BUSINESS PLANNING AND BENCHMARKING – NUCLEAR

1.0 PURPOSE

This evidence presents the nuclear business plan and benchmarking and provides a summary of nuclear operating costs.

2.0 OVERVIEW

A summary of the operating costs in the nuclear revenue requirement is presented in Ex. F2-T1-S1 Table 1. The nuclear Base OM&A, Outage OM&A and Project OM&A forecasts for the test period cover the operating costs for OPG Nuclear (i.e., Pickering A, Pickering B, Darlington and the related nuclear support divisions). OPG Nuclear's 2010 - 2014 Business Plan is provided in Attachment 1. The business plan for Darlington Refurbishment can be found at Ex. D2-T2-S1 Attachment 1.

In 2009, OPG Nuclear's business planning process was augmented with the introduction of a gap-based approach to business planning that included the use of performance targeting and benchmarking results as discussed below. With the successful implementation of gap-based business planning in 2009, OPG Nuclear will continue with this approach in the future. This change in business planning results from a major benchmarking initiative undertaken by OPG Nuclear, with the assistance of ScottMadden Inc. ("ScottMadden"), a consulting firm specializing in the provision of benchmarking and business planning services to nuclear utilities. The benchmarking initiative is described in greater detail in section 3.0 below. Discussion of the specific initiatives contained in the 2010 - 2014 Business Plan and their impact on operational and financial performance can be found in evidence on Base OM&A (Ex. F2-T2-S1), Outage OM&A (Ex. F2-T4-S1) and the production forecast (Ex. E2-T1-S1).

The Executive Summary in the OPG Nuclear 2010 - 2014 Business Plan (slide 2 of Attachment 1) shows the aggressive yet balanced targets that have been set under the gap-based business planning process:

- Targeting better than industry performance on safety.

- Targeting a significant improvement in reliability metrics (currently in the lowest quartile), while maintaining top quartile performance in other metrics.

- Incorporating plan over plan cost reductions of $293 million with the investment in the Pickering B Continued Operations initiative. Yearly cost savings (compared to the 2009 Nuclear Business Plan) over the planning horizon are as follows:

	2010	2011	2012	2013	Total
2010-2014 Business Plan with Continued Operations	84.0	43.0	68.0	98.0	**293.0**

- Targeting generation increases in 2010 to 2013 by 0.5 TWh (reduced by 2.6 TWh with Pickering B Continued Operations).

- Incorporating net reductions of 791 staff over the period from 2009 to 2014.

OPG's achievement in introducing a gap-based business planning process was also noted by ScottMadden in its Phase 2 transmittal letter (Ex. F5-T1-S2), as follows:

> It is our opinion that OPGN has undertaken the actions necessary to successfully pilot a gap-based business planning process as originally envisioned. These actions include: (a) fairly benchmarking the company's operational and financial performance to external peers, (b) using the benchmarking results to establish performance improvement targets that will achieve, or significantly drive the company closer to, top quartile industry performance, and (c) developing and implementing a gap-based business planning process that identified the improvement initiatives best able to close the identified performance gaps.
>
> Improvements in the OPGN planning process include the following: (a) establishment of top-down quantitative operational and financial targets for each year and each business unit, (b) identification of site, business unit, and functional improvement initiatives that are tied to specific operational and

financial targets, (c) designation of accountability points for the delivery of all improvement initiatives, (d) linkage of improvement initiatives to closure of documented performance gaps, and (e) incorporation of improvement initiatives into the site and support unit business plans and budgets."

3.0 NUCLEAR BUSINESS PLANNING AND BENCHMARKING

3.1 Nuclear Business Planning

OPG Nuclear's business planning for OPG's nuclear operations group is undertaken annually as part of and consistent with the OPG corporate business planning process (Ex. A2-T2-S1). The business planning process is focused on establishing strategic and performance objectives for nuclear in alignment with OPG's corporate objectives and identifying the initiatives and resources required to achieve these objectives.

The nuclear business planning process starts in the spring of each year with internal reviews of the current planning framework, the confirmation and updating of business objectives and priorities, a review of business planning instructions from Corporate Finance, a review of the status of operational and performance plans and related capital and OM&A expenditures, and the identification of emerging issues. Out of this process, strategic and performance objectives for OPG Nuclear are determined and prioritized. A consolidated preliminary business plan is developed for review and approval by the Chief Nuclear Officer ("CNO") in late August/early September. Thereafter the nuclear business plan is submitted for review by the President and Chief Executive Officer ("CEO") for final submission to the OPG Board of Directors, as discussed at Ex A2-T2-S1.

3.2 Benchmarking Initiative Overview

Consistent with the 2005 Memorandum of Agreement between OPG and its shareholder (provided at Ex. A1-T4-S1 Attachment 2), OPG Nuclear has benchmarked its performance against CANDU ("Canadian Deuterium Uranium") nuclear plants as well as against U.S. nuclear generators to identify opportunities for improvement. In 2009, OPG undertook a major new nuclear benchmarking initiative in conjunction with the development of its 2010 - 2014 Business Plan. This initiative was in response to the OEB directive in EB-2007-0905 Decision with Reasons (page 37) that OPG should target cost and operational performance

improvement as well as develop specific initiatives and actions to meet those performance targets.

The 2009 benchmarking initiative began in March 2009 following the retention of ScottMadden. OPG solicited benchmarking consulting services through a request for proposals and selected ScottMadden from among five respondents**.**

ScottMadden introduced a gap-based business planning process, as shown in Attachment 2, consisting of the following four steps:

- **Benchmarking:** Using selected industry performance metrics, establishing the current status of OPG relative to its peers.
- **Target Setting:** Implementing a "top-down" approach to set operational/financial performance targets and generation targets that will drive OPG closer to top quartile industry performance over the five year business plan.
- **Closing the Gap:** By reference to Nuclear's four cornerstone values of Safety, Reliability, Human Performance and Value for Money, developing various initiatives to close the performance gaps between OPG and its industry peers over the five-year business plan.
- **Resource Planning:** Preparing a OPG Nuclear business plan (i.e., the development of cost, staff and investment plans for each site and support group) that is based on the "top-down" targets and incorporates initiatives necessary to achieve targeted results.

The project was undertaken in two phases:

- **Phase 1: Benchmark Performance** – The goal of this phase was to benchmark OPG Nuclear's operational and financial performance to external peers to determine its relative standing on key operational and financial performance indicators.
- **Phase 2: Set Strategic Direction –** The goal of this phase was two-fold. First, use the benchmarking results to establish performance improvement targets that will achieve, or significantly drive OPG Nuclear closer to, top quartile industry performance. Second, identify the improvement initiatives best able to close the identified performance gaps to ensure that the desired performance targets are achieved. The Phase 1 and Phase 2

reports prepared by ScottMadden are provided at Ex. F5-T1-S1 and Ex. F5-T1-S2, respectively.

3.2 Benchmarking Initiative - Phase 1

During Phase 1, ScottMadden, assisted by OPG Nuclear, (a) identified the key performance metrics that would be benchmarked, (b) identified the most appropriate peer groups for comparison, and (c) prepared supporting analyses and charts.

Effective comparison of performance requires both the selection of appropriate performance indicators, and appropriate peer groups.

Appropriate benchmarking performance indicators are metrics with standard definitions, reliable data sources, and utilization across a good portion of the industry. With these criteria, the Phase 1 process established 19 benchmarking performance indicators divided into three categories which align with OPG Nuclear's cornerstone values of safety, reliability, and value for money, as set out in Chart 1 below. While ScottMadden was unable to recommend specific performance metric for the cornerstone value of human performance, it advised that good or poor human performance is manifest within many of the safety and reliability indicators selected.

OPG Nuclear has traditionally relied upon four primary performance indicators (Production Unit Energy Cost ("PUEC"), Elective Maintenance Backlogs, Unit Capability Factor and Forced Loss Rate) for external benchmarking. In its Phase 1 Report, ScottMadden recommended that OPG use a new metric, Total Generating Cost ($/MWh), as its primary financial benchmark performance indicator in place of PUEC. Total Generating Cost is calculated inclusive of Non-Fuel Operating Cost, Fuel Cost, and Capital Cost.

ScottMadden's rationale for selecting Total Generating Cost is twofold. First, PUEC is not a standard industry benchmark. Second, PUEC excludes consideration of capitalized costs. ScottMadden's Phase 1 report recommends that when benchmarking between OPG's CANDU units and its North American peers, capitalized costs should be included.

Five different peer groups were selected for benchmarking. Data provided by the World Association of Nuclear Operators ("WANO") was the primary source of benchmarking data for operational performance. Three peer groups were established using WANO data: (a) CANDU Owners Group ("COG") CANDUs (b) All North American Pressurized Water Reactors ("PWRs") and Pressurized Heavy Water Reactors ("PHWRs") which includes CANDU plants, and (c) all North American plants which includes all those in (b) plus Boiling Water Reactors ("BWRs"). Non-WANO data (i.e., Canadian Electrical Association and Institute of Nuclear Power Operations ("INPO") AP928) was used for injury rate comparison and maintenance backlogs since WANO's data is not available for these operating metrics. For financial performance comparisons, data compiled by the Electric Utility Cost Group ("EUCG") was used. The Phase 1 ScottMadden Report (Ex. F5-T1-S1) provides definitions of the benchmarking performance indicators.

Selecting all North American nuclear plants as peers, including those using PWR and BWR technology, expands the benchmarking peer group beyond that used in the benchmarking study that was filed in EB-2007-0905. OPG believes that there are a number of key drivers such as unit size (e.g., Pickering units at 500MW are among the smallest in North America), single unit versus multi unit stations, age of reactors and technology differences that assist in explaining relative performance. These key drivers are set out in Attachment 3 and discussed below in section 3.4. ScottMadden's transmittal letter, attached to the Phase 1 Benchmarking Report (Ex. F5-T1-S1) also noted the impact of factors influencing OPG's performance gap against best quartile, stating that

> In our opinion, the comparisons provided in this report present a fair and balanced view of OPG operating and financial performance compared to other operators in the nuclear generation industry. However, it would be inappropriate to generalize regarding OPG's absolute performance based solely upon comparisons to industry averages. Differences in design technology, the number of reactors on site, the geographic size of the site, reactor age, operational condition and other factors all influence OPG's operational and financial performance. Benchmark data can be useful for highlighting performance gaps relative to other nuclear generation operators but prescriptive conclusions regarding OPG's ability to narrow such performance gaps will require further analysis.

OPG accepted ScottMadden's recommendation to benchmark its CANDU units against a wide ranging, all inclusive peer group, and then to seek to understand and explain OPG Nuclear's performance gaps, in consideration of these key drivers.

Chart 1 below is from the OPG 2009 Benchmarking Report and provides a summary of OPG's plant-level performance as of 2008 compared to the benchmark for each of the 19 key performance metrics benchmarked during the Phase 1 study.

Chart 1

Summary Comparison of 2008 OPG Nuclear Performance to Industry Benchmarks

Metric	Best Quartile	Median	Pickering A	Pickering B	Darlington
Safety					
All Injury Rate			0.73	0.96	1.04
2-Year Industrial Safety Accident Rate	0.05	0.09	0.14	0.07	0.04
2-Year Collective Radiation Exposure (man-rem per unit)	62.15	81.84	44.2	95.81	72.83
Airborne Tritium (TBq) Emissions per Unit	48.0	101.0	101.0	50.7	40.0
Fuel Reliability (microcuries per gram)	0.000001	0.000165	0.00059	0.00159	0.00025
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.00	0.33	1.22	0.26	0.00
3-Year Auxiliary Feedwater System Unavailability	0.0014	0.0020	0.0119	0.0040	0.0017
3-Year Emergency AC Power Unavailability	0.0024	0.0076	0.0081	0.0091	0.0020
3-Year High Pressure Safety Injection Unavailability	0.0001	0.0037	0.0012	0.0001	0.0001
Reliability					
WANO NPI (Index)	96.19	62.46	60.84	60.93	95.67
2-Year Forced Loss Rate (%)	0.68	3.79	37.90	18.19	0.93
2-Year Unit Capability Factor (%)	90.97	84.31	56.6	73.17	91.99
2-Year Chemistry Performance Indicator (Index)	1.00	1.01	1.13	1.25	1.00
1-Year Online Elective Maintenance (work orders/unit)	218	278	425	695	311
1-Year Online Corrective Maintenance (work orders/unit)	4	7	14	28	11
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)	28.66	32.31	92.27	58.68	30.08
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	18.06	21.28	82.62	50.95	25.10
3-Year Fuel Costs per MWh ($/Net MWh)	5.02	5.37	2.64	2.68	2.62
3-Year Capital Costs per MW DER	32.79	46.22	32.07	32.44	18.79

KEY: Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

Some of the key findings from the ScottMadden Phase 1 report are provided below:

- **Unit Capability Factor ("UCF")** (Ex. F5-T1-S1 page 87)**:** UCF is a measure of reliability, a key factor to both operating and financial performance. Darlington has continued to perform as one of the better CANDU plants against the CANDU worldwide panel over the review period 2005 – 2008. Darlington performed better than median as a station, and is within close proximity of best quartile relative to the North American PWR and PHWR panel. Pickering A and Pickering B performance is below median compared to CANDU and its North American peers due to major fuel channel outages and unplanned production losses during the review period.

- **Nuclear Performance Index ("NPI**") (Ex. F5-T1-S1 page 68): NPI is a weighted average of several WANO indicators and is viewed within the nuclear industry as a primary operational performance indicator. It provides an overall measure of plant safety and reliability performance (70/30, safety/reliability split) based on a number of reliability and safety measures. Darlington performed well against both the CANDU worldwide and North American panels achieving best quartiles for part of the review period and falling just out of best quartile in 2008. Both Pickering A and Pickering B have performed below median compared to both the CANDU worldwide and North American panels.

  The low NPI scores at Pickering A and Pickering B in 2008 are driven by generation performance results. The stations are recovering from lengthy planned outages to address major life cycle and backlog issues. The results also reflect the high forced loss rates due to the poor material condition of the plants. It is important to underline that OPG Nuclear's NPI safety-related indicators average considerably better than the generation areas. Thus it is largely the generation scores that are lowering total NPI score.

- **Total Generating Costs** (Ex. F5-T1-S1 page 115**):** Darlington's performance on this indicator is in the 2nd quartile. Darlington's costs trended upward somewhat over the review period. In 2005, it was at best quartile level but by 2008 it was between best quartile and median levels. Both Pickering A and Pickering B are consistently performing well below median in the 4th quartile. Specific drivers of performance vary from station to

station but overall the biggest drivers are capability factor, station size, CANDU technology, corporate cost allocation and potential controllable costs. These drivers of performance are further discussed below in section 3.4.1.

Overall, the results from Phase 1 suggest that the U.S. industry (pressurized water reactors/boiling water reactors) has achieved a stable "high level" of generation performance and cost. The U.S. nuclear industry began improvement programs earlier than OPG and has achieved a steady state of top level performance in cost and output. OPG is moving in the same direction, and in some cases OPG is equal to or better than its peers. As ScottMadden noted in its 2009 Benchmarking Report, the benchmarking results established in Phase 1 present a fair and balanced view of OPG's operating and financial performance compared to other operators in the nuclear generation industry and that "the results indicate that OPGN performs well across a broad range of industry operational measures, that the Darlington station is within first or second quartile on a majority of measures, but OPG is clearly challenged with respect to reliability and cost at the two Pickering stations." (Ex. F5-T1-S2, page 8).

Discussion of each of the performance indicators, trends and relative drivers can be found in the Phase 1 report (Ex. F5-T1-S1).

3.3 Benchmarking – Phase 2 Overview

Phase 2 of the 2009 benchmarking initiative was primarily a re-engineering of nuclear business planning into a gap-based planning process by:

- **Target Setting**: The CNO, on the recommendation of the OPG Nuclear Executive Committee ("NEC"), set "top-down" operational and financial performance targets for nuclear. The top-down targets were set by reference to the Phase 1 benchmarking results and are intended to establish performance improvement targets that will achieve or significantly drive OPG nuclear closer to top quartile industry performance over the five year business plan. A copy of the communication from the CNO with the top-down targets is provided in Attachment 4.

- **Identify Site and Support Unit/ Functional Area Improvement Strategies:** Sixteen functional/ peer teams within OPG Nuclear identified a broad range of fleet-wide improvement initiatives that would contribute to achieving the operational and financial targets. In addition, the sites and support units were called upon to identify improvement initiatives within their unit that would assist in achieving the targets.

  The Phase 2 ScottMadden Report includes the staffing and organization structure analyses prepared by ScottMadden to assist in the gap-based planning process. This analysis involved assembling staffing comparisons between OPG Nuclear and industry peers in North America. This information was provided to the sites and functional teams to highlight staffing gaps and to encourage investigation of best practices during the development improvement initiatives that would result in reduced staffing levels. ScottMadden also prepared an organization structure analysis that reviewed the efficiency and effectiveness of the nuclear organization structure.

- **Development of 2010 - 2014 Business Plan:** ScottMadden worked with OPG Nuclear in the preparation of the site and support unit business plans that were ultimately incorporated into the Nuclear 2010 - 2014 Business Plan. ScottMadden helped ensure that the targets and the benefits (less costs) of the improvement initiatives were adequately accounted for and documented in the business plans. ScottMadden also provided OPG with advice on best practices (tracking and accountability) for implementing the improvement initiatives.

Detailed discussion of the Phase 2 activities, along with ScottMadden's observations and recommendations can be found in the Final Report of the 2009 Benchmarking Initiative submitted by ScottMadden (Ex. F5-T1-S2).

The following is a summary of ScottMadden's key Phase 2 recommendations and OPG's response:

- **Benchmarking:** ScottMadden recommended that OPG Nuclear prepare a Nuclear Benchmarking Report in 2010 using the process and procedures developed by the joint

ScottMadden/OPG team in Phase 1. OPG Nuclear accepts this recommendation and will annually update its external benchmarking using the performance metrics and peer groups identified by ScottMadden.

- **Target Setting:** ScottMadden recommended that OPG Nuclear engage in a top down target setting process similar to that undertaken in 2009 when it revisits its operational and financial performance targets as part of business planning. OPG Nuclear accepts this recommendation and is committed to using top down target setting in future business plans.

- **Fleet-wide Improvement Initiatives.** ScottMadden encouraged OPG Nuclear to refine and improve on the peer team initiatives and to make improvements to peer teams to improve their ability to identify and drive changes. ScottMadden also recommended re-examination of the current peer team's structure and governance. OPG Nuclear accepts this recommendation and has identified improvement in peer team effectiveness as a focus for 2010 and beyond.

- **Site and Support Unit Business Plans:** ScottMadden recommended that OPG Nuclear adopt its gap-based business planning model. OPG Nuclear accepts this recommendation, and will implement a gap-based business planning process in its preparation for the 2011- 2015 Business Plan.

- **Plan Execution and Monitoring:** ScottMadden recommended that OPG Nuclear establish a dedicated organization structure to oversee and coordinate the high impact/high hurdle improvement initiatives identified during the planning process, such organization to be headed by its own senior executive. ScottMadden has also recommended the use of external third parties to assist OPG Nuclear in implementation. OPG Nuclear accepts this recommendation and has assembled a project management team to drive the implementation of a number of the key initiatives and to provide general oversight over all of the projects designed to deliver significant improvements in all cornerstone areas. After review of internal resource capabilities, the project management

team decided to procure external resources to assist in this work. The project management team has been up and running since January 2010.

Another step undertaken was to build management accountability for the timely implementation of the improvement initiatives into Nuclear's 2010 scorecard, which is the basis for the annual incentive plan payout.

3.4 Discussion of Phase 2 Benchmarking Results

3.4.1 Target Setting

As described in ScottMadden's Phase 2 Final Report, the Nuclear Executive Committee ("NEC") held two target setting sessions in June 2009 focused on setting operational and financial performance targets.

Attachment 5 is from the ScottMadden Phase 2 report (page 15). It shows a hypothetical comparison of OPG performance to industry benchmarks in 2014 assuming OPG achievement of the 19 key benchmark performance indicators established during the target setting process. This comparison indicates the degree of improvement targeted by OPG over the five year business plan. As noted by ScottMadden in its Phase 2 report, the targets represent performance improvement that will achieve or significantly move OPG Nuclear towards top quartile industry performance based on current levels of industry performance.

The targeted performance improvement by 2014 with respect to Total Generating Cost for the Pickering stations is below median. This reflects the reality of OPG's initial starting point in terms of the material condition of these plants. Also, in OPG's view, there are various structural factors that influence costs and impact on OPG's ability to close the performance gap relative to top quartile cost performance (Attachment 3). These factors include nuclear generation complexity, safety and regulatory considerations, different generations of technology within the OPG Nuclear fleet, extensive training requirements in critical areas, demanding material standards, and a challenging work environment.

The Phase 1 Benchmarking Report (see Ex. F5-T1-S1, pages 115-132) also highlighted a critical subset of key drivers affecting OPG Nuclear's Total Generating Cost performance gap:

- CANDU technology, which may result in specific cost disadvantages related to the engineering, operating and maintenance costs as compared to Pressure Water Reactors/Boiling Water Reactors. Examples of this would include on-line fuel handling, heavy water management, and common station containment systems.

