

CAPITAL BUDGET – NUCLEAR

1.0 PURPOSE

The purpose of this evidence is to present an overview description of the nuclear capital project budget for the historical year, bridge year, and test period. In addition, a discussion of period-over-period variations is provided for the years 2005 through 2009.

2.0 OVERVIEW OF PROJECT MANAGEMENT PROCESSES

A project, whether OM&A or capital, is defined as a temporary, unique endeavour undertaken outside the routine base activities of the normal work program. The final decision on whether work will be classified as a project will be made based on the complexity and materiality of the work, with consideration of the following characteristics:

- Incremental cost, over and above base OM&A (Ex. F2-T2-S1) is greater than \$200k per generating unit.
- Execution duration is limited, with defined start and finish dates.
- Work is clearly incremental to regular ongoing work, non-repetitive in nature, recurring at an interval of greater than once every six years.
- Sponsorship and management accountabilities can be clearly defined.

OPG nuclear projects are developed to meet regulatory commitments (e.g., from the Canadian Nuclear Safety Commission), decrease future base or outage OM&A expenditures, increase system or unit reliability, or increase the output of the station. OPG Nuclear manages all projects, both capital and OM&A, by way of a project portfolio management procedure. This procedure ensures effective coordination and value assessment of all nuclear projects by developing a nuclear project portfolio. Among other things, the nuclear project portfolio facilitates comparative value assessments for project prioritization, and also forms the basis for project budgeting during the business planning process.

The nuclear project portfolio is approved via the OPG business planning process with the OPG Board of Directors approving the OM&A and Capital projects portfolio budget which is then administered via the portfolio management process described below. As part of the

2008 business planning process, the OPG Board of Directors approved \$290M (\$172 M capital and \$118M OM&A) as the appropriate and required level of ongoing project expenditure to maintain the generating assets and associated infrastructure. This funding level was developed in consideration of: historical investment patterns; project execution capabilities; potential beneficial impact of the improved project portfolio management processes; project expenditures in the approved 2007 business plan versus project requirements identified during the 2008 business planning process; and high level comparative data from other nuclear utilities. In addition to this ongoing project portfolio, there are expenditures associated with the P2/P3 Isolation Project and Pickering B Refurbishment Project (see Section 3.0). Total nuclear project costs are presented in Chart 1.

Chart 1: Total Nuclear Project Costs – Project OM&A and Capital

	\$ Million	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Plan
1	Total Project Capital	138.9	151.1	186.5	172.0	172.0
2	Total Project OM&A	155.9	140.4	102.1	118.0	118.0
3	Total Portfolio Costs	294.8	291.5	288.6	290.0	290.0
4	P2/P3 Isolation Project	0.0	2.7	18.8	43.6	24.0
	PB Refurbishment	0.0	0.0	0.0	0.0	153.9
5	Total Project Costs	294.8	294.2	307.4	333.6	467.9

At any point in time, the nuclear project portfolio potentially includes projects at all stages of the project life cycle, from newly identified opportunities to fully released projects in execution or close-out phases. The five phases of project life cycle and associated “release” funding normally associated with each phase are indicated here, and discussed below:

- Project identification (using base OM&A, leading to a request for conceptual funding)
- Project initiation (using conceptual funding, leading to a developmental release)
- Project definition (using developmental release, leading to a full or partial release)
- Project execution (leading to a full release if currently partial. Superseding release to be processed if required due to scope change or cost increase)

- Project close-out and post-implementation review

Project progression between phases is governed by a management process, which ensures that a periodic, systematic review is conducted and that approvals are obtained before proceeding with further investment. The recently-formed Asset Investment Screening Committee, discussed below, plays a key role in challenging value at these decision points.

2.1 Project Identification

The purpose of the project identification phase is to identify and assess opportunities for project work.

Potential projects are generally identified by Station Engineering through system health reviews, analysis of component failures, and the life cycle plans prepared for major systems. In addition, projects with an anticipated benefit for multiple sites are identified and sponsored by the support divisions. The life cycle management program is further discussed in Ex. E2-T1-S1.

When an issue or opportunity is identified a "Part A screening form" is completed by the responsible engineer or technical contact in order to characterize the issue and rank the potential impact using standardized prioritization criteria based on probability of occurrence, potential consequences of the issue and the urgency of implementation. If a system modification is required, an engineering change request is also prepared to initiate the engineering change control process. Projects that require engineering change control compliance receive an additional level of scrutiny to ensure that system modifications are consistent with the station design basis, adhere to all codes and standards, and do not compromise the safety of employees or the public.

A project charter, defining the issue or opportunity and the roles of different OPG departments is also prepared by the project sponsor at this stage.

