of risk to the organization.	
	Attributes: (Highlight appropriate items)	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Attributes: (Highlight appropriate items)**	**Supporting Fact, Example or Finding Reference**
Program	Requirements are clearly established in governance, governance is being well maintained, and compliance is consistent.	Requirements are established in governance, governance is generally maintained, and minor non-compliances exist.	Requirements are established in governance, governance is not well maintained, and compliance or performance gaps exist.	Controls are either not clearly established in governance or have not been effectively implemented, governance is not being maintained, and gaps to regulatory or code requirements are evident.	Finding 1 - O&C not implemented Finding 3 - Logic milestone
	Ownership and interfaces are well established and effective. Peer interfaces are recognized and implemented effectively.	Ownership is clear and interfaces are understood. Peer interfaces are recognized and managed.	Ownership and interfaces are inconsistent or not well understood. Most Peer interfaces are recognized.	Ownership and interfaces are inconsistent or not understood. Peer interfaces are not recognized or not effectively managed.	
	Organization is clearly established to support requirements on a sustainable basis.	Limited organizational issues or sustainability challenges exist to the support of OPGN requirements.	Organizational accountabilities have not been adequately established and challenges exist to effectively support OPGN requirements on a sustainable basis.	Organizational roles and accountabilities are not established and/or are not sustainable.	F2 - Reporting F3 - Logic Milestone
	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is up to date.	No examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires minor updating.	Isolated examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide requires updating.	Widespread examples of persons performing activities for which they are not shown as qualified within TIMS. Training Qualification Guide is well out of date.	Gaps covered by TIMS extension.
CAP/OPEX	CAPs are timely, proactive, and comprehensive with trends being self-identified.	CAPs are typically timely and effective in identifying causes and appropriate corrective actions. Adverse trends are self identified and addressed via the CAP process.	CAPs or plans to correct performance issues are not consistently effective or well executed.	CAPs or plans to correct performance issues are not effective or well executed, contributing to repeat of significant managed system implementation issues or breakthrough events.	Finding 1 CAP issues - more details in App/PDS
	Operating Experience (OPEX) is consistently reviewed and used effectively to improve performance.	Use of OPEX to improve performance is evident in most areas.	Weak or ineffective use of OPEX may have contributed to repeat events or issues not being identified and corrected in a timely manner.	Ineffective use of OPEX may have contributed to repeat events or issues not being identified or corrected in a timely manner.	No issues noted
	No significant issues have been identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE).	Not responsive to independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE) on a consistent basis.	Repeat issues identified by independent organizations (NSRB, Nuclear Oversight, WANO, CNSC, TSSA, MOE), requiring additional oversight.	No issues noted
Performance	Performance is exemplary, indicating the area could be a benchmarking opportunity for lower performing site(s).	Areas of concern do not significantly affect performance. Plans exist and appropriate actions are taken to address concerns.	Concerns still exist in some areas which are adversely affecting performance.	Performance has contributed to a reduction in Regulatory or Operating margin, or operating beyond design limits.	F2 - Refurb Pre-Req Completion <50% F3 - Logic impacts stability
	Performance is consistently meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training. Demonstrates ownership and effective use of training to improve performance.	Limited examples are evident where performance did not meet expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training.	Performance is not meeting expectations in some areas of Nuclear and Conventional Safety, Radiation Workers Practices, or Training.	Performance is not meeting expectations in the areas of Nuclear and Conventional Safety, Radiation Worker Practices, or Training, and recovery plans are not in place or are unlikely to succeed.	N/A
	No significant issues exist with the implementation of OPGN requirements.	Limited issues exist with the implementation of OPGN requirements.	Significant issues exist with the implementation of OPGN requirements.	Significant or chronic problems exist with the implementation of OPGN requirements. Failure to act on indications of performance issues have contributed to significant consequential events.	F1 - Compliance to CAP requirements F2- Reporting? F3 - Milestones
	Ownership displayed for overall station performance and/or fleet area improvements, and benchmarking performed to close gaps to industry best practices.	No significant consequential events but challenges to barriers exist.	Risk of a significant consequential event is relatively high or has occurred but was identified internally, ie. not by an external organization such as TSSA, CNSC, MOE.	Multiple or repeat significant consequential events have occurred; identified either internally or by external organization such as TSSA, CNSC, MOE.	F2 - Refurb low completion F3 - Milestone Logic
	No events, low level or otherwise, are evident that challenge barriers.	Self revealing events are few and are being dealt with appropriately.	Self revealing events continue to occur and are not consistently being dealt with effectively.	Safe operating margins are periodically challenged.	N/A
Oversight	Performance indicators are clearly established and consistently achieved or exceeded.	Performance indictors typically show performance is meeting expectations.	Performance indicators typically show performance is not fully meeting expectations or are not reflective of actual performance.	Performance indicators have either not been established or are not meeting expectations. A downward trend in performance exists.	Refurb Red Windows - Chronic Stability issues. Completions < Target.
	Self-Assessments are timely, critical, provide value and support continuous improvement including benchmarking to industry best practices.	Self-assessments are typically critical and provide value by identifying and closing gaps to top fleet performance.	Self-Assessments are not targeted at areas of sub-standard performance or are not sufficiently critical.	Self-Assessments have either been ineffective in addressing performance issues, or have not been performed.	F1 - PIR frequency 1 per year, not twice -SA containing recommendations with no actions
	No significant adverse trends are evident.	Limited performance adverse trends are evident and action plans are in place to improve performance.	The failure to identify precursors, monitor metrics, or measure performance is resulting in significant self revealing events.	Management is unaware of managed system state or performance, lack performance monitoring in critical areas, or performance gaps are not always addressed.	Finding 2
				Longstanding deficiencies with ineffective resolution were identified with potential for escalation by Nuclear Oversight.	N/A
				Work activities are being stopped by Nuclear Oversight or through the initiation of formal Stop Work proceedings.	N/A

Appendix G - Standard Audit Scope

The standard audit scope included a review of the following areas to assess compliance, implementation and performance effectiveness:

- Program Governance (N-PROG-MP-0014 R04, Reactor Safety, and implementing procedures and standards);
- Management Oversight / Learning Organization / Corrective Action Program – Findings, Self-Assessment ("SA"), Observation and Coaching ("O&C"), Root Cause Analysis ("RCA"), Fleetview reporting, System Health reporting, Corrective Action Plan ("CAP") effectiveness, and Operating Experience ("OPEX");
- Line Management interfaces with other programs, organizations, and Centre-Led Functional Area Management ("CFAM"); and
- External insights – World Association of Nuclear Operators ("WANO"), Nuclear Safety Review Board ("NSRB"), Canadian Nuclear Safety Commission ("CNSC"), and any applicable Significant Operating Experience Reports ("SOER").

Appendix H – Not Used

Appendix J - Distribution

TO:

Senior VP, Nuclear Refurbishment	M. ALLEN
Senior VP, Pickering	B. MCGEE
Senior VP, Darlington	B. DUNCAN
VP Fleet Operations and Maintenance	F. GUGLIELMI
Director, CFAM Work Management	V. SMYTH
Director, Work Management, Pickering	C. JOHNSTON
Director, Work Management, Darlington	D. NORRAD
Director, Work Management, Refurbishment	K. FRITZ
Manager, Work Control, Pickering	A. ROBERTSON
Manager, Work Control, Darlington	D. GUERNSEY
Director, Project Execution, Refurbishment	R. MARTIN

CC:

Distribution

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December 18, 2015

File No: N-REP-01070-0573047 T06

Nuclear Oversight Assessment Report
OPGN NO-2015-321
Follow-up to Human Performance Audit NO-2014-012

Objective and Scope

Nuclear Oversight conducted a performance based assessment to follow-up the Human Performance Audit NO-2014-012. The objective of this assessment is to determine if the corrective actions for the findings have been completed, implemented, and sustained. The scope includes the review of the following findings and the resultant CAPs for effectiveness. The audit findings were:

- Finding 1: Program Effectiveness Contributing to Declining Trend in Human Performance; and
- Finding 2: Ineffective Site Human Performance Committees.

The assessment was conducted across Nuclear over the period November 9-20, 2015.

Overall Assessment

The assessment has determined that the corrective action plans for the Human Performance Audit have not been fully effective in addressing the findings from the Human Performance Audit.

Progress has been made with Human Performance (“Hu”) program and targets which include:

- A reduction in the number of site EFDRS across Nuclear with the fleet in a position to meet their site Event Free Day Reset (“EFDR”) targets for 2015;
- A Nuclear Peer Team for Human Performance has been implemented. Individuals from across Nuclear, including vendors have attended;
- A Nuclear fleet plan has been developed; and
- Improvement in the number of departments that are trending Human Performance in their quarterly trending reports.

There are items however, that have not been effectively addressed from the Human Performance audit. Two problems and one insight have been identified:

- Human Performance Audit NO-2014-012 Finding 1 has not been fully addressed;
- Site Hu working and steering committees are not meeting as required, or have not been established. Hu training has not been provided to all Hu advocates or SPOCs on the committees; and

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- Insight #1 CFAM Human Performance Team – Areas for Improvement. Inconsistencies in governance regarding meeting frequency, and inconsistencies in meeting attendance of the Peer Team were identified.

Problems

1.1 Problem No. 1 – OPGN Audit 2014-012 Finding #1 not fully addressed

Criteria:

Deficiencies identified during the Human Performance Audit OPGN NO Audit 2014-012 were to have been addressed as follows:

- Fleet-wide Human Performance ("Hu") self-assessment performed;
- Fleet OPGN Peer Team established;
- Compliance with N-PROC-RA-0097 Self-Assessment and Benchmarking for Divisional Self-Assessment;
- N-INS-09030-10001 Human Performance Event Communication and Analysis is followed which requires EFDRs are analyzed for human performance elements using the Anatomy of Event form ("AOE") and communicated using the Human Performance Lessons Learned Communication Form ("HuLL"); and
- Perform Hu trending, coding, and reporting as per N-INS-01966.1-10000 Trending & Analysis Instruction and Performance Improvement Reporting.

Condition:

Actions to address issues identified in OPGN NO Audit 2014-012: Finding # 1 have not been fully implemented or effective. This includes:

- Finding 1 identified that there were no fleet Human Performance ("Hu") self-assessments ("SA"). The current status is:
    - The three Hu SAs scheduled as part of OPGN Human Performance Excellence Plan for 2015 have not been completed as planned; and
    - Divisional Hu SAs performed in 2014, were focused on Pickering and Darlington station Operations and Maintenance Organizations and did not include IMS, DNWM, and Projects and Modifications/DNR; and
- Review of four Site and 25 Department EFDRs from 2015 show that:
    - Documentation (AOE and HuLL forms) used to analyze the events has generally not been completed as required; and
    - EFDRs do not have an EFDR trend code applied to the Station Condition Records ("SCRs").

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Impact:

- Self-assessments at a fleet level provide an opportunity to identify Hu issues across Nuclear. Delays in these assessments means issues may not be identified or addressed;
- Events are not analyzed for Human Performance consistent with INPO 06-003. Human performance elements contributing to the events may not be identified; and
- Trend analysis of SCRs for human performance events will not capture all the EFDRs and their causes.

Additional details are in SCR N-2015-29665.

Management Action: SCR N-2015-29665, “Nuclear Oversight Performance Assessment-Human Performance Audit Follow-up - Deficiencies identified.”

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1.2 Problem No. 2 – Site Hu working and steering committees are not meeting as required, or have not been established. Hu training has not been provided to all Hu advocates or SPOCs on the committees.

Criteria:

Deficiencies identified during the Human Performance Audit OPGN NO Audit 2014-012 were to have been addressed including:

- N-GUID-09030-10001 Human Performance Program Guideline is followed for steering and working committees;
- Hu steering and working committees are meeting at the required frequency; and
- Training for Hu were to be established in governance and Hu advocates were to be trained.

Condition:

Actions to address issues identified in OPGN NO Audit 2014-012 Finding # 2 have not been fully implemented or effective.

- N-GUID-09030-10001 requires Hu working committees ("HuWC") to meet 8 times per year. PN and DN HuWC have not documented the required frequency of meetings in 2015.
    - PN HuWC is documented as meeting 6 times;
    - DN HuWC is documented as meeting 5 times;
- N-GUID-09030-10001 requires that the Hu Steering committee("HuSC") meet 4 times per year:
    - DNWM is below target with 3 of 4 HuSC held in 2015;
- N-GUID-09030-10001 requires quorum and stakeholder attendance greater than 50%. Quorums are not being met consistently for Pickering working committee. Three of 4 meetings did not meet quorum. One of 4 meetings had less than 50 % stakeholder attendance;
- There is a lack of clarity in N-GUID-09030-10001 regarding the establishment of steering and working committees for DNWM, DNR, and IMS or their Hu manager/advocate attendance at PN and DN site committee meetings. S 3.2.1 states that the Human Performance Manager serves as the HuSC Vice Chair, serves as the HuWC Chair, and participates in the Hu Peer Team as a quorum member.
    - DNWM has not established a HuWC.
    - DNR and IMS have not established a HuSC. Both DNR and IMS organizations have been attending the station Hu committee meetings but neither is a quorum member at PN or DN. Both have attended only 3 of 8 steering committee meetings at DN;
    - IMS has not established a HuWC. IMS participated through the site HuWC at PN and DN. IMS is not a quorum member.
- Although the advocate role and training requirements are defined in the Nuclear Hu Plan, the information has not been incorporated into site Hu strategy documents for Pickering and DNR. Hu advocates have not been identified for all departments within Pickering and DNR; and

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- PEL 71314, a New Human Performance Leads Seminar (“NHULS”) - is designed to equip new human performance leads (advocates) with the tools and knowledge needed to perform their roles effectively and to promote Hu excellence.
    - o This standalone PEL is not linked to any QUALs and is not referenced in the Nuclear Hu Program document (N-PROG-AS-0002); and
    - o 17 of 36 department Hu representatives attending HuWC meetings were not linked and did not complete this PEL credit.

Impact:

- Inconsistent monitoring and assessment of Hu Performance across Nuclear; and
- Potential for less than effective implementation of Hu improvement initiatives across Nuclear.

Additional details are in SCR N-2015-29665.

Management Action: SCR N-2015-29665, “Nuclear Oversight Performance Assessment-Human Performance Audit Follow-up - Deficiencies identified.”

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2.0 Insights

2.1 Insight No. 1 – CFAM Human Performance Peer Team - Areas for Improvement

The following areas for improvement were noted for the CFAM Peer Team and its governance since there are inconsistencies in the frequency, quorum and format for required meetings:

- N-GUID-09030-10001 Human Performance Program Guideline is not consistent with N-INS-08400-10026 Nuclear Peer Team Terms of Reference as follows:
    - N-GUID-09030-10001 states that the peer team meets quarterly but in N-INS-08400-10026 the requirement is monthly; and
    - N-GUID-09030-10001states that quorum for CFAM Peer Team includes two of the three Human Performance Managers and two of the three Site Training Managers but N-INS-08400-10026 states that quorum is Manager, Human Performance Darlington (SFAM) and Manager, Human Performance Pickering (SFAM);
- N-INS-08400-10026 Nuclear Peer Team Terms of Reference states :
    - "The peer team should have at a minimum, one meeting per calendar month, between one and three hours in duration. At a minimum, eight meetings per year should be face-to-face. Quorum is required in order to satisfy this meeting frequency requirement." Only eight of twelve meetings have been documented in 2015 (including the two fleet peer team meetings);
    - S. 1.3.1 "Meetings shall be arranged on weeks when there are no NEC or other executive level meetings to allow attendance by the Executive Team sponsor." The executive level sponsor was documented as attending only 1 of the 5 CFAM peer team meetings held in 2015. It was reported that the meeting attendance records were not accurate;

- Neither N-GUID-09030-10001 Human Performance Program Guideline nor N-INS-08400-10026 Nuclear Peer Team Terms of Reference specifies Darlington Refurbishment as a CFAM peer team member or their role (non-quorum member).

  Management Action: SCR N-2015-29665, "Nuclear Oversight Performance Assessment-Human Performance Audit Follow-up - Deficiencies identified."

3.0 Individuals/Organizations Briefed

Debrief meeting: 889 Brock Road, Room 502, December 3, 2015

Wayne Bowes, Human Performance Manager (CFAM)

John Thompson, Human Performance Manager (DN)

Jay Joyce, Performance Improvement Officer (PN)

Allan Webster, Senior Manager Strategic Planning (DNWM)

Mike Dance, Manager Refurbishment Operations & Maintenance (DNR).

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Signatures

Prepared by: Diana Baum Date: Dec 18, 2015

Diana Baum
Lead Auditor General
Nuclear Oversight
Cross-Functional Department

Approved by: Sarah Wood Date: Dec 18, 2015

Sarah Wood
Acting Senior Manager
Nuclear Oversight
Cross-Functional Department

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4.0 Appendices

Appendix 1

Additional Details for Problems

Hu Self Assessments:

- NO15-000997-TCD-July 31, 2015 has not been performed. The subject is to review the process for sharing and communicating of Hu lessons including the use and effectiveness of the HuLLs (Human Performance Lessons Learned Communication form (N-FORM-11611);
- NO14-001377-Original TCD February 15, 2015 deferred to March 2016. The subject is to measure advocate effectiveness; and
- NO15-000996-TCD October 30, 2015. This is currently in progress. The subject is to perform self-assessments to gauge supervisors' field presence and engagement with workers, and the adherence to the oversight controls process using the MRM/MRBs. Confirm worker behaviours are managed through coaching and reinforcement as appropriate.

Site EFDRs:
4 of 4 Site ERDRs for Pickering and Darlington did not comply with N-INS-09030-10001 R 4 (Sections 1.3; 1.5; 4.1) for documentation and analysis as follows:

- 4 of 4 did not have did not have a completed AOE form for the event free day reset in PJB database as required; and
- 4 of 4 did not have a completed Hull form attached to SCR as required. 0 of 2 DNGS Site event free day resets had Hulls posted on DNGS-rapid response depository);

Department EFDRs:

25 department event free day resets were reviewed across the nuclear fleet. Non-compliance with N-INS-09030-10001 R 4 (Sections 1.3;1.5; 4.1) for documentation and analysis was found at all sites as follows:

- 21 of 25 did not have an AOE form completed in the PJB database as required;
- 12 of 25 did not have a HuLL form attached to the SCR as required. Completed Hull forms were found for only 13 of 25 EFDRs; and
- 3 of 3 Hu departments interviewed indicated that the AOE forms are not submitted to them for review as required.

Coding requirements for EFDR Station Condition Records ("SCRs"):

- S 1.2.1(h) requires that site and department EFDRs have an EFDR code applied. EFDRs are not being coded as required:
  - 4 of 4 site EFDRs in 2015 did not have the Management Focus Area code ("MFA") EFDR or a Line Defined code ("LDC") EFDR;
  - 25 of 25 Department EFDRS reviewed did not have an EFDR trend code applied;
- Contrary to S 1.2.1 (g), 1 of 4 site EFDRs P-2015-05913 did not have a Human Performance Code identified (SCR states "none") even though the direct cause stated "human error wrong valve operated;"

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- Contrary to S 1.2.1(c), 1 of 4 site EFDRs did not identify a causal factor code as required; and
- N-INS-09030-10002 Site and Department Level Event Free Day Resets S 1.10 requires that site EFDRs are assigned to the causing department as a department EFDR. 3 of 4 site EFDRs in 2015 did not check the box reviewed for department EFDR.

Appendix 2

Distribution

TO: Wayne Bowes Manager, Senior Manager CFAM Human Performance

CC DISTRIBUTION LIST

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ONTARIO POWER GENERATION

Internal Audit

Finance's Controls over Darlington Refurbishment

December 2014

Distribution:

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FINANCE'S CONTROLS OVER DARLINGTON REFURBISHMENT

1.0 EXECUTIVE SUMMARY

Audit Rating[1]:	Requires Improvement
Enterprise Level Impact:	Moderate

Internal Audit (IA) has completed the Finance's Controls over Darlington Refurbishment audit. This was a risk-based audit identified in IA's 2014 - 2016 Strategic Audit Plan (SA Plan). The purpose of this audit was to independently assess the effectiveness of the design of Finance's controls over the Darlington Refurbishment program in line with its accountabilities per the OPG Business Model.

During the course of the audit, IA identified the following process strengths:

- Finance's involvement in all major aspects of the Refurbishment program through participation in committees, review sessions, and cross functional working teams;
- A well defined and established economic assessment and business case review and approval process is in place;
- DN Refurbishment Project team considers Finance a valued business partner.

IA noted that Finance's operating model is to provide support to the Refurbishment team as well as to provide financial challenge in all aspects of the Refurbishment program. In support of this model, Finance identified the need and developed a key stakeholders accountability framework (based on OPG decision rights) outlining key risk areas and associated high level controls for major Refurbishment processes. Through its supporting role, Finance gains greater familiarity with the program, which improves its ability to provide constructive challenge. Over the past year, Finance increased its resources dedicated to the refurbishment project. Towards this end, the Director Controllership role was split into two roles to allow dedicated attention to Refurbishment and Station Operations respectively and to ensure independent financial challenge exists for both the Project and Operations organizations. Additional analysts with assigned responsibility for specific areas of the program were hired to augment the local finance team. Finance made further structural changes to place resources closer to the Project business. These changes, as well as Finance's initiative to define roles and accountabilities of key stakeholders of major processes in the Refurbishment program, are still in progress.

IA also identified the following findings, which have been summarized below:

- In recognition of the strategic importance of its financial challenge role in the Darlington Refurbishment program, Finance has implemented controls to review, assess, and provide oversight on major aspects of the program. However, some of the related controls for certain key risk areas, have not been formally defined and documented to ensure that they are performed consistently as intended, with the desired frequency, and appropriate timeliness.
- Documentary evidence to demonstrate performance of certain key controls was not consistently retained. Throughout the audit, evidence was not easily retrievable and / or available within a reasonable time upon IA's request. As such, performance of some key controls and the results of such activities were not clearly evident.

[1] *Please see Appendix A for ratings definition*

FINANCE'S CONTROLS OVER DARLINGTON REFURBISHMENT

The success of the Darlington Refurbishment program is of paramount importance for both the Province of Ontario and OPG. The size, cost, complexity and duration of this critical program entail significant risks that need to be diligently managed in a consistent, structured and orderly manner. Given Finance's fiduciary role, the required improvement areas highlighted above, will help ensure that well-defined, sustainable control processes are in place to support the achievement of this crucial undertaking. Furthermore, as the Program progresses towards execution, and throughout this phase, appropriate periodic review and update of key controls is essential to continually align with any changes to risks.

All findings, including the above, have been reviewed with management and they have committed to specific action plans to address these findings. Please see Section 4.0 for specific details of all the findings along with the associated risk impact, audit recommendations and management action plans.

IA would like to take this opportunity to thank Nuclear Finance, Investment Planning and Shared Financial Services for their assistance and co-operation during this audit.

Approved By:

Michael Braude
Acting VP Assurance & Chief Audit Executive

2.0 BACKGROUND

Darlington Nuclear Generating Station is a four-unit nuclear power plant equipped with CANDU reactors that first came into commercial service in 1990. By design, CANDU reactors are expected to require refurbishment at the mid-point of their operational service life.

In this connection, OPG initiated detailed planning for the mid-life refurbishment of the four reactors that would enable their continued operation for an additional period of approximately 30 years. The Darlington Refurbishment (DNR) program is large and complex, spanning about 15 years, during which time the station continues generating electricity. The program is currently in the definition phase with the first refurbishment outage scheduled for 2016.

The centre-led Finance function, "Finance", plays a key supporting role regarding the Darlington Refurbishment program. Its key accountabilities, as defined in the OPG Business Model, include strategic and business decision support, effective financial challenge, sound financial and business analysis, business planning, and financial and performance reporting.

3.0 AUDIT OBJECTIVES AND SCOPE

The objective of this audit was to independently assess the effectiveness of the design of Finance's controls over the Darlington Refurbishment program in line with its accountabilities per the OPG Business Model.

A summary of sub processes, related inherent risks as well as Finance's risk focus that IA included in the audit scope is outlined below:

Sub Process	Inherent Risk Area	Finance's Risk Focus
A. Program Business Case and Project Release	1. Alternatives to DNR program	• Sound financial and business analysis of alternatives to DNR program
	2. Alternative options in DNR program	• Sound financial and business analysis of alternative options in DNR program • Strategic review of alternative options
	3. Program / project economic assessment including risk assessment	• Sound economic analysis, e.g., LUEC • Appropriate discount rate • Completeness and accuracy of sensitivity analysis • Completeness and appropriateness of risk assessment • Appropriateness of mitigating actions
	4. Program and release estimates including contingency costs	• Effective high level financial challenge of program and release estimates / schedules • High level reasonableness of assumptions • Completeness and appropriateness of contingency costs re: project phase, estimate class and probabilities
	5. Business case approval	• Concurrence by relevant Finance group
	6. Program baseline and project change management	• Appropriate impact assessment of program changes: costs and timelines • Appropriate review and approval of program changes

FINANCE'S CONTROLS OVER DARLINGTON REFURBISHMENT

Sub Process	Inherent Risk Area	Finance's Risk Focus
		• Appropriate impact assessment of project scope changes: costs and timelines • Alignment of projects with annual release and program
	7. Performance monitoring	• Comprehensive, relevant and timely performance metrics • Appropriate impact assessment of variances: costs and timelines
B. Contract Lifecycle	1. Contract strategy	• Effective financial challenge of contract strategy, cost benefit analysis based on scope, quality requirements and risks
	2. Proposal evaluation	• Effective financial challenge of proposal for VFM / demonstrating prudency
	3. Set up of contractors in source systems	• Appropriateness of setting up of contractors in Tempus / ONCORE • Appropriateness of cost reporting for effective contractor oversight
	4. Contract management	• Contract execution per approved financial terms and conditions
C. Resource Management	1. Labour strategy for contractors	• Appropriateness of OAR authority assignment to contractors
D. Business Plan	1. Refurbishment vs. Operations costs	• Refurbishment and Operations: omission, duplication or incorrect categorization of costs

The scope of this audit specifically excluded:

- an assessment of the role and accountabilities of key stakeholders other than Finance
- an assessment of the risks to achieving the refurbishment program overall objectives
- areas covered by other IA audits and those considered to be of lower priority audit risks, namely program financing cost, cost recovery strategy, program accounting, contracts / contact amendments approval, requisitions, invoice payments approval, financial reporting, program vs. long term business plan, and project life cycle targets vs. annual BP targets.

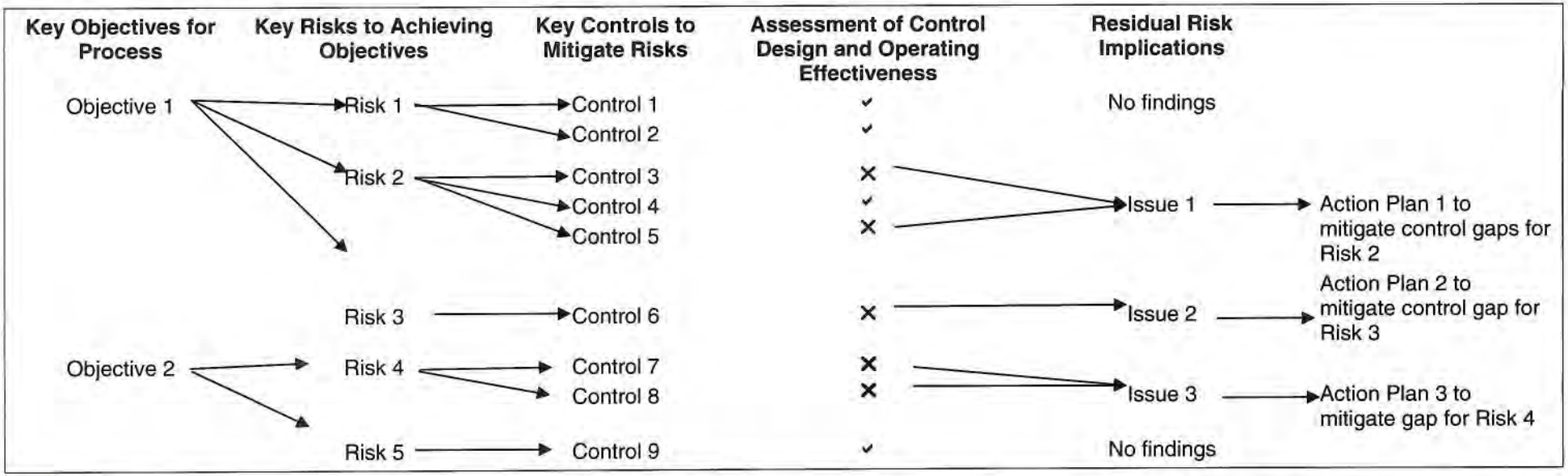
4.0 AUDIT FINDINGS

#	Finding	Process Risk Rating	Recommendation	Management Action Plan
4.1	**SOME OF FINANCE'S CONTROLS IN CERTAIN KEY RISK AREAS WERE NOT FORMALLY DEFINED AND DOCUMENTED**			
	In recognition of the strategic importance of its financial challenge role, Finance has implemented controls to review, assess, and provide oversight on major aspects of the program. However, some of the controls relating to Finance's oversight of release estimates, contingencies, scope changes and performance monitoring, have not been formally defined and documented, to ensure that they are performed consistently as intended, with the desired frequency, and appropriate timeliness. During interviews and walkthroughs with Finance, some control activities could not be clearly described and specifically linked to certain key risk areas. There was also lack of clarity as to what documentary evidence supported the existence and performance of those key controls. Risk Impact Analysis • Controls may not be performed as intended • Robustness and effectiveness of Finance's controls may not be consistent • Potential gaps in controls coverage for Finance's key risk focus areas	High	Finance management should: 1) further clarify Finance's oversight accountabilities for DNR 2) further define Finance's key controls and map to specific key risk focus areas.	Action Plan(s): 1) Finance Management will work with IA and the Project to clarify finance's roles and accountabilities relating to release estimates, contingencies, scope changes and performance monitoring. 2) Based upon an agreed understanding, Finance management will review project and finance governance to identify any gaps that exist to ensure alignment of roles and accountabilities. 3) Finance will ensure all key controls are defined, documented and mapped to key risk focus areas. Owner: Carla Carmichael, VP Nuclear Finance Target Completion Date: 1) Q1, 2015 2) and 3) Q2, 2015
4.2	**DOCUMENTARY EVIDENCE TO DEMONSTRATE PERFORMANCE OF CERTAIN KEY CONTROLS WAS NOT CONSISTENTLY RETAINED**			
	Documentary evidence to demonstrate performance of certain key controls was not consistently retained. Throughout the audit, evidence was not easily retrievable and/ or available during interviews and walkthrough of controls, or within a reasonable time upon request. As	Moderate	Finance management should ensure that adequate relevant documentary evidence is retained to be able to demonstrate that its controls	Action Plan(s): Determine and implement an appropriate documentation retention policy.

#	Finding	Process Risk Rating	Recommendation	Management Action Plan
	such, performance of some key controls was not clearly evident. There was also difficulty in demonstrating the results of the review or challenge within controls due to lack of documentation, which ultimately hinders the ability to demonstrate that these key controls have been performed as designed. The issue noted in finding 4.1 may contribute to this lack of control documentary evidence. <u>Risk Impact Analysis</u> • Inability to demonstrate that controls are performed and/or are performed as intended • Control breakdowns may go undetected		have been performed as intended.	<u>Owner:</u> Leo Saagi, Director Nuclear Refurbishment <u>Target Completion Date:</u> 1) Q1, 2015

APPENDIX A: OVERVIEW OF AUDIT RATING METHODOLOGY

IA's ratings for operational audits of OPG business processes are derived from an assessment of the management controls that are in place to mitigate key risks to the achievement of process objectives. The diagram below illustrates IA's basic approach to conducting an audit. If control deficiencies are identified that prevent IA from providing reasonable assurance that the process objective will be met (i.e. key risks are adequately mitigated), an audit issue will be noted and a corrective action plan from management will be required.



- *Effective*: control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- Generally Effective: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- Requires Improvement: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- Not Effective: control and risk management practices are not designed and/or are not operating effectively.

The second tier to IA's audit rating is an indication of the implications of the residual risk at the broader, enterprise level. This rating of "High", "Moderate" or "Low" is intended to answer the "so what?" question for senior management and the Audit and Risk Committee by giving context to audit results in terms of their impact on OPG as a whole.

OPG CONFIDENTIAL

ONTARIO POWER GENERATION

Internal Audit

Darlington Station Readiness for Refurbishment

January 2015

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1.0 EXECUTIVE SUMMARY

Audit Rating[1]:	Generally Effective
Enterprise Level Impact:	Moderate

Internal Audit (IA) has completed the Darlington Station Readiness for Refurbishment audit. This was identified in IA's 2014-2016 Strategic Audit Plan (SA Plan). The purpose was to independently assess key Darlington Station activities and processes in support of successful commencement and execution of the Darlington Nuclear Refurbishment (Refurb).

During the audit, IA noted the following positive aspects:

- Strong organizational structure has been developed through use of OPEX to support the transitions between Station and Refurb;
- Station roles and accountabilities including key interfaces have been defined and are clearly understood; and
- Mechanisms for identifying and resolving emerging issues such as the review of common milestones at the Station's Refurb Work Program Integration Meeting, and parallel department alignment meetings are in place to support essential communication between organizations.

The audit also included a review of the mitigation of two OPG Enterprise Risks relating to Fuel Handling Reliability and the 13-year License Renewal for Darlington. No issues were noted during the review of the risk treatment plans which are being implemented as outlined.

In addition, IA identified the following findings which have been summarized in order of significance:

- Readiness process does not incorporate a schedule to highlight periods of high concentration of planned station activities which may challenge resources or completion of activities.
- There is a two-week misalignment on start and end dates between the Station and Refurb in terms of dates submitted to the System Operator and the dates being used by Refurb.

While the station has progressed well in meeting its current milestones, metrics, and deliverables, workloads are expected to intensify and both organizations will need to continue their levels of engagement in integration activities and in particular, during upcoming station outages. Also, as Refurb scope continues to be reviewed, based on OPEX from other refurbishments, there is some uncertainty regarding the work that may need to be accommodated by the Station that could displace other planned projects. The continuing uncertainty with the Primary Heat Transport (PHT) pump motors failure risk (high Enterprise Risk) may similarly affect the station's readiness. Therefore, although the Station has introduced processes to manage these issues, close monitoring is required to minimize potential impacts to equipment reliability during and post Refurb.

The findings have been reviewed with management and they have committed to specific action plans to address these findings. The accountable managers have agreed to enter a Station Condition Record ("SCR") to document the audit findings and to initiate the Corrective Action Process. Included in the Title of the SCR should be "Internal Audit Issue" and a reference to the audit title. Please see Section 4.0 for specific details of the above findings along with the associated risk impact, audit recommendations and management action plans.

[1] *Please see Appendix A for ratings definition*

IA would like to take this opportunity to thank the Darlington Refurbishment Interface Department, other Darlington Station personnel, Refurbishment, People & Culture, Finance, Nuclear Engineering, and Nuclear Regulatory Affairs staff for their assistance and co-operation during this audit.

Approved By:

Michael Braude
Acting Vice-President Assurance & Chief Audit Executive

2.0 BACKGROUND

Darlington NGS is a top performing nuclear power plant that has been in commercial operation for over 20 years. Darlington Refurbishment is intended to extend the life of the station for an additional 210,000 Effective Full Power Hours (EFPH). Refurbishment outages commence in October 2016 with Unit 2 to be followed by Units 3, 1, and 4. The station will play a key role in support of the successful commencement as well as execution of Refurbishment through specific deliverables outlined in transition plans such as pre-requisites, resources, and services in readiness for breaker open, during the outages, and return to service for each unit.

3.0 AUDIT OBJECTIVES AND SCOPE

The objective of this audit was to independently assess key Station activities and processes in support of successful commencement and execution of Refurbishment.

A summary of the process activities that IA included in the audit scope is outlined below:

Ref	Process Activities/ Areas	Audit Criteria / Key Risk Areas
A	Integrated scheduling (Station and NR)	• Significant activities and integration points • Basis to support planning assumptions and estimates • Feasibility of integration/rub-points
B	Resources and accountabilities	• Needs and capacity of resources • Integration of resource needs • Roles and accountabilities clearly defined • Budgeting for required station resources
C	Key Deliverables (e.g. FH reliability, pre-reqs, etc)	• Pre-requisites impact on scope for NR at handover • Oversight and reporting of key deliverables • Fuel handling reliability issues
D	Regulatory support	• Regulatory requirements and commitments defined, communicated, monitored, reported, and completed
E	Training	• Training needs identified • Capacity to deliver training • Trained and qualified staff for implementation of transition plans
F	Identification of Operating Experience (OPEX) and Lessons Learned	• Significant issues identified and considered

4.0 AUDIT FINDINGS

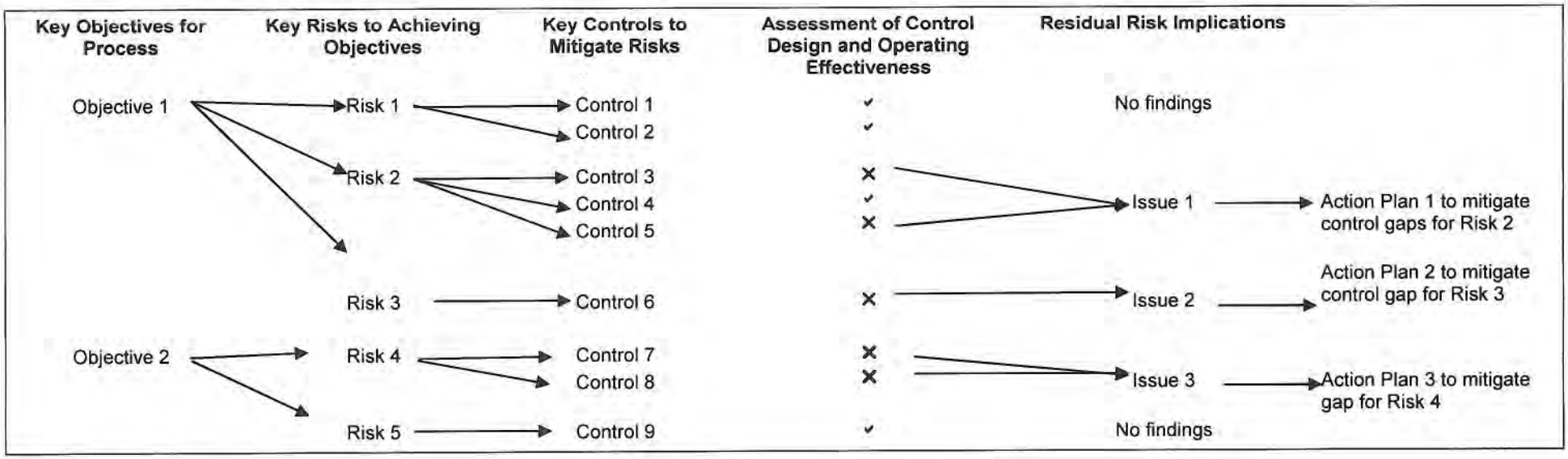
#	Finding	Process Risk Rating	Recommendation	Management Action Plan
4.1	Readiness process does not incorporate a schedule to highlight periods of high concentration of planned station activities.			
	Currently there is no schedule used for planning and executing actions from Department Ownership Transfer Plans (DOTPs) to highlight periods of high concentration of station activities. Planned readiness actions involve multiple departments and occur during other station activities (such as outages, vacation, and training) which may challenge resources or completion of activities. Actions have been managed to date using DOTP Action Request (AR) tracking on a spreadsheet and common milestones are tracked in the Refurb integrated schedule and reviewed at the Refurb Work Program Alignment meeting. These methods however, will not easily identify potential resource related rub-points or feasibility issues between departments during forecasted high concentration periods for example, the 2016 spring outage and months just prior to breaker open. In addition, although ARs have been developed for the period leading up to Breaker Open, and Return To Service (RTS) related activities are factored into DOTPs, ARs have generally not been created for the period of DNRU2 execution to breaker close. Therefore, these actions would not be visible to facilitate schedule planning during this period. Increased visibility of the work requirements during high concentration periods will allow early opportunities to address potential issues noted above and facilitate review of progress throughout the full Refub outage period. <u>Risk Impact Analysis</u> • Inability to identify a potential bow-wave in a timely manner to anticipate and control slippages and other schedule risks • Inability to proactively anticipate impact of schedule changes and shifting of activities • May result in unreasonable expectations on resources and impact the feasibility of completing planned actions.	Moderate	Darlington Refurbishment Interface Department in conjunction with Refurb to incorporate a schedule for planning and executing station readiness work and reviewing progress against milestones and ARs throughout the full Refurb outage period.	<u>Action Plans:</u> 1. Darlington Refurbishment Interface Department to work with Nuclear Refurbishment Programs to review the Department Ownership Transfer Plan Actions matrix for do ability issues. The potential issues identified will be reported at the Refurbishment work program integration meeting. 2. Darlington Refurbishment Interface Department will ensure Nuclear Refurbishment Programs will instruct all DOTP owners to include as a focus area, a do ability analysis of all Action Requests as part of their upcoming revision of their plans. They will ensure do ability of all actions and support of completion of these actions by integration with other groups where required. This will be reported to the Refurbishment Work Program Integration meeting team. Actions will be tracked through SCR D-2015-01367. <u>Owner:</u> Dianne Gaine, Manager Refurb Interface Mike Stewart, Manager Refurb Ops & Maintenance Programs

#	Finding	Process Risk Rating	Recommendation	Management Action Plan
				Target Completion Dates: 1. Feb 16, 2015 2. April 30, 2015
4.2	There is a misalignment on start and end dates between the Station and Refurb in terms of dates submitted to the System Operator and the dates being used by Refurb			
	Currently the dates for the DNRU2 outage in the OPGN Long Range Outage Plan Overview Schedule differ (by two weeks) from the planning dates that the Refurbishment organization is actively working towards and incorrect dates have been submitted in the outage request to the Independent Electricity System Operator (IESO). The current integration process does not consider alignment with existing Nuclear Outage and Generation Planning processes which resulted in this misalignment of dates. The station is responsible for updating OPG Electricity Sales & Trading and the IESO with outage requests by entering an Equipment Outage Slip in the Real-time Outage Management System (ROMS) database. The dates in the Long-Range Outage Plan were sent to Darlington Work Management and used to update ROMS (October 1, 2016 to September 30, 2019) differ from dates used in Refurb planning (October 15, 2016 to October 15, 2019). Outages submitted in ROMS are time-stamped and requests are reserved on a first come, first serve basis based on these times. Data needs to be accurate because any revisions to outages times on ROMs will create a new time-stamp. Risk Impact Analysis • Could result in Market Rule non-compliance (e.g. General Conduct Rule) if information communicated to the IESO is not accurate and timely. • IESO may not be able to accommodate Refurb planning dates due to submittal of incorrect dates or untimely correction for DNRU2 and subsequent outages. • There may be other unknown integration related misalignments.	Moderate	Centre-lead Functional Area Management (CFAM) Work Management to initiate an outage change to correct the dates in ROMS. Darlington Refurbishment Interface Department should review this and other similar integration processes to ensure that other misalignment issues do not occur.	Action Plans: 1. Darlington Refurbishment Interface Department will work with CFAM work management to initiate correction Unit 2 Refurbishment dates in ROMS and Station business plan dates to those in Refurbishment planning. 2. Darlington Refurbishment Interface Department will work with Refurbishment to perform an extent of condition review to identify any other potential gaps (e.g. dates, processes). Actions will be tracked through SCR D-2015-01371. Owners: Dianne Gaine, Manager Refurb Interface 1. Dan Norrad, Director, CFAM Work Management 2. Karen Fritz, Unit Director 1, Refurb Execution Target Completion Dates: 1. Feb 27, 2015 2. Feb 23, 2015

APPENDIX A

OVERVIEW OF RISK BASED AUDIT APPROACH AND AUDIT RATING METHODOLOGY

IA's ratings for operational audits of OPG business processes are derived from an assessment of the management controls that are in place to mitigate key risks to the achievement of process objectives. The diagram below illustrates IA's basic approach to conducting an audit. If control deficiencies are identified that prevent IA from providing reasonable assurance that the process objective will be met (i.e. key risks are adequately mitigated), an audit issue will be noted and a corrective action plan from management will be required.



- *Effective*: control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective*: control and risk management practices are not designed and/or are not operating effectively.

The second tier to IA's audit rating is an indication of the implications of the residual risk at the broader, enterprise level. This rating of "High", "Moderate" or "Low" is intended to answer the "so what?" question for senior management and the Audit and Risk Committee by giving context to audit results in terms of their impact on OPG as a whole.

ONTARIO POWER GENERATION

Internal Audit

EPC Contractor Procurement Review – Darlington Nuclear Refurbishment ("DNR") Project

October 26, 2015

Report Rating: **Generally Effective**

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Generally Effective**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Procurement oversight activities have not been centrally coordinated or standardized.	Operational		X	
2	An access control and monitoring plan has not been implemented for the Procurement Tracking Tool ("PTT").	Operational			X
Total			**-**	**1**	**1**

1.2 Background

The Darlington Nuclear Generating Station ("DNGS") Refurbishment project is currently in its detailed engineering and procurement phases. The project's execution phase (i.e. construction, installation, and commissioning work) for the first unit, Unit 2, is scheduled to begin in January 2016. As part of the planning efforts for this work, selected contractors engaged on the project have been tasked with planning, executing, and controlling the procurement of parts and materials. OPG maintains oversight of these efforts as part of its due diligence in ensuring all parts and materials are made available on-time and according to OPG specifications. Late delivery or poor quality of necessary parts and materials will result in schedule delays and cost overruns for the DNGS Refurbishment Project.

This is a risk-based audit identified in Internal Audit's ("IA's") 2015-2016 Strategic Audit Plan and was selected given the significant profile of the DNGS Refurbishment project and value of contractor procurement activities involved.

1.3 Objective & Scope

The objective of this audit was to assess the design and operational effectiveness of controls over the management of contractor procurement processes for materials, specifically long-lead materials, to ensure timely delivery of quality materials to meet the refurbishment requirements.

[1] Please refer to Appendix A for risk rating definitions

The scope of the audit included a review of processes and testing, on a sample basis, to determine whether:

Ref	Key Focus Areas	Key Activities
A	**Governance and Communication**	1. Roles and responsibilities for overseeing Contractor procurement processes have been clearly defined and communicated. 2. OPG policies, procedures and guidelines have been established to provide applicable OPG employees with information necessary to oversee Contractor procurement activities. 3. OPG processes have been established to engage the appropriate Supply Chain stakeholders to ensure alignment with agreed to quality and procurement expectations in the contract.
B	**Procurement Planning**	1. Supply Chain Project Oversight Plan(s) were communicated to key project stakeholders and participants with expectations for Contractor procurement activities. 2. A Materials Procurement Management Plan had been created for the project and frequently updated to ensure parts/long-lead items are identified and procurement activities monitored. 3. OPG expectations for Contractor performance, specific to the procurement of materials, is defined and communicated to the Contractor. 4. Prime Contractors only work with qualified, reputable suppliers and all Prime Contractors are qualified on OPG's Approved Suppliers List. 5. Prime Contractors adhered to their OPG qualified programs to ensure lower-tier suppliers meet required standards. 6. Processes exist to facilitate the Prime Contractor's use of OPG preferred suppliers where applicable.
C	**OPG Oversight of Contractor Procurement Activities**	1. Processes have been established to monitor contractor parts availability to ensure an appropriate level of supply. 2. Contractors utilized OPG preferred suppliers and optimal pricing arrangements where applicable to obtain optimum pricing. 3. Processes were used by OPG to monitor the quality of materials and parts ordered by Contractors. 4. OPG has established monitoring approaches to ensure that Contractors can deliver parts and long-lead items on-time, in the right place, and in the right quantity.

The scope covered the Darlington Nuclear Refurbishment ("DNR") Core Projects procurement activities and transactions for the period of July 1, 2014 to June 30, 2015.

1.4 Conclusions

At the current stage of the DNR project, the processes and controls over the management of contractor procurement processes for parts and long-lead materials are generally effective to manage the key activities. There are two key controls and management activities considered critical to enable OPG's effective oversight of Prime Contractor procurement activities. On-going maintenance and operating effectiveness of these tools are essential to manage significant procurement-related project related risk exposures.

- The Procurement Tracking Tool ("PTT") is a newly developed database that will be used to track the status of key procurement related activities (e.g. purchase order ("PO") issuance dates, PO acceptance dates, bill of materials information, the identification of long-lead materials and expected delivery dates) for the DNR project. Management should ensure that all Contractors utilize the database and that reconciliation activities are completed to ensure database completeness.

- OPG requires contractors to utilize suppliers on OPG's Approved Suppliers List ("ASL") where possible, to control the quality and reliability of the supply of materials into the DNR project. Management should ensure that the qualified status of all suppliers in the DNR project is maintained throughout the project.

Positive Observations

- PTT enables contractors, DNR leadership and project managers to rely on a single data source for all materials on the DNR project. This affords OPG and contractors an opportunity to share integrated, schedule-based materials information, promoting joint, effective and early issue resolution to enable the project to be on time and on budget.

- An OPG Oversight Steering Committee has been formed for the DNR project that consists of management level employees from various functions including project management, Supply-Chain and Human Resources. This cross-function management committee meets regularly to discuss project oversight activities, issues and results, including those related to the procurement of long-lead items.

- Prime Contractors are required to utilize OPG approved suppliers whenever possible to take advantage of existing preferred pricing and to help ensure parts and materials procured meet the quality expectations of OPG.

- OPG approval is required for Prime Contractors to purchase materials from non-OPG approved suppliers.

- Supply Chain oversight and supplier qualification audit procedures include specific procedures to evaluate a supplier's management and control of counterfeit, fraudulent and suspect items ("CFSIs") items. Engagement of a third party to complete an evaluation of the OPG CFSI management program in 2016 is in progress.

- DNR project management teams and members of the supply chain organization meet regularly with Prime Contractors to discuss the status of the project and project related issues and mitigation strategies, including issues related to the procurement of parts and long-lead items.

- A documented project assurance framework has been established.

Findings and Recommendations

- Currently, each project bundle uses different methodologies and criteria to assess component manufacturing related risks and as a result, oversight activities can vary between the bundles. This largely results from OPG not having a finalized single source of coordination and documented guidance to govern this oversight area. Management is currently developing this guidance which will be used to facilitate the allocation of resources, and to prevent oversight gaps and duplication.

- OPG has not formally implemented procedures to monitor and maintain access controls for PTT. Currently, 11 users have more than one access / security role in the application. Management should develop a database/security management plan and ensure access is appropriate before the application goes into full production.

The findings noted in this report have been reviewed with management and they have committed to a specific action plan. Please refer to Section 2.0 for specific details of the above findings along with the associated risk impact, audit recommendations and management action plans.

Opportunities for Improvement

We also noted areas that could improve the efficiency of controls and or processes. Details of these areas are presented to management for consideration.

- A common definition of “critical parts”, in the context of procurement related activities, should be defined by applicable stakeholders at OPG (Project Management, Supply Chain) and included in applicable procedural documentation, to ensure there is a common understanding throughout OPG and the Prime Contractors.

- OPG should consider requiring Prime Contractors to perform formal periodic procurement and material/sourcing risk assessments. The assessment should be attended by a cross-functional team of OPG employees to allow for “owner” visibility and input into the assessment. This activity would help drive the development Contractor test plans and oversight procedures.

- Prime Contractors should be required to formally document an issue escalation plan that includes specific measures, indicators and criteria, as defined by OPG, that would cause specific types of escalation (e.g. urgent escalation versus non urgent). This would help with the timely identification and resolution of critical issues.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix B.

1. Procurement oversight activities for suppliers have not yet been centrally coordinated or standardized.	**Moderate**

OPG uses a risk-based approach to select DNR project suppliers and sub-suppliers that require oversight. For example, all suppliers of nuclear grade and pressure boundary materials are subject to OPG oversight. Other factors and input considered include the component type, supplier history, results from prior oversight activities and discussions with stakeholders.

Currently, each project bundle uses different methodologies and criteria to assess component manufacturing related risks and as a result, oversight activities can vary between the bundles. This largely results from OPG not having a finalized single source of coordination and documented guidance to govern this specific area of oversight. Management is currently developing this guidance which will be used to facilitate the allocation of resources, and to prevent oversight gaps and duplication.

It should be noted that management has established various other controls and procedures to mitigate DNR project procurement risks and to manage supplier oversight. Please refer to Appendix A for additional details.

Potential Cause & Impact

Potential Causes:
Processes have not been collated into a single guidance document to ensure the consistent application of risk identification, assessment and management oversight activities across the DNR project bundles.

Impacts:
- The criteria used in the selection of oversight activities for supplied items may not be consistently considered and applied across all project bundles;
- Inappropriate OPG oversight of supplier/sub-supplier manufacturing activities; and
- Potential difficulty providing external parties (regulators, vendors, claimants) with documented support for the approaches used in the selection of vendor oversight activities.

Recommendation	Management Action Plan	Owner & Target Completion Date
As part of the current initiative to mitigate the risk of sub-standard manufactured materials being installed during the DNR, management should finalize the current effort to develop documented guidance that ensures a consistent, effectively managed, risk-graded approach to supplier and sub-supplier manufacturing oversight for the DNR project bundles.	Management agrees with the recommendation provided by Internal Audit as it aligns with the current initiative to develop a single source of coordination and documented guidance to ensure component manufacturing related risks across each of the project bundles is mitigated consistently.	Sean Toohey, Project Director – Integration March 25, 2016

2. An access control and monitoring plan has not been implemented for the Procurement Tracking Tool ("PTT").	**Low**

OPG technology assets and data should be appropriately secured through the application of general computer controls, logical access provisioning and security monitoring activities. Standard OPG processes and procedures have not yet been implemented to facilitate security/data integrity monitoring and the maintenance of the PTT. This includes processes to utilize the built-in database audit logs and the formal procedures for periodically validating user access. Additionally, during the database development period, 11 users have been provided with more than one access / security role in the PTT.

It should be noted that the functionality of the database has been successfully tested and that the database is still in a "development" phase and not in production. Additionally, the majority of users (63%) currently in the PTT have read-only access.

Potential Cause & Impact

Potential Causes:
The 11 'multiple access / security roles' were for New Horizons or OPG staff developing / testing the database, as the focus has largely been on the development of database functionality, awareness and testing.

Impact:
Post-commissioning inappropriate access and a lack of robust monitoring controls could result in unintended or unauthorized changes to material management data, which could then impact delivery schedules and management decisions.

Recommendation	Management Action Plan	Owner & Target Completion Date
Post – commissioning, only one security role should be provided to a user. Existing users with more than one security role should be adjusted accordingly. A database/security management plan and process including formal roles and responsibilities for database administration, approval of roles and the monitoring of audit logs should be developed.	Management agrees with the recommendation provided by Internal Audit and agrees that the risk, as described, is low given the non-commissioned status of the tracking tool. The issue of having multiple profiles has been resolved and will be re-validated prior to commissioning. Additionally, management will apply the standard OPG security protocols as part of the commissioning process.	Sean Toohey, Project Director – Integration January 30, 2016

APPENDIX A – PROCUREMENT RISK MANAGEMENT AND OVERSIGHT

Other activities and procedures used by OPG to assess and manage DNR Project procurement risks and supplier oversight are outlined below:

- A project oversight framework exists, with project oversight plans developed and oversight activities tracked in OPG's Risk Management Oversight tool;
- The recently created position of Director of Quality – DNR is accountable for ensuring effective oversight and will facilitate the coordination of OEM manufacturing and EPC Procurement Quality Oversight activities;
- PTT is being commissioned to track status of all material procurement;
- The list of the components that pose higher risk has been agreed to by DNR Project Managers, leadership and oversight groups;
- Various guidelines and procedures include criteria considered by OPG in the development of project oversight plans and in the selection of project oversight activities;
- Cross functional meetings are held to coordinate oversight on higher order risk component procurement activities;
- OPG project meetings are regularly/frequently held with Prime Contractors whereby the status of EPC procurement oversight activities and issues are discussed and resolved;
- The cross-functional DNR Oversight Committee meets regularly to monitor and discuss oversight activities and issues applicable to each of the project bundles; and
- The Supply Chain oversight group has drafted a "check sheet" to document criteria used in the selection of Supply Chain oversight activities under their purview.

APPENDIX B – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

ES MSA Recovery Negotiations Audit - Follow-up on 2013 Auditor General Findings

January 4, 2016

Report Rating: **Generally Effective**

Distribution:

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Generally Effective**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Differences in interpretation of contract terms have resulted in delays for negotiating recoveries.	Financial		X	
2	Balance of identified overbillings need to be recovered expeditiously.	Operational			X
Total		**2**	**0**	**1**	**1**

1.2 Background

In 2013, the Auditor General ("AG") of Ontario issued an audit report of OPG's processes related to Human Resources. Included in this report were the following findings:

- Contractor hours in Oncore had not always been reconciled to supporting documentation, which could lead to overpayment to vendors;
- Contract log books often did not contain information such as start and end times or work activities, the contractor supervisors' names and titles, the applicable work orders and the contractor worker's name;
- Contract administrators often did not reconcile the Job Clock reports to the time entered into Oncore prior to approval; and
- Overtime hours reported in Oncore were often not supported with documentation showing requests.

As a result, the AG recommended that OPG manage and monitor closely the hours reported by the contractors to avoid the risk of overpayment.

The AG was advised that part of OPG's compensating controls involved engaging a public accounting firm (Deloitte & Touche, LLP) to conduct contract compliance audits for the ES MSA contracts. [redacted] Deloitte's initial audit report of March 2015 revealed approximately $9.1M billed to and paid by OPG for the period from February 2012 to April 2014 to be "deviations from contract terms". The scope of the audit was subsequently expanded to cover the billing period up to March 2015. The audit report was re-issued in November 2015 which reduced the original estimated overbilling amount by $5.5M from $9.1M down to $3.6M. The reduction was primarily due to Deloitte's further understanding of the contract and contract interpretation issues, as well as an increased understanding of the contractor's internal processes.

[1] Please refer to Appendix A for risk rating definitions

The follow-up audits completed by the AG and the Ontario Internal Audit Division ("OIAD") in Q2 2015, identified the following activities:

- OPG will begin negotiations with vendors for any recoveries (Target Completion Date: Q3 2015); and
- Results of negotiations with vendors for recoveries will be independently verified by Internal Audit (Target Completion Date: Q4 2015).

1.3 Objective & Scope

The objective of this current audit was to assess the results of negotiations with [redacted], to determine that the $3.6M identified in the Deloitte audit reports were negotiated and recovered.

The scope of the audit included a review of processes and testing, on a sample basis, to determine whether:

- The $3.6M identified in the Deloitte audit reports was pursued with the contractors;
- Explanations for any amounts not recovered (including the $5.5M difference between the initial and revised Deloitte audit reports) were reasonable, documented and approved;
- Results of the negotiations and recoveries were communicated to the relevant key stakeholders;
- There was approval and sign-off by appropriate OPG and vendor representatives for settlement agreements and releases; and
- Payments or credits identified in settlement agreements were received by OPG.

The scope included findings identified by Deloitte in the contract compliance audits completed in 2015 on [redacted]

1.4 Status of Negotiations

Subsequent to the March 2015 report, Deloitte issued a final audit report in November 2015. Areas of ambiguity in the ES MSA contract resulted in revisions of claim amounts, and consequently delayed the issuance of their final audit report. Deloitte shared the audit findings with the contractors [redacted] and the negotiations for recovery commenced in [redacted].

The following table outlines, by vendor, the changes in the claim amounts [redacted]:

Claim as per Deloitte's Report dated:
[redacted]

Deloitte classified the differences into interpretation issues, details of which are outlined in Deloitte's November 2015 report. Internal Audit ("IA") did not verify the above figures, which were derived by Deloitte. The differences in some cases were directly attributable to the longer period of time over which the data was reviewed.

The delays in issuance of Deloitte's final report resulted in delays in OPG's recovery negotiations.

As at the date of this report, a recovery credit of $573K of the [redacted] from [redacted] was realized [redacted]. Negotiations for all other amounts are in progress and consequently no other funds have been recovered.

A settlement agreement with [redacted] for $2.1M of [redacted] has been provided to [redacted] for sign-off. Negotiations for the balance are in progress.

1.5 Conclusion

Positive Observations

- OPG's Law Division is involved in the recovery negotiations with the contractors. Senior Law Division employees, including Enterprise Leadership Team ("ELT") members are active participants in the structuring of a settlement agreement with [redacted]. A member of the Senior Counsel provided support for structuring a release which included the $573K credit from [redacted].

- Management has developed action plans, with target completion dates, to minimise the recurrence of the identified interpretation issues. Some of these plans have already been implemented; for example, [redacted]

Findings

- There have been multiple iterations of Deloitte's report spanning several months due to ambiguities in the ES MSA contract and difficulties that Deloitte had interpreting the billing practices of the various contractors. This has also contributed to delays in the recovery negotiations with the vendors. OPG should continue to pursue clarification of the ES MSA agreement in order to complete negotiations and prevent similar misinterpretations in the future.

- Of the total overbillings of $3.6M identified in Deloitte's November 2015 report, recovery action on $953KM (or 26%) is yet to be completed. OPG should continue to pursue negotiations to optimize recoveries, including items identified as interpretation issues as delays could reduce the likelihood of full retrieval.

The findings noted in this report have been reviewed with management and they have committed to specific action plans to address them. Please refer to Section 2.0 for details of the above findings along with the associated risk impact, audit recommendations and management action plans.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix A.

1. Differences in interpretation of contract terms have resulted in delays for negotiating recoveries.	**Moderate**
There have been multiple iterations of Deloitte's report spanning several months due to differences of interpretation of the ES MSA contract. This has also contributed to delays in the recovery negotiations with the vendors. Management has developed action plans, with target completion dates, to address Deloitte's findings. One of these actions is to clarify contract ambiguities identified by Deloitte. However, until the clarifications are made and communicated to all the stakeholders, there may still be a potential for findings. As part of Management's action plan, all clarifications are expected to be in place [redacted].	
Potential Cause & Impact Potential Cause: This was the first contract of its nature (ES MSA) at OPG. Consequently, the contract left certain areas open to interpretation. Impact: Ambiguities in the ES MSA contract could result in additional interpretations issues and potential financial loss.	

Recommendation	**Management Action Plan**	**Owner & Target Completion Date**
OPG should continue to pursue clarification of the ES MSA agreement in order to complete negotiations and prevent similar misinterpretations in the future.	In order to reduce the risk potential of this finding, Management will complete all the clarifications identified in the Deloitte Report per the agreed-to Management Action Plans (MAPs). **Note:** Some of the MAPs have already been completed, e.g. approval of the Contract Compliance Audit Plan, set-up of Tier I sub-contractors ([redacted]), and communication of individual rate change pre-approval process to all contractors.	Riyaz Habib Project Director, Projects & Modifications [redacted]

2. Balance of identified overbillings need to be recovered expeditiously.	**Low**

[redacted], Deloitte identified $3.6M in potential overbillings by [redacted] and their Tier I sub-contractors. IA noted:

- A recovery credit of $573K from [redacted] and its sub-contractors was realized in [redacted]. Negotiations for the balance of $838K against [redacted] and its sub-contractors are still in progress;
- A settlement agreement with [redacted] for $2.1M has been provided to [redacted] for sign-off. Negotiations for the balance are in progress.

Of the total identified of $3.6M, recovery action on $953K (or 26%) is yet to be completed.

Potential Cause & Impact

Potential Cause:
Negotiations for recoveries are being bundled with other outstanding issues with the vendors.

Impact:
Delays in recovery negotiations might reduce the likelihood of full retrieval.

Recommendation	**Management Action Plan**	**Owner & Target Completion Date**
OPG should continue to pursue negotiations to optimize recoveries, including items identified as interpretation issues.	As part of its Deloitte MAPs, Management will continue to pursue recoveries from vendors and document the recovery process including accountabilities and next steps.	Art Rob VP, Projects & Modifications [redacted]

APPENDIX A – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment ("DNR") Project Management

March 31, 2016

Report Rating: **Generally Effective**

Distribution:

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VP Planning & Controls

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Generally Effective**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Some project changes were directed to Contractors for execution prior to receiving DNR Change Control approval.	Operational		X	
2	Earned Value reporting inaccuracies were detected.	Operational		X	
3	The use of the Risk Management Oversight ("RMO") tool is inconsistent with the Risk Management Manual.	Operational		X	
4	Monthly project performance reports do not sufficiently explain variances, including contingency drawdowns.	Operational			X
5	Lessons Learned are not collected, shared and incorporated in a timely manner.	Operational			X
Total		**5**		**3**	**2**

1.2 Background

The Darlington Nuclear Refurbishment ("DNR") project will extend the operating life of this nuclear station by 30 years. In late 2015, OPG's Board of Directors approved the $12.8 billion project cost and execution schedule, also known as the Release Quality Estimate ("RQE"). The Execution phase will begin in October 2016 with the refurbishment of Unit 2. Project completion for all four units is scheduled for 2025.

DNR is managed as a program consisting of 'core refurbishment' projects and pre-requisite projects focused on facilities, infrastructure and safety improvement. As the program is transitioning into the Execution phase, the organization has re-defined the roles, responsibilities and oversight functions for Darlington Refurbishment. Additionally, the Program Management System consisting of the Program Charter and supporting governance and standards have been developed, specific to the DNR Program.

1.3 Objective & Scope

The objective of this audit was to assess the design and operating effectiveness of project management controls to support DNR completion on time and on budget and achievement of the program objectives.

[1] Please refer to Appendix B for risk rating definitions

To achieve the audit objective, we reviewed the project management processes and tested, on a sample basis, whether:

A. Governance & Procedures

- Policies and procedures have been established for project management processes and reflect current practices;
- Roles and Responsibilities for program management processes, project controls and oversight committees have been clearly defined;
- Processes have been established to support integration with the Darlington Nuclear Generation Station; and
- Resource management plans and succession plans for key roles have been developed.

B. Planning

- Program Management Plans ("PgMPs"), Project Charters and Project Management Plans ("PMPs") have been developed, approved and communicated for each of the core projects;
- The project scope documents have been clearly defined with the input of key stakeholders and approved;
- A framework for project change management has been established and clearly communicated;
- An appropriate Work Breakdown Structure ("WBS") has been developed which identifies all in-scope work, deliverables, budget allocation and contingencies;
- Schedules integrate resource requirements, activity interdependencies and project critical path have been identified;
- Contractor and subcontractor assumptions have been factored in the project plan and their cost and schedule progress incorporated in project reporting timely and accurately;
- Project risks have been formally identified with mitigation plans and managed with periodic reviews and updates;
- Major assumptions have been validated for adequacy throughout the project lifecycle; and
- Contingency amounts have been developed based on risk, with drawdowns formally approved and tracked.

C. Execution

- Schedules were monitored, updated and accurately reflect the status of deliverables, activities, interdependencies and timelines across the project;
- Program Milestones and Project Gates/Milestones have been defined, appropriately reported and approvals obtained to proceed to the next Gate;
- Earned value management methodology has been applied to measure project performance;
- Schedule and cost performance issues have been identified and escalated timely, forecasts updated and fallback plans initiated; and
- A Quality Plan has been established to ensure work package completion is adequately validated.

D. Reporting

- Cost, schedule and quality performance were accurately consolidated, measured and reported to management on a timely basis;
- Variances were reported completely and accurately, investigated and had recovery plans assigned and monitored; and
- Lessons learned debriefings have been completed for cost or schedule overruns and leanings incorporated in project plans.

1.4 Conclusion

DNR Project Management has implemented some leading practices in internal control. Findings listed below represent improvements necessary as the Program matures. As DNR transitions towards the Execution phase, more in-depth reviews of specific aspects of project management will be completed.

Positive Observations

- Contractors' detailed schedules are aligned with OPG's project schedules through a common Work Breakdown Structure and coding methods. Execution Phase project schedules are integrated within the DNR Program Coordination & Control Schedule, which is consistent with best practices allowing for efficient and accurate measurement of schedule progress;
- Actions, Issues, Assumptions, Decisions, OPEX, Risks, Lessons Learned and Oversight logs have been centralized in the Risk Management & Oversight ("RMO") tool that allows for consolidation, organization and integration of these items; and
- Business Intelligence ("BI") reports are available to the Project teams in real-time using integrated information pulled from source systems into the data warehouse. Such reports are instrumental for the Construction Work Packages progress tracking, engineering changes tracking, reporting of project status and the key performance metrics.

Findings & Recommendations

- Contractors were directed to execute some project changes prior to receiving DNR Change Control approval. Management should reinforce the change control process expectation to the parties involved in developing Directed Changes for execution;
- Earned Value reporting inaccuracies were noted due to suspense items not allocated to work packages and to the incorrect inclusion of a non-earning work package. Suspense items should be reviewed and cleared promptly in consideration of their magnitude, and access to change work package status in the earned value calculation should be restricted; and
- The RMO tool has been inconsistently used in reflecting the status of the ongoing project risk management activities, review of project assumptions and completion of assigned actions.

The finding(s) noted in this report has been reviewed with management and they have committed to a specific action plan. Please refer to Section 2.0 for specific details of the above finding along with the associated risk impact, audit recommendations and management action plan.

Opportunities for Improvement

- IA noted minor differences in CPI and SPI metrics calculated through the automated project reports ("Quad Chart reports") and the ELT Review Meeting package. Management should validate that consistent information is reported to different levels;
- The criteria to prioritize project issues should be clearly defined, including escalation mechanisms for significant issues that require immediate attention outside of the weekly review cycle;
- Project and Program performance metrics reporting may be skewed by the inclusion of Level of Effort ("LOE") activities such as Project Management and Oversight, compared to those associated with the completion of specific project deliverables. As the projects progress into execution, management should consider reporting CPI and SPI metrics that exclude LOE activities; and
- Project Management Plans for sampled projects were out of date and not aligned with the current processes and governance. These documents should be updated as the changes occur to ensure that they reflect the current requirements.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix B.

1. Some project changes were directed to Contractors for execution prior to receiving DNR Change Control approval.	Moderate

Project Change Directives ("PCD") are the mechanism stipulated in the contract for OPG to formally direct Contractors to make project changes. PCDs should be issued after receiving appropriate approval, as per the current approved Nuclear Refurbishment Program Change Management Manual. Change Control Forms ("CCF") facilitate this approval process and are used as a basis to update project performance baselines and earned value calculations.

Our testing identified certain project changes that were directed to Contractors for execution prior to having approved CCF's. However, there was no significant financial impact noted as no additional funding was required for the project changes sampled. The issue was remediated with the NR Program Change Control Manual implementation in Q4 2015. The updated Manual requires that directed changes also be documented and authorized through a CCF. No exceptions were noted since its implementation.