- Capability factor, which is the actual or forecast generation performance of a station, in relation to its overall potential. Unit Capability Factors at Pickering A and B are worse than median, which is a significant contributor to their Total Generating Cost/MWh performance gap.

- Corporate allocations and centrally held costs, which are considered in Ex. F3-T1-S1. As indicated in that exhibit, OPG is targeting improvements in the delivery of services by corporate support groups through a variety of means, including demand management, service optimization, improved technologies, and negotiated savings with third party vendors. OPG Nuclear is supporting these initiatives by working with the corporate support groups to optimize its demand for corporate services.

- Station size, which is the combined effect of the number of units at a given station, and size of the units. The ScottMadden Phase 1 report noted that "The 'station size' driver is the combined effect of number of units and size of units. The number of units and size of those units can have significant impacts on plant cost performance and review of the benchmarking data reveals a link between the two" (Ex. F5-T1-S1 Phase 1 Report page 117).

  ScottMadden identified that a multi-unit station may have some "economy of scale" advantages over single or two-unit plants (limited by OPG's non-standard fleet) while another factor affecting OPG Nuclear Total Generating Cost performance is the relative

unit size. Specifically, the cost and labour effort required to operate a four-unit station appears to be largely independent of the size of units in such a station (i.e., there are certain minimum functions required at a station regardless of the size of the units). Darlington has net capacity of 3,512 MW whereas Pickering B has a net capacity of 2,064 MW. As the reactors at both Pickering A and Pickering B are among the smallest in North America, ScottMadden was able to conclude that unit size is a significant contributor to the performance gap observed when benchmarking the Total Generating Cost metric.

- Potential controllable costs, these are the remaining costs that OPG Nuclear can directly impact in its Total Generating Cost measure.

3.4.2 Site and Support Unit/ Functional Area Improvement Initiatives

The operational and financial targets established during the target setting process were set by the CNO and then incorporated into the site and support group business planning. As part of that process, the site and support groups along with the 16 functional/peer teams were asked to develop improvement initiatives for the 2010 - 2014 Business Plan. The functional/peer teams were responsible for preparing templates that identified and documented various critical fleet-wide initiatives, whereas the site and support groups focused on site-specific initiatives. The functional/peer teams identified over 150 potential fleet-wide initiatives that were reviewed, revised, tested and prioritized by senior OPG Nuclear managers assisted by ScottMadden. Prioritization was based on the difficulty of the initiative relative to its contribution to achieving the targets. Ultimately 33 fleet-wide initiatives, as set out in Attachment 6, were included in the 2010 - 2014 Business Plan of which the following seven key initiatives were identified as the most likely to bring significant improvement to OPG Nuclear's operational and financial perfomance:

- Work Order Readiness
- Outage Improvement Strategy
- Standard Equipment Reliability
- Preventative Maintenance Program Improvement
- Engineering Value for Money Improvement

- Human Performance Improvement
- Days Based Maintenance

The development of the fleet-wide initiatives is described in further detail in the Phase 2 ScottMadden Report (Ex F5-T1-S2 pages 17-22). Further description of the seven key initiatives can be found at Attachment 7.

A preliminary assessment of combining the operations of Pickering A and B was also undertaken as a separate initiative by OPG, and some initial cost savings in Base OM&A were included in the 2010 - 2014 Business Plan, as further described at Ex F2-T2-S1 (page 19 of 34). Further action on this initiative has been delayed until after the completion of the 2010 Pickering Vacuum Building Outage.

The combination of the site and support unit initiatives, along with the fleet-wide initiatives, as revised and refined, ensured that the 2010 - 2014 Business Plan operational and financial targets established during the ScottMadden Phase 2 target setting were maintained and/or exceeded. The financial target reductions (compared to the 2009 Business Plan and inclusive of Pickering B Continued Operations) established during Phase 2 target setting totaled $165.1M. The financial target reductions that were ultimately built into the 2010 Business Plan totaled $293.0M (inclusive of Pickering B Continued Operations), with the net result that the business plan financial reductions were $128 million higher than the earlier financial targets.

Attachment 8 shows the final operational and financial targets for the 19 benchmark performance indicators by station for 2010, 2011 and 2012, as established during the 2010 - 2014 business planning process.

LIST OF ATTACHMENTS

Attachment 1:	2010 - 2014 Nuclear Business Plan
Attachment 2:	Gap-Based Business Planning
Attachment 3 :	Key Drivers of Total Generating Costs
Attachment 4:	CNO communication of June 30, 2009 Performance Targets for 2010-2014 Business Planning
Attachment 5:	Hypothetical 2014 Comparison of OPG Performance Indicators to Industry Benchmark
Attachment 6:	Fleet-Wide Initiatives
Attachment 7:	Top 7 Performance Improvement Fleet-Wide Initiatives
Attachment 8:	Final Station Performance Targets from 2010 – 2014 Business Plan

Note: Attachment 1 is marked “Confidential” because the original document contains confidential information. The redacted version provided as pre-filed evidence is not confidential.

ONTARIO POWER GENERATION

Nuclear Operations
2010-2014 Business Plan

OPG Board Of Directors
November 19, 2009

Accountability at OPG means we deliver committed actions that achieve the desired results.
Say it, Do it

Wayne Robbins
Chief Nuclear Officer

ONTARIO POWER GENERATION

Executive Summary

OPG Nuclear will continue to deliver on its mission of proudly generating clean, safe, low-cost electricity through dependable performance. This business plan outlines Nuclear's operational and financial performance targets for the next 5 years and the plan to meet this commitment.

With the use of external benchmarking, aggressive yet balanced targets have been set by the CNO under the 4 Cornerstones areas of Safety, Reliability, Human Performance and Value for Money:

- Nuclear will continue to target better than industry Safety performance.
- Reliability metrics currently in the lowest quartile will improve significantly, while maintaining top quartile performance in others.
- Plan over plan costs will be reduced by $423 million (or $293 million with investment in Pickering B Continued Operations).
- Generation will increase in 2010 to 2013 by .5 TWh (reduced by 2.6 TWh with Continued Operations).
- This plan incorporates net staff reductions of 791 from 2009 to 2014.

Using a fleet-wide peer team approach, Nuclear has developed an action plan to address the gaps between targets and current performance levels. 7 key initiatives have been identified that will drive significant performance improvement.

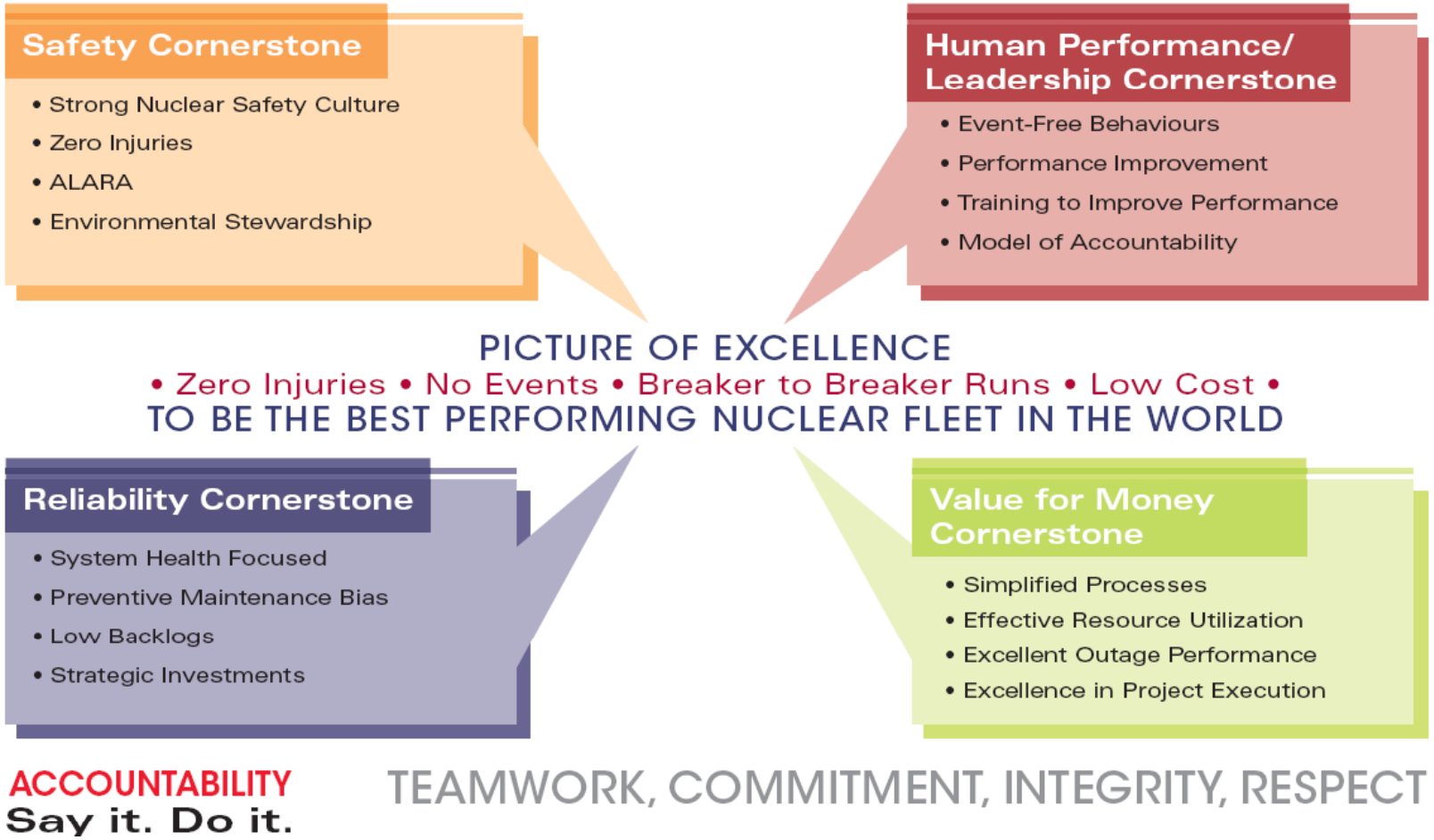
ONTARIO POWER GENERATION

Planning Assumptions

- Pickering B's investment in Continued Operations will extend the life of Units 5 and 6 to 2018 and Units 7 and 8 to 2020. Investment in Continued Operations is included in this business plan.
- Pickering A derate of 3% concludes in 2009 and the plant's end of life is consistent with Pickering B's end of life.
- Darlington begins refurbishment in October 2016.
- The 5 year generation plan does not assume demand will be effected by market conditions or future stakeholder decisions.
- Project portfolio investments align with end of life assumptions at all 3 sites.

ONTARIO POWER GENERATION

Nuclear Cornerstones for Excellence



ONTARIO POWER GENERATION

Gap Based Business Planning Methodology

Nuclear Cornerstones

Benchmarking

- ✓ **2008 Performance Benchmarks**

Target Setting

- ✓ **Strengths & Challenges**
- ✓ **Major Program Areas/ Objectives**
- ✓ **5 year Generation Targets**
- ✓ **2014 Performance Targets**

Closing the Gap

- ✓ **Reliability Targets and Initiatives**
- ✓ **Safety Targets and Initiatives**
- ✓ **Human Performance Targets and Initiatives**
- ✓ **Value for Money Targets and Initiatives**

Resource Planning

- ✓ **Cost Plan**
- ✓ **Staff Plan**
- ✓ **Investment Plan**
- ✓ **Risks to the Plan**

ONTARIO POWER GENERATION

2008 Performance Benchmarks

Metric	NPI Max	Best Quartile *	Median *	Pickering A	Pickering B	Darlington
Safety						
All Injury Rate		[redacted]	[redacted]	0.73	0.96	1.04
2-Year Industrial Safety Accident Rate	0.20	0.05	0.09	0.14	0.07	0.04
2-Year Collective Radiation Exposure (man-rem per unit)	80.00	62.15	81.84	44.2	95.81	72.83
Airborne Tritium (TBq) Emissions per Unit		48.0	101.0	101.0	50.7	40.0
Fuel Reliability (microcuries per gram)	0.000500	0.000001	0.000165	0.00059	0.00159	0.00025
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.50	0.00	0.33	1.22	0.26	0.00
3-Year Auxiliary Feedwater System Unavailability	0.0200	0.0014	0.0020	0.0119	0.0040	0.0017
3-Year Emergency AC Power Unavailability	0.0250	0.0024	0.0076	0.0081	0.0091	0.0020
3-Year High Pressure Safety Injection Unavailability	0.0200	0.0001	0.0037	0.0012	0.0001	0.0001
Reliability						
WANO NPI (Index)		96.19	62.46	60.84	60.93	95.67
2-Year Forced Loss Rate (%)	1.00	0.68	3.79	37.90	18.19	0.93
2-Year Unit Capability Factor (%)	92.00	90.97	84.31	56.6	73.17	91.99
2-Year Chemistry Performance Indicator (Index)	1.01	1.00	1.01	1.13	1.25	1.00
1-Year Online Elective Maintenance (work orders/unit)		218	278	425	695	313
1-Year Online Corrective Maintenance (work orders/unit)		4	7	14	28	8
Value for Money						
3-Year Total Generating Costs per MWh ($/Net MWh)		28.66	32.31	92.27	58.68	30.08
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)		18.06	21.28	82.62	50.95	25.10
3-Year Fuel Costs per MWh ($/Net MWh)		5.02	5.37	2.64	2.68	2.62
3-Year Capital Costs per MW DER**($/MW)		32.79	46.22	32.07	32.44	18.79

*Panel used for WANO quartile and median data was All COG CANDU
**DER - Design Electrical Rating

Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

Safety

- All 3 nuclear plants perform well against industry Safety metrics.
- Pickering A had 2 reactor trips in 2008 with no occurrences in 2009.
- Pickering B has seen improvement in both Collective Radiation Exposure and Fuel Reliability since 2008.

Reliability

- Reliability suffered in 2008 due to a high number of forced outages caused by equipment and human performance events at the Pickering stations.
- Darlington's reliability performance is excellent. Darlington has also made considerable strides towards reducing backlogs from 2004 to 2008.

Value for Money

- Fuel costs are at industry best quartile due to technology differences.
- Capital costs are difficult to compare due to OPG's higher capitalization threshold; Total Generation Costs is a better indicator of performance as it is independent of these differences.
- Non-Fuel Costs per MWh for the Pickering stations are a factor of lower generation and higher operating costs relative to industry benchmarks.

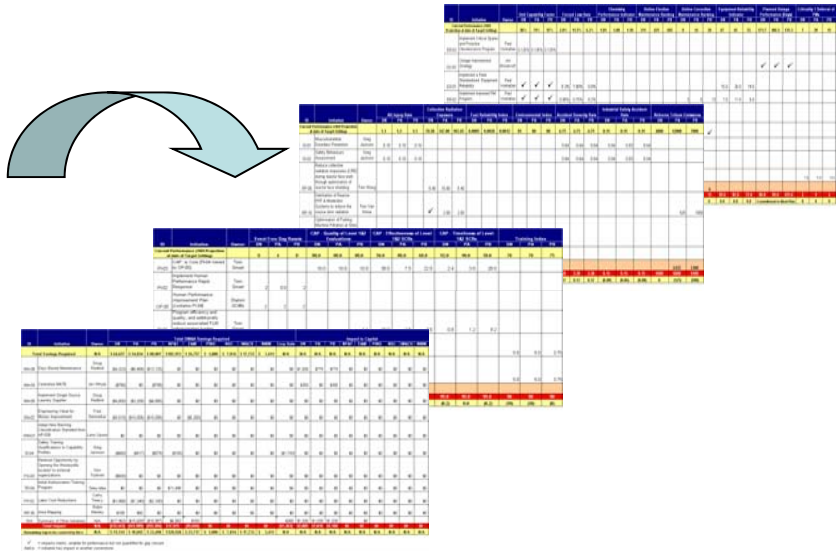
ONTARIO POWER GENERATION

2014 Target Setting and Closing the Gap

- Benchmarking data was used to set top down targets for the next 5 years.
- By considering OPG Nuclear's strengths and challenges as well as its major focus areas and objectives, a solid action plan was developed to address the gaps between current and targeted performance.
- Over a period of 8-10 weeks, fleet-wide peer teams developed initiatives that closed the gaps.
- Through prioritization and resource management, an initial list of 150 initiatives was narrowed to 33 (listed below by cornerstone). 7 of these initiatives (bolded below and detailed in the supporting materials section) are expected to bring stepped improvement to nuclear operations.
- Each initiative was quantified as to its impact on the gap between current and targeted performance.

Safety	Human Performance
1. IS-01 – Musculoskeletal Disorder Prevention 2. RP-26 – Area Mapping 3. EN-03 – Improve Fuel Reliability Index 4. RP-10 - Detritiation of Reactor PHT 5. IS-02 – Safety Behaviours Assessment 6. IS-03 – Review Incident Counting Practices 7. IS-04 – Constrain Training Qualifications 8. RP-05 – Optimize Reactor Face Shielding 9. RP-09 – Improve Fuel Machine Filtration	**1. OP-05 – Human Performance Improvement Program (contains OP-01)** 2. PI-01 – CAP Improvement Program 3. PI-02 – Implement Human Performance Rapid Response 4. PI-03 – CAP is Core 5. TR-02 – Computer Based Training Increase 6. TR-04 – Initial Authorization Training Program
Reliability	**Value for Money**
1. EN-01 – Work Order Readiness (contains MA-02 and TR-07) **2. OU-02 – Outage Improvement Strategy (contains OU-01, OU-02, OU-04, OU-05, OU-06, OU-07, TR-06)** **3. ER-01 – Standard Equipment Reliability Program** **4. ER-02 – Improve PM Program** 5. ER-03 – Critical Spares/Obsolescence 6. MA-01 – Improve FIN Effectiveness 7. OP-02 – Work Management Performance Improvement Plan 8. MA-07 – Leverage DN OEMB Process 9. WM-01 – Backlog Reclassification	**1. EN-02 – Engineering Value for Money** **2. MA-08 – Day Based Maintenance** 3. MS-02 – Inventory Management 4. MS-03 – Strategic Sourcing 5. MA-04 – Centralized Measurement and Test Equipment (give to facilities) 6. MA-06 – Maintenance "Helpers" 7. MA-09 – Single Source Laundry (Give to M&S) 8. FS-03 – Offer Fire Training (Revenue Opportunity) 9. FP-02 – Labour Cost Reduction

Bold initiatives are the identified high priority initiatives



ONTARIO POWER GENERATION

Major Objectives/Focus Areas

- Implement key fleet-wide and site specific initiatives to drive and sustain significant performance improvements:
  - Execute Continued Operations work at Pickering B to sustain base load generation until 2020 and during the refurbishment of Darlington.
  - Continue to improve plant reliability at Pickering A to achieve its potential.
  - Improve outage execution (readiness, scope, duration and costs) to make our plants more effective and efficient.
  - Improve inventory management and costs through better planning and getting work ready.
- Combine Pickering A and Pickering B into one station to leverage fleet advantages and capitalize on economies of scale.
- Execute Pickering Vacuum Building Outage successfully in terms of safety, scope, duration and costs.
- Implement accountability model across Nuclear through leadership courage, leadership presence and management effectiveness.

ONTARIO POWER GENERATION

Generation Plan

		2010	2011	2012	2013	2014	Delta
TWh	2010-2014 OPG Submission	46.2	48.9	50.0	48.1	49.3	
	Additional Site performance target	2	2	2	2	2	
	2010-2014 Nuclear Submission	48.1	50.9	52.0	50.1	51.3	
	2009-2013 Nuclear BP	48.6	52.1	52.8	50.2	0.0	
	Variance	***-0.5***	***-1.3***	***-0.7***	***-0.2***	***N/A***	***-2.6***
	Variance to 2009-14 Nuclear BP	***-0.2***	***0.1***	***-0.1***	***0.7***		***0.5***
	Variance - Continued Ops Impact	***-0.3***	***-1.3***	***-0.7***	***-0.9***		***-3.2***
Planned Outage	2010-2014 Nuclear Submission	554.8	372.3	312.5	400.2	364.8	
	2009-2013 Nuclear BP	513.8	267.3	249.5	373.2		
	Variance	***41.0***	***105.0***	***63.0***	***27.0***	***N/A***	***236.0***
	Variance to 2009-14 Nuclear BP	***13.0***	***-6.0***	***7.0***	***-44.0***		***-30.0***
	Variance - Continued Ops Impact	***28.0***	***111.0***	***56.0***	***71.0***		***266.0***
Forced Loss Rate	2010-2014 Nuclear Submission	3.5%	3.2%	2.8%	2.8%	2.5%	
	2009-2013 Nuclear BP	3.6%	3.2%	2.8%	2.8%		*(average)*
	Variance	***0.0%***	***0.0%***	***0.0%***	***0.0%***	***N/A***	***0.0%***
	Variance to 2009-14 Nuclear BP	***0.0%***	***0.0%***	***0.0%***	***0.0%***		***0.0%***
	Variance - Continued Ops Impact	***0.0%***	***0.0%***	***0.0%***	***0.0%***		***0.0%***

- Reduction of 30 planned outage days contributes to a plan-over-plan generation increase (excluding continued operations) of 0.5 TWh.
- Investment in Continued Operations requires an additional 266 planned outage days resulting in a 3.2 TWh loss, but translates into a long-term benefit to base load generation for Ontario in the next decade.
- 2010 - additional planned outage days are required for replacing vacuum building risers; 2012 - additional days are required at Pickering B for feeder replacements; all additional days are mitigated by reduced scope required under Life Cycle Management Plans and weld overlay implementation at Darlington in 2012.