During the project identification phase, project funding is preliminarily classified as either OM&A or capital based on the nature of the work. The rules for classification of a project as OM&A or capital are the same for all expenditures as described in Ex. A2-T2-S1. All contemplated project expenditures for existing assets are considered OM&A unless they qualify for capitalization as per corporate policy as outlined therein. Expenditure classification decisions are made independent of the impact to either the OM&A or the capital budgets, and all decisions are verified by the Finance organization.

The Part A screening form and the project charter are presented to the appropriate station Project Approval Committee. The Project Approval Committee consists of key management and supervisory staff within Station Engineering, Maintenance, Operations, and Support Services organizations. The members of Project Approval Committee challenge the justification for a project, perform a preliminary screening and make a decision on whether to proceed further with project definition or to cease further activity on the project. Projects approved by each Project Approval Committee will normally receive limited project OM&A funding ("conceptual funding", typically in the order of \$50k to \$100k) in order to proceed to the project initiation phase.

2.2 Project Initiation

Using the conceptual funding discussed above, the first step in the project initiation phase is a review of the alternatives to solve the identified problem or to pursue the identified opportunity. If this review concludes that a project is in fact not required (e.g., improved maintenance procedures will address the problem), then project analysis terminates at this point.

If the review concludes that undertaking a project is the recommended solution, the next step for most projects is completion of a developmental business case summary ("BCS"). The developmental BCS provides cost estimates for each of the viable project alternatives, recommends a preferred alternative, outlines project-specific funding required to progress the project to the next decision phase, and provides a cost estimate for the entire project with an accuracy of + 60 percent/ - 25 percent (consistent with industry standards).

1
2 In addition to the developmental BCS, the following documents are also produced during the
3 project initiation phase:

- 4 • A "Part B screening form", outlining the alternatives considered and the costs for each
5 alternative.
- 6 • A level 1 schedule, which is created to define completion dates for specific project
7 milestones and deliverables, to the degree that they are understood in the developmental
8 BCS.

9
10 The developmental BCS and the Part A and Part B screening forms are submitted to the
11 Asset Investment Screening Committee.

12
13 The Asset Investment Screening Committee was created in late 2006. The Asset Investment
14 Screening Committee consists of members from all Nuclear sites and Nuclear Finance. This
15 Committee has the mandate to review project recommendations and evaluate acceptance of
16 new projects to be added into the Nuclear project portfolio from an OPG nuclear fleet
17 perspective. The Committee evaluates the project value, relative priorities, schedules, and
18 cost estimates of the submitted projects and the do-ability constraints on the organization as
19 a whole. If the Asset Investment Screening Committee supports the proposal, the
20 developmental BCS will be routed as per the organizational authority register, see Ex. A2-T2-
21 S1 Section 5.0 for approval of the associated funding. This approval, and all subsequent
22 references to organizational authority register approval, requires both line management and
23 Finance signoff, with the project cost determining the organizational approval level required.
24 Upon approval of the developmental BCS and of the associated release of funds, the project
25 moves to the project definition phase, and the project-specific funding is released. The
26 project (with identification of sponsoring division) is then considered added to the portfolio.

27 28 **2.3 Project Definition**

29 The purpose of the project definition phase is to fully define the scope of the project,
30 complete approximately 40 percent of the expected engineering work and, from that, to
31 develop a preliminary project execution plan and a full release BCS to seek approval for

project execution. In some cases, in lieu of a full release BCS, a partial release BCS will be prepared as discussed below.

A project team of OPG regular staff (supplemented by external resources as required) is assembled during this phase. Work completed during this phase includes the following:

- A review of the documentation associated with the plant systems to be modified.
- A “walk-down” of the plant systems to identify potential issues with respect to construction, operation, maintenance, and safety of the associated systems.
- A review of the major material needs of the project, with consideration for long lead items requiring extended delivery schedules from suppliers.
- Completion of a more detailed work activity schedule (level 2), identifying significant milestones, engineering, and execution work and resources required to support the project.
- Completion of up to 40 percent of the design engineering work.
- Development of a cost estimate for the entire project with an accuracy in the range of + 30 percent/ - 15 percent.
- Drafting of a partial or full release BCS.

Approval of Project Releases

For a developmental release, project approval is based on the dollar value of the developmental release work as a stand-alone project. If an investment of > 10 percent of total project estimate had been required at this stage, or project staff recommend conducting some execution activities in advance of a full release, a partial release BCS will be prepared and approved as per the organizational authority register on the basis of total project estimate. This approach ensures effective management involvement and oversight in these instances to minimize financial commitment while providing management with adequate additional information to decide on proceeding with execution.