Re-tube and Feeder Replacement ("R&FR") Project:

- For Project Gate #3 approved on February 1, 2016, 10 of the 18 PCDs were issued for execution without approved CCFs. Consequently, cost baseline changes had not been input into the Proliance[2] system at that time. The 10 PCDs had a value of $25M and were issued prior to the current Program Change Manual implementation.
- CCF 715 ($21.8M) was submitted and approved in October 2015, 4 months after the respective PCD was issued to the vendor. While it was noted that the PCD cost estimate and schedule were not finalized until October 2015, the CCF should be submitted when the change is first identified to ensure accurate reporting.

It was also noted that the R&FR Project Change Log did not have details of the project change history such as the date a PCD was approved and issued, status (pending, approved, cancelled, implemented) and the linkage to the CCF or Project Gate approval.

Emergency Power Generator ("EPG") 3 Project:

- CCF 834 ($15.5M) was submitted in December 2015 and approved in March 2016. Within the CCF there were 2 PCDs with a total value of $316K previously issued to the Contractor. These PCD's included changes where the work had already begun and in some cases finished.

Heavy Water Storage and Drum Handling Facility (D2O) Project:

- One PCD ($450K) out of 10 sampled required a CCF, however it had not been filed.

[2] Proliance is a project cost planning and management system currently used by Nuclear Projects. Proliance will be replaced with Ecosys with the transition planned for April 2016.

Potential Cause & Impact		
Potential Causes: The lack of clarity regarding project change approval requirements prior to the new Program Change Control Manual roll out in October 2015. Impact: Earned value metrics reporting is inaccurate as the planned and earned values are not updated in the Proliance costing system.		
Recommendation	**Management Action Plan**	**Owner & Target Completion Date**
1. Reinforce expectations to all parties involved in the issuance of the PCDs (Project Managers, Contract Management and Supply Chain) and require that the parties developing the PCDs confirm that an approved CCF is in place. 2. Improve the R&FR Project change log to provide greater transparency.	1. Enhancements to the Project Change Control process were identified in 2015 and the NR Change Control Manual N-MAN-00120-10001-PC-12-R000 was approved and communicated to the project teams in late Q3 2015 and it is now fully implemented and operational. The updated Change Control Manual requires that a Change Control Form be submitted for every PCD going forward. 2. The R&FR team has acknowledged the opportunity to optimize information on the change log and will incorporate details of the project change history.	1. Gary Rose, VP Planning & Controls Completed 2. Roy Brown, Senior Project Director May 31, 2016

2. Earned Value reporting inaccuracies were detected.	**Moderate**

The approved project scope is broken down into work packages with the cost estimate defined for each. Planned Values ("PV") are calculated on the work package level based on established rules for each deliverable and the planned progress per baseline schedules. As the project progresses and actual costs ("AC") are incurred, earned value ("EV") is reported against the respective work packages for Schedule Performance Index ("SPI") and Cost Performance Index ("CPI") calculations.

In reviewing earned value reporting for the DNR program and projects life to date December 2015, we noted the following:

- Actual project costs that are not mapped to a work package in Proliance accumulate as suspense items in Finance Generated Accounts ("FGA"). This can happen when contractor invoices are not coded to an existing work package due to error or additional project scope not yet updated in Proliance. These accounts have not been consistently reviewed and cleared to ensure EV reporting is complete and accurate. The FGA balances under R&FR sub-bundles were reported as $4.25M as at December 2015 and $6.1M as at February 2016 month end and were not included in EV calculations. $188K of the suspense items was over 6 months old; $5M was between two and six months old; and $892K were current; and

- Testing identified a $9M error in Earned Value ("EV") metrics reported in December 2015 due to the incorrect inclusion of the R&FR EPC reimbursable expenses. The error was corrected in subsequent reports. This occurred due to an inadvertent work package status change in Proliance that caused its inclusion in the EV calculation. As a result, the sub-project CPI for December 2015 was reported more favorable by 0.03 and SPI by 0.01, with no impact to the total RF&R bundle metrics reported.

Potential Cause & Impact

Potential Causes:

- Work breakdown structure in source systems is not aligned with the cost management system; and
- Human error in inputting Work Package EV Exclusion status in Proliance resulting in improper inclusion of certain work packages.

Impact:

- Project and work package performance measures could be impacted until the suspense item is resolved. Impact to CPI and SPI would depend on the size of the work package where the actuals were not properly assigned; and
- Inaccurate project status reporting may be used in management decision-making.

Recommendation	Management Action Plan	Owner & Target Completion Date
1. Establish thresholds based on significance and aging of suspense items to be flagged for disposition by the project teams. Reinforce that such items should be cleared monthly. 2. Restrict the ability to change the EV Exclusion flag status in the Cost Management system to DNR Cost Management staff. Any changes should be based on adequately evaluated requests by the project.	1. Clearing of suspense items is a known initiative in Nuclear Refurbishment which has shown significant reduction and has been largely resolved over the past year and is not viewed as impactful to current EV measurement. There remain occasional errors that result in suspense items generation that must be resolved. Review of FGA clearing for potential thresholds and aging management will be conducted and changes implemented as necessary. 2. A review will be conducted to determine who can change the EV exclusion flag, and changes will be implemented as necessary.	Gary Rose VP Planning & Control July 31, 2016

3. The use of the Risk Management Oversight ("RMO") tool is inconsistent with the Risk Management Manual.	**Moderate**

OPG management's expectations regarding the use of the Risk Management Oversight ("RMO") tool, an application used to perform and document project risk management activities, are outlined in N-MAN-00120-100001 RISK, NR Risk Management Manual.

IA noted that the use of the RMO tool to reflect the status of the ongoing project risk management activities, review of project assumptions and completion of assigned actions is inconsistent. Examples noted include:

- The requirement for a "Risk Review" by owners on a monthly basis is not consistently met. The Risk Dashboard report as of January 2016 indicated 0% of Fuel Handling project risks and 7% of Balance of Plant ("BoP") risks were reviewed in the prior month. Additionally, the requirement to reference actions for mitigated risks is not consistently met e.g. Balance of Plant ("BOP") 43%, Turbine Generator 50% and R&FR 83% of the mitigated risks have mitigating actions identified;

- Of the 61 Program and Project Risks sampled, the "Post Mitigation" risk score was lowered with no mitigating actions assigned for 5 of the risks with the "Risk Treatment" response of "Monitor" or "Accept". This is not compliant with section 4.1.4 of the manual which indicates that the residual risk should reflect the current risk score, if nothing is actively done to reduce the risk. IA was informed that in two of the instances related to the R&FR project, the lowered residual score is correct due to mitigating actions identified, which have not yet been updated in the RMO tool;

- The RMO tool is not consistently used to document the review of project assumptions. Upon review of the R&FR and BOP project assumptions logged in the RMO tool, there is no Target Completion Date ("TCD") identified for re-validation or assignment of the associated actions. The RMO tool is not used for the Campus Plan projects (i.e. Heavy Water Storage & Drum Handling Facility ("D2O") and EPG3) to log and manage project assumptions; and

- As of March 1, 2016, it was noted that 34% of Actions in the RMO tool with a status of "In Progress" or "Not Started" are past their due date.

The monthly QUAD Chart reports include a Risk Performance section, which lists the top three risks for each project or bundle. The selection of the risks from the RMO Risk Log is subjective, based on what the project owners deemed to be most critical. There are insufficient details in the reports to provide insight into the project's risk profile and status of the risk response.

Potential Cause & Impact

Potential Causes:
Due to competing project priorities, the documentation is not updated to reflect activities.

Impact:
Records do not align with the status of risk management activities and mitigating actions.

Recommendation	Management Action Plan	Owner & Target Completion Date
1. Management should reinforce expectations on the use of the RMO tool and monitor/report on compliance. 2. Management should implement periodic reporting of QA measures and flag exceptions and trends in risk and action data for correction.	1. SVP, Nuclear Projects has communicated the expectations of risk management compliance as the project has progressed to execution, and more actions are being taken. These include risk reviews in the weekly issues/ opportunities meeting starting March 21 2016, seconding risk program support expertise to the execution organization. 2. Metrics will be reassessed to ensure the proper performance drivers and alignment with the risk manual. Appropriate metrics will be widely distributed from the Risk Management organization (i.e. “push notifications”) to RMO item owners.	Gary Rose, VP Planning & Controls 1. Completed 2. October 31, 2016

4. Monthly project performance reports do not sufficiently explain variances, including contingency drawdowns.	**Low**

The monthly QUAD reports are a key tool used by the Refurbishment Program executive team to monitor project performance. There is a requirement to provide an explanation of project performance variances in these reports for the metrics used such, as CPI, SPI and performance against the control budget.

From the review of three monthly QUAD reports for the DNR project bundles, IA noted the following:

- Explanations of variances were not clear or did not provide sufficient insight to determine the contributing factors. The explanation comments referred to "pending baseline revisions due to project changes" and "Gate approval". Examples of explanations for variances included in monthly QUAD Chart Reports are presented in Appendix A.

  However, we did note that the quarterly DNR Program reports to the ELT and the Board provided an adequate explanation of project performance.

- Detailed reporting of contingency drawdowns against program and bundle contingency reserves was not in place during the Definition phase. Contingency reporting exists only at a high level in the "Release 4D Program Contingency" as part of the quarterly DNR Program reporting package. There is no contingency detailed by project in the QUAD Chart reports.

  Management is working on a new contingency management model and status report that will be available online in Q2, 2016.

Potential Cause & Impact

Potential Causes:

- Timing delays in updating added project scope cost and schedule in Proliance through the DNR Change Control process lead to out-of-date reporting; and
- Contingency drawdowns were tracked manually, with automated reporting from Proliance not practical.

Impact:

- As a standalone project performance record, the monthly QUAD report will not provide a sufficient and clear insight into the project performance; and
- Inaccurate and out-of-date project status reporting may be used in management decision-making.

Recommendation	Management Action Plan	Owner & Target Completion Date
1. Variance explanation guidelines should be reinforced to communicate the standard for which all projects should be reporting.	1. Management will re-issue and re-communicate clear variance explanation guidelines, including showing what "excellent looks like".	Gary Rose, VP Planning & Controls July 31, 2016
2. Define how contingency reports will be included in management reporting packages, e.g. monthly QUAD Charts and Program level reports.	2. Management will define the usage of contingency reports is meeting packages in line with the Integrated Reporting Plan.	

5. Lessons Learned are not collected, shared and incorporated in a timely manner.	**Low**

Lessons Learned ("LL") are an important component to validate decisions and help other Project Managers avoid similar difficulties going forward. This process facilitates the identification and dispositioning of risks, issues, errors and the respective corrective actions.

There are no clearly documented criteria and accountabilities to ensure that Lessons Learned related to Project Management are documented in the RMO tool. No accountabilities or guidelines are currently in place to ensure that lessons learned are shared and institutionalized by relevant groups through formally monitored action plans.

Observations noted include:

- LL documented in the RMO tool are not consistently addressed with action plans. From a sample of 15 of the 29 LL Reports, only two of the 15 had actions generated from the recommendations identified in the reports; and
- Metrics for LL performance have not been collected and reported since July 2015, and the guidance document which provided the required metrics is no longer in effect.

Potential Cause & Impact

Potential Causes:

- Handover of the LL program and duties from the Planning and Control organization to the Managed Systems Oversight organization may have caused gaps in the process understanding; and
- There may be insufficient resources to administer a robust LL program.

Impact:

The inability to timely address project risks based on LL identified by other projects or departments could result in repeat negative events.

Recommendation	**Management Action Plan**	**Owner & Target Completion Date**
Establish and communicate the criteria and accountabilities for documentation of project LL in the RMO tool. Implement a process to ensure that impacted projects or departments are identified and the corresponding action plans are formally monitored.	Up to RQE, a very robust LL program was in place in the Planning and Control organization. It was decided at RQE that the LL program would be managed and administered by the Managed Systems Oversight ("MSO") organization. MSO will secure a dedicated resource and re-establish the program.	Dave Stiers, Director Refurbishment Managed System Oversight October 31, 2016

APPENDIX A – EXAMPLES OF VARIANCE EXPLANATIONS

Examples of inadequate explanations for variances included in monthly QUAD Chart Reports:

- R&FR (Oct to Dec 2015, Jan 2016) - The same explanation is used: "Proliance Budgets/Planned Values are pending revision due to project change directives (73112, 73110 & 73113). Budgets/Planned Values will be updated in January post Gate approval. Gate 3 completed in early January for the funding approvals for the reminder of the Definition Phase work and commencement of execution phase. Approval process in progress."

- EPG3 (Nov 2015) – "The Project has been subject to significant cost increases resulting in several CCFs. CCF765 is approved October 30, 2015 ($120.4K) provided funding for new PCAs / CTPs and additional project contingency in accordance with the recovery plan. CCF 834 is currently routing to allocate some of the newly released project contingency in accordance with the approved CTPs/PCAs. A PO revision is also in progress to align with the approved PCAs/CTPs to date."

- Defueling (Dec 2015) – "Project 73161 is ON TRACK and CPI is 0.92 [Report showed 0.88], due to an over-accrual … which will be corrected next month. Project 73156, OPG Oversight. This is an LOE project. CPI=1.10"

APPENDIX B – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

OPG CONFIDENTIAL

ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment ("DNR") - Contractor Invoicing Audit

March 31, 2016

Report Rating: Generally Effective

Distribution:

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: Generally Effective

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Invoices for some of the Owner-Supplied Materials and goods were not submitted with the contractor's invoice.	Operational		X	
2	The review frequency for changes in labour rates and potential overbilling across DNR projects was not clearly defined.	Operational		X	
3	Retention requirements for the supporting documentation of contractor invoices were not fully established.	Operational			X
4	Certain reimbursable work for the Defuelling project was billed at invalid labour rates.	Operational			X
Total		**4**	**-**	**2**	**2**

1.2 Background

The Darlington Nuclear Refurbishment ("DNR") program achieved a key milestone with the completion of the Definition Phase and the approval of the Release Quality Estimate ("RQE") by the Board of Directors in late 2015. The total cost of the program is estimated at $12.8 Billion. As of December 31, 2015, the life-to-date actual cost was $2.2 Billion.

The commercial strategy for DNR is a multi-prime contractor model in which there is a separate contract with each prime contractor responsible for the completion of specific major projects. The contracting strategy combined fixed/firm pricing based on the achievement of milestones for known or highly definable tasks and target pricing based on time and materials for the remaining scope where work is less definable. The prime contractor is responsible for invoicing that includes subcontractors and for compliance with taxation, legal and regulatory requirements.

A contract audit services agreement for the DNR program is in place with two external audit firms to periodically validate the completeness and accuracy of the contractor's invoicing process and compliance with OPG's policies and procedures as well as with the contractual terms.

This audit was conducted given the significance of the DNR program costs and the payments to third party contractors that carry out the major project work packages.

[1] Please refer to Appendix C for risk rating definitions

1.3 Objective & Scope

The objective of this audit was to assess the design and operating effectiveness of controls to ensure that contractor invoices paid were sufficiently supported, accurate and in accordance with the contractual terms and conditions.

In order to achieve the audit objective, we reviewed the contractor invoicing and payment process and tested, on a sample basis, whether:

Ref	Key Focus Areas	Key Activities
A	Invoice Processing Governance	• Roles, accountabilities, procedural steps and timelines for the DNR invoice payment process were clearly defined, with appropriate segregation of duties, documented and communicated.
B	Service Delivery Management	• Contractor invoices for fixed fees and reimbursable time and material costs were consistent with the terms and conditions of the contract and any subsequent change directives; and • Contractor invoices were supported by relevant documentation such as milestone certificates, subcontractor invoices, timesheets and expense receipts.
C	Invoice Processing	• Invoiced amounts were mapped to the correct Work Breakdown Structure ("WBS") elements, Cost Accounts, Work Packages, Schedule Line items and Purchase Order Line items in the Oncore cost allocation template; • Invoiced amounts were accurately computed including applicable taxes and foreign exchange conversion; • Time charges and other reimbursable costs were assessed for reasonableness; • Contractor invoices were sufficiently detailed to support the payment request and paid for in a timely manner; • Discrepancies and disputes relating to costs or fees payable were monitored and resolved through an established dispute resolution process; • Contractor invoices were reviewed and approved by the appropriate level of management as per established payment procedure; • Contractor invoices were processed, reviewed and monitored in a consistent manner across DNR major projects, as applicable; and • Supporting invoice documentation packages were retained for future reference.

Fraud Risk Considerations:

- Invalid invoices such as duplicate invoices and split invoices just below approval limit were processed and paid for;
- Invoices were paid for without the approval of authorized personnel;
- Invoices were paid for work not completed; and
- Adjustments to vendor accounts were made without the approval of authorized personnel.

The scope covered the process and controls over contractor invoicing for major project work packages for the period January 1 to December 31, 2015.

Exclusions

The Extended Services Master Service Agreement ("ESMSA") and the Owner Support Services ("OSS") contracts were excluded from the scope of this audit and will be covered in the 2016 DNR Contractor Time Keeping audit.

1.4 Conclusion

Contractor invoices for the DNR project were generally well supported with no significant errors noted.

Positive Observations

- There was close collaboration among Project Oversight, Finance, Planning & Controls and Contract Management in ensuring that invoices were adequately reviewed, supported and conformed to contractual terms;
- Finance has developed a job aid in addition to current governance requirements for the Major Contract Invoice Process that outlines the steps for the Project Managers and the Finance Analyst to review contractor invoices and the supporting documentation for major DNR contracts; and
- No errors were noted in the testing of invoices on the Retube & Feeder Replacement ("RFR") project which accounted for 27% of the total life to-date spend on the program as of December 31, 2015.

Key Findings and Recommendations

- The contractor for the RFR project did not provide copies of invoices for all OSM and goods purchased as part of their invoice submissions. OPG management also did not request back-up on items not considered significant, though technically, back-up is required per the contract. Management should require the contractor to comply with the contractual requirements or document acceptable thresholds levels and implement random testing; and
- The review frequency for changes in labour rates and potential overbilling across DNR projects was not clearly defined. Management should clarify the frequency of review based on the significance of reimbursable salary costs in each contract.

The findings noted in the report have been reviewed with management and they have committed to specific action plans to address them. Please refer to Section 2.0 for specific details of the above findings along with the associated risk impacts, audit recommendations and management action plans.

Opportunity for Improvement

In their review of the monthly RFR project invoices, OPG Project Managers and the Senior Financial Analyst validated employee hours based on the planned level of project activity. These time exceptions and other unusual occurrences were cleared with the contractor but were not always documented. It is recommended that adequate documentation of the dispositioning of exceptions be consistently retained.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix C.

1. Invoices for some of the OSM and goods were not submitted with the contractor's invoice. — **Moderate**

The EPC agreement for the RFR project requires that the contractor provide copies of invoices for all Owner Specified Materials ("OSM") and goods purchased as part of their monthly invoice submission. These invoices should expressly set out the actual costs, net of all discounts, rebates and refunds.

IA noted that the SLN-Aecon Joint Venture did not provide invoices for OSM and goods purchased as part of its monthly RFR invoice submission. Currently, OPG requests the contractor to supply copies of invoices for significant items of OSM and goods. In 2015, procurement costs on this project, including OSM and goods, were $28.9M. A sample of five monthly RFR invoices representing approximately 60% of the total procurement costs were reviewed (OSM - $14.7M and goods - $3.2M).

- Of the $14.7M OSM invoices reviewed, 99.98% were well-supported with documentation;
- However, of the $3.2M of goods reviewed; approximately $383k (12%) did not have supporting invoices. Refer to details in Appendix A.

For significant items, invoices were provided by the contractor and no exceptions were noted in the sample of OSM and goods invoices reviewed.

Potential Cause & Impact

Potential Cause:

- The RFR contract requirement for the contractor to provide copies of all invoices for OSM and goods was not enforced; and
- Management considered certain items not significant enough to justify the work effort required to retain and validate the related invoices.

Impact:
Invoiced amounts for OSM and goods may be inaccurate or invalid.

Recommendation	Management Action Plan	Owner & Target Completion Date
The RFR Project Oversight team should require that the contractor comply with contractual requirements for invoice submission. For goods, RFR Project Oversight can consider requiring the contractor to provide invoices for all items meeting certain criteria (e.g. based on risk or materiality). For items not meeting the criteria, the project team should request a sample of invoices for review at a defined frequency.	Going forward, the RFR Project Oversight team will require the contractor, as part of the monthly invoice submission, to provide copies of invoices for: a) all OSM line items; b) all goods line items above a certain threshold; and c) a sample of goods line items below the threshold, upon request. Additionally, the contractor will be requested to provide copies of invoices of all OSM and goods for the year 2015, which have not been previously included in the monthly invoice packages.	Roy Brown Senior Director Projects, Retube & Feeder Replacement August 31, 2016

2. The review frequency for changes in labour rates and potential overbilling across DNR projects was not clearly defined.	**Moderate**

In supporting OPG Project Managers in their review of reimbursable salary costs for the RFR project, the Senior Financial Analyst periodically verifies that the hourly rate for each employee was consistently charged month over month and that pay rate changes were justified. There is also a periodic review of each employee's hours across different DNR projects to detect overbilling of hours.

IA noted the following issues:

- the review of the month over month changes to labour rates was not performed in 2015; and
- the review of employee hours for overbilling across DNR projects was performed only once in 2015.

The monthly billing of reimbursable salary costs for the RFR project ranged from $3M to $5M. As part of the RFR contract audit, an external audit firm, KPMG, has been engaged to validate that salary charges were consistent with the amounts paid to employees and were supported by approved time records. An audit is currently under way.

Potential Cause & Impact

Potential Cause:
The frequency of the review was not clearly defined.

Impact:
Delays in identifying incorrect labour rates and hours may result in a build-up of overbilled amounts, difficulty in recovering overbillings and incorrect project reporting over time.

Recommendation	Management Action Plan	Owner & Target Completion Date
Nuclear Projects Controllership should clarify the frequency of review for the consistency of labour rates and potential overbilling across DNR projects based on the significance of reimbursable salary costs in each contract.	Nuclear Projects Controllership will establish an appropriate review frequency of: a) consistency of labour rates; and b) employee hours for overbilling across DNR projects.	Leo Saagi Director Controllership, Nuclear Projects August 31, 2016

3. Retention requirements for the supporting documentation of contractor invoices were not fully established.	**Low**

Supporting documentation for contractor invoices, including statutory declaration forms, milestone completion certificates, salary details and invoices for expenses, contains valuable information that support effective management of the DNR program. Such documentation may be required for future reference in the event of a legal dispute and should therefore be retained over the duration of the DNR program and a number of years thereafter. The retention process should ensure that the records can be readily accessed and retrieved as needed.

IA noted that the supporting documentation for contractor invoices was not retained through a process that ensured their accessibility and retrievability in the future. These documents were kept in the DNR Contract Management shared folder for the respective major project bundles, which was not subject to an established controlled process. FIN-0003 of the Corporate Records Retention Schedule ("CRRS") for Accounts Payable Invoices and Vouchers, which requires a retention period of six years, does not meet the requirements of the DNR program and does not specifically cover invoice supporting documentation. Though the relevant documents were available for the sample of invoices reviewed, their future availability may not be ensured.

Potential Cause & Impact

Potential Cause:
The specific documentation retention requirements for the DNR program have not been assessed.

Impact:
Information in the invoice supporting document packages may not be available for future reference nor to support legal proceedings.

Recommendation	Management Action Plan	Owner & Target Completion Date
Management should define and implement a process for the retention of the supporting documentation for contractor invoices that will meet the requirements of the DNR program.	Management will establish a document management process for the retention of the supporting documentation for contractor invoices, including: a) details of documents to be retained; b) location of the document repository; and c) document retention period.	Doug Semple Project Director, Contract Management September 30, 2016

4. Certain reimbursable work for the Defuelling project was billed at invalid labour rates.	**Low**

Reimbursable labour costs are payable to the contractor either on an actual cost incurred basis, which is the case for the RFR project or based on rates defined in the contract, as in the case of the Defuelling project. The Engineering Services and Equipment Supply Agreement ("ESA") for the Defuelling project established labour rates for engineering grades E1, E2, E3 and E6.

In reviewing the sampled invoice for Defuelling reimbursable costs, IA noted that one individual was charged under an E4 rate, which is not an approved contract rate. The identification of an invalid labour rate prompted a review of all invoices for reimbursable work, which started in 2015. It was then reported that invalid E4 and E7 rates were also charged in two other invoices. In total, reimbursable work on the Defuelling project was overcharged by approximately $2,000 out of $2.1M paid to date (refer to details in Appendix B).

Potential Cause & Impact

Potential Cause:
The transition to a new Section Manager, Defuelling Project during 2015 did not ensure that labour rates were reviewed for compliance with the approved contractual rates.

Impact:
As reimbursable work continues, the amount over-invoiced due to invalid labour rates may become significant.

Recommendation	Management Action Plan	Owner & Target Completion Date
The Defuelling Project Oversight Team should: a) ensure that the invoiced labour rates comply with those defined in the contract; and b) require the contractor to issue a credit for the overbilling.	The Defuelling Project Oversight Team will: a) verify that the labour rates for reimbursable work are consistent with the approved rates as per the contract; and b) request the contractor to issue a credit for the overbilling against the next invoice.	Sorin Marinescu Project Director, Fuel Handling June 30, 2016

APPENDIX A – INVOICES FOR OSM AND GOODS NOT SUBMITTED FOR RFR PROJECT

Owner Supplied Materials (OSM")

RFR Invoice #	Invoice Date	Number of Line Items	Total Amount ($)	Supporting Invoices Not Received	
				Amount ($)	%
41	25-Feb-15	11	5,191,777	-	-
44	25-May-15	3	472,894	-	-
47	25-Aug-15	6	2,386,058	-	-
50	25-Nov-15	12	3,293,812	2,902	0.02%
51	25-Dec-15	7	3,373,314	-	-
Total		**39**	**14,717,855**	**2,902**	**0.02%**

Goods

RFR Invoice #	Invoice Date	Number of Line Items	Total Amount ($)	Supporting Invoices Not Received	
				Amount ($)	%
41	25-Feb-15	10	147,876	147,876	100%
44	25-May-15	50	434,516	52,334	12%
47	25-Aug-15	31	1,303,088	65,846	5%
50	25-Nov-15	30	818,191	55,212	7%
51	25-Dec-15	29	485,055	61,393	13%
Total		**150**	**3,188,726**	**382,661**	**12%**

The average number of goods line items was 30 per month and the average value of goods line items without supporting invoices was $3.4K. Generally, each line item was supported by one invoice.

APPENDIX B – REIMBURSABLE WORK OVERBILLED FOR DEFUELLING PROJECT

Invoice #	Invoice Date	Rate Type	Rate ($)			Hours Billed	Amount Overbilled ($)
			Billed	Applicable	Differential		
13621	13-Jul-15	[redacted]					
13627	21-Aug-15						
13700	28-Sep-15						
13700	28-Sep-15						
Total						**56.5**	**2,003**

APPENDIX C – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment ("DNR") Contractor and Subcontractor Management Audit

June 13, 2016

Report Rating: **Generally Effective**

Distribution:

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Generally Effective**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	A formal process has not been established to facilitate Contractor notification and OPG adjudication of former OPG employees hired by Contractors.	Operational		X	
2	A formal dispute resolution document is not utilized across all Nuclear Refurbishment contracts.	Operational			X
Total		**2**	**-**	**1**	**1**

1.2 Background

The Darlington Nuclear Refurbishment ("DNR") Project is currently nearing the end of the planning, engineering, and procurement phase with the refurbishment of the first unit (i.e. U2 construction, installation and commissioning work) scheduled to begin in the fall of 2016. As part of the refurbishment, selected contractors have been tasked with managing the delivery of various services and project management activities. OPG maintains oversight of these activities as part of its due diligence in ensuring all services and installations meet various OPG and regulatory standards and requirements. Without effective oversight, contractors may not meet the requirements for quality or service, impacting the timely, cost-effective delivery of the DNR Project.

This is a risk based audit identified in Internal Audit's ("IA's") 2016 Strategic Audit Plan, selected given the significant profile of the DNR Project and value of contractor managed activities involved.

1.3 Objective & Scope

The objective of this audit was to ensure that services provided by qualified DNR contractors and subcontractors meet the quality expectations of OPG and are compliant with applicable OPG policies and contractual obligations.

To achieve the audit objective, Internal Audit assessed and selectively tested the design and operational effectiveness of OPG oversight processes and controls to determine whether:

A. Contractor / subcontractor qualifications

- OPG roles and responsibilities for verifying the initial and continued qualification of contractors and subcontractors have been clearly defined and communicated;
- Contracts are awarded to qualified contractors and subcontractors, including qualifications that are specific to the nature of services being provided;
- Processes and controls have been established to monitor the status of contractor and subcontractor qualifications, including activities and criteria to disqualify contractors and subcontractors as necessary; and

[1] Please refer to Appendix A for risk rating definitions

- Controls have been established to prevent OPG contractors from subcontracting work to companies or individuals that:
    a. Do not meet OPG quality requirements;
    b. Could have an explicit conflict of interest with OPG; and
    c. Could damage OPG's reputation.

B. OPG Terms, Conditions, Policies and Procedures

- Roles and accountabilities were clearly assigned to the various organizations within the DRP to monitor contractor and subcontractor compliance with the specific terms and conditions of the contract;
- Processes and controls have been established to monitor contractor and subcontractor compliance with terms and conditions included in contracts between OPG and the contractor (including commercial terms), and in other relevant reference documents (e.g. Contract Management Plans, Contractor/Owner Interface Requirements);
- Mechanisms exist to ensure that contractors require subcontractor compliance with flow-down provisions (commercial terms) from the contract between OPG and the contractor;
- Contractors and subcontractors were made aware of specific OPG policies and guidelines that must be complied with and OPG has established monitoring processes to monitor compliance with these requirements as applicable;
- Applicable contractor and subcontractor instances of non-compliance (quality of services) were tracked through SCRs; and
- Processes have been developed by OPG to take action on instances of non-compliance with specific OPG terms and conditions.

C. Contractor Management Programs

- OPG assessed and confirmed acceptance of contractor management programs (e.g. environment, safety, quality, corrective actions, training);
- OPG monitored contractor and subcontractor compliance with accepted management programs;
- OPG performed risk-based quality audits of contractors and subcontractors;
- OPG has processes in place (e.g. documentation, testing results) substantiating the delivery of quality services; and
- OPG ensured contractors and subcontractors maintained and provided OPG with documentation necessary to substantiate the successful and complete delivery of services as stipulated in contracts and Contractor Owner Interface Requirement (COIR) documents.

D. Contract Administration

- OPG has established processes, activities and controls to manage and approve changes to contract terms, maintains and updates contract management plans with contractors where applicable;
- Processes have been established by OPG to maintain an open line of communication along the entire workflow chain with contractors and subcontractors;
- Contractor action items and issues are tracked with related correspondence and evidence to support timely closure/resolution of items;
- Proper tracking and documentation retention mechanisms are in place for unresolved issues or any communications of service/quality issues to support future disputes or claims; and
- Established protocols are in place and adhered to for managing and escalation of disputes.

The scope covered the DRP contractor and subcontractor management/oversight activities for the period of June 1, 2015 to February 29, 2016.

1.4 Conclusions

Management has identified quality of services as a key factor in the success of the refurbishment program and is continuously monitoring contractor and subcontractor performance, including seeking process improvements.

Positive Observations

- An OPG Oversight Steering Committee has been formed consisting of management level employees from various functions including project management, Supply-Chain and Human Resources. This cross-function management committee meets regularly to discuss program oversight activities, issues and results, including those related to contractor and subcontractor qualifications.

- The Project and Contract Management Teams meet regularly with the Prime Contractors for each project to discuss the status of the project, project related issues and mitigation, including those related to quality, and flow-down provisions of contractual obligations.

- OPG encourages all Prime Contractors to utilize OPG's approved suppliers whenever possible and mandates the use of approved suppliers for critical parts and services to help ensure services performed meet OPG quality expectations and standards.

Findings and Recommendations

- Contractors are required to comply with OPG's re-hiring procedural document established in 2014 (Re-hiring Of Former OPG Employees, OPG-PROC-0145), which requires that former OPG employees may only be hired if certain criteria regarding their termination are met and a "cooling off period" has occurred. In addition, the contracts require the contractors to provide notification to OPG when hiring former OPG employees for DRP related work. However, contractors are not consistently notifying OPG when re-hiring former OPG employees to assist with DRP related contracts. It is recommended that OPG establish a formalized procedure aligned with OPG-PROC-0145 for receiving and adjudicating contractor notifications of intention to hire former OPG employees.

- A formal "Dispute Resolution Record" document is not being consistently used to track disputes with Prime Contractors. The use of a formalized document ensures disputes are tracked and key details documented to enable timely resolution. A "Dispute Resolution Record" should be put in place for all other Refurbishment contracts to ensure accurate tracking and timely resolution of identified disputes.

The findings noted in this report have been reviewed with management and they have committed to a specific action plan. Please refer to Section 2.0 for specific details of the above findings along with the associated risk impacts, audit recommendations and management action plans.

Opportunity for Improvement

- Although meetings are held regularly with contractors to discuss project status, updates and any issues encountered, issues identified are not consistently tracked across all projects. It is recommended that OPG and contractors record and track issues using a standard format and consider utilising a logging tool/program, such as the OPG'S Nuclear Projects Risk Management Oversight (RMO) tool; and

- Contractually, prime contractors are required to identify key subcontractors to OPG based on the financial value of work being performed. From a quality perspective, work packages are assessed by the Project Teams for criticality based on risks (e.g. nature of services performed, first time services, etc.) to determine the level of oversight activities. In addition to quality oversight, it is important to identify key subcontractors to ensure appropriate flow down of relevant commercial contract terms (e.g. warranties, liabilities, insurance, etc.). Management should consider including other factors in the criteria for determining key subcontractors, such as the nature, criticality or complexity of the work being performed, services performed within OPG's restricted areas, risks and impact to reputation.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix A.

1. A formal process has not been established to facilitate Contractor notification and OPG adjudication of former OPG employees hired by Contractors.	**Moderate**

Re-hiring Of Former OPG Employees governance (OPG-PROC-0145) requires that indirect employees hired by a vendor in a "managed task[2]" arrangement or who work without direct supervision of OPG management shall not be hired within six months from the date of termination or retirement.

Consistent with this procedural document, Nuclear Refurbishment contracts evaluated during this audit required Contractors to disclose in writing to OPG:

> "The names of each of the contractor's personnel who will be providing Work at the Site continuously, who is a former OPG employee and who received a severance package from OPG, is receiving pension payments from OPG or is receiving a non-working pension bridge from OPG".

However, (with the exception of the ESMSA contract) a procedure has not been established to facilitate contractor notification and formal OPG assessment of Contractor placement of former OPG employees in DNR work.

Potential Cause & Impact

Potential Causes:

OPG has not developed, implemented and communicated a formal process for receiving and adjudicating notifications from contractors intending to hire former OPG employees.

Impact:

- OPG may not be aware of all instances of contractors hiring former OPG employees to aid in OPG related work;
- Former OPG employees who were terminated with cause and re-hired by contractors could lead to quality issues, have an explicit conflict of interest with OPG and/or could damage OPG's reputation; and
- DNR Project teams may not adjudicate notifications in a consistent manner.

Recommendation	Management Action Plan	Owner & Target Completion Date
People and Culture, in conjunction with DNR Contract Management should establish a formal process to facilitate Contractor notification and guidelines to assess whether there are concerns with the individual (e.g. if individual was terminated by OPG).	People & Culture - Talent Management, in conjunction with DNR, will review the Rehiring Procedure and related labour and legal matters to determine how the notification and approval process for contractors rehiring former OPG employees can be standardized.	Nicole Lichowit VP Talent Management and Business Change December 16, 2016

[2] Refers to specific deliverables that are contracted out to an external contractor company. The Contractor is accountable for the deliverables and the contractor workers are not directly supervised by OPG.

2. A formal dispute resolution document is not utilized across all Nuclear Refurbishment contracts.	**Low**

Disputes between OPG and the contractors are expected to be resolved cooperatively and in a timely manner. Disputes not resolved within 10 Business days, for Nuclear Refurbishment contracts and 30 days, for the ESMSA contract, will be brought to the attention of the Steering Committee to attempt to resolve the dispute.

However, with the exception of the "ESMSA Dispute Resolution Record", formal documentation and tracking for disputes are not in place. As the Refurbishment project move into the execution phase, it is anticipated that the number of contractual disputes with our EPC contractors will increase significantly. Failure to utilize a formal tracking mechanism and collect and retain proper documentation could affect the timeliness of the Steering Committee's involvement and impair their ability to reach a final decision.

Potential Cause & Impact

Potential Causes:
Contract Management has not yet established and formalized a dispute tracking mechanism for Nuclear Refurbishment contracts.

Impact:

- The failure to employ a formal tracking mechanism may result in reduced visibility to disputes and prevent timely resolution;
- Without proper documentation and tracking of the dispute, information relating to disputes with contractors may not be fully recorded potentially resulting in misrepresentations and inaccuracies by the time of escalation to the Steering Committee; and
- Lack of evidence could lead to OPG losing the dispute against the contractor, causing OPG to incur settlement costs, project delays and reputational damage.

Recommendation	**Management Action Plan**	**Owner & Target Completion Date**
In contemplation of starting the Execution Phase, Contract Management should review its dispute tracking mechanism for each Refurbishment contract, and assess whether the process is sufficiently robust to ensure accurate tracking.	Each major Refurbishment contract will be reviewed for a dispute tracking mechanism. An evaluation will be made to determine whether potential amendment to the contract is required (i.e. amendment to the mechanism or establishment of a new mechanism).	Meg Timberg VP Contract Management December 16, 2016

APPENDIX A – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

DNR Contractor Procurement – R&FR Project Audit

September 20, 2016

Report Rating: **Effective**

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Effective**

There were no findings noted during the audit.

1.2 Background

The Retube & Feeder Replacement ("R&FR") project bundle is the largest work package in the Darlington Nuclear Refurbishment ("DNR") program, representing the critical path schedule and the core of the program. The scope covered by this bundle includes replacing each of the calandria tubes, which hold the pressure tubes and feeder pipes, using specialized tooling and tooling platforms.

To complete the R&FR scope, OPG awarded an Engineering, Procurement and Construction ("EPC") contract ("RFR EPC Agreement") to the Joint Venture ("JV" or the "Prime Contractor") of SNC-Lavalin Nuclear and AECON Construction Group. Through the agreement, OPG assigned responsibility for the procurement of all Owner-Specified Materials ("OSM"), Goods and Services to the JV.

OPG retains an oversight role with respect to this procurement activity to ensure that the JV delivers the products with acceptable technical quality and appropriate project controls. A unique aspect of the R&FR procurement approach (relative to that taken for the other DNR program bundles) has been the pre-production "testing" of certain OSM. In particular, OPG required the JV's suppliers to manufacture Pre-production Qualification ("PPQ") units for Equipment packages having a lead time of greater than 24 months and specialized parts requiring customization, prior to proceeding to the manufacturing stage. This provided OPG with assurances that the suppliers had the capability to meet technical specifications and schedule needs.

In addition, OPG Supply Chain is involved in the JV's pre-award procurement process. Proactive management of risks associated with the procurement process includes prescribed check points, which require the JV procurement team to actively seek OPG's input in the procurement process for purchase orders ("POs") that meet certain criteria (i.e., PO is in excess of $1 million, is procured on a "single source" basis, or is with a bidder other than the lowest-priced compliant bidder). Refer to Appendix A for further details.

To date, approximately 99% of the POs have been issued for OSM and Goods for Unit 2. Delivery of OSM and Goods is expected to commence in September 2017 at the JV's warehouse, in preparation for the installation and construction work which is scheduled to begin in the fall of 2018. The JV will retain ownership of the components throughout the project lifecycle until completion of the project, at which point ownership of the components will transfer to OPG.

This is a risk-based audit identified in Internal Audit's ("IA's") Audit Plan, selected given the significant profile of the DNR program and the significance of the R&FR project bundle on the overall project.

1.3 Objective & Scope

The objective of this audit was to independently assess the design and operating effectiveness of OPG's controls and processes to oversee the procurement of parts and materials to ensure timely delivery of quality materials for the Unit 2 R&FR bundle.

As the majority of OSM and Goods are not expected to be received until 2017, the focus of this audit was on the design of OPG's oversight processes over the JV's procurement activities.

To achieve the audit objective, we reviewed the processes and tested, on a sample basis, whether:

A. OPG Oversight of JV Procurement Activities

- OPG oversight issues and risks were tracked and resolved using the Risk Management Oversight ("RMO") tool;
- Regular and frequent touch points between the Project Management Team and the JV were conducted, and resulting activities and issues were included in the RMO tool;
- The Procurement Tracking Tool ("PTT") was effectively used to monitor the JV's procurement and logistics of parts and materials (i.e., 'the right materials in the right place at the right time');
- JV's performance (and sub-contractor's performance through the JV's monitoring activities) with respect to quality, timelines and budget was monitored and corrective action was taken as needed;
- OPG oversight activities were in place to ensure that OPG was notified of all contractually-defined POs for OSM and Goods which required OPG approval; and
- POs which required OPG approval were provided in accordance with contractual approval rights.

B. Materials Management, Warehousing and Vendor Quality Oversight

- OPG oversight activities were in place to ensure that the JV has an adequate quality program to ensure parts and materials were:
    - Monitored and stored at the JV's locations in accordance with both OPG and manufacturer specifications;
    - Inspected upon receipt to ensure they meet OPG quality requirements, regulatory codes and standards, and are verified for Counterfeit, Fraudulent and Suspect Items ("CFSI"); and
    - Where parts and materials do not meet OPG quality requirements, regulatory codes and/or standards, or were determined to be CFSI, such instances were escalated and documented.

C. Pricing and Markups

- Oversight was in place to ensure OPG received optimal pricing for parts and materials.

Fraud Risk Considerations:

- JV and suppliers may deliver CFSI to OPG; and
- Possible collusion between the JV and sub-contractors to mark-up pricing for parts and materials, transferring costs to OPG.

The scope of this audit covered the R&FR bundle's procurement activities and transactions for the period from July 1, 2015 to June 30, 2016.

1.4 Conclusion

Positive Observations

- The OPG Supply Chain Team is involved in the JV's procurement pre-award activities. Specific activities include involvement in the bid evaluation process to ensure optimal pricing and value-for-money for OSM and Goods.

- The PTT is the single data source to track the status of key procurement related activities for the R&FR project. The Nuclear Refurbishment Project Parts Integration Team has a process in place to verify the accuracy and completeness of the PTT information for the R&FR project.

- Supply Chain Oversight activities are based on a "risk-significance" graded approach. A Procurement Oversight Selection and Grading Worksheet is used to support the graded approach at the component level to ensure that the graded approach is consistently applied across all components. See Appendix A for details of the JV and OPG oversight activities.

- The R&FR Project Team and members of the Supply Chain organization meet regularly with the JV to discuss the status of the project and procurement-related issues and mitigation strategies, including issues related to PO approvals, logistics and the status of long-lead items.

Opportunity for Improvement

Meeting minutes between OPG and the JV for key and critical decision items should be recorded. The minutes can serve as a log of decisions and actions that can be referenced in the future (e.g., dispute resolution, legal protection and audit trail).

APPENDIX A – OPG SUPPLY CHAIN OVERSIGHT ACTIVITIES

The OPG Supply Chain ("SC") Team is involved in both the Pre-Award and Post Award procurement stages, and is involved with the JV's activities.

During the Pre-Award stage, the SC Team reviews and approves the Recommendation and Authorization to Purchase ("RAP") executive summaries as part of the JV's bid evaluation processes. The RAP executive summaries include a technical, quality and commercial evaluation on the Suppliers. As part of reviewing and approving the RAP executive summaries, the SC Team performs a detailed assessment of the commercial and price evaluation to ensure optimal pricing and value-for-money is obtained for OSM and Goods.

The SC Team is also involved throughout the Post Award procurement phase. A summary of activities for both the SC Team and the JV are shown in the figure below.

Post Award Activities

	Inspection & Testing Plans (ITPs)	Source Surveillance & Factory Testing	Receipt & Inspection	Materials Management
JV Activities	JV prepares ITPs based on work scope	JV executes inspection and test plans	JV receives, inspects, logs materials and goods, and issues Materials Receipt Report ("MRR")	JV manages warehouse and logistics per its Materials/Procurement Management Plan
OPG Supply Chain ("SC") Activities	SC performs graded assessment to determine oversight requirements; SC reviews and coordinates ITPs with other OPG functions.	Specific procurement oversight activities would include participating in hold and witness points, CFSI, receipt inspection, handling and storage, and maintaining quality records. SC Supplier Audits, and Quality Engineering & Performance assesses the performance of the JV as part of the Approved Supplier List ("ASL") requalification audit. Specific processes audited include receipt and inspection, sampling MRRs, storage and handling.		

APPENDIX B – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment ("DNR") Integrated Database for Project Reporting Audit

June 24, 2016

Report Rating: **Effective**

Distribution:

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Effective**

No.	Finding	Risk Type	Risk Rating [1]		
			High	Moderate	Low
1	A review of OPG user access was not performed timely, in accordance with OPG-STD-0035 Identity and Access Management.	Operational			X
Total		**1**	**-**	**-**	**1**

1.2 Background

In the early stages of the Darlington Nuclear Refurbishment ("DNR") project, the Nuclear Data Warehouse ("NDW") was used to house the DNR project schedule and cost information. As the DNR project data and reporting requirements evolved, the need for a more comprehensive solution was identified. The DNR Planning and Controls ("P&C") group developed the Integrated Database ("IDB") in 2014 to consolidate various source systems' data, such as Primavera and Proliance, and maintain master data sets (e.g. estimate comparisons), ultimately to facilitate combined project management reporting. P&C is currently replacing the Proliance capital program management software with a new Ecosys tool, which will add costing information to the IDB.

Data from the various OPG systems and applications are fed into the IDB via an automated batch job process managed by New Horizons Systems Solutions Inc. ("NHSS"), the organization's third party IT service provider. Users utilize a business intelligence ("BI") configuration tool to generate standard reports, as designed by the Reporting Team and made available on the SharePoint site. These reports are used for DNR project management.

Up until April 2016, the IDB was operated in "Development Phase" (i.e. it was owned by the OPG Project Management Team). In April 2016, as a result of the majority of IDB development being completed, the IDB transitioned into "Sustainment Phase" and transferred to NHSS for management of the database.

This is a risk based audit identified in Internal Audit's ("IA's") 2016 Strategic Audit Plan, selected given the significance of the IDB and its criticality to the overall DNR Project, as this tool provides information, including project performance reports, to management that is used to make decisions.

1.3 Objective & Scope

The objective of this audit was to assess the design and operating effectiveness of controls to ensure appropriate security of the IDB and data integrity of information used in project management reporting.

[1] Please refer to Appendix A for risk rating definitions

To achieve the audit objective, we reviewed the applicable processes and tested, on a sample basis, to determine whether:

A. Database Development and Change Management

- Controls and procedures were in place to prepare for the IDB go-live, including the development and execution of test plans for data mapping, mock data conversions, functionality and technical tests;
- User acceptance testing was conducted in a non-production environment in connection with the IDB go-live to ensure accuracy and completeness of data flow and functionality of reporting;
- Controls and procedures were in place to ensure the IDB go-live was undertaken in a manner supporting the accurate, complete and valid processing and recording of information;
- Change management policies and procedures have been developed and documented to ensure that, as part of the IDB's sustainment, all structural changes to the IDB are tracked from initiation to completion;
- New interfaces – e.g. between Ecosys and/or external sources and the IDB – have been tested and approved prior to go-live; and
- The IDB, including hierarchy, dependencies, logic restrictions, inputs/outputs and error handling procedures, has been documented.

B. General Security

- A risk assessment has been performed to define the controls to be established around the IDB;
- General security controls – e.g. encryption, firewalls, etc. – have been established where required and are monitored and documented for execution (by OPG and/or New Horizons, as applicable) to protect the IDB from unauthorized access and loss of critical and/or sensitive information; and
- User access to the IDB is controlled and managed such that only current and valid users (including external users) have access based on their roles and responsibilities.

C. Data Availability

- Processes and controls, including related to backup, disaster recovery and data restoration, have been established to ensure that historical (or "point-in-time") IDB data is available for recovery.

D. Integrity of Information

- Data imported to the IDB is complete and accurate;
- Interfaces between key applications which feed into the IDB and the IDB itself were actively monitored, and interface failures were resolved in a timely manner; and
- Master data sets created within the IDB were complete and accurate.

E. Accuracy and Functionality of Reporting

- Standard reports created within the BI tool adhered to change management policies and were tracked from initiation to completion, including the performance of user acceptance testing to ensure the reports met users' needs and were complete and accurate.

F. Data Retention

- Retention policies and procedures were defined and documented to ensure that reports generated from the IDB are appropriately retained, including defining retention location and period; and
- OPG established processes and controls to retain historical / point-in-time data from the IDB.

The scope of the audit did not include an assessment of the accuracy and validity of information / data from source systems being input to the IDB.

1.4 Conclusions

Controls are in place to ensure data integrity of information used in project management reporting. In addition, management is in the process of establishing additional processes and controls where needed for the Sustainment Phase.

Positive Practices Observed

- An analysis was performed prior to the development of the IDB to identify risks related to the database structure, purpose, functionality and design. Controls or activities were established to address these risks; and

- Data imported from source systems into the IDB is complete and the information is accurate to provide reports that are consistent and aligned for oversight and project reporting.

Finding and Recommendation

Management did not perform a review of OPG user access rights granted within the IDB for a period of approximately 18 months. A review of user access in May 2016 identified three exceptions. Management should perform annual reviews of OPG user access rights to the IDB in accordance with OPG-STD-0035 Identity and Access Management.

The finding noted in this report has been reviewed with management, who has committed to a specific action plan. Please refer to Section 2.0 for specific details of the above finding, along with the associated risk impact, audit recommendation and management action plan.

Opportunities for Improvement

- When standard reports are created or enhanced by the Reporting Team, they are tested through internal peer checks and reviews by the Team, as well as through User Acceptance Testing ("UAT") performed by the LOBs. Management should document UAT activities for new reports, particularly those that are used to support external, Board and executive reporting.

- The Reporting Team has developed in excess of 80 IDB reports, consolidating information from a variety of source systems. Management should review the effectiveness of these reports for project monitoring as the DNR program matures and goes into execution, and consider opportunities to further streamline and reduce the number of key management reports.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed finding and recommendation, which has been risk rated based on the definitions outlined in Appendix A.

1. A review of OPG user access was not performed timely, in accordance with OPG-STD-0035 Identity and Access Management.	**Low**

Select users within NHSS and OPG have access to the IDB environment, for the purposes of developing and maintaining the database, and creating standard reports, respectively. Both NHSS and OPG user access to the IDB is provisioned upon approval from the requesting user's direct supervisor and requires the user to have a valid OPG network account. Users are then assigned access based on pre-defined roles.

OPG-STD-0035 Identity and Access Management section 2.2 (a) requires "Regular review and, if required, realignment of the access rights […] annually, as a minimum, and more frequently based on the criticality/sensitivity of the application module involved based on a risk assessment." While NHSS performs periodic reviews of NHSS users' access, a similar review had not been performed by OPG for a period of approximately 18 months during which time the database was actively used to develop reporting.

Management's review of user access during the audit execution period identified three exceptions:

- One terminated user whose access to the IDB was retained after their departure from the organization approximately two years ago. Although the user's read-only access to the IDB was still provisioned, the associated OPG network account had been deactivated; and
- Two OPG staff had account-level read-only access. This does not align with the IDB access management approach where access is provisioned based on pre-defined roles.

Potential Cause & Impacts

Potential Cause:
Management's review of OPG user access was not performed until the IDB was transitioned to NHSS for management.

Impacts:

- Inappropriate user access rights may not be identified and adjusted in a timely manner.
- Individuals may have access to information that is not required for their job accountabilities.

Recommendations	Management Action Plans	Owner & Target Completion Date
1. Management should remove the individual account-level access to the IDB for the exceptions identified. 2. To ensure access provided continues to be commensurate with users' current job accountabilities, management should finalize the current draft Reporting Team IDB Admin User Guide and implement the periodic access review process.	1. Complete 2. Complete and issue the Reporting Team IDB Admin User Guide, which will set out the process for quarterly review of the system-generated listing of access privileges.	Joe Reid Section Manager - Project Reporting, DNR Planning & Controls September 30, 2016

APPENDIX A - RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment ("DNR") Engineering, Procurement and Construction ("EPC") Contractor Procurement Oversight Audit

November 1, 2016

Report Rating: **Requires Improvement**

Distribution:

Dietmar Reiner
SVP Nuclear Projects

Michael Allen
SVP Nuclear Refurbishment

Sean Toohey
Project Director, Parts Integration

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	Jody Hamade	VP Enterprise Risk Management
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	Art Maki	Project Director, Refurbishment Management Systems Oversight
	Roy Martin	Project Director, Project Execution Programs Strategy
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	Mark Knutson	Director Nuclear Oversight

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Requires Improvement**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	[redacted] source surveillance tracking documentation is incomplete.	Operational	X		
2	Contractors had incomplete and inaccurate cost performance reporting.	Operational			X
Total			**1**		**1**

1.2 Background

The Darlington Nuclear Refurbishment ("DNR") project is currently nearing the end of the planning, engineering, and procurement phase with the refurbishment of the first unit (i.e., Unit 2 construction, installation and commissioning work) scheduled to begin in the fall of 2016.

To deliver the DNR project, OPG has tasked select contractors with planning, executing, and controlling the procurement of critical parts. OPG maintains oversight of these efforts as part of its due diligence in ensuring parts and materials are available on-time and according to OPG specifications.

In August 2015, Internal Audit ("IA") conducted an audit of the DNR Engineering, Procurement and Construction ("EPC") Contractor procurement oversight activities to assess the design of controls over the management of contractor procurement processes for materials, specifically long-lead materials. At the time of that audit, processes were relatively new, few parts and materials had been procured by the EPC Contractors, and therefore operating effectiveness of OPG oversight controls over EPC Contractor procurement activities could not be assessed. This review expanded upon the previous audit and also assessed the operating effectiveness of controls over select EPC Contractor procurement activities.

This is a risk-based audit identified in IA's program, selected given the significant profile of the DNR project and value of contractor procurement activities involved.

1.3 Objective & Scope

The objective of this audit was to independently assess the design and operating effectiveness of controls and processes related to procurement of materials to ensure timely delivery of materials that meet OPG quality standards and refurbishment requirements. To achieve the audit objective, we reviewed the processes and tested, on a sample basis, whether:

[1] Please refer to Appendix A for risk rating definitions

A. Procurement Planning Oversight

- Updates to materials procurement management plans were communicated to EPC Contractors to establish and agree upon expectations for procurement activities;
- Prime Contractors and applicable sub-contractors were qualified on OPG's Approved Supplier List ("ASL"), maintained their qualification status and were re-qualified on a timely basis (if necessary);
- Prime Contractors had quality management plans in place to ensure that all parts and materials procured, including those from sub-contractors, met relevant standards;
- Processes existed to facilitate the Prime Contractor's use of OPG preferred suppliers where applicable; and
- A framework existed with activity requirements and clear roles and accountabilities for the various OPG functions involved in contractor procurement oversight, from initiation to delivery.

B. OPG Oversight of Contractor Procurement Activities

- Project oversight plans were developed for each project bundle's procurement activities based on a risk based approach;
- The Procurement Tracking Tool ("PTT") was effectively used to monitor the procurement and logistics of parts and materials ('the right materials in the right place at the right time') and was accurate and complete;
- Quality Management Plans ("QMPs") / Inspection & Test Plans ("ITPs") were developed, indicated planned timelines for hold/witness points and/or Factory Acceptance Tests ("FAT"), and considered the potential for Counterfeit, Fraudulent, Suspect Items ("CFSI");
- Testing of parts and materials was performed based on the ITPs in a timely manner and prior to delivery and installation to ensure compatibility and quality;
- Documentation to evidence testing performed on parts and materials was retained;
- Parts and materials met OPG quality requirements, regulatory codes and standards, and were verified for CFSI;
- Where parts and materials did not meet OPG quality requirements, regulatory codes and/or standards or were determined to be CFSI, the quality issue(s) was/were documented, escalated in accordance with defined processes and remediated in a timely manner; and
- The Prime Contractor's (and sub-contractor's, through the Prime Contractor's monitoring activities) performance with respect to quality, timelines and budget was monitored and corrective action was taken as needed.

C. Pricing and Markups

- Oversight was in place to ensure OPG received optimal pricing for parts and materials; and
- Contractors adhered to pricing terms, including in relation to markups for goods and services.

This audit followed-up on action plans developed in response to the findings from the 2015 DNR EPC Contractor Procurement Oversight Audit. An audit of the vendor qualification process was completed in a separate audit in 2016.

The scope of this audit covered the DNR program's procurement activities and transactions on the [redacted] for the period from July 1, 2015 to June 30, 2016.

1.4 Conclusions

Positive Observations

- A risk-graded approach for supply chain oversight has been implemented by OPG. Critical parts and materials have been identified and included in an OPG oversight schedule. The Refurbishment Quality Management team is in the process of developing a risk-graded approach at the component level for all DNR Project Bundles; and

- Management has implemented a quarterly security access review process to ensure the PTT and applicable data is secure and protected. PTT data is also reconciled to bills of materials to help ensure completeness.

Findings & Recommendations

- [redacted] Master Source Surveillance Plan ("MSSP"), which includes information on Manufacturing Inspection and Test Plans ("MITPs"), has not been properly maintained. Various fields in the MSSP are blank and do not reflect the actual completion of MITPs. Management should continue working with [redacted] to ensure the MSSP is accurately updated and reported to OPG. Periodically, management should compare the MSSP with internal records (Master parts tracking files and the Critical Material Oversight Schedule) to verify that no MITPs are missing in the MSSP.

- Cost performance reporting provided by [redacted] lacked information on cost status, milestones and key performance indicators. In addition, [redacted] reporting on actual costs and forecasted costs was not consistently accurate. Management should continue working with these contractors to improve the detail and quality of cost performance reporting.

The findings noted in this report have been reviewed with Management, who has committed to specific action plans. Please refer to Section 2.0 for specific details of the above findings, along with the associated risk impact, recommendations and management action plans.

Change in OPG Oversight Practices with [redacted]

OPG's execution strategy for DNR has been to position OPG as an "oversight" organization, with its contractors responsible for planning, coordinating, integrating and ultimately executing the scope of work. The contracts entered into by OPG and its contractors reflect this execution strategy.

Due to issues encountered on the project, an executive decision was made for OPG to be more "hands-on" with [redacted] which was a significant change in the OPG execution strategy. As such, some of the following issues may become the responsibility of OPG:

- Low productivity;
- Rework due to planning issues; and
- Integration with other work.

OPG should consider if PO amendments are required to ensure revised accountabilities are accurately represented and the risks associated with applicable contracts are adequately mitigated through contract provisions in the event of disputes or claims. In addition, given OPG's increased "hands-on" role, OPG should have an understanding of incremental costs and consideration should be given as to whether [redacted] should be charged for the additional costs. It may be prudent to document these costs in the event of disputes or claims.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following findings and recommendations which have been risk rated based on the definitions outlined in Appendix A.

1. [redacted] source surveillance tracking documentation is incomplete.	**High**

The [redacted] MSSP, which was created and used by [redacted] to document and track the status of source surveillance activities including MITPs, is not being properly maintained. As at September 2016, various fields in the MSSP were incomplete and did not reflect the actual completion of MITP activities. For example:

- [redacted] had MITPs completed and signed by both [redacted] and OPG (October 29, 2015 and November 4, 2015 respectively) but the completion of these activities was not noted in the MSSP;
- [redacted] has an MITP with an accepted and reviewed date by [redacted] as March 30, 2016 per their MSSP. However, the OPG project number is not listed on [redacted] plan; and
- [redacted] indicated that the job required source surveillance. However, the MSSP lacked details regarding the source surveillance to be performed, the location of performance or potential OPG involvement. It should be noted that OPG has classified this component as a "critical material requiring oversight" (reference: Critical Material Oversight Schedule).

For each of the above examples, Internal Audit was provided with evidence of the MITP being completed or scheduled.

Additionally, OPG is considering implementing additional processes to facilitate the tracking of MITPs including:

- The addition of an "Oversight Required" attribute for individual parts in the Procurement Tracking Tool; and
- Increasing coordination efforts with Prime Contractors to improve cross-referencing between oversight schedules maintained by the Prime Contractors, OPG Project Management and OPG Supply Chain.

Potential Cause & Impact

Potential Causes:
[redacted]

Impacts:
Requisite source surveillance activities may not be performed if surveillance activities are improperly tracked.

Recommendation	Management Action Plan	Owner & Target Completion Date
1) Management should work directly with [redacted] to improve the quality and completeness of the MSSP. A due date for completion of the MSSP should be documented. [redacted] 2) OPG should continue implementing the Procurement Tracking Tool update and coordinating MITP tracking efforts.	Management will have [redacted] update their schedule, and will reconcile to OPG's tracking.	Sean Toohey, Project Director,Parts Integration January 27, 2017

2. Contractors had incomplete and inaccurate cost performance reporting.	**Low**

Contracts with [redacted] require that the contractors provide certain cost performance reporting. In our testing, we noted that cost performance reporting did not consistently include requisite or accurate information as required by the contracts. Specifically:

- [redacted] reporting has not included information on cost status, milestone reporting, and key performance indicators ("KPIs") since November of 2015; and
- The forecasted completion costs, as provided by [redacted] in cost performance reporting, is not consistently accurate. For example, OPG has noted on occasion that [redacted] reported Estimate at Completion ("EAC") metrics were lower than actual costs incurred.

The risk that OPG does not have accurate information on contractor cost performance is minimal as internal OPG performance reporting provides the Project Management team with sufficient information. Also, management had detected these omissions and errors and has re-communicated their expectations to the contractors.

Potential Cause & Impact

Potential Causes:

- Staff turnover at the contractors may have lead to reporting errors or omissions; and
- The contractors may not have fully understood OPG's expectations.

Impacts:
Contractors may not be fully aware of actual cost performance or milestones and may track inaccurate information that could lead to potential cost overruns.

Recommendation	Management Action Plan	Owner & Target Completion Date
Management should continue working with [redacted] to improve the detail and quality of cost performance reporting. If the contractors continue having cost performance reporting issues, OPG should consider imposing applicable penalties as per contractual terms.	Management has worked with [redacted] and [redacted] to improve the detail and quality of reporting to include the cost status, milestones and KPI's.	Complete

APPENDIX A – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

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Plan

OPG Confidential Commercially Sensitive	
Document Number: **NK38-PLAN-09701-10009**	Usage Classification:
Sheet Number: **N/A**	Revision: **R000**

Title:
RETUBE & FEEDER REPLACEMENT PROJECT RFP SUBMISSION EVALUATION PLAN

Retube & Feeder Replacement Project Rfp Submission Evaluation Plan

NK38-PLAN-09701-10009-
2011-06-16

Order Number: N/A
Other Reference Number:

OPG Confidential
Commercially Sensitive

Prepared by:

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SVP-Nuclear Refurbishment
Nuclear Refurbishment

Concurred by:

Robert Vitalis — Date
Director - Supply Chain
Nuclear Refurbishment

Approved by:

Bill Robinson — Date
EVP-Nuclear Refurbishment Projects & Support

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Document Number: NK38-PLAN-09701-10009		Usage Classification:
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Title:
RETUBE & FEEDER REPLACEMENT PROJECT RFP SUBMISSION EVALUATION PLAN

Revision Summary

Revision Number	Date	Comments
R000	2011-06-16-112011-05-11	Initial issue.

1.0 PURPOSE

This document describes the procedure for evaluating the two requested Proposals for the Retube and Feeder Replacement Project in preparation for making a recommendation to the Executive Vice President Nuclear Refurbishment as to whether to accept a Proponent's Proposal or enter into negotiations with one or more Proponents, or exercise any other options, all as more particularly described in section 21 of the RFP Rules. It is intended to ensure that a fair evaluation of the Proponents is carried out. Included in this procedure are the responsibilities of the Evaluation Team members and an outline of the evaluation process. Capitalized terms used but not defined in this document have the meanings given to them in the Request for Proposals for the Retube and Feeder Replacement Project.

2.0 RESPONSIBILITIES

The relationships among the teams or groups described in this section are depicted in Appendix A.

2.1 Evaluation Team

The Evaluation Team is composed of three sub-teams: the Project Management Evaluation Team, the Financial Evaluation Team and the Commercial Evaluation Team. Each sub-team will evaluate the elements of the Proposals assigned to that sub-team in accordance with the Evaluation Criteria, which was distributed to the Proponents as part of the RFP Process.

Each sub-team has a Team Lead (denoted by "*") responsible for assigning tasks, coordinating meetings, ensuring adherence to the evaluation process and documenting the results of the sub-team's evaluation. The Team Leads and Team Alternates (denoted by "**") will represent the sub-team in any meetings or presentations required in connection with the evaluation process.

These three teams are comprised of the following members:

Project Management Evaluation Team	
Team Member	**Organization**
Santosh Panda*	OPG
**Scott. Waters	OPG
Andy Ireland	OPG
Terry Karaim	OPG
Derek McAuley	OPG
Gary Paterson	OPG
Scott Guthrie	OPG

Consortium Evaluation Team	
Team Member	**Organization**
Kath Hammond*	OPG
Farida James**	OPG
Ian Binnie	Blakes
John Cho	OPG
Gary Rose	OPG

Financial Evaluation Team	
Team Member	**Organization**
Trevor Green*	F&G
Richard Wong**	OPG
Lonnie Schofield	OPG
Carl Jones	F&G
Leo Saagi	OPG

Each evaluation sub-team is responsible for reviewing the Proposals and assigning fair and unbiased scores to the evaluated submittals, using the criteria and methodology specified in the RFP Rules. The Team Leads and Team Alternates are responsible for compiling and assessing the scores from the three sub-teams and for making a recommendation to the Steering Committee as to the path forward.

There are separate Technical, Commercial and Financial Support Teams which provide as required technical, commercial, financial and other support to the evaluation teams. The members of the Support Teams are identified in the following tables.

Additional resources may be added as required to each Support Team. The Support Team members will not be responsible for the evaluation or scoring of Proposals.

Project Management Support Team	
Team Member	**Organization**
Gary Kotwa	OPG
Gary Smurthwaite	OPG
Al Stewart	OPG
John Stopar	OPG
Ian McCrory	OPG
Andrew Elnazir	OPG
Walter Arnsby	OPG

Consortium Support Team	
Team Member	**Organization**
Cam MacLeod	OPG
Steve Harris	OPG
Svetlana Helc	OPG
Tax	OPG
Treasury	OPG
Insurance	OPG
Credit Risk Management	OPG

Financial Support Team	
Team Member	**Organization**
Rob Priller	OPG
Steve Wiacek	OPG

All Evaluation Team members are expected to attend preparatory meetings and any clarification meetings with Proponents and may be included in some or all of the Steering Committee meetings. The Team Leads and Alternates are expected to attend all Steering Committee meetings. All Support Team members are expected to attend all preparatory meetings and may be included in some or all of the Proponent clarification meetings and the Steering Committee meetings. It is expected that the

evaluation process will be each Evaluation Team member's top priority throughout the evaluation period.

2.2 Steering Committee

The Steering Committee is responsible for oversight of the activities of the Evaluation Team. The Steering Committee ensures that the Evaluation Team follows the procedures set out in this document and the RFP Rules and that a fair and unbiased process is followed. The Steering Committee is comprised of the following representatives:

Evaluation Steering Committee	
Dietmar Reiner	Senior Vice President- Nuclear Refurbishment (Chair)
Don Power	Vice President- Corporate Investment and Asset Planning
Neil Mitchell	Vice President- Refurbishment Engineering
Robert Vitalis	Director- Refurbishment Supply Chain
Bob Goodman	Director- Refurbishment Management System Oversight
Brian Duncan	Deputy Site Vice President, Darlington
Meg Timberg	Assistant General Counsel
Mark Arnone	Vice President- Refurbishment Execution

The Steering Committee reviews the recommendation of the Evaluation Team, requests further information or clarifications if appropriate, and ultimately endorses the final recommendation of the Evaluation Team. The Steering Committee then seeks the approval of the Executive Vice President, Nuclear Refurbishment. It is anticipated that the Steering Committee will meet at least once every two weeks, or more frequently if required, during the Proposal evaluation period in order to properly fulfill its oversight responsibilities. The Director-Refurbishment Supply Chain will circulate an agenda prior to each meeting of the Steering Committee and ensure that minutes are prepared and approved for each meeting of the Steering Committee.

Steering Committee members will sign the Confidentiality Agreement (Appendix C) and the Conflict of Interest Statement (Appendix D).

The Steering Committee may call on external advisors as required for additional expertise. External advisors will be required to sign the Confidentiality Agreement (Appendix C) and the Conflict of Interest Statement (Appendix D).

2.3 Approval

The Executive Vice President, Nuclear Refurbishment is responsible for approving the recommendations made by the Steering Committee and for obtaining any other approvals that may be required in order to carry out the recommendation of the Evaluation Team, including any approvals required by OPG's Organizational Authority Register. The Executive Vice President may obtain any necessary advice, guidance

and support from the Executive Oversight Team in accordance with the Terms of Reference set out in N-PLAN-09701-10002-R001. The Executive Oversight Committee is comprised of the following representatives.

Executive Oversight Committee	
David Brennan	
Donn Hanbidge	
Patrick McNeil	
Wayne Robbins	
Bill Robinson	
Albert Sweetnam	
Bruce Boland	

2.4 Process Advice

OPG has identified Mark Johnson of Blakes as the Process Advisor with respect to this evaluation process. At any time during the evaluation process, The Process Advisor will be available to the Director Supply Chain, the Team Leads and the chair of the Steering Committee to respond to questions and provide advice with respect to compliance with these procedures and the RFP Rules. Any individual Team members or Steering Committee members having questions should raise them with their respective Team Lead or Chair.

3.0 PROPOSALS

Proponents were requested to submit Proposals in response to the Request for Proposals for Retube and Feeder Replacement Project (Darlington Nuclear Generating Station Refurbishment Program) issued by OPG on March 7, 2011. OPG will receive five copies of the completed Proponent Information Form and five copies of the the completed Pricing Submission Forms, in a separately sealed envelope, together with six electronic copies in pdf form preferably on a CD-ROM, DVD or other similar form of electronic media. The closing date for the Proposals is June 20, 2011. The Proposals will be sent to OPG, Attention Director Refurbishment Supply Chain, at OPG's Proposal Depository at 700 University Avenue, Toronto.