ONTARIO POWER GENERATION

5 Year Performance Plan

Metric	2008 Pickering A	2008 Pickering B	2008 Darlington	2014 Pickering A	2014 Pickering B	2014 Darlington
Safety						
All Injury Rate	0.73	0.96	1.04	1.2	1.2	1.2
2-Year Industrial Safety Accident Rate	0.14	0.07	0.04	0.15	0.15	0.15
2-Year Collective Radiation Exposure (man-rem per unit)	44.2	95.81	72.83	125	82	66
Airborne Tritium (TBq) Emissions per Unit	101.0	50.7	40.0	81.1	36.5	27.0
Fuel Reliability (microcuries per gram)	0.00059	0.00159	0.00025	0.0005	0.0005	0.0005
2-Year Reactor Trip Rate (# per 7,000 hrs)	1.22	0.26	0.00	0.50	0.50	0.50
3-Year Auxiliary Feedwater System Unavailability	0.0119	0.0040	0.0017	0.0200	0.0200	0.0200
3-Year Emergency AC Power Unavailability	0.0081	0.0091	0.0020	0.0250	0.0250	0.0250
3-Year High Pressure Safety Injection Unavailability	0.0012	0.0001	0.0001	0.0200	0.0200	0.0200
Reliability						
WANO NPI (Index)	60.84	60.93	95.67	70.9	81.3	99.1
2-Year Forced Loss Rate (%)	37.90	18.19	0.93	4.00	4.00	1.25
2-Year Unit Capability Factor (%)	56.6	73.17	91.99	84.3	81	93.3
2-Year Chemistry Performance Indicator (Index)	1.13	1.25	1.00	1.04	1.04	1.01
1-Year Online Elective Maintenance (work orders/unit)	425	695	313	278	300	214
1-Year Online Corrective Maintenance (work orders/unit)	14	28	8	9	15	4
Value for Money						
3-Year Total Generating Costs per MWh ($/Net MWh)	92.27	58.68	30.08	70.81	64.80	36.75
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	82.62	50.95	25.10	60.07	52.47	28.82
3-Year Fuel Costs per MWh ($/Net MWh)	2.64	2.68	2.62	6.01	7.45	5.43
3-Year Capital Costs per MW DER**($/MW)	32.07	32.44	18.79	34.73	34.67	20.37

- Continue to lead industry in overall conventional and nuclear safety performance.
- Increase fuel reliability.
- Strengthen equipment reliability and human performance to reduce reactor trips.
- Focus on work order readiness, reducing backlogs, improving maintenance effectiveness, and work management.
- Reduce base and outage operating costs to improve fleet-wide total generating costs per MWh. Darlington becomes industry leader in costs. Pickering A and B narrow gaps.

2014 WANO indicator targets are set to provide maximum NPI points only. 2014 Cost Targets are above 2008 due to expected cost escalation of Median and Best Quartile Costs per EUCG panel historical trend. 2010-2014 values represent annual targets. Actuals will be calculated based on rolling average definitions.

ONTARIO POWER GENERATION

Safety Cornerstone
Targets and Gap Closure through Initiatives

ID	Initiative	Owner	All Injury Rate			Collective Radiation Exposure			Fuel Reliability Index			Environmental Index			Accident Severity Rate			Industrial Safety Accident Rate			Airborne Tritium Emissions		
			DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB
Current Performance (2009 Projection at date of Target Setting)			**1.3**	**1.3**	**1.3**	**78.50**	**147.00**	**103.45**	**0.0005**	**0.0028**	**0.0012**	**85**	**80**	**80**	**4.75**	**4.75**	**4.75**	**0.15**	**0.15**	**0.15**	**4000**	**12000**	**7000**
IS-01	Musculoskeletal Disorders Prevention	Greg Jackson	0.10	0.10	0.10										0.64	0.64	0.64	0.04	0.03	0.04			
IS-02	Safety Behaviours Assessment	Greg Jackson	0.10	0.10	0.10										0.64	0.64	0.64	0.04	0.03	0.04			
RP-05	Reduce collective radiation exposures (CRE) during reactor face work through optimization of reactor face shielding	Tom Wong				6.40	15.80	5.40															
RP-10	Detritiation of Reactor PHT & Moderator Systems to reduce the source term radiation	Tom Van Horne				✓	2.00	2.00														525	1050
RP-09	Optimization of Fueling Machine Filtration at Sites to minimize Co-59 injection and buildup of Co-60	John Pinnegar				1.90	5.90	1.00															
EN-03	Improved Fuel Reliability Index	M. O'Neill							✓	0.0023	0.0007												
Site Contribution to Gap Closure Identified by Functional Teams						**6.80**	**15.00**	**6.30**				**5**	**0**	**0**								**6125**	**2100**
2014 TARGET			**1.2**	**1.2**	**1.2**	**66.00**	**125.00**	**82.00**	**0.0005**	**0.0005**	**0.0005**	**80**	**80**	**80**	**3.30**	**3.30**	**3.30**	**0.15**	**0.15**	**0.15**	**4000**	**6000**	**5400**
Remaining Gap			**(0.1)**	**(0.1)**	**(0.1)**	**(2.60)**	**(16.70)**	**6.75**	**0.0000**	**0.0000**	**0.0000**	**(10)**	**0**	**0**	**0.17**	**0.17**	**0.17**	**(0.08)**	**(0.06)**	**(0.08)**	**0**	**(125)**	**(500)**

✓ = impacts metric, enabler for performance but not quantified for gap closure
italics = initiative has impact in another cornerstone
Bold = Key initiative (See Appendix)

IS-03, IS-04 and RP-26 are not included in table above as planning is still under development.

ONTARIO POWER GENERATION

Reliability Cornerstone
Targets and Gap Closure through Initiatives

ID	Initiative	Owner	Unit Capability Factor			Forced Loss Rate			Chemistry Performance Indicator			Online Elective Maintenance Backlog			Online Corrective Maintenance Backlog			Equipment Reliability Indicator			Planned Outage Performance (Days)			Criticality 1 Deferral of PMs		
			DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB
Current Performance (2009 Projection at date of Target Setting)			**86%**	**79%**	**87%**	**2.0%**	**11.5%**	**6.2%**	**1.01**	**1.08**	**1.10**	**311**	**425**	**685**	**8**	**14**	**28**	**67**	**45**	**52**	**171.7**	**106.5**	**135.3**	**7**	**20**	**15**
ER-03	Implement Critical Spares and Proactive Obsolescence Program	Paul Vonhatten	0.125%	0.125%	0.125%																					
OU-02	***Outage Improvement Strategy***	***Jim Woodcroft***																			✓	✓	✓			
ER-01	**Implement a Fleet Standardized Equipment Reliability**	**Paul Vonhatten**	✓	✓	✓	**0.3%**	**1.88%**	**0.8%**										**15.0**	**26.0**	**14.0**						
ER-02	**Implement Improved PM Program**	**Paul Vonhatten**	✓	✓	✓	**0.08%**	**0.75%**	**0.2%**							**3**	**5**	**13**	**7.0**	**11.0**	**6.0**						
OP-05	***Human Performance Improvement Plan (Contains PI-04)***	***Granville, Henderson, Guglielmi***	✓	✓	✓	**0.38%**	**2.70%**	**1.1%**																		
OP-02	WM Performance Improvement	Dave Walsh										✓	✓	✓	✓	✓	✓									
MA-01	Improve FIN Team Effectiveness	Jim Whyte				✓	✓	✓				✓	52	120												
MA-07	Leverage Darlington OEMB Process Across Fleet	Chris Johnston											95	265												
EN-01	**Work Order Readiness**	**Steve Woods**										*96												* 5	*11	*11
Site Contribution to Gap Closure Identified by Functional Teams			**0%**	**0%**	**0%**		**1.1%**		**0.01**	**0.06**	**0.10**	**0**	**0**	**0**	**0**	**0**	**0**									
2014 TARGET			**93%**	**84%**	**81%**	**1.25%**	**4.0%**	**4.0%**	**1.01**	**1.04**	**1.04**	**215**	**278**	**300**	**5**	**9**	**15**	**89.0**	**82.0**	**72.0**	**80.8**	**89.0**	**225.0**	**2**	**9**	**4**
Remaining Gap			**7%**	**5%**	**(6%)**	**0.0%**	**1.1%**	**0.1%**	**(0.01)**	**(0.02)**	**(0.04)**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0**	**0.0**	**0.0**	**Commitment to Meet Plan**			**0**	**0**	**0**

✓ = impacts metric, enabler for performance but not quantified for gap closure
italics = initiative has impact in another cornerstone
Bold = Key initiative (See Appendix)

WM-01 is not included in table above as planning is still under development.

ONTARIO POWER GENERATION

Human Performance Cornerstone
Targets and Gap Closure through Initiatives

ID	Initiative	Owner	Event Free Day Resets			CAP - Quality of Level 1&2 Evaluations			CAP - Effectiveness of Level 1&2 SCRs			CAP - Timeliness of Level 1&2 SCRs			Training Index		
			DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB	DN	PA	PB
Current Performance (2009 Projection at date of Target Setting)			**8**	**4**	**8**	**80.0**	**80.0**	**80.0**	**50.0**	**80.0**	**60.0**	**92.0**	**90.0**	**58.0**	**70**	**70**	**75**
PI-03	CAP is Core	Tom Smart				10.0	10.0	10.0	30.0	7.5	22.5	2.4	3.8	28.0			
PI-02	Implement Human Performance Rapid Response	Tom Smart	2	0.0	2												
OP-05	***Human Performance Improvement Plan***	***Station DOMs***	***2***	***2***	***2***												
PI-01	Program efficiency and quality, and additionally reduce associated FLM administrative burden	Tom Smart						1.1	10.0	2.6	7.6	0.8	1.2	9.2			
TR-02	Computer Based Training Development to Reduce Classroom Training Resources	Gord Haverluck													5.0	5.0	3.75
OU-02	**Outage Improvement Strategy**	**Jim Woodcroft**													**5.0**	**5.0**	**3.75**
Site Contribution to Gap Closure Identified by Functional Teams																	
2014 TARGET			**4**	**2**	**4**	**90.0**	**90.0**	**90.0**	**90.0**	**90.0**	**90.0**	**95.0**	**95.0**	**95.0**	**90**	**90**	**90**
Remaining Gap			**0**	**0**	**0**	**0.0**	**0.0**	**(1.1)**	**0.0**	**(0.1)**	**(0.1)**	**(0.2)**	**0.0**	**(0.2)**	**(10)**	**(10)**	**(8)**

✓ = impacts metric, enabler for performance but not quantified for gap closure
italics = initiative has impact in another cornerstone
Bold = Key initiative (See Appendix)

TR-04 included in the Value for Money slide .

ONTARIO POWER GENERATION

Value for Money Cornerstone
Targets and Gap Closure through Initiatives

ID	Initiative	Owner	Total OM&A Savings Required										Impact to Capital								
			DN	PA	PB	NP&T	E&M	PINO	NSC	IM&CS	NWM	Safety	DN	PA	PB	NP&T	E&M	PINO	NSC	IM&CS	NWM
Total 5 Yr Savings Required		**N/A**	**$ 77,760**	**$ 53,000**	**$ 55,000**	**$102,953**	**$ 26,757**	**$ 1,000**	**$ 7,014**	**$ 17,733**	**$ 3,411**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
MA-08	**Days Based Maintenance**	**Doug Radford**	**($4,323)**	**($8,468)**	**($13,125)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,500**	**$775**	**$775**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
MA-04	Centralize M&TE	Jim Whyte	($788)	$0	($788)	$0	$0	$0	$0	$0	$0	$0	$350	$0	$350	$0	$0	$0	$0	$0	$0
MA-09	Implement Single Source Laundry Supplier	Doug Radford	($4,000)	($3,200)	($4,800)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
EN-02	**Engineering Value for Money Improvement**	**Fred Dermarkar**	**($3,510)**	**($15,005)**	**($15,005)**	**$0**	**($5,200)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
IS-04	Safety Training Qualifications to Capability Profiles	Greg Jackson	($660)	($417)	($579)	($105)	$0	$0	$0	$0	$0	($1,743)	$0	$0	$0	$0	$0	$0	$0	$0	$0
FS-03	Revenue Opportunity by Opening the Wesleyville location to external organizations	Don Trylinski	($500)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TR-04	Initial Authorization Training Program	Silviu Idita	$0	$0	$0	$11,498	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
FP-02	Labor Cost Reductions	Cathy Treacy	($1,900)	($1,340)	($2,100)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
RP-26	Area Mapping	Robin Manley	$100	$50	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
N/A	Summary of Other Initiatives	N/A	($17,962)	($15,609)	($18,987)	$6,582	$160					$380	$1,035	$1,035	$1,035		$0				
Estimated Savings from Initiatives			**($33,543)**	**($43,989)**	**($55,384)**	**$17,975**	**($5,040)**	**$0**	**$0**	**$0**	**$0**	**($1,363)**	**$2,885**	**$1,810**	**$2,160**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Gap closed in Site and Support Group Plans			**$77,760**	**$53,000**	**$55,000**	**$79,879**	**$26,757**	**$1,000**	**$7,014**	**$ 29,533**	**$3,411**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Final Gap to Initial Savings Target			**$0**	**$0**	**$0**	**$23,074**	**$0**	**$0**	**$0**	**($11,800)**	**$0**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

✓ = impacts metric, enabler for performance but not quantified for gap closure
italics = initiative has impact in another cornerstone
Bold = Key initiative (See Appendix)

Site and support groups were asked to meet financial targets though a combination of fleet-wide savings initiatives (above) and site specific initiatives (in supporting site presentations).

MS-02, MS-03 and MA-06 are not included in table above as planning is still under development.

ONTARIO POWER GENERATION

Nuclear's Gap Based Business Planning Results

Nuclear's gap-based process has resulted in a business plan that reflects our objective of improved operational and financial performance across the fleet.

ScottMadden Inc., a general consulting firm, was retained by OPG management to undertake a benchmarking study comparing its nuclear financial and non-financial performance with industry peers. In the final benchmarking report, ScottMadden reported the following:

"It is our opinion that OPGN has undertaken the actions necessary to successfully pilot a gap-based business planning process as originally envisioned. These actions include: (a) fairly benchmarking the company's operational and financial performance to external peers, (b) using the benchmarking results to establish performance improvement targets that will achieve, or significantly drive the company closer to, top quartile industry performance, and (c) developing and implementing a gap-based business planning process that identified the improvement initiatives best able to close the identified performance gaps."

ONTARIO POWER GENERATION

Cost Plan - OM&A Cost Savings

Nuclear Operations 2010-2014 Business Plan

($ millions)	2010	2011	2012	2013	2014	Total
Total OM&A - 2009-2013 Approved BP	$1,679	$1,579	$1,617	$1,764		
Targeted Reductions (Note 1)	-$40	-$53	-$61	-$87		
Additional Expenditures (Note 2)	$14	$17	$20	$21		
Additional Savings (Note 3)	-$58	-$58	-$68	-$68		
Nuclear Operations OM&A Plan-over-Plan Reduction	**-$84**	**-$94**	**-$110**	**-$135**		**-$423**
Nuclear Operations OM&A 2010-2014 Submission	**$1,595**	**$1,485**	**$1,507**	**$1,629**		
Corporate Planning Guidelines 2010-2014	**$1,639**	**$1,579**	**$1,617**	**$1,764**		
Nuclear Operations Savings above Guidelines	**-$44**	**-$94**	**-$110**	**-$135**		
Pickering B Continued Operations Investment		$51	$42	$37		
Pickering A P2/P3 Project Timing	$9					
Total OM&A Submission 2010-2014	**$1,604**	**$1,535**	**$1,549**	**$1,666**	**$1,673**	

Note 1:	2010	2011	2012	2013
Pickering A	-$6.0	-$13.0	-$10.0	-$12.0
Pickering B	-$9.0	-$9.0	-$9.0	-$14.0
Darlington	-$9.0	-$9.0	-$11.2	-$21.4
Nuclear Programs & Training	-$10.0	-$14.4	-$20.8	-$25.4
Nuclear Supply Chain	-$0.5	-$0.5	-$0.5	-$2.0
Engineering & Modifications	-$2.0	-$3.5	-$5.2	-$7.0
Nuclear Waste Management	-$0.2	-$0.3	-$0.4	-$0.6
Inspection Maintenance & Commercial Services	-$2.3	-$2.9	-$3.9	-$4.3
Performance Improvement & Nuclear Oversight	-$0.2	-$0.2	-$0.2	-$0.2
CNO Office	-$1.0	$0.0	$0.0	$0.0
Targeted Reductions - Base and Outage	-$40.2	-$52.8	-$61.2	-$86.9

Note 2:	2010	2011	2012	2013
2010 Vacuum Building Outage	$14.0			
2011/2012 Turbine Work - PA		$7.2	$8.2	
Underfunded OM&A Project Portfolio		$5.0	$5.0	$10.0
NPT Shortfall on Targeted Reductions		$4.3	$6.3	$10.8
Additional Expenditures	$14.0	$16.5	$19.5	$20.8

Note 3:	2010	2011	2012	2013
Impact of Lower Labour Burden Rate	-$38.0	-$38.5	-$48.7	-$47.5
Impact of New Labour Rates	-$12.4	-$13.0	-$12.7	-$13.8
SAVHO Reallocation to Capital Projects	-$5.4	-$5.0	-$4.7	-$3.8
Continued Operations	-$2.0			
IM&CS Savings		-$1.3	-$2.1	-$3.3
Additional Savings	-$57.8	-$57.8	-$68.2	-$68.4

ONTARIO POWER GENERATION

Financial Plan

($ Millions)	Business Plan 2010-2014					Plan-Over-Plan			
	2010	2011	2012	2013	2014	2010	2011	2012	2013
OM&A Base and Outage Expenditures									
Pickering A	260.1	236.5	235.0	240.7	259.1	(17.3)	(18.1)	(15.7)	(26.0)
Pickering B	371.9	369.5	366.5	373.8	392.8	(13.9)	11.9	5.0	(0.2)
Darlington	398.2	362.6	372.1	471.6	426.9	(17.5)	(23.2)	(28.5)	(39.3)
Engineering & Modifications	68.4	63.9	63.8	66.8	66.9	(11.2)	(14.5)	(16.3)	(16.9)
Nuclear Programs & Training	234.1	249.7	253.9	255.9	264.3	(30.4)	(18.5)	(24.9)	(24.6)
Nuclear Supply Chain	68.6	68.4	69.1	69.3	70.5	(3.3)	(3.4)	(3.8)	(5.2)
Inspection Maintenance & Commercial Services	32.5	32.9	33.2	33.5	33.5	(7.6)	(9.0)	(10.8)	(12.2)
Nuclear Waste Management	4.3	4.4	4.6	5.4	4.3	(0.3)	(0.4)	(0.5)	(0.7)
PINO	9.1	9.2	9.4	9.6	10.0	(0.6)	(0.6)	(0.7)	(0.7)
CNO Office / Other	22.6	9.9	13.1	11.7	11.9	13.4	0.3	0.3	0.3
Total Base & Outage	**1,470.0**	**1,407.0**	**1,420.8**	**1,538.3**	**1,540.4**	**(88.8)**	**(75.3)**	**(96.0)**	**(125.5)**
OM&A Portfolio Projects	111.7	108.3	111.2	115.7	121.2	6.7	11.9	11.2	15.7
OM&A PB Continued Operations	1.8	19.9	17.0	11.9	11.3	(2.0)	19.9	17.0	11.9
OM&A P2/P3 Projects	20.6	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0
Total OM&A	**1,604.1**	**1,535.1**	**1,549.0**	**1,665.9**	**1,672.9**	**(75.0)**	**(43.5)**	**(67.8)**	**(97.9)**
Fuel & Waste Provision Expense									
Fuel (Uranium & Combustion Turbine Unit)	178.9	209.1	233.2	232.5	238.6	(0.5)	(14.6)	(17.9)	(16.6)
Fuel Provisions	23.5	25.7	27.2	27.9	29.9	(1.3)	(1.2)	(1.4)	(10.3)
Total - Fuel & Waste Provisions	**202.4**	**234.8**	**260.5**	**260.4**	**268.5**	**(1.7)**	**(15.7)**	**(19.3)**	**(27.0)**

ONTARIO POWER GENERATION

Financial Plan

($ Millions)	2010	2011	2012	2013	2014
Projects - Capital & OM&A and MFA					
OM&A Portfolio Projects	111.7	108.3	111.2	115.7	121.2
OM&A Pickering B Continued Operations	1.8	19.9	17.0	11.9	11.3
Capital Portfolio Projects	172.0	172.0	172.0	172.0	172.0
Total Portfolio and Other Projects	**285.5**	**300.2**	**300.2**	**299.6**	**304.5**
OM&A P2/P3 Projects	20.6	0.0	0.0	0.0	0.0
Capital P2/P3 Projects	8.8	0.0	0.0	0.0	0.0
Total P2/P3 Projects	**29.5**	**0.0**	**0.0**	**0.0**	**0.0**
Minor Fixed Assets	**20.2**	**19.7**	**19.5**	**19.6**	**19.7**
Total OM&A and Capital Projects and MFA	**335.1**	**319.9**	**319.7**	**319.2**	**324.3**

