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Title:

TURBINE GENERATOR REFURBISHMENT PROJECT ALTERNATE CONTRACTING PLAN

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**Turbine Generator Refurbishment
Project Alternate Contracting Plan**

NK38-PLAN-09701-10112-R000
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Revision Summary

Revision Number	Date	Comments
R000	2012-11-09	Initial issue.

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Executive Summary

This Turbine Generator Refurbishment Project Alternative Contracting Plan provides a recommended alternative contracting strategy for the Turbine Generator Project (the "**Project**") under the Darlington Refurbishment ("**DR**") program (the "**Program**") in the event project objectives and negotiations goals cannot be met through the original recommended contracting approach.

The Turbine Generator Project Team (the "**Team**") determined that the best alternative procurement option is to engage in a competitive process. In order of the Team's preference, the options include:

Option 1: Bundle the total scope of work and competitively bid using an EPC contracting model.

Option 2: Unbundle the scope of work into five SOW bundles and competitively bid individual or groups of bundles.

Option 3: Unbundle the scope of work by E, P, and C portions and competitively bid individual or groupings of portions.

The Team recommends allowing inclusion of the original equipment manufacturer ("**OEM**") in the alternate contracting plan. Participation of the OEM will help OPG minimize redesigned components and reverse engineering which will ultimately help to minimize risk.

Option 1, bundled EPC, is the recommended option. The EPC contracting model is recommended because it helps ensure the achievement of OPG's business objectives, DR Program and Project objectives and is the least risk option. This model includes:

- EPC with OEM as prime subcontractor or Joint Venture ("**JV**");
- EPC without the OEM (i.e. reverse engineering or full replacement);
- EPC where OPG manages the interface between OEM and EPC contractor where:
 - Work is done under 2 separate agreements (i.e., an agreement with the EPC contractor concluded as a result of a competitive process and an agreement with the OEM concluded as a result of selective single sourcing);
 - OPG contracts with OEM for engineering, technical support and OEM supplied equipment or components and then free issues materials to the EPC vendor selected through the alternate process; or OPG assigns the agreement with the OEM to the EPC contractor.

The Alternative Procurement Plan is expected to add up to an estimated 18 months to the procurement process.

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1.0 INTRODUCTION

1.1 Purpose

This plan provides a recommended alternative contracting approach and strategy for the Project under the DR. This alternate approach and plan ("**Plan B**") can be implemented when any of the following events occur [R-1]:

- OPG is unsuccessful in achieving the desired negotiations objectives and goals of the original recommended contracting approach;
- Instructions are given to cease negotiations respecting the original recommended contracting approach for any reason; or
- OPG's senior management does not approve the single source contract achieved as a result of the original recommended contracting approach when negotiations of such contract are completed.

The implementation of Plan B will mitigate the potential risks introduced when any of the events outlined above occur. OPG will implement this plan in the event that the recommended strategy in the Contracting Strategy for Turbine Generators [R-2] is not pursued. If required, approval for the implementation of Plan B from senior management will be requested.

1.2 Background

The original recommended contracting strategy for the Project was to bundle the total scope of work ("**SOW**") into one package using an Engineering, Procurement, and Construction ("**EPC**") contracting model with the OEM. This recommended contracting strategy is known as "**Plan A**" and described further in the Contracting Strategy for Turbine Generators [R-2].

2.0 ALTERNATIVE PROCUREMENT PLAN OPTIONS ANALYSIS

2.1 Analysis Overview

The Team considered the following options for alternative procurement:

- Option 1: Bundle the total scope of work and competitively bid using an EPC contracting model.
- Option 2: Unbundle the scope of work into five scope of work bundles and competitively bid individual or groups of bundles.

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- Option 3: Unbundle the scope of work by type (i.e. E, P, and C) and competitively bid individual or groupings of portions.

The Alternative Procurement Plan Options Analysis set out in Appendix A, evaluates desired objectives against each alternative procurement option to determine the advantages and disadvantages associated with its implementation. The analysis clearly identifies the positive and negative attributes associated with each option.

For reference, a summary of the Class 5 Cost Estimation Assessment is attached as Appendix B.