4.0 PREPARATION FOR EVALUATION

The Director, Supply Chain will perform an initial review of the Proposals to ensure that they are compliant with the RFP Rules If there are issues with respect to the compliance or substantial completeness of the Proposals which require a decision as to whether to proceed with their evaluation, the Director, Supply Chain will review these issues with the Process Advisor. If there are concerns about whether to proceed with the evaluation that cannot be resolved, the issue will be referred to the Steering Committee for a decision.

The Director, Supply Chain will then direct the Team Leads to co-ordinate the evaluation process and make copies of the Proposals available to the members of the Evaluation Teams at one or more secure designated locations. Each Sub Team's material will be stored in a separate room at the designated locations. Each Team Lead will ensure that access to these rooms is restricted to members of the relevant team who have signed either the Evaluation Team Member Acknowledgement (Evaluation Team) or the Confidentiality Agreement (Evaluation Support Team) as shown in Appendix C. The Evaluation Team member signs his or her name and the date and the time of entry in the "Check-in" column upon arriving and the date and time of exit in the "Check out" column. The documents must be stored in filing cabinets in a room designated for each Evaluation Team, under lock and key, at all times when not in use. The documents should not be removed from the designated Proposal document room except in very limited circumstances with the prior consent of the relevant Team Lead. In certain circumstances it may be necessary to permit some persons other than the Evaluation Team members access to the documents. In such cases the Team Lead shall first ensure that such persons have signed the necessary Confidentiality Agreement and Conflict of Interest Statement and understand the requirements of the Evaluation Process.

5.0 EVALUATION

The Director, Supply Chain distributes the Proposal Evaluation Criteria and Guidelines for the Evaluation Process (the "Proposal Evaluation Package") to the Evaluation Team members prior to receipt of Proposals. The evaluation items in the Package reflect the submission requirements of the Proposal.

Evaluation Team members will use the scoring as noted in the Proposal Evaluation Package to evaluate each Proposal. Evaluation Team members perform their initial evaluations independently and without consultations with other Evaluation Team members. The Team Leads ensure that the same Evaluation Team members evaluate the same Proposal submittals from each Proponent, although not every Team member will review every submittal submitted to that sub-team. The Team Leads and Team Alternates are accountable for reviewing and evaluating all elements for the Proposal submitted to their sub-team. The Team members will not share information with each other about their scoring until after the initial scoring is complete.

During review of the Proposals, members of the Evaluation Team may require additional information in order to clarify information provided in a Proposal. Members requiring clarifications provide a written request to the Team Lead to be provided to the Director Refurbishment Supply Chain for issuance to the Proponent. No member of the Evaluation Team may contact Proponent representatives during the evaluation process. The Director Refurbishment Supply Chain may request clarification from the Proponent in written format (e-mail, fax). The Director Refurbishment Supply Chain forwards the response to the relevant Team Lead for distribution to the Evaluation Team, in whatever format (e-mail, fax) provided by the Proponent, as part of that Proponent's Proposal.

Proponents may be offered the opportunity to deliver presentations regarding their Proposals, for information only, to one or more sub-teams. It is not anticipated that new information will be presented at these meetings. Any new information presented at these meetings may only be evaluated if it is submitted as a written clarification in response to a request from OPG.

When each Evaluation Team member has completed his or her independent evaluation, the relevant Team Lead convenes one or more separate meetings of the relevant Evaluation Team (Management, Commercial or Financial) to discuss scoring of the Proposals, using the appropriate methodology. Support Team members may be included in one or more such meetings as a resource at the discretion of the Team Leads, but they will not be responsible for the evaluation or scoring of the Proposals. The Team Lead reviews the scoring of the criteria. The Team Lead requires attendees to present and discuss their scoring and reach a consensus score across the members who reviewed a particular evaluation area. The Team Lead records the consensus score and any consensus supporting comments for each of the Evaluation Criteria on a consolidated Proposal Evaluation Form.

Upon completion of the Project Management, Commercial and Financial evaluations, the Team Leads and Team Alternates convene one or more meetings for the purpose of compiling and assessing the consensus scores and comments from the three sub-teams and for making a recommendation to the Steering Committee as to the path forward. This recommendation will be made in writing on a consensus basis.

A detailed record of evaluation activities (meetings, correspondence, etc.) will be maintained by the Director, Refurbishment Supply Chain.

In the event that access to evaluation materials is provided through SharePoint or a similar secure access software, Evaluation Team and Support Team members shall only access and view such evaluation materials in a secure location designated by the Director, Refurbishment Supply Chain and shall not in any manner print, copy, reproduce, distribute, republish or otherwise provide access to or deliver the evaluation materials in any medium, print or electronic, without the express written consent of the Director, Refurbishment Supply Chain.

6.0 REVIEW BY THE STEERING COMMITTEE

Once the Team Leads and Team Alternates have arrived at a recommendation, they will convene a meeting with the Steering Committee where the evaluations by the Project Management, Commercial and Financial Evaluation Teams are presented along with the recommended path forward.

The Steering Committee ensures conformance by the Evaluation Teams to the procedures set out in this document and the RFP Rules by reviewing the activities of the Evaluation Team and may request justification or documentation from members of

the Evaluation Team or that such members attend the Steering Committee meeting in person.

Once the Steering Committee is satisfied that the procedures set out in this document and the RFP Rules have been followed and that each Proposal has been evaluated fairly and without prejudice, the Steering Committee directs the Team Leads and Team Alternates, or their delegate, to complete preparation of the recommendation report. This report will include the evaluation of the Proposals and a recommendation to proceed with one of the courses of action described in section 21 of the RFP Process document. It will also include a recommendation for payment of the honorarium to the Proponents who have met all the conditions required for such payment as defined in the Section 23 of the RFP Rules.

The above description of the process to be followed by OPG is intended to ensure that a fair process is followed. It is possible that facts or events may occur that were not contemplated in this document that require that additional or different actions to be taken to ensure that a fair process is followed. If so, then the appropriate person or Team is authorized to take such additional or different actions, and to document the rationale.

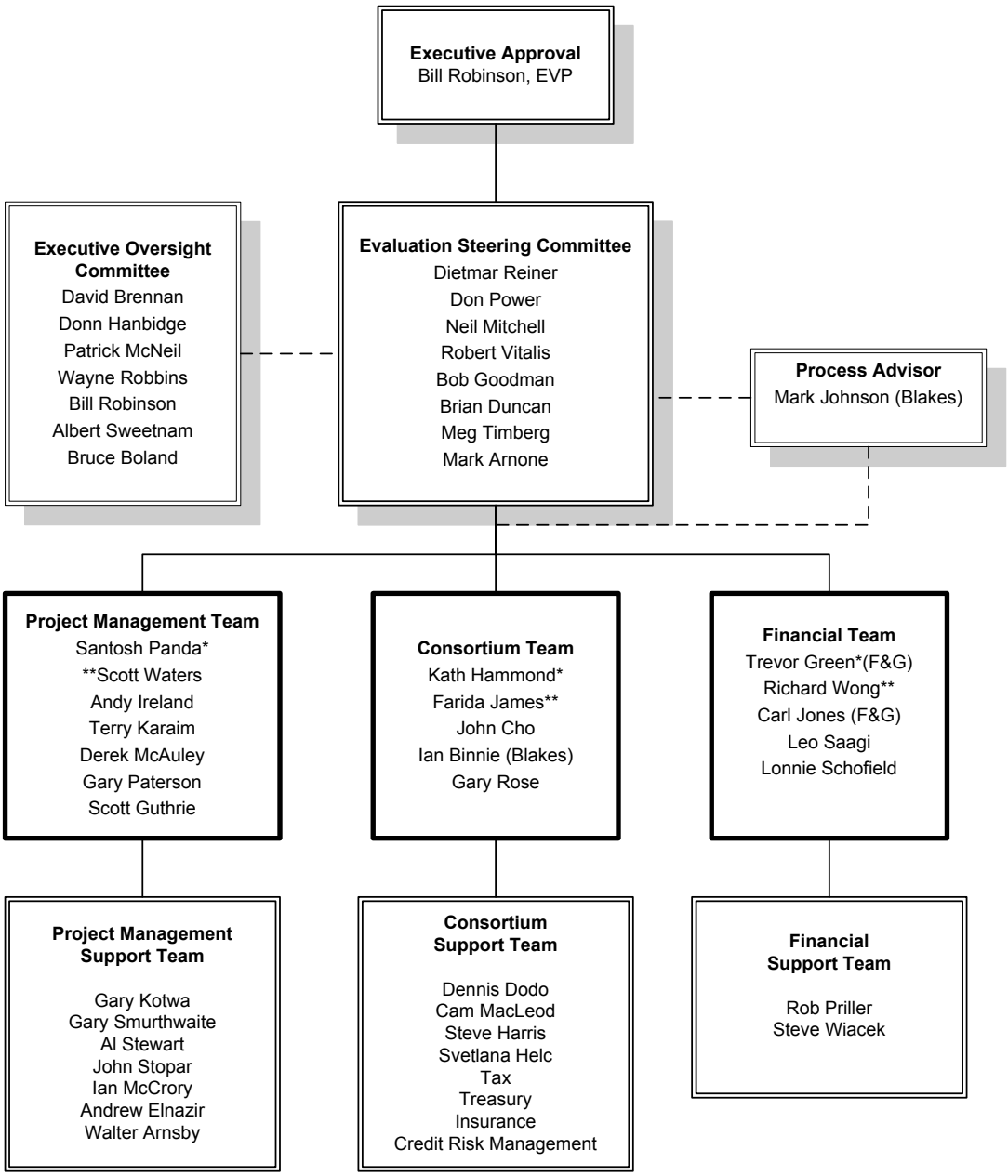
If the Evaluation Team recommends that OPG enter into negotiations with one or more Proponents as more particularly described in section 21 of the RFP Process document the RETUBE AND FEEDER REPLACMENT PROJECT RFP SUBMISSION NEGOTIATION PLAN, NK38-PLAN-09701-10011 will be followed.

7.0 CONFIDENTIALITY AGREEMENT & CONFLICT OF INTEREST STATEMENT

It is extremely important that the content of the Proposals, the results of the evaluations and the recommendation to the Steering Committee be treated as highly confidential both during the process and after it is complete. All members of the Evaluation Team, the Evaluation Support Teams and the Steering Committee are required to sign either the Evaluation Team Member Acknowledgement (Evaluation Team) or the Confidentiality Agreement (Evaluation Support Team) attached as Appendix C and the Conflict of Interest Statement attached as Appendix D. It must be stressed that there should be no communication with the Proponents, their subcontractors or any other related or interested parties other than through the Director Refurbishment Supply Chain.

Appendix A: Relationship Among Teams/Groups

R+FR RFP Evaluation Teams



Note: * Denotes Team Lead
** Denotes Team Alternates

Appendix B: Proposal Control Record

Proposal Control Record

Location:		**Evaluation Team:**	

		Team Member	All Required Forms Signed	Check-in Date and Time	Check –out Date and Time

Appendix C: Evaluation Team Member Acknowledgement & Confidentiality Agreement

To: Director, Refurbishment Supply Chain
From: _____
Print Name
Re: **Procurement Process - Retube and Feeder Replacement Project (the "RFR Project") at the Darlington Nuclear Generating Station**

OPG is currently evaluating proposals (the "**Proposals**") received in response to the request for proposals for the RFR Project (OPG RFP Number: 73100.001) (the "**RFP**"). As part of the evaluation process, a team of representatives from OPG (the "**Evaluation Team**") will be given access to: (i) the Proposals; (ii) technical, commercial and financial information about the RFR Project that is commercially sensitive and confidential; and (iii) information concerning the evaluation process itself (collectively "**Confidential Information**").
I, the undersigned, have agreed to participate as a member of the Evaluation Team and, in my capacity as an Evaluation Team Member, acknowledge and confirm as follows:

1. I have received a copy of and have examined in detail as appropriate the following:

    2. the RFP, including:

        3. Schedule "A" - Proponent Information Form;

        4. Schedule "B" – Pricing Submission Forms;

        5. Schedule "C" – Evaluation Criteria;

        6. Schedule "D" – Initial Conflict of Interest Declaration;

        7. Schedule "E" – Proponent Proposal Submission Form and Checklist;

        8. Schedule "F" – Data Room Protocol; and

        9. Schedule "G" – Form of RFR Project Agreement;

    10. all Clarifications and Amendments to the RFP (as defined in the RFP);

    11. the RFP Submission Evaluation Plan NK38-PLAN-09701-10009;

    12. the document entitled "Guidelines for Evaluation Process";

    13. the document entitled "Scoring Outline for Evaluation Process"; and

    14. the document entitled "Evaluation Scoring Form".

15. I have read, understood and will abide by the processes set out in RFP Submission Evaluation Plan NK38-PLAN-09701-10009;

16. I shall not access or use the Confidential Information except for the purpose of evaluating the Proposals in accordance with the RFP and RFP Submission Evaluation Plan NK38-PLAN-09701-10009;

17. I shall not in any manner print, copy, reproduce, distribute, republish or otherwise provide access to or deliver the Confidential Information in any medium, print or electronic, without the express written consent of the Director, Refurbishment Supply Chain;

18. I shall maintain all Confidential Information in strict confidence and shall only access and view the Confidential Information in a secure location designated by the Director, Refurbishment Supply Chain; and

19. I shall not, without the express written consent of the Director, Refurbishment Supply Chain, discuss with any person or disclose to any person the Confidential Information (or information that is reasonably derived there from) except to another Evaluation Team members in strict compliance with RFP Submission Evaluation Plan NK38-PLAN-09701-10009.

This Acknowledgement is signed _____ day of _____, 2011.

Signature *Print Full Name and Title*

CONFIDENTIALITY AGREEMENT

To: Director, Refurbishment Supply Chain
From: _____
Print Name
Re: **Procurement Process - Retube and Feeder Replacement Project (the "RFR Project") at the Darlington Nuclear Generating Station**

OPG is currently evaluating proposals (the "**Proposals**") received in response to the request for proposals for the RFR Project (OPG RFP Number: 73100.001) (the "**RFP**"). As part of the evaluation process, and in accordance with RFP Submission Evaluation Plan NK38-PLAN-09701-10009, certain representatives of OPG (each an "**OPG Representative**") may be given access to: (i) all or parts of the Proposals; (ii) technical, commercial and financial information about the RFR Project that is commercially sensitive and confidential; and (iii) information concerning the evaluation process itself (collectively "**Confidential Information**").
I, the undersigned, have agreed to participate in the evaluation process and, in my capacity as an OPG Representative, acknowledge and confirm as follows:

20. I shall not access or use the Confidential Information except for the purposes contemplated by and in accordance with the RFP and RFP Submission Evaluation Plan NK38-PLAN-09701-10009;

21. I shall not in any manner print, copy, reproduce, distribute, republish or otherwise provide access to or deliver the Confidential Information in any medium, print or electronic, without the express written consent of the Director, Refurbishment Supply Chain;

22. I shall maintain all Confidential Information in strict confidence and shall only access and view the Confidential Information in a secure location designated by the Director, Refurbishment Supply Chain; and

23. I shall not, without the express written consent of the Director, Refurbishment Supply Chain, discuss with any person or disclose to any person the Confidential Information (or information that is reasonably derived there from) except in strict compliance with RFP Submission Evaluation Plan NK38-PLAN-09701-10009.

This Confidentiality Agreement is signed _____ day of _____, 2011.

_____ _____
Signature *Print Full Name and Title*

Appendix D: Conflict of Interest

To: Chief Ethics Officer
Cc: Director, Refurbishment Supply Chain
From: _____
Print Name
Re: **Procurement Process - Retube and Feeder Replacement Project (the "RFR Project") at the Darlington Nuclear Generating Station**

I, the undersigned, understand that the entities listed in the attached Schedule A (the "**Disclosed Entities**", which term includes all directors, officers, employees and agents of such Disclosed Entities, whether or not such persons are listed in Schedule A) have been invited to participate in a procurement process for the RFR Project (the "**Procurement Process**") and acknowledge and confirm as follows:

1. Pursuant to section 1.0 of OPG's Code of Business Conduct, it is mandatory for employees to declare to their manager and the Chief Ethics Officer any actual, perceived, or potential conflict of interest. To highlight the importance of identifying potential conflicts of interest, all members of the Evaluation Teams and the Steering Committee (as defined in RFP Submission Evaluation Plan NK38-PLAN-09701-10009) for the RFR Project (each an "**OPG Representative**") are also being asked to disclose any situation where, in relation to the RFR Project, such OPG Representative's commitments, relationships or financial interests, if any, with one or more of the Disclosed Entities, could or could be perceived to exercise an improper influence over the objective, unbiased and impartial exercise of independent judgment by such OPG Representative (a "**Conflict of Interest**"), including any perceived, potential or actual Conflict of Interest.

2. Other than as may be disclosed on Schedule B, I do not have any direct or indirect ownership interests (of 5 percent or more), activities or relationships, financial or otherwise, with any of the Disclosed Entities, nor am I providing any services to the Disclosed Entities, that create an actual, potential or perceived Conflict of Interest with completing the tasks that I may be asked to perform as an OPG Representative during the course of the Procurement Process. For greater certainty, I understand and agree that a financial interest may include employment, stock ownership (of 5 percent or more), a creditor or debtor relationship or a prospective employee/employer relationship with any of the Disclosed Entities.

3. I have listed on Schedule B, if applicable, all of the relationships that either I have or my spouse, partner or children have with the Disclosed Entities, each of which may be a Conflict of Interest or appear as a potential Conflict of Interest with completing the tasks that I may be asked to perform as an OPG Representative during the course of the Procurement Process.

4. I understand that Schedule B will be reviewed by the Chief Ethics Officer, with a copy to the Director, Refurbishment Supply Chain, and that the Chief Ethics Officer may prescribe certain requirements to resolve any situations that the Chief Ethics Officer determines, in her sole and absolute discretion, create an actual or potential Conflict of Interest and/or exclude me from all or part of the Procurement Process.

5. I understand that the Disclosed Entities listed in Schedule A may be updated from time to time.

6. I agree to immediately disclose in writing to the Chief Ethics Officer, with a copy to the Director, Refurbishment Supply Chain, any actual, potential or perceived situation that may be reasonably construed as constituting an actual or potential Conflict of Interest in connection with the Procurement Process, including a situation arising from the updated Schedule A, and to comply with any requirements prescribed by the Chief Ethics Officer to resolve such Conflict of Interest. I understand that the Chief Ethics Officer may, in her sole and absolute discretion, exclude me from all or part of the Procurement Process.

This Statement is signed _____ day of _____, 2011.

Signature *Print Full Name and Title*

Schedule A

DISCLOSED ENTITIES

NAMES	COMPANY
	SNC-Lavalin Nuclear Inc.
	AECON Industrial, A Division of AECON Construction Group Inc.
	E.S. FOX LTD
	MacDonald, Deitweiler and Associates Inc.
	Promation Nuclear Ltd.
	Energy Solutions Canada Corporation
	AECL
	Babcock & Wilcox Canada Ltd.
	G.E. Hitachi Nuclear Energy Canada Inc.
	Black & McDonald Limited

Schedule B

I declare that the following is a list of all the interests, activities or relationships which I, and or any member of my immediate family has with the entities listed in Schedule A or any director, officer, employee or agent of such entity.

COMPANY NAME	RELATIONSHIP

ONTARIO POWER GENERATION

Plan

OPG Confidential Commercially Sensitive	
Document Number: NK38-PLAN-09701-10011	Usage Classification: N/A
Sheet Number: N/A	Revision: R000

Title:
RETUBE & FEEDER REPLACEMENT PROJECT RFP SUBMISSION NEGOTIATION PLAN

Retube & Feeder Replacement Project RFP Submission Negotiation Plan

NK38-PLAN-09701-10011-000
2011-05-16

Order Number: N/A
Other Reference Number:

OPG Confidential
Commercially Sensitive

Prepared by:
Kath Hammond — Date: July 18/11
Director - Commercial Strategy
Nuclear Refurbishment

Reviewed by:
Dietmar Reiner — Date: July 25, 2011
SVP-Nuclear Refurbishment
Nuclear Refurbishment

Concurred by:
Robert Vitalis — Date: 11.07.19
Director - Supply Chain
Nuclear Refurbishment

Approved by:
Bill Robinson — Date: July 25/2011
EVP-Nuclear Refurbishment Projects & Support
for Albert Sweetnam

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Plan

OPG Confidential Commercially Sensitive		
Document Number: NK38-PLAN-09701-10011		Usage Classification: N/A
Sheet Number: N/A	Revision Number: R000	Page: 3 of 9

Title:
RETUBE & FEEDER REPLACEMENT PROJECT RFP SUBMISSION NEGOTIATION PLAN

Revision Summary

Revision Number	Date	Comments
R000	2011-05-16	Initial issue.

1.0 PURPOSE

This document describes the procedure for negotiating with one or more Proponents who have submitted Proposals for the Retube and Feeder Replacement Project. Included in this procedure are the responsibilities of the Evaluation Team members and an outline of the evaluation process.

2.0 RESPONSIBILITIES

The relationships among the teams or groups described in this section are depicted in Appendix A.

If the Evaluation Team recommends that OPG enter into negotiations with one or more Proponents as more particularly described in section 21 of the RFP Rules, the following Negotiation Team will represent OPG in such negotiations:

Negotiation Team	
Team Member	**Organization**
Kath Hammond*	OPG
Mark Arnone	OPG
Ian McCrory	OPG
Ken Pearce	Blakes
Meg Timberg	OPG
Richard Wong	OPG

The Team Lead (indicated by "*") may determine that certain aspects of the negotiation can be advanced more effectively by creating a subset of the above Negotiation Team and/or establishing one or more parallel streams of discussion with a proponent.

The above Negotiation Team will be supported by the following Negotiation Support Team:

Negotiation Support Team	
Team Member	**Organization**
Farida James*	OPG
Ian Binnie	Blakes
Trevor Green	F&G
Mark Johnson	Blakes
Cam MacLeod	OPG
Santosh Panda	OPG
Steve Harris	OPG
Neill Allen	OPG

In addition to the above list, the Negotiation Team may request support from any member of the Evaluation Support Team as described in NK38NK38-09701-10009 Retube & Feeder Replacement Project RFP Submission Evaluation Plan R000.

All Negotiation Team members are expected to attend all meetings with Proponents as well as all preparatory meetings and Steering Committee meetings. All Negotiation Support Team Members are expected to attend all preparatory meetings and may be included in some or all of the Proponent meetings and the Steering Committee meetings. It is expected that the negotiations will be each Negotiation Team member's top priority throughout the negotiation period.

The Team Lead is responsible for coordinating preparatory meetings and meetings with Proponents, developing and documenting the negotiating agenda, and providing status reports to the Steering Committee. It is expected that the Steering Committee will meet frequently (at least once every two weeks) with the full Negotiation Team during the negotiation period to provide oversight and direction. Members of the Negotiation support Team my also be included at the request of the Team Lead or the Steering committee. The Negotiation Team is responsible for making a recommendation to the Steering Committee as to the path forward.

2.1 Steering Committee

The Steering Committee is responsible for oversight of the activities of the Negotiation Team. The Steering Committee membership during the negotiation period will be as follows:

Negotiation Steering Committee	
Dietmar Reiner*	Senior Vice President- Nuclear Refurbishment
Don Power	Vice President- Corporate Investment Planning
Neil Mitchell	Vice President- Refurbishment Engineering
Robert Vitalis	Director- Refurbishment Supply Chain
Bob Goodman	Director- Refurbishment Management System Oversight
Gary Rose	Director- Planning & Controls Nuclear Refurbishment
Brian Duncan	Deputy Site Vice President, Darlington
Dave Brennan	SVP, Law and General Counsel

2.2 Approval

The Executive Vice President, Nuclear Refurbishment is responsible for approving the recommendations made by the Steering Committee and for obtaining any other approvals that may be required in order to carry out the recommendation of the Negotiation Team. The Executive Vice President may obtain any necessary advice, guidance and support from the Executive Oversight Team in accordance with the Terms of Reference set out in N-PLAN-09701-10002-R001.

3.0 REVIEW BY THE STEERING COMMITTEE

The Steering Committee reviews the recommendations of the Negotiation Team, requests further information or changes if appropriate, and ultimately endorses the final recommendations of the Negotiation Team.

The Chair of the Steering Committee may elect to convene meetings of a subset of the above Committee in order to provide direction on a particular issue or aspect of the negotiation. This will not negate the role of the Steering Committee, which is expected to meet at least once every two weeks during the negotiation period. The Negotiation

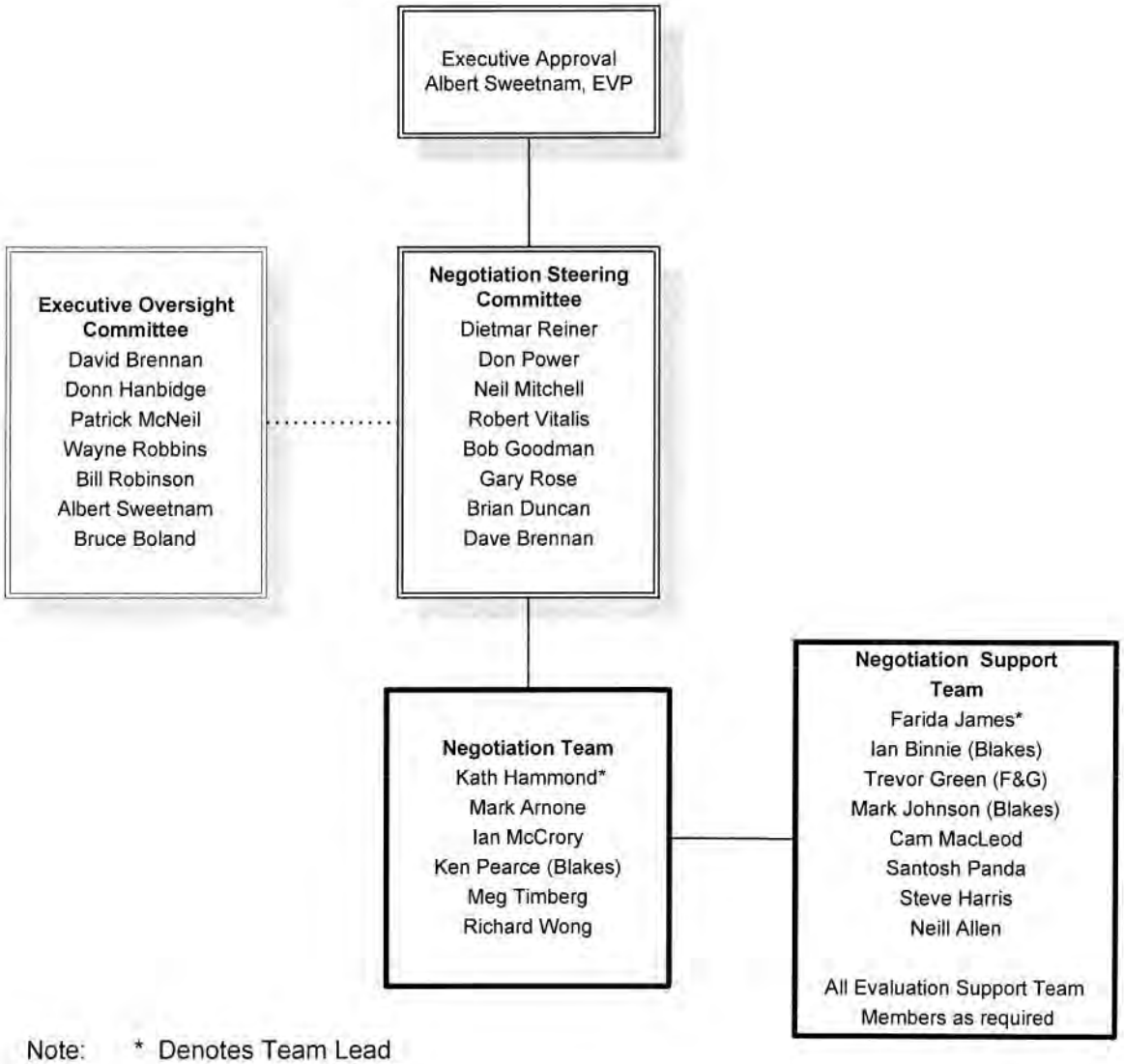
Team Lead will circulate an agenda prior to each meeting of the Steering Committee and ensure that minutes are prepared and approved for each meeting of the Steering Committee.

The Steering Committee then seeks the approval of the Executive Vice President, Nuclear Refurbishment.

4.0 CONFIDENTIALITY

It is extremely important that the results of the evaluations, the recommendation to the Steering Committee and any negotiations be treated as highly confidential both during the process and after it is complete. All members of the Negotiation Team, the Negotiation Support Team and the Steering Committee are required to sign the Confidentiality Protocol attached as Appendix B. It must be stressed that there should be no communication with the Proponents, their subcontractors or any other related or interested parties other than through the Director Refurbishment Supply Chain.

Appendix A: Relationship Among Teams/Groups



Note: * Denotes Team Lead

Appendix B: Confidentiality Protocol

To: Director, Refurbishment Supply Chain
From: _____
Print Name
Re: **Retube and Feeder Replacement Project at the Darlington Nuclear Generating Station**

Ontario Power Generation Inc, ("**OPG**") is currently evaluating Proposals for the Retube and Feeder Replacement Project (Darlington Nuclear Generating Station Refurbishment Program) (the "Project"). As part of the evaluation process, certain representatives from OPG ("OPG Representatives") will be given access to the Proposals, information concerning negotiations with Proponents, and information about the Project that is commercially sensitive and confidential ("Confidential Information"). Accordingly, this document establishes the process and procedures for ensuring the confidentiality of such information.

(a) OPG Representatives shall not use the Confidential Information except for the purpose of participating in, or supporting, OPG's negotiations with Proponents.

(b) All Confidential Information must remain in confidence and will be kept in a secure location. OPG Representatives shall not discuss nor disclose the Confidential Information (nor information that is reasonably derived there from) except to other OPG Representatives or to employees of OPG, who reasonably require information for the purpose of participating in, or supporting, OPG's negotiations with Proponents, and who are bound in writing by this confidentiality protocol.

(c) Copies of the Confidential Information can only be made with the consent of the Team Lead.

Confidentiality Agreement

I, _____ , have read and understand: (i) the Proposal Negotiation Procedure; and (ii) the procedures set out in the Confidentiality Protocol and agree to abide by them.

CONTRACTOR MANAGEMENT PROCESS MANUAL

FIN-MAN-CM-001-R004

Issue Date: December 2010

PURPOSE
This document identifies the process requirements for managing *contracted work*, including the identification of roles and accountabilities and the planning and administration of *contracted work* within Ontario Power Generation Inc. (OPG).
EXCEPTIONS
• Planning, procurement, administration or management of *augmented staff* supervised by OPG employees, e.g., temporary clerical, or engineering staff hired from agencies. (Refer to FIN-MAN-CM-002, Technical Contractor Management Process Manual). • Visitors and consultants, including technical and engineering staff, working in office settings or doing work where no additional safety or environmental controls are required beyond standard site visitor procedures (refer to FIN-MAN-CM-002). • Contracts issued for the purchase of manufactured goods delivered to site, or for work being done for OPG in a contractor's workplace. • Other contracts where the company is only on site for delivery, e.g., items handled through warehousing, courier, and bottled water delivery. The process DOES apply to contracts where the company requires craning and rigging to load and unload the delivery or when the delivery involves physical connections to OPG systems on OPG property; e.g., fuel oil, bulk chemicals, pressurized gases. • Contracts excluded with the approval of the Stratum IV Manager.
AUTHORIZATION
SINGLE POINT OF CONTACT: D. Da Silva Manager, Supply Services, Corporate Supply Chain **GOVERNING DOCUMENT OWNER:** D. Semple Director, Corporate Supply Chain

DOCUMENT RELATIONSHIP	
Receives authority from:	FIN-PROG-CM-001, Contractor Management Program
Review Date:	December 2013

REVISION SUMMARY

Revision Number	Date	Comments

R04	2010-12-30	• Rev bars are not shown. • General – Document reformatted throughout. • General – Spelling and grammatical errors corrected throughout. • General – Document references and titles updated throughout as appropriate. • General – Department and job titles updated throughout. • General – References to “Safety Environment and Quality Database” changed to “Safety, Environmental Quality Contractor Application” throughout the document • General – References to use of N-FORM-11312 removed throughout the document. • Exceptions have been moved to cover page and modified to reflect issuance of FIN-MAN-CM-002, Technical Contractor Management Process Manual. • Aligned Introduction - Purpose of Contract Management Process to FIN-PROG-CM-001, Contractor Management Program. • New note Introduction – Scope of Contractor Management Process about Augmented Staff, who perform physical labour. • Added clarification to Introduction - Roles & Accountabilities -Contract Owner. • Deletion of note Introduction – Small contracts. • Introduction: Small Contracts – Revised to clarify applicability of process. • Table 2 – Revised to identify roles and responsibilities. • Step 1.1 – Reference to PB Manual deleted from sub-tasks. • Step 1.1 – Added new reference OPG-PROC-0060, Requisitioning Items and Services. • Step 1.2: Identify Safety Hazards – New bullet added under Notes for Owner-Only contracts • Step 1.2: Identify How Work Protection Shall Be Administered – New bullet added under Notes for Owner-Only contracts. • Step 1.2 – New sub-task “Identify construction island boundaries” and associated bullets added. • Step 1.2 – Note after sub-tasks referencing use of MOU removed. • Step 1.2 – Deliverables rewritten to align with changes in section. • Step 1.2 – Added clarification about action required on the last “Note” • Step 1.3 – Under sub-task “Establish OPG’s role and duties under OHSA”, 3rd bullet, added reference to Law determining feasibility of Owner-Only contracts. • Step 1.3 – Added new ‘Note’ under “Assign Resources”. • Step 1.3 – Revised heading from Determine Qualification Criteria to Develop Proponents List to reflect the content of the section.

R04 (cont)		• Step 1.4 – Added reference to Appendix E under sub-tasks. • Stage I: Records Generated – Added note to FIN-FORM-CM-008 identifying it's an exception for Owner-Only contracts. • Step 2.2 – Section revised to align with requirements of OPG-PROC-0058. • Step 2.3 – Reference to PB Manual removed from sub-tasks. • Step 3.1 – Note under sub-task section revised to reference use of MOU. • Step 3.1 – Sub-task "Review Arrangement to do Work" rewritten in its entirety. • Step 3.1 – Sub-task "Review Safety and Environmental Requirements", added new bullet under Owner-Only referencing use of Worksheet B. • Step 3.1 – Sub-task "Review WPC Requirements", Owners-Only bullet rewritten. • Step 3.1 – Sub-task "Review Hazardous Materials and Designated Substances" reworded for clarity and to add reference to Appendix G. • Step 3.1 – Added clarifications for Owner-Only contracts under "Conduct Job Site and Orientation Meeting". • Step 3.1 – Deliverables revised to align with changes to this section. • Step 3.3 – References updated to delete reference to N-FORM-10448 • Step 3.3 – Sub-task "Conduct Orientation", new bullet for Owner-Only contracts added. • Step 4.1 (Section 4A and 4B) – Revised content for sub-task 'Manage Contract Changes' and added reference to procurement governance (OPG-PROC-0058 and N-PROC-MM-0016) • Step 4.1A and 4.1B – Added new action regarding rate verification. • Section 4B – Minor revisions to "General Methodology" section to clarify and improve flow. • Section 4B, Step 4.1 – Sub-task "Ensure Physical Isolation of Staff" revised to add reference to Appendix B and new FIN-FORM-CM-022. • Section 4B, Step 4.2 – Added bullet to sub-task "Maintain Ongoing Assessment of Hazards and *Environmental Impacts*" requiring *constructor* provide list of hazardous materials that may have *environmental impact*. • Section 4B, Step 4.2 – Deliverables revised to reference OPG-FORM-CM-022 • Section 6 – Section on Small Contracts has been completely rewritten

R04 (Cont)		• Appendix B – Work Protection Code Requirements has been clarified throughout section. • Appendix C – Content on 'training for staff' removed from document. • Appendix F – Rewritten in its entirety to align with OPG-PROC-0058. • Appendix G: Environmental Management for Owner-Only Contracts – Content under "Spill Reporting, CofA Infractions and Variances to Environmental Assessment Commitments" revised in their entirety. • Appendix H – Added reference to NEW forms OPG-FORM-CM-022 and OPG-FORM-CM-023. • Appendix I - Added new definitions for Condition Guarantee, *Supporting Guarantee*, *Workplace Harassment* and Workplace Violence. • Appendix I – Acronyms updated as appropriate.

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INTRODUCTION

Purpose of the Contractor Management Process

This document identifies the minimum process requirements for managing *contracted work* at OPG, including the identification of roles and accountabilities and the planning and administration of *contracted work*. The manual receives its authority from OPG-PROG-0009, Items and Services Management, FIN-PROG-CM-001 Contractor Management Program and is a corporate level practice owned by Corporate Supply Chain. Each Business Unit (BU) shall have a Single Point of Contact (SPOC) to assist with the process. For each step described in FIN-MAN-CM-001, an accountable party, responsible for ensuring the tasks listed are completed, is identified.

Within the Contractor Management Process, five management stages have been identified for each OPG *project* and *service contract*. *(See Figure1)* Activities to be carried out at each stage of the Contract Management Process are listed below.

- Stage I – Contract Planning – Reviews and assessments prior to undertaking a contract. This includes the development of the statement of work, identification and evaluation of safety hazards, environmental *risks* and quality program and Quality Assurance (QA) requirements, development of evaluation criteria, and the preparation of contract requirement documents.
- Stage II – Procurement - Obtain contracted services. This includes preparation of purchasing strategy, Request for Quotations (*RFQ*)/*Request for Proposals (RFP)*, evaluation and award of a contract.
- Stage III – Post Award - Activities carried out immediately following the award of a contract. This includes job site meeting, contractor orientation and the mark-up meeting.
- Stage IV – Contract Execution - Management of the contractor's activities during the work up to contract completion.
- Stage V – Contract Closeout – Resolution of all deficiencies, final evaluation of the contractor's performance, and administrative matters.

Scope of the Contractor Management Process

This corporate level process applies to:

- All contracted activities carried out in OPG workplaces.
- All staff (regular, temporary, or contracted) responsible for any part of contractor management.

Note

For management of *augmented staff* performing physical work at OPG facilities e.g., workers of a trade contractor (crane rental with operator or specialised services (annual fire alarm checks) see Section 6 Small Contracts.

Note

The term "*proponent*" is used throughout this document to denote an organization asked to respond to a *RFQ*/RFP . There is no implication that a *proponent* is always expected to submit a proposal.

Roles and Accountabilities

The following section describes the roles and responsibilities of key participants in the contract management process. An individual may fill one or more of these roles, depending on the complexity of the contract. The organizational level of the individuals accountable may change depending on the *risk* and complexity of the contract. Although some roles may be merged, there shall always be a Contract *Owner*. Primary responsibilities during the various stages of a contract are different for all three roles but the individuals responsible for the roles shall work as a team to be effective. General accountabilities are outlined in *Table 2*.

Contract *Owner*

The Contract *Owner* has overall accountability for successful completion of the contract and is accountable for ensuring that the processes outlined in this manual are followed.

The Contract *Owner* may be a Manager, *Project* Manager, Contract Manager, Section Manager or a *Project* Leader. The responsibilities for this role may be divided among different individuals but the accountable manager shall be considered the Contract *Owner*.

As part of the overall responsibility for Contractor Management, the Contract *Owner* shall set up the contract and provide the resources for the contract management team. This team may consist of a Contract Administrator (CA), a Contract Monitor(s), a Supply Chain representative, technical support personnel and any other resources deemed necessary. The Contract *Owner* is accountable for the overall success of this team, this includes ensuring all financial elements are met.

Contract Administrator

The CA is the OPG employee at site who ensures that all contractual conditions regarding safety, environment, quality, scope, legal requirements, cost and schedule are met in a timely manner. The CA is also responsible to control changes and ensure all deficiencies are corrected or directed to the appropriate authority.

Where OPG assumes the position of *Constructor*/Extended *Employer*, the CA's role may be undertaken by a Team Leader, Technical Engineer/Officer, General Foreman, First Line Manager (FLM) or First Line Manager's Assistant (FLMA), Contract Coordinator. Where OPG assumes the position of *Owner*-Only, then the Contract *Owner* shall appoint a senior CA to fulfill the responsibilities of the *Owner*.

During the execution of the contract, the CA is the SPOC for the contractor on all issues related to the *contracted work*. The CA shall ensure that the Contractor meets all contractual and regulatory requirements on a daily basis. This shall be a proactive process. The CA shall be delegated the authority to stop all work for unsafe acts and environmental concerns.

Contract Monitor

The Contract Monitor is the OPG employee at site who, on a daily basis, verifies and monitors the Contractor's workplace activities to ensure that they are carried out in a productive and safe manner and that quality and environmental standards are maintained. The Contract Monitor has the authority (delegated from the CA) to stop non-compliant work practices at the site.

The Contract Monitor role shall be assigned to staff with the qualifications to perform the role depending on the scope of work being performed, their level of competence and the support that is available to them. Where OPG is in the position of *Owner*-Only, a Contract Monitor is not appointed. *(See Appendix C)*

Constructor's Supervisor

This is an individual who is appointed by the *Constructor* as per S.14 of the c*onstruction* regulations of the Occupational Health and Safety Act (Ontario) OHSA. This applies when OPG is a *Constructor* on a *project* when there are five or more workers working at the *construction project* at the same time. This person "supervises the work at all times either personally or by having an assistant, who is a competent person, do so personally". The *Constructor's Supervisor* **supervises the work**, not the workers on the *project*. Under the OHSA, the contractors hired by OPG are the *employers* of their workers, and as such provide direct supervision to those workers.

See also roles and duties of *Constructor's Supervisor* in Appendix C.

Note

The Contract Monitor is primarily involved in the Contract Execution Stage (Stage IV) but may be asked to participate by the Contract *Owner* or the CA in other stages (Planning, Procurement, Post Award or Closeout).

Application of the Contractor Management Process

Project Work

As a guideline, for contracts required for major maintenance work or *construction project*s, i.e., a *project* involving costs greater than $200,000 and more than five contractor employees, the contractor management process is initiated by the *Project* Manager or *Project* Leader who may also be the Contract *Owner*. This generally takes place at the team assembly (initiation) stage of the *Project* Management Process. The scope of work (and some strategy) may be developed by the *Project* Manager/*Project* Leader or as part of the *Project* Execution Plan. The Contract *Owner* shall be assigned before the Contractor Management Process is initiated.

All steps of the Contractor Management Process Stages I through V shall be followed.

Small Contracts

For contracts involving service, small maintenance or *construction projects* budgeted at less than $200,000 and employing less than five contractor employees, the Contractor Management Process is initiated by the manager accountable for the work. The manager accountable shall define the scope of the *project* based on the requirements of the work to be done. A Contract *Owner* shall be assigned before the Contractor Management Process is initiated.

Note

This is a guideline for when small contract management process is to be used. If the dollar value and number of workers involved may be greater than $200,000 and 5 workers, and the small contract management process provides adequate guidance and documentation, then it may be used. Refer to Section 6 for details.

The small contract management process shall be used to manage *augmented staff* performing physical work at OPG facilities. The contract *owner* shall ensure the line organization has accepted responsibility to supervise the execution of work.

Follow Section 6 for Small Contracts in the Contractor Management Manual.

How to Use This Manual

This manual allocates a section for each of the stages in the Contract Management Process and lists the steps and sub-tasks that are to be carried out for each stage. Every step and sub-task is mandatory unless stated otherwise.

Therefore the manual may not be scaled by eliminating steps or sub-tasks but may be scaled by adjusting the time and effort spent on each step or sub-task.

Individual sites may introduce flexibility by developing site-specific job aids.

 Highlights important notes.

 Indicates a form, worksheet or a job aid (provided in the Appendix in the printed booklet format).

- All forms are mandatory and shall be completed and filed unless otherwise noted.
- All worksheets associated with the forms are mandatory unless substituted with equivalent worksheets approved by the *Business Level Authority* or delegate such as the BU SPOC for Contract Management.
- All job aids are provided for guidance and may be used as required or substituted with equivalent job aids approved by the *Business Level Authority*. Although job aids are guidance documents, there are some cases where this manual requires the information to be documented.

 **Note**

For guidance on the completion of forms, worksheets and job aids associated with Blanket Purchase Orders/*Drawdown contracts*/*Master Service Agreements*, see Appendix F.

 Indicates records that shall be filed as part of the contract documents.

Contract Management documentation shall be retained for a period of 6 years plus current in accordance with Record Retention Authorization (RRA) # 2007033. Refer to Appendix H for a list of documentation. Record-keeping shall also comply with BU and local requirements.

Table 1 - List of Forms, Worksheets and Job Aids

Stage	Form	Worksheet	Job Aid
I Contract Planning	FIN-FORM-CM-001-Form 1: Contract Planning Confirmation	FIN-FORM-CM-007-Worksheet A: Generic Requirements for Contract Requirements Document	
		FIN-FORM-CM-008-Worksheet B: Contract Safety Hazard Evaluation	FIN-FORM-CM-013-Job Aid I: Contract Management Plan
		FIN-FORM-CM-009-Worksheet C: Contract *Environmental Aspect* Evaluation	FIN-FORM-CM-014-Job Aid II: Contract Administrator and Monitor Qualifications FIN-FORM-CM-019-Job Aid VII: Roles and Responsibilities Matrix for Contractor Management
II Procurement	FIN-F0RM-CM-002-Form 2: Bid Selection Summary	FIN-FORM-CM-010-Worksheet D: Bid Evaluation Worksheet	
III Post Award	FIN-FORM-CM-003-Form 3: Contract Work Release FIN-FORM-CM-0022-Form 7: Control of Hazardous Energies Planning Phase *Owner*-Only	FIN-FORM-CM-011-Worksheet E: Contract Work Release Worksheet	FIN-FORM-CM-015-Job Aid III: Safety Certification/Control for Rented or Contractor's Equipment
			FIN-FORM-CM-016-Job Aid IV: Contract Change Authorization
IV Contract Execution	FIN-FORM-CM-004-Form 4: Contract Final Inspection	FIN-FORM-CM-012-Worksheet F: Contract Inspection Checklist	FIN-FORM-CM-017-Job Aid V: Contract Monthly Safety Incidents FIN-FORM-CM-020-Job Aid VIII: Daily Log FIN-FORM-CM-023-Job Aid IX: Control of Hazardous Energies Walkdown *Owner*-Only
V Contract Closeout	FIN-FORM-CM-005-Form 5: Contract Closeout and Evaluation		FIN-FORM-CM-018-Job Aid VI: Notice of *Construction Contract* Completion
VI Small Contract Management	FIN-FORM-CM-006-Form 6: Small Contract Management Folder		

Figure 1

Contractor Management Process Flowchart

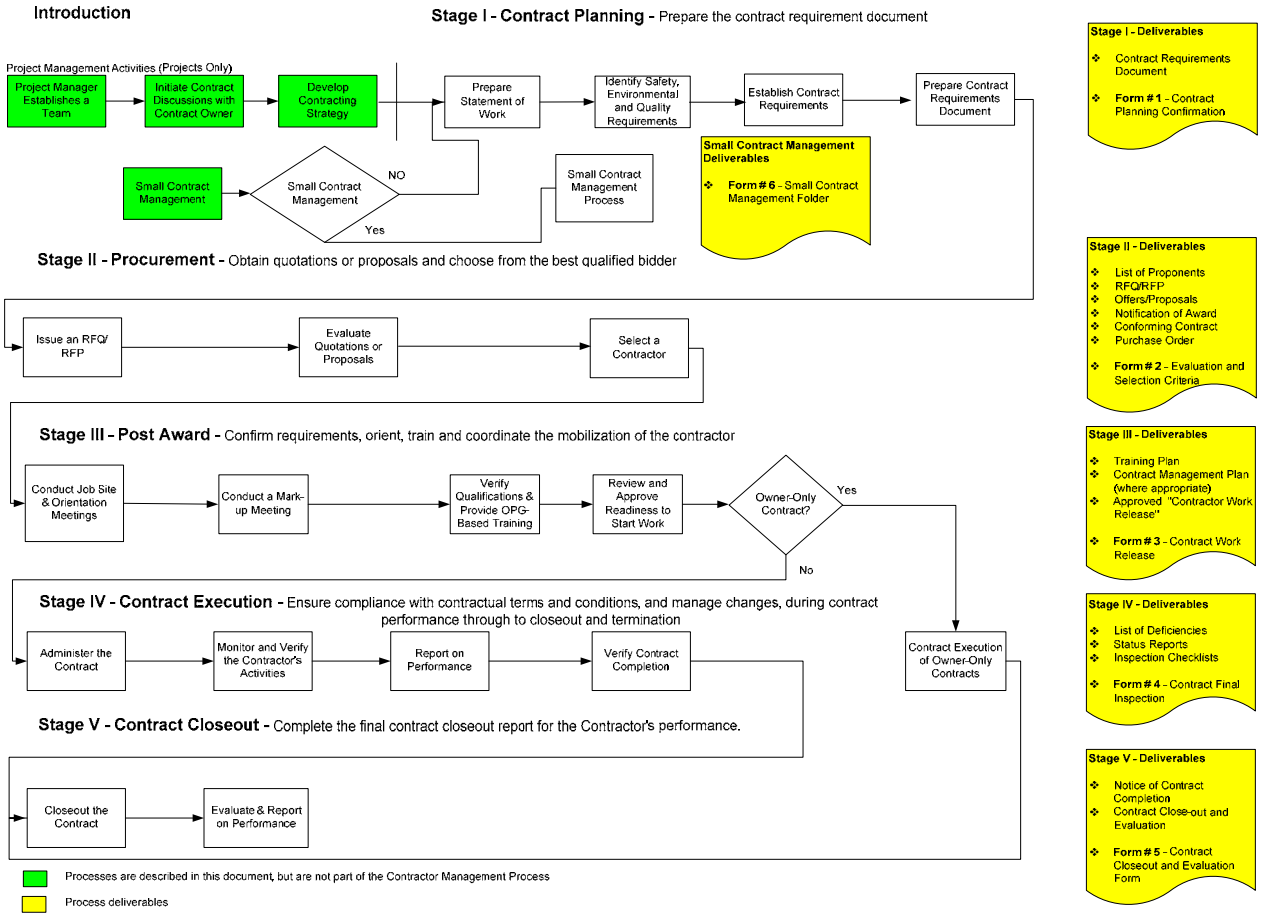

Table 2: Accountability Matrix

Contract Management Process

Stage	*Process Step*	*Requirements*	*Contract Owner*	*Contract Administrator*	*Contract Monitor*	*Supply Chain*	*Other*
Contractor Prequalification	Provide contractor with Prequalification Package	Forward copy of contractor questionnaire, along with cover letter and "Information for Contractors", to contractor	A			R	
	Evaluate contractor's prequalification submission	Potential contractor's health and safety program and Workplace Safety and Insurance Board (WSIB) experience rating shall be evaluated before the contractor is eligible to submit a quotation or proposal on a contract					A Supplier Safety Compliance Dept.
Stage I – Contract Planning	Prepare Statement of Work	Clearly define the extent of the work and identify required resources.	A			I	
	Identify Safety, Environmental and Quality Requirements	Conduct a review of the work to be done to identify all foreseeable significant safety, environmental and quality requirements.	A				C Safety, Environmental, Technical resources and others as required
	Establish Contract Requirements	Determine roles under OHSA and finalize contract requirements.	A	C		C	C Legal and other stakeholders as required
	Prepare Contract Requirements Document	Prepare the contract requirements document for review and approval and develop a purchasing strategy.	A			A	R Technical Resources and others as required
Stage II Procurement	Issue an Invitation to Contract	Prepare and issue a *RFQ* or *RFP* to a list of qualified and approved *proponents*.	CR	C		A	C Legal and other stakeholders as required

Stage	*Process Step*	*Requirements*	*Contract Owner*	*Contract Administrator*	*Contract Monitor*	*Supply Chain*	*Other*
	Evaluate Proposals/Quotations	Evaluate Submissions and recommend the best value submission(s).	A	C		A	C Legal, Technical resources, and other stakeholders (as required e.g. Cross Functional Sourcing Team)
	Select a Contractor	Award the contract and issue a Purchase Order	CR	C		A	C Legal
Stage III Post Award	Conduct Job Site & Orientation Meeting(s)	Job site meeting(s) provide an opportunity to meet personnel and review the terms and conditions	I	A	I	I	
	Conduct a Mark-Up Meeting	Schedule a mark-up meeting to discuss work distribution among the trades if the work is to be conducted under the auspices of the *Construction* Collective Agreement.		A			C Human Resources
	Verify Qualifications & Provide OPG-Based Training	Determine whether competency requirements and qualifications have been met and define the plans for any required OPG-based training.	C	A			
	Review and Approve Readiness to Start Work	Review and approve all permits, training, etc. required to begin work.	S	A		I	
Stage IV A Contract Execution	Administer the Contract	Ensure compliance with contractual terms and conditions, and manage changes, during contract performance through to closeout and termination.	S	A	I	C	
	Monitor and Verify the Contractor's Activity	Monitor work activities to contract compliance.	I	C	A	C	
	Report on Performance	Document administrative actions and all data required to support the *project's* business activities and performance assessment.	V	A	V	V	

Stage	*Process Step*	*Requirements*	*Contract Owner*	*Contract Administrator*	*Contract Monitor*	*Supply Chain*	*Other*
	Verify Contract Completion	Verify that the technical and commercial contract conditions have been fulfilled.	S	A	C	C	
Stage IV B Contract Execution - *Owner*-Only	Administer the Contract (*Owner*-Only)	Administer and record job progress. Monitor the work for correction of deficiencies by the contractor.	S	A		C	
	Monitor & Verify Contractor's Activities (*Owner*-Only)	Monitor work activities to verify contract compliance.		A			
	Report on Performance (*Owner*-Only)	Document administrative actions and all data required to support the *project's* business activities and performance assessments.	C	A	C	C	
	Verify Completion of Contract (*Owner*-Only)	Verify that the technical and commercial contract conditions have been fulfilled.	S	A	C	C	
Stage V Contract Closeout	Evaluate and Report on Performance	Complete the final contract closeout report for the Contractor's performance.	S	A	C	C	
	Closeout the Contract	Ensure that all work has been completed successfully and that all deficiencies and administrative matters have been resolved.	S	A	C	C	

Legend	**A** = Accountable	**CR =** Shall concur	**S** = Shall Approve	**R** = Responsible	**C** = Consult, As Required	**V** = Shall Review	**I** = Shall be Informed

Small Contract

Process Step	***Requirements***	***Contract Owner***	***Contract Administrator***	***Contract Monitor***	***Supply Chain***	***Other***
Provide contractor with Prequalification Package Evaluate contractor's prequalification submission	Forward copy of contractor questionnaire, along with cover letter and "Information for Contractors", to contractor Potential contractor's health and safety program and WSIB experience rating shall be evaluated before the contractor is eligible to submit a quotation or proposal on a contract	A				A Supplier Safety Compliance Dept.
Planning/Hazard Assessment	Define the scope of work and the contract requirements.	A	R			
Procurement	Select a qualified Contractor and issue a purchase order.	S	V		A	
Post Award	Ensure that all issues are discussed and a consensus is reached on the expectations for the work.	V	A OPG Supervisor for *augmented staff*		C	
Administer the Contract	Manage the Contractor's execution of the work		A* OPG Supervisor for *augmented staff*	C		
Closeout the Contract	Ensure that all work has been completed successfully and that all deficiencies and administrative matters have been resolved.	S	A	C	C	

Legend	**A** = Accountable	**CR =** Shall concur	**S** = Shall Approve	**R** = Responsible	**C** = Consult, As Required	**V** = Shall Review	**I** = Shall be Informed

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1. STAGE I - CONTRACT PLANNING

STEP 1.1 - PREPARE A STATEMENT OF WORK

Task

Clearly define the extent of the work and identify required resources.

Accountabilities

Accountable – Contract *Owner*

Shall be Informed – Supply Chain

References

Document No.	Title
OPG-PROC-0060	Requisitioning Items and Services
FIN-FORM-CM-001	Form 1 - Contract Planning Confirmation
FIN-FORM-CM-007	Worksheet A – Generic Requirements for Contract Requirements Document

Sub-Tasks

Determine the Extent of the Work

To Do	*Notes*
Prepare Technical Specification and a Statement of Work ***Document the Technical Specification and Statement of Work.***	Some factors to consider when preparing a Technical Specification or a Statement of Work document are listed below: • Pay attention to format, accuracy, clarity and completeness. • Fully describe the expected deliverables. • Include any standard specifications, drawings data, reports, etc. in an appendix. • Do not include any commercial conditions or requirements. • Make sure all the information has been reviewed and approved by the requisitioner's line management.

To Do	*Notes*
Identify Required Resources	• Obtain commitment in principle for internal and external resources. (Note that assignments of responsibility often do not take place until roles under OHSA have been determined).

Deliverables

1) Technical Specification and Statement of Work

STEP 1.2 – IDENTIFY SAFETY, ENVIRONMENT AND QUALITY REQUIREMENTS

Task

Conduct a review of the work to be done to identify all foreseeable significant safety, environmental and quality requirements.

Accountabilities

Accountable – Contract *Owner*

Consult, As Required – Safety, Environmental, Technical Resources (others as required)

References

Document No.	Title
FIN-FORM-CM-001	Form 1 – Contract Planning Confirmation
FIN-FORM-CM-008	Worksheet B – Contract Safety Hazards Evaluation
FIN-FORM-CM-009	Worksheet C – Contract Environmental Aspect Evaluation
Appendix B	Work Protection Code Requirements

Sub-Tasks

Identify Safety Hazards & Control Measures

To Do	***Notes***
Identify Safety Hazards ***Record on Worksheet B***	• List all foreseeable high *risk* health and safety hazards associated with OPG's operations and facilities related to the *contracted work*. • Identify all designated substances present at the work site and report on the type, percentage and location of all friable asbestos-containing materials likely to be encountered by the contractor. • Identify *risk* interfaces to other OPG personnel or contractors due to work activities or processes (shared workspaces, shared services, etc). • If considering an ***Owner*-Only Contract,** review Worksheet B as an aid in determining OPG's roles under OHSA. Worksheet B to be completed by the *Constructor* post award.
Identify Requirements to Eliminate or Control Hazards ***Record on Worksheet B***	• Identify all regulatory requirements, and OPG requirements necessary to eliminate or control the hazard. This should include any site-specific control measures, training and emergency response plans. • If possible explore less hazardous alternatives in order to choose work methods with less harmful energy sources or greater hazard controls (Note: It may not be possible to perform this step until the contractor provides information on how the job shall be performed).
Identify Accountability to Eliminate or Control Hazards ***Record on Worksheet B***	• Identify whether it is OPG or the Contractor who shall implement the controls. • If OPG shall implement controls, inform the manager accountable. • Identify any services that OPG shall provide prior to work commencement, e.g. identify buried services, work protection and training.

Identify Environmental Aspects & Control Measures

To Do	***Notes***
Identify *Environmental Aspects* ***Record on Worksheet C***	• List all foreseeable *environmental aspects*, associated with OPG's operations and facilities related to the *contracted work*.
Identify Environmental Controls ***Record on Worksheet C***	• Identify all applicable Federal, Provincial and Municipal environmental statutes, regulations and bylaws and site-specific rules and procedures including existing operational control plans for significant *environmental aspects* identified in the site *Environmental Management System* (*EMS*).
Identify Environmental Control Accountability ***Record on Worksheet C***	• Identify whether it is OPG or the Contractor who shall implement the controls. • If OPG shall implement the controls, obtain the agreement of the manager accountable.

Identify Quality Requirements, Controls & Accountability

To Do	***Notes***
Identify Quality Controls ***Record Quality Controls***	• Consult with technical resources to determine all applicable technical and quality codes and standards and record them. Obtain approvals as required. • Determine qualification codes for key contractor staff and trades, as applicable to the scope of work. • Consult with client on performance requirements and record them. • Determine control measures necessary to meet the requirements, e.g. quality plans, inspection and test plans, non-conformance reporting, etc., and record them. • Address records retention of QA records.
Identify Quality Control Accountability ***Record Quality Controls Accountabilities***	• Identify accountability for quality requirements compliance (codes, standards, etc.) e.g., Pressure Boundary Program. • Identify accountability for quality requirements for measuring and test equipment (M&TE).

Identify Work Protection Requirements

To Do	***Notes***
Identify Work Protection Code (WPC) Requirements based on the hazardous energy sources identified for the work performed. ***Reference Appendix B Step 1***	• Determine if Work Protection is required to isolate a hazardous energy source. • Contact Technical Resources, i.e. Work Protection Code Coordinator (WPCC), if required.
Determine how Work Protection shall be administered. ***Reference Appendix B Record on Worksheet B***	• Determine and document requirements and responsibilities for administering Work Protection between OPG and the Contractor, to control the hazardous energies. • Determine if the Holder of Record (HoR) responsibilities shall be held by the Contractor or by OPG. • For Nuclear sites determine if the Maintenance Authority (MA) responsibilities shall be held by the Contractor or OPG. • If considering an ***Owner*-Only Contract,** leave completion of Worksheet B to the *Constructor* post award.
Identify Contractor's WPC Training Requirements ***Reference Appendix B Record on Worksheet B***	• Determine number of contractor employees to be WPC qualified. • Determine training needs of the Contract Workers, Contractor's *Supervisor* and HoR or MA.

Identify Construction Island Boundaries	
Identify *Construction Island* Boundaries For *Owner*-Only Contracts ***See Appendix B***	• The designation of a *Construction Island* (CI) serves to show the delineation between industrial and *construction* work at the worksite or the delineation between *projects* and/or other work. • This delineation assists with determining OPG's role and duties under OHSA.

Identify Security Requirements	
Identify Security Requirements	• All personnel shall be security cleared to work at OPG facilities. Contractors shall be made aware of this requirement, and of the process and required timing for obtaining clearance. • Contact appropriate Security department (Nuclear, Corporate) to ensure proper processes are followed.

Deliverables

1. Worksheet B (Including identification of Work Protection requirements and responsibilities). If considering an ***Owner*-Only Contract,** leave completion of Worksheet B to the *Constructor* post award.
2. Worksheet C
3. *Construction Island* boundary if applicable
4. List of quality requirements and controls

STEP 1.3 – ESTABLISH CONTRACT REQUIREMENTS

Task

Determine roles under OHSA and finalize contract requirements.

Accountabilities

Accountable – Contract *Owner*, Supply Chain

Consult, As Required –, CA, Law, other stakeholders as required

References

Document No.	Title
OPG-PROC-0058	Procurement Activities
FIN-FORM-CM-001	Form 1 – Contract Planning Confirmation
FIN-FORM-CM-013	Job Aid I – Contract Management Plan
FIN-FORM-CM-014	Job Aid II – Contract Administrator and Monitor Qualifications
FIN-FORM-CM-019	Job Aid VII – Roles and Responsibilities Matrix for Contractor Management **(mandatory for Nuclear BU)**
Appendix C	Roles and Duties under OHSA.
Appendix D	Application of OPG Safety Requirements to Contractors
Appendix G	Environmental Management for *Owner*-Only Contracts

Sub-Tasks

Determine OPG's Role under OHSA

To Do	***Notes***
Determine which OHSA Regulation applies to the work (e.g. *Construction*, Industrial, Diving etc). ***Reference Appendix C***	• Refer to the individual Regulations to determine applicability
Establish OPG's role and duties under OHSA ***Reference Appendix C***	• Determine whether OPG is the *Constructor*, Extended *Employer* or whether the nature and location of the work allows OPG to be *Owner*-Only. The Contract *Owner* should determine whether it is preferable to be *Owner*-Only rather than *Constructor*). • OPG's duties under the OHSA shall be determined and all legal requirements identified. Appendix C shall be reviewed prior to any decision that the work should proceed as *Owner*-Only. Law Division shall be consulted if after reviewing Appendix C it is determined that the opinion continues to support the contract be executed as an *Owner*-Only. Supplier Safety Compliance Dept. shall support Law Division in determining the feasibility of *Owner*-Only *projects*.
Other Considerations in any Decision to be *Owner*-Only	
Structuring a *Construction Project* with OPG as *Owner*-Only (contractor is "*Constructor*") allows OPG to pass to a contractor the responsibility for safety and the OHSA liability. ***Reference Appendix G***	• If OPG were to be *Constructor*, could it be more cost effective to perform portions of work with its own staff, e.g. orange badge training, radiation monitoring, electrical work. • Are environmental *risks* involved with the work too significant so that OPG needs a greater degree of control and oversight with respect to environmental matters than *Owner*-Only considerations allow? (Appendix G: Environmental Management for *Owner*-Only *Projects*).

To Do	*Notes*
If *Owner*-Only is determined to be permissible given nature and location of work review other considerations to determine if advantage of being *Owner*-Only outweighs other considerations (if not, OPG should remain *Constructor*).	• Does the requirement to provide complete separation of *Constructor* work and staff from OPG work and staff present too many operational restrictions to OPG work or present other excessive costs? • Is there substantial *risk* that it shall be difficult to provide barriers to effectively separate the *Constructor*'s work and staff from OPG work and staff or that OPG shall have difficulty relinquishing the required degree of control? (E.g. work protection) If so, this presents an OHSA *risk* that OPG shall be found to be the *Constructor* but did not perform all of the due diligence of a *constructor*, i.e. increases OHSA *risk* in comparison to OPG acknowledging and effectively performing *Constructor* role.

Assign Resources

To Do	*Notes*
Assign Resources ***Record on Form 1*** ***Reference Job Aid II*** ***Record on Job Aid VII (Nuclear only)***	• Assign roles of CA and Contract Monitor. • Determine qualification requirements for the CA and Contract Monitor, including specialized training needs, e.g. WPC, Asbestos, Pressure Boundary Program and others. • Assign a *Constructor's Supervisor* (if OPG is the *Constructor*).
Identify Support Staff	• Identify additional support staff to be used on an "as required" basis (Design, Operations, Maintenance, Law, Safety, Environment, Supply Chain or other stakeholders). • Confirm availability with appropriate line management.

Note: Completion of Job Aid VII is mandatory for Nuclear BU.

Determine Contract Requirements

To Do	***Notes***

Summarize the Health & Safety, Environmental and Quality Requirements
 	
Record Summary of Requirements
 	
Reference Appendix D
 	
Record on Form 1
	• Identify if contractor shall be required to complete a Pre-Start Health & Safety Review. See "Contract Standard A-5 Standard Commercial Terms for Engineered Equipment". Section 19 summarizes the conditions under which a Pre-start Health & Safety Review is required.
	• For contractors supplying engineered equipment, ensure that the contractor has a quality program as described in Section 16 of "Contract Standard A-5 Standard Commercial Terms for Engineered Equipment" and in Section 13 of "Contract Standard A-6 Standard Commercial Terms for Engineered Equipment Spare Parts"
	• Using the information captured on Worksheets B**,** C, and the record of quality controls and accountabilities:
	  • Prepare a list of safety hazards, *environmental aspects*, quality requirements and specific control measures/programs that the Contractor is required to implement. This includes all OPG site requirements that shall be followed.
	  • Prepare a list of quality controls and accountabilities.
	  • Prepare a list of contractor's training requirements.
	  • Prepare a list of designated substances that the contractor could be exposed to, including a report on the presence of asbestos in the workplace.
	  • Request for Wage Schedule and Labour Requirements Clause for Tendering Documents Involving Field Labour.
	• Identify to contractor that an audit by OPG Supply Chain Quality Services (SCQS) may be required to finalize on site contractor's *Approved Suppliers List (ASL)* qualification status in accordance with N-PROC-MM-0010, Establishing and Maintaining Ontario Power Generation Approved Suppliers List. *(Nuclear only).*

To Do	***Notes***
Identify External Agency Approval Requirements	• Determine if a "Notice of *Project*" form is required. • Identify any building permits required. • Identify Certificates of Approval requirements. • Identify Technical Standards and Safety Authority (TSSA) registration requirements. • Identify electrical safety approval requirements, e.g., Canadian Standards Association (CSA) or Electrical Safety Authority (ESA).
Start preparation of an OPG Contract Management Plan (CMP) ***Document the CMP***	• A CMP records planning and post-award decisions that shall be used by OPG to monitor the contract. It is both a communication and control tool. It can become a key factor in dispute and event resolution. • Completed detailed CMPs shall be registered in PASSPORT for Nuclear BU.

Note

The CMP shall be documented in either one of three ways:

1. Specific CMP
2. *Project* Execution Plan
3. Job Aid I.

The CMP may include:

- Scope of contract
- Contract strategy
- Responsibility matrix (OHSA)
- Management of *risk* for the contract (environmental, safety, etc.)
- Communication plan
- Schedule
- Special administrative requirements
- Detailed plan for managing human performance during contract execution
- Detailed plan for managing safety during contract execution including monitoring requirements, any deficiencies in the contractor's safety program identified in the pre-qualification process
- Dispute resolution
- Change management documentation
- Acceptance plan
- Transfer of continuing obligations
- Payment plan
- Method of capturing "lessons learned"

The plan shall be finalized by the end of step 3.4

Multiple *Constructors*

When two (or more) *construction projects* are planned at a single site, OPG may wish to appoint multiple *Constructors* (i.e., OPG plus a General Contractor or multiple General Contractors (OPG is the *Owner*-Only). In these situations, it may be necessary for OPG to apply to the Ministry of Labour (MOL) for a designation of "Part *Project*" pursuant to Section 4 of the *Construction* Regulations. In addition, all *Constructors* should file separate *Notice of Project* forms and attach:

1) A detailed description of the *contracted work*
2) A drawing of the *project* site boundaries.
3) Details on how each General Contractor shall physically separate and control its own *construction project*. As it may take several months to receive MOL approval, it is important to apply early. If designation is not received prior to the start of the work, contact Law.

A Notice of *Project* is required when:

- The total cost of labour and materials for the *project* is expected to exceed $50,000.
- The work is the erection or structural alteration of a building more than two storeys or more than 7.5 metres high.
- The work is the demolition of a building at least 4 meters high with a floor area of at least 30 square metres.
- The work is the erection, structural alteration or structural repair of a bridge, an earth-retaining structure or a water-retaining structure more than three metres high or of a silo, chimney or a similar structure more than 7.5 metres high.
- Work in compressed air is to be done at the *project*.
- A tunnel, caisson, cofferdam or well into which a person may enter is to be constructed at the *project*.
- A trench into which a person may enter is to be excavated at the *project* and the trench is more than 300 metres long or more than 1.2 metres deep and over thirty metres long.
- A part of the permanent or temporary work is required by this Regulation to be designed by a professional engineer.