ONTARIO POWER GENERATION

Staff Plan

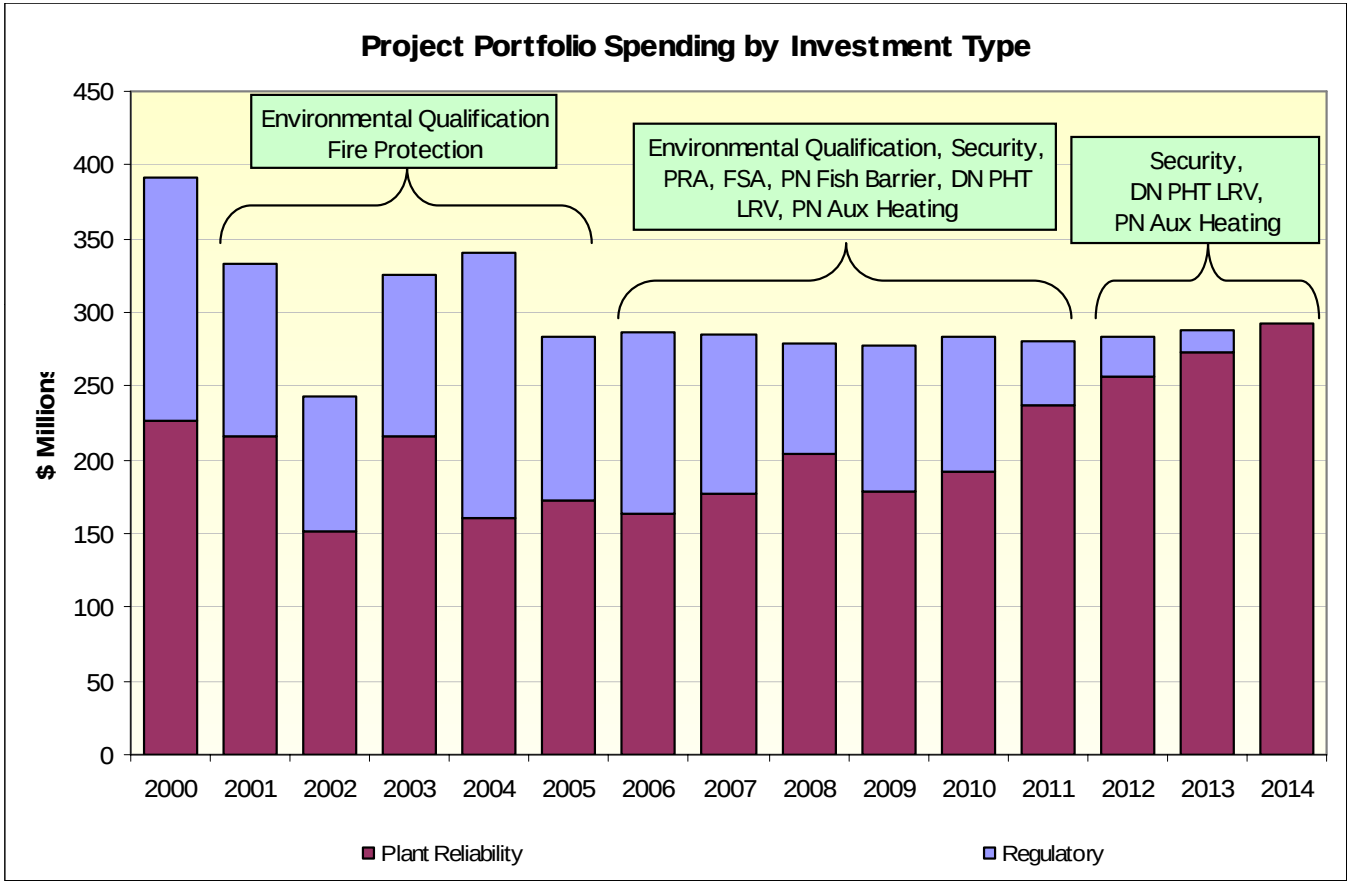
MAJOR DEPARTMENTS	Headcount	Full Time Equivalent					Variance from BP 2009-2013				
Regular Staff	**2009 Year-End**	**2010**	**2011**	**2012**	**2013**	**2014**	**2009 YE**	**2010**	**2011**	**2012**	**2013**
Pickering A	1,266	1,129	998	987	986	982	(12)	29	10	9	8
Pickering B	1,608	1,636	1,606	1,558	1,554	1,523	2	77	66	24	10
Darlington	1,703	1,693	1,667	1,663	1,647	1,654	(51)	(25)	(20)	(19)	(24)
Engineering & Modifications	674	667	626	606	576	568	(3)	0	(12)	(23)	(34)
Nuclear Programs & Training	976	1,027	988	973	961	968	6	(15)	(39)	(69)	(66)
Nuclear Supply Chain	380	370	362	353	347	343	(18)	7	3	3	(3)
Performance Improvement & Nuclear Oversight	57	57	57	57	57	57	-	(1)	-	-	-
Inspection Maintenance & Commercial Services	589	545	484	439	406	373	(6)	(1)	(63)	(108)	(141)
Nuclear Waste Management	312	310	307	307	307	307	(1)	(3)	(6)	(6)	(6)
CNO Office	2	2	2	2	2	2	-	-	-	-	-
Regular Staff Total	**7,567**	**7,435**	**7,095**	**6,945**	**6,842**	**6,776**	**(83)**	**68**	**(61)**	**(189)**	**(256)**

Plan-Over-Plan Major Business Reason for Regular Staff Variance from BP 2009-2013	2009 YE	2010	2011	2012	2013
Pickering A - Unit 2/3 Long Term Provision hires offset by staff reductions in major departments	(17)	9	10	9	8
Pickering B - Reductions in staff are attributable to Fleet and Station Initiatives	2	4	(40)	(68)	(72)
Pickering B - Staff hires for turbine crew funded from purchased services		19	19	19	19
Pickering B - Continued Operations Staff	-	54	87	73	63
Darlington - Staff Reductions in Operations, Maintenance, Fuel Handling, Engineering, Projects Support and MSSP	(62)	(25)	(20)	(19)	(24)
Engineering & Modifications - Staff Reductions in major departments	(3)	-	(12)	(23)	(34)
Nuclear Programs & Training - Staff Reductions in Nuclear Programs and Nuclear Integration	1	6	(26)	(46)	(37)
Nuclear Supply Chain - Staff Hires offset by reductions in major departments	(18)	7	3	3	(3)
Performance Imp. & Nuclear Oversight - Eliminate 1 Engineering Position from VP's Office	-	(1)	-	-	-
Inspection Maintenance & Comm. Serv. - Discontinuing Service Agreements with Bruce Power	(6)	(4)	(65)	(110)	(143)
Nuclear Waste Management - Planned reductions in Used Fuel Ops. and Engineering Staff offset by hires in Waste Ops	(1)	(3)	(6)	(6)	(6)
Other Contributing Variances	21	2	(11)	(21)	(27)
TOTAL REGULAR STAFF REQUIREMENTS - PLAN-OVER-PLAN	**(83)**	**68**	**(61)**	**(189)**	**(256)**

FTE #'s do not reflect changes due to reorganization of Nuclear Operations and Nuclear Refurbishment, Projects and Support.
FTE #'s do not include Security.

ONTARIO POWER GENERATION

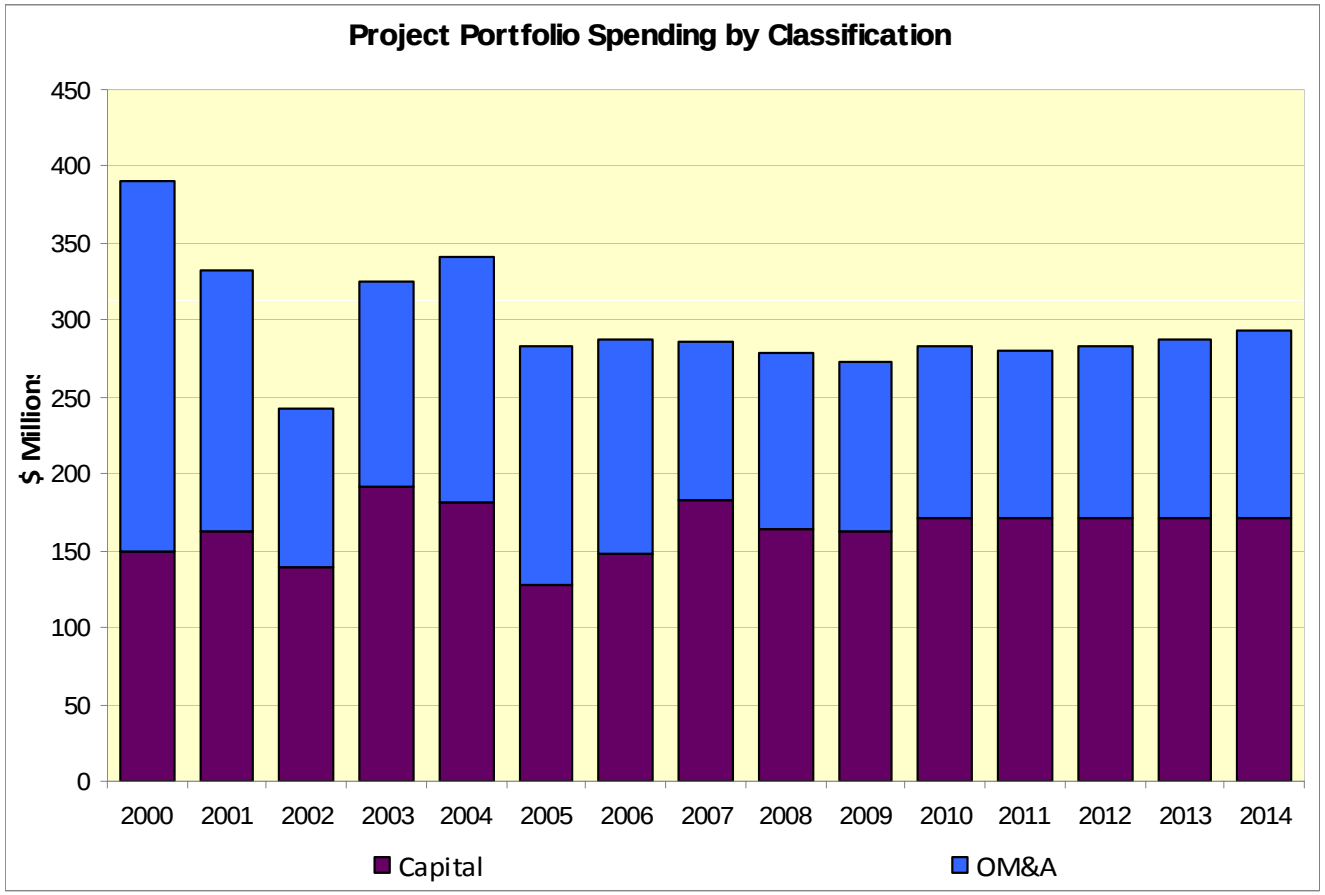
Investment Plan



- Known regulatory projects end in the planning period but history shows new regulatory projects continuously emerge.
- Previous decreases in portfolio funding are not sustainable.
- Benchmarking capital expenditures is difficult due to OPG's higher capitalization threshold; however, it is believed that OPG spends less on plant reliability investment due to high regulatory capital requirements than industry benchmark.

ONTARIO POWER GENERATION

Investment Plan



- SAVH has been re-allocated to capital and OM&A project portfolio.
- Capital expenditures in 2010-2014 business plan ceiling maintained at $172 million.
- Nuclear labour rate savings have been re-allocated to OM&A project portfolio in the amounts of $5 million (2011-2012); $10 million (2013) and $15 million (2014).

ONTARIO POWER GENERATION

Risks to Business Plan

Safety

- Darlington Heat Transport System Aging impact on adequate operating margins determined by safety analysis limits. MEDIUM
- Environmental Qualification of Darlington Nuclear by 2010 to meet licensing condition. LOW

Human Performance

- Human Performance trending indicates challenges with: Procedure Use & Adherence, Work Protection and rework. The risk impact on the business is not achieving zero human performance consequential events in the areas of Nuclear Safety and Worker Safety (including Radiological safety). STRATEGIC

Value for Money

- Implementation of initiatives using the same staff which are involved in day-to-day operations and maintenance. MEDIUM

Reliability

- Replacement of Feeder Pipes in Nuclear Stations due to thinning: Thin spots at Graylocs at Darlington; and "Blunt flaws" under welds and feeder bend thinning rates unknown at Pickering A. LOW
- End of Life Determination: The medium risk in the confidence level of attaining the planned effective full power hours (EFPH) for Darlington and Pickering B units is insufficient for effective business planning. STRATEGIC
- Corrosion of Pickering A Calandria Vault: The corrosion of structural components and cooling systems is being caused by moisture in the vault atmosphere and radiolysis forming nitric acid which attacks the carbon steel components in the reactor vault. STRATEGIC

ONTARIO POWER GENERATION

Darlington
2010-2014 Business Plan

"Beyond Sustainability"

Say it, Do It

ONTARIO POWER GENERATION

Major Objectives/Focus Areas

Darlington's objective for the 2010-2014 plan is to continue to focus on achieving top operational performance in the nuclear industry and position the station for refurbishment and beyond.

- The plan proposes a significant improvement in contribution margin with cost reductions achieved through:
    - Peer team and site specific initiatives
    - The challenge and prioritization of work programs
    - Cost control and productivity improvements
    - Continued optimization of the feeder replacement program

- Plan-over-Plan 2010-2013 costs are reduced by $108.6 million and revenues are increased by $22.2 million.

- Funds for newly identified life cycle management programs have been accommodated in the plan.

ONTARIO POWER GENERATION

Pickering B
2010-2014 Business Plan

"Delivering on our Commitment to Achieve Continued Operations for OPG"

Say it, Do It

ONTARIO POWER GENERATION

Major Objectives/Focus Areas

The objective of the 2010-2014 Pickering B plan is to deliver on the commitment to improve the operational performance of the station and extend the life of Pickering B to 2020. The Plan includes:

- Extending the life of Pickering B through the "Continued Operations" program and providing the Province of Ontario and OPG with a highly valued source of base load generation through the next decade, as well as, a source of generation during the potential refurbishment of Darlington
- Additional investments will also be required to ensure plant equipment operates as intended to 2020
- Significant improvements in cost performance totaling $55 million in OM&A reductions – reducing the overall OM&A impact of Continued Operations

ONTARIO POWER GENERATION

Continued Operations

Program Background

- Pickering B Continued Operations is a work program consisting of inspections, physical work and Research & Development with the objective of extending the operating life of the Pickering B units from their current nominal end of life of 2014/2016 by four years to 2018/2020.
- This requires incremental investments in plant equipment and increases in outages over the next few years. In addition to extending the Pickering B station life, it provides greater assurance of the extended operation of Pickering A Units 1 and 4 to 2020 due to the technical interdependencies between the two stations.
- The achievement of Continued Operations would also benefit the Ontario electricity system by providing additional nuclear base load generation during a period of planned intensive nuclear unit refurbishment in Ontario.

Risks

- A number of technical and regulatory issues will need to be managed to ensure acceptability of Pickering B Continued Operations.
- This plan identifies funding requirements and generation impact for all 5 years of the plan ($190 million in outage costs and 266 days or approximately 3.2 TWh in generation).

ONTARIO POWER GENERATION

Pickering A
2010-2014 Business Plan

"Achieving Our Potential "

Say it, Do it

ONTARIO POWER GENERATION

Major Objectives/Focus Areas

The objective of the 2010–2014 Pickering A plan is to reduce Forced Loss Rate, increase Capability Factor and decrease Total Generating Cost over the five year period. We are working to "Achieve Our Potential" by:

- Continuing to improve the material condition of the plant
- Maximizing the operating time at 100% Full Power
- Restoring margins
- Maintaining continuous improvement in Safety, Reliability, Human Performance and Value for Money with a focus on achieving industry standards
- Improving accountability and focus on results

  Plan-over-Plan Changes:

  Cost = -$77.1 million

  Generation = +0.17 TWh or $9.2 million in additional revenue

ONTARIO POWER GENERATION

Appendix

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
EN-01	**Work Order Readiness** Steve Woods	Redevelop the process, procedures, organizational accountabilities, reporting relationships, authorities, metrics, and stakeholder support organizations, (specifically design engineering, procurement engineering, maintenance assessing and supply chain buyers) so that work orders are efficiently and effectively assessed, parts are available and tasked are scheduled to allow maintenance to execute work more efficiently. Four sub-initiatives will be executed to complete this improvement: EN 1.1 Implementation of an Accountability Model EN 1.2 Pro-Active Assessing Improvements EN 1.3 Establish Fleet EFIN Formal Process and Organizational Structure EN 1.4 Timely Holds Resolution Improvements
OU-02	**Outage Improvement Strategy** Jim Woodcroft	Review and implement fleet contractor management procedure (how contractor work is managed, what work is performed, when the work is scheduled, what support is available, standards for scope change/approval, revise strategic planning of contract work). Drive toward consistent use of contractors across the fleet and improve contractor efficiency, simplify resource planning, improve oversight and quality of contractor function. Improve the execution rate - the amount of work done per day. Review standard durations on critical path and look for opportunities to reduce/improve. Utilize gap analysis outage over outage and identify and implement opportunities for improvement. Integrate the scoping process of MA-0013, MA-0036, AS-0043. Make changes to the scoping process to improve timely identification and assessing prior to scope freeze milestone (PO-12). The result will be an improved scope at scope freeze milestone. Review and implement fleet standards for minimum OCC staffing requirements for best in fleet organizational structure. Ensure OCC staff involvement during outage planning phase. Develop future Outage Managers. Modify this year's lessons learned process and MA13 improvement / realignment session into OPGN's outage program by updating N-PROC-MA-0013 to allow the stations to exchange key learnings from previous years and tackle issues across the fleet. Take over running and maintenance of all outage metrics to support continuous improvement.

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
ER-01	**Standard Equipment Reliability** Paul VonHatten	Specify and implement industry standard ER program. Standardize existing elements across the fleet for efficiency and effectiveness. Establish roles and accountabilities for ER at the station and corporate level. Establish an ER peer team. Specify and implement supporting IT structure to improve ER program effectiveness and to reduce costs.
ER-02	**PM Program Improvement** Paul VonHatten	Comprehensive implementation and improvement of the Preventative Maintenance Program across the fleet. The elements of this plan include: 1. Implementation of the revised criteria for classification of component criticality. This is an enabler to the PM program effectiveness in improving equipment reliability while improving cost performance. 2. Validation and implementation of the new PM templates developed through the AP913 process. 3: Establishing methodologies to establish PM budgets linked to improved ER performance, and a focused review of the top 5 systems/components contributing to FLR and the Top 5 systems contributing to high levels of EM/CM work, and the Top 5 systems from a PM cost perspective. Although all 3 sites are currently executing various local and shared initiatives design to improve their PM Program. 4. Implementation of a robust PM feedback and review process. 5. Improvements to the PM program efficiency and effectiveness. 6. Establishing a Graded approach to Non-Critical Component Technical Basis.
EN-02	**Engineering Value for Money Improvement** Fred Dermarker	Site and central engineering groups are conducting an overall cost and efficiency evaluation aimed at staff reductions as a result of organizational realignment and a close examination of products and services. Several functions will be centralized and roles may shift between Engineering and Maintenance as well from Reactor Safety to Operations.

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
OP-05	**Human Performance Improvement** Sean Granville Tom Henderson Frank Guglielmi	Accelerate and sustain fleet Performance Improvement through the establishment of a formal Fleet initiative. Improved organizational recognition, control and response to pre cursor events; reduction in frequency and significance of events and accelerated response to performance/behavioral underlying contributors. OPGN has been criticized for not having an obvious Fleet improvement model and leveraging the common strengths/weaknesses of the sites. Adoption of the INPO document 05-005 Guidelines for Performance Improvement at Nuclear Power Stations provides the PI model, with three main areas of PI: performance monitoring; analyzing problems, identifying and planning solutions; and implementing solutions. Sites need to take full advantage of lower level events or trends to be predictive and take corrective action to mitigate risk. Staff engagement is not fully leveraged since the results of adverse condition reporting at low levels are not quickly evident. External groups are critical of our ability to resolve underlying trends. Trending at OPGN needs to intrusive and critical, and not limited to binning. Effective implementation of solutions remains a challenge. Staff behaviors are not always guided or corrected through the use of supervisor/management oversight and intervention.
MA-08	**Days Based Maintenance** Doug Radford	OPG has a long standing practice of performing maintenance around the clock on a shift basis. This is not the industry practice. Approximately 45% of the total maintenance compliment at each site for Control and Mechanical functions are assigned to shift. The necessary work required on a 24/7 basis is estimated to be 3 FTEs for Control and 0 FTEs for Mechanical. The sole reason these staff remain on shift is to provide emergency response functions. Many of the emergency response functions they provide could be automated with currently available technology. In order to staff these functions 24/7 we require 5 staff of which only 2 are present at site in any 24 hour period. This means at any one period in time 30% of our Control and Mechanical functions are away from the stations. Studies of the productivity of shift versus day maintenance indicate days-based maintenance is more effective (regardless of working 8 or 12 hours). In addition shift premiums result in a 17% escalation in wage costs. A move towards a days-based maintenance operation will require introduction of new technology for radiation data gathering (currently done manually) and changes to the Shift Minimum Compliment document (regulatory approval required). Based on reducing current maintenance shift compliment to 25 (5 x 5 crews), the savings in shift differential would be approximately $3M per year (moving from a current shift compliment of 250 to a compliment of 75.