2.2 Reverse Engineering and Compatibility and Integration Risks

It is anticipated that extensive reverse engineering would be required in cases where certain information that traditionally can only be provided by the OEM is not available. The reverse engineering report from Faithful+Gould Inc. [R-3] estimates costs associated with reverse engineering. The report states that reverse engineering does not address the integration risks associated with engineering work on highly specialized and integrated systems. This higher integration reverse engineering risk results in potential cost impacts to the Project that are significantly higher than the direct reverse engineering costs. For example, compatibility and integration risks for the highly specialized turbine generator equipment may negatively affect overall unit reliability.

With Plan A, any compatibility and integration risks were addressed by using the OEM as the sole contractor. With Plan B, if the OEM is included, such compatibility and integration risks will be mitigated.

2.3 Recommended Alternative

The Alternative Contracting Plan Options Analysis in Appendix A provides the advantages and disadvantages associated with the implementation of each alternative procurement option. The Team determined that Option 1 provides the highest number of advantages of any option. These advantages are:

- Utilizing the EPC contracting model decreases the complexity of managing the Project.
- Bundling decreases the number of interfaces and integration issues, and provides a single point of accountability for the assigned work.
- Bundling decreases the amount of effort in contract and project management oversight due to the reduced number of contracts.
- Technical integration risk of hardware and controls will decrease, particularly if there is involvement of the OEM as a subcontractor or as part of a JV. The non-OEM scopes of work will be completed by a single vendor.

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Under this recommended option, the OEM could be involved under any of the following models:

1. As a prime sub-contractor or JV partner.
2. OPG contracts with OEM for engineering, technical support and OEM supplied components only.
3. OPG free issues materials to the EPC vendor selected through the alternate process.

Involvement of the OEM will mitigate risks associated with reverse engineering and contracting with a non-OEM vendor.

3.0 PLAN ACTIVITIES

3.1 Activity Timeline

The implementation of Plan B is expected to add up to an estimated 18 months to the procurement process. The time required to successfully implement each internal work activity of this plan is visually represented in Appendix C and is summarized in Table 3-1.

Table 3-1: Overview of Alternate Contracting Plan Activities

Activity	Estimated Time	Tasks Involved
Expression of Interest (EOI)	1 month	• Provide vendors with an overview of the scopes of work. • Gauge vendor interest in the various scopes of work.
Assess response(s) to EOI	1 month	• Determine level of OEM involvement, if any. • Determine path forward.
Reassessment of Turbine Generator Scope of Work Bundles	1 month	• Analyze the turbine generator scope of work items to determine the impact of alternate contracting option(s).¹ • Determine the optimal method of bundling the total turbine generator scope of work.²
Selective Single Source Contract (Engineering, Technical Support and OEM supplied equipment or components) with OEM³		
Finalize, Approve and Award Contract	2-3 months	• OPG internal approvals of the finalized contract. • Terms and conditions are executed.
Competitive Procurement Process		

¹ This work can be done concurrently with the EOI activities.

² For the controls scopes of work, more time will be required to complete internal work activities if this work is assigned to the competitive source contract.

³ To be established and used as (if) needed

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Activity	Estimated Time	Tasks Involved
Technical Specification Preparation	3-6 months	- Prepare technical specifications for competitively sourced scopes of work. - Conduct a detailed scope of work and proprietary component analysis.
Execute Competitive Procurement (Request for Proposal and Negotiations)	6-8 months	- Submit request for proposal packages to interested vendors. - Evaluate proposals received from each vendor. - Decide path forward for negotiations. - Define negotiation terms. - Execute negotiations.
Finalize, Approve, and Award Competitive Source Contract	2 months	- OPG senior management approvals of the finalized contract(s). - Terms and conditions are executed.

3.2 Explanation of Activities

Details of each activity are described in the subsequent sections, which include the time, resource, and vendor considerations associated with each activity. These activities are visually represented in Appendix C and are summarized in Table 3-1.

3.2.1 Expression of Interest (“EOI”)

The purpose of the Expression of Interest (“EOI”) activity is to provide potential vendors with an overview of the SOW and to gauge their interest in competing for the work. An EOI will be sent to potential EPC and non-EPC qualified vendors with the details of the SOW. Vendors that express interest will be considered by the Team as potential vendors for the Project. Based on the EOI results, the Team will reassess the alternative contracting options to ensure that the selected option is the best path forward for the Project with the involved vendors.

The prospective proponents will be asked to express interest in completing all 5 scopes of work or any individual work scopes (i.e. any of the 5 SOWs). The prospective proponents will also be asked to provide information on any alternate approaches (e.g. replacement rather than refurbishment) that they may propose.