(O.Reg. 213/91 *Construction Projects*, Part I §6)

Note Annual Notice of *Project*

At OPG sites, it is a common practice to apply for an annual site Notice of *Project* to cover most planned and emergency maintenance *project*s which may occur throughout the year and for which OPG shall be the *Constructor*. It is recommended that this annual Notice of *Project* contain a general description of the work to be undertaken, e.g., planned outage work, and a listing of major *projects* which are anticipated. It is also recommended that each site appoint an individual from the organization who shall be responsible for signing the annual Notice of *Project*.

Additional Notice of *Project* may be required under special circumstances, e.g. large *projects* not referred to in the annual Notice of *Project* where OPG is the *Constructor* for the *project*.

For some *projects*, where OPG is the *Owner*-Only, OPG may assume the role of *Constructor* for aspects of the work, e.g., tie-ins. Designation of part *project* (O.Reg. 213/91, §4) shall be applied for from the MOL. Refer to the note on Multiple *Constructor*s for additional information regarding designation of part *project*.

Note Form 1000 Registration of *Constructor*s and *Employers* Engaged in *Construction*

Section 5(2) of the Regulations Concerning *Construction Projects* (O.Reg. 213) requires the *Constructor* and each *Employer* working on a *Project* complete an approved registration form. The form provided for this purpose is the MOL Form 1000 Registration of *Constructors* and *Employers* Engaged in *Construction*.

A completed OPG-specific Form 1000 is posted on the OPG intranet. To access the form, go to the OPG “Index” web page. Under the Wellness and Safety heading, select Forms > Safety/Incident >Ontario Ministry of Labour *Construction Project* Forms. To use the posted Form 1000, sites shall indicate the average number of employees on the *Project* by checking the appropriate box and have the form signed by the individual designated by the site. It is not necessary to send the Form 1000 to the MOL. However, the Form 1000 should be posted at the *Project* with the Notice of *Project*.

Where OPG is the *Constructor* on a *Project*, we shall ensure that all contractors employed on the *Project* provide OPG with a completed Form 1000 for their company. It is not required that these forms be posted at the *Project* but they shall be available at the *Project* for inspection by the MOL. A blank Form 1000 is available on the OPG Safety web page for completion by contractors.

Develop Proponents Lists

To Do	***Notes***
Identify potential Contractors	• Supply Chain, with input from the requisitioner, shall assemble a list of potential *suppliers* to approach for formal *RFQ* and *RFP* based on the criteria as identified in OPG-PROC-0058.
Ensure Potential Contractors are Prequalified	• If a *proponent* is not in the Safety Environmental Quality Contractor Application (SEQC) Database and, if applicable, the *ASL*, the *Proponent* shall be pre-qualified by Supply Chain prior to accepting their proposal.

Note

All contractors including sub-contractors shall be pre-qualified with respect to safety performance when OPG is the *Owner-Constructor* or *Owner*-Extended *Employer*. When OPG is *Owner*-Only, the *Constructor* shall be prequalified but OPG is not permitted to prequalify the *Constructor's* subcontractors. OPG may, however, require the *Constructor* to submit as part of its *RFQ*/*RFP* package or contract proposal the health and safety records and programs of the primary subcontractors the *Constructor* proposes to use for the *project*. OPG may evaluate the subcontractors for the sole purpose of determining which potential *Constructor* to select for the work. An *Owner*-Only shall not advise a *Constructor* to replace a subcontractor or require a proposed subcontractor to make changes to the subcontractor's safety program other than before contract award, to provide a greater level of detail for assessment and *Constructor* selection purposes. OPG should not indicate to a *Constructor* that OPG endorses or approves of the use of any particular subcontractor.

Deliverables

1. Summary of all safety, environment and quality requirements for the contract.
2. List of prequalified potential contractors.
3. Start of CMP.

STEP 1.4 – PREPARE CONTRACT REQUIREMENT DOCUMENT

Task

Prepare the contract requirement documents for review and approval and develop a purchasing strategy.

Accountabilities

Accountable – Contract *Owner*, Supply Chain

Shall Review – Technical Resources and other stakeholders as required

References

Document No.	Title
OPG-PROC-0058	Procurement Activities
FIN-FORM-CM-007	Worksheet A – Generic Requirements for Contract Requirements Document
FIN-FORM-CM-010	Worksheet D – Bid Evaluation Worksheet
Appendix E	Guideline for the preparation of a contract requirements document

Sub-Tasks

Prepare Contract Requirement Document

To Do	***Notes***
Compile all support documents necessary for the contract requirements ***Reference Appendix E Complete Worksheet A***	• An ill-defined requirement, or one that cannot reasonably be met, shall result in a poor and/or expensive response from the vendor community. Post-contract misunderstanding can lead to disputes, dissatisfaction, and additional cost. • The support documents shall include the Health and safety, environmental and quality requirements summarized in Step 1.3. • **For *Owner*-Only** review *Construction Island* considerations in Appendix E. • Before sending the document to Supply Chain make sure all information has been reviewed/approved by the requisitioner's line management.
Prepare Evaluation Criteria ***Record on Worksheet D***	• The evaluation criteria should be developed to ensure that the evaluation criteria are included in the *RFQ*/*RFP*. Refer to OPG-PROC-0058 for details on establishing and communicating evaluation criteria.

Develop a Purchasing Plan

To Do	***Notes***
Develop a Purchasing Plan ***Record the purchasing plan for Single-Source***	• Development of a purchasing plan includes compensation schemes, commercial terms & conditions, the *RFQ*/*RFP* process, proposal/quotation evaluations, etc. Refer to OPG-PROC-0058 for details on developing Purchasing Plans.
Obtain Justification for *Single Source* Purchase (if applicable)	• If the required service is only available from one source, or if conditions dictate the use of a *single source*, document justification from the requisitioning department on OPG-FORM-0003, Single /Sole Source Justification. Refer to OPG-PROC-0058 for details on allowing the use of *single source* procurement. (Supply Chain).
Review Justification ***Record the justification*** ***Record the Purchasing Plan for Owner-Only Contract***	• Review the OPG-FORM-0003 and either propose alternative sources or provide concurrence to proceed. Retain OPG-FORM-0003 in the contract document if one was required. (Supply Chain).

Confirm Planning Complete

To Do	***Notes***
Complete Form 1	• By signing Form 1, the Contract *Owner* is confirming that the requirements of Stage I have been met. • Provide copies of the records generated from Stage I to Supply Chain include Worksheet D when completed.

Deliverables

1. Contract Requirements Document
2. Purchasing Plan

STAGE I - RECORDS GENERATED

Records

Document No.	Title
FIN-FORM-CM-001	Form 1 – Contract Planning Confirmation
FIN-FORM-CM-007	Worksheet A – Generic Requirements for Contract Requirements Document
FIN-FORM-CM-008	Worksheet B – Contract Safety Hazards Evaluation*exception for *Owner*-Only
FIN-FORM-CM-009	Worksheet C – Contract Environmental Aspect Evaluation
	List of Potential *Proponents*
OPG-FORM-0003	Single/Sole Source Justification
	Purchasing Plan
	Technical Specification and/or Statement of Work
	List of Quality Requirements and Controls
	Summary of Safety, Environment and Quality Requirements
	Start of CMP

2. STAGE II - PROCUREMENT

STEP 2.1 – ISSUE AN INVITATION TO CONTRACT

Task

Prepare and issue a *RFQ*/*RFP* to a list of qualified and approved *proponents*.

Accountabilities

Accountable – Supply Chain

Shall Concur – Contract *Owner*

Consult, As Required – CA, Law, Labour relations

References

Document No.	Title
FIN-FORM-CM-010	Worksheet D – Bid Evaluation Worksheet
FIN-STD-PR/AP-001	Purchases and Payable Controls
N-PROC-MM-0016	Nuclear Procurement Activities
OPG-PROC-0058	Procurement Activities

Sub-Tasks

Issue an Invitation to Contract

To Do	***Notes***
Review Contract Requirements	• The contract requirements are reviewed to determine if there is information that requires clarification is incorrect or missing. If so, the Contract *Owner* is requested to disposition the gaps.

To Do	*Notes*

Prepare *RFQ*/*RFP*
 	
Reference Worksheet D
	• Invitational competitive procurement process, as defined in OPG-PROC-0058 is to be followed.
	  • Invitational competitive procurement process is to be used for consulting purchases with a total estimated value less than $100,000, and for all non-consulting services with a total estimated value equal to or greater than $10,000.
	  • Open competitive procurement process shall be used for all consulting services with a total estimated value equal to or greater than $100,000.
	  • *Single source* shall be used as an exception to the normal *RFQ*/*RFP* process and shall be approved by the appropriate purchasing authority. Refer to OPG-PROC-0058 for details on allowable exceptions to competitive procurement allowing the use of *single source*.
	• Potential contractors shall be registered with the WSIB or have equivalent insurance in Ontario.
	• Rules for *proponents* including evaluation methodology, criteria, and weightings for each of the criteria shall be established by Supply Chain and the Contract *Owner*. Evaluation methodology (the process used to assess, evaluate, and score supplier quotations) shall be fully disclosed. The evaluation criteria shall have three sections:
	  • Mandatory requirements, if applicable, shall be assessed on a pass/fail basis and indicate how contractors achieve a passing grade.
	  • Rated requirements, including all weights and, if applicable, sub-weights and a description of any short-listing processes including any minimum rated score requirements and the role and weighting of reference checks, oral interviews, demonstrations, and site visits.
	  • Price/cost and description of evaluation methodology including use of scenarios in the evaluation process to determine cost for specific volumes and/or service levels.

To Do	*Notes*

	• Only evaluation criteria established and communicated to *proponents* in the *RFQ*/*RFP* shall be used in the evaluation of quotations or proposals.
	• Prepare the *RFQ*/*RFP*. This includes, but is not limited to:
	  • Technical Specifications
	  • Contract Standards
	  • Special Conditions including all safety, environmental and quality requirements from Step 1.4
	  • Labour Requirements (to be followed when OPG is contemplating contracting out work that may involve trades labour at field locations)
	  ▪ Request for Wage Schedule and Labour (OPG-FORM-0024, Wage Schedule Request)
	  ▪ For procurement of Piping and Piping Accessories - UA Label see OPG-PROC-0058, Appendix B
	  ▪ For procurement of Sheet Metal Fabrication and Installation see OPG-PROC-0058, Appendix C
	  ▪ Requirements Clause for Tendering Documents Involving Field Labour, Generation *Projects* (Thermal, Hydro-electric and Corporate)
	  ▪ Evaluation criteria

Finalize List of *Proponents* ***Record list of Proponents***	• Review the list of recommended *proponents* and determine if all the *proponents* are pre-qualified. Identify any actions OPG shall take to address deficiencies discovered in the contractors' health and safety programs by the pre-qualification evaluation. If any *proponent* has not been qualified under OPG-PROC-0073, Supplier Management and Quality Services, they shall be removed from the list or shall be qualified prior to receiving their quotation or proposal.
Distribute *RFQ*/*RFP* to *Proponents* ***Record* RFQ/*RFP* distribution list**	• The *RFQ*/*RFP* is distributed to all *proponents*.

Deliverables

1. Complete *RFQ*/*RFP* contract documents with all required documentation

2. List of pre-qualified *proponents*
3. *RFQ*/*RFP* Distribution List

STEP 2.2 – EVALUATE QUOTATIONS / PROPOSALS

Task Evaluate submissions and recommend the best value submission(s)

Accountabilities

Accountable – Contract *Owner*, Supply Chain

Consult, As Required – CA, Law, Technical Resources, and other stakeholders (as required e.g. Cross Functional Sourcing Team)

References

Document No.	Title
FIN-FORM-CM-002	Form 2 – Bid Selection Summary
FIN-FORM-CM-010	Worksheet D – Bid Evaluation Worksheet
OPG-PROC-0058	Procurement Activities

Sub-Tasks

Evaluate Proposals

To Do	***Notes***

Conduct Pre-Submission Meeting
 	
Record minutes of meeting
	• A pre-submission meeting (if required) provides *proponents* with the opportunity to acquire additional information to complete their quotations or proposals.
	• It may not be required if *proponents* have previously performed work for OPG and there is no change in site conditions.
	• Pre-submission meetings are normally held at the work site so that *proponents* can become familiar with OPG's operations and facilities.
	• A record of the pre-submission meeting is to be filed with the contract documents.
	• *Proponents* are given a site tour to discuss:
	  • All foreseeable hazards.
	  • OPG's expectations for managing hazards/significant *environmental aspects* as determined in *RFQ*/*RFP*.
	  • File a record of the site tour.
	• Any new information or proposal clarifications arising from the meeting shall be documented and issued to all invited *proponents*.

Receive Submissions ***Log the Quotations or Proposals received***	• The submissions are received and verified to determine conformance with the submission criteria. All quotations or proposals that do not conform shall be disqualified.
Evaluate Quotations/Proposals ***Complete Worksheet D*** ***Reference FIN-FORM-CM-002***	• Refer to OPG-PROC-0058 for details on the evaluation of quotations/proposals. • Evaluate the submissions using evaluation criteria and weightings communicated to *proponents* in the *RFQ*/*RFP* with assistance from the appropriate Subject Matter Experts (SME) as applicable.

To Do	*Notes*
	• Evaluation of price/cost shall only be undertaken upon completion of the evaluation of mandatory and rated criteria. • Verify the health and safety and environmental qualifications of the contractor and their sub-contractors against contract specifications. • Note any deficiencies identified in the contractor's health and safety program by the pre-qualification evaluation and determine the actions required to address these deficiencies.

Note

Activities associated with obtaining additional information shall ensure ethical treatment of the *proponents* as per the "Code of Business Conduct". Maintain confidentiality and do not use submissions from one contractor to leverage the offerings of another.

Deliverables

1. Quotations or proposals are evaluated.

STEP 2.3 – SELECT A CONTRACTOR

Task

Award the contract and issue a Purchase Order

Accountabilities

Accountable – Supply Chain

Shall Concur – Contract *Owner*

Consult, As Required – CA, Law, Credit Risk, Treasury and other stakeholders, as required

References

Document No.	Title
FIN-FORM-CM-002	Form 2 – Bid Selection Summary
OPG-PROC-0058	Procurement Activities

Sub-Tasks

Select A Contractor

To Do	*Notes*

Conduct Pre-award Negotiation
 	
Record minutes of meeting
	• Negotiations for a *RFQ*/*RFP* may be conducted with a prospective contractor(s) to:
	  • Revise the requirements (scope, deliverables, etc).
	  • Identify and agree on any new requirements to address deficiencies in the contractor's health and safety program as determined by the pre-qualification evaluation.
	  • Explore alternatives offered as part of the submission.
	  • Better align the contractor's offering with the specific requirements identified.

Select a Contractor ***Complete FIN-FORM-CM-002***	• The best overall value submission is selected and the selection is approved and documented.

To Do	*Notes*
Agree to Conforming Contract ***Record any Changes***	• A "conformed" contract which captures any changes made during the negotiations shall be developed and agreed to by OPG and the contractor.
Award the Contract	• The successful *proponent* is notified in writing of the award of contract. • Contractor shall include or make reference to documented agreed upon changes.
Create Purchase Requisition (Material Request)	• Contract *Owner* shall ensure that Purchase Requisition or MR and N-FORM-10029, Services- Request for Purchasing (for Nuclear) are created.
Issue Purchase Order (PO)	• Ensure that the purchase order reflects any changes identified in the preparation of the conforming contract.

Notes

- No work can commence without a purchase order or authorization of Supply Chain. Failure to comply shall be reported to senior management.
- During negotiations regarding *Owner*-Only contracts OPG shall not suggest or require specific changes to the proposed *Constructor's* Health & Safety Program or *Project* Site Specific Safety Plan (PSSSP). If, as part of the *RFQ*/*RFP* process, the *Constructor's* proposal contains overly general Health and Safety requirements OPG is permitted to ask the *Constructor* to provide more detailed safety procedures or a more specific PSSSP, for the purposes of evaluation and selection of a Contractor, however, OPG shall not "negotiate" changes to safety requirements or prescribe OPG policies or procedures to be used. If the *Constructor* is overly general in its safety program or PSSSP submission it is a good idea (but not required) to ask for a greater level of detail so OPG has something specific to audit the *Constructor* against for contract compliance to EH&S requirements in the execution stage of the contract.

Deliverables

1. Conforming contract agreed to and awarded
2. Purchase Requisition or Material Request created

STAGE II - RECORDS GENERATED

Records

Document	Title
FIN-FORM-CM-010	Worksheet D – Bid Evaluation Worksheet
FIN-FORM-CM-002	Form 2 – Bid Selection Summary
	Proponent's List
	RFQ/*RFP*
	Notice of Pre-Submission Meeting
	Minutes of Pre-Submission Meetings
	List of Quotations or Proposals Received
	Minutes of Pre-award Negotiation Meeting
	Purchase Requisition or MR and N-FORM-10029 for Nuclear
	Notification of Award
	Purchase Orders
	Conformed Contract
	Correspondence

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3. STAGE III - POST AWARD

STEP 3.1 – CONDUCT JOB SITE & ORIENTATION MEETINGS

Task

Job site meeting(s) provides an opportunity to meet personnel and review terms and conditions.

Accountabilities

Accountable – CA

Shall be Informed – Contract *Owner*, Contract Monitor, Contractor's *Supervisor*, Supply Chain, Safety Staff, HR for Electrical Power Systems *Construction* Association (EPSCA)/CUSW work, Field Engineers and other stakeholders, as required.

References

Document	Title
FIN-FORM-CM-003	Form 3 – Contract Work Release
FIN-FORM-CM-011	Worksheet E – Contract Work Release
Form 1000 (MOL)	Registration of *Constructors* and *Employers* Engaged in *Construction*
FIN-FORM-CM-015* *Shall be used if equipment being brought on site	Job Aid III – Safety Certification/Control for Rented or Contractor's Equipment

Sub-Tasks

Prepare for the Job Site & Orientation Meetings

Note

The meeting(s) should be used to ensure that OPG's expectations regarding management of the contract – particularly safety, environmental and quality – have been clearly communicated to the contractor's management and supervisory team and have been aligned with the requirements of the *RFQ*/*RFP* and the contract. The orientation meeting is a chance to view the actual location and condition of the work site. Note that these two meetings may be held separately but are usually conducted during the same visit.

A *Memorandum of Understanding* (*MOU*) may be used to document the parties' understanding with respect to certain site-specific *project* details, such as establishing a *construction island* for the work, site access, communication protocols and control of hazardous energies if required. The *MOU* is not intended to conflict with the Contract; in the event of any conflicts between the Contract and the *MOU*, the Contract provision shall prevail.

To Do	***Notes***
Determine the Issues to be Discussed ***Record on FIN-FORM-CM-011***	• Identify all logistical issues necessary to support the *Constructor's* on-site activities.
Identify Attendees	• OPG's attendance should include the Contract *Owner*, CA, Contract Monitor, OPG Safety Support (as appropriate), Supply Chain, and key stakeholders. Depending on contract size, it could also include representation from OPG's senior site management at the first meeting. • Contractor's attendance should include the *Project* Manager, Site Superintendent, and the Safety Officer. Depending on contract size, the contractor's Vice President (or delegate), and contractor's Business Manager may also attend the first meeting.

Conduct the Job Site and Orientation Meeting

To Do	*Notes*
Introduce Staff and their Roles ***Reference Appendix C*** ***Record minutes of meeting***	• The CA shall chair the meeting. • Introduce contractor personnel to site personnel. • Identify the lines of communication and the roles and responsibilities, including those that apply under OHSA. • Request that the contractor identify any sub-contractors not previously approved in quotation or proposal evaluation for OPG's approval. The CA shall advise the contractor if any sub-contractors are not acceptable to OPG. • **For *Owner*-Only Contracts**, OPG can refuse to allow any substitution of subcontractors identified in the contract for specific work (see specific contract wording) but OPG may not reject subcontractors from performing work where a specific subcontractor was not assigned in the contract to perform the work.
Review Logistical Issues	• Discuss all logistical support issues that were raised during the preparation for this meeting.
Review Arrangement to Do Work	• Review any *construction island* requirements if applicable, including lay-down areas. • Develop a *MOU* to address control of the work area by multiple parties • **For *Owner*-Only contracts** – Develop a *MOU* to address *project* specific details such as determining the Control of Hazardous Energies methods, identifying certain hazards, establishing the CI, designating a parking area for contractors and its subcontractors if outside the CI, establishing a protocol for OPG access to the CI, etc.
Clarify Overall Expectations ***Reference Appendix D***	• Clarify OPG's expectations for managing safety, environment and quality of work • Clarify expectations regarding OPG's Code of Conduct. • Clarify OPG's role in monitoring the workplace. • **For *Owner*-Only Contracts**: Ensure that OPG and contract staff clearly understands that the *Constructor* and their subs are working to their policies and procedures and not to OPG's policies and procedures.
Review Contract Terms and *Project* Management	• Review outstanding commercial conditions, contract schedule, change management plan, acceptance plan, payment plan, reporting requirements, and claim/dispute process.

To Do	*Notes*

Review Safety and Environmental Requirements
 	
Review Worksheets B and C
	• Review OPG expectation (as per OHSA) for contractor with 6 or more employees working on OPG site to post a copy of contractor's Health and Safety Policy in a conspicuous place or be readily available on site (i.e., in toolbox) if posting not practical.
	• Distribute any OPG procedures and handbooks.
	• Clarify OPG's monitoring and oversight activities as described in the Contractor Management Process manual.
	• Emphasize immediate reporting of all safety and environment incidents as per contract and review the incident reporting requirements outlined in the business' specific procedures for safety and environmental reportable events.
	• Review health and safety hazards, *environmental aspects*, and control measures.
	• Review any applicable OPG Occupational Health & Safety (OH&S) standards, policies and procedures, including *project* Safe Work Practices and inspection and tagging of 600V equipment.
	• Review the contract safety and environment stipulations.
	• **For *Owner*-Only Contracts**:
	  • Completion of Worksheet B by *Constructor* will assist with development of PSSSP
	  • Request PSSSP and Site Specific Environmental Management Plan (SSEP) from contractor
	  • Reinforce contract differences with respect to reporting and use of the contractor's safety program rather than OPG's.
	  • Ensure that the contractor understands that signage requirements to be posted at the entrance of the work site shall clearly state the role of OPG and strict access restrictions for OPG staff, i.e. access by OPG staff limited to contractual compliance monitoring.
	  • Review reporting differences

To Do	*Notes*

Communicate Local *EMS* Information	• For sites which have an International Organization for Standardization (ISO) 14001 *EMS* in place, the standard requires that individuals working on behalf of OPG (i.e., contractors):
	  • Are competent to perform the tasks required;
	  • Are trained, as required
	  • Are made aware of OPG's environmental policy and *EMS* and the *environmental aspects* which could be affected by their work.
	• Local environmental support staff should be consulted for information regarding site *environmental aspects* and training and competence requirements.
	• **For *Owner*-Only Contracts** local environmental support staff shall review the SSEP against completed Worksheet C to ensure all applicable *environmental aspects* are addressed.

Review Emergency Plan Requirements	• Review all site emergency plan requirements:
	  • Alarms
	  • Emergency contacts
	  • Contractor's emergency plans
	  • Fire prevention plans.

Review Security Requirements	• All personnel shall be security cleared to work at OPG facilities. Contractors shall be made aware of this requirement, and of the process and required timing for obtaining clearance. • Contact appropriate Security department (Nuclear, Corporate) to ensure proper processes are followed.
Initiate Contractor's *Safe Work Planning* Requirements	• When OPG is the *Owner-Constructor* or *Owner-Employer*, a written safe work plan shall be developed by the contractor and reviewed by the Contract *Owner***.** (This may be a schedule of required Job Safety Analysis (JSA) or individual safe work plans). • **For *Owner*-Only Contracts:** As the *Constructor*, the contractor shall establish a PSSSP. Reinforce the fact that the contractor as *Constructor* is responsible. OPG shall review the plan and note areas for improvement.

To Do	*Notes*
Review WPC Requirements ***Reference Appendix B*** ***Complete FIN-FORM-CM-0022 (if applicable)***	• Ensure that all OPG and contractor Work Protection requirements (as per step 1.2) are identified and reviewed. • **For *Owner*-Only Contracts:** Establish specific control of hazardous energy requirements using FIN-FORM-CM-022: Form 7 – Control of Hazardous Energies Planning Phase Form – *Owner*-Only. Attach form to *MOU*.
Review Hazardous Materials and Designated Substance Requirements **Reference Appendix G**	• Ensure all hazardous materials to be used during the *project*, including products to be installed and left on site, are approved per local and BU hazardous materials programs. Installed products may have to be added to the local/BU inventory if replacement is anticipated. • Obtain Material Safety Data Sheets (MSDS) for all hazardous material that may be used or installed. (**For *Owner*-Only Contracts:** the purpose of obtaining MSDS's is to address any environmental considerations). • Review all designated substances present at the job site to which the contractor may be exposed. • Develop a disposition plan for any hazardous materials to be used.
State Equipment and Approval Requirements ***Record on Job Aid III***	• State that equipment brought to the site shall be safety certified. • Review approvals, permits and test requirements.
Confirm Site Requirements	• Confirm lay down areas and any job shack requirements (e.g., electricity, water). • Review parking, washrooms and smoking limitation.
Answer Safety and Environmental Questions	• If questions are generated from the safety and environmental information distributed, they should be addressed at this time. • **For *Owner*-Only Contracts**: Reinforce different requirements as stated in *Owner*-Only contracts with respect to the contractor being the *constructor* and therefore being responsible for safety as per OHSA.

To Do	*Notes*

Review Training Requirements	• Identify:
	  • Who needs it?
	  • Responsibility for delivery (contractor or OPG).
	  • How and when it shall be delivered.
	  • Requirements for records.
	Note: Requirements for Workplace Hazardous Materials Information System (WHMIS). Note: OPG does not provide safety training to *Constructor* or its subcontractors for *Owner*-Only Contracts, however, OPG may advise the *Constructor* and its subcontractors as to site security and emergency requirements).

Note

Handouts at the meeting can include:

- Site specific procedures
- OPG Corporate Safety Rules, Common Safety Rules, WPC, Environmental Policy.

Deliverables

1. Plans or *MoU* for control of the work area (if applicable).
2. PSSSP and SSEP (if applicable)
3. Training requirements and schedule
4. Access requirements
5. Reporting requirements

STEP 3.2 – CONDUCT A MARK-UP MEETING

Task

Ensure the Contractor schedules a mark-up meeting to discuss work distribution among the trades if the work is under the auspices of the *Construction* Collective Agreement.

Accountabilities

Accountable – CA (to ensure)

Shall be Informed – Contractor's *Supervisor*

Consult, As Required – Human Resources

References

Document	Title
FIN-FORM-CM-011	Worksheet E – Contract Work Release

Sub-Tasks

Identify Key People to Attend the Mark-Up Meeting

To Do	*Notes*
Identify Attendees for the Mark-Up Meeting	• Attendees may include the CA, site superintendent, sub-contractors, EPSCA Human Resources representatives, union stewards and business agents.

Conduct the Mark-Up Meeting

To Do	*Notes*
Introduce the *project*	• Present an overview of the *project* and scope out individual tasks.
Determine the Assignments ***Document the assignments***	• Assign tasks to the trades. • Challenge the assignments.

Note

A signed copy of due “Acknowledgement of Labour Requirements” is forwarded to the site *Construction* Labour Relations representative.

The contractor shall provide the site *Construction* Labour Relations representative sufficient notice of pending work to facilitate proper notice to union representatives of a pre-job mark-up meeting. Timelines are contained in the appropriate collective agreement. The contractor shall participate in the pre-job mark-up meeting. At this meeting, the contractor shall:

- Outline the scope of the services to be performed at the site.
- Identify key trades people, staffing requirements, work schedules and other labour relations issues pertinent to the work at hand.
- Make proposed work assignments to the unions and respond to any questions and consider any input/evidence the unions may have, either during or subsequent to the meeting.
- Make final work assignments.

Deliverables

1. Marked-up tasks agreed upon

STEP 3.3 – VERIFY QUALIFICATION & PROVIDE OPG-BASED TRAINING

Task

Determine whether competency requirements and qualifications have been met and define the plans for any required OPG-based training.

Accountabilities

Accountable – CA

Shall be Informed – Contractor's *Supervisor*

Consult, As Required – Contract *Owner*, BU Training Department, if required

References

Document	Title
FIN-FORM-CM-003	Form 3 – Contract Work Release
FIN-FORM-CM-011	Worksheet E – Contract Work Release

Sub-Tasks

Conduct site orientation and confirm Qualifications and Training Requirements

To Do	*Notes*
Conduct Orientation ***Record Attendance***	• Set clear expectations for all contractors' employees regarding safety, environment, emergencies and security. • Orientation is mandatory for all contractors' employees on the work site. • **For *Owner*-Only Contracts**: orientation may need to be modified to reflect OPG's role as *Owner*-Only.

To Do	*Notes*

Determine Training Requirements And Confirm Qualifications
 	
Record additional training requirements
Record completion of training courses
	• Confirm records of completed training.
	• Assess requirements for any additional, specialized training to be provided by OPG. This could include, but is not limited to, training on:
	  • Radiation protection (Nuclear).
	  • Network applications (Nuclear).
	  • Specialized equipment usage.
	  • Safety training.
	  • Environmental awareness training.
	  • Work Protection.
	• Deliver OPG training to eliminate gaps and fulfill requirements or contractor to arrange training.
	• **For *Owner*-Only Contracts**: Verify any special requirements stipulated in *Owner*-Only contracts.

Deliverables

1. Documented qualification requirements and status of contract staff
2. Training schedule

STEP 3.4 – REVIEW AND APPROVE READINESS TO START WORK

Task

Review and approve all permits, training, etc. required to begin work.

Accountabilities

Accountable – CA

Shall Approve – Contract *Owner*

Consult, As Required – Contractor's *Supervisor*

Shall be informed – Supply Chain

References

Document	Title
FIN-FORM-CM-003	Form 3 – Contractor Work Release
FIN-FORM-CM-011	Worksheet E – Contractor Work Release
MOL Form 0175	Notice of Project

Sub-Tasks

Verify Notice of Project and Completion of Safe Work Planning

To Do	*Notes*
Verify that Notice of Project is in place	• Check that a site Notice of Project has been filed. ***(Section 6 (3) of the Construction Regulations and MOL Form 0175-Notice of Project)***

To Do	*Notes*

Ensure that *Safe Work Planning* has been Undertaken	• Where possible, all requirements for *safe work planning* shall have been completed and submitted to OPG for review. (Note that not all safe work plans shall be ready for review at this time; however, the overall plan and schedule shall be reviewed).
	• **For *Owner*-Only Contracts:** PSSSPs are the responsibility of the contractor and OPG may review them but does not approve them. (See note at end of section).
	• Compile a list of any safe work plans yet to be developed.
	• PSSSP's prepared at Step 3.4 may require detailing and amendment immediately prior to the start of work.
	
	All written safe work plans/JSA shall:
	
	• List main job steps in sequence.
	• Identify the actual or potential OH&S hazards associated with each job step including:
	  • All hazards identified in the contract document.
	  • Use of any hazardous materials or designated substances.
	  • Any hazards associated with OPG facilities or operations that could negatively impact the *contracted work* or the contractor's employees.
	• Identify all significant *environmental aspects* associated with each job step.
	• Specify control measures required to eliminate or minimize the hazards/aspects identified incorporating all OPG requirements.
	• List the steps to be taken in case of an emergency, including calling local emergency numbers.

Finalize the CMP as per Step 1.3 and Release the Work

To Do	*Notes*
Approve CMP	• The CMP shall be approved prior to proceeding with the Contract Execution Stage of the process.

Obtain the Contract *Owner*'s Work Release Approval ***Complete Form 3***	• The CA shall complete the Contract Work Release form and submit it to the Contract *Owner* for approval • Completed detailed CMPs shall be registered in PASSPORT for Nuclear BU.

Note

Handouts at the meeting may include:

- Site specific procedures
- OPG Corporate Safety Rules, Common Safety Rules, WPC, Environmental Policy, Contractor's Safety Instruction for Thermal and Hydroelectric.

Deliverables

1. Finalized CMP

STAGE III - RECORDS GENERATED

Records

Document No.	Title
FIN-FORM-CM-003	Form 3 – Contractor Work Release
FIN-FORM-CM-011	Worksheet E – Contract Work Release Worksheet
N-FORM-10448	Nuclear Energy Worker Confirmation Form for OPG Employees
0175 (MOL)	Notice of Project
Form 1000 (MOL)	Registration of *Constructors* and Employers Engaged in *Construction*
	CMP
	Minutes of the Job-Site and Orientation Meetings
	Minutes of the Mark-Up Meeting
	Record of Site Orientation
	Record of Training and Qualifications

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4A. STAGE IV - CONTRACT EXECUTION

IMPORTANT NOTE:

IF IT HAS BEEN DETERMINED IN STEP 1.3 THAT THE CONTRACT IS "*OWNER*-ONLY", DO NOT USE THIS SECTION. PROCEED DIRECTLY TO SECTION 4B.

STEP 4.1 – ADMINISTER THE CONTRACT

Task

Ensure compliance with contractual terms and conditions, and manage changes, during contract performance through to closeout and termination.

Accountabilities

Accountable – CA

Shall Approve – Contract *Owner*

Consult, As Required – Supply Chain

Shall be Informed – Contractor's *Supervisor*, Contract Monitor

References

Document	Title
FIN-FORM-CM-016	Job Aid IV – Contract Change Authorization
Appendix C	OPG Roles and Duties Under the OHSA

Sub-Tasks

Manage the Contract

To Do	*Notes*
Manage Terms and Conditions ***Reference Appendix C***	• Coordinate OPG review and acceptance of contractor submitted documents. • Assess the extent to which contractors are meeting the contract specifications and schedules. • Manage the contract within the stipulated terms and conditions. • Determine if scope changes fall in or out of contract requirements. • Emergency work or service is managed in accordance with OPG-PROC-0058. • The local contract administration team (i.e. Contract *Owner*, CA or Contract Monitor) shall direct the Contractor consistent with the obligations specified under OHSA and the requirement of the CMP.

Manage Contract Changes
 	
Complete Job Aid IV
	• Contract changes shall be reviewed and accepted by the CA and Contract *Owner* and documented using FIN-FORM-CM-016: Job Aid IV.
	  • Refer to OPG-PROC-0058 for details on processing contract changes.
	  • **For Nuclear only:** Refer to N-PROC-MM-0016 for additional details on processing contract changes.

Manage the Financial Aspects of the Contract	• Review contractor claims for extra reimbursement. • Verify that the rates used on invoice match negotiated rates or rate card. • Review and verify invoices for payment. • Ensure efficient management of funding, changes, and invoices.
Provide Status Updates	• Provide status updates, as required, to line management and Supply Chain regarding expenditures, status of work, revised completion dates, etc., in accordance with local reporting requirements.

Deliverables

1. Contract specifications and obligations are met

STEP 4.2 – MONITOR AND VERIFY THE CONTRACTOR'S ACTIVITIES

Task

Monitor work activities to contract compliance.

Accountabilities

Accountable – Contract Monitor

Consult, As Required – CA, Supply Chain

Shall be Informed – Contractor's Representative, Contract *Owner*

References

Document No.	Title
FIN-FORM-CM-013	Job Aid I – Contract Management Plan
FIN-FORM-CM-015	Job Aid III – Safety Certification/Control for Rented or Contractor's Equipment
FIN-FORM-CM-017	Job Aid V – Contract Monthly Safety Incidents
FIN-FORM-CM-012	Worksheet F – Contract Inspection Checklist
968-7671:0	Corporate Report of Injury/Incident
FIN-FORM-CM-020	Daily Log

Sub-Tasks

Monitor the Work

To Do	*Notes*
Monitor and Verify Compliance – Safety, Environment and Quality	• Monitor for compliance with the contract. • Base the frequency of monitoring on the level of *risk* and indicators of compliance for environmental, health and safety and quality, or as documented in the CMP. • For *construction* or high-*risk service contracts*, daily monitoring is required.

To Do	*Notes*
Complete Worksheet F ***Reference Job Aid I*** ***Complete Job Aid III***	• A record of monitoring and verification activities is prepared at least once a week in addition to personal logs (see below). • Review contractor's JSAs and monitor compliance to JSAs. • Monitor contractor's adherence to key elements of contractor's safety program (i.e., *supervisor*, monitoring, pre-job meetings, etc). • If a life-threatening situation is observed, the CA or Contact Monitor stops the work immediately. • Review quality, inspection and test plans, perform (or coordinate with Field Engineering) Inspection and Test Plan hold and witness point inspections and verify conformance. • Confirm inspections, tests and audits through a review of quality records. • Inspect (or coordinate inspection with Field Engineering) contractor's work quality regularly and document concerns. • Confirm adherence to scheduled stop and hold points. • The Contract *Owner* shall periodically monitor the work site for environmental and health and safety issues.
Pre-Job Briefings	• Keep a record of pre-job briefings for which the CA or Contract Monitor were present (noting any health and safety hazards and *environmental aspects* discussed). • Use the contractor's pre-job briefings to advise of any changes in workplace conditions that could impact health, safety or the environment.
Maintain a Logbook	• Keep daily log document of all contractor activities, discussions and deficiencies. FIN-FORM-CM-020, Daily Log, can be used as a template. • Note that the *project* logbook is an extremely important part of the reporting process and may be used in a court of law.

To Do	*Notes*

Maintain Ongoing Hazard Assessment, *Environmental Impact* and Communicate to Contractor	• Assess any potential hazards to employees or the public based on:
	  • Flash Reports or results of accident investigations.
	  • Contractor's work and work practices.
	  • Contractor's tools and equipment.
	  • Assessment of OPG facilities/operations.
	  • Work being performed by other groups.
	  • QA programs.
	  • Inspections, tests and audits as per plan.
	  • Adherence to schedule stop/hold points.
	  • Conformance with all contact health, safety and environmental requirements.

Notify Stakeholders	• Notify all stakeholders of any new hazards or *environmental impacts*. • Communicate this information and any new requirements to the contractor.

Document and Report Deficiencies

To Do	*Notes*
Identify Deficiencies ***Complete Worksheet F***	• Request corrective actions from the contractor and track to completion. Ensure that deficiencies are completed in a timely manner with agreed upon completion dates. Document the agreed upon corrective action plan and the contractor's response. • If the CA cannot resolve a deficiency or it is not complete in a timely manner, review contractual options with Supply Chain and use them to affect a resolution. Address non-compliance issues to correct deficiencies using escalating corrective action up to and including de-selection of contractor.

To Do	*Notes*

	• Identify issues/deficiencies to Supply Chain and resolve them within the terms and conditions of the contract.
	• If the deficiencies require immediate corrective action then:
	  • Stop work until the problem is corrected.
	  • State that failure to comply may result in contract termination.
	  • Specify a date by which a written response shall be received. Based on the severity of the problem, a formal request may be sent to the contractor's executive officers.
	  • Review the contractor's response and decide if the deficiencies can be resolved.
	  • Notify Supply Chain.

Document Deficiencies	• Document deficiencies, incidents and contract deviations. • In Nuclear, use the Station Condition Record (SCR) to input all incidents and deficiencies.
Report Deficiencies	• Report serious deficiencies as soon as practical to the Contract *Owner* or CA (e.g., life threatening, etc). • Forward copies of deficiency documentation to the contractor along with any non-conformances and a request for corrective action. **For Nuclear Only:** • The CA or Contract Monitor shall notify their *supervisor* immediately of all SCR's being entered. • An evaluator (usually the Section Manager) shall be assigned and a rating attached to the SCR indicating the manner of investigation and follow-up.

To Do	*Notes*
Report Safety Incidents and Environment ***Complete Job Aid V***	• Report all safety incidents immediately to the CA including contractor High MRPH incidents, critical injuries, lost time accidents, medical treatment injuries, MOL charges, MOL Orders to Comply, and all *construction* occurrences. ***Reference "Safety Incident Management Standards" OPG-SFTY-STD-005*** The CA initiates the reporting notification and investigation requirements according to corporate and local procedures. • For non-nuclear, fax a copy of the form to site health and safety support staff. ***(Reference "Corporate Report of Incident/Injury Form" - 968-7671:0)*** • For Nuclear BU, file a SCR. • Report all nonconformances. • All incidents above should be reported to the Contract *Owner*. • Report all significant environmental incidents to the Contract *Owner* and corrective actions taken using the appropriate BU procedures.
Follow-up/Verification ***Record the follow-up/verification***	• A formal request for correction of all deficiencies should be made by the Contract *Owner* to the contractor. • Ideally, a collaborative solution to the problem shall be possible.

Deliverables

1. Compliance to contract specifications and obligations
2. Compliance to Environmental Health &Safety (EH&S) and quality requirements
3. Documented deficiencies
4. Correction of problems and deficiencies

STEP 4.3 – REPORT ON PERFORMANCE

Task

Document administrative actions and all data required to support the *project's* business activities and performance assessments.

Accountabilities

Accountable – CA

Shall Review – Contract *Owner*, Contract Monitor, Supply Chain, and other stakeholders

Shall be Informed – Contractor's Representative

References

Document No.	Title
FIN-FORM-CM-012	Worksheet F – Contract Inspection Checklist
FIN-FORM-CM-013	Job Aid I – Contract Management Plan
FIN-FORM-CM-017	Job Aid V – Contract Monthly Safety Incidents

Sub-Tasks

Stay Informed

To Do	*Notes*
Hold Contract Review Meetings ***Reference Job Aid I Record of Contract Review Meeting***	• Meet regularly with the contractor and Supply Chain to discuss progress, deficiencies, OHSA and environmental violations, and the status of corrective actions and any new information or requirements from Flash Reports or accident investigations.
Mentor Safety Excellence ***Reference Job Aid I***	• Ensure that contractors conduct regular staff safety meetings. • Ensure compliance with health and safety and environmental monitoring/reporting requirements.

To Do	Notes
Status Review and Corrective Action	• Hold regular meetings with the contractor to discuss performance and corrective actions. • Document the meetings. • Follow up and report on required corrective actions.

Safety Performance Summary

To Do	Notes
Review Joint Health and Safety Committee (JH&SC) Minutes	• Review JH&SC meeting minutes, if applicable, and reports, prepared by contractors.
Maintain Safety Report ***Complete Worksheet F*** ***Complete Job Aid V***	• Maintain monthly safety performance reports, per local procedures, including the number of High MRPH incidents, lost time accidents, medical treatments, first aid treatments, hours worked, accident severity rate, and lost time accident rate.

Audit

To Do	Notes
Audit Key Activities (*Constructor*) ***Complete Worksheet F*** ***Reference Job Aid I***	• As the *constructor*, OPG shall also audit key activities in the contractor's health and safety program as specified in the contract and in the CMP.

Deliverables

1. A series of completed reports that provide a clear indication of *project* progress and the contractor's performance.

STEP 4.4 – VERIFY CONTRACT COMPLETION

Task

Verify that the technical and commercial contract conditions have been fulfilled.

Accountabilities

Accountable – CA

Consult, As Required – Contract Monitor, Contract *Owner*

Shall be Informed – Contractor's Representative

References

Document No.	Title
FIN-FORM-CM-004	Form 4 – Contract Final Inspection
FIN-FORM-CM-012	Worksheet F – Contract Inspection Checklist
FIN-FORM-CM-013	Job Aid I – Contract Management Plan

Sub-Tasks

Inspect the Site to Ensure Contract Requirements Have Been Met

To Do	*Notes*
Inspect the Site and Compare the Work Against the Contract (Pre-demobilization) ***Reference Job Aid I***	• Determine if any contract conditions have not been fulfilled. • Inform the contractor's *supervisor* of deficiencies to be corrected prior to OPG's confirmation of contract completion.
Ensure Contract Requirements Have Been Met (Post demobilization) ***Record on Form 4*** ***Reference Job Aid I***	• Inspect the site to ensure that all contract requirements have been met following site demobilization. Note: This inspection cannot be assigned to a third party. • Ensure that all turnover training is complete (through customer acceptance of the equipment for operations).

To Do	*Notes*
Check the Site for Cleanliness ***Record on Form 4*** ***Reference Job Aid I***	• Ensure that all equipment and all hazardous, surplus and debris materials have been removed from the site. • Report findings to the Contract *Owner*. • Report the use of any National Pollutant Release Inventory (NPRI) substances to the local environmental support staff.

Develop a Turnover Package
 	
Reference Job Aid I
Record on Form 4
	• The contractor develops a turnover package that includes:
	  • Required documentation
	  • Training
	  • Affected drawing
	  • Certifications
	  • Manuals
	  • Inspection and test results
	  • Health and safety and environmental documents and records
	• Forward the package to the CA for review.

Inform Stakeholders of New Hazards

To Do	*Notes*
Check Health & Safety Hazards	• If new health and safety hazards have been created by the contract work and cannot be immediately eliminated or controlled, the Contract *Owner* informs the affected line manager and/or employees and develops a corrective action plan.
Check Environmental Requirements	• Communicate any new requirements for Certificates of Approval or permits to the appropriate site environmental support staff. • Advise the Plant/Group Manager of any changes to inventories of PCB, ozone depleting substances, etc.

Confirm Final Inspection

To Do	*Notes*
Complete Form 4	• The Contract *Owner* shall approve the turnover of the *project*.

Deliverables

1. A clean site ready for work

2. Completed turnover training

STAGE IV - RECORDS GENERATED

Records

Document No.	Title
FIN-FORM-CM-004	Form 4 – Contract Final Inspection
FIN-FORM-CM-012	Worksheet F – Contract Inspection Checklist
968-7671:0	Corporate Report of Injury/Incident
FIN-FORM-CM-015	Job Aid III – Safety Certification/Control for Rented or Contractor's Equipment
FIN-FORM-CM-016	Job Aid IV – Contract Change Authorization (if required)
FIN-FORM-CM-017	Job Aid V – Contract Monthly Safety Incidents
	Pre-job Briefings
FIN-FORM-CM-020	Job Aid VIII – Daily Log
	Deficiencies Reports
	Disposition of deficiencies and follow-up activities
	SCRs – Nuclear Only
	Notification of New Hazards or *environmental impacts*
	Minutes of Contract Review Meetings
	Audit Reports

4B. STAGE IV - CONTRACT EXECUTION (OWNER-ONLY)

IMPORTANT NOTE: THIS SECTION SHOULD NOT BE USED UNLESS IT HAS BEEN DETERMINED IN STEP 1.3 AND 1.4 THAT THE CONTRACT IS "*OWNER*-ONLY". THE "*OWNER*-ONLY" PORTIONS OF APPENDIX C ("ROLES AND DUTIES UNDER OHSA") SHALL BE REVIEWED AS WELL PRIOR TO EXECUTION OF AN *OWNER*-ONLY CONTRACT.

General Methodology

The OHSA allows an *owner* to pass to a contractor the responsibility and OHSA liability with respect to the execution of a *Project*. In order to avoid an *Owner* being found to be the "*Constructor*", the *Owner* shall allow the contractor complete control to determine the means, methods and procedures for the execution of the work. The *Owner* can prescribe the contract specifications the *Constructor* shall meet (i.e. the "product" the contractor shall design or build) but cannot dictate, recommend or suggest to the *Constructor* how they should achieve the product/specifications. This applies to any work relating to the *Project*, whether it is Health & Safety, Environmental, Engineering or any other area. This does not mean, however, that an *Owner* cannot take some reasonable steps to ensure the *Project* is completed safely. OPG has committed to hiring safe contractors. It is during the Procurement stage of a *Project* when an *Owner* should evaluate the safety performance , company safety program and procedures, and any PSSSP submitted at that stage to ensure the *Owner* is comfortable that the *Constructor* that is hired shall execute the work competently and safely. See Appendix C for details.

Once OPG contracts with a *Constructor*, OPG tasks during contract execution shall be limited to monitoring the *Constructor* for compliance to the specifications and requirements in the written contract. If, as part of the contract terms or submittals, the Contractor has incorporated specific procedures or safeguards into the work (e.g. through *Project* Site Specific Safety or Environmental Plans) then OPG is entitled to monitor the Contractor to ensure the Contractor complies with what the Contractor itself determined was reasonable and contracted to do.

STEP 4.1 – ADMINISTER THE CONTRACT (OWNER-ONLY)

Task

Administer and record job progress. Monitor the work to ensure compliance by the contractor (*Constructor*) to contract specifications and requirements.

Accountabilities

Accountable – CA

Shall Approve – Contract *Owner*

Consult, As Required – Supply Chain

References

Document	Title
FIN-FORM-CM-016	Job Aid IV – Contract Change Authorization
FIN-FORM-CM-022	Control of Hazardous Energies Form
FIN-FORM-CM-023	Job Aid IX- Control of Hazardous Energies Walkdown

Sub-Tasks

Manage the Contract

To Do	***Notes***
Ensure Physical Isolation of Staff ***Reference Appendix B*** ***Complete FIN-FORM-CM-022***	• Ensure that effective physical barriers are in place to create a separation of all OPG work and staff from the *Constructor's* work and staff. The *Constructor* shall have a *construction island* within which it can perform its work, so that safety of the *Constructor's* staff shall not be impacted by OPG work (and vice versa). • Ensure *MOU* is completed. • Review Control of Hazardous Energies Form if applicable and complete a walkdown to verify and document that the conditions are accepted. Reference Job Aid IX. • Physical separation shall usually be achieved by erecting fences, installing concrete barriers, or walls; if there are natural barriers in place these may be sufficient to delineate one or more boundaries of a *construction island* (e.g. a forested area or canal separating the *construction* area from where other OPG work is occurring). • Temporary extensions to the *construction island* may be necessary in some situations. For example, it may be permissible to allow the *Constructor* to add to the main *construction island* fence for a week to perform tie-ins to service lines or pipes outside of the main fenced area. After the service tie-ins are complete the *Constructor* shall turn the temporarily fenced area back to OPG.
Manage Terms and Conditions ***Reference Appendix C***	• Assess the extent to which contractors are meeting the contract specifications and schedules based on CMP. • Manage the contract within the stipulated terms and conditions. • The contractor is the *Constructor* and OPG does not have the responsibilities of the *Constructor* as stipulated in OHSA. OPG shall fulfill the *Owner*-Only OHSA obligations listed in Appendix C.

To Do	*Notes*

Manage Contract Changes
 	
Complete Job Aid IV
	• Contract changes shall be reviewed and accepted by the CA and Contract *Owner* and documented using FIN-FORM-CM-016: Job Aid IV.
	  • Refer to OPG-PROC-0058 for details on processing contract changes.
	  • **For Nuclear only:** Refer to N-PROC-MM-0016 for additional details on processing contract changes.

Manage the Financial Aspects of the Contract	• Review claims. • Verify that the rates used on invoice match negotiated rates or rate card. • Review and verify invoices for payment. • Ensure efficient management of funding, changes, and invoices.
Provide Status Updates	• Provide status updates, as required, to line management and Supply Chain regarding expenditures, status of work, revised completion dates, etc.

Deliverables

1. Contract specifications and obligations are met.

STEP 4.2 – MONITOR & VERIFY CONTRACTOR'S ACTIVITIES (OWNER-ONLY)

Task

Monitor work activities to verify contract compliance.

Accountabilities

Accountable – CA, Contract Monitor (if necessary)

References

Document No.	Title
FIN-FORM-CM-013	Job Aid I – Contract Management Plan
FIN-FORM-CM-020	Job Aid VIII – Daily Log

Sub-Tasks

Monitor the Work

To Do	***Notes***
Monitor and Verify Contract Compliance for Schedule	• Monitor for compliance with respect to schedule adherence. Safety inspections shall not be done since OPG is not the *constructor*. Doing so could jeopardize OPG's role of "*Owner*-Only" and OPG can periodically audit the *Constructor* to ensure the *Constructor* is complying with its company safety program and PSSSPs and Environmental Plans, e.g. if contractor's Safety Program indicates it shall prepare a written JSA for all trenching work OPG should periodically check to ensure *Constructor* is doing so. • OPG staff may be asked to perform QA field visits but should avoid doing so. OPG should request the *Constructor* perform and attend the visit so as to ensure any individuals on the visit meet the *Constructor's* safety requirements and that the *Constructor* is liable should individuals on the visit be injured. OPG staff may participate in the visit including assisting the *Constructor* to describe the *project* or explain the *project* goals and status. • OPG staff if performing an audit to ensure the contractual obligations are being met shall remember that they shall follow the *constructor's* safety program while in the *Construction Island*.

To Do	***Notes***

Maintain Ongoing Assessment of Hazards and *Environmental Impacts*	• Assess any potential hazards to OPG employees, operations or the public based on:
	  • Contractor's work and work practices.
	  • Contractor's tools and equipment.
	  • Assessment of OPG facilities/operations.
	  • Work being performed by other groups.
	• Request *constructor* provide list of hazardous materials that may have *environmental impact*.
	• Review, inspection and test plans.
	• QA programs.
	• Inspections, tests and audits as per plan.
	• Adherence to schedule stop/hold points.
	• Conformance with all contract health, safety and environmental contractual requirements.
	• Notify the contractor of any new hazards or *environmental impacts* that may be introduced as a result of OPG work (although OPG work should not endanger the *Constructor* and its staff. If OPG work creates safety hazards to the *Constructor* or requires intermingling of *Constructor* and OPG staff (OPG staff not involved in contract compliance monitoring) then OPG may have to take on role of *Constructor*. Consult Law if such scenarios arise.
	• Review conformance and compliance with contract environmental requirements.
	  • Stop the contractor's work if there are serious quality issues or other significant non-compliances with contract requirements that should be remedied before the work continues; however, reinforce the fact that the contractor is responsible (as the *Constructor*) for correcting safety concerns and determining how the work is to be executed.

To Do	*Notes*
Maintain a Logbook	• Keep daily logs documenting all contractor activities, discussions and nonconformances. Ensure that entries regarding any discussions are written clearly to avoid the reader having the impression that OPG suggested or recommended to the *Constructor* procedures to use or how a non-compliance with the contract requirements should be addressed (other than to note OPG required a clear term of contract be followed). • Note that the *project* logbook is an extremely important part of the reporting process and may be used in a court of law (e.g. dispute regarding delays or approval of extras).
Confirm Performance ***Reference Job Aid I***	• Confirm inspections, tests and audits through reviews of quality records. • Confirm adherence to scheduled stop and hold points. • Establish hold points with the contractor whereby the *owner's* representative can witness tests (if required).
Identify Deficiencies	• Identify deficiencies to Supply Chain and resolve them within the terms and conditions of the contract.

Document Reported Deficiencies

To Do	*Notes*
Document and Report Deficiencies	• Document and report all deficiencies, incidents and contract deviations. • Report serious deficiencies immediately if practical to the Contract *Owner* or CA (e.g., life threatening, significant environmental *risk*, etc). • Forward copies to the contractor along with any nonconformances and a request for corrective action.
Note the Special Provisions for Nuclear Reporting	• For **Nuclear BU**, use the SCR process to input all incidents and deficiencies for tracking purposes. • The CA or Contract Monitor shall notify their *supervisor* immediately of all SCRs being entered. • An evaluator shall be assigned and a rating attached to the SCR, indicating the manner of follow-up.

To Do	*Notes*

Report Safety Incidents	• Contractor shall immediately report:
	  • Fatality
	  • Critical Injury
	  • *Construction* Occurrence
	  • MOL Orders and Charges.
	• Report all safety incidents reported by the Contractor including critical injuries, MOL charges, MOL Orders to Comply, and all *construction* occurrences. Refer to OPG-SFTY-STD-005, Safety Incident Management Standard, and local procedures for reporting requirements.

Report Environmental Incidents	• Review and report all significant environmental incidents reported by the contractor and any corrective actions taken as per OPG procedures.
Report Deficiencies	• Report all deficiencies to accountable OPG staff, including the Contract *Owner*.

Monitor for Correction of Problems

To Do	*Notes*
Monitor the Status of Corrections	• Participate in the regular meetings with the Contract Management Team (including the contractor) to discuss progress, deficiencies, OHSA and environmental violations, and the status of corrective actions (again, OPG shall not suggest or recommend the means, methods or procedures to use to correct the deficiencies). • Document the agreed upon corrective action plan for deficiencies and the contractor's response. • Request the status of corrections for all deficiencies from the contractor.

Disposition Cases Requiring Immediate Action	• If the nonconformances/non-compliances require immediate corrective action then:
	  • Ensure that this is quickly brought to the attention of the contractor's site superintendent for immediate correction
	  • Ensure that non-compliance is recorded and, if applicable, send a copy to senior management of the contractor. Supply Chain shall be involved in this decision.

Deliverables

1. Compliance to contract specifications and obligations
2. Compliance to EH&S and quality obligations
3. Control of hazardous energies form
4. Documented deficiencies
5. Correction of problems and deficiencies

STEP 4.3 – REPORT ON PERFORMANCE (OWNER-ONLY)

Task

Document administrative actions and all data required to support the *project*'s business activities and performance assessments.

Accountabilities

Accountable – CA

Consult, As Required – Contract Monitor, Supply Chain, Contract *Owner*

Shall be Informed – Site Superintendent

References

Document No.	Title
FIN-FORM-CM-013	Job Aid I – Contract Management Plan

Sub-Tasks

Stay Informed

To Do	*Notes*
Hold Contract Review Meetings	• Participate in regular meetings with the Contractor to discuss performance and the status of corrective actions (ensuring that the contractor's responsibility as *Constructor* is maintained). • Ensure that meetings are documented. • Follow up and report on required corrective actions.
Maintain Safety Reports	• Maintain monthly safety performance reports from contractors (as stipulated in the contract). These shall include reports with numbers of lost time accidents, medical treatments, first aid treatments, and hours worked, which are submitted monthly by the contractor.

To Do	*Notes*
Conduct Surveillance Audits ***Reference Job Aid I***	• Audit quality, inspection and test plans and verify conformance per BU requirements. Site visits focussed on auditing for contract non-compliance relating to contract safety requirements should occur no more often than on a weekly basis (bi-weekly is appropriate for the majority of *Projects*). • Audit records and conduct quality audits (or co-ordinate with a qualified person to do so) in order to verify contractual compliance.

Deliverables

1. A series of completed reports that provide a clear indication of *project* progress and the contractor's performance.

STEP 4.4 – VERIFY COMPLETION OF CONTRACT (OWNER-ONLY)

Task

Verify that the technical and commercial contract conditions have been fulfilled.

Accountabilities

Accountable –CA

Consult, As Required – Contract Monitor

Shall be Informed – Site Superintendent

References

Document No.	Title
FIN-FORM-CM-013	Job Aid I – Contract Management Plan
FIN-FORM-CM-004	Form 4 – Contract Final Inspection

Sub-Tasks

Inspect the Site & Ensure Contract Requirements Have Been Met

To Do	*Notes*
Inspect the Site and Compare the Work Against the Contract ***Reference Job Aid I***	• Determine if any contract conditions have not been fulfilled. • Inform the contractor's *supervisor* of any non-conformances to be corrected prior to OPG's confirmation of contract completion.
Ensure that all Training is Complete ***Reference Job Aid I***	• Ensure that all turnover training is complete (through customer acceptance of the equipment to run).
Check the Site for Cleanliness ***Report on Form 4***	• Ensure that all equipment and all hazardous, surplus and debris materials have been removed from the site. • Report findings to the Contract *Owner*. • Record the use of any NPRI substances to appropriate site environmental support staff.

Inform Stakeholders of New Hazards

To Do	*Notes*
Check Health & Safety Hazards ***Reference Job Aid I***	• Provide the Pre-Start Health & Safety Review Report or any exemption memorandum to the appropriate line manager, if applicable. • If new health and safety hazards or significant *environmental impacts* have been created by the contract work and cannot be immediately eliminated or controlled, the Contract *Owner* informs the affected line manager and/or employees and develops a corrective action plan.
Check Environmental Requirements	• Communicate any new requirements for Certificates of Approval or permits to the appropriate site environmental support staff. • If any Certificates of Approval or permits have not been finalized, obtain interim approval from the Ministry of the Environment to commission the equipment. • Advise the Plant/Group Manager of any changes to inventories of PCB's, ozone depleting substances, etc.
Check Reporting Requirements	• Notify the appropriate government agencies of any outstanding reporting requirements.

Confirm Final Inspection

To Do	*Notes*
Complete Form 4	• The Contract *Owner* shall approve the turnover of the *project* to OPG. On occasion it shall be necessary for OPG to become the *Constructor* for the remainder of the *project*. For example, if an office building was almost completed but OPG staff started to move into the building while minor interior finishing, HVAC system testing, etc. was being completed by the Contractor then OPG would need to adopt the *Constructor* role if complete separation/isolation of OPG staff and contractor staff could not be maintained.
Inform Supply Chain of Contract Status	• Inform Supply Chain when all conditions of the contract have been satisfied.

Deliverables

1. A clean site ready for work
2. Completed turnover training

STAGE IV B - RECORDS GENERATED

Records (*Owner*-Only Contracts)

Document No.	Title
FIN-FORM-CM-004	Form 4 – Contract Final Inspection
968-7671:0	Corporate Report of Injury/Incident
FIN-FORM-CM-016	Job Aid IV – Contract Change Authorization (if required)
	Record of Monitoring and Verification Activities
FIN-FORM-CM-020	Job Aid VIII – Daily Log
	Deficiencies Reports
	Disposition of deficiencies and follow-up activities
	SCRs – Nuclear Only
	Notification of New Hazards or *environmental impacts*
	Minutes of Contract Review Meetings
	Audit Reports

5. STAGE V - CONTRACT CLOSEOUT

STEP 5.1 – EVALUATE AND REPORT ON PERFORMANCE

Task

Complete the final contract close out report for the Contractor's performance.

Accountabilities

Accountable– CA

Shall Approve – Contract *Owner*

Consult, As Required – Supply Chain, Contract Monitor Engineering, Safety, Environmental

Shall be Informed – Contractor's Representative

References

Document No.	Title
FIN-FORM-CM-005	Form 5 – Contract Close-out and Evaluation

Sub-Tasks

Conduct a Performance Evaluation

To Do	***Notes***
Evaluate the Contractor's Performance ***Complete Form 5***	• Identify contract deliverables and verify the extent to which they were met. • Evaluate contractor performance. • Complete FIN-FORM-CM-018. • Complete the evaluation within two weeks of contract completion. Forward a copy to the Supplier Safety Compliance Department at P82-2 and distribute additional copies per local procedures (e.g., to Supply Chain). File a copy of the Form 5 in the contract master file.
Review the Evaluation	• Supply Chain shall obtain additional information (if needed) to assess the fairness and objectivity of the evaluation and to determine any necessary actions (e.g., redoing a portion of the work, etc).
Retain Data for Future Use	• Evaluation data is retained in a database and considered as part of the contractor qualification/requalification process.

Note

Inputs to the contractor evaluation include:
- Weekly inspection documents.
- Minutes of regular meetings with the contractor.
- Correspondence with the contractor.
- Safety performance statistics for the duration of the contract.
- Contractor's responsiveness to requests for corrective actions.
- Safety or environmental regulatory non-compliances .

Note

The Contract Closeout and Evaluation Form shall be completed annually for contracts that are in place for more than one year. It should be completed and sent to Supply Chain every year for the duration of the contract.

Note

The intention of performing the closeout is to accurately assess the performance of the contractor based on the criteria they were chosen on. This information should also be shared with the contractor in order that they improve their processes or are given both positive and negative feedback. It is also the opportunity for the contractor to provide positive and negative feedback on how OPG administered the process so OPG is also capable of improving.

Deliverables

1. Database summary of contractor performance for reference in issuing future contracts.

STEP 5.2 – CLOSE OUT THE CONTRACT

Task

Ensure that all work has been completed successfully and that all deficiencies and administrative matters have been resolved.

Accountabilities

Accountable – CA

Shall Approve – Contract *Owner*, Engineering, Human Resources, Finance and other stakeholders, as required.

Consult, As Required – Supply Chain, Contract Monitor

Shall be Informed – Contractor's Representative

References

Document No.	Title
FIN-FORM-CM-018* * The use of the Notice of *Construction Contract* Completion is mandatory for contracts when a hold back is used and for *construction contracts* other than *drawdown contracts*.	Job Aid VI – Notice of Construction Contract Completion

Sub-Tasks

Verify Contract Completion and Close the Purchase Order

To Do	***Notes***
Verify Work Completion	• Verify that contract deliverables have been met. • Verify that deficiencies have been corrected.
Check WSIB Clearance Certificate Prior to Issuing Payment	• OPG is responsible for any outstanding WSIB costs if the Clearance Certificate has lapsed.
Close the Purchase Order ***Complete Job Aid VI***	• Notify Supply Chain that the job is complete.

Deliverables

1. Completed contract and a closed purchase order.

STAGE V - RECORDS GENERATED

Records

Document No.	Title
FIN-FORM-CM-005	Form 5 – Contract Closeout and Evaluation
FIN-FORM-CM-0018	Job Aid VI – Notice of Construction Contract Completion

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6. SMALL CONTRACTS

This section is a simplified version of the Contract Management Process and applies to:

1. Service, maintenance or *construction contracts* with a value of less than $200,000 and involving five or less contractor employees

   NOTE: This is a guideline for when the small contract management process is to be used. The aim of the contract management process is to ensure that the deliverable(s) of an agreement are met. If the dollar value and number of workers involved is greater than $200,000 and 5 workers and the small contract management process provides adequate guidance and documentation, then it may be used. The intention is to allow the Contract Administration team the flexibility to use either the small process or large process depending on *risk* and how that *risk* is mitigated.

2. Management of *augmented staff* performing physical work at OPG facilities.

   The small contract management process shall be used to manage *augmented staff* performing physical work at OPG facilities. These workers are hired to work with existing staff, bringing either specialized knowledge or equipment or additional labour to a job. Examples are: workers of a trade contractor (e.g. crane rental with operator) or specialized services, (e.g. annual fire alarm checks). The Contract *Owner* shall ensure the line organization has accepted responsibility to supervise the execution of work.

   The Contract *Owner* is responsible to ensure that the process outlined here is followed. Note the different paths to follow in the processes from step 6.3 onward for *augmented staff* or Small Contracts.

   For service or *maintenance contracts* the role of OPG is as Extended *Employer* (See Appendix C for guidance regarding OPG's role). If the work is ongoing and does not change significantly from job to job, the Contract Administrator shall complete the Form 6 Small Contract Management Folder at the beginning of the contract and review with the contractor annually on the anniversary date of the contract.

   If the safety, environmental or quality aspects of the *contracted work* could/may change during the life of the contract and will not be managed through other processes, the Contract Administrator will determine if a more frequent review of the Form 6 with the contractor is required, based on an assessment of the *risk*s presented. During the execution of the small service or *maintenance contract*, it is recommended that the Contract Administrator monitor the work periodically with frequency based on *risk* and record his or her observation in Section 11 Field Log of the Form 6 or other log being used by the Contract Administrator.

The Process

STEP 6.1 – PLANNING/HAZARD ASSESSMENT

Task

Define the scope of the work and the contract requirements.

Accountabilities

Accountable – Contract *Owner*

Responsible – Contract Administrator

References

Document No.	Title
FIN-FORM-CM-006	Small Contract Management Folder

Note

A Stratum IV Manager can approve the substitution of a local job planning folder/job aids in place of the Form 6 only if the same material is addressed. All the sections of Form 6 must be addressed but may be completed using any other means acceptable to the users. For example, if Section 9 Contract Requirements Summary is not used, the information captured on it has to be provided to the buyer in a form acceptable to the buyer. If there is a separate Contract Monitor, information they need such as the applicable safety requirements needs to be passed on clearly.

Sub-Tasks

To Do	*Notes*
Define the scope of the work ***Record on Form 6***	• Clarify expectations and deliverables with the accountable manager requesting the work.
Establish OPG's role and duties under OHSA Reference Appendix C Record on Form 6	• Review Appendix C and determine whether OPG is the *Constructor* or Extended *Employer*.
Conduct a safety hazard assessment and, if required, an *environmental aspects* assessment ***Record on Form 6***	• Identify hazards and environmental aspects and the necessary controls. • As part of this assessment, identify other work processes in the area and exposure to any designated substances. • Use support staff to assist in preparing the job plan when there are new hazards to be considered. • For repeat jobs review the previous job safety analysis/hazard assessment and environmental aspect assessment and update for any changes.
Identify applicable safety and environmental standards	• Identify any safety and environmental governing documents that apply. • Identify the specific requirements from these governing documents that apply to this contract. • Identify any Certificates of Approval required.
Identify product quality requirements ***Record on Form 6***	• List all product quality and performance requirements.
Identify resources ***Record on Form 6***	• Identify which of the following resources are required: Contract Monitor, technical support, safety or environmental support, site maintenance, etc.
If required, arrange Work Protection ***Reference Appendix B*** ***Record on Form 6***	• Determine who will hold the Work Protection – the Contract Administrator or delegate or the contractor. • Note that training is required for contract staff working under Work Protection.
Identify Security requirements ***Record on Form 6***	• All personnel must be security cleared to work at OPG facilities. Contractors must be made aware of this requirement and the process and required timing to ensure proper processes are followed.

To Do	*Notes*
Contract requirements	• Summarize and issue contract requirements to Supply Chain for inclusion in the *RFP*.

Deliverables

1. Summary of contract requirements including:
   - Safety hazards and associated control measures.
   - Environmental aspects and impacts associated control measures
   - Applicable OPG safety and environmental requirements
   - Quality controls
   - List of designated substances that the contractor may be exposed to.

STEP 6.2 – PROCUREMENT

Task

Select a qualified Contractor and issue a purchase order.

Accountabilities

Accountable – Supply Chain

Must Review – Contract *Owner*/Contract Administrator

References

Document No.	Title
FIN-FORM-CM-006	Small Contract Management Folder

Sub-Tasks

To Do	*Notes*
Identify potential Contractors	• Supply Chain, with input from the requisitioner, shall assemble a list of potential *suppliers* to approach for formal *RFQ* and *RFP* based on the criteria as identified in OPG-PROC-0058.
Ensure potential Contractors are Prequalified	• If a *proponent* is not in the Safety Environment and Quality Database and the *ASL* (if applicable), the *Proponent* shall be pre-qualified by Supply Chain prior to accepting their proposal.
Solicit Bid ***Record list of Proponents***	• Use established templates developed by Corporate Supply Chain to request bids.
Evaluate Bids ***Record the evaluation and Bid selection summary***	• Evaluate the bid submissions in accordance with OPG-PROC-0058. • Verify the health and safety and environmental qualifications of the contractor and their sub-contractor's against contract specifications. • Note any deficiencies identified in the contractor's Health and Safety Program by the pre-qualification evaluation and determine the actions required to address these deficiencies.
Award the contract	• Contact the successful *proponent* to review and confirm the contract requirements. • Review any specific requirements for coming onto the site.