Gap Based Business Planning Methodology

Nuclear Cornerstones

Filed: 2010-05-26
EB-2010-0008
Exhibit F2-1-1
Attachment 2

- ✓ **2008 Performance Benchmarks**

- ✓ **Strengths & Challenges**
- ✓ **Major Program Areas/ Objectives**
- ✓ **5 year Generation Targets**
- ✓ **2014 Performance Targets**

- ✓ **Reliability Targets and Initiatives**
- ✓ **Safety Targets and Initiatives**
- ✓ **Human Performance Targets and Initiatives**
- ✓ **Value for Money Targets and Initiatives**

- ✓ **Cost Plan**
- ✓ **Staff Plan**
- ✓ **Investment Plan**
- ✓ **Risks to the Plan**

ATTACHMENT 3

Key Drivers of Total Generating Costs

OPG Nuclear business planning has historically been driven by certain key factors that drive costs, many of which are unique to CANDU (Canadian Deuterium Uranium) operations:

Complexity: Nuclear plants are technologically sophisticated facilities, with a large number of safety and process systems, and a high level of redundancy for critical components within the plant. In addition to the complexity inherent in boiling or pressurized water reactors, on-line refueling and functions associated with heavy water management add significantly to the cost and complexity of CANDU operations.

There are numerous differences between CANDU and other reactors that result in different costs. Of the world reactor fleet of 436 units, 265 or 61 per cent are pressurized water reactors. Ninety-two or 21 per cent are boiling water reactors, and 39 or 9 per cent are CANDU type. The remaining units are mainly gas cooled reactors. Some of the most significant technological differences driving costs are noted here.

Technology Differences between CANDU and Pressurized Water Reactors/Boiling Water Reactors

Components	Pickering A	Pickering B	Darlington	Pressurized Water Reactor	Boiling Water Reactor
Reactor	Horizontal pressure tubes	Horizontal pressure tubes	Horizontal pressure tubes	Pressure vessel	Pressure vessel
Reactor coolant and associated systems	Heavy water	Heavy water	Heavy water	Light water	Light water
Generator Output	540MW	540MW	934MW	500-1400 MW	500 – 1400 MW
Steam Generators (SG)/unit	12	12	4	2 - 4	NA
Main Coolant Pumps/unit	16	16	4	2 - 4	2
Large Isolation Valves Main Circuit	40/unit	40/unit	0	0	4/unit
Standby Generators & Emergency Power Generator	6 for 4 units	8 for 4 units	6 for 4 units	2/unit	2/unit
Computers/unit	2	2	8	1	1
Shut Down Systems/unit	2	2	2	2	2
On line Fuelling Machines	8 for 4 units	8 for 4 units	6 for 4 units	NA	NA
Tritium Removal Facility	0	0	1	NA	NA
Heat Transport System	Carbon steel	Carbon steel	Carbon steel	Stainless steel	Stainless steel

- **Generation Technology:** OPG's nuclear stations contain the first large-scale commercial CANDU units ever built, the result being that many of the technological issues OPG faces are being addressed for the first time in the nuclear industry. Addressing issues affecting critical components such as steam generators, feeder pipes, and pressure tubes has demanded and will continue to demand extensive effort. This work includes high cost maintenance activities such as the feeder replacement program,

and preservation of fuel channels through restoration of spacing margin to prevent deterioration (spacer location and relocation program). Aging technology also drives OPG's ongoing investment in research and development programs. To the greatest extent possible, life cycle plans for all major components assist in ensuring fitness for service.

- **Safety and Regulatory:** OPG must ensure that the stations are operated and maintained safely at all times, and remain safe even when non-operational. For example, even when a unit is shut down, nuclear fuel continues to produce heat that must be removed.

  The requirement to meet nuclear safety regulations and standards imposed by the federal *Nuclear Safety and Control Act*, and the need to satisfy OPG's nuclear regulator, the CNSC, as described in Ex A1-T6-S1, drives a large number of ongoing work activities and costs. These include scheduled "periodic inspections" of specified equipment, in-depth analysis and assessments of systems, systems operations and component conditions, and preventive and remedial activities. In addition to ongoing activities, there is also extensive effort for re-licensing of each station every five years and the potential of additional requirements and costs associated with the license renewal.

  While nuclear safety is an obvious driver of maintenance and monitoring activities and therefore of costs, there has also been a trend in recent years for the CNSC to mandate changes to organizations and facilities to address changing requirements in such areas as physical security and fire protection.

- **Training:** A further consequence of complexity is that OPG must hire staff with special skills that require extensive and ongoing training. The following provides an example of the impact of training in the critical area of nuclear operators obtaining their station-specific certification:
  - Non-licensed Operators: When a new field operator is hired, it typically takes approximately two years of training before the operator is able to perform work in the station. At this point, the non-licensed operator is able to work independently, but may still be required to work alongside an experienced operator for sensitive activities.

- Licensed Operators: As opposed to the field-based non-licensed operators, licensed operators are authorized to physically operate the station within the main control room. Certification to become a fully authorized nuclear operator typically requires two to six years of field work as a trained operator, followed by four to five years of study and regulatory examination, to be allowed to operate as a unit panel operator on an independent basis. Certification further requires ongoing training (generally, one week out of five).

- **Material Standards:** Equipment in a nuclear station can be subjected to demanding conditions on an ongoing basis and may be required to operate in a harsh environment (e.g., steam environment, increased radiation, high temperature and pressure or seismic acceleration) under postulated accident conditions. The harsh environment not only necessitates more frequent maintenance or replacement of parts, but also requires tightly-specified replacement parts that are environmentally-qualified for operations under such conditions, and detailed maintenance procedures to ensure that such qualification is not inadvertently compromised. Supply Chain must create and maintain the infrastructure to identify and audit vendors who can meet the stringent requirements from both a technical and quality assurance program standpoint, complying with all applicable codes and standards. “Cradle to grave” traceability (from the material manufacturer of record, to the exact end use location within the station along with the qualifications of all staff who handled the item while in process), is an example of the very costly process that is required for many components.

- **Work Environment:** In addition to the direct impact on materials costs and demanding maintenance procedures as noted above, work environment (primarily radiation) also constrains labour productivity, since maintenance in some physical locations of the nuclear plant requires both protective procedures and equipment (e.g., the wearing of cumbersome plastic suits, with dedicated breathing air). Furthermore, within and outside radiation areas, labour productivity is significantly impacted by the need for:
  - Stringent security procedures required of all staff prior to entering protected areas of the plant (such as badging, security clearances, and metal detection).

- Turnover communications/pre-job briefing for all staff, including procedure review for the specific job at hand.
- Obtaining radiation protection approvals, and adjusting protective equipment or receiving additional briefing as required.
- Having equipment physically taken out-of-service, or appropriately isolated, such that work can proceed safely.

ONTARIO POWER GENERATION

889 Brock Road P826-1 Pickering, Ontario **L1W 3J2**

June 30, 2009

NEC Members

Subject: Performance Targets for 2010 - 2014 Business Planning

Earlier this year we committed to a new "gap-based" approach to business planning. Last month we successfully completed the external benchmarking phase of this effort. As you know, the benchmark comparisons highlighted a number of performance areas we need to address. We are now engaged in the business planning phase, during which we will develop our plan for closing these performance gaps.

As a first step in our revised planning process, the NEC met as an executive team on June 8 and June15 and committed to a series of operational and financial targets that we intend to achieve over the next five years. I approved these targets, with some required modifications, and they were submitted to corporate yesterday. They are attached to this memo.

With regard to meeting the specific 2010 financial challenge, I would like to thank you all for your efforts. A few of you still have some work to do, but I am holding firm on our commitment to find savings as per the original distribution provided by Tom Mitchell. I will be setting up further meetings with a few of you to monitor the situation and ensure we continue to be on track.

In addition to the OM&A savings targeted over the next 5 years, I would like to incorporate the same level of savings into our Provisional funding. Accordingly, I am directing Nuclear Waste to build in a cumulative savings of 2% per year into all years of the business plan, consistent with the challenge accepted by other business units for their OM&A budgets.

By setting aggressive yet achievable targets for the year 2014, we are driving our organization towards continuous improvement and meeting our commitment to our shareholder and the people of Ontario. I realize that some of our people are uncomfortable with setting long-term targets that will require considerable change in our behaviors and practices to attain. My expectation is that you, as leaders of the organization, accept these targets, as well as, provide your people with the direction, resources and support needed to tackle old problems with new ideas. We will all need to work as a team to deliver these results.

At this time we are asking our sites and functional peer teams to identify improvement initiatives that will achieve the performance and financial targets we have set. These teams are staffed with some of our most knowledgeable employees. We are asking a great deal from these individuals at a time when they are struggling to meet multiple commitments. Please support them in this effort over the next 60 days.

Wayne Robbins
Chief Nuclear Officer

Safety Performance

Metric	Business Unit	2014 Target	North American PWR/PHWR		CANDU	
			Best Quartile	Median	Best Quartile	Median
Tier 1						
All Injury Rate (# injuries per 200,000 worker-hours)	Darlington	1.2			[redacted]	
	Pickering A	1.2				
	Pickering B	1.2				
	IM&CS	1.2				
Collective Radiation Exposure[1] (person-rem)	Darlington	***66***	50.70	66.00	62.15	81.84
	Pickering A	125	50.70	66.00	62.15	81.84
	Pickering B	82	50.70	66.00	62.15	81.84
Fuel Reliability[1] (microcuries per gram)	Darlington	***0.00050***	0.000001	0.000012	0.000001	0.000165
	Pickering A	***0.00050***	0.000001	0.000012	0.000001	0.000165
	Pickering B	***0.00050***	0.000001	0.000012	0.000001	0.000165
Environmental Index (%)	Darlington	80				
	Pickering A	80				
	Pickering B	80				
Accident Severity Rate (# days per 200,00 worker-hours)	All	3.30				
Tier 2						
Industrial Safety Accident Rate[1] (# accidents per 200,000 worker-hours)	Darlington	***0.15***	0.05	0.09	n/a	n/a
	Pickering A	***0.15***	0.05	0.09	n/a	n/a
	Pickering B	***0.15***	0.05	0.09	n/a	n/a
SS - Auxiliary Feedwater System Unavailability[1]	Darlington	***0.0200***	0.0025	0.0042	0.0014	0.0020
	Pickering A	***0.0200***	0.0025	0.0042	0.0014	0.0020
	Pickering B	***0.0200***	0.0025	0.0042	0.0014	0.0020
SS - Emergency AC Power Unavailability[1]	Darlington	***0.0250***	0.0087	0.0130	0.0024	0.0076
	Pickering A	***0.0250***	0.0087	0.0130	0.0024	0.0076
	Pickering B	***0.0250***	0.0087	0.0130	0.0024	0.0076
SS - High Pressure Safety Injection Unavailability[1]	Darlington	***0.0200***	0.0021	0.0041	0.0001	0.0037
	Pickering A	***0.0200***	0.0021	0.0041	0.0001	0.0037
	Pickering B	***0.0200***	0.0021	0.0041	0.0001	0.0037
Reactor Trip Rate[1] (# trips per 7,000 hours critical)	Darlington	***0.50***	0.00	0.25	0.00	0.33
	Pickering A	***0.50***	0.00	0.25	0.00	0.33
	Pickering B	***0.50***	0.00	0.25	0.00	0.33
Airborne Tritium Emissions (Curies)	Darlington	4000				
	Pickering A	6000				
	Pickering B	5400				

Bold, underlined values indicate maximum NPI point threshold met for this measure.
Note 1: Metric is a sub-component of the WANO Nuclear Performance Index.

Reliability Performance

Metric	Business Unit	2014 Target	North American PWR/PHWR		CANDU	
			Best Quartile	Median	Best Quartile	Median
Tier 1						
WANO Nuclear Performance Index	Darlington	98.6	96.45	91.87	96.19	62.50
	Pickering A	70.9	96.45	91.87	96.19	62.50
	Pickering B	81.3	96.45	91.87	96.19	62.50
Unit Capability Factor[1] (%)	Darlington	***93.3***	92.78	90.44	90.97	84.31
	Pickering A	84.3	92.78	90.44	90.97	84.31
	Pickering B	80.8	92.78	90.44	90.97	84.31
Forced Loss Rate[1] (%)	Darlington	1.25	0.95	1.81	0.68	3.79
	Pickering A	4	0.95	1.81	0.68	3.79
	Pickering B	4	0.95	1.81	0.68	3.79
Net Electrical Production (TWh)	Darlington	28.67				
	Pickering A	7.57				
	Pickering B	14.66				
Tier 2						
Chemistry Performance Indicator[1]	Darlington	1.01	1.00	1.01	1.00	1.01
	Pickering A	1.04	1.00	1.01	1.00	1.01
	Pickering B	1.04	1.00	1.01	1.00	1.01
Online Elective Maintenance Backlog (# of workorders)	Darlington	215	218	278		
	Pickering A	278	218	278		
	Pickering B	300	218	278		
Online Corrective Maintenance Backlog (# of workorders)	Darlington	5	4	7		
	Pickering A	9	4	7		
	Pickering B	15	4	7		
Equipment Reliability Index	Darlington	89				
	Pickering A	82				
	Pickering B	72				
Planned Outage Performance (days)	Darlington	80.8				
	Pickering A	89				
	Pickering B	225				
System Health (%)	Darlington	95.0%				
	Pickering A	98.0%				
	Pickering B	85.0%				
Preventative Maintenance Deferrals (#)	Darlington	2				
	Pickering A	9				
	Pickering B	4				
Dry Storage Containers (#)	NWMD	111				
Liquid Waste Incineration (cubic meters)	NWMD	40				
Western Used Fuel Dry Storage Capability Factor (%)	NWMD	99				
Transportation Package Maintenance Compliance (%)	NWMD	95				
Meet Needs for Accepting Low Level Waste Volumes (%)	NWMD	100				
Radioactive Transport Preventable Collision Rate (# collisions/1.6 million km)	NWMD	2.5				
Inventory Accuracy (%)	NSC	99.5				
Stock Out Materials (%)	NSC	1.00				
OPG Outage Scope Delivered on Schedule (%)	IM&CS	95.0				
IMS Equipment Condition Index (%)	IM&CS	85.0				

Bold, underlined values indicate maximum NPI point threshold met for this measure.
Note 1: Metric is a sub-component of the WANO Nuclear Performance Index.

Human Performance

Metric	Business Unit	2014 Target	No Benchmark Available	
			Best Quartile	Median
Tier 1				
Event Free Day Resets (#)	Darlington	4		
	Pickering A	2		
	Pickering B	4		
Tier 2				
Corrective Action Program - Quality of Level 1 & 2 Evaluations (%)	All	90		
Corrective Action Program - Effectiveness of Level 1 & 2 SCRs (%)	All	90		
Corrective Action Program - Timeliness of Level 1 & 2 SCRs (%)	All	95		
Training Index (%)	Darlington	90		
	Pickering A	90		
	Pickering B	90		

Bold, underlined values indicate maximum NPI point threshold met for this measure.
Note 1: Metric is a sub-component of the WANO Nuclear Performance Index.

Value for Money Performance

Metric	Business Unit	2014 Target	Projected Benchmark Values	
			Best Quartile	Median
Tier 1				
OM&A Base & Outage ($ millions)	Darlington	444.8		
	Pickering A	272.9		
	Pickering B	399.9		
	NPT	257.3		
	EMD	77.8		
	PINO	10.6		
	NSC	73.9		
	IM&CS	43.1		
	NWMD	4.4		
Non-Fuel Operating Cost per MWh ($/MWh)	Darlington	28.82	25.53	29.08
	Pickering A	60.07	25.53	29.08
	Pickering B	52.47	25.53	29.08
Total Generating Cost per MWh ($/MWh)	Darlington	36.75	33.98	37.90
	Pickering A	70.81	33.98	37.90
	Pickering B	64.80	33.98	37.90
Tier 2				
Nuclear Projects Available for Service (#)	Darlington	100%		
	Pickering A	100%		
	Pickering B	100%		
	EMD	100%		
Annual Projects Started (#)	EMD	9		
Nuclear Waste Liabilities - Internal ($ millions)	NWMD	164.10		
NWMD Capital / MFA ($ millions)	NWMD	0.00		
Inventory Creep (%)	NSC	0.00		
Material Requested Not Issued (%)	NSC	10.00		
Total Process Cost (¢/kWh)	NSC	0.145		
Nuclear Waste Liabilities - ONFA ($ millions) - DGR	NWMD	135.70		
Nuclear Waste Liabilities - ONFA ($ millions) - NWMO	NWMD	70.90		
Cost per Unit Execution - CIGAR Inspection ($)	IM&CS	TBD		
Cost per Unit Execution - Feeder Inspection ($)	IM&CS	TBD		
Cost per Unit Execution - Steam Generator Tube Inspection ($)	IM&CS	TBD		

Bold, underlined values indicate maximum NPI point threshold met for this measure.
Note 1: Metric is a sub-component of the WANO Nuclear Performance Index.

ATTACHMENT 5

Hypothetical Comparison of OPGN Performance to Industry Benchmarks Assuming Achievement of all Operating and Financial Performance Targets by 2014

Metric	Best Quartile	Median	Pickering A	Pickering B	Darlington
Safety					
All Injury Rate			1.2	1.2	1.2
2-Year Industrial Safety Accident Rate	0.05	0.09	0.15	0.15	0.15
2-Year Collective Radiation Exposure (man-rem per unit)	62.15	81.84	125	82	66
Airborne Tritium (TBq) Emissions per Unit	48.0	101.0	81.1	36.5	27.0
Fuel Reliability (microcuries per gram)	0.000001	0.000165	0.0005	0.0005	0.0005
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.00	0.33	0.50	0.50	0.50
3-Year Auxiliary Feedwater System Unavailability	0.0014	0.0020	0.0200	0.0200	0.0200
3-Year Emergency AC Power Unavailability	0.0024	0.0076	0.0250	0.0250	0.0250
3-Year High Pressure Safety Injection Unavailability	0.0001	0.0037	0.0200	0.0200	0.0200
Reliability					
WANO NPI (Index)	96.19	62.46	70.9	81.3	98.6
2-Year Forced Loss Rate (%)	0.68	3.79	4.00	4.00	1.25
2-Year Unit Capability Factor (%)	90.97	84.31	84.3	81	93.3
2-Year Chemistry Performance Indicator (Index)	1.00	1.01	1.04	1.04	1.01
1-Year Online Elective Maintenance (work orders/unit)	218	278	278	300	218
1-Year Online Corrective Maintenance (work orders/unit)	4	7	9	15	5
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)**	37.97	42.60	70.81	64.80	36.75
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)*	25.53	29.08	60.07	52.47	28.82
3-Year Fuel Costs per MWh ($/Net MWh)	7.62	8.15	7.45	6.01	5.43
3-Year Capital Costs per MW DER	35.49	50.03	34.73	34.67	20.37

*OPG's 2014 Total Generating Costs per MWh target is inclusive of OPEB. To ensure accurate comparison, best quartile and median values were similarly adjusted upward to account for OPEB

KEY: Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

ATTACHMENT 6

Fleet-Wide Initiatives

Top Priority Initiatives – New initiatives that require support outside of the normal course of business and identified as high priority by the functional teams

- EN-01 – Work Order Readiness (contains MA-02 and TR-07)
- EN-02 – Engineering Value for Money
- ER-01 – Standard Equipment Reliability Program
- OP-05 – Human Performance Improvement Program (contains OP-01)
- OU-02 – Outage Improvement Strategy (contains OU-01, OU-02, OU-04, OU-05, OU-06, OU-07, TR-06)
- MA-08 – Day Based Maintenance
- ER-02 – Improve PM Program

"Just do it" – New initiatives that will be completed as part of the normal course of business

- ER-03 – Critical Spares/Obsolescence
- MA-04 – Centralized Measurement and Test Equipment (give to facilities)
- MA-06 – Maintenance "Helpers"
- MA-07 – Leverage DN OEMB Process
- MA-09 – Single Source Laundry (Give to M&S)
- FS-03 – Offer Fire Training (Revenue Opportunity)
- IS-02 – Safety Behaviours Assessment
- IS-03 – Review Incident Counting Practices
- IS-04 – Constrain Training Qualifications (delay)
- FP-02 – Labour Cost Reduction (delay)
- PI-01 – CAP Improvement Program
- PI-03 – CAP is Core
- WM-01 – Backlog Reclassification
- **RP-05 – Optimize Reactor Face Shielding**
- RP-09 – Improve Fuel Machine Filtration
- TR-02 – Computer Based Training Increase
- TR-04 – Initial Authorization Training Program (redevelop initiative)

"Ongoing" – Initiatives that are currently in process and will continue until completed

- MS-02 – Inventory Management
- MS-03 – Strategic Sourcing
- IS-01 – Musculoskeletal Disorder Prevention
- OP-02 – Work Management Performance Improvement Plan
- MA-01 – Improve FIN Effectiveness
- RP-26 – Area Mapping
- EN-03 – Improve Fuel Reliability Index
- RP-10 - Detritiation of Reactor PHT
- PI-02 – Implement Human Performance Rapid Response

ATTACHMENT 7

Top 7 Performance Improvement Initiatives

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
EN-01	**Work Order Readiness** Steve Woods	Redevelop the process, procedures, organizational accountabilities, reporting relationships, authorities, metrics, and stakeholder support organizations, (specifically design engineering, procurement engineering, maintenance assessing and supply chain buyers) so that work orders are efficiently and effectively assessed, parts are available and tasked are scheduled to allow maintenance to execute work more efficiently. Four sub-initiatives will be executed to complete this improvement: EN 1.1 Implementation of an Accountability Model EN 1.2 Pro-Active Assessing Improvements EN 1.3 Establish Fleet EFIN Formal Process and Organizational Structure EN 1.4 Timely Holds Resolution Improvements
OU-02	**Outage Improvement Strategy** Jim Woodcroft	Review and implement fleet contractor management procedure (how contractor work is managed, what work is performed, when the work is scheduled, what support is available, standards for scope change/approval, revise strategic planning of contract work). Drive toward consistent use of contractors across the fleet and improve contractor efficiency, simplify resource planning, improve oversight and quality of contractor function. Improve the execution rate - the amount of work done per day. Review standard durations on critical path and look for opportunities to reduce/improve. Utilize gap analysis outage over outage and identify and implement opportunities for improvement. Integrate the scoping process of MA-0013, MA-0036, AS-0043. Make changes to the scoping process to improve timely identification and assessing prior to scope freeze milestone (PO-12). The result will be an improved scope at scope freeze milestone. Review and implement fleet standards for minimum OCC staffing requirements for best in fleet organizational structure. Ensure OCC staff involvement during outage planning phase. Develop future Outage Managers. Modify this year's lessons learned process and MA13 improvement / realignment session into OPGN's outage program by updating N-PROC-MA-0013 to allow the stations to exchange key learnings from previous years and tackle issues across the fleet. Take over running and maintenance of all outage metrics to support continuous improvement.