3.2.2 Reassessment of the Turbine Generator Scope of Work Bundles

OPG will be required to review the technical requirements, update the SOWs and reassess the bundling of the various SOWs. This analysis will be required in preparation for a competitive process, to determine OEM specific portions of work and to reconsider the scope based on the risk profile (i.e. OPG may decide to delete work scope if the risk associated with execution without the OEM is too high).

The total SOW is currently unbundled into five equipment/component bundles:

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- Steam Turbines and Turbine Auxiliaries: inspections, repairs and/or replacements of high pressure and low pressure turbine components and auxiliaries.
- Generator and Generator Auxiliaries: inspections, repairs and/or replacements of generator components and generator auxiliaries.
- Moisture Separator Reheater: inspection, overhaul and/or replacements of Moisture Separator Reheater internals and auxiliaries.
- Turbine Controls Upgrade: replacement of the obsolete analogue Turbine Generator Electronic control system with a new digital system.
- Generator Excitation Upgrade: replacement of the obsolete Generator Excitation control system with a new digital system.

The reassessment will be based on the risk profile of the work to determine whether other types of bundling or unbundling may provide a more effective and efficient distribution of work between the potential vendors.

There are significant project management complexities and integration issues that arise if unbundling is selected due to the increased number of vendors providing highly specialized components, equipment, and services which must be compatible and integrated with the turbine generator system.

The turbine, generator and excitation controls SOWs may be required to be allocated to a separate vendor that specializes in controls engineering, manufacturing, and installation. The complexity of these systems requires subject matter experts in these areas in order to reduce or eliminate reverse engineering and integration risks.

3.2.3 Finalize, Approve and Award Contract with OEM

If negotiations for an EPC contract with the OEM (Plan A) are unsuccessful and Plan B is required to be implemented, negotiations may continue with the OEM in order to pursue a selective single source contract for engineering, OEM manufactured equipment / components and technical support. The negotiations plan for Plan A is described in detail in the Darlington Refurbishment Turbine Generator Project Negotiations Plan [R-4]. A selective single source contract would be established as (if) needed, finalized and approved by OPG senior management and based on the assessment of turbine generator SOW items.

3.2.4 Technical Specification Preparation

Where required, technical specifications will be prepared based on the reassessment of the turbine generator SOW bundles and the finalized selective single source contract. Since the original SOW packages were written based on the OEM providing the entire Project (Plan A), a significant amount of work will be needed to enable non-OEM vendors to understand and participate in a competitive process.

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For the turbine, generator and excitation controls work, additional time will be required to competitively source this work (i.e. to allow vendors time to analyze the technical specifications and to finalize the conceptual design, preliminary and detailed engineering work).

3.2.5 Execute Competitive Procurement

OPG will issue request for proposals (“**RFP**”) packages to selected potential vendors based on the responses to the EOI and project contracting requirements. The proposals received from the vendors will be evaluated by the Team in order to determine which proposals provide the best fit for the Project based on key project considerations and criteria. The Team will decide the appropriate path forward for negotiations to finalize an agreement.

3.2.6 Finalize, Approve and Award Competitive Source Contract

Completion and approval of the competitive source contract will address the remaining SOW for the Project and it is to be finalized and approved by OPG senior management after the Execute Competitive Procurement process is complete.

4.0 ACRONYMS AND REFERENCES

4.1 Acronyms

DNGS	Darlington Nuclear Generating Station
DSR	Darlington Scope Request
EOI	Expression of Interest
EPC	Engineering, Procurement, and Construction
IP	Intellectual Property
OEM	Original Equipment Manufacturer
OPG	Ontario Power Generation Inc.
RFP	Request for Proposal
SOW	Scope of Work
TG	Turbine Generator

4.2 References

- [R-1] NK38-REP-09701-10030 R000, “Contracting Strategy Summary for Turbine Generators”, 2012-03-09.
- [R-2] NK38-REP-09701-10021 R000, “Contracting Strategy for Turbine Generators”.
- [R-3] Report, Faithful+Gould Inc., “OPG Darlington Refurbishment IP and Reverse Engineering Report”, 2012-03-12.
- [R-4] NK38-PLAN-09701-10096 R000, “Darlington Refurbishment Turbine Generator Project Negotiations Plan”, 2012-03-12.
- [R-5] Spreadsheet, “Turbine Generator Refurbishment Project Class 5 Cost Estimation Assessment”, R001, 2011-09-01.