Note

All *proponent*s must be pre-qualified by Corporate Supply Chain.

Note

FIN-FORM-CM-002: Form 2 – Proponent Selection Summary, is optional for small contracts. It is useful for multi-bid contracts to determine the best qualified contractor or when the Contract *Owner* or Buyer is unfamiliar with the *proponents*.

STEP 6.3 – POST AWARD

Task

Ensure that all issues are discussed and a consensus is reached on the expectations for the work.

In the case of *augmented staff*, ensure direct supervisory role has been assigned to an OPG *Supervisor* and expectations with respect to *augmented staff* performing physical work at OPG facilities (e.g., crane rental with operator and/or specialised services e.g., annual fire alarm checks have been reviewed).

Accountabilities

Accountable – Contract Administrator or OPG *supervisor**

****NOTE***: The OPG *supervisor* for the work assumes full supervisory responsibilities as per the duties of the OHSA and applies the same due diligence as for OPG employees.

Shall Review – Contract *Owner*

References

Document No.	Title
FIN-FORM-CM-006	Form 6: Small Contract Management Folder

Sub-Tasks (as applicable to contractor or *augmented staff*)

To Do	*Notes*

Review site specific hazards/aspects and requirements
 	
Record minutes of meeting
	• Hold a meeting on site with the contractor, sub-contractor and respective staff. If appointed, the contract monitor should also attend.
	  • Reach agreement on expectations for the work including the schedule.
	  • Review terms and conditions.
	  • Review site access and security issues.
	  • Identify the hazards, including designated substances, that the contractor could be exposed identified in Form 6.
	  • Identify steps OPG will take to protect the contractor from the hazards created or controlled by OPG.
	  • If applicable, review the control measures needed to protect the environment.
	  • Review applicable safety and environmental procedures with this contractor

Check Safety Certification of Equipment ***Record on Job Aid III***	• Check contractor employee safety qualifications. • Have the contractor certify the safe condition of transport and work equipment and rental equipment if applicable.
Review Hazmat Products	• Have the contractor submit MSDS sheets for new products to be brought on site and get them approved if applicable
Work Protection	• Have any required WPC documentation prepared.
Review and Approve Readiness to Start Work	• Review Work Protection requirements with contractor. • Review contractor's job safety plans specific to the work being done to ensure that all hazards and controls are consistent with OPG requirements specified in Form 6.

Augmented Staff Only

To Do	*Notes*
Review site specific requirements ***Record on Form 6 or local business unit job plan***	• Review site access and security issues. • Conduct jobsite orientation. • Review applicable OPG safety and environmental procedures. • Check contractor employee safety qualifications and site specific training requirements.
Check Safety Certification of Equipment if applicable ***Record on Job Aid III***	• Have the contractor certify the safe condition of transport and work equipment and rental equipment.

Note

Handouts at the initial meeting can include those specific safety procedures and environmental procedures specified in the contract and:

1. Schedules
2. Any site specific information (e.g. security, access, parking, emergency plan etc.) required for contractors.

STEP 6.4 – ADMINISTER THE CONTRACT

Task

Manage the Contractor's execution of the work.

Manage *augmented staff* performing physical work at OPG facilities.

Augmented staff becomes part of the work crew for the work.

Accountabilities

Accountable – Contract Administrator or OPG *Supervisor**

NOTE: The OPG *supervisor* for the work assumes full supervisory responsibilities as per the duties of the OHSA and applies the same due diligence as for OPG employees.

Consult, As Required – Contract Monitor

References

Document No.	Title
FIN-FORM-CM-006	Form 6: Small Contract Management Folder

Sub-Tasks (as applicable to contractor or *augmented staff*)

To Do	*Notes*
Verification of Equipment ***Job Aid III***	• Verify with contractor that their equipment has been certified and approved for use. Check environment protection measures if any are required.
Administer the Contract ***Record follow-up on documented deficiencies***	• Coordinate the work and record job progress. • Follow up with contractor to correct deficiencies.

To Do	***Notes***
Monitor and Verify the Contractor's Activities ***Reference Form 6***	• Monitor for compliance with the contract, requirements in Form 6 and the contractor's job safety plan. • The frequency of monitoring should be based on the level of *risk* (health and safety, environment or quality) associated with the work being done by the contractor. • Stop any unsafe work where there is immediate danger and report this to the Contract *Owner* and contractor's *supervisor* immediately. • Maintain a personal log documenting all contract activities, discussions and deficiencies. • Follow up with contactors to correct deficiencies and track to ensure deficiencies are complete. Discuss any ongoing deficiencies with the Contract *Owner*. • Conduct an ongoing assessment of any new potential hazards due to OPG's operations or the contractor's work. • Coordinate the reporting of any reported accidents/spills/incidents according to local procedures.

To Do For *Augmented staff*	• Ensure *augmented staff* participates in *safe work planning* and tailboard meetings with the OPG work crew and sign on as crew member.

All Manage Changes ***Record changes***	• Changes must be agreed to in writing.

STEP 6.5 – CLOSE OUT THE CONTRACT

Task

Ensure that all work has been completed successfully and that all deficiencies and administrative matters have been resolved.

Accountabilities

Accountable – Contract Administrator

Must Approve – Contract *Owner*

Consult, As Required – Buyer, Contract Monitor

References

Document No.	Title
FIN-FORM-CM-006	Form 6: Small Contract Management Folder
FIN-FORM-CM-005	Form 5: Contract Closeout and Evaluation
FIN-FORM-CM-018	Job Aid VI – Notice of Construction Contract Completion

Sub-Tasks (as applicable to contractor or *augmented staff*)

To Do	*Notes*
Ensure work is complete ***Complete Form 6*** ***Complete Job Aid VI*** ***Complete Form 4***	• Determine if the contract is complete and all deficiencies have been fixed. • Notify Supply Chain that the job is complete.
Report on Contractor's Performance ***Complete Form 5***	Complete the evaluation within two weeks of contract completion. Forward a copy to the Supplier Safety Compliance Department at P82-2 and distribute additional copies per local procedures, e.g., to local Buyer for inclusion in the PO file.

SMALL CONTRACTS

RECORDS GENERATED

Records

Document No.	Title
	Contract Documents
FIN-FORM-CM-006	Form 6: Small Contract Management Folder
FIN-FORM-CM-018	Job Aid VI – Notice of Construction Contract Completion
FIN-FORM-CM-005	Form 5 – Contract Close-out and Evaluation

Appendix A

CONTRACTOR PREQUALIFICATION PROCESS

Governing Principle

FIN-PROG-CM-001 requires that OPG select contractors based on their ability to manage safety, environment and quality requirements, in addition to satisfying other technical and commercial criteria. A prequalification process has been established to ensure that only contractors that meet OPG standards are eligible to perform work at OPG workplaces. Contractors and their sub-contractors shall be pre-qualified in order to be considered as a *proponent*. Where OPG has assumed the role of *Owner*-Only on a *project*, the contractor acting as *Constructor* shall be pre-qualified, but OPG shall not undertake to pre-qualify the *Constructor's* sub-contractors.

OPG's Contractor Prequalification Process

In order to be considered as a *proponent* for OPG work, a contractor shall be evaluated using OPG's prequalification process.

Step 1: Contractor Prequalification Package

When a contractor indicates an interest in working for OPG, Supply Chain staff shall provide them with a "Prequalification Package". The package consists of:

- A cover letter, outlining the prequalification process;
- A questionnaire which collects specific information about the contractor's health and safety program and industry safety record;
- "Information for Contractors" document which provides the contractor with background information on OPG's expectations of a health and safety program.

Once completed, the completed questionnaire and supporting information is returned to the Supplier Safety Compliance Department for evaluation. The submission is evaluated against established criteria and is assigned two scores, one based on the questionnaire ("Program Evaluation") and the other based on WSIB performance statistics ("Industry Data").

Step 2: Field Audit

Based on the evaluation of the written submission, OPG may ask to conduct a field audit of a job currently being done by the contractor. The purpose of the audit is to verify the implementation of the contractor's written health and safety program. If an audit has been completed, the audit score is combined with the score from the written program evaluation and posted under "Program Evaluation" section of the Contractor Safety Environmental Quality Contractor (SEQC) Database.

Step 3: OPG Experience (Form 5)

FIN-FORM-CM-005: Form 5 – Contract Closeout and Evaluation, shall be completed by the CA for each *project*. Completed Form 5's are to be sent to Supplier Safety Compliance Department's general mailbox at P82-2 or by e-mail to ccs@opg.com. Additional copies should be distributed according to local requirements. Electronic copies of each Form 5 are attached to the contractor's record in the Contractor SEQC Database and an average score ("OPG Experience") is calculated based on all the Form 5's received for the contractor.

Step 4: Contractor Safety, Environmental Quality Contractor Database

The Contractor SEQC Database contains the following information:

- Contractor's individual scores for "Program Evaluation", "Industry Data" and "OPG Experience".

- An “Overall Rating” based on the three parameters above.
- A “Comments” section which provides details on the strengths and weaknesses of the contractor’s health and safety program.
- Electronic copies of Form 5’s for the contractors submitted by CAs.

Access to the Contractor SEQC Database is provided to Supply Chain, Contract *Owners*, CAs and others upon request. To request access to the Contractor SEQC Database, contact the Manager of the Supplier Safety Compliance Department at ccs@opg.com.

What Prequalification Is Not

The fact that a contractor is “pre-qualified” does not mean that their health and safety program has been approved by OPG or that they are the “best” contractor available. Pre-qualification simply means that the contractor’s health and safety program and WSIB experience has been evaluated against established criteria and rated accordingly. The Contractor SEQC Database provides specific information on the strengths and weaknesses of the submitted program along with information on the contractor’s industry health and safety performance (from the WSIB) and their previous performance at OPG. It is up to the CA to provide coaching and instruction to the contractor to ensure that areas of weakness are addressed when the contractor is working at an OPG site.

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Appendix B

WORK PROTECTION CODE REQUIREMENTS

Governing Principle

The OPG Work Protection Code (WPC) is a set of rules created to assist personnel in providing a Safe Work environment. The WPC uses a written contract to guarantee and maintain the safe working environment. In order to apply the WPC in a safe and consistent manner, the requirements shall be clearly understood and applied by all staff affected by its use.

It is for this reason that special care shall be taken to ensure all contracted staff brought into OPG facilities receive the necessary level of WPC training coincident with the requirements of the work they shall be involved with. (This does not apply where OPG is in the role of *Owner*-Only).

This appendix provides the guidance necessary to those preparing the contracts to ensure these requirements are clearly identified and shall be reviewed with the local Work Protection Code Coordinator (WPCC).

Step #1 – Determine if Work Protection is required

Shall the work being contracted require the isolation of a Hazardous Energy Source? Examples would be:

- Electricity
- Hydraulic Fluids
- Pressurized Water Systems
- Steam
- Compressed Gases/Air
- Chemical Systems

Note: This list is not inclusive

No – If the answer is “No”, Work Protection is not required. You can leave Appendix “B”.

Yes – If the answer is “Yes” to any of the above, continue to Step #2.

Step #2 – Establish Role of OPG

As per Step 1.3 under Stage 1 Contract Planning, determine OPG’s role (*Owner*-Only, *Owner Constructor* or *Owner* Extended *Employer*)and follow the applicable processes as outlined below:

For *Owner*-Only:

- Site drawings and/or maps shall be used to identify a defined boundary (*Construction Island*(s)) (CI) within which the *Constructor* shall perform the *contracted work*.
- The *constructor* shall mark up the site drawings and/or maps signifying the area (CI) they require to execute the *project* safely.
- Contract *Owner*, in consultation with the *constructor*, shall review the drawings/map of the requested area(s) and accept the boundaries.
- This defined boundary (CI) within which all of the *contracted work* shall be performed, shall be clearly delineated and identified as much as possible by appropriate barriers, signage, etc. and communicated to OPG personnel.

- As the *project* progresses and boundaries are altered such drawings and/or maps shall be updated.
- Access to the identified area shall be controlled to ensure the only OPG staff that accesses the CI are OPG staff involved in contract administration and quality control.
- Only staff of the *constructor* or its subcontractors shall be allowed to perform work inside the CI.

Planning Phase – Control of Hazardous Energies

The Contract *Owner* and the *Constructor* shall complete FIN-FORM-CM-022- Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only, identifying the hazardous energy sources and the method of control. Options are:

- *Terminal Point* (*TP*) – *Terminal Point* is a device that serves as a division point between equipment under control of any two authorities. The device may be under the operating control of either authority.
- Condition Guarantee (CG) – Hazardous energy source will be controlled by OPG Condition Guarantee(s) issued to the *constructor*. In addition, the *constructors* lock out / tag out process shall be applied to the associated isolating devices.
- Not to be Isolated (NTBI) - The Contract *Owner* must also identify all hazardous energies in the CI that are not to be isolated and de-energized, that will remain in service and under OPG control. These hazardous sources will be addressed by the *constructor* in their *project* specific site safety plan.
- *TP* shall be the first option considered. CG's shall be reserved for sources that have a high likelihood of being recalled during the *project*.
- Contract *Owner* shall seek the assistance of the local BU's operations staff to identify which devices shall be required to be isolated and de-energized to eliminate any hazardous energy flows into the CI.
- The local WPCC shall be consulted to determine the best approach and may contact the Senior Advisor Work Protection.
- The *constructor* shall identify a competent person from within their organization to the Contract *Owner* to act as the SPOC for the control of hazardous energies. The *constructor's* SPOC shall request to the Contract *Owner* the isolation of any OPG controlled sources of hazardous energies for the protection of their workers.
- Site drawings, flow sheets and/or maps identifying the CI shall be attached to Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only.
- Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only shall be included in the *MOU* established for an *Owner*-Only *project*. (See Appendix E for information on *MOU*).
- Transfer of Control documentation shall be used under the *TP* process following the established Business Unit Transfer of Control process. (Transfer of Control documentation is the mechanism for transferring device(s) from the OPG Controlling Authority to the *constructor*).
- *TP*s shall be located outside of the CI whenever possible with an isolating device inside the CI which can be used by the *constructor* for their own lockout / tag-out requirements in accordance with the OHSA and Regulations.
- Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only, shall be reviewed and signed by the WPCC.
- Confirmation and acceptance of the planned conditions of the devices shall be documented with sign-offs by the Contract *Owner* and *constructor*. Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only shall be the signed agreement between the Contract *Owner* and the *constructor*.

Execution Phase – Walkdown

- After the conditions described in Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only are established and prior to the commencement of work, the Contract *Owner* shall perform a walkdown with the *constructor* to verify the condition(s) of the device(s).
- The walkdown shall be documented and signed off by the Contract *Owner* and *constructor* to demonstrate the conditions have been verified and accepted by the *constructor*. FIN-FORM-CM-023 Job Aid IX Control of Hazardous Energies Walkdown *Owner*-Only may be used for documentation.
- If during the execution of work the condition(s) of the device(s) are required to be changed, the Contract *Owner* shall perform a walkdown with the *constructor* again to verify the changed conditions. Such walkdown shall be documented and signed off as above.
- If during execution of work there are any changes in the CI boundary and/or identified devices a new Form 7 Control of Hazardous Energies Planning Phase *Owner*-Only shall be completed with appropriate reviews and approvals.

For *Owner Constructor*:

Is OPG going to provide Qualified Staff to act as HoR and/or Maintenance Authorities *(Nuclear Only*) where appropriate?

If "Yes":

- OPG Contract *Owner* shall plan to resource for the required number of HoRs and MAs to meet the demands of the amount of work to be done.
- OPG Contract *Owner* shall ensure the contractor is aware of the requirements to have all contract staff who shall be working under the protection provided by Work Protection be "Worker" qualified.
- OPG Contract *Owner* shall ensure that the contractor is aware of the lead time required to schedule and receive the necessary training.
- OPG CA shall ensure all contractors' *supervisors* who shall be supervising staff working under the protection provided by Work Protection, as a minimum, receive the Work Protection training equal to or greater than the workers they shall be supervising.
- OPG CA shall ensure the additional contractor training requirements are properly resourced and scheduled in advance of the work to be performed.

If "No":

- OPG Contract *Owner* shall ensure the contractor is aware of the need to resource the *project* to meet HoR and/or MA requirements.
- OPG Contract *Owner* shall ensure that the contractor is aware of the training requirements that shall be met to qualify their staff as HoR and/or MA *(Nuclear Only)* where appropriate.
- OPG Contract *Owner* shall ensure the contractor is aware of the requirements to have all contract staff who shall be working under the protection provided by Work Protection" be "Worker" qualified.
- OPG Contract *Owner* shall ensure that the contractor is aware of the lead time required to schedule and receive the necessary HOR and MA (if applicable) training.
- OPG CA shall plan to ensure all contract *Supervisors* who shall be supervising staff working under the protection provided by Work Protection receive the Worker training.

- OPG CA shall ensure the additional contractor training requirements are properly resourced and scheduled in advance of the work to be performed.

For *Owner* Extended *Employer*:

If the work is on OPG owned equipment on OPG property then OPG Work Protection shall be used.

- Equipment is to be isolated using the OPG WPC.
- OPG shall ensure the necessary resources are available to prepare, apply and administer all required Work Protection.

If the equipment is on OPG property but not owned by OPG and no OPG work is allowed on the equipment then the contractors lock out/tag out process may be used if:

- OPG Contract *Owner* shall set-up a defined boundary within which all of the *contracted work* shall be performed. This defined boundary shall be clearly delineated and identified as much as possible by appropriate barriers, signage, etc and communicated to the contractor and OPG personnel.
- Access to the identified area shall be controlled to ensure the only OPG staff that accesses the identified area is OPG staff involved in contract monitoring or administration.
- Only staff of the *constructor* or its subcontractors shall be allowed to perform work inside the marked off area.
- All hazardous sources are *terminal pointed*.
- The lock out/tag out process meets OHSA requirements.

Appendix C

ROLES AND DUTIES UNDER OHSA

Determining OPG's Role and Duties under OHSA

For guidelines in determining OPG's role see flowchart at end of this Appendix C.

Whenever hiring *Contractors*, OPG shall establish its role and duties under the OHSA as one of the:

- *Owner-Constructor* (i.e., when contracting a *construction project*; includes duties of *Owner* plus the duties of *Constructor*.
- *Owner* –Extended *Employer* (i.e., when contracting for services which are not a *construction project*; includes duties of *Owner* plus the duties of *Employer*).
- *Owner*-Only (i.e., when hiring a General Contractor who has "full and complete control" of the *construction project* and *project* site).

Key Roles and Duties According to OHSA, and Regulations under OHSA[1]

OPG as *Project Owner* (*Construction Project* → Applies where OPG is either the *Owner*-Only or the *Owner-Constructor*).

- Determine if any designated substances are present at the *project* site. Prepare a list of all designated substances present and include in proposal(s).
- Prepare a report of all friable asbestos-containing materials that shall be handled, dealt with, disturbed or removed, including the type and location (Asbestos Regulation-*Construction*).

OPG as *Owner-Constructor* [Duties of *Project Owner* and *Constructor*]

Ensure that:

- Measures and procedures prescribed[2] by the OHSA and Regulation are carried out on the *construction project.*
- Every *employer* and worker on the *construction project* complies with the OHSA and the Regulations.
- The health and safety of <u>all</u> workers on the *construction project* is protected.
- Notify the MOL of incidents, as required. Submit completed registration and notification forms to MOL, as required. Post forms, as required (*Construction* Regulations).
- Appoint *competent persons* as *supervisors* and conduct inspections on the *construction project (Construction* Requirements).
- Implement emergency response procedures (*Construction* Regulations).
- Ensure all prospective *contractors* receive a copy of all the designated substance list and/or asbestos report and/or asbestos report prior to award of *contract* (OHSA) and Asbestos Regulations-*Construction*).
- Advise workers of the presence of friable asbestos-containing materials, if likely to disturb or working in close proximity (*Construction* Regulations).

[1] This is not a complete listing of all Employer, *Constructor* and Owner duties prescribed under the OHSA, the Regulations to OHSA Construction. For a complete listing of duties, refer to all Parts/Sections of all applicable Regulations.

[2] Prescribed in any applicable Regulation under the OHSA.

OPG as *Owner*-Extended *Employer* [Duties of *Owner* (Non-*Construction Project*) and *Employer*]

Ensure that:

- Prescribed facilities are provided and maintained.
- Workplace is constructed, developed, reconstructed, altered or added to in compliance with the OHSA and Regulations.
- Prepare a report of all friable asbestos-containing materials that shall be handled, dealt with, disturbed or removed, including the type and location (Asbestos Regulation-*Construction*).
- Prescribed equipment, materials and protective devices are provided.
- All equipment, materials and protective devices provided are maintained in good condition.
- All prescribed measures and procedures are carried out.
- All prescribed equipment, materials and protective devices are used as prescribed.
- Workplace structures are capable of supporting all loads.
- Provide information, instruction and supervision necessary to protect health and safety of workers.
- Appoint competent persons as *supervisors*.
- Acquaint workers and *supervisors* with all hazards in the work and in the handling, storage, use, disposal and transport of any article, device, equipment or biological, chemical or physical agents.
- Take every precaution reasonable in the circumstances for the protection of a worker.
- Prepare and review annually a written OHS policy. Develop and maintain a program to implement this policy.
- Provide copies of OHS reports to JH&SCs and workers.
- Comply with duties prescribed under Designated Substance Regulations.
- Comply with WHMIS Regulations.
- Advise workers of the presence of friable asbestos-containing materials, if likely to disturb or working in close proximity. Provide awareness training (Asbestos Regulations-*Construction*).

Note Ensure = Shall Make Certain

In the Wyssen decision, the Court of Appeal Stated the term “ensure” “puts the *Employer* virtually in the position of an insurer who shall make certain that the prescribed regulations for safety in the workplace have been complied with before work is undertaken by either employees or independent Contractors. (This does not apply where OPG is the “*Owner*-Only”).

Note Duty to Take Every Precaution Reasonable

Case law states that *Employers* are expected to take steps that are objectively reasonable in the circumstances. This may include complying with MOL guidelines, recognized industry standards, e.g., CSA, ANSI, NFPA, etc, other regulations that afford greater protection to workers, etc. What is considered reasonable under the circumstances shall ultimately depend on the facts of each case and could be decided in a court of law. (This does not apply where OPG is the “*Owner*-Only”).

OPG as *Owner*-Only [Duties of *Construction Project Owner* and Prudent *Owner*]

Ensure that:

- Determine if any designated substances are present at the *project* site. Prepare a list of all designated substances present and include in proposal(s).
- Prepare a report of all friable asbestos-containing materials that shall be handled, dealt with, disturbed or removed, including the type and location (Asbestos Regulation-*Construction*).

The following provides more detail as to how OPG would demonstrate Due Diligences as required by OHSA.

OPG as *Constructor* (*Construction Projects*)

Typically, OPG is the *Constructor* for all *construction projects.* As the *Constructor,* OPG shall exercise the following due diligence when contracting:

- Appoint *competent persons* as *Project/Contract Managers, Site CAs* and/or *Site Monitors.* These shall be appointed in sufficient numbers to execute OPG's duties as the *Constructor* (see Sections 23 and 27 of the OHSA, Sections 14-15 of the Construction Regulations, and all other applicable Parts/Sections of the Construction Regulations).
- Identify all legal requirements applicable to the *contracted work*. While detailed knowledge of these requirements may not be reasonable (i.e., for highly specialized work), some knowledge is required in order to assess the c*ontractor's EH&S management system.*
- Pre-qualify all *contractors* and sub-contractors to confirm they have an operational EH&S management system and acceptable EH&S performance. The EH&S policy, programs and procedures shall address hazards specific to the *contracted work*.
- As the *Constructor,* implement an EH&S management system to assess and control OH&S hazards. This EH&S management system shall address the hazards specific to the *construction project*/project site and should include rules, procedures, training, a work site inspection process, a c*ontractor* monitoring process, a c*ontractor* disciplinary process, etc.
- As required, file completed registration and notification forms with the MOL.
- Confirm *contractor* employees have been provided with appropriate instruction, training and orientation. As required, provide specialized training to *contractor* employees on hazards unique to the *project* site (i.e., anhydrous ammonia). Document all training delivered with appropriate sign-offs.
- Conduct job site meetings to organize work, familiarize *contractors* to the hazard of the *project* site and outline OPG's expectations (i.e., compliance with all legal requirements, JSAs, housekeeping, etc.). Pre-job briefings and expectations, *project* site hazards and any changes to equipment, people, procedures or the work environment.
- Monitor *contractors* to confirm they have adequate numbers of competent *supervisors* and processes for monitoring compliance.
- Inspect the work site and monitor *contractor* performance with sufficient frequency to ensure compliance. For complex *construction projects*, a full time *Site CA* or Site *Monitor* may be required. Record non-compliances and corrective actions to be taken by the *contractor.*

- Confirm commercial terms and conditions allow for termination of a *contractor* for non-compliance. Establish clear disciplinary and termination processes. Document all verbal and written warnings.

***Constructor's Supervisor* (Where OPG is the *Constructor*)**

OPG shall appoint a person to this role. A single person such as a CA or a Contract Monitor who is physically located at the job site can fulfill these duties in the case of a smaller *project*. O.Reg. 213, S.14 (2) also allows the "*Constructor's Supervisor*" to appoint an "assistant who is a competent person". OPG may, therefore, fulfill its duties by assigning an individual within an organization, (e.g., a Manager within a *Project* or Contract Management Office) as the "*Constructor's Supervisor*" and allowing him or her to delegate specific duties to other competent individuals within the organization for the *project* (e.g. CA or Contract Monitors) who are physically at the *project* site. This person supervises the work on the *project*, not the contractor's workers. Direct supervision of the contractor's workers is provided by the contractor, not OPG.

In OPG, the duties of the *Constructor's Supervisor* and their on-site "assistants" (if applicable), which are specified in Section 14 of the *Construction* Regulations, are met by fulfilling the responsibilities of Contract *Owner*, CA or Contract Monitor in the Contractor Management Process Manual.

Note Multiple *Constructors* and Designation of *Projects*

Under Section 4 of the *Construction* Regulations, an *Owner* can apply to the MOL Director for designation of a portion of a larger *construction project,* to be considered a separate *project* so that two or more *Constructors* can work on different parts of the same *project.* What may appear as a distinct, separate *Project* may be considered by the MOL as a single *project* if the work tasks or phases of a *project* are connected in some way. Consequently, *construction* activities that are potentially connected or overlapping should be examined to see if a designation of Part *Project* Application is necessary. Processing of these applications can take several months. Prior to hiring multiple *Constructors* to undertake separate parts or phases of a large scale *construction project* or applying for designation of part of a *construction project,* the *Project/Contract Manager* shall consult with Law.

***Extended Employer* (Contracting for Services)**

When contacting for services (i.e., work not defined as a *construction project),* OPG is the *employer* due to the extended definition of *Employer* under the OHSA. As the *Extended Employer,* OPG shall exercise the following due diligence when contracting:

- Appoint *competent persons* as *Project/Contract Managers, Site CAs* and/or *Site Monitors.* These shall be appointed in sufficient numbers to execute OPG's duties as the *Employer* (see Sections 25, 26 and 27 of the OHSA and applicable Regulations).
- Identify all legal requirements applicable to the *contracted work*. While detailed knowledge of these requirements may not be reasonable (i.e., for highly specialized work), some knowledge is required in order to assess the *Contractor's* EH&S management system.
- Pre-qualify all *contractors* and sub-contractors to confirm they have an operational EH&S management system and acceptable EH&S performance. The EH&S policy, programs and procedures shall address hazards specific to the *contracted work* (i.e., elevator maintenance, diving, janitorial services, window cleaning, etc). When hiring *contractors* to performs highly specialized work where OPG has little in-house expertise (i.e., diving, window washing, etc.)

preference should be given to large well-established *Employers* with evidence of an operational OH&S management system.

- Confirm *Contractor* employees have been provided with appropriate instruction, training and orientation. As required, provide specialized training to *Contractor* employees on hazards unique to the *project* site (i.e., anhydrous ammonia). Document all training delivered with appropriate sign-offs.
- Conduct pre-job briefings to familiarize *Contractors* to the hazards of the *project* site and outline OPG's expectation (i.e., compliance with all legal requirements. JSAs, housekeeping, etc.). Inform *Contractors* of all foreseeable hazards, no matter how obvious. On an on-going basis remind Contractors of hazards emphasize expectations and detail any changes to equipment, people, procedures or the work environment.
- Coordinate *contracted work* where:
  - *Contractor's* work could endanger OPG employees, or
  - OPG's operations could endanger *contractor's* employees.
- Monitor *contactors* to ensure they have adequate numbers of competent *supervisors* and processes for monitoring compliance (i.e., the greater the *risks* associated with the *contracted work*, the more supervision required).
- Inspect the work site and monitor *contractor* performance with sufficient frequency to ensure compliance. Record non-compliances and corrective actions to be taken by the *contractor.*
- Confirm commercial terms and conditions allow for termination of a *contractor* for non-compliance. Establish clear disciplinary and termination processes. Document all verbal and written warnings.

Note "Hands-On" or "Hands-Off" Approach

When OPG is the *Extended Employer,* OPG automatically assumes the duties of the *Owner* (see Section 29-30 of the OHSA). As the *Owner*, OPG shall exercise the following due diligence when contracting:

- Maintain the physical conditions of the work site.
- Inform *contractors* of any foreseeable hazards resulting from the nature of OPG operations or facilities.

Note Exercising Prudence Where OPG is the *Owner*-Only

For *construction projects* where OPG is the *Owner*-Only, the General Contractor shall maintain full and complete control over the *construction project* site. In addition:

- The *project* site shall be physically separated (via walls or barriers) from the operating plant and intermingling of OPG and *contractor* employees is prohibited (typically the *Constructor's* work area is fenced so the *Constructor* has its own "*Construction Island*").
- OPG shall limit its involvement to that of a "prudent *owner*" (i.e., ensuring only quality and contract requirements are met). This is achieved by: (1) selecting a *Constructor* with a good safety record and HS&E program; (2) after contract award performing periodic contract compliance audits to ensure the *Constructor* follows the specific aspects of its HS&E plans that the *Constructor* itself stated it would follow as a contract requirement.
- OPG shall **not** supervise or direct the work of *contractors* or approve their work methods or safety plans. In a situation that is life threatening, OPG may intervene by directing the General Contractor to implement immediate corrective actions. However by intervening, i.e. directing the work, the role of the *Constructor* may revert back to OPG despite best attempts to act as the *Owner*-Only.

Accountabilities

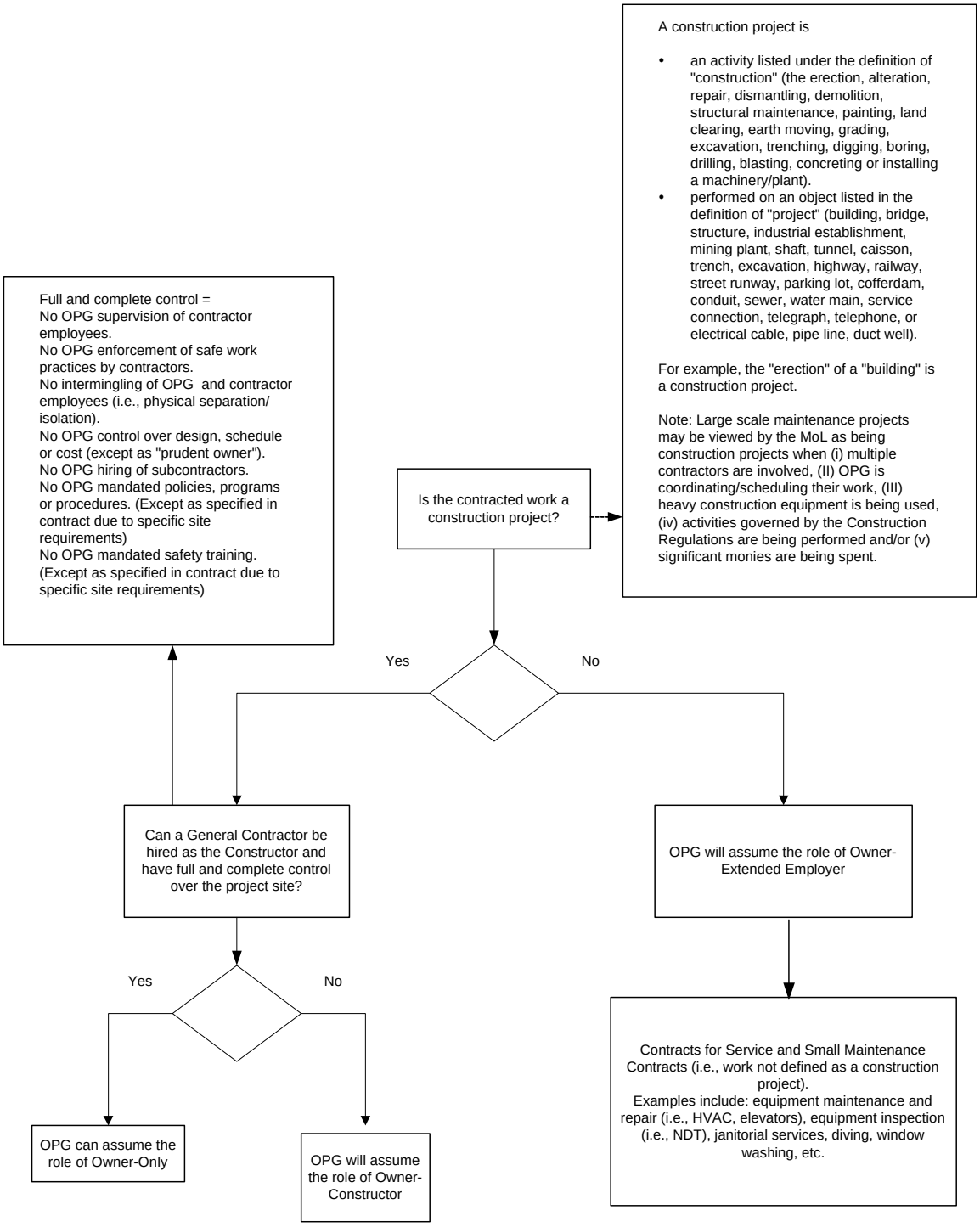
An overview of the roles and accountabilities associated with the *contractor* Management process is presented in *Table 2: Accountability Matrix.* For small *contracts,* the triple role of *Project/Contract Manager, Site CA and Site Monitor* may be held by one individual.

Note Contractor Accountabilities

Contractors also have accountabilities under the OHSA, including the duties listed for Directors and Officers, *Employers*, *Supervisors*, Workers, self-employed persons, Suppliers, Architects and Engineers.

Note Contractor Hours of Work

Not all *contracted work* is performed Monday to Friday on day shift. Consideration shall be given to how this work shall be monitored on night shifts or weekends.


A construction project is
• an activity listed under the definition of "construction" (the erection, alteration, repair, dismantling, demolition, structural maintenance, painting, land clearing, earth moving, grading, excavation, trenching, digging, boring, drilling, blasting, concreting or installing a machinery/plant).
• performed on an object listed in the definition of "project" (building, bridge, structure, industrial establishment, mining plant, shaft, tunnel, caisson, trench, excavation, highway, railway, street runway, parking lot, cofferdam, conduit, sewer, water main, service connection, telegraph, telephone, or electrical cable, pipe line, duct well).
For example, the "erection" of a "building" is a construction project.
Note: Large scale maintenance projects may be viewed by the MoL as being construction projects when (i) multiple contractors are involved, (II) OPG is coordinating/scheduling their work, (III) heavy construction equipment is being used, (iv) activities governed by the Construction Regulations are being performed and/or (v) significant monies are being spent.
Full and complete control =
No OPG supervision of contractor employees.
No OPG enforcement of safe work practices by contractors.
No intermingling of OPG and contractor employees (i.e., physical separation/ isolation).
No OPG control over design, schedule or cost (except as "prudent owner").
No OPG hiring of subcontractors.
No OPG mandated policies, programs or procedures. (Except as specified in contract due to specific site requirements)
No OPG mandated safety training. (Except as specified in contract due to specific site requirements)
Is the contracted work a construction project?
Yes
No
Can a General Contractor be hired as the Constructor and have full and complete control over the project site?
OPG will assume the role of Owner-Extended Employer
Yes
No
OPG can assume the role of Owner-Only
OPG will assume the role of Owner-Constructor
Contracts for Service and Small Maintenance Contracts (i.e., work not defined as a construction project).
Examples include: equipment maintenance and repair (i.e., HVAC, elevators), equipment inspection (i.e., NDT), janitorial services, diving, window washing, etc.

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Appendix D

APPLICATION OF SPECIFIC OPG SAFETY REQUIREMENTS TO CONTRACTORS

[This Appendix does not apply to *Owner*-Only contracts. OPG should, however, prior to hiring a *Constructor*, review the *Constructor's* safety record and company safety program to ensure that the *Constructor* is likely to maintain an overall level of safety equivalent to that of OPG.]

Application of the Corporate Safety Rules to Contractors:

The Corporate Safety Rules do not apply to contractors where OPG is the "*Owner* -only".

Where OPG is the *Constructor* or Extended *Employer* the Corporate Safety Rules apply as follows:

Common Safety Rules

The Common Safety Rules shall be followed by all contractors.

***Risk* Based Safety Rules and Management Requirement Rules**

OPG Contract *Owner*s are responsible to identify the appropriate *Risk* Rules and Management Requirement Rules that apply to contractors where the contractor's work involves hazards addressed by these rules. They shall also ensure that these requirements are included in contract documents. The applicable rules shall be based on the nature of the contract and the *risk*s involved.

OPG's Health and Safety Policy states the following regarding expectations for contractors:

"OPG and its contractors shall meet all applicable health and safety legislative requirements. ... OPG shall require that contractors and their sub-contractors maintain a level of safety equivalent to that of OPG employees while at OPG workplaces".

What does this statement mean?

In general, the statement regarding "a level of safety equivalent to that of OPG employees" means that we expect no more or no less from our contractors than we do of ourselves. The Contract *Owner* or CA shall use their discretion in determining how to apply this statement in determining safety requirements for the specific *contracted work* that they are managing. The way in which that "equivalent level of safety" is reached may vary depending on the nature of the work, *risks* involved and OPG's own standards in controlling the *risk*. At the end of the day, the contractor's level of safety shall be equivalent to OPG employees' level of safety.

"Equivalent" may mean following the "same" OPG programs or procedures.

OPG may require that a contractor follow exactly the same procedures as our own employees depending on the nature of the work, the safety *risks* and OPG's own standards for controlling the *risk*. This shall be identified by OPG in our contracts with contractors in order to hold the contractor accountable to these expectations. For example, for some *risk* areas that are unique to OPG it may be important to control the hazard using very prescriptive OPG requirements. Examples where we typically do this are requiring in the *RFQ*/*RFP* that the contractor follow the OPG WPC or Radiation Protection Procedures. There may be other cases where OPG's safety requirements may exceed legislative requirements, creating a higher standard of safety than the contractor may normally meet. In these cases, OPG would need to specify these same requirements in the *RFQ*/*RFP* so that the contractor's level of safety meets OPG's standards. An example of this is that the Corporate Safety Rules (3.4b) require that the Safety Person working with an employee who is working on live electrical equipment be CPR qualified. The Industrial Regulation, Section 42.1(3), require only that this person be able to perform artificial respiration. In this case OPG's specific requirement would be the same as that for the contractor.

"Equivalent" may mean following the contractors program or procedures but still achieve an equivalent level of safety.

Alternatively we can allow the contractor to use their own work procedures as long as their procedures provide a level of safety for their employees that is equivalent to that for OPG employees. In these cases, OPG may state in the *RFQ*/*RFP "what"* standard or requirement we expect them to meet and the contractor can determine *"how"* they shall meet that requirement or standard. To highlight a practical example, unless OPG specifies otherwise, a contractor may provide their own fall arrest training to their employees that meets the MOL OHSA requirements. This training may not be the same as OPG training, but it shall be equivalent and meet the MOL's standards. Another example: we may hire contractors to remove asbestos. OPG may decide that a qualified contractor can use their own asbestos removal work procedure, equipment, and can train their employees in asbestos removal as long as the procedure, equipment and training meets the MOL's standards. All of these may be somewhat different from what OPG uses. However, at the end of the day, the level of safety protection provided to their workers shall be equivalent to the level of protection our approach would offer to our workers. There may also be instances where the contractor's own safety requirements may exceed OPG's requirements. This may be due to the nature of *risks* their employees are routinely exposed to, day after day, and the approaches they have chosen to employ to minimize these high *risks* (for example, additional training, inspections, tailboards, etc.).

Note

In the Hydroelectric and Thermal BUs, *the Contractor Safety Instructions* (94546) document or equivalent plant *project* safety manual merges the OPG Corporate Safety Rules and other requirements into a single document rewritten for contractors.

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Appendix E

GUIDELINE FOR THE PREPARATION OF A CONTRACT REQUIREMENTS DOCUMENT

Preparation of Contract Requirements Document

OPG shall create contract documents that shall define the work to be done along with any special conditions or requirements.

The Contract *Owner* shall compile all documents necessary for the contract requirements and shall be responsible for ensuring that any required technical reviews and approvals are carried out. The contract requirements shall then be forwarded to Supply Chain who shall distribute them for legal, *risk* and assurance, and other reviews and approvals as required.

The documents describe the material and/or services to be acquired together with quality information. Standard specifications, drawings, data, reports, etc. should be included as an appendix. This document should be reviewed/approved by the requisitioner's line management prior to being sent to Supply Chain. It should not contain any commercial conditions or requirements.

Environment, Safety and Health Requirements

Standard contract language has been developed to specify environment, health and safety requirements. The requirements (some of which do not apply to *Owner*-Only contracts) emphasize the following:

- Compliance with work site emergency preparedness and response plans.
- Compliance with all applicable environmental and health and safety legislation and standards, including the OHSA and Regulations and any OPG environmental and safety standards/requirements.
- Compliance with all requirements by the sub-contractors.
- Demonstration of management's commitment to good environment, health and safety performance and evidence of an established program acceptable to OPG.
- A job-specific safety plan if required.
- A communication protocol between OPG's CA and the contractor's SPOC.
- Compliance by the Contractor, employees, and agents of the Contractor and sub-contractors that any tier is fit for duty while performing work on OPG's premises or elsewhere (if involved in performing services for OPG).
- Prompt reporting of all accidents and near misses to the OPG CA under OPG's Incident Management Standard or contract specifications (including incidents reportable under the OHSA) and the requirement that OPG maintain the right to investigate any incident.
- Corrective actions are to be completed in a timely manner.
- A monthly report (to the *project* CA) of safety statistics regarding *project* site work and that of the company's sub-contractors as stipulated.
- Equipping of workers with all safeguards and personal protective equipment necessary for the performance of the work stipulated in either OHSA or OPG procedures (at no additional cost to OPG).
- Competent *supervisors* and workers as defined by OHSA.

- Good standing with the WSIB at all times.
- Provision of a detailed JSA for each sequential job step in the *project* in accordance with its contract Safety Plan.
- Compliance with contract requirements for confining materials and *construction* equipment to the location designated by OPG's site representative.
- Compliance with relevant federal, provincial legislation and regulations and any site specific procedural requirements pertaining to any product used at an OPG site which is categorized as a hazardous material.
- Fire protection equipment in compliance with OHSA and the Ontario Fire Code (OFC) and the requirements of the Ministry of Natural Resources (MNR) work permit and other regulatory, e.g., municipal, requirements.
- A fire prevention plan in force prior to mobilization to the site.
- Provision of a qualified First-Aid Attendant in accordance with the OHSA.
- Compliance with all relevant statutes, regulations, bylaws and directives of competent authorities in matters related to all environmental aspects of work done on the *project* site.
- Identification of any non-standard equipment, procedures or work that shall be used.
- Identification of hazards and use of appropriate operational controls to eliminate or reduce safety *risks* and/or *environmental impacts*.
- Completion and approval of all scheduled prerequisites prior to proceeding to the next step.
- Contractor to provide organization chart identifying contractor's site *supervisors* who shall be assigned to this contract and those that hold responsibility for safety support.
- Evidence of training records/qualifications and licences required.

Note

In the Hydroelectric and Thermal BUs, providing a copy of the *Contractor Safety Instructions* (94546) document completes many of the above items.

For *Owner*-Only contracts, alternate contract language is also provided in OPG's contract precedents. For environmental, engineering, Health &Safety or other matters, contract specifications cannot prescribe the means or methods (the "how") for completing the work. The procedures used and manner in which the work is to be executed shall be left to the *Constructor* to determine. OPG can, however, detail in the contract the performance measure the end product shall meet (performance based specification) or the detailed physical specifications the end product shall match. For example, OPG may specify that a *Constructor* design and build a turbine capable of a specified power output (performance-based specification). OPG may also provide a detailed physical specification as an environmental requirement of the contract that the contractor shall meet such as the depth and materials a spill retaining trench shall conform to (physical-based specification). In either case the *Constructor* would determine the means, methods and procedures it would utilize to achieve the

contract specification. [*Note*: In *Owner*-Only contract, OPG would not specify or suggest to the potential *Constructor*(s) the content of the *Constructor's Project* Site-Specific Plans. However, the above-noted criteria could be used as a guideline in the *Constructor* selection process to assess whether the *Constructor* had submitted plans that demonstrated it was competent to appropriately manage Health and Safety and Environmental matters].

For *contracted work* with significant environmental *risks*, an ISO 14001 registered contractor or one that has a comprehensive EMS/program is required.

OPG may require that the contractor provide a *project* site-specific health and safety or environmental management plan for a *project*.

Suggested *Project* Site-Specific Plan Content

***Project* Site Specific Safety Plan Contents**	**Site-Specific Environmental Management Plan Contents**
1.0 Scope of Work	1.0 Scope of Work
2.0 Contractor's Health and Safety Policy 2.1 Contractors Policy or Policies on *Workplace Violence* and Harassment 2.2 Contractors Program(s) on *Workplace Violence* and Harassment	2.0 Contractor's Environmental Policy
3.0 Regulatory Framework 3.1 General 3.2 Permits	3.0 Regulatory Framework 3.1 General 3.2 Permits, Certificates and Approvals
4.0 Roles and Responsibilities 4.1 *Project* Manager 4.2 *Supervisor* 4.4 Worker 4.5 Site Safety Manager 4.6 Corporate Safety	4.0 Roles and Responsibilities 4.1 *Project* Manager 4.2 *Supervisor* 4.3 Worker 4.4 Corporate Environment
5.0 Hazard Evaluation 5.1 Hazard Identification 5.2 *Risk* Assessment 5.3 Control Measures	5.0 Environmental *Risk* Assessment 5.1 Review of OPG Aspects and Impacts 5.2 Identification of Project Aspects and Impacts 5.3 *Risk* Assessment 5.4 Control Measures
6.0 Site-Specific Procedures 6.1 General Site Rules 6.2 Hazard/Job Specific	6.0 Site-Specific Procedures 6.1 Water Pollution 6.2 Air Emissions 6.3 Erosion and Sediment Control 6.4 Noise and Vibration 6.5 Habitat Protection 6.6 Discovery of Contamination 6.7 Waste Management 6.7.1General 6.7.2 Waste Audit and Reduction Workplan
7.0 Communication 7.1 *Project* Meetings 7.2 Safety Meetings – *Supervisor* and Crew Meetings 7.3 Pre-Job Briefings	7.0 Communication 7.1 *Project* Meetings 7.2 Pre-Job Briefings 7.3 Stakeholder Communication 7.4 Reports

***Project* Site Specific Safety Plan Contents**	**Site-Specific Environmental Management Plan Contents**
7.4 *Project* Signage 7.5 Reports	
8.0 Training 8.1 Training Requirements 8.1.1 Induction Training 8.1.2 Certificates and Qualifications 8.2 Training Delivery 8.3 Records	8.0 Training 8.1 OPG *EMS* Awareness 8.2 Environmental Induction Training
9.0 Monitoring 9.1 By Contractor 9.1.1 Equipment Inspections 9.1.2 Site Inspections 9.2 By OPG 9.3 By Worker Rep/JH&SC 9.4 By Regulatory Agency 9.5 Correction of Deficiencies	9.0 Monitoring 9.1 By Contractor 9.1.1 Equipment Inspections 9.1.2 Site Inspections 9.2 By OPG 9.3 By Regulatory Agency 9.4 Correction of Deficiencies
10.0 Emergency Response 10.1 Reporting and Notification 10.1 First Aid Requirements 10.2 Medical Emergency Response 10.3 Fire Emergency Response 10.4 Confined Space Rescue 10.5 Arrested Fall Rescue	10.0 Emergency Response 10.1 Reporting and Notification 10.2 Spills Response
11.0 Accident/Incident Investigation	11.0 Incident Investigation
12.0 Sub-contractor Requirements	12.0 Sub-contractor Requirements

Appendix F

GUIDELINE FOR ADMINISTRATION OF BLANKET PURCHASE ORDERS/DRAWDOWN CONTRACTS AND MASTER SERVICE AGREEMENTS

Master Service Agreements, Blanket POs/*drawdown contracts* can be established with a contractor to provide general *construction* services to OPG. OPG also uses MSA's to retain service and maintenance contractors, e.g., locksmith service, helicopter service. The terms and conditions are established at the PO level with a total PO dollar value for a general scope of work. Smaller pieces of work are then issued to the contractor as a release on the blanket PO/*drawdown contract*. Specific work packages outlining the technical aspects or detailed scope of work are provided to the contractor for each release.

This section of the Manual provides guidance on how to administer these types of agreements.

Roles

The **Contract *Owner*** role is transferred from the signing authority for the blanket PO/drawdown/MSA to the field execution Contract *Owner*.

The CA shall complete all necessary forms as identified below for blanket PO/*drawdown contracts*. In addition, the CA is responsible for verifying and acknowledging the acceptability of invoices in PassPort or SAP or Oncore, as applicable.

Contractor Planning and Procurement Process for MSA/Blanket Purchase Orders/Drawdown Contracts

The management or execution of the *project* shall follow the process outlined in this manual.

Contract Planning

The Contract *Owner* is accountable for the completion of the work package which is comprised of a statement of work (including the scope of work and its deliverables) and contract strategy. Any safety, environmental and quality aspects shall be stated in the statement of work.

For Nanticoke, safety, environmental and quality aspects unique to the work package being released through the issuance of the *Contract Work Package Authorization (CWPA)* under a MSA shall be stated in the *CWPA*.

When the Small Contract Management process is used to administer a blanket PO/*drawdown contract*, a *risk* assessment shall determine the frequency that FIN-FORM-CM-006, Small Contract Management Folder, shall be completed during the life of the contract. As work is released against the MSA /blanket PO/ *Drawdown contract*, a process shall be in place to communicate any unique safety, environmental or quality aspects that particular release of work imposes.

Procurement

All purchasing activities shall be conducted in accordance with the requirements of OPG-PROC-0058. For Nuclear, refer to N-PROC-MM-0016 for additional details and requirements.

Post Award, Execution, Close-Out

Post Award, Execution and Close-Out activities shall be performed in accordance with this manual.

Governance

The governing document EP-BA-009, Utilizing the Electricity Production Construction and Maintenance *Master Service Agreement*, describes the standardized process for the administration and management of *construction* and maintenance MSAs in Thermal and Hydroelectric BUs.

For Nuclear Only - Forms, worksheets and job aids associated with FIN-MAN-CM-001, shall be completed as follows:

1) The following documents shall be completed annually or when a new blanket PO is awarded or renewed:

   - FIN-FORM-CM-001: Form 1
   - FIN-FORM-CM-003: Form 3
   - FIN-FORM-CM-007: Worksheet A
   - FIN-FORM-CM-008: Worksheet B
   - FIN-FORM-CM-009: Worksheet C

2) The following documents shall be completed for all releases to the blanket POs:

   - FIN-FORM-CM-004: Form 4
   - FIN-FORM-CM-005: Form 5
   - FIN-FORM-CM-011: Worksheet E

   Note: Completion of all other forms, worksheets and job aids are optional and may be used as needed.

In Nuclear, a “Blanket PO Binder” shall be set-up to house all documentation related to the overall blanket PO. A binder/file should also be set-up for each release and should refer back to the blanket PO Binder as applicable (i.e. a form may not be in the release binder/file because it is only required at the blanket PO level and is therefore located in the Blanket PO Binder).

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Appendix G

ENVIRONMENTAL MANAGEMENT FOR OWNER-ONLY CONTRACTS

Environmental Management for *Owner*-Only Contracts (Note: this section *supplements* other portions of this Manual).

Different Procurement Approaches and Introduction

Environmental Law does not recognize the "*Owner*-Only" concept established in OHSA. OHSA allows an *Owner* to contract out of liability for *project* safety by properly adhering to "*Owner*-Only" *Project* set-up and restrictions; however, the Environmental Protection Act (EPA) does not allow an *Owner* to contract out of liability for EPA infractions relating to a *Project*. Consequently, even when an *Owner*-Only contract is set-up and administered correctly, if there is an environmental incident, OPG may still be held liable by the regulator. The purpose of this section is to ensure that OPG does not inadvertently jeopardize its *Owner*-Only status under OHSA by managing the environmental aspects of the work.

There are different approaches available when preparing environmental specifications for an *Owner*-Only Contract. One available approach is for OPG to provide detailed specifications as part of the *request for quote*/proposal. These detailed specifications can address either (or both) detailed performance specifications and the high-level control methodologies the *Constructor* shall utilize to achieve the performance specifications. This would be more appropriate when smaller *Constructors* would not likely have the environmental expertise or OPG is not comfortable that the field of potential *Constructors* shall hire the appropriate expertise. However, OPG shall be comfortable that the selected *Constructor* shall have sufficient capability to execute the specifications and control methodologies on its own, without oversight by OPG (other than periodic audits). If OPG is not comfortable in this regard, then an *Owner*-Only contract shall not be suitable, and OPG should retain the *Constructor* role.

The other approach to consider is to leave it to the potential *Constructor* to formulate the environmental specifications that shall be part of its proposal. OPG can state *performance* expectations in the *RFQ*/*RFP*, and then have the *Constructor* submit a proposal that details the control methods and/or procedures they shall use to achieve the performance standard. The performance measures specified by OPG in the *RFQ*/*RFP* can be highly specific (e.g. noise not to exceed specified decibel level that is less than local municipal by-law) or can be more general (e.g. "compliance with all legislative requirements"). The potential *Constructor* can be asked to develop performance measures for all or some environmental aspects that the *Constructor* proposes be achieved as part of its contractual commitments. In a competitive *RFQ*/*RFP* process, this may result in a *Constructor* proposing rigorous environmental standards as part of its proposal. A *Constructor* can even be asked as part of its proposal to identify the procedures it shall use to implement the control methodologies and to achieve the environmental performance specifications. The *Constructor's* details regarding environmental aspects of their proposal would be in the form of a SSEP prepared by the *Constructor*. Compliance with the SSEP would be part of the final contract document. This approach is more appropriate for *project*s where the *Constructor* has a level of sophistication or history that suggests it shall ensure that reasonable environmental specifications shall be developed as part of its proposal.

OPG is entitled to select either of the above approaches and shall decide on a case by case basis which approach is more appropriate for the *project* under consideration.

The difference between the "how" and the "what" is sometimes confusing with respect to limitations regarding managing environmental aspects of *Owner*-Only contracts; often the high-level control method utilized is inseparable from the quality of environmental performance achieved (i.e. dictating the high-level control method shall achieve a better level of performance). In such cases the high-level control method is still a "what" whereas the detailed procedures to implement and carry out the control method is the "how". The detailed procedures have a direct impact on worker safety and shall be left to the *Constructor* to determine. The below *examples* are intended to show what OPG is entitled to do and key limitations when managing environmental aspects of *Owner*-Only contracts (However, please also keep in mind that this section is not a "complete code" for dealing with environmental requirements relating to *Owner*-Only contracts and issues. This section shall be read in conjunction with the requirements of the remainder of

the manual. In particular, the *Owner*-Only references in section 1.3 and Appendices C and E, and all of Stage 4B of this manual address important considerations specific to *Owner*-only contracts).

Planning Stage

COMPLIANCE WITH REGULATION AND POLICY	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can require in the contract that the *Constructor* comply with all relevant environmental legislation. This allows OPG to audit for compliance to clearly prescribed (e.g. numerical) environmental legislative requirements. OPG can request that the *Constructor* meet legally required environmental training standards (e.g. per Transportation of Dangerous Goods Regulations, asbestos shipping requirements per Regulation 347 under the EPA).	OPG cannot direct the *Constructor* as to how to comply with legislative requirements that are dependent on subjective interpretation of a legislative requirement (e.g. a requirement to use "adequate", "reasonable" measures, interpretations dependent on one's interpretation of a definition or technical matter where more than one potential interpretation exists). OPG cannot require or request the *Constructor* conform to OPG Policies.

ENVIRONMENTAL ASSESSMENTS/APPROVALS/PERMITS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG shall make the decision on who is to obtain the environmental approvals (Environmental Assessment (EA), Certificate of Approval (C of A), permits, etc.) required for the work dependent on complexity, duration of work, anticipated terms & conditions and legacy of the approvals. There is first a need to consult with Law regarding this. *Owner*-Only *risk* is minimized by having the *Constructor* obtain and hold approvals and interact directly with MOE or other regulatory agencies regarding approval issues wherever possible. In some cases, however, the regulator shall require that an approval/permit be issued in OPG's name. In such cases, it is important to consult with Law regarding the *Constructor's* and OPG's roles in any filings or other submissions required pursuant to the approval and to ensure that the approvals/permits do not specify the procedures to be used by the *Constructor*. In some cases, in the interests of advancing the *project* schedule, OPG may, prior to awarding a contract initiate the process for obtaining an environmental approval with the intention of turning	OPG shall not try to indirectly dictate or control the procedures used to perform the environmental aspects of the work by incorporating (or suggesting to the MOE, DFO etc. to incorporate) this into environmental approvals that the *Constructor* shall be bound to follow.

ENVIRONMENTAL ASSESSMENTS/APPROVALS/PERMITS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
the process over to the *Constructor* once the *Constructor* is selected. This may be acceptable; however, it should be determined on a case by case basis with Law. It may be permissible to require the *Constructor* to comply with OPG existing C of As depending on the terms of the Approvals, including the level of detail of the existing Approvals. In many cases it shall be necessary to obtain a *Project* Specific C of A. This should be determined on a case by case basis in consultation with Law. Even where the C of A or other permit or approval for the *Project* is in OPG's name, *risk* to OPG's *Owner*-Only status is minimized by, whenever possible, having the *Constructor* rather than OPG interact directly with the regulators.	

PREPARING ENVIRONMENTAL SPECIFICATIONS (SEE ALSO O/O REFERENCES IN "STAGE 1" AND APPENDIX E	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can provide environmental requirements that state both the performance required and the control method to achieve that performance. Examples include but are not limited to: • *Containment* as the control method for a spill (e.g. compliance with performance requirements of Canadian Council of Ministers of the Environment (CCME) standard). • Silt curtain as the control method for erosion & sediment control (could also specify the type/quality of silt curtain). • Control and collection of grout slurry near watercourses to protect water quality (quality/performance measure). • Waste management performance targets (e.g. diversion of waste from landfill through recycling). • Fish to be removed from the work area prior to dewatering and released alive immediately downstream (performance measure). • Wash, refuel, service machinery and store fuel	OPG cannot provide a procedure, suggestions, recommendations or approval regarding 'how' to install an environmental control, e.g. OPG cannot recommend or approve a procedure for installing *containment* or a silt curtain. OPG should ensure that the *Constructor's* SSEP does not contradict (and incorporates/is consistent with) any other environmental commitments agreed to by the *Constructor*. Such other commitments include constraints associated with the EA, EA Approval Conditions, applicable C of As, and 3rd Party Agreements (e.g. agreements with municipalities that contain requirements relating to environmental matters). OPG cannot expand upon or provide its subjective interpretation of general terms in such documents were doing so may be construed as suggesting procedures to be used to implement the environmental requirements contained in such documents.

and other material for the machinery a specified distance away from the water (directed at performance - i.e. prevention of any harmful substance entering water) • Noise levels not to exceed Ministry of Environment or local by-law requirements (performance measure – *Constructor* has some choice as to how they shall control noise); • Water as the control method required for dust control. (Control method to achieve desired performance).	**Note:** Appendix E provides a chart outlining suggested content of an Environmental Site Specific Plan. With the **exception** of items in the chart relating to OPG required training or use of OPG policies or procedures, OPG may provide this chart to a potential *Constructor* and require that, as a minimum, the *Constructor* address the listed areas when submitting its SSEP.

Procurement Stage

PROCUREMENT	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can review the *Constructor's* SSEP submitted by the *Constructor* (*before* the Plan is finalized) for areas where the *Constructor* has only provided general requirements. Where the *Constructor* has only provided general requirements, OPG can ask the *Constructor* to provide a *greater level of detail* as to the materials, control methods and procedures it shall use to complete the work. OPG can then include these detailed environmental specifications as contractual obligations. These may or may not have a specific bonus/liquidated damage clause attached. OPG can then require, as part of the contract monitoring process, that the *Constructor* follow the greater level of detail the *Constructor* itself provided in the revised SSEP. If OPG is not satisfied with the greater level of detail OPG requested OPG can, with most procurement processes, dictate a specific material, control method, or performance measure to be used (but not the procedures to implement the control method or performance measure). OPG would ask the *Constructor* to provide a revised price on the more specific requirements. (Also see discussion in the *Different Procurement Approaches and Introduction* section above).	

Execution Stage (See also Stage 4B in this manual)

CONTRACT AUDITING/MONITORING - ACCESS TO SITE	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG environmental staff can access the *Construction Island* for contract compliance monitoring, but shall obtain the *Constructor's* permission and follow the *Constructor's* site procedures. Often the CA or monitor (including an "*Owner*'s Rep") shall be the sole OPG representative monitoring for contractual compliance.	OPG staff may not enter the *Construction island* without the *Constructor's* approval. Should limit monitoring for environmental aspects to scheduled, periodic audits; e.g. no more than weekly so as to avoid perception that OPG representative is supervising work or that the *Constructor's* staff is relying on the OPG representative for direction or approval.

MONITORING - COMPLIANCE WITH REGULATIONS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can monitor and audit compliance to clearly prescribed (e.g. numerical) environmental legislative requirements.	OPG cannot monitor the *Constructor* as to how to comply with legislative requirements that are dependent on subjective interpretation of a legislative requirement (e.g. a requirement to use "adequate", "reasonable" measures, interpretations dependent on one's interpretation of a definition or technical matter where more than one potential interpretation exists).

MONITORING - ENVIRONMENTAL APPROVALS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can monitor and audit the *Constructor* for compliance with environmental approvals and EA Approval Conditions.	OPG may not participate in any changes to regulatory approvals prepared by the *Constructor*, especially once the *Constructor* has mobilized and is on site, with the exception of: • Authorized scope of work change. • Approval extensions. • Regulator investigations.

MONITORING - ENVIRONMENTAL SPECIFICATIONS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can monitor and audit the detailed environmental specifications set in the contract, e.g. set by OPG or that the *Constructor* itself incorporated into the SSEP, to ensure the contractual performance measures are met. For example, if *containment* was specified in the contract, OPG could monitor that *containment* was in place and would function as intended in case of a spill. (See in particular Stage 4B under the headings: "Monitor the Work", "Document and Report Deficiencies" and "Monitor for Correction of Defects" for further details regarding identifying and addressing contractual deficiencies).	OPG cannot approve, supervise, monitor and/or direct the *Constructor* regarding how the *Constructor* installs environmental controls that are not in the SSEP, e.g. if the contract specified that the *Constructor* install spill *containment*, OPG could not monitor the step by step procedure of putting *containment* in place. Environmental monitoring should be limited to very periodic monitoring (e.g. once per week) to avoid the *Constructor* or its subs perceiving that or looking to OPG to supervise the execution of the environmental work. When deficiencies are noted, ensure that OPG does not dictate/suggest corrective actions not clearly prescribed by the contract, legislation or SSEP.

ENVIRONMENTAL AUDITING	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
See monitoring above.	OPG cannot conduct ISO 14001 or other types of management systems audits of *Constructor* activities.

SPILL REPORTING, C OF A INFRACTIONS AND VARIANCES TO ENVIRONMENTAL ASSESSMENT COMMITMENTS	
THINGS OPG IS ENTITLED TO DO	**THINGS OPG CANNOT DO**
OPG can request that the *Constructor* report to OPG all spills, C of A infractions and variances to EA commitments to OPG regardless of magnitude, duration or location. It is important to remember that the EA commitments are the *owner's* responsibilities.	With respect to spill reporting to the regulator, OPG shall not be responsible for, or report environmental spills (as per EPA) that are caused by the '*Constructor*'. If the *Constructor* refuses to report a spill, OPG may decide it is necessary to report the spill to the MOE, after consultation with Law.

Appendix H

RECORD RETENTION

Contract Management documentation shall be retained for a period of 6 years plus current in accordance with RRA 2007033, and may include but is not limited to the following:

- FIN-FORM-CM-001: Form 1 – Contract Planning Confirmation
- FIN-FORM-CM-002: Form 2 – Bid Selection Summary
- FIN-FORM-CM-003: Form 3 – Contract Work Release
- FIN-FORM-CM-004: Form 4 – Contract Final Inspection
- FIN-FORM-CM-005: Form 5 – Contract Closeout and Evaluation
- FIN-FORM-CM-006: Form 6 – Small Contract Management Folder
- FIN-FORM-CM-007: Worksheet A – Generic Requirements for Contract Requirements Document
- FIN-FORM-CM-008: Worksheet B – Contract Safety Hazards Evaluation
- FIN-FORM-CM-009: Worksheet C – Contract Environmental Aspect Evaluation
- FIN-FORM-CM-010: Worksheet D – Bid Evaluation Worksheet
- FIN-FORM-CM-011: Worksheet E – Contract Work Release Worksheet
- FIN-FORM-CM-012: Worksheet F – Contract Inspection Checklist
- FIN-FORM-CM-013: Job Aid I – Contract Management Plan
- FIN-FORM-CM-014: Job Aid II – Contract Administrator and Monitor Qualifications
- FIN-FORM-CM-015: Job Aid III – Safety Certification for Rented or Contractor's Equipment
- FIN-FORM-CM-016: Job Aid IV – Contract Change Authorization
- FIN-FORM-CM-017: Job Aid V – Contract Monthly Safety Incidents
- FIN-FORM-CM-018: Job Aid VI – Notice of Construction Contract Completion
- FIN-FORM-CM-019: Job Aid VII – Roles and Responsibilities Matrix for Contractor Management
- FIN-FORM-CM-020: Job Aid VIII – Daily Log
- FIN-FORM-CM-022: Form 7 – Control of Hazardous Energies Planning Phase Owner-Only
- FIN-FORM-CM-023: Job Aid IX – Control of Hazardous Energies Walkdown Owner-Only

Appendix I

GLOSSARY OF TERMS

Acronyms

ASL	Approved Supplier List
BTU	Building Trades Union
BU	Business Unit
CA	Contract Administrator
CCME	Canadian Council of Ministers of the Environment
CCR	Contract Change Request
C of A	Certificate of Approval
CG	Condition Guarantee
CI	Construction Island
CMP	Contract Management Plan
CPAA	Chestnut Park Accord Addendum
CSA	Canadian Standards Association
CWPA	Contract Work Package Authorization
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment
EH&S	Environment, Health & Safety
EMS	Environmental Management System
EPA	Environmental Protection Act
EPSCA	Electrical Power Systems Contractors Association
ESA	Electrical Safety Authority
H&S	Health & Safety
HoR	Holder of Record
ISO	International Organization for Standardization
JH&SC	Joint Health and Safety Committee
JSA	Job Safety Analysis
MA	Maintenance Authority
MOE	Ministry of the Environment
MNR	Ministry of Natural Resources
MOL	Ministry of Labour
MOU	Memorandum of Understanding

MSA	Master Service Agreement
MSDS	Material Safety Data Sheet
MRPH	Maximum Reasonable Potential for Harm
M&TE	Measuring and Test Equipment
NPRI	National Pollutant Release Inventory
O&M	Operation and Maintenance
OFC	Ontario Fire Code
OH&S	Occupational Health & Safety
OHSA	Occupational Health & Safety Act
OPG	Ontario Power Generation Inc.
QA	Quality Assurance
PCB	Polychlorinated Biphenyls
PO	Purchase Order
PVL	PASSPORT Vendor List
RFP	Request for Proposal
RFQ	Request for Quote
RRA	Record Retention Authorization
SCR	Station Condition Record
SEQC	Safety, Environmental and Quality Contractor
SME	Subject Matter Expert
SPOC	Single Point of Contact
SSEP	Site Specific Environmental Plan
PSSSP	Project Site Specific Safety Plan
T&M	Time and Materials
TP	Terminal Point
TSSA	Technical Standards and Safety Authority
WHMIS	Workplace Hazardous Materials Information System

WPC	Work Protection Code
WPCC	Work Protection Code Coordinator
WSIB	Workplace Safety and Insurance Board

Definitions

Adverse Effect	Impairments or potential impairments of the natural environment for any use that can be made of it; damage to property, plant or animal life; physical damage or injury to any person, or interference with the normal conduct of business.
Approved Supplier List (ASL)	A subset of the PASSPORT Vendor List which contains those suppliers qualified by Supply Chain Quality Services (SCQS) in accordance with N-PROC-MM-0010 to supply *items* and services requiring a Quality Program, or OPG Nuclear specified QA requirements.
Augmented Staff	Includes all individuals engaged "independently" through a pre-qualified staffing agency or provided by another external firm. These individuals perform somewhat loosely defined work, frequently in an identical working environment as an employee, under the direct supervision of an OPG employee/*supervisor*.
Business Level Authority (BLA)	Executive Vice President or Senior Vice President of a business responsible to implement this standard.
Condition Guarantee	Is a guarantee issued in support of Work Protection(s) and/or Condition Guarantee(s).It certifies that an isolated or isolated and de-energized condition exists at points under the control of the Issuer of the Condition Guarantee. (per WPC).
Construction	Includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, land clearing, earth moving, grading, excavating, trenching, digging, boring, drilling, blasting or concreting, the installation of any machinery or plant, and any work or undertaking in connection with a project. It does not include any work or undertaking underground in a mine (O.Reg. 213/91, §1(1))
Construction Contract	Is a contract with an external company for the installation, erection or demolition of major systems, components or structures and may include design or engineering functions; (this can include Engineering/Procure/Construct contracts).
Construction Island	An island physically separated from OPG controlled areas by clearly defined physical boundaries within which construction activities (as defined by OHSA) occur that are controlled by a Constructor other than OPG.
Constructor	Means a person who undertakes a project for an Owner and includes an owner who undertakes all or part of a project by

	himself or by more than one *employer*. (O.Reg. 813 §1(1)
Contaminant	Any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination thereof, resulting directly or indirectly from human activity.
Contract Work Package Authorization (CWPA)	Authorization given to a contractor to proceed with the quoted contract work package (scope of work). Authorization is given for the mutually agreed quoted amount when the Project Sponsor signs the "Authorization" portion of the “CWPA Form.
Contracted Work	Construction, maintenance or services performed by companies external to OPG for an agreed upon fee.
Constructor’s Supervisor	A supervisor appointed by a Constructor to fulfill the requirements of Section 14 of O. Reg. 213/91 Construction Projects.
Drawdown Contract	An approved contract issued to a pre-qualified contractor for a work package with pre-determined terms and conditions. Work shall be completed within a reasonable period of time following the issue date of the original contract.
Employer	A person who employs one or more workers or contracts for the services of one or more workers and includes a contractor or sub-contractor who performs work or supplies services and a contractor or sub-contractor who undertakes with an owner, constructor, contractor, or sub-contractor to perform work or supply services (OHSA §25,26).
Environmental Aspect	An element of an organization’s activities, products or services that can interact with the environment. (ISO 14001:2004)
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services. (ISO 14001:2004)
Environmental Management System (EMS)	The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy. (ISO 14001:2004)
Firm Performance Index	A calculated index prepared by the WSIB for construction trade firms that incorporates the firm’s WSIB related costs and Lost Time Accident Frequency. A *Firm Performance Index* value of “0” represents the trade group average. A positive value indicates that the firm is above the trade group average in performance while a negative value indicates below average performance.