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
ER-01	**Standard Equipment Reliability** Paul VonHatten	Specify and implement industry standard ER program. Standardize existing elements across the fleet for efficiency and effectiveness. Establish roles and accountabilities for ER at the station and corporate level. Establish an ER peer team. Specify and implement supporting IT structure to improve ER program effectiveness and to reduce costs.
ER-02	**PM Program Improvement** Paul VonHatten	Comprehensive implementation and improvement of the Preventative Maintenance Program across the fleet. The elements of this plan include: 1. Implementation of the revised criteria for classification of component criticality. This is an enabler to the PM program effectiveness in improving equipment reliability while improving cost performance. 2. Validation and implementation of the new PM templates developed through the AP913 process. 3: Establishing methodologies to establish PM budgets linked to improved ER performance, and a focused review of the top 5 systems/components contributing to FLR and the Top 5 systems contributing to high levels of EM/CM work, and the Top 5 systems from a PM cost perspective. Although all 3 sites are currently executing various local and shared initiatives design to improve their PM Program. 4. Implementation of a robust PM feedback and review process. 5. Improvements to the PM program efficiency and effectiveness. 6. Establishing a Graded approach to Non-Critical Component Technical Basis.
EN-02	**Engineering Value for Money Improvement** Fred Dermarker	Site and central engineering groups are conducting an overall cost and efficiency evaluation aimed at staff reductions as a result of organizational realignment and a close examination of products and services. Several functions will be centralized and roles may shift between Engineering and Maintenance as well from Reactor Safety to Operations.

OPG Nuclear Operations - Top 7 Initiatives

Initiative		Description
OP-05	**Human Performance Improvement** Sean Granville Tom Henderson Frank Guglielmi	Accelerate and sustain fleet Performance Improvement through the establishment of a formal Fleet initiative. Improved organizational recognition, control and response to pre cursor events; reduction in frequency and significance of events and accelerated response to performance/behavioral underlying contributors. OPGN has been criticized for not having an obvious Fleet improvement model and leveraging the common strengths/weaknesses of the sites. Adoption of the INPO document 05-005 Guidelines for Performance Improvement at Nuclear Power Stations provides the PI model, with three main areas of PI: performance monitoring; analyzing problems, identifying and planning solutions; and implementing solutions. Sites need to take full advantage of lower level events or trends to be predictive and take corrective action to mitigate risk. Staff engagement is not fully leveraged since the results of adverse condition reporting at low levels are not quickly evident. External groups are critical of our ability to resolve underlying trends. Trending at OPGN needs to intrusive and critical, and not limited to binning. Effective implementation of solutions remains a challenge. Staff behaviors are not always guided or corrected through the use of supervisor/management oversight and intervention.
MA-08	**Days Based Maintenance** Doug Radford	OPG has a long standing practice of performing maintenance around the clock on a shift basis. This is not the industry practice. Approximately 45% of the total maintenance compliment at each site for Control and Mechanical functions are assigned to shift. The necessary work required on a 24/7 basis is estimated to be 3 FTEs for Control and 0 FTEs for Mechanical. The sole reason these staff remain on shift is to provide emergency response functions. Many of the emergency response functions they provide could be automated with currently available technology. In order to staff these functions 24/7 we require 5 staff of which only 2 are present at site in any 24 hour period. This means at any one period in time 30% of our Control and Mechanical functions are away from the stations. Studies of the productivity of shift versus day maintenance indicate days-based maintenance is more effective (regardless of working 8 or 12 hours). In addition shift premiums result in a 17% escalation in wage costs. A move towards a days-based maintenance operation will require introduction of new technology for radiation data gathering (currently done manually) and changes to the Shift Minimum Compliment document (regulatory approval required). Based on reducing current maintenance shift compliment to 25 (5 x 5 crews), the savings in shift differential would be approximately $3M per year (moving from a current shift compliment of 250 to a compliment of 75.

ONTARIO POWER GENERATION

889 Brock Road Pickering, ON L1W 3J2

February 18, 2010

NEC Members

Subject: Performance Targets for 2010-2014 Business Planning

As part of last year's business planning and benchmarking efforts, 19 performance measures with 2014 targets were identified. These targets were set to drive our organization towards reducing gaps and to meet our commitment to our shareholder and the people of Ontario of continuous performance improvement.

As a follow up, I am issuing the nuclear organization's 5-year targets for each of the 19 benchmarking targets (see attached). My expectation is that you provide your people with the direction, resources and support to address issues with new ideas so we can meet these targets. Teamwork will be essential between station and support organizations, including the peer teams, for success.

These 19 targets are integrated into our report card and AIPs, so we can monitor our effectiveness and keep our focus. Meeting these targets will be key to demonstrating how well we have done in running our business.

Wayne Robbins
Chief Nuclear Officer

OPG Nuclear Operations

Benchmarking Indicators - Targets	2010	2011	2012	2013	2014
Safety					
All Injury Rate (#/200k hours worked)	1.28	1.26	1.24	1.22	1.20
Industrial Safety Accident Rate* (#/200k hours worked)	0.15	0.15	0.15	0.15	0.15
Fuel Reliability* (micro-curies I131/g)	N/A	N/A	N/A	N/A	N/A
Reactor Trip Rate* (trips/7k hr critical)*	N/A	N/A	N/A	N/A	N/A
Auxiliary Feedwater System Unavailability* (#)	N/A	N/A	N/A	N/A	N/A
Emergency AC Power Unavailability* (#)	N/A	N/A	N/A	N/A	N/A
High Pressure Safety Injection Unavailability* (#)	N/A	N/A	N/A	N/A	N/A
Collective Radiation Exposure* (person rem/unit)	102.14	85.47	90.85	93.99	87.81
Airborne Tritium Emissions per Unit (Curies)	24,300	23,900	21,000	18,600	15,400
Reliability					
Nuclear Performance Index (%)	79.3	80.6	85.0	87.0	87.2
Forced Loss Rate* (%)	3.54	3.20	2.77	2.81	2.47
Unit Capability Factor* (%)	83.3	88.1	89.8	86.8	88.8
Chemistry Performance Indicator* (#)	1.05	1.04	1.04	1.03	1.03
On-line Elective Maintenance Backlog (work orders/unit)	380	337	318	290	261
On-line Corrective Maintenance Backlog (work orders/unit)	16	13	13	12	9
Value for Money					
Total Generating Costs per Net MWh ($/MWh)	49.41	46.86	47.10	52.28	51.22
Non-Fuel Operating Costs per Net MWh ($/MWh)	41.10	38.33	38.27	43.13	42.13
Fuel Costs per Net MWh ($/MWh)	4.32	4.77	5.15	5.33	5.36
Capital Costs per MW DER (k$/MW DER)	29.10	29.02	28.99	29.00	29.03

* Sub-indicator of WANO NPI

Darlington

Benchmarking Indicators - Targets	2010	2011	2012	2013	2014
Safety					
All Injury Rate (#/200k hours worked)	1.28	1.26	1.24	1.22	1.20
Industrial Safety Accident Rate* (#/200k hours worked)	0.15	0.15	0.15	0.15	0.15
Fuel Reliability* (micro-curies I131/g)	0.00050	0.00050	0.00050	0.00050	0.00050
Reactor Trip Rate* (trips/7k hr critical)*	0.50	0.50	0.50	0.50	0.50
Auxiliary Feedwater System Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Emergency AC Power Unavailability* (#)	0.0250	0.0250	0.0250	0.0250	0.0250
High Pressure Safety Injection Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Collective Radiation Exposure* (person rem/unit)	89.20	55.00	50.00	100.00	66.00
Airborne Tritium Emissions per Unit (Curies)	4,000	4,000	4,000	4,000	4,000
Reliability					
Nuclear Performance Index (%)	96.5	96.0	98.8	98.6	98.3
Forced Loss Rate* (%)	1.68	1.50	1.50	1.50	1.25
Unit Capability Factor* (%)	90.3	93.9	94.1	88.7	93.3
Chemistry Performance Indicator* (#)	1.01	1.01	1.01	1.01	1.01
On-line Elective Maintenance Backlog (work orders/unit)	275	250	235	225	214
On-line Corrective Maintenance Backlog (work orders/unit)	9	8	7	6	4
Value for Money					
Total Generating Costs per Net MWh ($/MWh)	36.83	35.70	36.69	43.52	40.08
Non-Fuel Operating Costs per Net MWh ($/MWh)	28.22	26.52	26.98	33.75	30.66
Fuel Costs per Net MWh ($/MWh)	4.24	4.66	5.02	5.16	5.21
Capital Costs per MW DER (k$/MW DER)	34.52	37.23	38.73	35.74	34.30

* Sub-indicator of WANO NPI

Pickering A

Benchmarking Indicators - Targets	2010	2011	2012	2013	2014
Safety					
All Injury Rate (#/200k hours worked)	1.28	1.26	1.24	1.22	1.20
Industrial Safety Accident Rate* (#/200k hours worked)	0.15	0.15	0.15	0.15	0.15
Fuel Reliability* (micro-curies I131/g)	0.00050	0.00050	0.00050	0.00050	0.00050
Reactor Trip Rate* (trips/7k hr critical)*	0.50	0.50	0.50	0.50	0.50
Auxiliary Feedwater System Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Emergency AC Power Unavailability* (#)	0.0250	0.0250	0.0250	0.0250	0.0250
High Pressure Safety Injection Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Collective Radiation Exposure* (person rem/unit)	120.52	147.00	189.00	120.00	130.00
Airborne Tritium Emissions per Unit (Curies)	11,500	11,500	9,000	7,000	6,000
Reliability					
Nuclear Performance Index (%)	60.3	61.6	68.1	73.6	76.8
Forced Loss Rate* (%)	8.00	7.00	5.00	5.00	4.00
Unit Capability Factor* (%)	73.7	82.6	85.3	84.8	86.8
Chemistry Performance Indicator* (#)	1.07	1.06	1.05	1.04	1.04
On-line Elective Maintenance Backlog (work orders/unit)	350	335	320	300	278
On-line Corrective Maintenance Backlog (work orders/unit)	10	10	10	10	9
Value for Money					
Total Generating Costs per Net MWh ($/MWh)	80.35	72.99	71.30	74.62	76.06
Non-Fuel Operating Costs per Net MWh ($/MWh)	70.12	63.37	62.38	64.63	65.78
Fuel Costs per Net MWh ($/MWh)	4.54	4.81	5.20	5.41	5.44
Capital Costs per MW DER (k$/MW DER)	36.56	34.63	27.74	33.85	36.63

* Sub-indicator of WANO NPI

Pickering B

Benchmarking Indicators - Targets	2010	2011	2012	2013	2014
Safety					
All Injury Rate (#/200k hours worked)	1.28	1.26	1.24	1.22	1.20
Industrial Safety Accident Rate* (#/200k hours worked)	0.15	0.15	0.15	0.15	0.15
Fuel Reliability* (micro-curies I131/g)	0.00050	0.00050	0.00050	0.00050	0.00050
Reactor Trip Rate* (trips/7k hr critical)*	0.50	0.50	0.50	0.50	0.50
Auxiliary Feedwater System Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Emergency AC Power Unavailability* (#)	0.0250	0.0250	0.0250	0.0250	0.0250
High Pressure Safety Injection Unavailability* (#)	0.0200	0.0200	0.0200	0.0200	0.0200
Collective Radiation Exposure* (person rem/unit)	105.90	85.18	82.63	74.98	88.53
Airborne Tritium Emissions per Unit (Curies)	8,800	8,400	8,000	7,600	5,400
Reliability					
Nuclear Performance Index (%)	71.7	74.8	79.7	82.0	81.2
Forced Loss Rate* (%)	5.00	4.50	4.00	4.00	4.00
Unit Capability Factor* (%)	76.1	81.0	84.7	84.4	81.9
Chemistry Performance Indicator* (#)	1.07	1.06	1.05	1.04	1.04
On-line Elective Maintenance Backlog (work orders/unit)	500	425	400	350	300
On-line Corrective Maintenance Backlog (work orders/unit)	25	20	20	20	15
Value for Money					
Total Generating Costs per Net MWh ($/MWh)	59.94	55.64	54.67	56.75	59.73
Non-Fuel Operating Costs per Net MWh ($/MWh)	53.14	48.95	47.54	49.12	51.87
Fuel Costs per Net MWh ($/MWh)	4.37	4.96	5.38	5.58	5.59
Capital Costs per MW DER (k$/MW DER)	16.15	12.25	13.03	15.12	16.25

* Sub-indicator of WANO NPI

Numbers may not add due to rounding.

Table 1
Operating Costs Summary - Nuclear ($M)

Line No.	Cost Item	2007 Actual	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)
	OM&A:						
1	**Base OM&A**	1,204.9	1,252.4	1,216.5	1,187.0	1,192.3	1,219.8
2	**Project OM&A**	111.6	136.5	143.7	143.8	135.9	132.2
3	**Outage OM&A**	215.6	196.1	254.8	284.6	214.8	201.1
4	**Subtotal**	1,532.0	1,585.0	1,615.0	1,615.5	1,543.0	1,553.2
5	**Generation Development OM&A**	11.8	34.1	79.5	40.5	5.9	4.5
6	**Allocation of Corporate Costs**	240.7	237.6	234.5	247.0	249.2	252.3
7	**Allocation of Centrally Held Costs**	210.2	132.2	58.8	171.0	199.0	234.3
8	**Asset Service Fee**	33.2	28.8	27.2	24.6	24.1	23.7
9	**Total OM&A**	2,027.9	2,017.7	2,015.0	2,098.6	2,021.2	2,067.9
10	**Nuclear Fuel Costs**	113.0	149.9	172.6	201.9	235.6	261.7
	Other Operating Cost Items:						
11	**Depreciation and Amortization**[1]	300.7	301.0	319.8	209.6	235.4	256.4
12	**Income Tax**	0.0	0.0	45.0	0.0	53.9	75.9
13	**Capital Tax**	7.9	7.8	7.7	2.9	N/A	N/A
14	**Property Tax**	8.2	15.0	14.2	15.0	16.0	16.6
15	**Total Operating Costs**	2,457.6	2,491.3	2,574.3	2,528.1	2,562.2	2,678.5

Notes:
1 Includes nuclear waste management variable expenses.

BASE OM&A – NUCLEAR

1.0 PURPOSE

This evidence provides a description of the nuclear base OM&A expense for the historical years, bridge year, and test period.

2.0 OVERVIEW

The nuclear base OM&A expense for 2007 - 2012 is provided in Ex. F2-T2-S1 Table 1. The test period base OM&A expense of $1,192.3M and $1,219.8M in 2011 and 2012, respectively forms part of the OM&A expense in the revenue requirement.

OPG has made significant operational and cost improvements which have been demonstrated since the previous application: Specifically:

- 2012 base OM&A costs are to be forecast to be below 2008 actual costs, with cumulative work-driven cost savings of $260M for the 2010 - 2012 period;
- 2012 regular staff levels are forecast below 2008 levels by 689 staff, while non-regular staff FTEs ("full time equivalents") are reduced by 559;
- 2009 elective and corrective maintenance backlogs are below 2008 actuals, with 2012 forecast levels for maintenance backlogs significantly lower again.
- 2009 total Nuclear FLR is below 2008 actual (2008 actual of 12.3 per cent versus 2009 actual of 6.4 per cent); with 2012 forecast levels of 2.8 per cent.

Further details are provided in this exhibit and in Ex. E2-T1-S1. Base OM&A provides the main source of funding for operating and maintaining the nuclear stations in support of:

- The ongoing production of electricity from the operating units
- Ensuring safe operation of the plants
- Maintaining or improving reliability of the nuclear assets
- Ensuring compliance with applicable legislation and nuclear regulatory requirements

In addition to the routine activities listed here, base OM&A is also used to fund the cost of:

- Regular staff labour for planned outages.

- All costs associated with forced outages and derates. Forced outages, in particular, can require significant efforts to address the cause of the outage and return a unit to operation. As these are unplanned events for which no budget is provided, other base OM&A work is carefully reviewed, and very selectively reduced or deferred on a prioritized basis to accommodate this effort. (See Ex. F2-T4-S1 section 5.0 for further details of outage costing.)
- Inventory adjustments that periodically re-value inventory (see section 2.2), including an obsolescence provision.
- Indirect costs associated with commercial activities and providing inspection and maintenance services to OPG's stations and external customers.

While base OM&A is the predominant funding source for the nuclear business, there are other sources of funding as noted here:

- Outage OM&A (Ex. F2-T4-S1), which provides incremental funding for work performed during planned outages, excluding regular staff labour (as noted above), and excluding all project OM&A or project capital work executed during the outage (as described in Ex. F2-T3-S1 and Ex. D2-T1-S1).
- Fuel Cost (Ex. F2-T5-S1), which covers all nuclear fuel bundles issued for loading into the reactors, the variable cost component of OPG's nuclear used fuel management liabilities as well as the cost of fuel for standby generators.
- Project OM&A (Ex. F2-T3-S1) and project capital (Ex. D2-T1-S1), which fund non-repetitive, incremental work reflecting an investment of greater than $200k per unit.
- Decommissioning Fund (Ex. C2-T1-S1) which funds the Pickering A Unit 2 and 3 Safe Storage Project, and will ultimately fund decommissioning activities and management of low and intermediate level waste at all OPG reactors.
- Used Fuel Fund (Ex. C2-T1-S1) which funds the handling of used fuel when it is removed from the irradiated fuel storage bay.
- Provision funding, to manage other nuclear waste obligations in the short term (Ex. C2-T1-S1).
- Nuclear Generation Development (Ex. F2-T7-S1), which funds the activities in support of Darlington Refurbishment and New Nuclear Generation at Darlington.

As discussed at Ex. A1-T4-S3, the Nuclear business unit is comprised of Nuclear Operations, Darlington New Nuclear Project and Nuclear Refurbishment, Projects and Support. As noted in Chart 1, in addition to the three generating stations (Pickering A, Pickering B, and Darlington – as described in Ex. A1-T4-S3), the support divisions within Nuclear Operations are: Engineering, Programs and Training, Supply Chain, Performance Improvement and Nuclear Oversight ("PINO"), Nuclear Waste Management and Nuclear Level Common.

Chart 1: Nuclear Operations Divisions/Functions

	Chief Nuclear Officer
Stations	- Pickering A
	- Pickering B
	- Darlington
Support Divisions	- Nuclear Engineering
	- Programs and Training
	- Supply Chain
	- Performance Improvement and Nuclear Oversight
	- Nuclear Waste Management
	- Nuclear Level Common
	SVP Nuclear Refurbishment, Projects and Support
Support	- Nuclear Facilities, Nuclear Facility Management
	- Inspection, Maintenance and Commercial Services
	- Projects & Modifications

The three functions of Nuclear Facilities/Facility Management, Projects and Modifications, and Inspection, Maintenance and Commercial Services were transferred without change of function or incremental costs to the newly-created position of SVP - Nuclear Refurbishment, Projects and Support in 2009. This was done to consolidate nuclear projects and non-core support organizations under one OPG senior executive, and allow the Chief Nuclear Officer ("CNO") to focus solely on the core business of operating and improving the operation of the ten in-service units.