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Appendix A: Alternate Contracting Plan Options Analysis

The alternative procurement options for the Project include the following:

Option 1: Bundle the total scope of work and competitively bid using an EPC contracting model. This model includes:

- EPC with OEM as prime subcontractor or JV;
- EPC without the OEM (i.e. reverse engineering or full replacement);
- EPC where OPG manages the interface between OEM and EPC contractor where:
 - Work is done under 2 separate agreements (i.e., an agreement with the EPC contractor concluded as a result of a competitive process and an agreement with the OEM concluded as a result of selective single sourcing);
 - OPG contracts with OEM for engineering, technical support and OEM supplied equipment or components and then free issues materials to the EPC vendor selected through the alternate process; or OPG assigns the agreement with the OEM to the EPC contractor.

Option 2: Unbundle the scope of work into five SOW bundles and competitively bid individual or groups of bundles.

Option 3: Unbundle the scope of work by E, P, and C portions and competitively bid individual or groupings of portions.

In each case, OPG will be required to review the technical requirements, reassess the bundling of the various SOWs and update the SOWs as necessary. The requirements and timeline for this activity are described in section 3.1 and Appendix C.

This analysis evaluates each option against the following desired objectives:

- Minimize risks to project execution and scheduling for:
 - Development of engineering requirements (Engineering Requirements)
 - Duration of the procurement process (Procurement Process)
 - Complexity of work execution and integration (Work Complexity and Integration)
- Maximize value for money (Value for Money)
- Appropriate allocation and transfer of risk to vendor and ensure accountabilities for deliverables is clear (Risk Transfer and Accountability)
- OPG maintains oversight and impact on maintenance and training practices is minimized (Oversight, Maintenance, Training).

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Alternative Contracting Options	Pros	Cons
Option 1: Bundle the total scope of work and competitively bid using an EPC contracting model. This Option includes: 1. EPC with OEM as prime subcontractor or JV; 2. EPC without the OEM (i.e. reverse engineering or full replacement); or 3. EPC where OPG manages the interface between OEM and EPC contractor	Engineering Requirements: By including the OEM in the procurement process either as a subcontractor, JV or by portioning out the scopes of work that required their involvement, effort and costs to develop engineering requirements will be reduced and reverse engineering will be minimized. Procurement Process: Bundling the total SOW reduces the number of competitive processes running in parallel, therefore reducing time and effort to manage these processes. Work Complexity and Integration: Utilizing the EPC contracting model with the OEM as part of the model decreases the integration risk and complexity of managing this work since the OEM with the proprietary information is still part of the solution. Risk Transfer and Accountability: Bundling decreases the number of interfaces and integration issues, and provides a single point of accountability for the assigned work. This includes areas such as scheduling, integration, coordination, and work execution. Oversight, Maintenance, and Training: Bundling decreases the amount of effort in contract and project management oversight due to the reduced number of contracts. Reducing the number of vendors increases the consistency of integration and configuration of TG components, which reduces the maintenance and training practices required post refurbishment.	Engineering Requirements: Due to the large portion of scope which requires OEM's involvement, the benefits that may be realized by OPG managing the interface between the OEM and EPC contractor may be limited. Similarly, contracting to a non-OEM will increase the time and effort required for reverse engineering and detailed tech spec development which may negate any other advantages with a non-OEM vendor. Value for Money: Using an EPC contract limits the number of vendors qualified to complete the bundled scope of work available for a competitive process. This option potentially results in a higher cost due to the risk being transferred to the vendor. In addition, OPG may be exposed to increased costs associated with non-OEM engineering work (i.e. to validate design assumptions prior to designing or supplying components under the EPC contract). Risk Transfer and Accountability: Full scope EPC to a non-OEM vendor results in increased integration risk residing with OPG. As a result, the quality of project deliverables may decrease and the potential for rework will increase. Compatibility and integration issues/risks affecting unit reliability lie with OPG.