With reference to a partial BCS, this approach may be used to allow execution of the first unit of a multi-unit project or the first stage of a large (multi-stage) project. A phased approach is

1 used to allow confirmation of costs and benefits from the first unit installation, prior to
2 committing to undertake work for the balance of units with a full release BCS.

3
4 The appropriate BCS is routed for funding approval as per OPG's organizational authority
5 register. Upon approval of the funding associated with the BCS and associated project
6 change request authorization form, the project moves forward to the project execution phase.

8 **2.4 Project Execution**

9 During the project execution phase, design engineering is completed, a detailed project
10 execution plan is prepared, and requests for proposal of bids from prospective contractors
11 are reviewed for contract award (as applicable). A level 3 schedule (task level detail) and an
12 updated cost estimate for the entire project with an accuracy of + 15 percent/ - 10 percent
13 are also prepared, and detailed installation instructions are issued for implementation in the
14 field.

15
16 For multiple unit projects, installation then proceeds on the first unit. Identified tasks are
17 incorporated into station work schedules and resources are assigned to execute identified
18 tasks in the field. Installation activities are followed by commissioning activities
19 (measurements, checks, and tests) and, upon completion, the system is declared in-service.
20 If work on the first unit (or first stage) has been funded via a partial release, a full release
21 BCS is prepared for release of the balance of funding for the remaining units, and approval of
22 funds is requested as per the organizational authority register.

23
24 Projects are continuously scrutinized during the execution phase. In addition to operational
25 reviews within Project and Modifications Department of Engineering and Modifications
26 Division, monthly station Project Approval Committee meetings and Asset Investment
27 Screening Committee reviews, the major project status review meeting provides a forum for
28 key finance, project management, engineering staff, and senior management to review and
29 challenge all Nuclear projects with a total project estimate $\geq$ \$5M. Project status, issues, and
30 proposed corrective actions are then formally reported to senior management.

1 If, during the execution of a project, the cost projection at completion is forecast to exceed
2 approved funding, a superseding BCS is prepared to document the status of the project, the
3 causes for forecast over-expenditure, the management actions taken to-date to control costs,
4 and all viable options for cost control or scope adjustment for management consideration.
5 The funding request as identified in the superseding BCS is routed for approval as per the
6 organizational authority register; approval is required before exceeding the previously
7 approved full release amount.

8 9 **2.5 Project Close-Out and Post-Implementation Review**

10 Upon completion of all execution and commissioning activities, project close-out is
11 performed. This phase involves:

- 12 • Closure of engineering activities, including drawing updates.
- 13 • Procedure update, as required.
- 14 • Financial activities, such as cost account closure and in-service declaration for capital
15 projects.
- 16 • Contract closeout activities.

17
18 These process steps ensure proper completion of all project, engineering and financial
19 activities, and sharing of project experience for future benefit. At this point, regular
20 employees are assigned to other projects within the Nuclear project portfolio, and contractors
21 are released.

22
23 As outlined in Ex. A2-T2-S1, following project completion, a post-implementation review
24 should be completed, to review the success of the project in achieving the objectives defined
25 in the BCS and to promote continuous improvement and maximum future economic benefit
26 to OPG through dissemination of "lessons learned".

27
28 Final post-implementation review reports are approved by the project sponsor, and Nuclear
29 Finance. To date, OPG Nuclear has not reached full compliance in this area, in that there is a
30 backlog of post-implementation reviews to be completed that is being addressed
31 aggressively.

3.0 OVERVIEW OF CAPITAL EXPENDITURES

Exhibit D2-T1-S1 Table 1 presents Nuclear capital project expenditures by sponsoring division and category for the period 2005 - 2009.

Exhibit D2-T1-S1 Table 1 presents the following information for facility projects:

- "Released Facility Projects" includes the value of completed work (2005 - 2007) and the planned expenditures for released projects (2008 - 2009) for each facility. The values include the approved release amounts for all projects with a developmental, partial or full release. These projects have been added to the Nuclear project portfolio, as described in section 2.2.
- "Facility Projects to be Released" includes the balance of the total project estimate for projects with a developmental or partial release. At the completion of the developmental or partial release phase, a BCS will be produced for funding approval, at which time management will assess the value of continuing with the proposed balance of the work scope ("balance to be released").
- "Listed Work to be Released" reflects funding available to undertake project work that is currently in the project identification or project initiation phases (D2-T1-S2 Table 4a/4b for capital projects, and F2-T3-S3 Table 4a/4b for OM&A projects). This reflects the difference between the project portfolio envelope approved by the OPG Board of Directors during business planning, and the cost of identified facility projects that are either 'Released' or 'To Be Released' at the time of filing. Where Listed Work to be Released is a negative amount, it indicates that planned work exceeds approved funding, and will be addressed through the portfolio management process.
- "P2/P3 Isolation Project" reflects work to achieve operational isolation of Pickering A Units 2 and 3 (i.e., those units in the safe storage state), as well as modifications to common system controls which are currently located on Unit 2. This project enables continued operation of remaining Pickering A Units 1 and 4, and Pickering B, upon completion of the safe storage project as discussed at Ex. A1-T4-S3. This work is listed separately from ongoing Nuclear portfolio work due to its extraordinary nature. In addition to amounts in Ex. D2-T1-S1 Table 1, there is an OM&A component discussed in Ex. F2-T3-S2.