This base OM&A evidence addresses the budget for the Nuclear Operations business unit, as well as those aspects of the Projects and Support budgets indicated above which are directly related to ongoing nuclear operations. In total, these functions represent Nuclear Operations as described in this filing.

The expenditures for Darlington New Nuclear and Nuclear Refurbishment are addressed at Ex. D2-T2-S1**.**

Base OM&A is budgeted on an organizational basis as well as by using a series of standard resource types to ensure appropriate resources to execute planned work. Specifically, the major resource types used in budgeting are:

- Labour: Salary and benefit costs of staff on OPG's payroll, both regular and temporary.
- Overtime: Pay for staff on OPG's payroll, both regular and temporary, for work outside of normal hours of work.
- Augmented Staff: The costs of specialized, incremental staff resources paid by purchase order, but supervised by OPG staff; for example, specialised engineering staff supplementing core resources for peak workload.
- Materials: The costs of all consumables, replacement parts, and associated transportation service costs incurred in performance of ongoing maintenance and repair work, as well as the cost of all such items used during forced outages.
- Licence: The costs of licensing-related fees paid to the Canadian Nuclear Safety Commission ("CNSC").
- Other Purchased Services: The costs of specialized resources paid by purchase order, but supervised by an external company; e.g., construction and maintenance services, personal protective equipment laundry services, specialised technical services including research and development, testing services and security services. This category also includes direct costs of inspection and maintenance services provided to the stations.
- Other: The costs of miscellaneous items such as staff travel, fees to industry peer groups, utility expenses (water, sewage, and electricity for administration buildings), inventory adjustments, and contingency provisions.

Exhibit F2-T2-S1 Table 1 provides a summary of base OM&A over the 2007 - 2012 period, by organization and function. Exhibit F2-T2-S1 Table 2 provides a summary of base OM&A over the 2007 - 2012 period by resource type.

2.1 Operational Functions Supported by Base OM&A

The Nuclear business plan outlines base OM&A requirements for each generating station and support division, as noted previously. A detailed description of the activities performed by these divisions was provided in Ex. F2-T2-S1 in EB-2007-0905 and is not repeated here. A summary description is provided below.

For the operational functions listed below, the vast majority of funding is provided by base OM&A. However, some functions are partially funded by project OM&A (Ex. F2-T3-S1), outage OM&A (Ex. F2-T4-S1) or project capital (Ex. D2-T1-S1), as outlined in those exhibits.

2.1.1 Operational Functions within the Generating Stations

At each of the generating stations, operational functions are broken down into four main components: Operations and Maintenance, Station Engineering, Work Management, and Support Services as described below. In addition, for the Pickering site, there is a fifth function, noted as Common Services.

- Operations and Maintenance includes:
  - Operations: Operations staff operate the plant on a 24-hour basis, which includes starting up and shutting down components/systems/plant, system monitoring, ensuring safety of stations operations, responding to non-standard conditions, and performing activities associated with preparing and placing systems and components in-service and out-of-service for maintenance. The CNSC approves the Operations organization structure, including mandating minimum shift complement to address foreseeable emergency response requirements.

- Maintenance: Performs all activities directly related to the preventive, elective, and corrective maintenance of structures, systems, or components so as to address material condition issues, maintain equipment reliability, and optimize equipment life.
- Fuel Handling: Includes all activities in support of refuelling the reactor during unit operation; maintenance of the fuelling machines, and related systems; support of outage activities requiring fuelling machine or related systems; and, management of new fuel storage.
- Radiation Protection, Chemistry, and Environment: Includes assistance with radiation protection during plant operation and maintenance activities, and administration of the program for keeping radiation As Low As Reasonably Achievable ("ALARA"); operation of the chemistry lab; environmental compliance and monitoring; and, assistance in managing plant chemistry.

- Station Engineering: Provides engineering oversight, analysis, and support for Work Management and Operations and Maintenance at the stations in the areas of components and equipment, performance engineering, plant design, and reactor safety.

- Work Management: Includes two main functions – Work Control and Outage Planning. The Work Control function utilizes a 16 week rolling schedule to ensure corrective, elective, and preventive maintenance is performed effectively and efficiently. The Outage Planning function (funded by base OM&A) supports outage execution by utilizing an 18 month planning process to develop specific milestones for critical activities such as scope definition, long lead materials, schedule development, and pre-requisite work.

- Support Services: Generally includes Business and Strategic Planning, Fire Protection, and station-specific aspects of both PINO (see section 2.1.2), and Regulatory Affairs. In more detail:
  - Business Support is accountable for the station-specific accounting/controllership function, cost reporting and analysis, and business plan coordination.
  - Strategic Planning is accountable for producing long range outage plans; supporting outage scoping, forced loss rate assessments, and asset management/investment

planning efforts; and, providing support for financial modeling of staffing requirements.

- Fire protection is accountable for around-the-clock fire protection, first aid, and hazardous materials response at the stations. In addition, they are accountable for fire safety inspections, and performing surveillance of fire protection systems and equipment. There is a minimum staffing level specified in each station's operating license. (For the Pickering site, this function resides in Pickering B Maintenance, and provides fire protection services to Pickering A and B).
- PINO is accountable for managing each station's human performance, operating experience and corrective action programs, supporting station performance improvements, and providing support to the corporate audit function.
- Regulatory Affairs is accountable for managing the station regulatory affairs function, in particular, interactions with the CNSC. For the Pickering site, this is a common function managed by Pickering B.

Pickering Common Services: operates and maintains station and site support systems for Pickering A and B, specifically, management of heavy water and operation of facilities common to Pickering A and Pickering B (e.g., heavy water upgraders and radioactive waste management). These services are planned, budgeted and managed by Pickering A staff, though for calculations of total generating cost (as defined in Ex. F2-T2-S1) by station and all tables accompanying in this application, these costs are allocated to Pickering A and B on a per unit basis.

While work activities and associated organization structures are to a large extent consistent across generating stations, there are some areas where OPG has pursued cost efficiencies through consolidation. Specifically, as noted above, Pickering A manages common services for both Pickering A and B, while Pickering B manages a common Chemistry and Environment Department, as well as the Regulatory Affairs and Fire Protection functions.

The Tritium Removal Facility ("TRF"), located at Darlington, provides tritium removal services to all OPG nuclear stations and third party customers (as discussed in Ex. G2-T1-S1).

In addition to these ongoing operational functions, Ex. F2-T2-S1 Table 1 and associated tables include two non-standard operational functions that are also funded by base OM&A. Specifically, Pickering B Continued Operations and Pickering B Refurbishment. These activities are discussed in detail in Ex. F2-T2-T3.

Within the stations, the majority of base OM&A costs are with the Operations and Maintenance functions. The relatively lower base OM&A cost for operating Pickering A reflects the fact that it is a two unit station versus four units at Darlington and Pickering B. As there are certain minimum functions required at a station regardless of the number of units supported, resources required for Pickering A do not reflect a simple 50 per cent pro-rating of Pickering B resources. The relatively higher cost of Darlington with respect to its four-unit counterpart Pickering B reflects primarily the costs of operating the TRF at Darlington. Further breakdown of the station functions and an explanation of cost trends can be found in Ex. F2-T2-S2.

2.1.2 Operational Functions within the Support Divisions

Support divisions are accountable for providing specialized services to the generating stations, as well as the common procedural framework within which the stations operate. Key functions of the support divisions are outlined here.

Engineering is accountable for:

- Engineering Services, including non-station specific engineering support, project design support, nuclear safety analysis, and life cycle plans for steam generators and fuel channels.
- Science and Technology Development, which provides administration of the nuclear research and development program (see Attachment 1) as well as specialized technical support for key nuclear plant systems and equipment.
- Engineering Codes, Standards and Quality Programs, which provides expert-level support on nuclear industry codes and standards; interfaces with technical standard organizations (the CNSC, as well as Technical Standards and Safety Association, and

Canadian Standards Association); and, manages governance for programs such as the engineering change control program.

Projects and Modifications, which functions as an internal general contractor, is accountable for executing or managing the execution of the majority of project work carried out at the generating stations or their associated sites. Project work (in contrast to base OM&A work) is defined at Ex. D2-T1-S1. While the Projects and Modifications function is primarily funded by project OM&A and capital (Ex. F2-T3-S1 and Ex. D2-T1-S1), Projects and Modifications also provides a limited amount of operational support to the stations which is funded by base OM&A.

Programs and Training consists of three basic units, with accountabilities as described here:

- Nuclear Programs and Training designs and delivers required training across the Nuclear organization. This includes conventional safety, general orientation, licensed and non-licensed operator training, skilled trades, engineering and leadership training. Nuclear Programs and Training also maintains the nuclear-wide programs and procedures used by all stations in the areas of Operations, Maintenance, Radiation Protection, Fire Protection, Work Management, Heavy Water Management and Emergency Preparedness. This function also includes central Regulatory Affairs, accountable for developing/maintaining the regulatory programs for nuclear divisions and providing both strategic direction and support to stations.
- Security, which provides security services for nuclear sites and facilities, and ensures compliance with all CNSC security requirements.
- Records and Administration, which provides centralized business services (clerical/administration/records), and maintains the governing document framework for all nuclear divisions.

Nuclear Facilities and Facilities Management is accountable for managing all nuclear facilities outside of the protected areas of the generation stations, but within the station boundaries.

Supply Chain is accountable for providing the materials and services required by the Nuclear business, including fuel purchases.

PINO is a central support function that provides the audit function for station operations.

Inspections, Maintenance and Commercial Services functions are for:

- Providing Inspection and Maintenance Services to supplement those carried out by station staff, where the nature of the skills or equipment required makes these more effectively managed as a central function for all stations. Direct costs associated with provision of inspection and maintenance services to OPG stations during outage are presented in Ex. F2-T4-S1, while direct costs associated with external services are discussed in Ex. G2-T1-S1. Costs set out in nuclear base OM&A evidence (Ex. F2-T2-S1 and Ex. F2-T2-S2) are the indirect costs of this function.
- Commercial services, which includes marketing and management of sales of isotope products and services to third parties (see Ex. G2-T1-S1), and managing the Bruce Lease (see Ex. G2-T2-S1). Direct costs associated with external services are discussed in Ex. G2-T1-S1. Costs set out in nuclear base OM&A evidence (here and Ex. F2-T2-S2) are the indirect costs of this function.

Waste and Transportation Services is a function within the Nuclear Waste Management Division, which is also accountable for radioactive waste and used fuel management operations at the stations, and limited conventional waste and transportation service support to the stations. The function of conventional waste and transportation services is funded by base OM&A. This application includes the costs and full time equivalents ("FTE") associated specifically with this work, which includes: managing recycled conventional wastes; providing conventional waste transportation services for all stations.

Expenditures to manage radioactive waste and used fuel management operations are funded by Nuclear Waste Liabilities (see Ex. C2-T1-S1).

Nuclear Level Common includes centralized costs required to manage the Nuclear business overall that are not directly attributable to any one plant or support organization. Typical costs include nuclear level consulting contracts. In addition, Nuclear Level Common includes the labour price variance, which is the difference between actual nuclear payroll costs incurred and the standard labour costing model used in the divisions to facilitate resource planning and cost reporting. For example, the business plan labour cost forecast is established using standardized labour rates calculated for job families, whereas actual costs reflect the true payroll cost for each employee.

Within the support divisions, the largest cost is with Programs and Training, reflecting the significant level of infrastructure associated with providing core services in the key areas outlined above, including developing and delivering training, managing the overall security function for the generating stations and support divisions, administrative support and records management. Further breakdown of Programs and Training functions, and explanation of year-over-year trends for all support divisions can be found in Ex. F2-T2-S2.

2.2 Resources Required to Execute Base OM&A Work Programs

Exhibit F2-T2-S1 Table 2 presents the mix of resources required to execute the broad range of base OM&A functions. Further details of each resource type are provided here.

Labour: The majority of base OM&A costs are labour, averaging 76.7 per cent of total base OM&A expenditures over the test period. Labour costs reflect staffing levels and wages; including negotiated labour agreements for unionized staff (see Ex. F4-T3-S1). The labour rates used to derive Nuclear base OM&A include staff wages and payroll benefit costs, and are therefore impacted by wage rate increases, payroll burden changes as well as accounting provisions for a 53rd fiscal week in 2012 (see Ex. F2-T2-T1 Table 3).

Other Purchased Services: After labour, the next largest cost element is other purchased services, averaging 8.4 per cent of total base OM&A over the test period. For the generating stations, other purchased services represents work done by specialized contractors, such as laundry services, maintenance contractors, material repairs, environmental compliance

testing, facility services, as well as engaging external contractors to perform base work that cannot be accomplished due to staff shortages or the need for specialised skills. For the support divisions, other purchased services again reflects some coverage for regular staff vacancies, but more significantly, nuclear safety analysis services, research and development ("R&D") program contract costs, and contracted security services (pending completion of transition to OPG security forces). For further details regarding purchased services, see Ex. F2-T6-S1.

In the case of the R&D program (noted as Other Purchase Services, above), services are contracted to the CANDU Owners Group, an association conducting research and development work on industry-wide issues which allows utilities to share R&D costs, Specifically, Atomic Energy of Canada Limited pays 25 per cent of the costs, while the balance is divided between participating utilities that includes OPG, Hydro Quebec, Bruce Power, and New Brunswick Power on the basis of the number of nuclear generating units. For further details of the R&D, see Attachment 1.

Materials: Materials (averaging 6.7 per cent of total base OM&A over the test period) are the next most significant component of base OM&A costs. Costs include all consumables and replacement parts used in the performance of ongoing maintenance and repair work, as well as items used during forced outages (charged to base OM&A, as indicated above).

Overtime: Overtime (averaging 2.6 per cent of total base OM&A over the test period) covers the cost of staff working beyond core hours, for example; during forced outages or urgent repairs, coverage of licensed positions and providing backup for absent staff so as to maintain minimum staff complement on shifts. In addition to the other purchased services resource type, overtime is also used to perform work impacted by unfilled vacancies. In the support divisions, the majority of overtime is associated with maintaining CNSC-mandated minimum staff complement.

Other: The resource type Other (averaging 3.5 percent of total base OM&A costs over the test period), covers costs related to utilities for nuclear facilities (water, sewage, electricity for

administrative buildings), maintenance of OPG work equipment and vehicles, and travel and accommodations for staff (associated with off-site technical training, participation in industry conferences, technical standard working committees, World Association of Nuclear Operators audits as well as conducting supplier audits by Supply Chain). The final component of Other is inventory adjustments, which are addressed in two ways:

- An inventory valuation provision, which is assessed on a quarterly basis and adjusted as required. The provision addresses inventory which has been de-valued due to shelf-life expiry and subsequent disposal, and inventory losses identified through the cycle count or physical verification process**.**
- An obsolescence provision, which is assessed on an annual basis. The provision recognizes the unique nature of the majority of nuclear materials, and their limited use outside of OPG, by allocating (depreciating) the expected residual inventory value at end of station life over the remaining station life. This provision also addresses the cost impact of technical obsolescence, due to design changes or other technical factors that would preclude inventory use within the stations.

License: The resource type License (averaging 1.7 percent of total base OM&A over the test period) covers fixed costs of the station operating licences, as well as a forecast of the costs to be charged by CNSC on a fee-for-service basis relating to services for review of additional work programs such as refurbishment and new nuclear build programs.

Augmented Staff: The resource type Augmented Staff (averaging less than 0.3 per cent of total Base OM&A over the test period) reflects the limited costs of engaging external personnel to backfill for vacancies within the organization or provide specialized expertise within an organization.

3.0 INITIATIVES AND TRENDS

As outlined in Ex. F2-T1-S1, the 2010 - 2014 Nuclear business planning process incorporated the recommendations from the 2009 nuclear benchmarking initiative. The resulting OPG Nuclear business plan therefore specifies financial and operational targets to address performance gaps identified during the benchmarking initiative.

As part of the business planning process, fleet-wide and divisional initiatives were then developed to achieve operational performance targets, with much of this effort carried out by base OM&A resources described in this exhibit.

To achieve the divisional financial performance targets, the business planning process developed a number of fleet level "value for money" initiatives, again supplemented by specific divisional cost control initiatives. Further discussion on operational and financial initiatives is provided in section 3.1.

The associated Nuclear base OM&A budget (established through the business planning process) has been subjected to rigorous review and challenge by the CNO and SVP Nuclear Refurbishment, Projects and Support prior to further senior executive review at the corporate level. The budget was ultimately presented to OPG's Board of Directors for final approval as part of the overall business plan. Exhibit F2-T2-S1 Table 1 provides a summary of base OM&A over the 2007 - 2012 period, including the approved budgets for the test period.

3.1 Business Plan Major Objectives/Focus Areas

As indicated in Ex. F2-T1-S1, the 2010 - 2014 Business Plan indicates specific major objectives and focus areas that will drive nuclear work programs, and impact base OM&A efforts. These priority programs are outlined here.

- Development and execution of fleet-wide performance improvement initiatives, and additional divisional initiatives as required to achieve nuclear performance targets set during business planning. As noted above, these initiatives will be largely executed by base OM&A resources. Further discussion can be found in section 3.3.

- Execution of Pickering B Continued Operations initiative, to sustain base load generation until 2020 (units 5 and 6 to 2018, units 7 and 8 to 2020). This work primarily entails extended outages due to larger and consequently longer inspection programs (boilers and pressure tubes) to ensure fitness for continued service. In addition to the impact on

generation (see Ex. E2-T1-S1), the Continued Operations initiative impacts project OM&A, outage OM&A and base OM&A. Details of the initiatives and associated benefits are provided in Ex. F2-T2-S3, and associated base OM&A costs and FTEs are included in this exhibit.

- Continuing to improve plant reliability. The primary driver of generation reliability is plant condition and, to address this, Pickering A has undertaken an Equipment Reliability Restoration program. Details of this program, and related initiatives for Pickering B and Darlington, are provided in Attachment 2.

- Proceeding with Pickering A and Pickering B consolidation into one station (including confirmation of benefits and defining the target structure) to benefit from economies of scale. This initiative and the forecast benefits are described further in section 3.3.

3.2 Base OM&A Trends

Base OM&A activities over the period 2007 - 2012 reflect a continued emphasis on improving plant material condition (corrective and elective maintenance activities) as well as maintaining plant condition (preventive maintenance activities). There is also continued focus on sustaining the benefits of previous improvement programs (to retain improved performance until end of plant life), details of which are provided in Attachment 3 for reference.

While the business planning process has historically had a performance improvement focus, the 2010 - 2014 planning process evolution has made the process more rigorous. As a result, 2010 - 2012 base OM&A budgets reflect an even stronger focus on cost control as driven by the recent benchmarking efforts -- resulting in forecast 2012 base OM&A levels that are lower than actual 2008 costs (Ex. F2-T2-S1 Table 1). Achieving these nuclear cost control targets will present a significant challenge, but one that OPG is committed to meet.

3.2.1 Cost Trends and Reductions

OPG Nuclear has been successful in keeping test period base OM&A costs lower than 2008.

As shown in Ex. F2-T2-S1 Table 1 and as further analysed in Chart 2 below, base OM&A costs increased to approximately $1,252M in 2008 to support ongoing improvement efforts at the stations, and are forecast to remain below 2008 actual cost levels through 2012. This is a clear demonstration of the significant cost containment efforts that OPG has undertaken and is planning for the bridge and test periods. This achievement is particularly noteworthy given the cost pressures over this period from cumulative labour cost escalation, payroll burden change and accounting for the 53rd fiscal week in 2012 (approx. $86.4M over the 2010 - 2012 period, as noted in Chart 2 below, and Ex. F2-T2-S1 Table 3) and the incremental costs required for Pickering B Refurbishment and Continued Operations activities (approximately $43.4M in the same period, Chart 2 below and Ex. F2-T2-S1, Tables 4 - 6). As summarized in Chart 2, this indicates net cumulative cost reductions in the bridge and test period of over $260M (averaging 7 per cent per year) due to improvement initiatives and cost containment efforts. Further details of cost control efforts are provided in section 3.3.

In addition to the impact of cost reduction efforts, base OM&A costs are impacted by the 2009 decision to exit the contract with Bruce Power for the provision of Inspection and Maintenance Services (see Ex. G2-T1-S1). OPG is forecasting a base OM&A reduction of $1.8M in 2010 and $3.0M in 2011 and $3.9M in 2012 as a result of this decision.

Chart 2:
Base OM&A Cost Control Results

	Base OM&A ($M)	Actual 2007	Actual 2008 (Note 1)	Actual 2009	Plan 2010	Plan 2011	Plan 2012	Cumulative 2010-12 vs. 2008
1	Base OM&A	1204.9	**1243.4**	1216.5	**1187.0**	**1192.3**	**1219.8**	
2	Base OM&A Change versus 2008				(56.4)	(51.1)	(23.6)	(131.1)
3	Less: Escalation/53rd week in Base OM&A				(0.9)	39.5	47.8	86.4
4	Less: PB Continued Ops/Refurb in Base OM&A				11.0	17.7	14.7	43.4
	Equals:							
5	Base OM&A - Net change versus 2008				**(66.5)**	**(108.3)**	**(86.1)**	**(260.9)**
6	Base OM&A - Net change versus 2008				**-5.3%**	**-8.7%**	**-6.9%**	

Note 1: Excludes $9M of PB Refurb Costs, for consistency with 2010-2012.