Master Service Agreement	Establishes agreed upon terms (e.g., rights and obligations of the supplier including insurance, credit provisions, events of default, termination, etc.) under which OPG may purchase services from time to time on an ongoing basis from a supplier. The scope of work (for services) as well as the economic terms of a particular transaction (including special pricing terms such as a fixed price, schedule, quantity, liquidated damages, etc.) are agreed upon in a separate transaction document at the time of each purchase. Each transaction document incorporates the terms of the Master Agreement by reference. A Master Agreement, typically: • Applies to the purchase of similar items and services. • May be used across multiple BUs or across multiple plant groups. • Is re-evaluated periodically by OPG. • Aids in minimizing transaction cycle time .
Maintenance Contract	A contract with an external company for the maintenance of station or site equipment, components or systems, e.g., turbine, valve, or electrical equipment maintenance.
Memorandum of Understanding	Written to document the parties' understanding with respect to project details.
Owner	Includes a trustee, receiver, mortgagee in possession, tenant, lessee, or occupier of any lands or premises used or to be used as a workplace, and a person who acts for or on behalf of an owner as an agent or delegate (OHSA §29).
PASSPORT Vendor List (PVL)	A PASSPORT system used for all Nuclear POs which is tied into SAP for all payments made to suppliers. To be awarded a nuclear PO, suppliers are required to be on the PVL. (FIN-PROG-MM-001)
Project	A construction project, public or private, including: 1. The construction of a building, bridge, structure, industrial establishment, mining plant, shaft, tunnel, caisson, trench, excavation, highway, railway, street, runway, parking lot, cofferdam, conduit, sewer, water main, service connection, telegraph, telephone or electrical cable, pipe line, duct or well, or any combination thereof. 2. The moving of a building or structure. 3. Any work or undertaking, or any lands or appurtenances used in connection with construction (O.Reg. 213/19, §1(1).
Proponent	Means any potential supplier who is invited to submit a quotation or proposal to OPG in response to a RFP or RFQ (OPG-PROC-0058)

Request for Proposal (RFP)	Is a procurement document that requests suppliers to supply solutions for the delivery of items and/or services or to provide alternate options or solutions. It is a process that uses predefined criteria in which price is not the only factor. A *RFP* is used where the estimated value of the requirement is $100,000 or greater. (OPG-PROC-0058)
Request for Quote (RFQ)	Is a procurement document that requests a supplier response to supply items and/or services based on stated delivery requirements, performance specifications, terms and conditions. A *RFQ* usually focuses the evaluation criteria predominantly on price and delivery requirements. A *RFQ* is used where the estimated value of the requirement is less than $100,000. (OPG-PROC-0058)
Risk	A measure of the probability and severity of an adverse effect to health, property or the environment.
Safe Work Planning	Generic term for the process used to identify hazards and eliminating or developing controls and communicating them to employees. See Corporate Safety Rule Risk Rule 1.1. A written safe work plan may be a Job Safety Analysis, a Job Planning folder, or any other suitable planning tool.
Service Contract	A contract with an external company for the maintenance of minor equipment, e.g., janitorial services, snow removal.
Single Source	Refers to the use of a non-competitive procurement process to acquire items or services from a specific supplier
Special Commercial Conditions	Defines the safety, environment and quality standards, and field inspections required.
Supervisor	A person who has charge of a workplace or authority over a worker (OHSA §27).
Supporting Guarantee	Is a guarantee issued in support of Work Protection certifying that an isolated or isolated and de-energized condition exists. A Supporting Guarantee may be a Condition Guarantee or an Internal Condition Guarantee (N-LIST-08400.11-10000)
Terminal Point	A Terminal Point is a device that serves as a division point between equipment under control of any two authorities. The device may be under the operating control; of either authority. (WPC Manual)
Vendor Master	Is a SAP list of individuals or organization with which OPG has placed a contract. To be awarded a PO by Corporate, Thermal or Hydroelectric, suppliers shall be listed on the Vendor Master. (FIN-PROG-MM-001)

Workplace Harassment	Engaging in a course of vexatious comment or conduct against a worker in a workplace that is known or ought to be known as unwelcome
Workplace Violence	(a) The exercise of physical force by a person against a worker, in a workplace, that causes or could cause physical injury to the worker (b) An attempt to exercise physical force against a worker, in a workplace, that could cause physical injury to the worker, (c) A statement or behaviour that it is reasonable for a worker to interpret as a threat to exercise physical force against the worker, in a workplace, that could cause physical injury to the worker

CEA 2-30

1. We continue to advertise for internal staff and have followed our business plan.
2. Contracted external vendors on available staff + interviewed selections made in area of quality assurance auditors.
3. Hired permanent staff for development as a succession plan.
4. Temporary staff hired and in place. Current temp staff to address short term procurement needs.

ONTARIO POWER GENERATION

Internal Use Only		
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Usage Classification: Information	Sheet Number: N/A	Page: 1 of 22

Nuclear Instruction

TITLE
NUCLEAR PROJECT - GATED PROCESS

AUTHORIZATION	
SINGLE POINT OF CONTACT:	Paul James Manager, Program Infrastructure Nuclear Refurbishment
AUTHORIZATION AUTHORITY:	Derek McAuley Manager, Project Management Office Nuclear Refurbishment
COMPLIANCE DATE:	Immediate

PURPOSE
This procedure ensures Nuclear Projects uses a common approach to approving progression through the various project phases and is in alignment with corporate requirements. This procedure takes authority from N-PROC-LE-0009 NR Schedule Management

EXCEPTIONS
None

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1.0 DIRECTION

1.1 Objective

The objective of this Instruction is to outline the purpose and provide instructions on the Nuclear Project Gated Process. This Instruction was designed to meet the needs of Nuclear Refurb but may be used by other Nuclear Project groups.

All refurb projects including Campus Plan projects will utilize this process to obtain funding.

This Instruction"s focus is primarily Project work. Divisional and programmatic work is excluded from this Instruction"s requirements. Programmatic work may elect to manage their work through this Gated Process.

This Instruction is intended to be in alignment with the Project Development Protocol (PDP) Standard (OPG-STD-0073). All projects over $25m must go to the Board and must demonstrate adherence to this standard.

A key objective of this process is to keep it simple through the use of simplified and standardized templates and forms while balancing the need for appropriate oversight and project controls.

1.2 Purpose

The purpose of the Instruction is to provide Project staff with knowledge of:

- Project Gate/Milestone concept
- A definition of requirements for each Phase/Gate/Milestone
- Key Inputs, Key Deliverables, and Gate Outcomes
- Gate Review Board Roles & Responsibilities
- Milestone Completion Requirements

1.3 Intended Audience

This Instruction is intended for all Projects within the Darlington Refurbishment Program as documented in the DN Refurbishment Program WBS (N-GUID-09701-10006).

Project Managers will co-ordinate the requirements identified to satisfy the Gated Process and may include such information/requirements in Tender Specification documents/RFP documents.

1.4 Background

The Gated Process was developed using „staged-gate" decision methodology best practice information from a variety of industries. The traditional „staged-gate" process is tailored to product development, and the continued viability of the product along stages of development.

The owner or investor of the „product" would have the option to approve or „kill" the product at any gate if the product development did not align with financial, company or program objectives. This enabled the company to have control over how far the product development would progress and how much money would be released to the product team.

The Gated Process for projects is similar to the „product development" concept in that the management team (Gate Review Board) mandates „check-points" at each major project phase in order to ensure the project is on track in its development regarding scope, cost, quality and schedule. The Gated concept is designed to control funding approval, and to control steps of progression approvals for each individual project. The process is supported by a set of project management processes and other functional area processes (namely Schedule/Cost, Engineering, Commissioning, Quality, and others) in order to establish work process flow and expectations for the project management team.

A Gate/Milestone is a single point in time at the end of a Phase. The Gate is the decision point to accept that the project is ready to progress to the next Phase. The Milestone is on the project schedule template backed up with the requirements to allow the project to go to the next phase. The process is based on completing the deliverables while progressing through each Phase, presenting the deliverables and getting funding approved for the next Phase. Progress through that Gate is approved by the Gate Review Board based on acceptance of the required deliverables presented by the Project Manager at the Gate Review Board meeting. The approval allows the project to proceed to the next phase.

Each Phase does not always end in a Gate. Some of the Phases end in a Milestone. These are the Phases where there is no decision to be made by a Gate Review Board (GRB). These Milestones will be monitored on a schedule and adherence is required to a Milestone Definition.

The Nuclear Project Gated Process has gates, each representing a decision point in the project life cycle. At any gate in the process, the Gate Review Board has the ability to:

(a) Approve the project gate proposal to allow development and release of funds (at specific gates only) to progress to the next project phase, ensuring the gate expectations have been met and challenged if required. The Gate Review Board also has the accountability to ensure the gate proposal includes the identification of the appropriate performance measures required to continue progress through the next project phase.

(b) Ensure confidence, independent of the Project team, in the project's ability to deliver, per project specifications.

(c) Reject the project gate proposal and stop the project. If Gate Review Board makes this decision, the project would be formally stopped and subsequently closed.

(d) Defer the decision, request additional analysis, and revisit at a later date.

(e) Redirect/redefine the gate proposal, and request the project team to update gate deliverables per the direction provided and return to the Gate Review Board for future consideration. Project is not approved to proceed at this time.

It is important to ensure the projects within the program meet a consistent expectation of quality and performance. The Gated Process can facilitate that expectation, through the support of all the project management processes and templates required by the project teams during all project phases. Project Managers are accountable to present "Why their Project meets each Gate expectation". For each of the gates in the process, there is a Gate Document that will be required for submission at each Gate Review Board meeting. These documents will identify all the key inputs, key deliverables, key outputs and next steps required to complete the gate. Formal approval for the Project to move on through the Gate will be given by the Gate Review Board. The Gate Document will record this decision from the Gate Review Board. Each key deliverable will be supported by a procedure/process or template for consistency of standards.

For each of the milestones in the process, there is a Milestone Completion Document that will be completed and signed off prior to acceptance of Milestone Completion. These documents will identify all the key deliverables, key outputs and next steps required to complete the milestone. There is no decision required by the GRB at Phases that end with a Milestone.

The Nuclear Refurbishment website will contain critical forms/templates related to and in support of this Gated Process as they are approved for use.

1.5 Project Manager Accountability

The following actions are executed by the Project Manager:

- Ensure Project is scheduled on the agenda of the Gate Review Board Meeting.
- Prepare the Gate Documents in advance of the Gate Review Board Meeting.
- For Darlington Refurb prepare the Milestone Completion Document per D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration prior to the scheduled milestone completion date.
- Submit required project deliverables for inclusion on the Gate Review agenda.
- Attend Gate Review and respond to Gate Review Board"s questions and assessment.
- Ensure that Project schedules include the Gates as milestones.

1.6 Gate Review Board Chair

- In accordance with NK38-PLAN-09701-10006 - Gate Review Board Terms of Reference Signs the Gate Sign off Document at each GRB meeting based on recommendations from the GRB Committee.

1.7 Process Owner Accountability (Gate Review Board Secretary)

- Set up the Gate Readiness Reviews prior to the GRB (Gate Review Board) Meeting

- Set up Gate Review Board Meeting agenda.
- Record decisions made by the Gate Review Board.

2.0 GATED PROCESS

Scope is approved at Gate 0 of the Gated Process. Approved Scope will have different levels of complexity. Different types of scope/projects may have different decision gates which will require different forms of management reviews and approvals. Each type of scope/project will be reviewed to determine the level of gate decisions required (for illustration purposes only).

Gate	*EPC	Non EPC	Campus Plan (inside protected area)	Campus Plan (outside protected area)	Cyclical Work/ Maintenance
G0	X	X	X	X	X
G1	X	X	X	X	
G2	X	X	X	X	
G3	X	X	X	X	
M1	X	X			X
M2	X	X			X
G4	X	X	X	X	X
M3	X	X			
M4	X	X	X	X	
G5	X	X	X	X	

*EPC – Engineer, Procure, Construct.

Milestones have been added after Gate 3 to further define “Ready to Execute” and “Ready to Commission/Turnover” checkpoints.

For Projects being executed in multi units, Milestones have been added after Gate 4 for unitized Project Closeout and unitized Post Implementation Review (PIR). Some Projects will be not unitized and will not require these intermediate milestones. They will perform PIR and Project Closeout for these types at Gate G5.

For Darlington Refurb Projects completion of documentation requirements for Milestones M1 to M4 will be per D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration.

Gate G5 is final Project Closeout.

Approval of Scope at Gate 0 is generally performed in a Functional Organization approach. Progressing through Gates/Milestones 1 to 5 is performed in a Project Organization approach.

Note: This Gated Process covers a normalized gating process. It is understood that the Project Manager can combine gates, combine deliverables within gates and bring deliverables ahead or move them back as long as the Project Manager requests the deviation and as long as Gate Review Board approves the approach. Due to differences between Gated Process requirements and EPC, flexibility is required to allow the project to obtain concurrence to get

funds approved at G1 or earlier for Long Lead Material purchases and EPC RFP/Award of Contract. The Project Manager is expected to develop a Gate Progression Strategy (identifying deviations to the Gated Process) which is presented to the GRB at Gate G1.

The structure of the Gated Process for Projects in relation to the Program Milestones is shown in Appendix A.

See Appendix B for detailed requirements of the Overview of the Nuclear Refurbishment Project Gated Process.

As identified in NK38-PLAN-09701-10006 - Gate Review Board Terms of Reference there is a requirement to hold a Gate Readiness Review and a BCS/DRAS Review prior to the Gate Review Board Meeting. See Section 3.0 and Appendix “C” for details of the reviews required.

A GRB Summary Sheet and Gate Requirements/Gate Signoff submission shall be completed for each gate to provide evidence that gate requirements have been met (including project phase outputs and gate submission documents). The GRB Summary Sheet (N-FORM-11397) and Gate Requirements/Gate Signoff forms (N-FORM-11398, N-FORM-11399, N-FORM-11400, N-FORM-11401, N-FORM-11402) to be utilized at the Gate Review Board Meeting reside in PASSPORT.

Note that the Gate is for the deliverables at the end of the phase and is approval to proceed to the next phase.

2.1 Gate 0 Business Proposal (Program Scoping)

The Business Proposal or Program Scope is presented at Gate 0 (G0). Per NK38-PLAN-09701-10006 - Gate Review Board Terms of Reference, Gate G0 is the Scope Review Board (SRB). The scope proposal provides sufficient information to justify a decision to support whether or not to establish a Project to deliver the identified scope. Approval at G0 will signify the completion of the Business Proposal or Program Scoping Phase and will allow the project/deliverables to proceed to the Identification Phase.

2.2 Gate 1 Identification Phase

The Project Manager will be identified prior to this phase and will be accountable for all deliverables.

During the Identification Phase, the work is focused on the primary phase deliverables, which are the Project Charter, the Initiation Phase funding requirements, and initially defining/planning the initiation phase work complete with Level 3 schedule/metrics for the next phase and deliverable dates.

After scope has been approved at the Program Scope Review Board in Gate 0 further analysis/update of the Business Need may be required. This will be done through the development of a Project Charter and other documents. The Project Charter is an agreement between the Project Sponsor and the Project Manager to develop and assess alternatives which could be implemented to meet the need, and to characterize those alternatives sufficiently in order to develop an estimate of the scope of work, costs and schedule associated with each alternative.

The Project Manager will identify resource support required for the Identification Phase and will request sufficient Identification Phase funding to proceed to the preparation of Gate 1 Deliverables and to identify required prereq work/inspections that require execution in a Darlington Planned Outage.

For all projects at this phase, initial risk assessment must be completed.

A preliminary Contracting Strategy will be developed in this phase. The Project Manager will need to present a Gate Progression Strategy identifying deviations required to the Gated Process due to EPC or other requirements.

The Project Manager will prepare an Initiation BCS (where required) or a Decision Record Analysis and Summary (DRAS) in accordance with N-PROC-LE-0008 and N-FORM-11390 – Decision Record Analysis and Summary Form.

The decision at Gate 1 will support the progression of the project to the Initiation Phase, where the Project Team will develop alternatives and select and propose the preferred alternative.

2.3 Gate 2 Initiation Phase

The purpose of the Initiation Phase is to develop and evaluate the Alternative Options, determine the appropriateness of the Project Manager"s proposal for the preferred alternative option, and select/approve the preferred option. In proposing the preferred option, the Project Manager will need to confirm that the option selected meets the approved scope requirements, is affordable, achievable, and will achieve value for money. A Project Management Plan (and associated components) will be prepared and approved in addition to a Definition BCS (where required) or a DRAS form prior to progressing beyond Gate 2.

This phase involves further economic analysis of each option, risk analysis and development of the schedule and estimate in sufficient detail to support the preferred option, to move the project into Definition Phase.

During this phase, major risks are identified and a risk management plan is developed for use in the next Phase. Gate 2 also requires an update to the Contracting Strategy and a review of Major Long Lead Materials to identify funding required in the Definition Phase for procurement contracts.

The decision at Gate 2 will support the progression of the project to the Definition Phase.

2.4 Gate 3 Definition Phase

The primary purpose of the Definition Phase is to develop the Preferred Option to a degree where the Project Manager and Sponsor have a high degree of confidence that the project can be executed within the proposed project baselines (cost, schedule and scope).
During the Project Definition Phase, there will be significant progress made in development of required preliminary engineering deliverables (10% - 40% Eng complete) in order to request funding for the execution phase. The project manager may request funding through a Full Release Business Case Summary (where required) or DRAS form supported by a Class 3 Estimate at the Gate 3 meeting.

The primary purpose of the Gate 3 Decision is to accept that the project is ready to progress to the Execution Phase - Prepare. Particular attention at this Gate will be given to the preparation and final proposals for performance baselines of Scope, Cost and Schedule, and the control and monitoring methods the Project Manager has in place to manage these baselines. As this is the Gate where major contract funding may be requested, the Project Manager should be able to demonstrate that the contract is robust and the risks in the terms/conditions/ partnership agreements are quantified and the risk levels are understood by the organization prior to significant contractual commitments with appropriate Contract Exit Strategies in place.

Project risk management at this Gate is also a focus, and the Project Manager must provide evidence that risks have been adequately managed and quantified in the project baselines. The Project Manager

must show how the project risks and mitigation actions will be managed through the Execution Phase to ensure project success.

2.5 Gate 4 Execution Phase

Gate 4 (G4) has been broken up into 3 distinct areas to define the transition within the stages of execution:

Prepare for Execution (Milestone M1)

Execute (Milestone M2)

Commission/Turnover (Completion of Gate 4)

The Milestones are not Gates at which a decision by the Gate Review Board is required. They are used to define scheduling transitions (managed by the Project Manager on the Project and/or Program Schedule) for completion of preparations activities, execution and ensuring readiness for commissioning/turnover.

Non station projects: ie Facility Projects may elect not to use the intermediate milestones. This should be documented with the gating strategy.

Prepare for Execution (Milestone M1)

This Milestone is for final execution preparation activities. During the pre-execution phase, 100% of the project is defined and infrastructure is put in place to implement/execute the project deliverables. This phase involves development of detailed designs and specifications, material procurement, finalizing services contracts and completion of testing/training prior to execution of the project. Completion of this Milestone will signify Readiness for Execution with an accuracy of Class 2 estimate.

Execute (Milestone M2)

This Milestone is for execution activities. The Execution Phase involves distribution of all work packages to the owners and execution of assigned tasks. Project progress is reviewed at regular intervals to monitor completion of the work packages. Completion will signify that the Project Manager has documented support to prove the completion of all deliverables as defined during the Execution Phase (not including turnover deliverables). Depending on the project scope and schedule, some commissioning or equipment testing activities may be scheduled in the Execution Phase. The deliverable completion documentation should support the expected schedule, scope, cost and quality performance as compared to the approved performance baseline.

During the Execution Phase, the project is executed, monitored and controlled as per the approved Project Management Plan. The team will monitor project performance against the approved project baselines (cost, schedule, scope) and take corrective where necessary to improve performance. Changes are managed during this phase, including cost, schedule, and scope changes that affect the project baseline. Should the baseline require a revision, this baseline revision will follow the business unit process for approvals required to change a project baseline and update the Project Management Plan.

Commission/Turnover (Completion of G4)

The purpose of the Commission/Turnover Phase is to commission the newly installed project in accordance with approved commissioning plans and specified tests and to transition the project from execution accountability to an operational accountability. The approval of Gate G4 signifies the approval to start formal transition to Operations/Maintenance. Where agreed (depending on system criticality), project deficiencies are documented and corrective actions are assigned for continued follow-up. Formalized documentation will exist in advance to outline the accepted process for turnover, and after Gate G4 is approved, the turnover can be finalized. Part of the documentation will be the acceptance of the turnover by Darlington Operations.

The Project Manager must ensure that the Darlington Operations has accepted the scope to be complete and all project deliverables have been completed. For Outstanding Scope/Deliverables, the Project Manager must demonstrate that adequate plans have been put in place to meet all project commitments with a plan and schedule for these outstanding deliverables, and accountable resources have been assigned to ensure project scope and commitments are fulfilled.

The Project Manager must show evidence that the project commitment for all approvals, warranties, licences, etc. have been met and are in place.

At the end of the Commission/Turnover Phase, the project will be declared In-Service and the Available for Service (AFS) completed and accepted.

The primary purpose of the Gate 4 Decision is to consider the project for progression to the Close-Out Phase. The focus of this Gate is to ensure all Project Deliverables have been completed and scope has been verified to be complete.

2.6 Milestone Unitized Project Closeout Phase (M3)

During the Unitized Project Closeout Phase, all project management activities for the unit are finalized and formally completed. One of the most important elements of declaring Unitized Project Closeout is the production of a lessons learned summary, and communication of the lessons in a formal report. It involves soliciting feedback from the project team and other stakeholders to improve future performance. All lessons learned reviews and project completion reports shall be stored in a centralized organizational repository for future access.

All outstanding financial and contractual obligations, liens, issues and disputes for the unit shall be identified or settled.

The primary purpose of this Milestone completion is to approve the project for „Unitized Project Closeout" Complete declaration. The Project Manager must show evidence that all unitized scope and all Project deliverables have been completed and accepted. A formal project report provided by the Project Manager shall be due at the Unitized Project Closeout Milestone. This report will be used as the basis for Final Project Closeout (G5) after the last unit project work is completed.

2.7 Milestone Post Implementation Review (PIR) (M4)

The purpose of the Post Implementation Review (PIR) is to assemble a PIR Team and evaluate unitized project performance against the baseline plan, determine actual business

benefits, and prepare a report in accordance with the PIR Corporate Process. Completion of this Milestone will signify that all unitized project requirements have been met, the actual business benefits have been accepted by the stakeholder, and determine if the project provided the benefits that were planned to be delivered to the organization. Project monitoring is complete for the unit.

After the PIR has been completed for the last unit, the project can progress to Gate 5.

2.8 Gate 5 Final Project Closeout Phase

The purpose of the Project Closeout Phase is to review all unitized project work, milestones and gates and to assess the project and derive any lessons learned and best practices to be applied to future projects. Prior to completion of this phase, all lessons learned reviews and project completion reports from the 4 units will be finalized into a single report. All outstanding financial and contractual obligations, liens, issues and disputes shall be identified or settled. During the Final Project Closeout Phase, all project management activities are finalized and formally completed. A formal project report for all units shall be due at the close-out gate (Gate 5).

The primary purpose of the Gate 5 Decision is to consider the project for „Project Close-Out" Complete declaration. The Project Manager must show evidence that all scope and all Project deliverables have been completed and accepted by the Project Sponsor and primary Project customer.

Completion of Gate 5 (G5) will signify the review and approval of the Project Completion Report and acceptance of final project metrics compared to baseline for all units. The Project Manager must demonstrate that the project will not incur any more costs after the project has met the requirements of Gate 5. All contract closeout documentation is completed, and financial closeout is declared. Project Monitoring is complete and the Project can be closed financially.

3.0 PRE GATE REVIEW BOARD READINESS REVIEW

The intent of the pre Gate Review Board Readiness Review is to ensure that the Project Manager has completed the requirements identified in each phase and has prepared the Gate Submission documents in accordance with this Instruction. The funding requirements for the next phase, and the overall estimated costs will be scrutinized to ensure alignment with the original cost estimates. This will be co-ordinated by the GRB SPOC.

All gate submission documents must be received in advance of the GRB as outlined in Appendix “C” by the GRB SPOC. The Director, Planning and Control will set expectations regarding advanced gate readiness and BCS/DRAS screening committees and review of meeting material, including timely distribution of material to all GRB members and other stakeholders.

The outcome of the readiness review is an analysis of the package and a recommendation to the GRB.

See Appendix “C” for the requirements of the pre GRB Meeting Readiness Review.

3.1 Gate Package Readiness Review

This is a Darlington Refurb internal review of the GRB Gate Documents. The Gate documents are comprised of the following: GRB Summary Sheet, DSR Database Details, Gate Requirements/Gate Signoff Document,

The review will entail completeness of the submitted package, and a graded approach of oversight of deliverables.

3.2 BCS/DRAS/Funding Request Review

This is a Darlington Refurb internal review of the BCS/DRAS/Funding Request with input from departments outside of Refurb as required.

The review will entail Completeness, Budget Review, Validate Accruals for past releases, Release Strategy Document, NPV Analysis, Alignment with Schedule and Milestones, Commentary for Variances, cost estimate in accordance with AACE Standard, Cost Impact on Nuclear Refurbishment Program, impact on Program related Milestones, Risks Related to the Program and Contingency, NPV, Economic Analysis, alignment with Charter, and alignment with original scope approval.

The GRB SPOC will co-ordinate the review including input from Major Nuclear Projects – Finance, Nuclear Investment, Corporate Investment Asset Planning as required.

4.0 GATE REVIEW BOARD

4.1 GRB Meetings

The Director, Planning and Control will establish the GRB meeting dates, as identified in NK38-PLAN-09701-10006 - Gate Review Board Terms of Reference

4.2 Gate Review Board Documentation

The Secretary will ensure that all decisions are fully documented and maintained for auditing purposes. Reasons for Gate rejection must be clearly documented.

Documents are to be stored electronically in a secure database.

4.3 Performance Reporting Between Gates

Due to the longevity of the Refurb Program and the complexity involved in preparations during each Phase there will be a long duration between Gate Review Boards for each Project.

Therefore interim update requirements for progress, schedule, cost, and quality for each Phase will be presented to Senior Management.

The Director, Planning and Control will establish reporting requirements between the Gate Review Board Meetings and the forum for presentation.

4.4 Change Control

Significant Changes to Scope, Cost, or Schedule which are outside the boundaries approved by the GRB will need to follow the change control process (ref N-PROC-LE-0010) and reviewed for impact and a decision required depending on threshold to return back to Gates. Change control will also need to be applied from unit to unit.

5.0 DEFINITIONS AND ACRONYMS

5.1 Definitions

N/A

5.2 Abbreviations and Acronyms

N/A

6.0 RECORDS AND REFERENCES

6.1 Records

6.1.1 Any controlled documents which may be produced as a result of this document should be managed in accordance with N-PROC-AS-0003, Controlled Document Management.

6.1.2 Any records which may be produced as a result of this document should be managed in accordance with N-PROC-AS-0042, Records and Document Management.

6.1.3 The following records may be generated by use of this document and shall be registered in appropriate document management system in accordance with the following table.

Record Created	Associated Form Number	QA Record? Y/N	Filing Information/Retention (PASSPORT Type/Sub-Type)
Gate Review Board Summary Sheet	N-FORM-11397		Indexed in Passport Records Management
Gate 1 Requirements and Signoff (and attachments as required)	N-FORM-11398	N	File package as single record N-REF-09701-xxxxxxx Retention – T18 RRC - TBD
Gate Review Board Summary Sheet	N-FORM-11397		Indexed in Passport Records Management
Gate 2 Requirements and Signoff (and attachments as required)	N-FORM-11399	N	File package as single record N-REF-09701-xxxxxxx Retention – T18 RRC - TBD
Gate Review Board Summary Sheet	N-FORM-11397	N	Indexed in Passport Records Management

Gate 3 Requirements and Signoff (and attachments as required)	N-FORM-11400		File package as single record N-REF-09701-xxxxxxx Retention – T18 RRC - TBD
Gate Review Board Summary Sheet Gate 4 Requirements and Signoff (and attachments as required)	N-FORM-11397 N-FORM-11401	 N	Indexed in Passport Records Management File package as single record N-REF-09701-xxxxxxx Retention – T18 RRC - TBD
Gate Review Board Summary Sheet Gate 5 Requirements and Signoff (and attachments as required)	N-FORM-11397 N-FORM-11402	 N	Indexed in Passport Records Management File package as single record N-REF-09701-xxxxxxx Retention – T18 RRC - TBD

6.2 References

N-PROC-LE-0009 - NR Schedule Management

N-PROC-LE-0008 – NR Assumptions, Constraints, Issues, and Decisions Management

N-FORM-11390 – Decision Record Analysis and Summary Form

NK38-INS-00400-10001 - Nuclear Refurbishment Cost Estimate

N-PROC-LE-0010 - Nuclear Refurbishment Cost and Schedule Change Control

NK38-PLAN-09701-10006 - Gate Review Board Terms of Reference

N-PROC-LE-0008 – Nuclear Refurbishment Assumptions, Constraints, Issues and Decisions Management

N-FORM-11392 - Funding Request Form

D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration

AACE (Association for the Advancement of Cost Engineering) International Recommended Practice No.18R-97

6.2.1 Performance References

Per Section 6.1.3

6.3 Authority

This Guide receives its authority from N-PROC-LE-0009 NR Schedule Management and is used in conjunction with NK38-PLAN-09701-10006 Gate Review Board Terms of Reference

7.0 REVISION SUMMARY

This is a new document.

Nuclear Instruction

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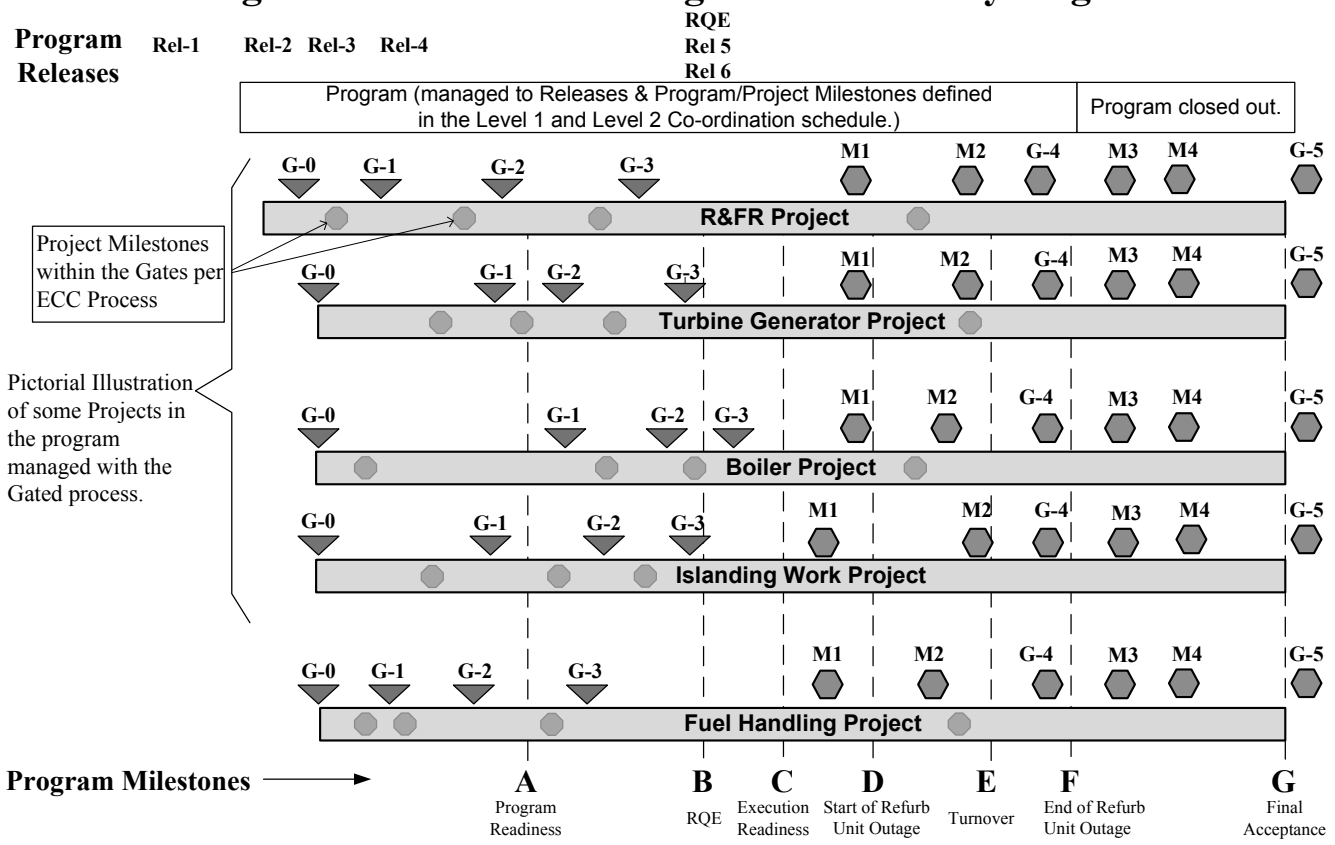
Title:
NUCLEAR PROJECT - GATED PROCESS

Appendix A: Appendix A: Structure of Gated Process/Program Milestones

Darlington Refurbishment Program – Efficiency Alignment



G-0 Project Scope Approval (Program Scope Review Board PSRB)
G-1 Approval to Proceed to Initiation Phase
G-2 Approval to Proceed to Definition Phase
G-3 Approval to Proceed to Execution Phase
M1 Unit Ready for Execution – Start of Installation
M2 Unit Ready for Commissioning/Turnover
G4 Unit Ready for Closeout
M3 Unit Project Close Approved
M4 Unit PIR Report Approved
G-5 Project Closed Financially

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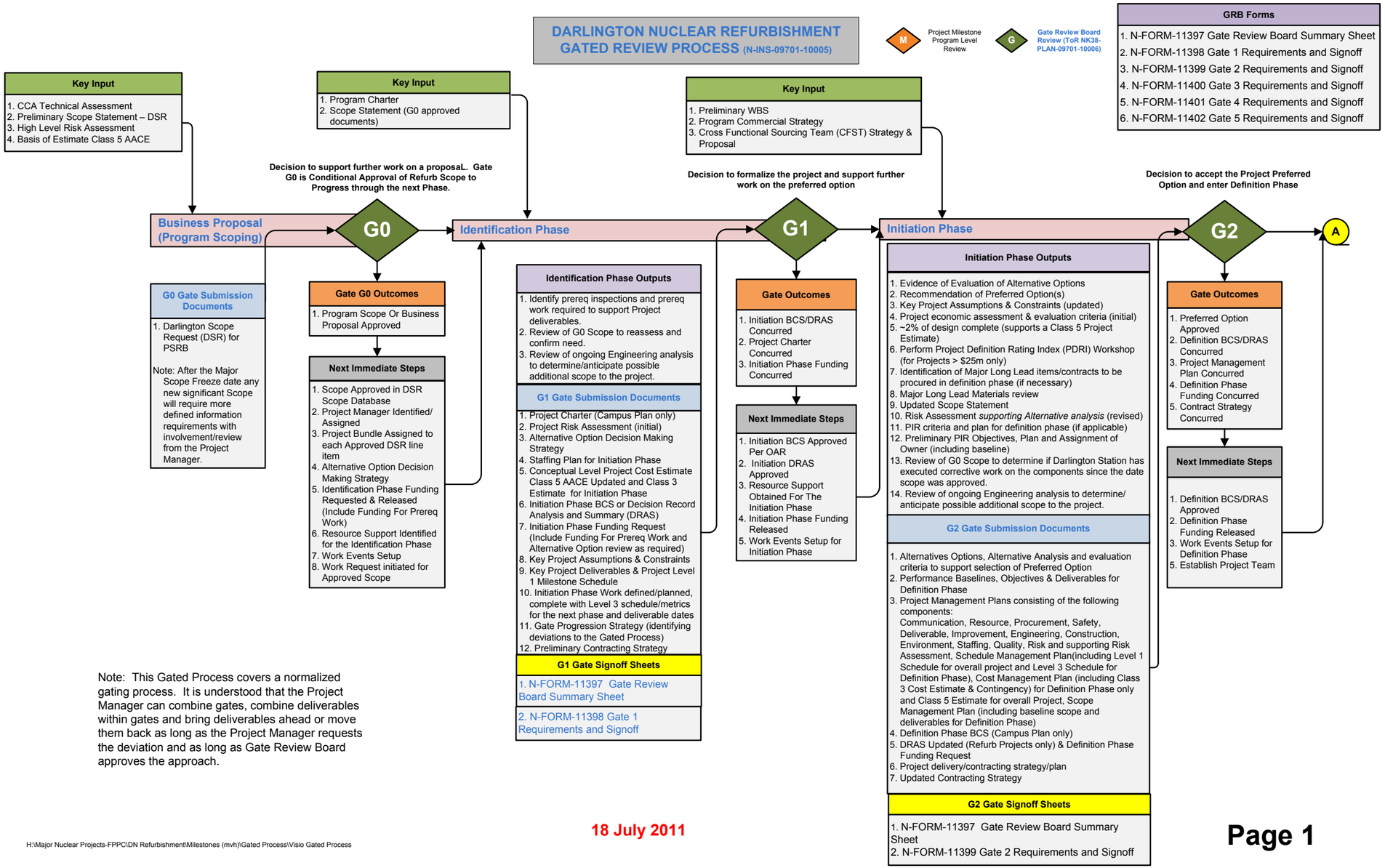
Title:
NUCLEAR PROJECT - GATED PROCESS

Appendix B: Nuclear Project Gated Process



Note: This Gated Process covers a normalized gating process. It is understood that the Project Manager can combine gates, combine deliverables within gates and bring deliverables ahead or move them back as long as the Project Manager requests the deviation and as long as Gate Review Board approves the approach.

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18 July 2011

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Nuclear Instruction

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Title:
NUCLEAR PROJECT - GATED PROCESS

DARLINGTON NUCLEAR REFURBISHMENT GATED REVIEW PROCESS (N-INS-09701-10005)

M – Project Milestone Program Level Review

G – Gate Review Board Review (ToR NK38-PLAN-09701-10006)

GRB Forms

1. N-FORM-11397 Gate Review Board Summary Sheet
2. N-FORM-11398 Gate 1 Requirements and Signoff
3. N-FORM-11399 Gate 2 Requirements and Signoff
4. N-FORM-11400 Gate 3 Requirements and Signoff
5. N-FORM-11401 Gate 4 Requirements and Signoff
6. N-FORM-11402 Gate 5 Requirements and Signoff

Key Input

1. Regulator License Requirements (if req"d)

Key Input

1. System Functions & Requirements Document
2. Value Management/Engineering Report
3. Contract Pre-Job Documentation Approved
4. Refined Performance Baseline
5. Work Packages Quality Document

Key Input

1. Change Management against Baseline Plans
2. Work Package Register

A → **Definition Phase**

Definition Phase Outputs

1. Scope of Work
2. Key Contracts Identified and ready for formal Agreement. Where contracts are not in place, but required for Execution, identify requirements and planned agreement date (include in baseline schedule).
3. 10% - 40% of design complete (for EPC Scope of Work satisfies this requirement)
4. PO for Long Lead Items (if applicable)
5. Summary of PIR Criteria and Plan
6. Perform Project Definition Rating Index (PDRI) on the project and results and recommended PDRI actions added to the Gate Deliverables
7. Key assumptions & constraints (revised)
8. Status of Regulatory Approvals (EA, ISR, Permits) and schedule for approvals not obtained to date
9. Contract Exit Strategy (off-ramps)
10. Class 3 Estimate (AACE: +30/-20% range) plus contingency, management reserves
11. Level 3 Schedule for remainder of entire project, including Project Close Out milestone and PIR Milestone. This will be the Project Baseline Schedule (as determined by Project Manager, level of detail could be more than Level 3, depending on contracting strategy and Owner management approach). Level 3 is the minimum requirement.
12. Baseline WBS & Dictionary
13. Risk Assessment with quantification and analysis of prioritized risks, updated to reflect calculation of contingency and reserves (cost and schedule)
14. Review of G0 Scope to determine if Darlington Station has executed corrective work on the components since the date scope was approved
15. Review of ongoing Engineering analysis to determine/anticipate possible additional scope to the project.

G3 Gate Submission Documents

1. Labour agreements (Jurisdiction/Mark-ups/PSAs) (if applicable)
2. Funding release strategy throughout Execution through to Project Closeout
3. Project economic assessment & evaluation criteria (final) (not req"d for Core Scope)
4. Cost Management Plan (updated) (including Class 3 Cost Estimate for overall Project (parts of the estimate may be Class 1, Class 2, Class 3, Class 4, Class 5 depending on Contracting Strategy and Bid Strategy). Basis of Estimate to be included in this deliverable
5. Schedule Management Plan (updated) (including Baseline Level 3 Schedule)
6. Scope Management Plan (updated) (including WBS for baseline scope for the project)
7. Risk Management Plan (updated) (with supporting Risk Assessment conclusions)
8. Staffing Management Plan (updated)
9. Quality Management Plan (updated)
10. Project Management Plan Updated
11. Execution Phase BCS/DRAS (approval of project execution scope & funds)
12. Execution Phase Funding Request

G3 Gate Signoff Sheets

1. N-FORM-11397 Gate Review Board Summary Sheet
2. N-FORM-11400 Gate 3 Requirements and Signoff

Decision to accept project readiness for Execution Phase. Final investment decision. → **G3**

Gate Outcomes

1. Full or Partial Release BCS/DRAS Concurred
2. Project Management Plan concurred
3. Execution Phase Funding Concurred
4. Baselines Established

Next Immediate Steps

1. Full or Partial Release BCS/DRAS Approve
2. Execution Phase Funding Released
3. Establish Metrics Suite
4. Work Events Setup

Unitized Execution Phase – Prepare

Unitized Execution Phase – Prepare Outputs

1. Materials Staging Schedule Completed
2. Testing/Training Plan in Place
3. Knowledgeable Internal 3rd Party Readiness Review
4 . Review of G0 Scope to determine if Darlington Station has executed corrective work on the components since the date scope was approved
5. Engineering Deliverables (Final)
6. Construction Execution Readiness
7. Commissioning Plan
8. Execution Baseline Developed
9. Cost Management Plan Class 2 Estimate for overall Project
10. Schedule Management Plan Level 3 Schedule Resource Levelled Schedule for overall project
11. Evidence that Execution Preparation Milestones met (old MA-0013/MA0022 type)
12. Review of ongoing Engineering analysis to determine/anticipate possible additional scope to the project.

M1 Milestone Signoff Sheets

1. D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration

Ready to Execute → **M1**

Gate Outcomes

1. Execution Baseline Accepted
2. Execution Readiness Confirmed
3. Unitized Project Ready to execute

Next Immediate Steps

1. Execution Contract Mobilization
2. Contract & Work Permit Checked
3. Prepare Performance Metrics

Unitized Execution Phase – Execute

Unitized Execution Phase – Execute Outputs

1. Execute to Plan Complete (list of outstanding work)
2. Certificate of Completion/CIS Packages
3. Quality Performance Review
4. Pre-Commissioning Check Out Plan
5. Demobilization Plan Approved
6. Execution Status Metrics
7. Contract Deliverables Checked

M2 Milestone Signoff Sheets

1. D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration

Ready for Commissioning/Turnover → **M2**

Gate Outcomes

1. Progress Reviewed
2. Forecast Evaluated/ Confirmed
3. Pre-Commissioning Plan Concurred
4. Demobilization Plan Concurred
5. Unitized Project ready for Commissioning/Turnover

Next Immediate Steps

1. Commissioning Plan Checked
2. Isolation/Permit Reviewed
3. Completion of Contractor Scorecard

→ B

H:\Major Nuclear Projects-FPPC\DN Refurbishment\Milestones (mvh)\Gated Process\Visio Gated Process

18 July 2011

Nuclear Instruction

Internal Use Only		
Document Number: N-INS-09701-10005		Revision: R000
Usage Classification: Information	Sheet Number: N/A	Page: 21 of 22

Title:
NUCLEAR PROJECT - GATED PROCESS

DARLINGTON NUCLEAR REFURBISHMENT GATED REVIEW PROCESS (N-INS-09701-10005)

M – Project Milestone Program Level Review

G – Gate Review Board Review (ToR NK38-PLAN-09701-10006)

GRB Forms

1. N-FORM-11397 Gate Review Board Summary Sheet
2. N-FORM-11398 Gate 1 Requirements and Signoff
3. N-FORM-11399 Gate 2 Requirements and Signoff
4. N-FORM-11400 Gate 3 Requirements and Signoff
5. N-FORM-11401 Gate 4 Requirements and Signoff
6. N-FORM-11402 Gate 5 Requirements and Signoff

Key Input
1. Integrated System Commissioning
2. Schedule & Cost Variance Report
3. Forecast Cost at Completion
4. Work Order/Tasks Set to Complete

Key Input
1. Settlement of All Outstanding Financial and Contractual Obligations, Claims, Issues & Disputes
2. In Service Report
3. QA Document Certified

Key Input
1. PIR Criteria & Plan
2. Baseline Schedule and Costs
3. Actual Schedule and Costs

Key Input
1. Settlement of All Outstanding Financial and Contractual Obligations, Claims, Issues & Disputes
2. In Service Report
3. QA Document Certified

B

Unitized Execution Phase – Commission/ Turnover

Project In-Service Decision to progress to Close-Out — **G4**

Unitized Project Closeout Phase

Unit Close Out Phase Complete — **M3**

Unitized Post Implementation Review (PIR)

Post Implementation Review (PIR) Completed — **M4**

Final Project Closeout Phase

Final Close Out Phase Complete Decision to accept Project Closeout — **G5**

Unitized Execution Phase – Commission/Turnover Outputs
1. Deliverables/scope verification & acceptance by Sponsor as per Business Unit process
2. Deliverables/scope verification & acceptance by the Customer (Operator) per Business Unit process
3. Demobilization Check
4. Quality & ITP Document Signed Off
5. Demobilization Plan Updated
6. Project has been declared In-Service and all project deliverables to support the declaration have been completed.

G4 Gate Submission Documents
1. Summary of Warranties, permits, licences, registrations, certificates, regulatory approvals, C of A, etc. required as part of Project Scope, and required in order to move to Project Close-Out Phase.
2. For Outstanding Scope and Project Deliverables, a plan and schedule for these outstanding deliverables (deficiency list), including accountable resources for each to ensure project scope and commitments are fulfilled.
3. Transition to Operations Report
4. Commissioning Work Plan
5. Available for Service Approval

G4 Gate Signoff Sheets
1. N-FORM-11397 Gate Review Board Summary Sheet
2. N-FORM-11401 Gate 4 Requirements and Signoff

Gate Outcomes
1. Deliverables and benefits accepted
2. Deficiency List Approved
3. Unitized Project ready for closeout

Next Immediate Steps
1. Regulatory Approvals Obtained
2. Formal Transition to Ops./ Maint.

Unitized Project Closeout Phase Outputs
1. Preparation & Issue of Project Completion Report
2. Formal Documentation of Archived Documents
3. Review of Post Implementation Review (PIR) Plan
4. Lessons Learned Report
5. Contract closeout documentation
6. Financial closeout documentation per Corporate process
7. Final Cost & Review of Variance

M3 Milestone Signoff Sheets
1. D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration

Gate Outcomes
1. Lessons Learned Review
2. Project Completion Report Concurred
3. PIR Plan Concurred
4. Accountability Metrics for Closeout Document

Next Immediate Steps
1. Sponsor Performance PIR after 6 Months Post AFS

Unitized Post Implementation Review (PIR) Phase Outputs
1. Post Implementation Review (PIR) Report (per corporate process)

M4 Milestone Signoff Sheets
1. D-FORM-10790 Darlington Refurbishment Deliverables Completion Declaration

Gate Outcomes
1. PIR Report for the Unit Approved
2. Final PIR completed if Project completed for the last unit

Next Immediate Steps
1. After last Unit completed Final Project Closeout

Final Project Closeout Phase Outputs
1. Preparation & Issue of Project Completion Report
2. Formal Documentation of Archived Documents
3. Review of Final Post Implementation Review (PIR) Report
4. Lessons Learned Report

G5 Gate Submission Documents
1. Contract closeout documentation
2. Financial closeout documentation per Corporate process
3. Lesson Learned Report
4. Final Cost & Review of Variance

G5 Gate Signoff Sheets
1. N-FORM-11397 Gate Review Board Summary Sheet
2. N-FORM-11402 Gate 5 Requirements and Signoff

Gate Outcomes
1. Lessons Learned Review
2. Project Completion Report Concurred
3. Final PIR Report Concurred
4. Accountability Metrics for Closeout Document
5. Declare Project Monitoring Complete
6. Project Closed Financially

Next Immediate Steps
1. Project Close Out Documentation
2. Closeout Project Number

18 July 2011

Appendix C: Gate Readiness & BCS Review Flow Chart

GRB Gate Readiness & BCS/DRAS Review Flow – Darlington Refurb Organization

T = -4 | T = -3 | T = -2 | T = -1 | T = 0

Gate Readiness Review

GRB Package Submission to DR SRB/ GRB SPOC Who: Project Manager

Internal Review of GRB Gate Submission Documents and Concurrence (includes GRB Summary Sheets, Gate Signoff Documents)

Quality Review (Checklist) Who: DR SRB/GRB SPOC

Audit for:
- Completeness of Package
- GRB Summary Sheet
- Gate Signoff Document
- Completion of Deliverables
- Grated Approach for Oversight of Deliverables
- Impact to Program Milestones

Feedback to Project Manager Who: DR SRB/GRB SPOC

Revise as required and resubmitted to SPOC for review

Gate Submission Documents Ready/ Distributed for SRB/GRB Who: Project Manager

Disposition of Comments. Gate Submission Documents Approved by Project Manager

SRB/GRB OAR Approvals/Board Co-ordination Who: DR SRB/GRB SPOC & Director P&C

BCS/DRAS/ Funding Request Review

BCS/DRAS/Funding Request Submission to DR SRB/GRB SPOC Who: Project Manager

P&M to Perform an Internal Review of BCS and Concurrence

Quality Review (Checklist) Who: DR SRB/GRB SPOC

Review for:
- Completeness
- Budget Review
- Validate Accruals for past releases
- Release Strategy Document
- NPV Analysis
- Alignment with Schedule and Milestones
- Commentary for Variances
- Inclusion in package of cost estimate

Review Scope Who: Darlington Refurb Sponsor

Review for:
- G0 Scope Alignment
- Alignment with Charter
- Strategy

Finance Review Who: Darlington Refurb Controller

Review for:
- NPV
- Economic Analysis

Co-ordination of comments as req'd from:
1) Major Nuclear Projects – Finance
2) Nuclear Investment
3) Corporate Investment Asset Planning (for CEO & above approvals)

Schedule/Cost Review Who: DR Planning Manager

Audit for:
- Estimate in accordance with AACE Standard and Cost Impact on Nuclear Refurbishment Program
- Program related Milestones
- Risks Related to the Program and Contingency

Consolidate Comments Who: DR SRB/GRB SPOC

Feedback to Project Manager Who: DR SRB/GRB SPOC

Revise as required and resubmitted to SPOC for review

BCS/DRAS/Funding Request Ready for SRB/ GRB Who: Project Manager

Disposition of Comments. BCS Approved by P&M

13 Jun 2011

ONTARIO POWER GENERATION

Darlington Nuclear Refurbishment Program

APPENDIX 1: SAFETY PERFORMANCE

Bundle and Vendor Performance Year-To-Date

Period Ending: 31-Mar-16

SAFETY PERFORMANCE - YEAR TO DATE (YTD)

All Injury Rate (AIR)	Actual	Target	Status	Trend
Nuclear Refurbishment Program				
OPG and Vendor Refurbishment Staff	0.00	0.24		-

EXPLANATORY NOTES

Safety performance over the period has been positive with zero lost time injuries, and zero Level 1 Work Protection Events.

BUNDLE SAFETY PERFORMANCE - YEAR TO DATE (YTD)

		All Injury Rate (AIR)	*Accident Severity Rate (ASR)*	*Reportable Safety Incidents*			*Incidents*			
Line	Bundles	Actual	Actual	# Lost Time Injury	# Medical Injuries	# First Aid Injuries	# High MRPH	# Med. MRPH	# Level 1 Work Protection Events	Hours Worked
1	Re-tube & Feeder Replacement									
2	Turbine Generator									
3	Fuel Handling & Defueling									
4	Steam Generator									
5	Balance of Plant & Refurb. Support Facilities									
6	Facilities & Infrastructure and Safety Improvement Opportunity Projects									
7	**Nuclear Refurbishment Performance**	**0.00**	**0.00**	**0**	**0**	**1**	**1**	**0**	**0**	**233,676**

VENDOR SAFETY PERFORMANCE - YEAR TO DATE (YTD)

		All Injury Rate (AIR)	*Accident Severity Rate (ASR)*	*Reported Safety Incidents*			*Incidents*			
Line	Vendors	Actual	Actual	# Lost Time Injury	# Medical Injuries	# First Aid Injuries	# High MRPH	# Med. MRPH	# Level 1 Work Protection Events	Hours Worked
1	SNC-Lavalin & Aecon									
2	ES Fox Ltd.									
3	BWXT									
4	GE-Alstom									
5	GE Hitachi Nuclear									

EXPLANATORY NOTES

1) First Aid was administered when an [redacted] contractor backed into a furniture partition which tipped over and struck the worker in the back. The contractor reported the incident but was not seriously injured and returned to normal duties. Partitions were subsequently moved until ready for installation and the contractor was coached on situational awareness.

2) A high MRPH occurred on the Turbine Generator project when a temporary handrail installed on the turbine hall crane struck and damaged a section of lighting fixtures. The fixtures fell on top of the crane, and the light tubes fell approximately 19 meters to the turbine hall floor. No injuries resulted from this event. An investigation is underway to identify causal factors and actions to prevent recurrence.

ONTARIO POWER GENERATION

Darlington Nuclear Refurbishment Program

APPENDIX 2: QUALITY PERFORMANCE

Bundle and Vendor Performance Year-To-Date

Period Ending: 31-Mar-16

QUALITY PERFORMANCE - YEAR TO DATE (YTD)

Overall Quality Performance	# Program Event Free Day Resets	# Regulatory Non-Compliance Events	Status	Trend
Nuclear Refurbishment Program				
Significant Quality Events	0	0		-

EXPLANATORY NOTES

The yellow status indicator is related to quality issues with [redacted]). An investigation is in progress, and Regulators are being kept informed and are satisfied with our oversight of the investigation. The extent of condition review will include documentation of Refurbishment projects, and vendors.

BUNDLE QUALITY PERFORMANCE - YEAR TO DATE (YTD)

Line	Bundles	*# Program Event Free Day Resets*	*# Regulatory Non- Compliance Events*	*# NCAR Initiated in Period*	*# CAR Initiated in Period*	*Avg. # Field Initiated Changes*	*# ITP Non Compliance*
1	Re-tube & Feeder Replacement	[redacted]					
2	Turbine Generator						
3	Fuel Handling & Defueling						
4	Steam Generator						
5	Balance of Plant & Refurb. Support Facilities						
6	Facilities & Infrastructure and Safety Improvement Opportunity Projects						
7	**Nuclear Refurbishment Performance**	**0**	**0**	**1**	**-**	**0.99**	**1**

VENDOR QUALITY PERFORMANCE - YEAR TO DATE (YTD)

Line	Vendors	*# Program Event Free Day Resets*	*# Regulatory Non- Compliance Events*	*# NCAR Initiated in Period*	*# CAR Initiated in Period*	*Avg. # Field Initiated Changes*	*# ITP Non Compliance*
1	SNC-Lavalin & Aecon	[redacted]					
2	ES Fox Ltd.						
3	BWXT						
4	GE-Alstom						
5	GE Hitachi Nuclear						

EXPLANATORY NOTES

1) Reported NCAR under [redacted] Issue identified with performance of work done under [redacted] quality program, and corrective action and root cause analysis are underway.
2) Reported NCAR under Campus Plan and vendor [redacted]: Repeat Finding on [redacted] that sub-supplier was not on Approved Supplier List. Action with vendor to correct.
3) The average number of FICs to approved modification packages for Balance of Plant is slightly above the target of 1.5. Actions are in place to understand the root causes of the FICs to prevent recurrence.

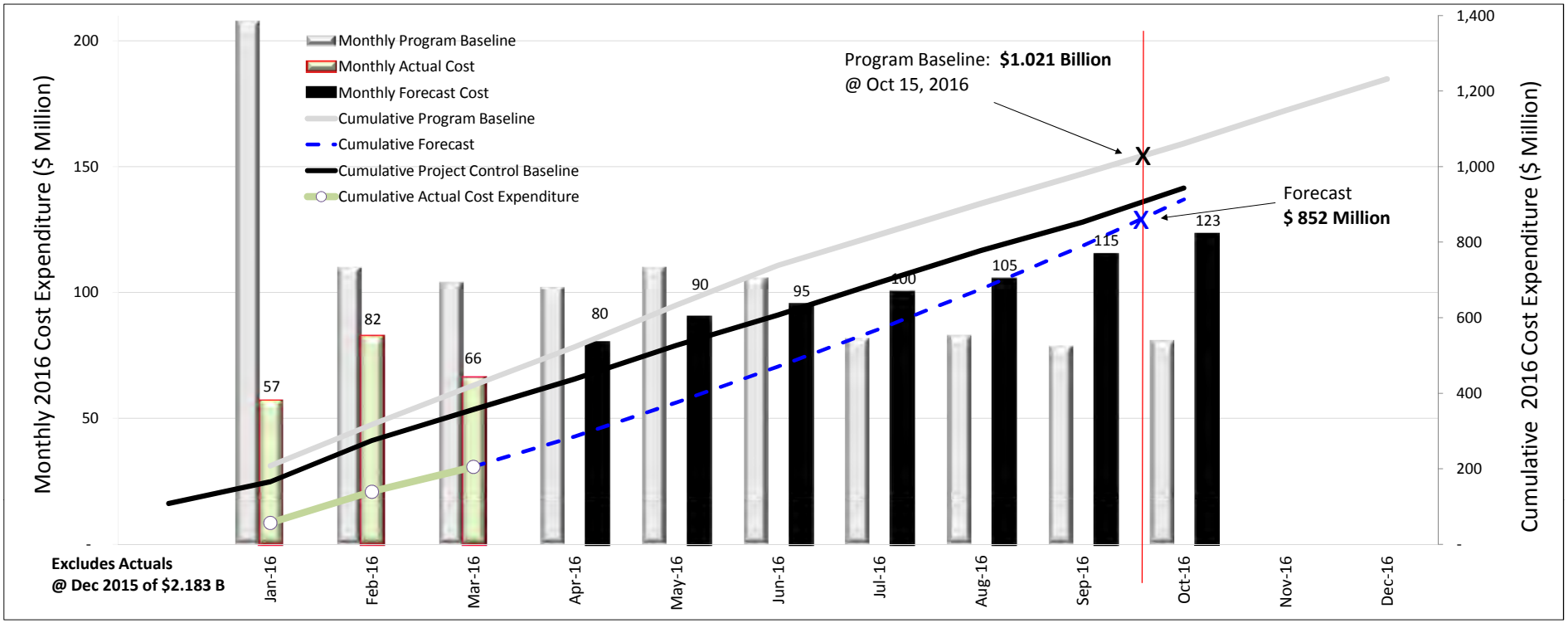
**NCAR = Non-conformance Corrective Action Request; CAR= Corrective Action Request; ITP = Inspection and Test Plan*

ONTARIO POWER GENERATION Darlington Nuclear Refurbishment Program

Period Ending: 31-Mar-16

APPENDIX 3: FINANCIAL PERFORMANCE

Financial performance of the Unit 2 Mobilization release for the period until October 15, 2016 (Breaker Open)



Executive Summary & Discussion:

2016 Cost Expenditure Summary	*Life-to-Date Cost ($M)*	*Variance from Plan ($M)*	*%*	*@ Completion of Rel 5a : October 15, 2016*	*Cost Expenditure*	*%*
Program Baseline[(a)]	421	**(216)**	**-51%**	Total Release 5a	1,021	
Project Control Baseline [(b)]	357	**(152)**	**-42%**	Forecasted Expenditures through Oct 15th	852	**-17%**
Actual Cost Expenditure	**205**	-	-	**Variance from Plan**	**(169)**	

1 - Actual expenditures as of March 31 is $216 Million below plan due to:

(i) Lower spend by the Re-tube & Feeder Replacement ($96 Million) due to delays in work instruction development and assessment, and the procurement of reactor components. The project is expected to recover the majority of this delay by Q3 of 2016.

(ii) Schedule delays in Facilities & Infrastructure and Safety Improvement Opportunities ($63 Million), including the 3rd Emergency Power Generator and Heavy Water Storage Project. These projects have recovery plans in place through 2016 and into early 2017.

(iii) Lower OPG resources ($16 Million) due to delays in transferring of staff to the project and/or recruitment. Recruitment strategies are in place to ramp up to meet the planned staffing levels.

2 - Forecasted cost expenditures through Oct 15, 2016 is $169 Million below plan mainly due to re-flowing of the work based on the latest schedules presented at Gate and as a result of the delays in completing the Heavy Water Storage Project as noted above. The life-cycle forecast for the overall program remains at $12.8 Billion.

Notes:

(a) Program Baseline represents the amount of funds released to the project by the Board of Director's at the Release Quality Estimate (November 2015).

(b) Project Control Baseline represents the amount of funds released by the Program, to the individual projects, for executing their scope. It is the basis for which individual project performance, including SPI, CPI, etc. is measured.

ONTARIO POWER GENERATION

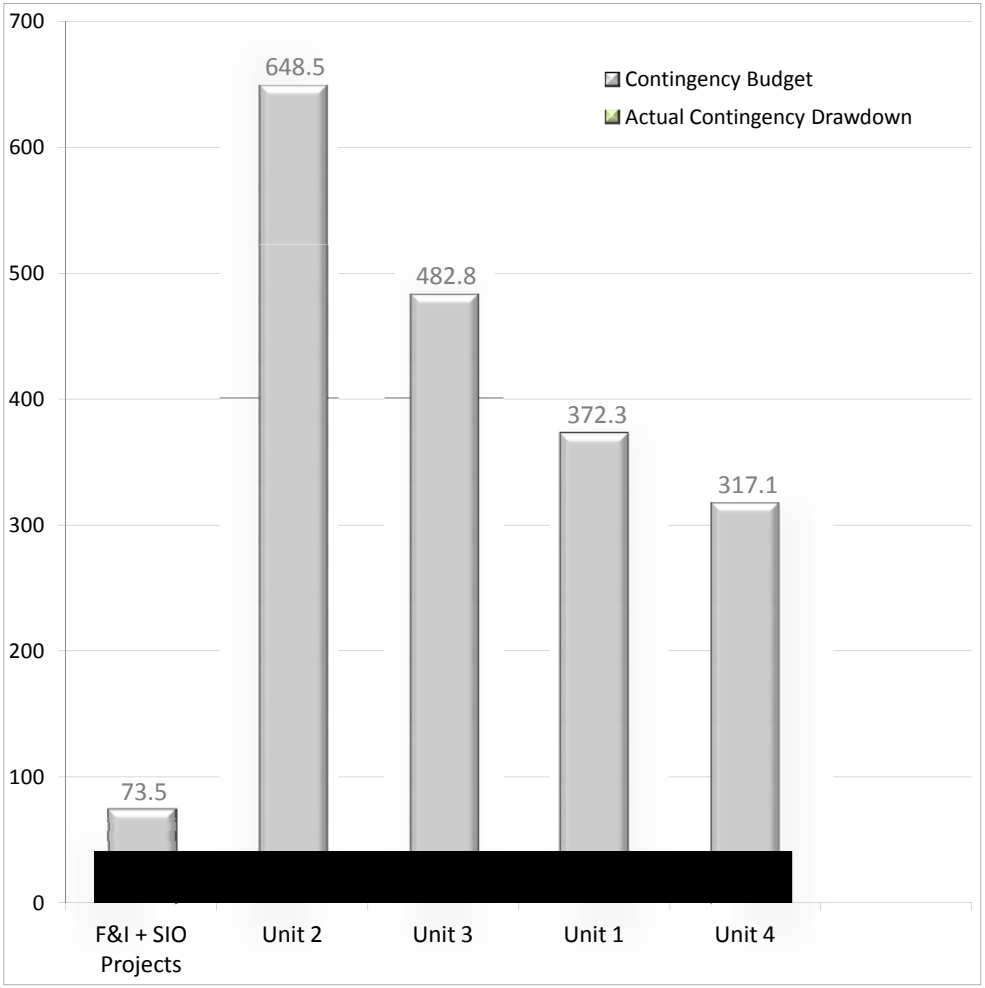
Darlington Nuclear Refurbishment Program

APPENDIX 4: CONTINGENCY MANAGEMENT

Period Ending: 31-Mar-16

CONTINGENCY DRAWDOWNS BY UNIT AGAINST TOTAL PROGRAM BUDGET

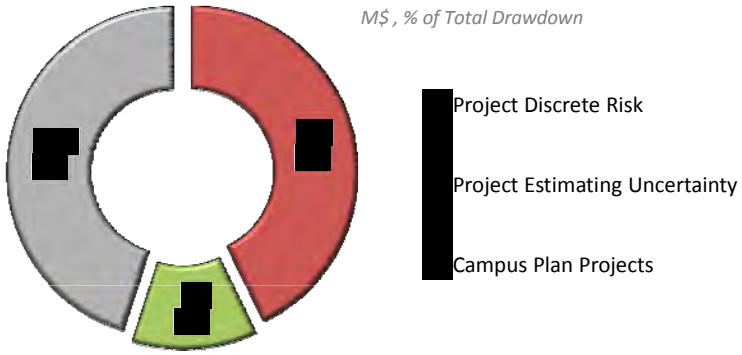
	Unit	Contingency Budget (M$)	Approved Program Release (5a)	LTD Actual Contingency Drawdown	Remaining Contingency	% Drawn
1	F&IP & SIO Projects	73.5	36.8	[redacted]		
2	Unit 2	648.5	32.7			
3	Unit 3	482.8	-			
4	Unit 4	372.3	-			
5	Unit 1	317.1	-			
6	**Total**	**1,894.1**	**69.5**			



EXECUTIVE DISCUSSION

1 - The unitized contingency includes embedded inflation / escalation of $189 Million on top of the $1,706 Million ($2015) reported in Release Quality Estimate.