1
2 • “Pickering B Refurbishment Project” reflects potential capital expenditures as described
3 in Ex. D2-T1-S3, should the OPG Board decide to proceed with life extension options as
4 outlined further in that exhibit.

5
6 In addition, capital project expenditures have been categorized in Ex. D2-T1-S1 Table 2 by
7 the categories of regulatory, sustaining or value enhancing/strategic as defined in Ex. A2-T2-
8 S1.

9
10 Exhibit D2-T1-S1 Table 1 presents the following trends in capital expenditures:

- 11 • “Released Facility Projects” work decreases in the test years (from \$186.5M in 2007 to
12 \$37.7M in 2009), reflecting completion of currently ongoing project work while some
13 2008/2009 work is yet to be released. As the data presented reflects 2008 business
14 planning information, this is consistent with industry experience, where up to two years of
15 released work is the norm.
- 16 • “Facility Projects To be Released” work increases in the test years (complementary to the
17 trend for “released” work above), reflecting expected further release of funds to complete
18 project work currently in the project definition phase, or undertaking any of the numerous
19 projects currently in the project identification or initiation phases.
- 20 • “Listed Work to be Released” increases in 2009, consistent with expectations that listed
21 projects will move from the project identification and initiation phases into project
22 development phase during 2008.
- 23 • “P2/P3 Isolation Project” work increases in 2007 and 2008 reflecting peak project
24 activity, then ramps down to completion in 2009.
- 25 • Pickering B Refurbishment Project reflects potential expenditures if the OPG Board
26 decides to proceed with one of the life extension options. See Ex. D2-T1-S3.

27
28 Exhibit D2-T1-S2 presents further details of capital projects included in these expenditures.

29
30 **3.1 Capital Project Drivers**

1 Regulatory projects have been a major factor in capital project expenditures over the 2005 -
2 2009 period, with fire protection, security and auxiliary power system issues (in response to
3 the loss of the bulk electric system on August 14, 2003) predominating. Due to its sensitive
4 nature, limited information is available for security projects.

5
6 For projects with cash flows in the test period, additional project information can be found in
7 Ex. D2-T1-S2.

8
9 In 2005, the security optimization projects (\$47.2M), Darlington fire protection phase 3
10 (\$16.8M) and Pickering B auxiliary power system installation (\$10.2M) required the most
11 significant effort.

12
13 In 2006, the major capital initiatives were again regulatory in nature, with the Pickering B
14 auxiliary power system installation (\$57.9M) and the security optimization project (\$22.8M).

15
16 In 2007, there are again major regulatory capital expenditures associated with the Pickering
17 B auxiliary power system installation (\$36.3M) and security fence project (\$18.5M). Major
18 sustaining initiatives included the Darlington used fuel dry storage in-station modifications
19 (\$15.0M). In addition, there is significant effort on the P2/P3 Isolation Project (\$9.3M), as
20 noted above.

21
22 In 2008, major capital items include regulatory-driven security projects at all stations (totalling
23 ~\$36M). There are significant expenditures associated with sustaining projects such as the
24 Darlington used fuel dry storage in-station modifications (\$12.3M) and the Darlington second
25 full scope simulator installation (\$10.2M). In addition, there is continued effort on the P2/P3
26 Isolation Project (\$17.0M).

27
28 In 2009, major capital initiatives are influenced by security fence project, security hardening
29 project, controlled area improvements (security) and security doors (totalling \$22.4M),
30 continued effort on the Darlington D₂O storage facility improvements (\$7.2M), and ramp up of
31 Darlington maintenance facilities replacement (\$14.5M).

There are seven major sustaining capital projects planned to come fully into service during the test period (reference Ex. D2-T1-S2 Table 1), the largest of which is the Darlington used fuel dry storage in-station modifications project (\$43.9M). In addition, there are 11 major regulatory capital projects planned to come fully into service during the test period (Ex. D2-T1-S1 Table 1), including six security-related projects, the major auxiliary power system project for Pickering B and the Darlington fire protection upgrade phase 3 program.