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Alternative Contracting Options	Pros	Cons
Option 2: Unbundle the scope of work into five scope of work bundles and competitively bid individual or groups of bundles.	Value for Money: Unbundling into five SOW bundles encourages the most competition amongst potential vendors of any option, which may potentially result in the lowest contracting costs for the Project. Risk Transfer and Accountability: Unbundling into five SOW bundles allows for the utilization and retention of subject matter expertise for the SOW related to specific components. (i.e. individual SME for each of the five bundles)	Engineering Requirements: Unbundling into five SOW bundles increases the time and effort required for reverse engineering and detailed technical specification development for a non-OEM vendor. This might negate other advantages. Procurement Activities: Running parallel competitive processes will increase the procurement time required for multiple contracts. Work Complexity and Integration: Unbundling into five SOW bundles introduces further technical integration risks due to the separation of hardware and controls work portions. Risk Transfer and Accountability: Unbundling the five SOW bundles results in multiple contracts, where integration risk between the contracts lies with OPG. As a result, the quality of project deliverables may decrease and the potential for rework will increase. Compatibility and integration issues and risks affecting unit reliability lie with OPG. Oversight, Maintenance, and Training: Unbundling into five SOW bundles will increase the amount of effort in contract and project management oversight due to the increased number of contracts. Involving multiple vendors may decrease the consistency with the integration and configuration of TG equipment and components. As a result, increased maintenance and training practices required post refurbishment is highly probable. There will also be an increased requirement for spares inventory as some of the units will still have OEM parts while others have non-OEM parts. Also, there is significantly higher execution and construction complexity with multiple vendors on site, which requires much higher effort for scheduling and coordination.

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Alternative Contracting Options	Pros	Cons
Option 3: Unbundle the scope of work by E, P, and C portions and competitively bid individual or groupings of portions.	Engineering Requirements: Engineering requirements and specifications will require design basis information that can be provided from the OEM if they are responsible for the Engineering work component. This significantly reduces the time and effort required for reverse engineering and detailed technical specification development for a non-OEM vendor. Value for Money: Unbundling by E, P, and C increases the pool of vendors for each bundle of work, which encourages more competition between potential vendors. This will potentially result in lower costs for the contracts for the scopes of work.	Engineering Requirements: It is highly unlikely the OEM would agree to release certain information that traditionally can only be provided by the OEM (e.g., design basis information) to another vendor to manufacture and install components. This will make it difficult to separate the E, P and C portions. Procurement Activities: Unbundling by E, P and C introduces the opportunity for vendor refusal to complete work that relies on another vendor's engineering designs. In addition, running parallel competitive processes will increase the procurement time required for multiple contracts. Work Complexity and Integration: By separating the E, P, and C work activities, technical integration risk for hardware and controls is higher since vendors may have to install OEM and non-OEM components. Compatibility and integration issues and risks affecting unit reliability will lie with OPG. Risk Transfer and Accountability: Unbundling by E, P, and C results in multiple contracts, where the integration risk between the engineering, procurement, and construction work lies with OPG. As a result, the quality of project deliverables may decrease and the potential for rework will increase. In addition, this option requires ongoing involvement from the engineering vendor for procurement activities to minimize potential design risk. Compatibility and integration issues/risks affecting unit reliability will lie with OPG. Oversight, Maintenance, and Training: Unbundling by E, P and C will increase the amount of effort in contract and project management oversight due to the increased number of contracts. Involving multiple vendors for a particular scope of work may decrease the consistency with the integration and configuration of TG components. As a result, increased maintenance and training practices may be required post refurbishment.

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Appendix B: Summary of the Class 5 Cost Estimation Assessment