DRAWDOWN BY CONTINGENCY CATEGORIZATION



DESCRIPTION OF CONTINGENCY DRAWS DURING THIS PERIOD

#	Description	Amt $ mil
1	Unit Islanding: Work Plan revisions and operations support for moderator draining.	$ [redacted]
2	Turbine Generator: Pre-requisite work support activities, and software qualification.	$
3	Re-tube & Feeder Replacement: Minor changes to power supply until Temporary Power Distribution System is in service.	$
4	Fuel Handling / Defueling: Minor modifications to Universal Carriers for Trolleys and New Fuel Transfer Mechanism.	$
5	Balance of Plant: Improve reliability of dryers and reduce overall schedule risk; and ES Fox and OPG support for assessing milestone.	$
6	STOP Project: Discovery work that identified design modifications to address the pre-existing system condition.	$
7	Facilities & Infrastructure and Safety Improvement Opportunities: 3rd Emergency Power Generator, Re-tube & Feeder Island Support Annex and the Refurbishment Project Office.	$
8	Other.	$
-	**Total Draw this Period**	**$**

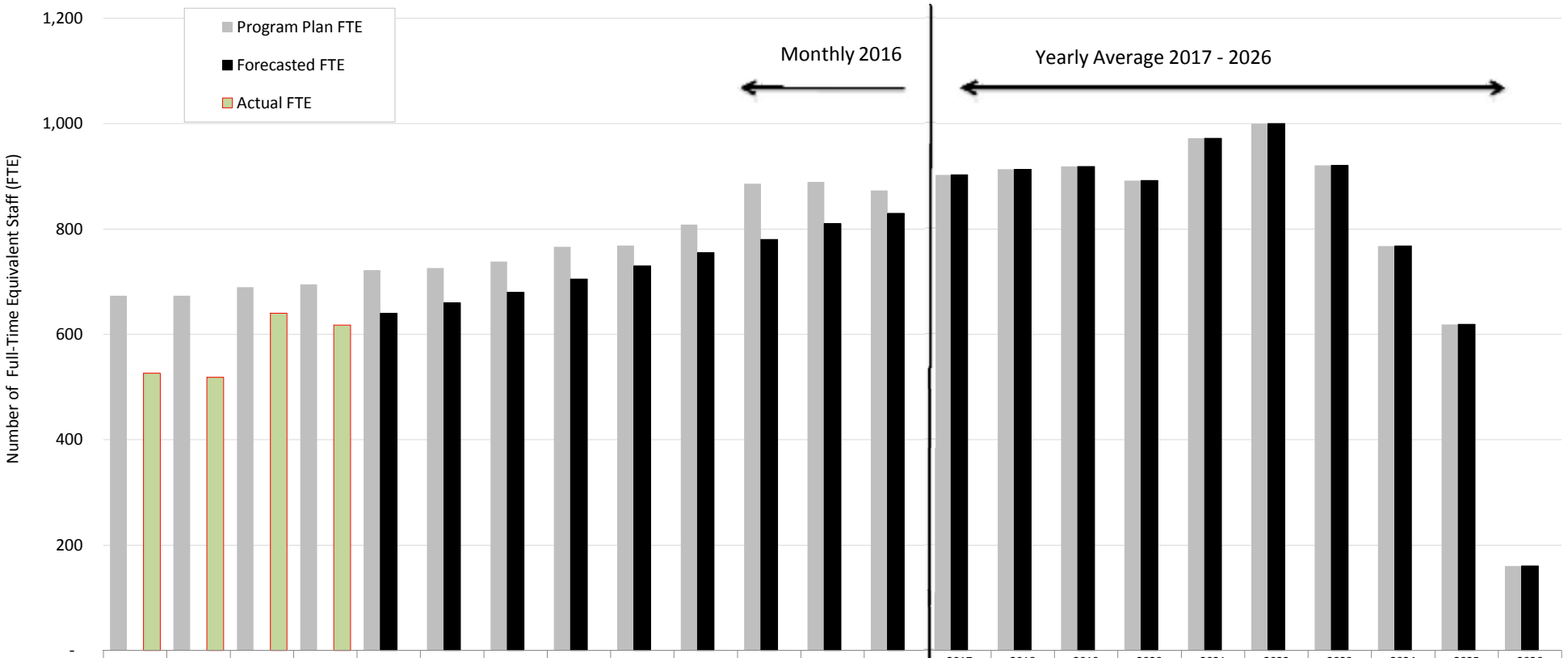
ONTARIO POWER GENERATION

Darlington Nuclear Refurbishment Program

Period Ending: 31-Mar-16

APPENDIX 5: OPG PROJECT RESOURCES

Excluding Purchased Services / Contract Labour $



	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	2017 Avg/mos	2018 Avg/mos	2019 Avg/mos	2020 Avg/mos	2021 Avg/mos	2022 Avg/mos	2023 Avg/mos	2024 Avg/mos	2025 Avg/mos	2026 Avg/mos
Program Plan FTE	674	674	690	695	722	726	738	766	769	809	886	889	873	903	913	919	892	972	1,000	921	768	619	161
Forecasted FTE					640	660	680	705	730	755	780	810	830	903	913	919	892	972	1,000	921	768	619	161
Actual FTE	526	519	641	618	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Executive Discussion

1 - OPG Staffing includes Functions, Operations & Maintenance and Bundle Project Management/Oversight Teams and counts regular, augmented (agency), Electrical Power Systems Construction Association (EPSCA) and temporary staff.

2 - OPG actual staffing levels are 11% below RQE plan (618 vs. 695) due to slower than expected hiring and planned transfers of staff from Operations. In some cases, these shortfalls are being mitigated through purchased services contracts.

3 - A Nuclear Projects Staffing and Hiring Plan has been developed to ensure that resource requirements and strategies are identified, and that they effectively utilize resources for the project while considering staffing strategies relating to Pickering End of Commercial Operation. As of March 2016, over 100 regular and approximately 80 augmented positions are currently in various stages of the recruitment process, which will support the resource need for the start of Unit 2 Refurbishment. The resource identification process is being reviewed for optimization.

Darlington Nuclear Refurbishment Program

Period Ending: 31-Mar-16

APPENDIX 6: FACILITIES & INFRASTRUCTURE AND SAFETY IMPROVEMENT PROJECTS

Cost and Schedule Performance

COST DETAIL ($ MILLION)

		Cumulative (Life-to-Date)					At Completion of Project				In-Service Date			
		a	b	c=b-a	d	e	f	g	h	j	k	m	n	o
Line	Project Title	Plan (PV)	Actual (AC)	Variance	CPI	SPI	Budget at Completion (BAC)	Estimate at Completion (EAC)	Variance from BAC	Variance from Last Period	Need Date	Current Forecast	# Months Float	Variance from Last Period
1	Heavy Water Storage & Drum Handling Facility	253.2	217.9	(35.2)	1.03	0.80	356.3	381.1	24.8	0.0	Feb 2017 (PHT) May 2017 (Full)	1 Nov 2016 (PHT) May 2017 (Full)	0	0
2	3rd Emergency Power Generator	87.7	85.1	(2.6)	0.94	0.79	105.4	128.8	23.4	3.8	Oct 2016	Sep 2016	1	2 1
3	Containment Filtered Venting System	62.7	66.3	3.6	0.89	1.01	75.4	84.6	9.2	0.0	Oct 2016	Sep 2016	1	0
4	Shield Tank Over Pressure Protection	10.4	11.9	1.5	0.94	0.88	13.4	3 14.1	0.7	0.0	Mar 2017	Feb 2017	1	0
5	Balance of Pre-Requisite Projects In-Service	324.8	323.8	(1.0)	*	*	4 327.1	333.7	6.6	(0.5)	IN SERVICE			
6	**Subtotal Campus Plan Before Contingency**	**738.7**	**705.0**	**(33.7)**	**0.95**	**0.84**	**877.6**	**942.3**	**64.7**	**3.3**				
[redacted]														
Portion of the Re-Tube & Feeder Replacement Bundle														
9	Re-tube Waste Processing Building	65.9	52.4	(13.5)	5 Under Review		192.0	192.0	0	0	Jul 2017	Jun 2017	1	0

Notes: * Indicates not applicable. The CPI and SPI calculations exclude project management costs and support tasks which are considered level of effort.

Executive Discussion

1 - *The final in-service date for the facility has been maintained since the previous report. The schedule performance has been impacted due to delays in material pre-fabrication and construction pre-requisite activities such as Comprehensive Work Package development. At OPG's request, the vendor has put a new project manager and additional resources in place. Construction activities have been re-sequenced to recover schedule and maintain the planned in-service dates. Contingency plans to mitigate potential impacts of a delayed in-service on the Unit 2 refurbishment execution schedule are being developed*

2 - *The current in-service date for the 3rd Emergency Power Generator has been delayed to September 30 due to construction delays, potential material delivery issues and potential delays in commissioning. The delays in construction are due to 1) [redacted] r and 2) issues with obtaining quick resolution of engineering issues in the field. [redacted] OPG is also recruiting field engineers with a strong construction background.*

3 - *The forecast to complete is expected to increase as a result of the design changes required to rectify the pre-existing system condition. The installation of the STOP modification is on track to be completed during the current Unit 4 outage, while remaining installations on Unit 1 and Unit 3 are on track to support the need date of March for Unit 2 Bulkhead in-service milestone .*

4 - *Included in the Balance of Pre-Requisite Projects In-Service is the Refurbishment Project Office and Re-tube & Feeder Replacement Island Support Annex. Variance memos for both have been updated to align with the most current estimate-at-complete costs and have been approved by the CEO. The final estimate-to-complete cost was included in the previous report and has not increased. Minor savings have been noted in the closeout of in-service projects, resulting in $0.5 Million of reductions over the period.*

5 - *The contract amendment for the Re-tube Waste Processing Building has been finalised, and is in alignment with the Release Quality Estimate. The project cost and schedule will be aligned with the amendment, and the revised cost and schedule performance index will be included in the next report.*

6 - *Based on the Estimate at Complete, there is currently [redacted] of anticipated contingency use. To date, [redacted] has been released to the projects for use. Additional details are contained within Appendix 4 Contingency Management.*

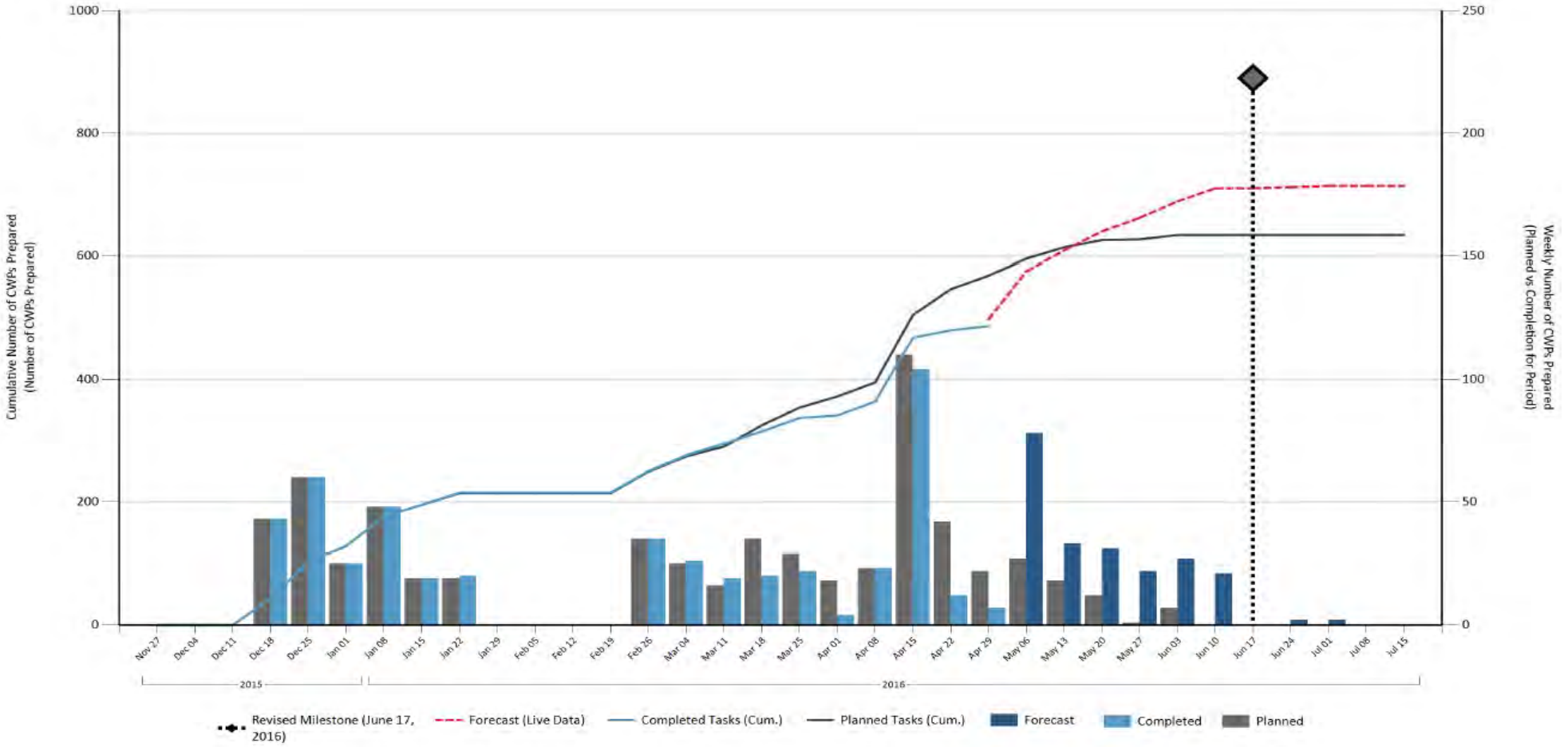
Darlington Nuclear Refurbishment Program

Period Ending: 31-Mar-16

APPENDIX 7: COMPREHENSIVE WORK PACKAGE COMPLETION

Planned and forecast completion of Comprehensive Work packages to support Work Package Assessment Milestone (June 17, 2016)

COMPREHENSIVE WORK PACKAGE COMPLETION FOR UNIT 2 REFURBISHMENT



Executive Discussion

1 - Vendor completion of comprehensive work packages is behind plan largely due to delays within the Re-tube & Feeder Replacement project. Vendor is delayed due to a general lack of working experience and understanding of the integration requirements when performing work in an operating nuclear station. As an interim measure, OPG has provided the vendor with skilled resources to train vendor staff and accelerate completion of the work packages.

2 - An OPG team is in place to expedite Comprehensive Work Package reviews as the documents become available. An increase in completions over the next 2 weeks is expected.

3 - The total number of Comprehensive Work Packages has increased from the original plan as a result of increased clarity on the work. All Comprehensive Work Plans are expected to be complete prior to the June 17 target.

ONTARIO POWER GENERATION

Darlington Nuclear Refurbishment Program

APPENDIX 8: VENDOR PERFORMANCE

Vendor Performance within the Core Nuclear Refurbishment Projects

Period Ending: 31-Mar-16

VENDOR PERFORMANCE INDICATORS

Line	Vendor Name & Key Scope	Safety	Quality	Cost	Schedule	Relationship	Explanatory Notes
1	**SNC-Lavalin & Aecon** Fuel Channel and Feeder Tube Replacement, Turbine Generators Execution	[redacted]					
2	**ES Fox Ltd.** Balance of Plant, Fuel Handling						
3	**BWXT** Steam Generators, Balance of Plant						
4	**GE-Alstom** Turbine Generators Parts and Technical						
5	**GE Hitachi Nuclear** Defueling						

Note: The CPI and SPI calculations exclude the project management costs and support tasks which are considered level of effort.

APPENDIX 9: UNIT 2 READY TO EXECUTE MILESTONES

Significant Milestones Leading to October 15, 2016 (Breaker Open)

KEY MILESTONES & STATUS

Line	Milestone	Baseline	Forecast	Explanatory Notes
1	Regulatory Final Approvals Requested	COMPLETE		
2	Re-tube & Feeder Replacement Island Support Annex	COMPLETE		
3	All Level 3 Schedules Quality Acceptance Complete	COMPLETE		
4	Field Constructability Reviews Complete	COMPLETE		
5	↳ Work Package Assessing Complete	15-Apr-16	17-Jun-16	
6	↳ Draft Unit 2 Integrated Schedule Issued	31-May-16	17-Jun-16	[redacted].
7	↳ Unit 2 Integrated Schedule Complete	15-Jul-16	25-Aug-16	
8	Construction Readiness Lookaheads Complete (Seg. 1)	15-Jul-16	15-Jul-16	
9	Refurbishment Construction Review Board	*New*	5-Jun-16	Tentative date to be finalised.
10	Regulatory Final Approvals In Place	15-Jul-16	15-Jul-16	
11	Outage Execution Metrics Prepared	15-Jul-16	15-Jul-16	
12	Unit 2 Execution Estimate Complete [Presentation to DRC]	11-Aug-16	11-Aug-16	
13	Refurbishment Construction Review Board	*New*	15-Aug-16	Tentative date to be finalised.
14	Fuel Handling Ready to Defuel	30-Sep-16	30-Sep-16	
15	Unit 2 Readiness Review [Presentation to DRC]	30-Sep-16	30-Sep-16	
16	Refurbishment Construction Review Board meeting with DRC	*New*	30-Sep-16	Tentative date to be finalised.
17	Unit 2 Breaker Open	15-Oct-16	15-Oct-16	

Legend
- Completion forecast within 1 month of baseline.
- Completion forecast as late greater than 1 month of baseline.

APPENDIX 10: KEY PROGRAM RISKS

Risks Being Actively Managed by the Program

KEY PROGRAM RISKS AND MITIGATION STATUS

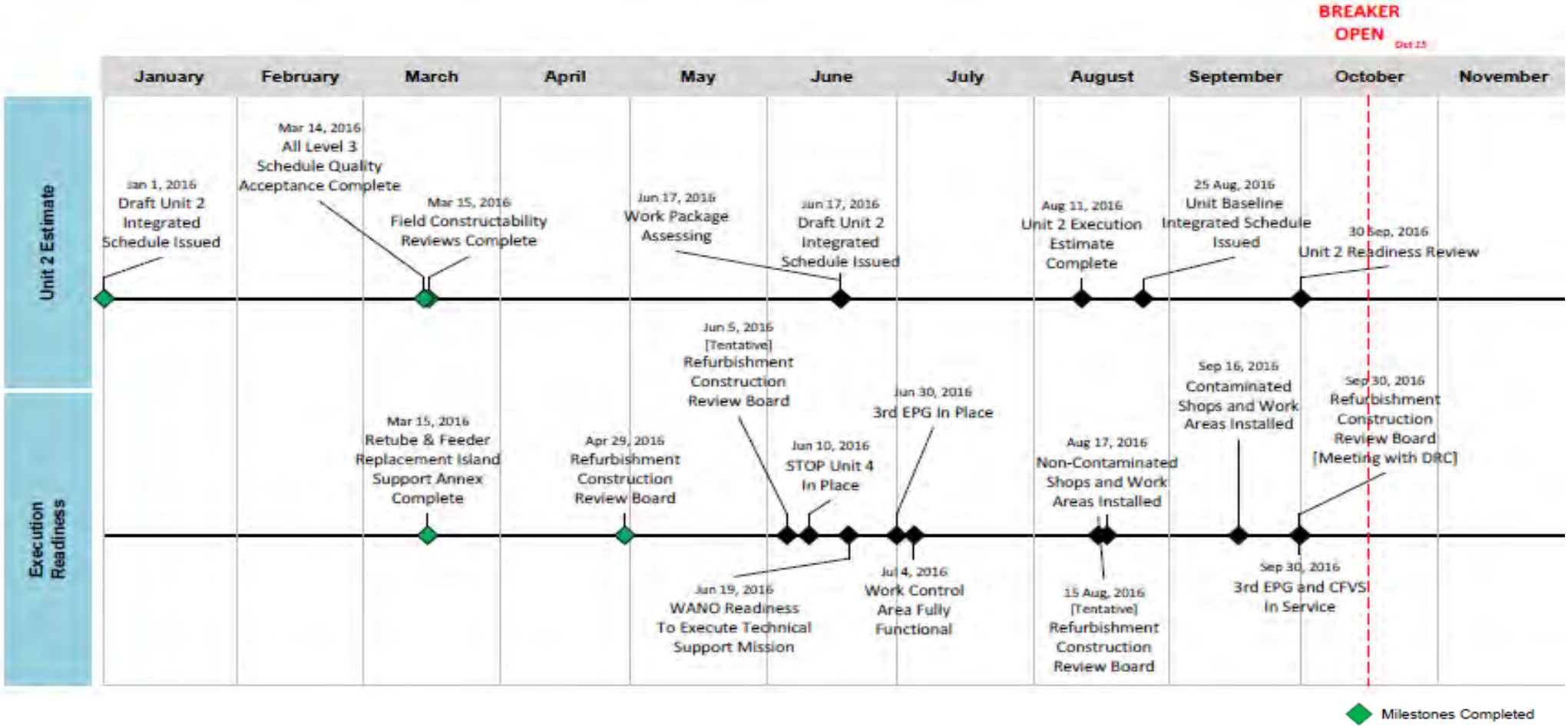
Line	Status	Risk Description	Mitigation Plan
1	↓	**Vendor Performance** Poor vendor performance will negatively impact safety, quality, cost and/or schedule.	A Readiness to Execute oversight plan has been issued. This will support the detailed readiness assessment challenge process leading to the readiness milestone in June 2016. Plans to improve collaborative activities with the vendors for Engineering, Procurement and Construction have been developed. It includes active management and assisting vendors in removing barriers to work. A Nuclear Construction Supervisor Academy is operational, and is integral in improving vendor supervisory performance. The integrated field readiness walk downs at T-6 months and T-3 months with refurbishment and vendor teams will also promote better vendor performance overall in the field portion of the work.
2	–	**Availability/Retention of Staff** Key project personnel with the required skill set will not be in place for the full refurbishment program resulting in impacts on performance.	Nuclear Projects People & Culture completed all but two actions from its comprehensive Mitigation Plan that addressed the risk in four key areas: 1. Strategic Direction; 2. Succession Plans/Process Improvements; 3. Building Project Depth/Emerging Talent; 4. PPR Health & Development Planning. The focus has been on establishing a strategic resourcing framework for the project under the RQE approved budget with the right organizational design and ensuring the right leadership pipeline is in place for future Unit Refurbishments (Units 3, 1, 4). Phase 2 of the Nuclear Fleet Bench Strength Improvement Plan in progress.
3	–	**Availability of Skilled Craft Resources/ Supervision** Key skilled craft resources may not be available when required for the Execution Phase.	OPG is participating in labour market information studies to gain insights into labour market issues, including the identification of skilled craft resource needs using tactics that include both short and long term approaches. The current plans and tactics are being evaluated to ensure integration with the Nuclear fleet to minimize the risks in all support areas. Provisions in trades union agreements also provide for resourcing flexibility.
4	↑	**First of A Kind/First in A While Work and Processes** A lack of recognition of FOAK/FIAW work and processes during design and execution planning results in installations that do not meet requirements causing rework/delay or degraded production post Refurbishment.	A thorough and in-depth review was completed with Engineering, Project Teams and various execution and functional groups in Nuclear Refurbishment and Projects & Modifications organizations to flag FOAK/FIAW risks. A defined set of screening criteria align with WANO 2015 SOER report was developed and utilized. Specific mitigation actions are defined for FOAK/FIAW risks, and In-depth challenge/review of risks impact/events along with robust tracking of the mitigation actions are in progress.

– No change over period ↑ Improvement ↓ Decline HIGH RISK LOW RISK

APPENDIX 11: KEY DELIVERABLES FOR NEXT PERIOD

Significant Milestones Leading to October 15, 2016 (Breaker Open)

KEY SCHEDULE MILESTONES



Darlington Nuclear Refurbishment Program

APPENDIX 12: PHOTO CATALOGUE

PROJECT	
Heavy Water Storage & Drum Handling Facility	  Installation of a temporary roof
3rd Emergency Power Generator	  Concrete pours and rebar construction

ONTARIO POWER GENERATION

Darlington Nuclear Refurbishment Program

APPENDIX 12: PHOTO CATALOGUE

PROJECT		
Containment Filtered Vented System		
	Filter enclosure	
Re-tube Waste Processing Building		
	Pilecap construction	

Darlington Nuclear Refurbishment Program

APPENDIX 12: PHOTO CATALOGUE

PROJECT		
Re-tube & Feeder Replacement Island Support Annex		Building completion
Refurbishment Project Office	 	Building completion

Darlington Nuclear Refurbishment Program

APPENDIX 12: PHOTO CATALOGUE

PROJECT	
Re-tube Waste Storage Building (non-Refurbishment funded)	  Erection of structural steel
Used Fuel Dry Storage Building (non-Refurbishment funded)	  Construction complete

APPENDIX 13: METRICS LEGEND

DARLINGTON REFURBISHMENT PROGRAM PERFORMANCE DASHBOARD

METRIC/DESCRIPTION	TARGET	🟢	🟡	🔴	↑ – ↓
COST PERFORMANCE INDEX (CPI) = Earned Value / Actual Costs Ratio that measures the financial effectiveness. **SCHEDULE PERFORMANCE INDEX (SPI)** Ratio of schedule efficiency to date.	**1.00**	**0.95-1.05** Within 5% of the target.	**≥1.06** **0.90-0.94** Between 5% and 10% off target OR greater than 10% off target in positive direction.	**≤0.89** Greater than 10% off target in negative direction.	Managements assessment on the current performance trend. ↑ Performance is IMPROVING; – Performance is being maintained; ↓ Performance is DECLINING.
ALL INJURY RATE (AIR) (# Safety Events/200k hrs worked) - Year-to-Date Safety events are categorized as the number of fatalities, lost-time injuries, medical treatment injuries and other injuries/illnesses. **The safety statistics include both OPG and contractor performance year-to-date (i.e. reset in January).**	**0.24**	**AIR ≤0.24** **AND** **WP Events = 0**	**AIR 0.25-0.27** **OR** **WP Event = 1**	**AIR >0.27** **OR** **WP Event ≥2**	
# LEVEL 1 WORK PROTECTION EVENTS Count of the number of Level 1 Work Protection Events on DRP over the quarter.	**0**	AIR is at or below target AND zero Work Protection Events in the quarter.	AIR is above target within 10% OR 1 Work Protection Event occurred in the quarter.	AIR is above target > 10% OR ≥2 high Work Protection Event occurred in the quarter.	
# EVENT FREE DAY RESETS (EFDR) # of Darlington Site Event Free Day Resets that occurred within the quarter as a direct result of work being performed within the Darlington Refurbishment Program. The criteria are aligned to the nuclear industry standards and applied consistently across the sites to allow performance comparisons and benchmarking.	**0**	**BOTH at ZERO**	**EFDR + REG. = 1** Cumulative No. events for the quarter is 1. OR management assessment on low level trending.	**EFDR + REG. ≥ 2** Cumulative No. events for the quarter is greater than, or equal to 2. OR management assessment on low level trending.	
# REGULATORY NON- COMPLIANCE Count of the number of number of regulatory non-compliance events related to quality that have occurred within the quarter.	**0**				

FINANCIAL SUMMARY

CURRENT APPROVED RELEASE refers to the total budget of the last release approved by the Board of Directors. The last release was approved by the Board in November 2015, and was to complete the Mobilization Phase.
MOBILIZATION PHASE refers to the work completed Dec 31, 2015 (end of Definition Phase) to October 15, 2016 (Unit 2 Breaker Open).
TOTAL PROGRAM refers to the refurbishment of all 4-units.

METRIC/DESCRIPTION	🟢 🟡 🔴	↑ – ↓
LIFE-TO-DATE COST (M$) **ACTUAL** Total Program costs incurred to date against the Approved Release. **PLAN** Planned Program costs to date for the Approved Release. **VARIANCE** Variance of Actual to Plan. ($) indicates underspent vs. plan. **AT COMPLETION OF MOBILIZATION PHASE** **FORECAST** Forecast of total Program costs at the end of Mobilization phase. **PLAN** Planned Program costs at the end of Mobilization phase as per the Approved Release. **VARIANCE** Variance of Forecast to Plan. ($) indicates underspent vs. plan.	Managements assessment based on: Current cost performance; Estimate at Completion; Contingency allocation.	Managements assessment on the current performance trend. ↑ Performance is IMPROVING; – Performance is being maintained; ↓ Performance is DECLINING.

PROJECT PERFORMANCE INDICATORS AND TRENDS

METRIC/DESCRIPTION	🟢 🟡 🔴	↑ – ↓
UNIT 2 EXECUTION PROJECTS **PRE-REQUISITE PROJECTS**	Managements assessment of current performance and risk to Unit 2 Refurbishment Execution.	Managements assessment on the current performance trend.

ONTARIO POWER GENERATION

July 31, 2015

NUCLEAR REFURBISHMENT

Darlington Refurbishment Internal Planning Assumptions (RMO Assumption #536)

The purpose of this file is to document the 'financial related' internal planning assumptions used for both the Release Quality Estimate and 2016 - 2018 Business Plan. These Financial assumptions would normally not be found within the Functional Management Plans, Project Management Plans, or Execution Projects Gate Review Packages. Therefore, these assumptions are directed primarily at Finance Support staff and Project & Control Leads to ensure that as estimates are developed a consistent set of assumptions are applied to produce both the overall escalated dollar estimate and the 2015$ estimate.

Refurbishment Staff Overtime

Refurbishment Project and Functional Managers are expected to plan appropriate staffing resources required to complete their work programs without planned overtime. RQE planned overtime is considered as contingency for vacancies, emergent work, etc. For the Execution phase (2016 - 2025), the estimate will include 2 weeks (typically 35 hours per week) of overtime for every represented full time equivalent (FTE) included for each year. For the 2026 Close-out period, will include only 1 week of overtime.

Refurbishment Business and Travel Expenses (BTE)

The current RQE and Business Plan estimate assumes $1.5k per year of BTE for every full time equivalent (FTE) plus an additional $15k per year for each RPET member, for both Definition and Execution phases.

Refurbishment Staff Relocation Expenses

Employee relocation costs are estimated at $250k per year (covers all regular staff) for the duration of Refurbishment Program (2015 to 2026).

Refurbishment OBU Costs

Refurbishment OBU costs, including support groups staffing, contract costs, facilities costs and CIO costs, are to be aligned with the service providers during RQE planning and will be documented with Service Level Agreements. OBU costs will be planned in accordance with the current OPG Cost Model – Service providers hold the budget and charge to Refurb project numbers.

Refurbishment Execution Phase Swing Staff

Refurbishment swing staff figures are to be aligned with the station transition plans during RQE planning and will be documented with Service Level Agreements. Swing staff will be included in the NR headcount.

OPG Labour Rates

Refurbishment labour is included in the RQE and Business Plan using the standard OPG labour rates for 2016 to 2020. Thereafter, 2% escalation rate will be used from 2021 onwards. Augmented staff will be costed using a 15% mark-up over OPG labour rate.

Accounting Treatment Assumptions (RMO Assumption #394)

Accounting Classifications are based on the revised *Accounting Treatments for Darlington Refurbishment Project* Memo dated April 21, 2015.

This memo is currently under review by Refurbishment Finance and Corporate Finance. Improved definition of the following accounting treatment categories has been included in the updated memo:

1) Removal Costs
2) OPG-owned or Vendor-owned Tools
3) Operations & Maintenance Costs (Return to Service, Online Work, Project Support)
4) Overheads and Support Group Costs & Allocations
5) Cost Recognition & Accruals
6) Inventory, Spares & Obsolescence
7) In Service Strategies
8) Facilities (temporary vs permanent)

Capital Interest

Interest is applied to Capital projects until the asset is placed in service. In compliance with direction from Corporate Planning, a 5% interest rate will be used to calculate interest for project planning purposes for the period 2015 to 2021. Thereafter, a 6% higher interest rate will be used. These short-term and long-term interest rates will also be used by Investment Planning (Finance) for the Refurbishment BCS.

Escalation

OPG labour will be costed based on standard OPG labour rates for 2016 and 2018, and then escalated by 3% for 2019 to 2020, and 2% from 2021 onwards. Augmented staff will be costed using a 15% mark-up over OPG labour rate.

All other non-labour costs will use the following escalation rates to align with Investment Planning (Finance) & the Refurbishment BCS, except for contracts where the escalation assumptions are provided and applied.

Escalation Rate	2015	2016	2017	2018	2019	Future
	1.6%	2.1%	2.0%	2.0%	1.9%	2.0%

Major contracts where escalation rates are provided and applied are included in their RQE submission in escalated dollars. In order to prepare the 2015$ Estimate, the cost flows in these contracts. will be de-escalated by Finance using the contract escalation indices where available. If the contract escalation indices are not readily available to Finance, the costs will be de-escalated using escalation rates noted above.

If you have any questions about the data noted above, please contact Steve Wiacek in Refurb Finance.

From: SMITH Ryan -NUCLEAR
Sent: Wednesday, May 25, 2016 12:22 PM
To: WONG Evelyn -LAWDIV; 'Jeremy Clark'
Subject: Fw: Top 10
Importance: High

Sent from my BlackBerry 10 smartphone on the Bell network.

From: OWENS Bill -NUCLEAR <bill.owens@opg.com>
Sent: Wednesday, May 25, 2016 12:21 PM
To: SMITH Ryan -NUCLEAR
Subject: FW: Top 10

Ryan, as requested.

Bill Owens
Vice President
Refurbishment Execution
905-623-6670 Ext.7411
bill.owens@opg.com
BB 289-314-7424
Blackberry Pin # 2BA7103D

Top 10

Item	Topic	Owners	TCD
1	**Staff Hiring SPOC/Simplification-**	**G. Rose**	**07-15-16**
2	**HT/Flush Hot Conditioning**	**M. Stewart**	**10-06-16**
3	**Civil Vendor of choice**	**C. Leca**	**01-10-16**
4	**Cyclical valve maintenance strategy**	**V. Bevacqua**	**01-10-16**
5	**Housekeeping standards/'Clean As You Go' Implemented**	**C. Leca**	**10-06-16**
6	**D1711 Conflicts/Decision on outage date**	**B. Owens**	**30-05-16**
7	**Rubber Areas - decision on execution**	**C. Leca**	**15-07-16**
8	**CPT Workplan issued**	**M. Paiment**	**17-06-16**
9	**Dead leg resolution & Dry Air Skid contract awarded**	**J. Diening**	**03-05-16**
10	**ES Fox resource plan in place for work program**	**C. Keeler**	**06-30-16**

ONTARIO POWER GENERATION

Plan

Document Number:	Usage Classification:
NK38-NR-PLAN-09701-10001	
Sheet Number:	Revision:
0016	R002

Title:
DARLINGTON REFURBISHMENT STAFFING PROGRAM MANAGEMENT PLAN

Darlington Refurbishment Staffing Program Management Plan

NK38-NR-PLAN-09701-10001-0016-R002
2015-03-01

Order Number: N/A
Other Reference Number:

Prepared by: H. Viveiros
Sr. Manager, Human Resources
Nuclear Projects

Concurred by: C. Treacy
Vice President, Nuclear HR
Business Partners

Approved by: D. Reiner
SVP, Nuclear Projects

Plan	Document Number: NK38-NR-PLAN-09701-10001		Usage Classification:
	Sheet Number: 0016	Revision Number: R002	Page: 2 of 19

Title: **DARLINGTON REFURBISHMENT STAFFING PROGRAM MANAGEMENT PLAN**

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	Sheet Number: 0016	Revision Number: R002	Page: 3 of 19

Title:
DARLINGTON REFURBISHMENT STAFFING PROGRAM MANAGEMENT PLAN

Revision Summary

Revision Number	Date	Comments
R000	2014-02-10	This document supersedes NK38-PLAN-09701-10067 Sheet 0008. The changes between NK38-PLAN-09701-10067 Sheet 0008 and this document are as follows: • The content of the document and its document number has been changed to meet the requirements of NK38-NR-MAN-09701-10001, • The security classification has been changed to OPG Confidential, and • References have been updated.
R001	2014-06-13	Updated to remove confidential information and to declassify the document.
R002	2015-03-01	Revised to address comments from Self Assessment RF14-000625

1.0 PURPOSE

This document describes the plan for staffing the Darlington Refurbishment Program and the processes to manage staffing and succession planning over the life of the Program. This includes hiring of OPG employees as well as contract staff, succession planning and performance development. This plan references existing OPG and refurbishment planning processes, People and Culture policies, Supply Chain policies, and applicable Collective Agreements that may be used for program staffing. In this plan, the term "Staffing" is used broadly to define the staffing life-cycle from recruitment and selection, on-boarding, succession planning, performance development, retention and employee terminations. This document addresses Darlington Refurbishment (DR) resources as well as those external to the program (within or outside the organization). Given the nature of the work program, it is anticipated that program staffing needs will evolve and change as work scope, milestones and external factors change. Nothing in this plan is intended to limit management's ability to alter staffing plans and resourcing needs associated with the Project.

2.0 PROGRAM REQUIREMENTS

2.1 Staffing Assumptions

As an over-riding principle, and from a business efficiency and project continuity perspective, it is OPG's intent to maintain qualified personnel within the DR Program or replace with existing, qualified OPG personnel. Contractors and temporary staff should be used to augment base staffing levels and manage peaks in demand or address areas where there is a shortage of critical resources or qualified and experienced staff.

Existing OPG job documents will be used to staff the Project, except where new, specific job documents are required to address organizational needs. In such cases, OPG job evaluation processes will be used to create new job documents as needed.

OPG's core business is operating and managing the maintenance of its generating assets. As a result, OPG does not have the requisite project management expertise to take on various critical roles within the Projects and DR Organizations. To address this need, OPG's plan is to utilize external industry expertise in areas that are not core to its business. There are, however, several external factors impacting OPG's ability to adequately staff the Project such as competition for resources from external organizations, an EPC model that is new to existing OPG staff and government restrictions on compensation that make it difficult to attract external talent and retain existing talent, especially at the Management Group level. Section 2.2 details the approach for staffing into the Project given the existence of these external factors which are impacting the DR Project.

It is understood that a robust succession planning process and defined development plans and career paths are needed to ensure that staff are retained and promoted within the organization and utilized from across the fleet. While program ownership of the Succession Planning process lies with People & Culture, line management must take accountability for the process, its significance and associated deliverables.

2.2 Staffing and Resource Requirements

Staffing and resource requirements will change as the program progresses through the definition phase. Keeping in mind the staffing assumptions noted in Section 2.1, this document will be updated as required to prepare for upcoming phase changes.

The Darlington Refurbishment Project may be resourced in a number of ways, ensuring compliance with OPG policies and relevant Collective Agreements:

(a) Direct OPG staff reporting to the Darlington Refurbishment organization and contributing to deliverables for the Darlington Refurbishment program. These staff may be full-time, temporary or on rotational assignments into the organization.

(b) Support from other OPG Business Units in a “matrix” (functional staff working in project teams), as planned in the Business Planning process and documented in individual procedures and/or interface agreements. Partnering and interface agreements will document and formalize the working relationships amongst all groups.

(c) External purchased services contracts for the provision of specialized technical, project management and other staff/services including Augmented Staff , specialized contracts and managed task contracts. At the time of writing, these include Ian Martin, CPUS, AMEC, Worley Parsons, F&G and others. All external purchased services must comply with relevant Supply Chain procedures and Collective Agreements, Union settlements and Memorandums of Understanding.

Details of the staff and resources are contained within the Program Business Plan, which is part of OPG’s Business Plan, as outlined in N-PROG-AS-0005 Nuclear Business Planning, and its supporting Business Planning process, N-PROC-AS-0080.

2.3 Staffing Processes and Strategic Elements

Darlington Refurbishment will follow OPG People & Culture staffing processes and relevant Supply Chain contract staff processes with support from local Human Resources. Documents related to staffing are available to supervisors via the OPG intranet, Manager Self Serve, the HR Service Centre and local HR Offices. Staffing will be in compliance with all labour requirements/collective agreements and be aligned with corporate goals relating to Business Transformation and organizational designs.

In addition to relevant collective agreements, Functional Line Managers shall ensure compliance with all People & Culture and Supply Chain policies and procedures (e.g.

Hours of Work, Overtime, etc.) as well as the Organizational Change Control Procedure (N-PROC-AS-0068).

DR will participate in the corporate workforce planning process. Functional Line Managers should also ensure they are familiar with the DR On-Boarding process and the OPG Staff Orientation package found on the OPG Human Resources webpage.

2.4 Darlington Refurbishment Staffing and Succession Plan (DRSSP)

Succession Planning efforts at the nuclear level are enshrined in the current Nuclear Executive Committee (NEC) Succession Planning process and the Peer Team processes. NEC examines those positions identified as Priority 1 roles, while the respective Peer Teams review positions identified as Priority 2 roles. See Appendix A for an illustration of this process and the roles reviewed.

Succession planning efforts in DR take place at the Nuclear Projects level and by organization in DR. They are not intended to replace discussions held at the fleet level on this topic, either at the NEC Succession Planning meetings or via the Peer Teams. In order to be successful and ensure a wide breadth of opportunities and development for staff, integration of the DR Succession Planning efforts into broader efforts is critical. The DR process will establish some rigour and oversight into performance development and talent growth for the Project. It is expected that Integration should occur in three ways: in HR via the VP, Nuclear Business Partners who attends the NEC Succession Planning meetings, with the SVP, Nuclear Refurbishment who also attends such meetings and the DOM and VP, Engineering in DR who attend the Nuclear Fleet Peer Team discussions on succession planning. Integration with Projects & Modifications has taken place via formal succession planning meetings with an aim to assessing and cultivating project management talent across the broader Nuclear Projects organization.

The DR Staffing and Succession Planning process will focus on High priority positions specific to DR and critical job families required for the successful completion of DR (known as Priority 3 roles). Consideration for whether positions are deemed critical follow the centre-led model. Appendix B illustrates the Decision Support for Critical Positions tool which has helped inform thinking amongst the team in determining those roles that are high priority and critical to DR. In order to address succession planning in DR and staffing for critical roles, a formalized Succession Planning Process has been developed which is outlined in the Terms of Reference (Appendix C).

The DR Staffing and Succession Planning Process will also focus on the creation of mitigation plans as needed for critical job families in the Project. Functional Line Managers shall have ownership of these plans which will be reviewed quarterly at the formal succession planning meetings as required.

2.4.1 Program Plan and Set-Up Phase

Program staffing and resourcing profiles for each Refurbishment department and project have been developed as part of the Definition Phase planning effort. At the time of Board approval of Release 4D, the staffing plans were baselined.

Further changes/increases to the staffing plan baseline approved for Release 4D) will be through the Refurbishment Cost and Schedule Change Control process, N-MAN-00120-10001-PC-01 and the Project Gated Process, N-MAN-00120-10001-GRB.

2.5 Defining Program Staffing and Resources Requirements

Staffing and Resources requirements for the Project are based on the scope, the existing matrixed organization as defined in Section 2.2 (b), and the need to provide oversight to Engineering Procurement Construction (EPC) contractors.

Program Staffing Requirements include:

- Refurbishment Program Executive Team
- Administrative support
- Corporate support (strategic e.g. Law, Regulatory Affairs, Finance, People and Culture)
- Functional Management, including Program Planning & Control, Managed Systems Oversight, Engineering
- Project Managers and staff, including matrixed staff, for each of the Program's Projects
- OBU support (technical e.g. Nuclear Engineering, Finance)

Each Function and Project requires an overall resource plan that is included in their Management plans that support Business Planning.

2.6 Program Organization

The Darlington Refurbishment Program Organization can be found in the Darlington Refurbishment Project Charter (D-PCH-09701-10000).

2.7 Program Staff Tracking and Management

Darlington Refurbishment Program staff will use OPG Nuclear's standard time reporting system, TEMPUS, for timekeeping and time management related needs, such as vacations.

Darlington Refurbishment supervisors will use OPG Nuclear's standard Human Resource tools and processes for performance monitoring; e.g. Performance Planning & Review (PPR). Clear linkages to development planning and Annual Incentive Plans (where applicable) will be formally documented as part of the PPR process. It is expected that Managers endeavour to hold quarterly performance review meetings with their staff to assist in this activity and entrench a culture of continuous development.

2.8 Replacement of Program Staff

Refurbishment Program staff vacancies are addressed through the normal OPG hiring processes as outlined in Section 2.2 of this plan.

2.9 Program staff Transition at Program Commencement and Execution through to Completion

A plan will be developed to transition staff to and from the Refurbishment Program and to Nuclear Operations during the phases of the Project. The Integrated Workforce Transition Team under DR Operations & Maintenance contemplates how these "swing staff" will be selected and staffed from the Fleet. This will be complete as part of the transition plans that are being developed for each organization. Further planning will be required for core Darlington Refurbishment Program staff (NK38-PLAN-09701-10113 Sht: OPS-01).

2.10 Approved Organization Changes

Organization changes will be processed per N-PROC-AS-0068 Organizational Change Control.

3.0 ROLES AND ACCOUNTABILITIES

Responsibility for staff and resource planning lies with the Functional Line Manager with support from the Human Resources Manager, the Director, Planning and Controls and the Controller. The Functional Line Manager is accountable for resource planning and identification of staffing needs as part of the overall planning process. This includes alignment with business planning and headcount targets. It is expected that the Functional Line Managers periodically review their staffing needs and ensure alignment with their work programs. Fiscal responsibility and adherence to OPG values and behaviours is required where increases or decreases to staff numbers are necessary. Roles and responsibilities are defined at all levels of the organization and are available in Passport under series N-MAN-08131-10000.

3.1 Senior Manager, Human Resources Nuclear Projects

Is the document owner and is accountable for its definition, implementation and continual improvement.

4.0 DEFINITIONS & ACRONYMS

4.1 Definitions

None.

4.2 Acronyms

CFAM	Centre-Led Functional Area Manager
DNGS	Darlington Nuclear Generating Station
DOM	Director Operations and Maintenance
DR	Darlington Refurbishment

DRSSP	Darlington Refurbishment Staffing and Succession Planning
EPC	Engineer Procurement Construction
HRBP	Human Resources Business Partners
NEC	Nuclear Executive Committee
OBU	Other Business Unit
PPR	Performance Planning & Review
RPET	Refurbishment Project Executive Team

5.0 REFERENCES

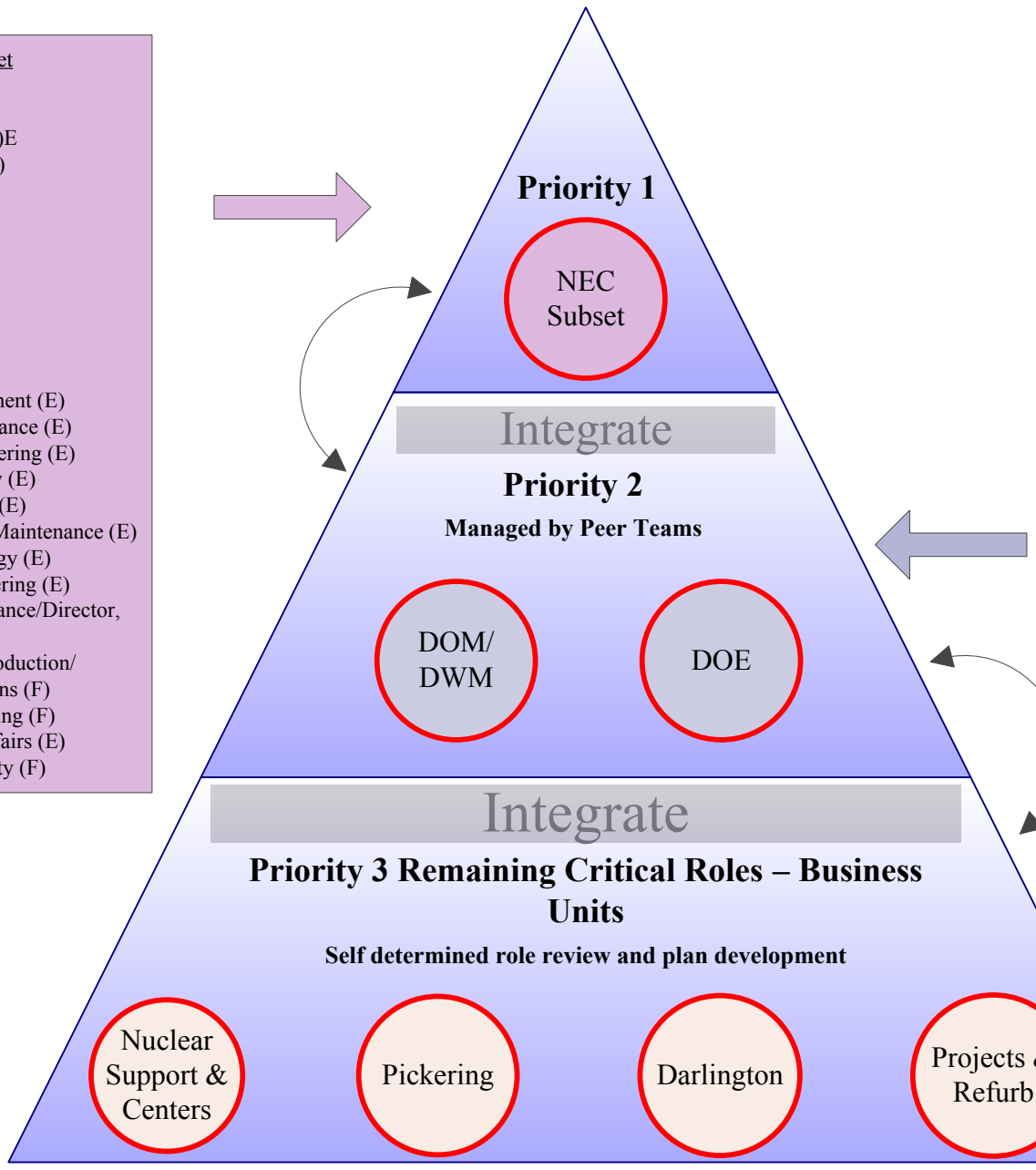
- D-PCH-09701-10000, Darlington Refurbishment Project Charter
- N-MAN-00120-10001-GRB, Nuclear Projects Gated Process
- N-MAN-00120-10001-PC-01, Nuclear Refurbishment Cost and Schedule Change Control
- N-MAN-08131-10000, Job Document Series
- N-PROG-AS-0005, Business Planning
- N-PROC-AS-0068, Organizational Change Control
- N-PROC-AS-0080, Nuclear Business Planning
- NK38-PLAN-09701-10113 Sht: OPS-01, Operations – Ownership Transfer Plan

Appendix A: Nuclear Succession Planning – Integrated Tiered Approach

Nuclear Sucession Planning – Integrated Tiered Approach

Priority 1 Roles

NEC Subset
- SVP Refurbishment (D)
- VP Projects & Mods (E)
- VP Refurb Eng (519081)E
- VP Refurb Execution (E)
- SVP Pickering (D)
- SVP Darlington (D)
- SVP Eng & CNE (D)
- VP Nuc Services (E)
- VP SES (E)
- VP I&MS (E)
- VP Waste Mgmt (E)
- Deputy Site VP (E)
- Director Work Management (E)
- Director Ops & Maintenance (E)
- Director, Station Engineering (E)
- VP Engineering Strategy (E)
- Director Nuclear Safety (E)
- VP Fleet Operations & Maintenance (E)
- VP Science & Technology (E)
- Director Design Engineering (E)
- Manager, Plant Maintenance/Director, CFAM Maintenance (F)
- Manager, Operations Production/ Director CFAM Operations (F)
- Director Strategic Planning (F)
- Director, Regulatory Affairs (E)
- Director, Radiation Safety (F)



Priority 2 Roles

DOM/DWM
- Mgr, Ops Prod (F)
- Assistant Operations Manager (G)
- Mgr, Plant Mtce (F)
- Assistant Maintenance Manager (G)
- Radiation Protection Manager (G)
- TRF Manager (G)
- Fuel Handling Manager (G)
- Common Services Manager (G)
- Manager, Chemistry & Environment (G)
- Outage Manager/Sr. Mgr CFAM (G)
- Manager Work Cont/Sr. Mgr CFAM (G)
- Manager, Field Operations (IMS) (G)
- Director, Low &IL Waste (F)
- Director, Ops & Reactor Mtce (F)

DOE
- Manager, Nuclear Safety (G)
- Manager, Nuclear Safety & Tech Dept (G)
- Manager, Projects Design (G)
- Engineering Manager & Design Authority (G)
- Manager, Plant Design (G)
- Manager Design Engineering – Refurb (G)
- Manager Engineering Mechanics (G)
- Manager, Technical Services (G)
- Manager Components & Equipment (G)
- Manager, Performance Engineering (G)
- Director, Engineering (F)
- Dir, Supply Chain Quality & Eng Serv (Obsolete Replace?)
- Director, Engineering – Nuclear Waste Mgmt (F)
- Senior Manager Plant Design (F)

Nuc Eng
- Role
- Role
- Role

Nuc Serv
- Role
- Role
- Role

Fleet Ops & Mtce
- Role
- Role
- Role

SES
- Role
- Role
- Role

NWMD
- Role
- Role
- Role

- Role
- Role
- Role

- Role
- Role
- Role

IMS
- Role
- Role
- Role

Nuclear Projects
- Role
- Role
- Role

Nuclear Refurb
- Role
- Role
- Role

Vertical Alignment (continuous process)

1. HRM's provide Carolyn with names of individuals that should be included in the Succession Plan for any roles listed in Priority 2 Succession Plans. State "ready now", "ready soon", or "ready later".
2. Carolyn shares with the applicable HRM's any employees that are discussed from their client groups and add to the Succession Plan for a priority 2 role.
3. Once established on the Priority 2 Succession Plan; the applicable Line client will be invited to the Peer Team meeting when the role is discussed.

Cross Function Alignment

1. HRM's provide peers with names of individuals that should be included in the Succession Plan for any roles listed in Priority 3 Succession Plans. State "ready now", "ready soon", or "ready later".
2. Peers share with the applicable HRM's any employees that are discussed from their client groups and add to the Succession Plan for a priority 3 role.
3. Once established on the Priority 3 Succession Plan; the applicable Line client may be invited to the Succession Planning meeting when the role is discussed.

Appendix B: Decision Support for Critical Positions Tool

Decision Support for Critical Positions Tool

A guideline for Human Resources to support their clients in determining a "Critical Position" in Succession Planning

Decision Support Considerations		Indicate Impact		
Position: _____		**High**	**Med**	**Low**
		Score		
		5	**3**	**1**
Critical Tasks and Decision Making	The position exerts critical decision making and influence to OPG's operational/strategic objectives and performance outcomes			
	The level of impact on bottom-line results			
	The position is important to the future delivery of projects, programs and services			
	The extent to which position manages other critical positions			
	A vacancy in the position would cause substantial disruption to the functioning of OPG's operations productivity, performance and level of service			
Hard to Recruit	The position is specialized or requires unique expertise that is difficult to replace			
	The position demands a high level of competency limiting the ability to "start as a rookie"; the development process to qualify a candidate for the position is lengthy			
	In the current job market, the positions is a less attractive option for high potential talent (in the terms of status, profile, perceived developmental value)			
	Degree of Competition for this position in the marketplace *(Consult with Recruiting to answer this question)*			
	Current market value of the position *(Consult with Compensation & Recruiting to answer question)*			
	The geographic location is unattractive or the least attractive of similar roles			
Knowledge at Risk	The position is in danger of "knowledge" drain due to forecasted attrition			
Total		**0**	**0**	**0**

Risk Rating Legend:

	Score
High	40 - 50
Med	30 - 39
Low	20 - 29

Appendix C: Darlington Refurbishment Succession Planning TOR

Darlington Refurbishment Succession Planning

TERMS OF REFERENCE

Drafted by: People & Culture, Nuclear Business Partners

Mandate

The Darlington Refurbishment succession planning process is intended to be a confidential senior leadership RPET forum used to ensure that the necessary talent, behaviours, skillsets, knowledge and abilities will be maintained for all identified positions within the organization. The process prepares for critical leadership vacancies by developing the leadership talent pool and deploying the right talent in a coordinated effort. While discussions are intended to be confidential, they should be candid, productive and challenging in a respectful manner.

Approach to Succession Planning

RPET will meet on a quarterly basis and review the organizational charts and the current talent in each organization. Talent will be identified by Position, Band level, Current incumbent name, Date of Birth and Estimated Undiscounted Retirement date.

Current talent in the NEC Priority 1 and 2 roles will be discussed as well as "Priority 3", Refurb specific positions that are identified as critical positions to the organization that are of risk to the organization if no immediate candidate is available to be placed into role. Positions will have "Ready Now", "Ready Short Term (1-2 yrs)" and "Ready Long Term (3-5 yrs)" candidates identified from all business units across the nuclear fleet.

Although not required to be captured formally as Priority 1, 2 or 3 sequences, a listing of "Emerging Talent" should also be maintained and reviewed on a quarterly basis.

All Priority roles, current incumbents and successor candidates will be reviewed in each meeting by each respective RPET member for their own department.

In assessing talent, the corporate succession planning process at OPG focuses on a number of areas:

- Alignment with OPG's Leadership Behaviours (*see Appendix C.1.0 – OPG's Mission, Values & Behaviours*)
- Performance and Potential Matrix (*see Appendix C.2.0 - Succession and Talent Review Toolkit; Page 36 "Performance / Potential Matrix (Nine Box Model)"*)
- Mapping and Developing Talent (*see Appendix C.3.0 - Succession and Talent Review Toolkit; Page 37-38 "Mapping & Developing Talent – Using the Performance/Potential Matrix*)
- A balance between Ability, Engagement and Aspiration using The High Potential Model *(see Appendix C.4.0 - Succession and Talent Review Toolkit; Page 14 "The High Potential Model"*)
- Alignment with what OPG is looking for in its Leaders (*see Appendix C.5.0 – Succession and Talent Review Toolkit; page 15 "What is OPG Looking for in Their Leaders?"*)

- A balance between Technical Skills, Business Skills and Leadership Behaviours (*see Appendix C.6.0 – Succession and Talent Review Toolkit; Page 16 "How Does the OPG Behaviours/Skills Weighting Distribution Look at Different Levels?"*)

Employees identified for succession planning roles should have a Development Plan on file (*see Appendix C.7.0 – Individual Development Plan Template*). Accountability for this plan and its deliverables rests with the employee and his/her supervisor as well as the Manager once removed.

Meeting Frequency

Minimum quarterly or as determined by the Accountable Sponsor.

Additional Tools & Resources

Additional tools to be used to guide succession planning discussions may include:

- Attrition reports
- Knowledge Management tools
- 360 Assessments
- Leadership Assessments (an assessment that includes a self-assessment survey, psychometrics, behavioural interview, custom report and feedback session
- OPG Behaviours and Career Development Framework Skills and Competencies Assessment tools to be formalized in Q3 of 2014.
- Nuclear Managers training listing (AOOM, SNPM, NPDS etc)

Members & Quorum

Accountable Sponsor:	SVP, Nuclear Refurbishment Project
Chairs:	SVP, Nuclear Refurbishment Project Manager, Human Resources Nuclear Business Partners
Quorum Members:	RPET

Deliverables

At each meeting the following should take place:

- All Priority roles, current incumbents and successor candidates will be reviewed in each meeting
- The succession planning charts will be updated and revised as appropriate
- Actions will be logged and reviewed at the end of the meeting and prior to the next meeting
- Feedback into Development Plans should be fed back to the respective line manager or HR Manager through the Nuclear Projects Manager, Human Resources

Actions will be logged and recorded by the Manager, Human Resources.

Drafted by:

Helen Viveiros, Manager Human Resources — Date: Feb 6/2014

Approved by:

Dietmar Reiner, SVP Nuclear Refurbishment Project — Date: Feb 7, 2014

C.1.0 MISSION, VALUES & BEHAVIOURS OVERVIEW

Mission, Values and Behaviours


OPG's Mission, Values & Behaviours

OUR MISSION ▸ **To be Ontario's low cost electricity generator of choice**

VALUES

- **Safety**
- **Integrity**
- **Excellence**
- **People and Citizenship**

Our strengths, the fundamental truths about OPG that don't change.

BEHAVIOURS

Say It, Do It
Demonstrate personal accountability to deliver results and hold others accountable.

Simplify It
Create the most straightforward path to execution.

Think Top and Bottom Line
Look for ways to improve efficiencies, eliminate waste, maximize generation and make money.

Integrate and Collaborate
Break down silos and work together in support of OPG's mission.

Tell It as It Is
Demonstrate open and direct communication, to everyone with the intention of making things better.

The culture shifts we need to make in order to achieve sustained high performance.

ONTARIO POWER GENERATION

OPG Behaviours Model


the way we do things around here

	all employees	flm/supervisors	middle managers	senior leaders
Say It, Do It	Demonstrate personal accountability to deliver results and hold others accountable.	Demonstrate personal accountability to deliver results and hold others accountable.	Influence a culture of accountability and results based execution.	Drive a culture of accountability and results based execution.
Simplify It	Create the most straight forward path to execution.	Create the most straight forward path to execution.	Ensure work is done in the simplest, possible way without compromising results.	Ensure work is done in the simplest, possible way without compromising results.
Think Top and Bottom Line	Look for ways to improve efficiencies, eliminate waste, maximize generation and make money.	Look for ways to improve efficiencies, eliminate waste, maximize generation and make money.	Recommend ways to improve efficiencies, eliminate waste, maximize generation and make money.	Lead the business to optimize revenue, get value for money and generate new opportunities.
Integrate and Collaborate	Break down silos and work together in support of OPG's Mission.	Break down silos and work together in support of OPG's Mission.	Manage in the matrix; enable seamless integration and collaboration across teams.	Lead in the matrix; create seamless integration and collaboration across OPG.
Tell It as It Is	Demonstrate open and direct communication to everyone with the intention of making things better.	Demonstrate open and direct communication to everyone with the intention of making things better.	Create an environment for open and direct communication.	Create an environment for open and direct communication.
Drive Performance, Build Potential		Make leading people a priority.	Build talent and high performing teams.	Build a high performing organization.
Build Relationships		Influence and build relationships across teams.	Influence and build relationships with internal and external stakeholders.	Influence and build relationships with internal and external stakeholders.
Lead Change		Influence organization and culture change.	Enable organization and culture change.	Drive organization and culture change.
Generate the Future			Influence strategic initiatives and priorities.	Provide enterprise strategic leadership.

VALUES
Safety • Integrity • Excellence • People & Citizenship

ONTARIO POWER GENERATION

Behaviours - All Employees


OPG Behaviours

the way all employees do things around here

Below are the behaviours expected from all employees regardless of role, job, or group – they guide all of us at OPG.

Say It, Do It

Demonstrate personal accountability to deliver results and hold others accountable.

✓ IT IS
- Deliver on commitments with a consistent focus on safety and quality.
- Expect others to deliver on their commitments and results.
- Surface issues and identify problems in a timely manner and recommend solutions where required.
- Own mistakes and failures, and learn from them to improve the next time.
- Understand the risks and implications of decisions and actions; ask if you don't know.

✗ IT ISN'T
- Compromise safety requirements, or eliminate the safety verification process.
- Blame others instead of owning mistakes.
- Work around people who aren't delivering on their commitments.
- Use governance as a reason for not delivering on a commitment.

Simplify It

Create the most straight forward path to execution.

✓ IT IS
- Simplify work practices and procedures within your control; input to simplify ones that aren't.
- Identify issues, barriers or perceived low value work within processes or procedures and where possible suggest solutions.
- Influence and challenge the status quo when something doesn't make sense, or is overly complex.

✗ IT ISN'T
- Compromise or sacrifice quality or safety.

Think Top and Bottom Line

Look for ways to improve efficiencies, eliminate waste, maximize generation and make money.

✓ IT IS
- Identify ways to do things better and more efficiently.
- Understand there is a limited amount of money, and act accordingly.
- Recognize that all the small costs add up to a larger overall cost.
- Understand how your actions and decisions impact operations.
- Understand the challenges of our industry and what it means for OPG.

✗ IT ISN'T
- Behave as if there is an endless pot of money and time.
- Spend money and time on "Nice to haves" vs. "Need to haves".

Integrate and Collaborate

Break down silos and work together in support of OPG's mission.

✓ IT IS
- Work collaboratively to problem solve issues, work through conflict and learn together.
- Keep others informed and ensure quality handoffs and knowledge transfer.
- Consider the impact of actions and decisions on others within and beyond the team.
- Proactively build strong working relationships across teams and geographies.

✗ IT ISN'T
- Operate in silos.
- Behave with an "Us" vs. "Them" mentality.
- Perform tasks in isolation of the bigger picture and team.
- Build your own solution without considering others' needs and impact to others.
- Solely rely on email as a key means to build working relationships.

Tell It as It Is

Demonstrate open and direct communication to everyone with the intention of making things better.

✓ IT IS
- Speak the truth in a constructive, factual and respectful manner, without blame or judgement.
- Receive feedback openly from peers, subordinates and bosses.
- Deliver both good news and bad news.
- Respectfully call out others on inconsistent behaviours.

✗ IT ISN'T
- Avoid difficult discussions.
- Use a process or procedure in place of a difficult discussion.
- Use silence as a way to disagree.
- Be defensive.
- Talk behind others' backs.

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ONTARIO POWER GENERATION

Behaviours – FLM/Supervisors


OPG Behaviours

the way flm/supervisors do things around here

Building on the all employees behaviours, below are the added expectations for those in the critical role of flm/supervisor at OPG.

Say It, Do It

Demonstrate personal accountability to deliver results and hold others accountable.

✓ IT IS
- Set clear expectations, observe work execution, provide feedback on performance.
- Hold others to their commitments and results, recognize when they deliver, and challenge when they don't.
- Ensure staff has the appropriate decision authority aligned to their role.
- Provide input to decisions, and once a decision is made, own and support the decision, and execute the plan of action.
- Plan and organize work to ensure that work is completed efficiently, and monitor for timely and accurate completion.

✗ IT ISN'T
- Make commitments that you cannot keep.
- Do others' work rather than hold them accountable.
- Create governance for everyone to follow because a few people aren't delivering.

Simplify It

Create the most straight forward path to execution.

✓ IT IS
- Work to change procedures that are perceived as barriers or low value work for staff.
- Ask your staff only for the work necessary to get the job done; eliminate work that isn't.
- Acknowledge and empower skill of the craft/discipline where it makes sense rather than set procedures.

✗ IT ISN'T
- Be more prescriptive than required.
- Create governance or procedures to address an exception, where there is low risk, or in response to an individual mistake.

Think Top and Bottom Line

Look for ways to improve efficiencies, eliminate waste, maximize generation and make money.

✓ IT IS
- Be conscious of your team's productivity and take action to make it better.
- Operate within your means, including budget and resources, looking for ways to reduce costs.
- Understand and demonstrate the importance of valuing and developing people.
- Understand what it takes to maintain OPG's license to operate within each of our communities, and take actions accordingly.

✗ IT ISN'T
- Cut corners that may lead to an unsafe workplace safety or other unacceptable risks.
- Spend too much time and effort on things that have very little benefit.

Integrate and Collaborate

Break down silos and work together in support of OPG's Mission.

✓ IT IS
- Actively work with and involve the right people in decisions and solutions affecting them, sharing early and often.
- Break down silos to promote cross-team cooperation.
- Define success in terms of the whole team.
- Be visible and demonstrate that you are approachable in day-to-day interactions with others.

✗ IT ISN'T
- Place your responsibility for making difficult decisions on others.
- Refuse to make a decision until consensus is achieved.

Tell It as It Is

Demonstrate open and direct communication to everyone with the intention of making things better.

✓ IT IS
- Take responsibility to speak up.
- Confront the brutal facts and sensitive issues early on.
- Be open and honest about what you can and can't say.
- Promote two-way discussion and test for buy-in and understanding.

✗ IT ISN'T
- Sit on bad news, sugar coat the message.
- Use feedback as an excuse to be rude or disrespectful to others.
- Manage conflict or difficult situations by email.

Drive Performance, Build Potential

Make leading people a priority.

✓ IT IS
- Set challenging goals for your team, provide clear performance expectations, and clarify how their work contributes to broader OPG goals.
- Delegate meaningful tasks and motivate your employees to develop and learn.
- Provide your employees with the opportunities they need to succeed and develop.
- Encourage your employees to learn and grow from their accomplishments and failures.

✗ IT ISN'T
- Tell your direct reports the solution rather than enabling them to resolve challenges.
- Have performance discussions only during formal review times.
- Do the work of employees because it is easier or quicker.

Build Relationships

Influence and build relationships across teams.

✓ IT IS
- Initiate and build meaningful relationships with your direct reports and across teams.
- Seek input and involve others in problem solving and decision making, when appropriate.
- Listen actively with a desire to understand.
- Ask questions to encourage the sharing of opinions and ideas.
- Provide convincing rationale to influence and effectively gain the support of others towards win-win outcomes.

✗ IT ISN'T
- Be unwilling to listen to the diverse viewpoints of others.
- Show insincere interest in others.

Lead Change

Influence organization and culture change.

✓ IT IS
- Act as a role model by visibly modelling and supporting change.
- Ensure your team understands the need for change, future direction, and how change will impact them.
- Get employees directly involved in making the change successful.
- Implement change programs and processes, deal with resistance and encourage buy in.

✗ IT ISN'T
- Expect or tell others to accept change.
- Avoid concerns about change.
- Expect your employees to figure out how they can support change on their own.

VALUES
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ONTARIO POWER GENERATION

Our Behaviours - Middle Managers


OPG Behaviours

the way middle managers do things around here

Building on the fim/supervisors behaviours, below are the added expectations for those in the critical role of middle manager at OPG.

Say It, Do It

Influence a culture of accountability and results based execution.

✓ IT IS

- Establish clear individual and team objectives on performance.
- Carefully consider what you and your employees commit to, assign clear accountabilities and drive follow through on commitments.
- Ensure positive and negative consequences for delivering—or failing to deliver—on commitments and results are clear and acted upon.
- Present opportunities and risks against decision criteria when recommending and appropriately involve the right people.
- Identify and remove barriers to achieving results; empower others to be able to deliver.

✗ IT ISN'T

- Create rules, policies, process that are unnecessary or that disempower others.
- Recognize and manage everyone the same way, rather than based on their performance.
- Focus on activity or process only, rather than results.

Simplify It

Ensure work is done in the simplest possible way without compromising results.

✓ IT IS

- Simplify existing work practices and procedures within your control; encourage and support others to do the same.
- Ask only for the work necessary to get the job done; take the lead in eliminating work that isn't necessary.
- Use principles, individual accountability and judgment where it makes sense rather than set procedures.
- Set clear boundaries for when procedures must be followed and when it is appropriate to seek efficiencies.

✗ IT ISN'T

- Create governance where only process, clear accountability or open dialogue is required.
- Misuse governance as an excuse to not deliver on commitments made.

Think Top and Bottom Line

Recommend ways to improve efficiencies, eliminate waste, maximize generation and make money.

✓ IT IS

- Recommend new, safe and reliable ways OPG can save money and maximize revenue.
- Consider the value and cost implications of work activities and decisions to both your business unit and the rest of OPG.
- Explain what contributes to OPG making and losing money, and support employees to act on this knowledge to get results.
- Ensure your team demonstrates intelligent compliance; comply with what is required, and only go beyond when appropriate.

✗ IT ISN'T

- Deliver best in class solutions whether or not they are required.
- Operate like our generation portfolio and ongoing financial security are guaranteed.

Integrate and Collaborate

Manage in the matrix; enable seamless integration and collaboration across teams.

✓ IT IS

- Build effective relationships and work collaboratively on issues with customers, other business units, or groups.
- Identify, involve, or communicate with key stakeholders early.
- Build trust by taking others' objectives and needs into account; agree to and deliver on commitments.
- Act based on what is in the best interest of OPG rather than your business unit or group.
- Work with others across OPG to share resources, minimize re-work, and eliminate duplication.

✗ IT ISN'T

- Build your own solution without considering needs of others.
- Do not share failure or success with others.
- Use a consensus decision making approach for every decision.

Tell It as It Is

Create an environment for open and direct communication.

✓ IT IS

- Speak openly with everyone, regardless of position.
- Deal with conflict directly and respectfully early on.
- Demonstrate judgment and sensitivity to the audience when delivering messages.
- Encourage healthy disagreement and manage conflict productively.
- Provide helpful, behaviourally based feedback to others.

✗ IT ISN'T

- Misrepresent the facts or omit information that can mislead.
- Share confidential information.

Drive Performance, Build Potential

Build talent and high performing teams.

✓ IT IS

- Inspire, stretch, motivate, and empower your team to perform at their best.
- Promote team performance and accountability by setting challenging goals, providing constructive feedback and differentiating performance and rewards.
- Manage resourcing and delegate meaningful work to enable the team to perform optimally.
- Support employees to reach their potential based on an understanding of their strengths, development needs, and career aspirations.