4.0 PERIOD-OVER-PERIOD CHANGES – TEST PERIOD

Year-over-year variances are broken down by facility in Ex. D2-T1-S1 Table 3b and are explained below. Where projects have cash flows in the test period, more detailed project information is contained Ex. D2-T1-S2.

2009 Plan versus 2008 Plan

The increase in planned spending in 2009 compared with 2008 plan (Ex. D2-T1-S1 Table 3b, \$141.9M) reflects the planned purchase of long lead-time materials for the Pickering B refurbishment project (\$148.8M), partly offset by planned reductions in P2/P3 Isolation Project work as this projects moves to completion in 2009 (-\$6.9M).

2008 Plan versus 2007 Actual

The decrease in planned spending in 2008 compared with 2007 actual (Ex. D2-T1-S1 Table 3b, -\$6.8M) is a result of reducing project portfolio capital to the Board of Directors approved level of \$172M (-\$14.5M), partly offset by P2/P3 Isolation Project work deferred from 2007 (\$7.7M).

5.0 PERIOD-OVER-PERIOD CHANGES – BRIDGE YEAR

Year-over-year variances are presented by facility in Ex. D2-T1-S1 Table 3b and are explained below. Where projects have cash flows in the test period, and only for those projects, more detailed project information is contained Ex. D2-T1-S2.

2007 Actual versus 2007 Budget

Capital is under spent in 2007 (-\$54.7M), primarily due to deferral of potential 'Listed Work to be Released' (-\$22.6M), no requirement to draw on planned contingency (-\$5.0M), and the net impact of project-specific variances associated with the 118 capital projects that were managed in 2007 (-\$12.8M). The establishment of more achievable target capital expenditure levels in the test period (as outlined in Section 2.0 above) is expected to significantly reduce such variances in future. The balance of the under-expenditure results from delays in the P2/P3 Isolation Project (-\$14.3M), reflecting deferral of construction and maintenance ramp-up (to allow greater progress on engineering/assessing activities), and the new CNSC requirement for an environmental assessment (with conservative deferral of potentially-impacted activities).

2007 Actual versus 2006 Actual

The increase in spending in 2007 compared with 2006 actual (Ex. D2-T1-S1 Table 3a, \$43.5M) was due to increased work on the security fence project (\$16.9M), Darlington used fuel dry storage facility in-station modifications (\$9.1M), Pickering A switchyard relay building cable replacement (\$9.4M), Pickering A calandria vault inspection tooling development (\$7.2M) and the P2/P3 Isolation Project (\$8.2M). These increased efforts are partly offset by reductions in spending due to the Pickering B auxiliary power system installation (-\$21.6M) and the security optimization project (-\$15.5M).

6.0 PERIOD-OVER-PERIOD CHANGES – HISTORICAL YEARS

Year-over-year variances are broken down by facility in Ex. D2-T1-S1 Table 3a, and explained here. Where projects have cash flows in the test period, and only for those projects, more detailed project information is contained Ex. D2-T1-S2.

2006 Actual versus 2006 Budget

The variance to budget in 2006 (Ex. D2-T1-S1 Table 3a, -\$117.3M) reflects primarily delays in various security projects (-\$27.8M), Darlington used fuel dry storage in-station modifications (-\$13.2M), Pickering B auxiliary power system installation, 49104 (-\$11.8M), Pickering A calandria vault inspection tooling development, 46537 (-\$6.3M), cancellation of

the Pickering B lunch/shower/change room facility (-\$5M), unspent contingency (-\$5M) and minor delays in a large number of other projects (- \$1M to - \$4M each).

2006 Actual versus 2005 Actual

The change in spending 2005 - 2006 (Ex. D2-T1-S1 Table 3a, \$13.3M) reflects primarily a major ramp-up in work on the Pickering B auxiliary power system installation, 49104 (\$47.7M increase over 2005), partly offset by winding down of the security optimization project (-\$24.4M) and Darlington fire protection phase 3 project (-\$14.1M).

2005 Actual versus 2005 Budget

The variance to budget in 2005 (Ex. D2-T1-S1 Table 3a, -\$92.1M) reflects primarily material delays for the Pickering B auxiliary power system installation (-\$34.7M), unutilized contingency and balancing adjustment (-\$25.4M), delays in the security optimization project and security fence project (-\$19M) and delays in the Pickering B lunch/shower/change room facility (-\$4.9M).

It should be noted that significant improvements have been made to the project management process to reduce the variances due to project delays noted during the historic period.