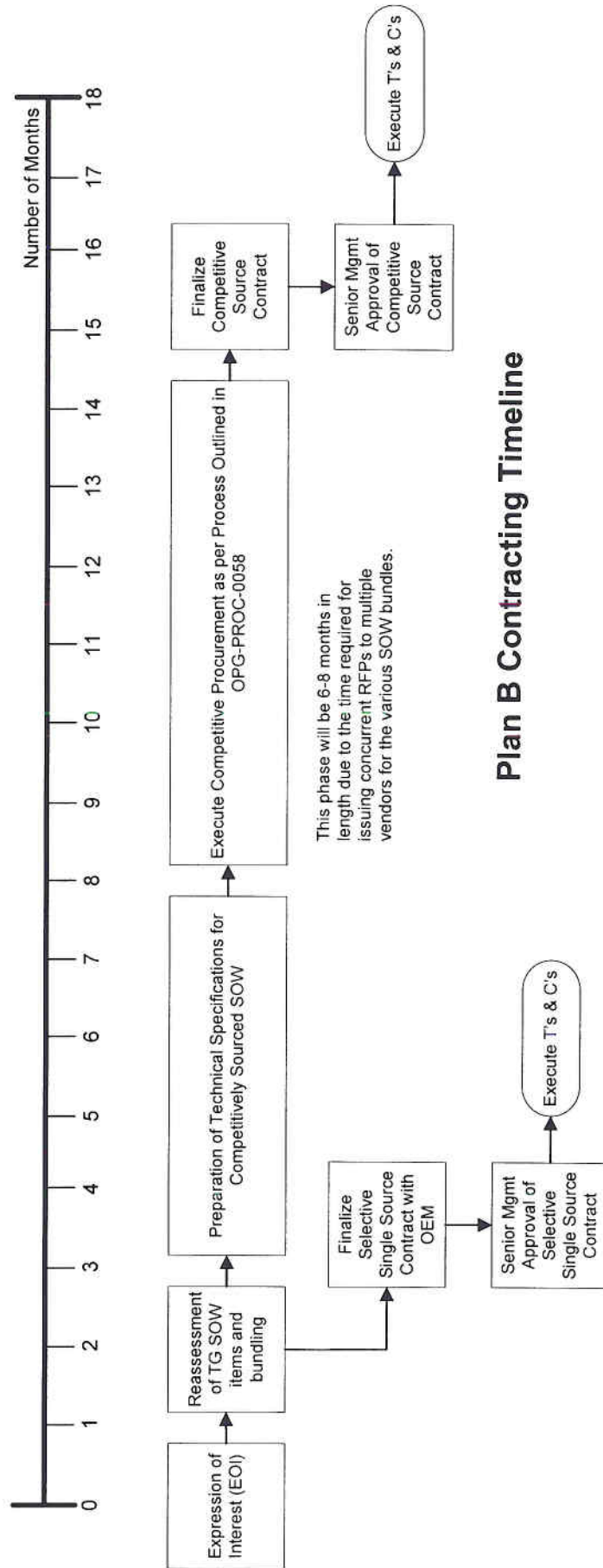
B.1.0 SUMMARY OF 2011 CLASS 5 COST ESTIMATES

Note: Full assessment details are provided in [R-5] and will be updated to reflect technical scoping clarifications and Decision Record Analysis Summary ("DRAS") recommendations for specific DSR items.

SOW (DSR)	First Unit Gross Total (\$k)	2 nd Unit LFE ?* 0.975 (\$k)	3rd Unit LFE * 0.970 (\$k)	4th Unit LFE * 0.965 (\$k)	Estimate LFE No Contingency (\$k)	Estimate Contingency (\$k)	TOTAL (Team) (\$k)
NK38-SOW-41000-10001 (TS0750) Steam Turbines and Turbine Auxiliaries	21,473.81	20,936.97	20,829.6	20,722.23	83,962.62	98,616.23	182,578.85
NK38-SOW-42000-10001 (TS0760) Sum for Generator and Generator Auxiliaries	37,846.48	36,900.32	36,711.08	36,521.85	147,981.25	1,285.45	149,266.71
NK38-SOW-41800-10001 (TS0680) Moisture Separator Reheater	2,198.2	2,143.24	2,132.25	2,121.26	8,594.96	48,384.88	56,979.83
NK38-SOW-64100-10002 (SI0010) Turbine Control Upgrade	22,053.77	21,502.43	21,392.16	21,281.89	86,230.26	0.0	86,230.26
NK38-SOW-64220-10001 (SI0020) Generator Excitation Upgrade	7,343.6	7,160.01	7,123.29	7,086.57	28,713.47	199.4	28,912.86
Additional DSRs	2,787.31	2,717.63	2,703.69	2,689.76	10,898.39	10,127.53	21,025.93
Total without Additional DSRs	90,915.86	88,642.97	88,188.39	87,733.81	355,482.55	148,485.96	503,968.51
Total with Additional DSRs	93,703.18	91,360.6	90,892.08	90,423.57	366,380.95	158,613.49	524,994.44

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Appendix C: Timeline of Internal Work Activities



- Plan B can be invoked anytime by the TG Negotiations team.
- The implementation of these work activities is expected to delay the TG project by up to 18 months.
- For the controls scopes of work, more time will be required to complete internal work activities if this work is assigned to the competitive source contract.