✗ IT ISN'T

- Focus on business objectives only and lose sight of healthy team dynamics.
- Own problems that do not warrant your personal attention.
- Prescribe solutions when others can solve them on their own.

Build Relationships

Influence and build relationships with internal and external stakeholders.

✓ IT IS

- Develop strategic, mutually beneficial relationships with key stakeholders.
- Listen and ask questions to encourage trust and sharing of diverse ideas and opinions.
- Communicate with stakeholders actively, concisely, persuasively, and with credibility.
- Understand people's needs and concerns, your impact on them, and anticipate how they are likely to react to a given situation.
- Influence and collaborate across functional boundaries.

✗ IT ISN'T

- Build relationships only when there is an obvious or immediate practical benefit.
- Focus solely on your own agenda and fail to consider the needs of others.

Lead Change

Enable organization and culture change.

✓ IT IS

- Act as a role model by owning and leading change.
- Help employees understand the need for change, and its benefits to them, OPG, and its various stakeholders.
- Rally others around the future direction, confirm buy-in, and address concerns.
- Provide the team with the necessary change programs, processes, tools, and support they need to shift their behaviours and implement change.
- Recommend opportunities and solutions to drive change and support OPG's change objectives.

✗ IT ISN'T

- Assume your team is on board.
- Refuse to modify plans once a new direction has been set.
- Oppose change passively or through lack of action.

Generate the Future

Influence strategic initiatives and priorities.

✓ IT IS

- Identify and recommend initiatives that support OPG's current strategic objectives.
- Clearly communicate OPG's Mission and future in a way that instils confidence and enlists support of your team.
- Translate organizational priorities into clear objectives and practical action.
- Deal with ambiguity and complexity effectively, look beyond the obvious, and don't stop at first answers.

✗ IT ISN'T

- Neglect short-term/immediate imperatives.
- Promote initiatives that seem beneficial but that do not align with OPG's current strategic objectives.

VALUES
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ONTARIO POWER GENERATION

Our Behaviours - Senior Leaders


OPG Behaviours

the way senior leaders do things around here

Building on the middle managers behaviours, below are the added expectations for those in the critical role of senior leader at OPG.

Say It, Do It

Drive a culture of accountability and results based execution.

✓ IT IS
- Establish, and oversee execution of goals and deliver the business plan while driving efficiencies.
- Push decision making authority down and ensure people are enabled to own and deliver results.
- Act decisively and be willing to make tough calls while navigating complexity and ambiguity.
- Manage the response to risk, compliance, and issues while striving to attain objectives.
- Align rewards and recognition to reinforce desired values and behaviours in the achievement of results.

✗ IT ISN'T
- Use policy, process, or governance to enforce accountability.
- Use uncertainty, fear, or intimidation to drive results.
- Focus solely on getting results at all costs and not on how you get there.

Simplify It

Ensure work is done in the simplest possible way without compromising results.

✓ IT IS
- Challenge and enable own and other business units to simplify.
- Promote principles, individual accountability, and judgment to get work done; implement procedures and rules only when necessary.
- Establish clear accountabilities, involve others appropriately, and minimize approvals and sign offs.
- Simplify governance and managed systems wherever possible and eliminate duplication.

✗ IT ISN'T
- Eliminate or disregard beneficial processes that add value and mitigate risk.
- Allow OPG Values to be compromised in the name of efficiency.

Think Top and Bottom Line

Lead the business to optimize revenue, get value for money and generate new opportunities.

✓ IT IS
- Contribute to the development of OPG-wide business strategies that help us secure our position in the market and achieve results.
- Identify, negotiate, and execute business opportunities that support generating electricity and optimizing revenue.
- Make tradeoffs, modify programs, and reduce costs based on a consideration of value for money.
- Ensure your business unit demonstrates intelligent compliance; comply with what is required, and only go beyond when appropriate.

✗ IT ISN'T
- Make decisions without an appropriate consideration of their financial implications or long-term impact to OPG.
- Make decisions that are more beneficial to your business unit than to OPG more broadly.

Integrate and Collaborate

Lead in the matrix; create seamless integration and collaboration across OPG.

✓ IT IS
- Assemble and lead cross-functional teams to work effectively together and deliver results.
- Build trust by taking others' objectives and needs into account; agree to and deliver on commitments.
- Ensure your team's goals and work are aligned to OPG's Mission, Values and Behaviours.
- Minimize customization and duplication by working synergistically with other business units and identifying opportunities to share resources.
- Create opportunities and remove barriers for business units, share information, align objectives, and work together towards common goals.

✗ IT ISN'T
- Allow functional boundaries to limit communication and collaboration.
- Reinforce or condone independent or self-serving behaviour.
- Abdicate your responsibility for making difficult decisions to others.

Tell It as It Is

Create an environment for open and direct communication.

✓ IT IS
- Deliver both good and bad news tactfully and respectfully.
- Listen and be open to change based on constructive feedback.
- Communicate for impact; consider the purpose of communications in deciding what to say and how to deliver the message.
- Promote open and direct discussion of tough issues, create open channels of communication, and remove barriers.

✗ IT ISN'T
- Allow conflict to happen through back channels rather than in the open.
- Deliver insincere feedback.

Drive Performance, Build Potential

Build a high performing organization.

✓ IT IS
- Promote a culture of performance and accountability by establishing challenging goals, providing constructive feedback, and differentiating performance and rewards.
- Identify long-term organization talent strategies and ensure there is a plan in place to build capability.
- Invest time in the next generation of leaders by providing coaching, developmental experiences, challenges, and needed resources so people can reach their potential.
- Find opportunities to move talent across the organization, as one enterprise talent pool.

✗ IT ISN'T
- Focus only on your best or worst performers.
- Move talent to avoid dealing with people-issues.
- Develop talent without a strategic focus on the needs of the business.

Build Relationships

Influence and build relationships with internal and external stakeholders.

✓ IT IS
- Develop trusting, long term, strategic internal and external relationships.
- Monitor and anticipate the implications of shifts in the stakeholder/external environment and stay connected to the right people.
- Navigate complex organizational structures and public environments.
- Advocate for OPG and communicate persuasively and credibly when interacting with media and internal and external stakeholders.
- Understand and demonstrate effective interactions with the Board, OPG unions, and governing bodies.

✗ IT ISN'T
- Be manipulative or focus solely on your own interests.
- Engage in coercive or unethical relationships with stakeholders.

Lead Change

Drive organization and culture change.

✓ IT IS
- Demonstrate active and visible leadership for change by challenging existing power bases, effectively dealing with ambiguity, breaking boundaries, and consistently demonstrating OPG's Values and Behaviours.
- Articulate a compelling future, explain why it is better than the current state, and build confidence that it can be attained.
- Align systems and implement programs to reinforce and reward desired behaviours.
- Encourage employees to initiate new and creative solutions to problems and opportunities.

✗ IT ISN'T
- Drive change that is not practical or of limited benefit to OPG.
- Drive change through fear and compliance.
- Be passive and not visible or accessible at key phases of change.

Generate the Future

Provide enterprise strategic leadership.

✓ IT IS
- Stay on top of dynamic trends (political, economic, competitive, technological and social) and understand their potential implications for OPG.
- Identify new opportunities that will leverage OPG's strengths to counter competitive threats.
- Align organizational goals, structure, process, and talent to drive the strategy.

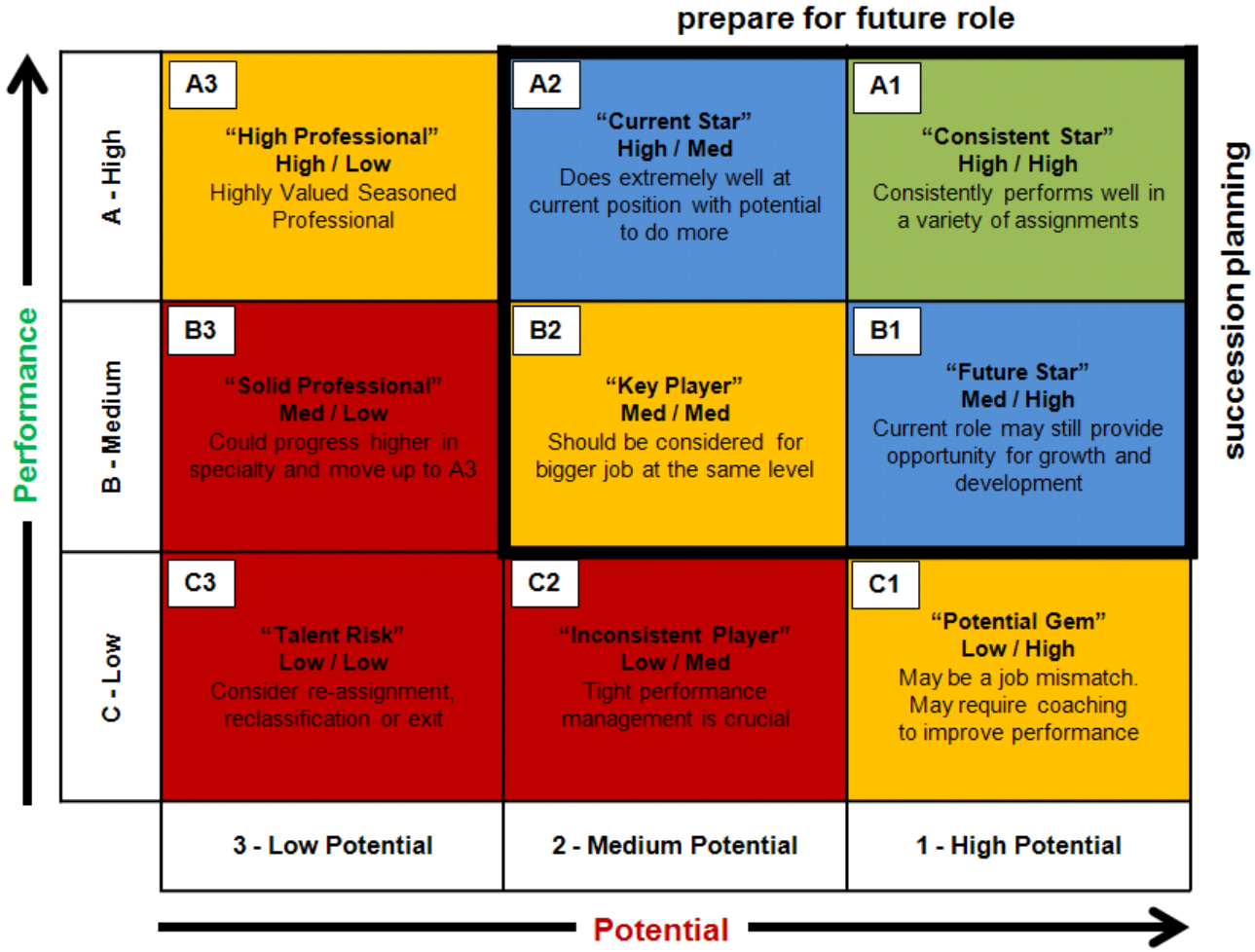
✗ IT ISN'T
- Focus on strategy at the expense of execution.
- Avoid dealing with difficult business trade-offs and prioritization.

VALUES
Safety • Integrity • Excellence • People & Citizenship

ONTARIO POWER GENERATION

C.2.0 PERFORMANCE AND POTENTIAL MATRIX

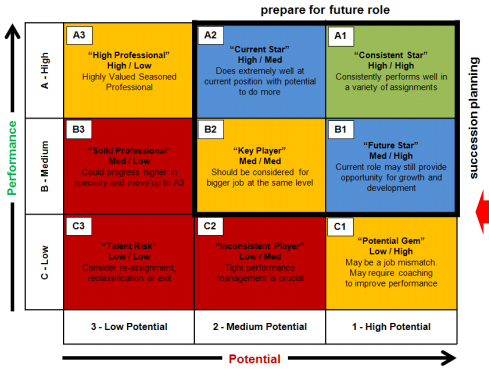
Performance / Potential Matrix (Nine Box Model)



Individuals identified in the blue and green shaded boxes are likely the "high potential" leadership successors. During succession planning talent reviews and when planning for the future, focus should be given to those employees that are placed within A1, A2 and B1, B2.

C.3.0 MAPPING AND DEVELOPING TALENT

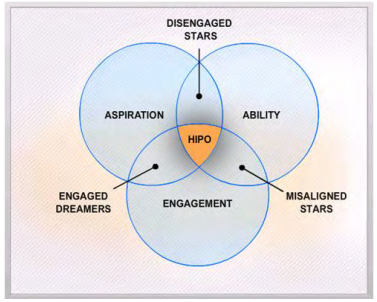
Mapping & Developing Talent – Using the Performance/Potential Matrix



Objective of the tool

To assist managers in assessing the potential of an employee which allows them to place the employee on the Performance / Potential Matrix. In addition, this tool supports managers in developing employee-specific development plans relevant to both performance and potential.

Keep in Mind: The High Potential Model



When completing the Talent Mapping using the Performance / Potential Matrix, consider:

High Potentials are consistently strong performers capable of advancing beyond their present positions and possess the business skills, technical skills, and leadership behaviours to rise to and succeed in more senior critical leadership positions.

Critical Positions: are those positions that are critical to OPG's success now and in the future and therefore cannot be left unfilled for any substantial length of time. This may include a multi-incumbent role that is a key support to operating the business.

A-HIGH

	High Professional	Current Star	Consistent Star
Profile	(High Performance/Low Potential) • **Definition:** Individual is performing well in his/her current job but needs to continue development in current role, or may have valuable technical skills but has not exhibited leadership potential. Individual has not demonstrated willingness to take on significantly greater scope and responsibility in the next 12 months.	(High Performance/Medium Potential) • **Definition:** Individual performs well in his/her current job, makes valuable contributions and consistently demonstrates competencies required. May be ready to take on greater scope and responsibility in the next 12 months.	(High Performance/High Potential) • **Definition:** Individual is developing faster than the demands of his/her current position and/or division. Individual has been given additional assignments and has demonstrated high-level commitment/achieved significant results. Individual is ready to broaden his/her skill set and take on significantly greater scope and responsibility.
Development Suggestions	***Watch for signs of retention risks*** • Understand individual's motivators and what/how they want to develop • Provide recognition and rewards • Provide opportunities to develop in current role, grow deeper, broader capabilities and knowledge • Ask them to mentor, teach, and coach others • Allow them to share what they know, presentations at company meetings, external conferences, to be "the highly valued expert" • Provide honest feedback about their opportunities for advancement in career discussions	***Difference as compared to A1s is degree of readiness for larger roles*** • Seek development similar to A1s, but stretch at a different pace • Focus on job experiences that help build leadership capability in key areas – people skills, management ambiguity and change, alignment, accountability and personal challenges	***Keep them engaged; watch for signs of retention risks*** • Allow them to innovate within a reasonable risk free environment • Provide stretch assignments where the stakes are high but with a reasonable risk to both the individual and the business • Give them a startup or "fix it" assignment • Provide job changes, swaps, rotations, job shadowing –opportunity to experience a new role, broaden knowledge • Help to build and broaden cross-functional networks • Give them a mentor/coach • Help them get exposure one/two levels up to senior leadership, access to meetings, etc.

B-MEDIUM

	Solid Professional	Key Player	Future Star
Profile	(Medium Performance/Low Potential) • **Definition:** Individual is currently meeting the expectations of his/her role. Individual is not prepared to absorb additional scope or complexity in the next 12-24 months. Improve in current role.	(Medium Performance/Medium Potential) • **Definition:** Individual is currently meeting expectations but may not be willing or able to advance; may not be ready to absorb additional scope or complexity in the next 12-24 months.	(Medium Performance/High Potential) • **Definition:** Individual is contributing as expected and is meeting performance expectations. Individual may be ready to take on greater technical and/or leadership responsibility in the next 12-24 months.
Development Suggestions	• Highlight and leverage their strengths • Provide combination training and coaching to help increase performance level • Identify and remove organizational barriers that may get in the way of enhancing performance • Provide honest feedback about their opportunities for advancement in developmental/career discussions	• May not be eager or able to advance; don't push them, allow them to stay where they are • Continuously check-in regarding willingness to advance, relocate • Help their performance move from "good to great" • Tell them they are valued; listen to their ideas; recognize their accomplishments and trust them	***Differences as compared to A1 is current performance level*** • Provide development activities similar to A1, but stretch at a different pace • Focus more on competency gaps that will move them from B to A performance • Focus on job experiences that help build leadership capability in key areas • Identify and remove organizational barriers that may get in the way of enhancing performance

C-LOW

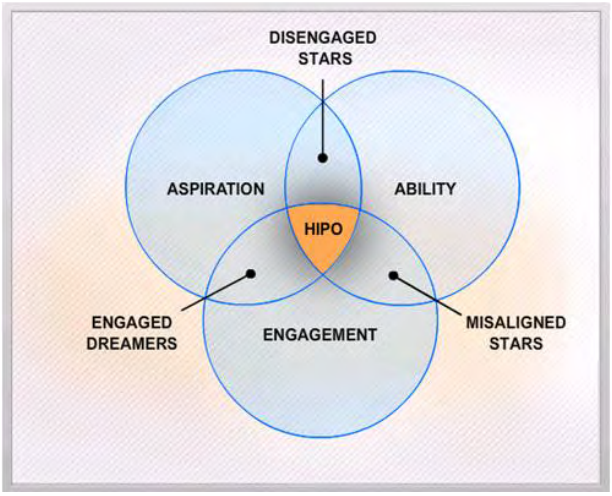
	Talent Risk	Inconsistent Player	Potential Gem
Profile	(Low Performance/Low Potential) **Definition:** Individual is not meeting performance expectations and there is still more to learn in the current position. There are questions about his/her ability to succeed in the current role long-term. Reconsider position.	(Low Performance/Medium Potential) **Definition:** Individual has not been in the position long enough to adequately demonstrate his/her technical abilities, or may have lost pace with changes in the organization.	(Low Performance/High Potential) • **Definition:** Individual is not meeting the requirements in his/her current role. It is possible that the individual could be more successful in the current role with more direction or in another role or division that more appropriately fits his/her skill set.
Development Suggestions	• Focus on the root cause of low performance -- where does low performance stem from? • Use a performance management approach to try and improve performance • After a "reasonable" amount of time, move out of role if performance doesn't improve • Identify and remove "blockers", poor performers standing in the way of development opportunities for high potentials	***This category is often used for leaders too new to rate*** • Focus is on boarding, orientation, relationship building • Provide leadership transition support • Provide a peer mentor • Provide formal leadership training	• May not be eager or able to advance; don't push them, allow them to stay where they are • Continuously check-in regarding willingness to advance, relocate • Help their performance move from "good to great" • Tell them they are valued; listen to their ideas; recognize their accomplishments and trust them

C.4.0 THE HIGH POTENTIAL MODEL

The "High Potential" Model

A "high potential" is a consistently strong performer capable of advancing beyond their present position and possesses the ability, engagement, and aspiration to rise to and succeed in more senior critical leadership positions.

Research indicates that current performance alone does not predict success at more senior levels. To advance and succeed in more senior and critical roles, **employees must have all three components of potential:** ability, engagement, and aspiration. Relative to the broader workforce, High Potentials (HIPOs) are **three times more likely to succeed** as future leaders.



The **High Potential Components and Shortcomings** document will provide you with more detailed information on each element of high potential as well help you to more accurately identify HIPOs, accelerate their development, and evaluate and ensure their continued success in your organization.

When looking at employees, it is important to distinguish between "High Professional" and "High Potential". A "high professional" is a top performer and a recognized functional/technical expert who:

- Has depth of organizational knowledge
- Is reliable and can be counted on, especially in tough times
- Is committed to organization and its success
- Works independently with little direction
- Is a trusted source/resource in the organization
- Works the informal network
- Has a professional reputation outside the company

High professionals may not be suitable candidates for promotion into senior leadership roles as they may not have the desire to pursue this track and/or may be assessed lacking in leadership potential. The contribution of "high professionals" is extremely significant and critical to the company. Succession management includes identifying and planning for a qualified talent pool for these critical roles and retention strategies where required.

When assessing employees, OPG focuses on both performance and potential. OPG uses a **Performance / Potential Matrix** to map identified employees.

C.5.0 WHAT OPG IS LOOKING FOR IN ITS LEADERS

What is OPG Looking for in Their Leaders?

High Potentials are consistently strong performers capable of advancing beyond their present positions. They must have the motivation and belief system to drive the new OPG culture, have demonstrated desired behaviours, as well as have both the technical and business skills, and the leadership behaviours, needed to rise and succeed in more senior critical leadership positions.

OPG's Leadership Model reflects the individual and three levels of leadership behaviours (the "hows") that are valued in leadership roles at OPG to inspire, deliver on vision and achieve performance excellence. The model helps create alignment of leaders around a shared set of values and is the foundation for assessment, training and development, and selection. The way in which we look at leaders changes depending on their level within the organization. **IMPORTANT: Depending on the level of leadership, the weighting distribution in each of the required behaviours/skills will change.** (see over)

CRITICAL CRITERIA

MUST:

- **Have the motivation and belief system to drive the new OPG culture.**
- **Have demonstrated desired behaviours**

Modeling for the Future

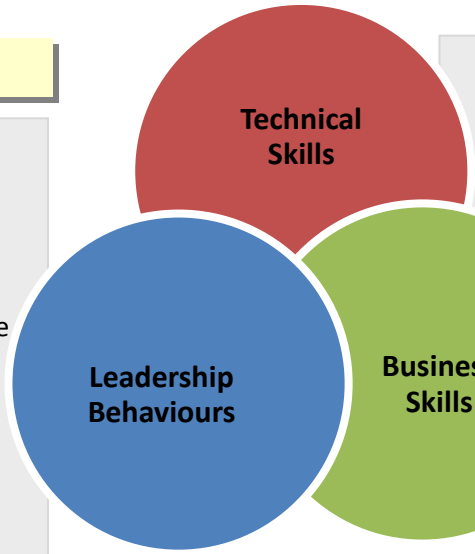
Leadership Behaviours

All Employees

- ✓ Say It, Do It
- ✓ Simplify It
- ✓ Think Top and Bottom Line
- ✓ Integrate and Collaborate
- ✓ Tell It As It Is

Leadership Levels

- ✓ Drive Performance, Build Potential
- ✓ Build Relationships
- ✓ Lead Change
- ✓ Generate the Future



Technical Skills

- ✓ Operations experience
- ✓ Internal or external specialized experience

Technical and Business Skills

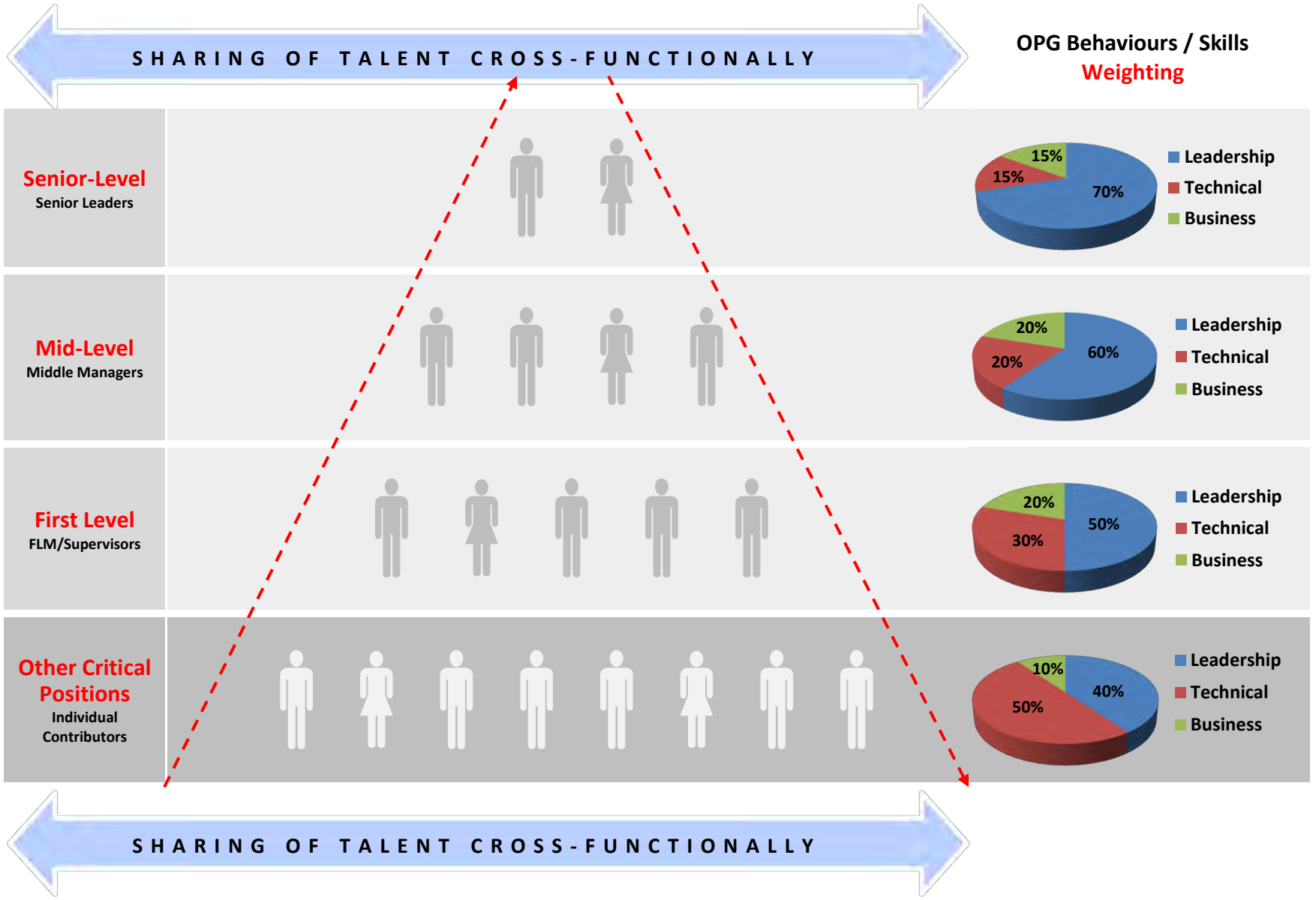
Business Skills

- ✓ Well-rounded business leader
- ✓ Industry knowledge
- ✓ Financial acumen
- ✓ Proven track record of delivering results

A key element in the succession planning process is having knowledge about the behaviours that people need to be successful in their jobs. The **OPG Leadership Model** and the **OPG Behaviours** one-pagers will help to further define and communicate those behaviours that are expected for current and future leaders in a given "critical" position.

C.6.0 OPG BEHAVIOURS AND SKILLS WEIGHTING DISTRIBUTION AT DIFFERENT LEVELS

How Does the OPG Behaviours/Skills Weighting Distribution Look at Different Levels?



C.7.0 INDIVIDUAL DEVELOPMENT PLAN TEMPLATE

Individual Development Plan

Individual Development Plans using SMART objectives enable the achievement of both business and career goals. Employees are expected to take responsibility for their learning and development. During the performance reviews, managers and employees will review the development plan and agree on development activities for the year. Managers are expected to support development and monitor employees' development activities and coach them by giving timely on-the-job and formal feedback throughout the year.

Employee Name:		Employee Number:	
Employee Department:		Employee Work Location:	
Time in current role:		Employee Job Title:	
Manager's Name:		Date of Completion:	

Begin your development planning by selecting 2-3 behaviours and development goals that you feel are most important to address. These may be selected in order to leverage existing strengths or to address gaps. Use the Identifying your Development Priorities Worksheet to help you prioritize your development priorities.

OPG Behaviour What behaviour do I want to work on?			
Area for Development This could include strengths to build on.			
Development Actions What specifically will I do and what will it achieve? What are the best development activities for my identified area for development?			
Target Completion Date			
Measure of Success How will I measure my development?			
Support and Feedback What support do I need and from whom? Who will give me feedback?			
Areas of Interest			
Target Positions			

Note: *This Individual Development Plan template is not mandatory. It is a supplementary support tool to help facilitate employee development. It's a two-way commitment between the employee and their manager on what they are going to do to grow. The PPR tool and word template also have a means of capturing this commitment.*

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Plan

Internal Use Only	
Document Number: NK38-NR-PLAN-09701-10001	Usage Classification: N/A
Sheet Number: 0018	Revision: R001

Title:
DARLINGTON REFURBISHMENT - RADIATION PROTECTION PROGRAM MANAGEMENT PLAN

Darlington Refurbishment - Radiation Protection Program Management Plan

NK38-NR-PLAN-09701-10001-0018-R001
2015-01-06

Order Number: N/A
Other Reference Number:

Internal Use Only

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	Sheet Number: 0018	Revision Number: R001	Page: 2 of 9

Title:
DARLINGTON REFURBISHMENT - RADIATION PROTECTION PROGRAM MANAGEMENT PLAN

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	Sheet Number: 0018	Revision Number: R001	Page: 3 of 9

Title:
DARLINGTON REFURBISHMENT - RADIATION PROTECTION PROGRAM MANAGEMENT PLAN

Revision Summary

Revision Number	Date	Comments
R001	2015-01-06	Revision to add additional references to Refurbishment RP documentation, strategy documents, and white paper.

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	Sheet Number: 0018	Revision Number: R001	Page: 4 of 9

Title:
DARLINGTON REFURBISHMENT - RADIATION PROTECTION PROGRAM MANAGEMENT PLAN

Records Table

The following Records may be generated by use of this document and shall be registered in the appropriate document management system in accordance with the following table:

Record Created	Associated Form or Template Number	QA Record? Y/N	Filing Information/Retention (AIMS Type/Sub-Type)
NA	NA	N	NA

1.0 PURPOSE

N-PROG-RA-0013 *Radiation Protection (RP) Program,* implements a series of standards and procedures for the conduct of activities within nuclear sites and with radioactive materials, intended to achieve and maintain high standards of RP.

This Darlington Refurbishment Radiation Protection Program Management Plan (PgMP) stipulates radiation protection requirements and processes specific to the Darlington Refurbishment Project execution. It conveys how employees working within the Darlington Refurbishment Program will do their work while meeting the intent of the existing the OPG Management System, specifically N-PROG-RA-0013.

2.0 PROGRAM REQUIREMENTS

N-PROG-RA-0013 *Radiation Protection (RP) Program* remains the overall program document for operating units across the OPG Nuclear fleet including refurbishment units. The hierarchy of the governing documents and the relationship of these documents to the program objectives are shown in N-PROG-RA-0013 Fig.1.0 *Radiation Protection Program Implementing and Interfacing Documents*

Some RP governance and supporting documents may require revision in order to meet the needs of Darlington Refurbishment. The Nuclear Refurbishment Radiation Protection Department shall receive and review any requests for governance revisions. These document reviews and potential revisions shall follow N-PROG-AS-0001, *Managed Systems*, N-PROG-AS-0006, *Records and Document Control* and any other appropriate governance. Nuclear Refurbishment Radiation Protection has a set of P6 schedule items (NR.FN.FN.01.U0.73018.6.02) to perform reviews of the RP Program and governance to identify any potential revisions required.

Any program changes will be documented in future revisions of this Plan.

2.1 New Governance Specific to the NR Project

The implementation and strategy description of the Radiation Protection program in Nuclear Refurbishment is documented in NK38-REP-09701-10009 “White Paper: Radiation Protection Management for Darlington Refurbishment Project” and NK38-REP-09701-10088 “Darlington Nuclear Refurbishment -Radiation Protection Strategy”

2.2 Ownership Transfer Plans

NK38-PLAN-09701-10113 Sht: RAD-01 “Radiation Protection - Ownership Transfer Plan” documents the issues and interfaces between the Nuclear Refurbishment Radiation Protection Department and the DNGS Radiation Protection Department.

3.0 ROLES AND ACCOUNTABILITIES

3.1 Director, Radiation Safety

With respect to the Darlington Refurbishment Project:

- Assumes Program Owner roles and accountabilities outlined in N-PROG-AS-0001 for the RP program.
- Implements the RP program framework including setting standards of RP performance and ALARA.

3.2 Department Manager, Radiation Protection – Nuclear Refurbishment

Provide and maintain Nuclear Refurbishment RP direction, programs, procedures and services pertaining to Health Physics, Occupational RP, and Nuclear Refurbishment RP coverage.

Responsibilities are detailed in NK38-REP-09701-10009 *White Paper: Radiation Protection Management For Darlington Refurbishment Project*

4.0 DEFINITIONS AND ACRONYMS

4.1 Definitions

None

4.2 Acronyms

None

5.0 REFERENCES

[R-1] N-PROG-RA-0013 Radiation Protection (RP) Program

[R-2] NK38-REP-09701-10009 White Paper: Radiation Protection Management for Darlington Refurbishment Project

[R-3] NK38-REP-09701-10088 Darlington Nuclear Refurbishment -Radiation Protection Strategy

[R-4] NK38-PLAN-09701-10113 Sht: RAD-01 Radiation Protection - Ownership Transfer Plan

NUCLEAR CONSTRUCTION SUPERVISOR ACADEMY – FEEDBACK SUMMARY

Wednesday, April 13, 2016

Darlington Refurbishment Execution and Training, in collaboration with Vendor Partners, have designed and facilitate the delivery of Nuclear Construction Supervisor Academy (NCSA – 2 day classroom) for all incoming Trades Supervisors.

The Nuclear Construction Supervisor Academy (NCSA) training program was developed with the goal that "*Managers and Supervisors have the knowledge needed to reinforce the high standards and special requirements for nuclear project construction and to identify and correct quality and safety issues*" **INPO09-007 - Principles for Excellence in Nuclear Project Construction**

The NCSA training program strategically emphasizes **"Why Nuclear is Different"** and that Supervisors are the most critical component of creating and maintaining a Nuclear Safety Culture.

The 2 day course educates Vendor Supervisors on the basic nuclear fundamental elements and connecting the relevance to their job role and how they can impact Nuclear Power Plant performance. This is done in the course by not only using practically the **Nuclear Operations & Maintenance Handbook** and (INPO) **Principles for Excellence in Nuclear Project Construction** but in reviewing relevant OPEX and Case Study work to ensure that participants recognize how their role impacts Nuclear Safety and relevant tools that Nuclear Industry utilizes to assist them perform their job role.

The NCSA training program focuses on the areas and traits impacting on "Nuclear Safety Culture" and also ensuring Supervision understands that this is their role, why it is important and that they have the skills to impact and engage their staff. Throughout the course there are consistent linkages to emphasize how the Supervisor controls and impacts Safety, Quality, Cost and Schedule.

Each course closing remarks by Refurbishment Execution Leadership reinforced the Expectations for the performance of Nuclear Work to ensure understanding that the work being performed is to the required standards to maintain nuclear safety and station reliability.

5 (five) deliveries took place to-date, prior D1641, at the DEC, totaling 74 students.

Very positive feedback was received (answer to question "*this training will improve my job performance*"):

- 61% rated as "5" (highest);
- 30% rated "4 and
- 8% rated "3".

6 (six) more NCSA deliveries are scheduled until end of May.

NUCLEAR CONSTRUCTION SUPERVISOR ACADEMY – FEEDBACK SUMMARY

Wednesday, April 13, 2016

Comments from participants: feedback at the end of the course (a total 54 feedback forms were received)

Positive:

- "Excellent course for new supervisors to learn";
- "Excellent presentation of course material and exercises" ;
- "Gained a better understanding of a proper nuclear culture" ;
- "I see more clearly how behaviours, positive and negative reinforcing impacts safety and quality";
- "Will reconfirm for new supervisors what the expectations of nuclear culture (are)";
- "This course allowed me to learn more about the nuclear culture";
- "Makes me conscious of my responsibilities".

Deltas and improvements suggested:

- "As a new supervisor I am realizing more training and information on the day-to-day requirements of a supervisor (Foreman)";
- "Touch up on paperwork associated with the day-to-day supervision";
- "More courses, safety work plans, passport would probably help";
- "How to navigate work reports, TIMS";
- "Filing SCRs and work requests";
- "This training should be given to PMs for a refresher";
- "Managers/Project coordinators should be involved in this training".

The value has been in how participants viewed the experiences during training. Having presentations and exercises aligned to a common set of Nuclear Safety values and behaviors created opportunities to talk about things that impact the work execution and the importance of doing the work. More importantly, doing it right, with the right conduct & behaviors.

ONTARIO POWER GENERATION

Manual

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Sheet Number: **SCH-09**	Revision: **R000**

Title:
Nuclear Projects Scheduling Requirements From EPC Contractors

Nuclear Projects Scheduling Requirements From EPC Contractors

N-MAN-00120-10001-SCH-09-R000
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Title: **Nuclear Projects Scheduling Requirements From EPC Contractors**

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Manual	Internal Use Only		
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Title: **Nuclear Projects Scheduling Requirements From EPC Contractors**

Revision Summary

Revision Number	Date	Comments
R000	2013-06-18	Initial issue.

1.0 OBJECTIVE

This document establishes the scheduling requirements from Contractors who shall work for Nuclear Projects for Darlington Refurbishment and Projects and Modifications.

The intended audience of this manual is all staff involved in NP work, including OPG, direct work contractors and their major sub-contractors.

2.0 WORK BREAKDOWN STRUCTURE (WBS)/ALIGNMENT WITH OPG WBS

Please refer to the latest version of the **Nuclear Refurbishment Program/ Project WBS** manual, N-MAN-00120-10001-SCH-05. The primary objective of this document is to provide a common framework for establishing the work breakdown structure (WBS) for all works within the Darlington Nuclear Refurbishment Program or Projects.

The Contractor shall prepare detailed WBS aligned with the OPG Manual detailed to include every work package that cover 100 % of the scope of the contract. Revision zero shall be issued with the submission of the contractor Level 3 baseline schedule.

Any change to the WBS shall be formally communicated and approved by OPG.

3.0 CODING STRUCTURE/ALIGNMENT WITH OPG CODING REQUIREMENT

The Contractor shall prepare and submit to OPG all coding structures and values which shall be used within the Contractor's Level 3 schedule to generate the various filters and layouts.

Some codes shall be required by OPG and need to be added to the contractor's Level 3 activities to allow schedules and cost integration with OPG systems.

For example, Level 2 ID Code shall be assigned to every Level 3 activities to align with OPG Level 2 Control & Co-ordination (C&C) Schedule

WBS Summary activities shall be added for every work package as defined by the WBS, the activity ID shall follow OPG numbering methodology.

4.0 SCHEDULING REQUIREMENTS

Please refer to the latest revision of the Nuclear Projects Schedule Management manual, N-MAN-00120-10001-SCH.

4.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the

Precedence Diagram Method (PDM) and identify float at the activity level. All work including, but not limited to, submittals, major procurement, delivery and construction activities shall be included.

4.2 Level of Detail Required

Contractor submissions shall follow the direction of OPG regarding the details in the Level 3 schedules. The Level 3 schedule shall be detailed to cover 100% of the scope and all work types by SCI and work areas. The level of detail shall be proposed by contract and approved by OPG.

4.3 Activity Durations

Contractor submissions shall follow the direction of OPG regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined.

The Level 2 rollup of the Level 3 schedule should not exceed 90 calendar days unless it is a Level of Effort work package or agreed by OPG.

4.4 Long Lead Procurement Items

Tasks related to the procurement of long lead materials or equipment shall be included in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 120 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery.

The Level 3 schedule shall include every Purchase Order and all pre and post order activities.

4.5 Resource Loading

The Level 3 schedule shall be resource loaded at the activity level such as labour and quantity. No cost data will be required within the schedule. Contractor's Resource Breakdown Structure shall be proposed by the contract and approved by OPG.

4.6 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

Contractor submission of work area shall follow the direction of OPG.

Logic – all relationships and types between activities shall be shown.

Calendar – All calendars used in the CPM schedule shall be provided.

4.7 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

4.8 SCI (System Classification Index)

All installation activities shall be identified in the Contractor's Level 3 Schedule by SCI system, as defined by OPG.

4.9 Lags

Lag durations contained in the Contractor's Level 3 Schedule shall not have a negative value. Lags are only to be used when logic cannot be used. All lags must be identified.

4.10 Percent Complete Calculation

Physical percent complete shall be calculated for every activity in the Level 3 schedule and rolled to the work package level.

The calculation of percent complete shall follow the earning rules proposed by the Contractor and approved by OPG.

4.11 Schedule Software

Primavera P6 has been selected as the scheduling software for Nuclear Projects.

5.0 BASELINE SCHEDULES

The contractor shall submit a detailed Level 3 schedule for OPG acceptance within a number of days, as per the signed agreement.

The Level 3 shall be detailed to cover the full scope of work and every work package. Once accepted the baseline shall be stored and XER files shall be issued to OPG for review.

Variance analysis shall be prepared versus the baseline.

6.0 CHANGE MANAGEMENT

Any added/deleted activities shall be kept to the minimum after the baseline submission. Changes to the schedule must be identified to OPG with every submission:

- Added and deleted activities

- Change to activity description or duration
- Change in relationships between activities

7.0 BASIS OF SCHEDULE DOCUMENTS

Contractors must issue a basis of schedule document or equivalent with the submission of the baseline schedule. The document should include, but not limited to, the following:

- Summary description of the scope and main deliverables
- List of all Project/Payment milestones and key dates
- WBS / Primavera files structures and integration
- Coding structures for generating the various Schedules layouts
- Calendars used with the various activities
- Productivity rates / Assumptions
- Benchmarking to similar projects for duration assumption
- Progress measurement process for all work packages
- Regular scheduling reports
- Resource usage and limitations

8.0 XER FILES

Formal submission of XER shall be required with every schedule submission unless file exists in OPG's database. The format shall be prepared as directed by OPG.

The contractor must perform quality check before submitting XER files and must remove unnecessary codes and calendars as directed by OPG.

A statement must be added to the submitted letter to confirm that the Contractor performed the quality check and removed unnecessary coding. Failure to do so may result in damaging OPG files.

9.0 SCHEDULE AND COST INTEGRATION

Refer to the latest version of the Nuclear Refurbishment Earned Value Management manual, N-MAN-00120-10001-SCH-07.

10.0 MONTHLY UPDATE CYCLE

The Contractor shall submit periodic schedule updates. These submissions shall enable OPG to assess Contractor's progress.

The Control or Level 3 schedule shall be updated weekly, bi-weekly, or once per month, as required by OPG. The data date shall follow OPG fiscal month end dates for proper Earned Value Calculation.

OPG may require more frequent updates depending on the criticality of the Project.

11.0 REPORTING

A Narrative Report shall be provided with the preliminary, initial, and each update of the project schedule. The Narrative Report shall include: a description of activities along the critical and near critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. Upon OPG’s approval, the Narrative Report can be completed with the standard month end reporting.

12.0 INTERGRATION

OPG reserves the right to require the Contractor to work in the same Primavera database. The Contractor shall format their schedule in order to integrate with the appropriate Work Management process.

OPG Confidential Exclusive

FOR INFORMATION to the Board of Directors

March 4, 2016

DARLINGTON REFURBISHMENT PROGRAM - COMPARISON TO THE BRUCE POWER REFURBISHMENT AGREEMENT

REASON FOR REPORT

This report compares features of the Darlington Refurbishment Release Quality Estimate (RQE) with the publicly available details of the recently announced Bruce Power refurbishment project, where comparisons can reasonably be made

HIGHLIGHTS

In December 2015, the Ontario government announced that an agreement had been reached with Bruce Power - the "Amended and Restated Bruce Power Refurbishment Implementation Agreement" - facilitating the approval to proceed with the six-unit refurbishment. This agreement and associated public and media announcements indicated that six-units would be refurbished for $13B and that Bruce Power would bear the costs of any project overruns. The Agreement approved by the Independent Electricity System Operator (IESO) Board of Directors, the Bruce Power owners, and the Minister of Energy (after Cabinet review); was announced and posted on the IESO website on December 3, 2015. Full details of the scope of refurbishment work are not publicly available.

The pricing mechanism is established in the Agreement, but final costs and payments will be fixed over time. Specific pricing information (such as Bruce Power's cost estimates or threshold base amounts for each unit) is not included in the agreement posted on the IESO website; however, the indicative total cost estimate, and the mechanism for setting final costs were publicly released.

OPG has conducted a cross-functional review of publicly available reports and documentation detailing the cost estimate and conditions of the Bruce agreement. High level comparisons were made, with assumptions documented where appropriate, to equivalent DRP data. The focus of the comparison was to address a possible perception that the Bruce Power Project is yielding six refurbished Units for $13B (nominally $2.1B/unit) versus the DRP RQE which has identified a four-unit refurbishment for $12.8B (nominally $3.2B/unit).

The following table summarizes, by key element, how the Bruce Power agreement compares with the DRP RQE, approved in November 2015.

Project Element	Summary of Comparison
Strategy	There is a significant difference in approach to executing the life extension work. [redacted] Bruce presents a more drawn out approach, using future planned outages (an "Asset Management Program") to complete the equivalent scope that Darlington intends to execute in single refurbishment outages. [redacted] There is no clear mechanism or strategy available for review to assess the feasibility of their proposal.
Scope	The major difference between the scopes of the Bruce and Darlington refurbishments is that Bruce Power is replacing the steam generators for their units, whereas Darlington is only refurbishing them. [redacted]

Project Element	Summary of Comparison
	[redacted] The Canadian Nuclear Safety Commission (CNSC) has not concurred with the Bruce Power refurbishment plans, [redacted] Further, the extent of the campus plan and long term asset management scopes cannot be determined as the Bruce refurbishment includes an inspection program only, [redacted] Having already refurbished Units 1 and 2, Bruce Power [redacted] for those refurbishments, particularly for the refurbishment of Units 3 and 4.
Cost	OPG's RQE estimate and schedule are high confidence and rigorously detailed. [redacted] The Bruce cost estimate expressly excludes escalation and interest, and the contract provides opportunities for potential cost growth as the project progresses. [redacted] The IESO does not require the equivalent of OPG's RQE to be submitted until 15 months before each refurbishment outage.
Schedule	The first Bruce outage duration is eight months longer than Darlington's first unit outage duration. All other Bruce durations are comparable to the Darlington durations. The steam generator replacement work undertaken at the Bruce site is unlikely to affect durations as it is reasonable to assume that the replacement lies below the critical path. OPG's schedule has been developed based on testing on the mock-up, detailed reviews by OPG and the Engineering Procurement Construction (EPC) vendor and detailed risk analysis. [redacted] For OPG, the durations presented are the high confidence risk informed durations.
Economics/LUEC	[redacted]

Project Element	Summary of Comparison
Cost Recovery	[redacted]
Off Ramps	The 2013 Long Term Energy Plan (LTEP) refurbishment principles, including establishment of realistic off-ramps, applies to both Bruce Power and Darlington. This agreement allows Bruce Power to cancel the agreement at certain junctures under certain criteria. It must demonstrate that the economics of the project are "significantly impaired". OPG does not have this ability, but as a publicly owned entity it is not a relevant disadvantage.

CONCLUSIONS

Based on a review of publicly available documentation, the commercial structure and execution strategy of the Bruce Power refurbishment project has major differences when compared to the Darlington Refurbishment Project. [redacted] Analysis will continue to be conducted as more details emerge.

Submitted by:

_____
Dietmar Reiner
Senior Vice President, Nuclear Projects

APPENDICES

None

RCRB April 25 to 29 - Site Visit Recommendations
Theme: OPG needs to rapidly transition to an Execution-Focused Organization

= Quick Win
= New Recommendation not in draft report
= New Action Proposed. To be confirmed

RMO Issue Number		RCRB Recommendation	RMO Action #	Refurbishment Response and Action Plan (What)	Responsible Owner/ Delegate (Who)	TCD (When)
247	Shift Mindset to Execution Owner: Mike Allen	**(1) Mind Set:** Need to start changing the organizational mind set from planning /preparation to project execution and from an operation to a construction mindset, quickly!	7674	1. PMs to create top 10 list by bundle. SVP Execution to create roll-up top 10 list. Lists to contain the # days the issue/risk could add to the schedule and a due date of when the issue/risk must be resolved by (or it will go into the schedule). Post Top 10 list in the workplace. Review status at cornerstone and other meeting forums.	Bill Owens	20-May
		a. Leadership needs to vocalize: Safety, Quality, Cost and Schedule at every opportunity, and demonstrating it.	7675	2. Rollout and Communicate across the fleet the DOR/how work gets done.	Sean Toohey	27-May
		b. Say it! Do it! When you said you would! Need to be more definite about the name, date, and action when it comes to task assignments. There is a need to hold people accountable for their performance.		3. Communications Strategy Improvement:		
		c. Craft-based, work-based processes, work instructions are key.	7684	a. Re-focus the Weekly Message – focus on mindset/execution.	Sean Toohey	In Progress
		d. Need to determine the balance between operating and project mentality.	7685	b. Implement 9:45am All Hands Weekly Huddles – RPO and DEC	Scott Berry	24-May
		e. The project may need external support with construction experience to help guide along?	7686	c. Conduct an Offsite Alignment Session (NPET and Band Fs) – focus on shift to execution	Sean Toohey	26-May
		f. Have spent so much time in planning and prep, need to make the mental shift to execution and start getting stuff done – need to start thinking about the people working in the field.	7687	d. As part of PJB – change messaging to a thoughtful execution culture	Sean Toohey/Grant Howard	28-May
		g. OPG has spent much time in planning and preparation. Leadership and the organization needs to make the mental shift to execution and start getting work done. Leadership needs to change the focus to the people working in the field.	7688	e. Change messaging in on-boarding – thoughtful execution message. Note Action (d) is the pre-req to this action. Message to be created under action (d) and used by on-boarding	Andy Forsyth	7-Jun
		(8) Project Culture: Project Managers need to be more results-oriented and more demanding.	**7692**	4. Conduct benchmarking on how to make construction environment work – reach out to RCRB (Rencheck) on recommendation of who to benchmark	Mike Allen	31-Jul
		a. Sense of urgency to make decisions.	7693	5. Get Engineers deployed into the field (Resident Engineers) with the right authority - define how work will flow. 50% already deployed. Additional 50% remaining.	Neil Mitchell	1-Sep
		b. Culture of accountability (who, what, when around safety, quality, cost, schedule)	7694	6. Implement the Valve Program Strategy (Cyclic Valve Program Strategy)	Val Bevacqua	1-Oct
		c. People are not working as a team, they are collaborative and respectful but routinely miss commitments to each other without asking for help.	7696	7. Implement a paper closure program/program lead (configuration management, CAP, Management Actions, RFIs, Design Paperwork, SAFs, etc)	Imtiaz Malek	15-Aug
		d. For the project, people have to be accountable for completing the issues in the time established, by committed deadlines in order to support their teammates	7689	8. Implement the Friday afternoon worksite clean-up (Tidy Friday) and Housekeeping Standards/Clean As You Go focus	Ken Hobbs/Grant Howard	31-May
		e. Recommendation: The project implementation plan that shows how this project is going to run – roles, responsibilities, accountabilities for each phase of the project.	7690	9. Develop and Implement Proposal for Project Controls and Authority Level	Gary Rose	30-Jun (TBC to be moved forward?)
		f. Bring in a select number of key players that can help senior team (from industry best vendors) with some of the concepts above	7697	10. Implement Material Expediters - eg. 1 in Eng, 1 in PCC	Sean Toohey	15-Sep
		(10) Engineering: Work scope left to complete is not completely defined, and in some cases is unknown. Open scopes such as the valve program, procurement, temp alts, etc., will adversely affect schedule fidelity.	7691	11. Communicate the following regarding islanding: • the physical islanding strategy for the refurbishment unit including system islanding strategies and use of Protected Equipment Zones (PEZ) within the island. • defined boundary points with the operating station which will define the division between controlling authorities. • Strategy for defined terminal points where vendor applied lock-out-tag-out will be utilized. • training plan for station integration and unit islanding including the comprehensive training needs analysis.	Boris Vulanovic/Steve Gregoris	3-Jun
		a. A decision is needed regarding how the valve program is to be established. This needs to be completed soon. This will potentially have a large impact on Engineering (screening, etc.)	7698	12. Implement the Central Nuclear Projects Resourcing Initiative - implement a centralized Nuclear Projects Resourcing centre and framework for reporting and tracking	Gary Rose/Helen Viveiros	30-Jun
		b. The field engineer program needs to be established to address both intent and non-intent changes to minimize work documents where possible (especially within the 'construction' work boundaries.) What Field Engineering will 'look like' must be defined. – stated during the review week	7699	13. Implement and optimize the Nuclear Resourcing Program per established plan inclusive of increasing recruitment resources , implementation of process and policy changes and reporting of metrics through the dashboard. Finalize RFP for preferred vendors. Establish pro-active partnerships with vendors, unions and the business.	Nicole Lichowit/Kris Oomen	15-Jul
		c. There is a need to finalize the remaining open modifications and resources should be added where needed.	7700	14. Improve ability to process quantity within the Onboarding centre – Facility enhancements have been completed to permit a higher number of staff to be processed at any one time. Additional action of hiring additional Onboarding instructors will ensure projected hiring numbers can be processed.	Andy Forsyth	1-Sep

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247	Shift Mindset to Execution Owner: Mike Allen	d. The scope of "paper closure" is not known, and is not adequately included in the schedule. If unknown, estimates must be included. This is especially important when the refurbishment of overlapping units occurs and could overwhelm engineering.	7701	15. Review the audit Program from a programmatic perspective to streamline. Consider both NO and IA audits. Review with CNO and VP Assurance	Meg Timberg	31-May
		e. Scope, as the result of inspections, will be an unknown. Dedicated HIT teams will be needed to screen and address scope additions.		16. Revisit and revise the P&C Service Model including work direction for P&C leads and estimating	Mike Allen/Gary Rose?	TBD?
		(11) Housekeeping: This is a leading indicator of Safety. This standard needs to be maintained early-on during the refurbishment, and on an ongoing basis, which will help keep the site in a "safety conscious" mind set. However, this is bigger than just refurbishment and the station's lay down areas. The station will still have operating units and the world class standards must be applied to the operating units. The standards need to be clearly defined between Refurbishment areas and the Operating Units.				
		Safety: Housekeeping could be improved in a number of locations. Outside there are many "loose" materials that could become airborne during storms. Inside the power block, the laydown areas should be minimized in the operating plant. The operating plant must be clearly maintained under standards for Operational Excellence. No safety issues were identified during this review.				
		(12) Project Controls and Authority Level: Integrity and accountability are key components in managing projects and maintaining job scope. Clear spending accountability with respect to decision making needs to be defined. A clear definition of what a Scope Change really means is needed (additional scope versus what is needed to meet scope). A $100,000 limit if drawing a contingency is currently the authorized amount for the project manager to spend, without additional approval. This limit should be reviewed and substantially increased (in our opinion). Expenditures are likely to be much greater, and frequent. The time required to process and obtain approval for expenditures will have a substantial impact on critical path. ($2000 per minute is the estimated impact for critical path.) A support mechanism should be in place to relieve the burden, other than initial notification to Senior Management, to process and document the basis for these expenditures.				
		(4) Operations: The lack of clarity of how Operations will handle parts of the project is not providing certainty for the schedule and work structure for the upcoming refurbishment. They have not yet articulated what the expectations are for some areas they are accountable for, and when preparations work will be completed. Operations alignment with the Refurbishment project is lacking on how to control work. This activity is both a key risk to integrated schedule completion and delivery of the schedule as planned.				
		a. The decision on what portions of the plant need to remain under operations control and plant programs versus that portion that needs to be turned over to construction/project control needs to be completed very soon. This should be based on what is truly needed to support the running units and what is in the best interest of the project to complete work in an efficient manner. As part of this decision, the testing, commissioning and restoration process should also be a factor.				
		b. Once this division referenced in a) is complete, the block permiters must then be decided or modified to suit the way the unit will be laid out. The resource-loading to apply the permitry is not ready, and needs to be planned and scheduled in order to fully support the beginning of work.				
		c. The support processes under the permitry program needs to have clear statements on what processes will be applied. (Scaffolding, temp alts, seismic constraints, etc.)				
		d. Physical barriers need to be put in place to protect key running equipment needed to support the operating units. Walkways (or areas) and other equipment need to be clearly marked and defined to ensure personnel do not disturb operating equipment.				
		e. To assist in this process, work with Engineering and Nuclear Safety may be required.				
		f. Nuclear safety has yet to finalize equipment credit review that was initiated. This work needs to be completed with priority in order to support the islanding project.				
		(5) Hiring of Personnel: The hiring of personnel needed to support Refurbishment needs to be very timely. Current practices are largely based on hiring permanent staff per the Operating Plants. While the Augmented and OSS processes are much faster than the regular staffing model, there are areas for improvement regarding the requirements and timeliness for hiring from both HR and Refurbishment staff. An expeditious process to screen, hire and get into the work force is needed. Security requirements and the timeliness of those requirements also need to be carefully evaluated. (a) Positions and security clearance need to be prioritized on criticality to execute refurbishment. (b) Metrics associated with time to field the priority positions need developed. (c) A priority system for security would expedite those personnel who are needed immediately. (d) Tracking the hiring process from the initial request to being on-site will point out areas for improvement. (e) Current efforts to improve this process need to be expedited.				
		(7) Level of project oversight: It was evident from a review of audit and oversight schedules that there's a large burden on the refurbishment organization. There were nearly 60 different audit/oversight activities in 2016 (internal and external). The RCRB strongly recommends that these activities are consolidated as much as possible and resource balanced. Example, if several groups are reviewing same focus areas. As the organization enters the execution pnhase, OPG will clearly need to be mindful of this burden, but still provide the right level of oversight for this project.				

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248	Schedule Resource Loading Owner: Mike Allen	**(2) Schedule:** Still working on schedule (appears there is a lack of alignment on progress made in the schedule) –resource-loading, and less than 6 months out. This needs to be completed as a first priority so that durations and logic can be verified.	7702	1. Complete Assessing/Milestone Recovery	Karen Fritz	3-Jun
		a. Need to focus on interfaces and handoffs. These are high "risk of execution" areas for delay (Which are being looked at in the vertical reviews, but not completed yet).	7703	2. Conduct Offsites	Karen Fritz	30-Jun
		b. It is unclear who owns the work interfaces. The key question is: does the PM own the pre-requisites and turnover interface.	7704	3. Conduct Vertical slice reviews (designate interfaces and handoffs)	Karen Fritz	31-Aug
		b. Need to go from making the schedule to using the schedule.	7705	4. Disposition the 40 Open Items	Karen Fritz	TBD
		c. The approximately 40 items (3 significant) that have potential schedule impact. These are unresolved. We recommend that completion dates, and weekly reviews are established. This is necessary to meet the June 17th date.	7706	5. Implement "carry around schedule" - schedule in hand for all critical meetings. Talk about the schedule	Karen Fritz	17-Jun
		d. Additionally, these items have potential schedule impact and should be included in the schedule until resolved. (Lock end date so people do not think they have extra time to complete the work but drive resolution through the schedule - what, who, when).	7707	6. Develop L2 "what if" schedules (with risk included). Issues/Risks as they appear in the Top 10 list if not resolved by the established dates, to be added into the schedule.	Gary Rose/Derek McCauley/Ryan Smith	15-Jul
		e. Need to transition from developing the schedule to using the schedule.				
		f. Should consider brining in schedule expertise to support the effort to verify that it is 'implementable.'				
		e. Recommendation: lay out what needs to be done to produce the Rev. 0 schedule. This includes having vendors to commit to resources and verifying committments on a weekly basis. This will ensure that by June 17th the Rev 0 schedule is resource-loaded, and in a format that is usable. When the schedule is resource-loaded then other things will start falling into place.				
		f. Do not talk about the P90 schedule outside of BOD and confidential business case updates				
		i. Once the schedule is finalized, OPG needs to be clear that all people working on the project are working to the schedule.				

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249	Metrics to Prevent Issues Owner: Gary Rose	**(3) Metrics:** Individual metrics exist for various parts of the project. However, it is standard practice to have a high level suite of metrics (approx 10 Key Performance Metrics), and tier 2&3 metrics that feed it. The current effort to produce these pyramidal metrics must be expedited. There appears to be a lack of project (execution) metrics (e.g. Work Package work down). This is an important management tool that is missing (comprehensive suite of visible Refurbishment metrics). These metrics must be based on schedule derived targets where the metric actually indicates progress towards achievement. General thoughts are:	7708	1. Identify top 10 metrics to manage to ("Scorecard").	Gary Rose	31-May
		a. Establish key metrics with targets (or goals) based on thhe work needs to support schedule execution. It was unclear "what the key goals and targets are". Is there a hierarchy that supports the organization?	7709	2. Develop Targets and scorecard. Communicate it consistently througout the org.	Gary Rose	15-Jul
		b. The vision is: a central group to manage performance. Ensures accuracy, consistency, and timeliness of reporting.	7710	3. Present Targets to DRC	Gary Rose	31-Aug
		b. There is a likely need for more people to build the project controls department, similar to what a Plant Hatch-type company would deploy on a large scale project. The existing team may be too small from our experience	7711	4. Develop Tier 1 and 2 metrics and reports to support them	Gary Rose	15-Jul
		c. Need a balanced scorecard for Refurbishment only (not Nuclear Projects)	7712	5. Conduct Benchmarking on metrics (consult with Mike Rencheck). Consider CII top metrics for large projects.	Gary Rose	30-Jun
		d. Typical metrics: % Progress, earned value, productivity, cost → planned vs. actual.	7713	6. Complete org chart reviews and transition to project org	Gary Rose	31-May
		e. There is a need for measures for the people in the field which need to change with the progress of the project. This in effect allows staff to see their contribution to the project and build ownership at the craft level.	7714	7. Review Change Control Process and add coding to segregate those initiated by a Contractor or OPG. Also, add code list re: 'Types' of changes to cover off Recommendation 15.	Gary Rose/Tracy Leung	15-Jun
		f. There is a need for top level indicators: safety, quality, cost, schedule for each project and for each contractor. Put on one sheet of paper.	7715	8. In contingency report, show full breakdown of Contingency showing Vendor/Owner related.	Gary Rose/Lindsay Greenland	15-Jun
		g. 2 sets of metrics: one to tell outside world, one for internal (pyramid approach). These need to be consistent and accurate.		No action to track. Response to 17 Project Record: Role being put in place, with P&C Strategy Group, for this very purpose. Self Assessment of documentation/records in progress (Sarah Elliott). DRASs used to document basis of decisions; CCF and Risk Register must be clearly documented (ongoing reinforcement)		
		(14) Project Reporting: The RCRB has seen a significant example where the metrics do not accurately reflect the actual state of the project. Approximately half of the 2016 pre-refurbishment ytd budget is not spent. The basis for this under spend is that work is not done. However, the schedule metric also shows as 'green.' This situation does not present the most accurate representation of the project. This presents an optimistic view of the project, instead of a true reflection of the status. The appropriate methodology and sensitivity for metrics are critical attributes for any project. In addition the status of the reporting needs to reflect future performance and status. a. Vendor performance during the execution of the refurbishment project is not known, but the initial preparatory projects should be a good source of productivity and performance data.				
		(15) Change Management (Scope Change): The Change Management Process is critical to enable visibility of scope and cost changes to the project. Anticipating and trending changes, assessing the impact of these changes, promptly agreeing to the cost or schedule impacts with vendors, and including these changes in the forecast. It is suggested to Trend, Change Order, scope and design changes. The Process should recognize two types of changes, those initiated by OPG, and those initiated by the Contractors as a result of unforeseen conditions or events. There are many examples of these processes available to the OPG team and external help can be sought to address this if required.				
		(16) Contingency: Messaging of contingency allowance and "cost at risk" is inconsistent. In some presentations OPG is showing only "vendor cost" as risk, excluding risk of cost overruns for O&M and Project Support. However the Contingency breakdown shows contingency for O&M and Project Support Services. It is suggested that this inconsistency be corrected.				
		(17) Project Record: OPG is subject to intense scrutiny by multiple agencies and regulators. For prudency hearings purposes it will be critical to write the facts and evidence that support any cost increases. OPG will need to demonstrate prudent management of risks and cost overruns and the application of best management practices to support the case for any overruns to be passed through to the rate payers. The creation of an "independent" project record (detailed with daily records and monthly reports) will also be critical to protect OPG from contractor claims if required. OPG should appoint an appropriate person(s) to monitor, collect and draft project records and prepare detailed risk assessment reports on a monthly basis in advance of OEB hearings, and in support of any contract claims or future contract settlement negotiations or litigation.				

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	Vendor Success Factors Owner: Mike Allen	**(6) Getting people (Craft) to work:** Need to determine the way to effectively and efficiently get people to work and keep them working.	**7716**	1. Implement the Use of Vendor Quality Assurance Program	Dave Stiers/Imtiaz Malek	31-May
		E.g. CAP – what do you really need to effectively monitor their job (as appposed to trying to make them a world-class CAP company).	7717	2. Complete initiative for consistent vendor low level reporting , trending, and taking action consistent with their quality programs	Dave Stiers/Imtiaz Malek/Ken Hobbs/Grant Howard	15-Jun
		(a) The vendors do not need to have an operating CAP mentality. Needs to be more simplified – create a observation based system that creates a lot of input (people feel comfortable reporting), but that dispositions and fixes issues quickly. Focus on safety, housekeeping, and quality. • If not tailored, both the vendor and OPG will spend a lot of time, with little value added. This is an example of how to slow the vendor down. Think: What are you really trying to achieve? • Need to ensure a CAP program exists for vendors doing engineering. For construction vendors, something simpler (they're own process) is required. • Let the vendors implement their program (but hold them accountable to do that). Don't try to force them to use the OPG CAP program. Station/project to monitor the vendor's program. E.g.: daily disposition, weekly senior oversight of bigger issues.	7718	3. Develop, document and implement the CWP tear out program – issue the guide for CWP tear outs	Ken Hobbs/Grant Howard/Contractors	31-Aug
		(b) A shift in focus in getting the craft 'ready to work' needs to be established at a lower level in the organization, and with a more detailed focus on ease to get to work and the execution of work.	???	4. Implement the Nuclear Safety Culture Action Plans regarding "One Team" and Contractor Partnerships.	Per the Nuclear Safety Culture Action Plans	Per the Nuclear Safety Culture Action Plans
		(c) Standards need to be communicated in simple terms for housekeeping, safety, quality and schedule adherence. Pocket-sized Refurbishment guide that is included in 'on boarding' training is needed.	7719	5. Conduct time and motion studies to drive productivity (consult with Rencheck). Interim studies being conducted currently by Ken Hobbs	Gary Rose (TBC - request by Execution to change to Ken Hobbs)	31-Aug (Phase 1) (TBC - sooner per Execution)
		(d) CWPs, Work Plans and Work Packages are not craft friendly and contain more information than needed. Craft Implementation Plans need to be created that contain only the needed craft instructions, drawings, and work instructions. (We are not recommending that the CWP be changed at this point, but a working "craft" package be created	7720	6. Revisit Vendor efficiencies inside the island (SATM, LOTO, seismic scaffold, steam doors, etc)	Ken Hobbs/Grant Howard/Paul Ross	31-Aug
		(9) Contractors: The perspective of OPG should be that the contractors must be successful, and that the whole purpose of the preparation and successful execution of work is dependent on the success of the contractor. Currently, the safety culture surveys and other inputs show that there is a gap in the OPG contractor relationship that is preventing OPG from getting the needed input. This is recognized by OPG and steps are being made to address the gap.				
		a. The contractor needs to provide the proper interface and activities such that OPG has the required information. ES Fox has been given a significant work scope, and they need to get set up to perform this work. This includes more sophisticated tools, and additional personnel to complete this work.				
		b. OPG must draw out the needed information, so that the contractor needs and performance (safety, quality, schedule, and cost) are known to OPG.				
		c. The scheduling process must include the questions to ensure that roadblocks are identified. This will ensure that the proper contractor culture is established.				
		d. The managing of contractor productivity is not defined. A specialized consultant should be retained in order to study 'time and motion' and to provide the appropriate metrics. Do this early (prior to breaker open), at the beginning of work execution, and then periodically.				
		e. A shift in focus in getting the craft 'ready to work' needs to be established at a much lower level in the organization, and with a more detailed focus.				
		f. Signage in the break rooms and other key locations needs to be visible. The content needs to include safety messages, key performance metrics and reinforcement of standards.				

RCRB April 25 to 29 - Site Visit Recommendations
Theme: OPG needs to rapidly transition to an Execution-Focused Organization

= Quick Win
= New Recommendation not in draft report
= New Action Proposed. To be confirmed

RMO Issue Number		RCRB Recommendation	RMO Action #	Refurbishment Response and Action Plan (What)	Responsible Owner/ Delegate (Who)	TCD (When)
	Other	**(13) Risk Management:** The current practice of removing the "topic" that is tracked in the risk management program when the due date is exceeded, or deemed past due, does not address the impact on the refurbishment. It also takes away from the continued importance of the item. When risk is not addressed, cost is the result. In addition, the future impact of that risk item does not 'go away' even though the item is removed from the key risk item list. Keeping the topic of risk on the risk management summary keeps focus on the issue, and provides input to future actions and schedule. a. The schedule does not include resource loading and the identification of handoff points. The RCRB believes these present one of the greater risks to the refurbishment schedule, but are not among the most important risk items. b. Another potential risk is the new inspection ports to be installed on the Steam Generators. The RCRB recommends that an independent group review the process and the risk associated with installing Steam Generator lancing ports. (Information is being collected to provide to the RCRB). Other high consequence items should be identified and reviewed.	7721	1. Recommendation 13 a is being loaded by the Schedule team. Risk Management will asseses handoff points and ensure adequate risk identification and management of these. Perform Review as par tof the June schedule review meeting.	Gary Rose/Ryan Smith	15-Jul
		(18) Project Risks: Several commercial risks should be carefully managed: • Vendor material cost increases (prices not fixed in contracts). • Schedule Change Impacts (schedule is still live and a potential gap is being created between the current schedule and the contractual schedules). The fact that schedules are not yet resource loaded may also imply changes and bring cost impacts due to changes in resource quantities and cash flow curves. • Change Orders have the potential to increase the Target Cost. Scenario analysis should be done to understand potential pessimistic outcomes and have mitigation plans in place. • OPG removed risk / contingency from the JV price prior to contract signing on the assumption that "OPG is the best party to manage such risks". Contingency was then allocated. An independent verification of the risk dollars removed versus the contingency added should be performed to ensure consistency in this approach. • Cost of closing documents and final "sign-off" of systems is not included in the schedule. This is real work. Updates to the schedules should reflect this reality, and cost impacts should be allocated to the appropriate budget line items in the cost forecast.	7722	2. High consequence/low probability and FIAK/FIAW risks are being fully assessed currently. Risk Management to review Steam Generator risk and discuss with project team and assess value in third party review	Gary Rose/Ryan Smith	15-Jun
			7723	3. Risk Management to collaboratively review Recommendation 18 Project Risks with project teams and assess risk register/response	Gary Rose/Ryan Smith	30-Jun