3.2.2 Regular Staff Labour Trends and Reductions

As presented in Ex. F2-T1-S1 Table 14 and as summarized in Chart 3 below, total Nuclear Operations regular staff FTEs peaks at 7,348 in 2008 (with completion of the majority of pre-existing improvement programs) trending down to 6,659 regular staff in 2012. Adjusting for the impact of non-standard activities (Pickering B Continued Operations, Pickering B Refurbishment and P2/P3 safe storage project), Chart 3 presents an even more aggressive picture; with regular staff declining from 7,207 in 2008 to 6,586 in 2012, for a reduction of 621 FTEs (8.6 per cent) from 2008 levels.

Chart 3:
Regular Staff Trends

		Headcount			Full Time Equivalents		
	Regular Staff	**Actual 2007**	**Actual 2008**	**Actual 2009**	**Plan 2010**	**Plan 2011**	**Plan 2012**
1	Nuclear Operations -- Gross Total	7281	7348	7332	7155	6810	6659
2	Less: PB Continued Ops/PB Refurbishment	50	24	11	53	87	73
3	Less: P2/P3 Safe Storage Project	108	117	126	55	0	0
4	Nuclear Operations -- Net Total	7123	7207	7195	7047	6723	6586
5	Regular Staff - Net Change vs 2008			(12)	(160)	(484)	(621)
6	Regular Staff - Net Change vs 2008			-0.2%	-2.2%	-6.7%	-8.6%

Exhibit F2-T2-S1 Table 14 provides further insight into staff trends over the bridge and test period. Forecast 2012 staff levels for all stations and support divisions are less than 2008, with the exception of the Facilities Management function – where apparent increased staff levels reflect the filling of a large number of vacancies that existed in 2007, when the work was accomplished by non-regular staff and overtime.

A significant reduction in non-regular staff is also forecast in Ex. F2-T1-S1 Table 13; with 161 non-regular staff FTE forecast for 2012, versus 720 FTE in 2008. This reduction reflects: divisional cost control efforts introduced in 2010 - 2014 business planning, focused on discretionary cost reduction.

It should be noted that the information provided in Ex. F2-T2-S1 Tables 13 and 14 and referenced above includes staff funded by all sources (base OM&A, outage OM&A, project capital and OM&A, decommissioning provision for P2/P3, etc.). In addition, some of the reductions are the result of discontinuing inspection and maintenance service agreements with Bruce Power. Specifically, exiting the Bruce Power agreements accounts for 15 FTEs in 2010 and a further 49 FTEs in 2011 of the forecast IMS staff reductions for a total of 64 FTEs going forward. The great majority of regular staff reflected above are base OM&A funded, and the regular staff reduction trends most significantly reflect base OM&A improvement efforts.

3.3 Cost Containment/Performance Improvement Initiatives

As indicated above, the 2010 - 2014 Business Plan drove a series of initiatives that impact base OM&A expenditures over the test period. These include: a series of proposed fleet-wide improvement initiatives intended to support achievement of 2014 performance targets; and, specific divisional initiatives to support achieving cost control targets in the early years of the business plan (2010 - 2012).

- The fleet-wide initiatives (as identified in Ex. F2-T1-S1) identify process or system level improvements that potentially benefit all stations. The seven highest impact initiatives were presented to the OPG Board of Directors during business plan approval, and are listed here:
  - EN-01: Work Order Readiness (Reliability Cornerstone)
  - OU-02: Outage Improvement Strategy (Reliability Cornerstone)
  - ER-01: Standard Equipment Reliability (Reliability Cornerstone)
  - ER-02: Preventive Maintenance Program Improvement (Reliability Cornerstone)
  - EN-02: Engineering Value for Money Improvement (Value for Money Cornerstone)
  - OP-05: Human Performance Improvement (Human Performance Cornerstone)
  - MA-06: Days Based Maintenance (Value for Money Cornerstone)

  Of these seven initiatives, four are associated with the reliability cornerstone (supporting achievement of associated operational performance targets identified during business

planning). OP-05 supports human performance improvement targets. Improvement Initiatives EN-02 and MA-06 are value for money initiatives, the primary focus and benefit of which is cost control. However, the nature of the fleet-wide improvement initiatives is such that they require more detailed planning and assessment prior to implementation, and are therefore more related to achieving 2014 performance targets. As a result, and as discussed further below, the majority of the 2010 - 2012 year-over-year cost savings are the result of divisional cost control efforts as opposed to the fleet-wide initiatives.

- The divisional cost improvement initiatives are expected to close or narrow the remaining financial target gaps. The majority of the cost savings noted in section 3.2.1 are the result of aggressive support division and station efforts to control overtime, and to reduce purchased services and discretionary costs to the greatest extent possible. For example, contractor “in-processing” time; introducing efficiencies to reduce the cost of internally-provided, on-line inspection and maintenance services for the stations; and, numerous divisional efforts to reduce FTEs through process improvement and organizational consolidation.

One such divisional initiative is the proposed Pickering A and B site consolidation effort. As noted in Section 2.1.1, numerous departmental consolidation activities have been implemented across the Pickering site; for example, Pickering A manages common services for both Pickering A and B, while Pickering B manages a common Chemistry and Environment Department, as well as the Regulatory Affairs and Fire Protection functions for both Pickering stations. The natural evolution of this process was to seek out and capture any remaining economies of scale, up to and including the combination of the two stations into a single organizational unit. Following completion of the upcoming Vacuum Building Outage in 2010, a study will be undertaken and more detailed proposal developed. In anticipation of a financial benefit, the reductions indicated in Chart 4 have been built into the 2010 - 2014 business plan.

Chart 4: Forecast Benefits of Pickering A and B Consolidation

Savings $M/FTEs	2010	2011	2012
Total Savings	$1.0M / 0 FTEs	$3.6M / 28.5 FTEs	$7.6M / 48 FTEs

LIST OF ATTACHMENTS

ATTACHMENT 1

Research and Development Program Overview

Objective

The objective of the Research & Development ("R&D") program is to develop tools and methods to address technical, design basis, and operational issues in its fleet of CANDU reactors.

Background

There is a CNSC regulatory obligation to fund nuclear research. Experience has shown that R&D in support of OPG's nuclear plants is most cost-effectively handled on a shared-basis with other CANDU owners, and that is the basis for the programs outlined below.

Program Overview

OPG is planning to invest approximately $16M per year during the test period on nuclear R&D programs in partnership with other industry participants. Costs are shared on a per unit basis. As outlined in Chart 1 below, the main elements are:

- The CANDU Owners Group ("COG") R&D Program (approximately $41M/yr), shared by OPG (approximately $13M/yr, as indicated in Chart 1), Bruce Power, Atomic Energy of Canada Limited ("AECL"), Hydro-Quebec, New Brunswick Power, and SNN of Romania.
- The COG Joint Program includes additional, small-scale R&D programs that OPG undertakes jointly with one or more COG members.
- Membership in the U.S. Electric Power Research Institute ("EPRI") Nuclear Sector, shared by OPG, Bruce Power, Hydro Quebec, New Brunswick Power, and SNN of Romania.
- University Network of Excellence in Nuclear Engineering ("UNENE") research and training programs shared by OPG, Bruce Power, and AECL.

To achieve the objectives noted above, the program focuses on the following key areas:

- Addressing safety issues and resolving regulatory-mandated generic action items.

- Developing, validating, and qualifying industry standard computer codes used in nuclear safety analysis. They include modeling containment response, thermal hydraulics, reactor physics, and fuel and fuel channels.
- Investigating materials and system aging issues that impact the safety, reliability and economic performance of the plants. This work encompasses a broad range of components including fuel channels, feeders, and steam generators. It develops mitigation strategies, non-destructive examination methods and tools, fitness-for-service guidelines, and assessment techniques. The work is focused on CANDU-specific issues for which solutions are not available in international R&D programs.
- Addressing radiation protection and environmental safety issues to ensure that the impacts of nuclear plant operations on people and environment are as low as reasonably achievable.
- Providing access to the EPRI Nuclear R&D program. This U.S. research program addresses a broad range of topics in material reliability and life cycle management, risk and safety management, corrosion and chemistry control, instrumentation and control, non-destructive examination, and equipment assessment. Although primarily focused on light water reactor issues, the technology created by the EPRI programs is relevant to CANDU.
- Creating a university-based nuclear engineering program: The UNENE initiative sponsors university-based research on critical CANDU topics, trains nuclear professionals and creates a network of credible experts for public, industry, and regulatory consultations.

Program Benefits

The R&D program comprises a large number of projects. The majority of these have produced results which have been of direct benefit to the safe, reliable and economic operation of the OPG plants. The following examples outline typical benefits of the R&D program.

- Pressure tube technology: Pressure tubes are CANDU-unique components that operate under harsh conditions. Understanding pressure tube degradation mechanisms is important to ensure that CANDU units operate safely. The CANDU Owners Group R&D program is the principal source of understanding of pressure tube behaviour.

- Safety and Licensing: OPG manages long standing design basis issues and newly developing issues using results from the R&D program.
- Components and Materials: The large number of components unique to CANDU reactors poses challenges, and R&D results have been beneficial in addressing many issues.
- Health and Safety: CANDU reactors pose some unique radiological and environmental hazards which are addressed through the R&D program. For example, validation of the model for calculating derived release limits and annual dose to the public, to provide assurance to OPG's stakeholders, regulators, and the public that the calculated annual dose is correct.
- Feeders: Feeders are CANDU-specific components which have aged unexpectedly. Industry-wide R&D has determined the mechanism of feeder thinning and has tested the impact of potential mitigation methods. An extensive array of inspection tools has been developed to characterize the thinning of the feeders and other aging mechanisms. A "fitness for service guideline" has been developed to provide guidance on managing all forms of feeder aging.
- EPRI products and services: The use of EPRI products has grown over the past four years and the value of utilized products has increased to nearly $30M/year. Numerous cases of beneficial application of EPRI products have been reported, which represents major financial benefits in avoiding forced outages or very expensive solutions.

In addition to the work outlined here, the Fuel Channel Life Cycle Management Project (see. Exhibit F2-T3-S1) can also be considered as a Nuclear R&D initiative. While this project is being managed as a COG Joint Program, the costs are incremental to those shown in Chart 1.

Resource Profile

Chart 1:
Research and Development Program Resource Profile

($M)	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
	Actual	Actual	Actual	Plan	Plan	Plan
COG R&D Program	12.7	13.6	13.8	13.6	13.2	12.9
COG Joint Programs	1.3	1.2	1.0	0.5	0.5	0.5
EPRI	1.5	1.4	1.6	1.5	1.6	1.6
UNENE	0.9	0.9	0.7	0.9	0.9	0.9
Total	**16.5**	**17.2**	**17.1**	**16.5**	**16.2**	**15.8**

ATTACHMENT 2

Equipment Performance Improvement Initiatives

Objective

In order to safely, efficiently, and reliably operate nuclear units, it is essential that plant equipment is operated and maintained to industry-accepted standards. The objective of this program has therefore been to develop processes (or adopt them from other utilities) for: assessing nuclear system performance; setting equipment performance improvement targets as part of the annual business planning process; and, investing the required resources to achieve targets.

Background

Maximizing a generating unit's equipment availability directly supports reliable and cost-effective electricity generation. Not only is this the business strategy and operating philosophy of OPG, but it is the expectation of both the CNSC and World Association of Nuclear Operators.

Consistent with the setting of value for money targets described in section 3.1, and as outlined in Ex. F2-T1-S1, the 2010 - 2014 business planning process confirmed on-line elective maintenance backlogs and on-line corrective maintenance backlogs as appropriate metrics for external benchmarking. On-line corrective maintenance backlog is a measure of the number of out-of-service or broken pieces of equipment (e.g., a pump which will not operate). On-line elective maintenance backlog is a measure of the number of pieces of equipment that can still operate, but have a deficiency (e.g., an oil or water leak) that could develop into a corrective maintenance problem. Top down targets were then set during business planning to drive performance improvement.

Program Overview

Equipment Performance Improvement consists of two primary areas: maintenance backlog reduction at all stations; and, the supplemental "equipment reliability restoration program" at Pickering A.

On-line Maintenance Backlog Reductions

As opposed to a standalone program, this initiative is a collection of station programs to improve the performance of the units. Additionally, each station's improvement plan will have elements to address equipment reliability and human performance.

Since 2007, OPG has been focusing resources on programs to reduce outstanding on-line maintenance items (backlogs) with the goal of improving reliability and reducing the number of forced production losses due to unplanned outages. Backlog reduction initiative efforts are largely funded by base OM&A and stations will allocate significant resources (Operations, Engineering, Maintenance, and/or Work Control) to support the backlog reduction efforts.

The magnitude of the backlog varies from station to station depending on the rate of new deficiencies identified, available resources to support backlog reduction, and ability to address repetitive equipment failures.

At Darlington and Pickering A, the primary focus has been on reducing elective backlogs which are above the industry standard of 350 work orders per unit. The level of corrective backlogs is comparable with the industry standard of 20 to 25 work orders per unit. For Pickering B, the initial focus has been on reducing corrective backlogs before major steps can be made to reduce the elective maintenance backlogs. As a result of external benchmarking done in conjunction with 2010 - 2014 business planning, test period targets for on-line elective and corrective backlogs at Pickering A and Darlington have been set below previous industry standards.

Chart 1 provides an overview of backlog reduction history and future plans (repeated from Ex. E2-T2-S1 Appendix A),

Chart 1: One-year Maintenance Backlogs

		Actual			Plan		
Station	**Backlog** (work orders/unit)	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Pickering A	Elective Mtce	428	420	333	350	335	320
	Corrective Mtce	14	17	11	10	10	10
Pickering B	Elective Mtce	926	681	554	500	425	400
	Corrective Mtce	22	24	20	25	20	20
Darlington	Elective Mtce	373	313	279	275	250	235
	Corrective Mtce	13	8	7	9	8	7
Nuclear Total	**Elective Mtce**	**605**	**482**	**400**	**380**	**337**	**318**
	Corrective Mtce	**17**	**16**	**13**	**16**	**13**	**13**

Resource Profile

Prior to 2010, incremental funding and FTEs had been assigned to all stations to drive the backlog reduction effort. As part of the 2010 - 2014 business planning process, incremental funding for these activities has been removed with the exception of the Pickering A equipment reliability restoration ("ERR") program, described below, and stations are now expected to continue backlog reduction efforts through prioritization of base OM&A work and efficiency improvements.

Pickering A Equipment Reliability Restoration Program

Recognizing the need for significant generation performance improvement, the objective of the Pickering A ERR program is to restore Pickering A plant performance to historically achieved levels, reduce forced losses and improve generation performance.

The program consists of five key elements:

- Focusing corrective and elective maintenance efforts on work having the most significant impact on plant reliability and improving execution rate for this work (e.g., resolution of recent issues with the liquid zone control system at Pickering A Unit 4, which have been a significant contributor to forced loss rate).
- Improving material condition of plant equipment that represents reliability vulnerability.
- Focus project spending on upgrades that improve reliability.

- Increase availability of spare parts for maintenance to improve plant health including the U2/3 parts recovery initiative.
- Define optimum maintenance methods and procure required parts.

Resource Profile

Incremental resources have been planned for Pickering to implement this critical program. This includes test year funding, as indicated below:

Chart 2: ERR Program Resource Profile

	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2011 Plan	2012 Plan
Base OM&A Cost ($M)	0.0	0.0	9.3	9.8	7.4	0.0
Regular Staff	0	0	12	15	2	0

Current Status/Results

Program is on track for 2011 completion. Highlights for 2009 include:

- Actual on-line elective maintenance backlog reductions for 2009 better than target (333 actual versus a target of 375).
- Completed 637 planned “plant reliability list” work orders (versus a target of 600) to improve system health and plant reliability update.
- Completed major work programs associated with pump and motor refurbishments, and critical system modifications and improvements. On track for 2010 completion.
- Achieved CNSC agreement for removal of 3 per cent power de-rating.

ATTACHMENT 3

Status of Base OM&A Initiatives Reported in EB-2007-0905

Supply Chain Improvement Initiatives: Supply Chain is continuing with their performance improvement plan which commenced in 2005, with a focus on three broad program objectives that include; improving material availability, establishing a competent nuclear supply chain organization, and re-establishing commercial leverage. Results at year-end 2009 include: staff levels cut back to below 2005 levels; average cycle time backlogs reduced from an average of 930 days in 2005 to 113 days; stock-out levels are down from 20 per cent to 4 per cent; and, materials on-site for outages has increased from 88 per cent to 99 per cent. The base OM&A and regular staff reductions for Nuclear Supply Chain included in this evidence (and highlighted in Ex. F2-T2-S1 Table 1 and Ex. F2-T2-S1 Table 14) are a direct result of these initiatives.

Addressing Demographics of an Aging Workforce: Consistent with experience in the nuclear industry and other industries, workplace demographics mean that OPG will be facing a significant loss of key staff in the very near future. In response to this, a workforce development plan, initiated in 2004, continues throughout the bridge and test periods. The goal of this plan is to attract, hire and retain new staff for Nuclear Operations to address the challenge of an aging workforce. Costs relate to the hiring and initial salary costs of inexperienced new hires, as well as strategic partnerships with colleges and universities to help ensure a supply of high quality candidates. In addition to engineering graduates, the workforce development plan targets skilled trades, including an apprenticeship program, and licensed/non-licensed operator positions. The incremental investment in this program is shown here, with budgeted costs accounted for in the division receiving the trainees.

Chart 1

Incremental Cost of Workforce Development Program ("WDP")

Costs ($M)	2007	2008	2009	2010	2011	2012
	Actual	Actual	Actual	Plan	Plan	Plan
Operations WDP	6.8	13.1	13.9	14.3	11.8	12.3
Maintenance WDP	4.2	3.5	2.4	1.7	1.8	2.2
Engineering WDP	4.9	5.8	5.8	3.7	4.3	4.6
Total	15.9	22.4	22.1	19.6	17.8	19.1

Addressing Tritium Removal Facility ("TRF") Reliability: The TRF condition had degraded over the years, such that reliability is impacting station performance and limiting revenue from external sales of detritiation services. The TRF improvement plan was an initiative to improve the facility's material condition, thereby improving reliability and reducing outages. Through these improvements, the goal by 2011 is to increase the volume of heavy water treated (detritiated) to 2,300 Mg/yr (calculated on a three year average), from a historical average of 1,600 Mg/yr. The improvement program continues, but there will be no incremental funding beyond 2009. TRF reliability has improved over the past year, such that detritiation services supplied in 2009 were above business plan targets (1,940 MG versus 1,795 MG), and there were no unplanned outages in 2009. Performance is on track to achieve target volume of 2,300 Mg/yr by 2011.

Addressing Programs and Training Infrastructure: Over the 2007 - 2009 period, Programs and Training faced increased short-term program and resource demands in three key areas; facilities, training, and security. Addressing these issues required incremental costs of $7.7M ($3.4M 2007, $2.4M 2008, and $1.9M in 2009). Initiatives were successfully completed over the 3-year time period, with key highlights noted below:

- Leadership Academy Program Development – Programs were developed and delivered to new supervisors and incumbents, with focus on improving supervisory and managerial capability particularly in Operations and Maintenance. Post-training feedback indicates that the programs were successful in accomplishing this objective.

- Pandemic Planning – all OPG Business units have completed planning, and the OPG CEO has issued a declaration of pandemic readiness. In response to the H1N1 influenza virus, pandemic plans were revised, updated and reissued in August 2009.
- Training Material Updates - Identified revision backlogs in the operations and maintenance training programs have been addressed, such that training program materials for these critical skill job families are now current.

Table 1
Base OM&A - Nuclear ($M)

Line No.	Division	2007 Actual	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)
	Nuclear Stations						
1	Darlington NGS	294.6	304.7	308.2	291.5	302.1	317.8
2	Pickering A NGS	162.5	187.6	187.3	175.9	172.9	170.6
3	Pickering B NGS	287.4	306.6	292.2	285.3	279.1	288.6
4	Pickering B Continued Operations	0.0	0.0	1.6	9.8	17.7	14.7
5	Pickering B Refurbishment	23.3	9.0	4.3	1.2	0.0	0.0
6	**Total Stations**	767.9	807.9	793.7	763.7	771.8	791.5
	Nuclear Support Divisions						
7	Engineering	60.5	62.4	59.9	56.6	55.8	56.5
8	Projects & Modifications	10.7	12.2	13.9	7.6	5.4	5.1
9	Facilities Management	41.8	38.4	41.8	41.5	42.5	43.4
10	Programs & Training	160.1	169.5	198.4	191.5	193.3	195.1
11	Supply Chain	80.2	77.0	63.6	67.0	67.0	67.7
12	Performance Imprvmnt & Oversight	28.8	29.5	8.5	9.1	9.2	9.4
13	Inspection & Mtce Services	37.7	45.6	38.1	30.8	31.2	31.4
14	Commercial Services[1]	1.3	1.4	1.5	1.7	1.3	1.4
15	Waste & Transportation Services	4.8	5.7	4.2	4.8	5.0	5.1
16	Nuclear Level Common	11.1	2.9	(7.1)	12.6	9.9	13.1
17	**Total Support**	437.0	444.5	422.8	423.4	420.6	428.3
18	**Total**	1,204.9	1,252.4	1,216.5	1,187.0	1,192.3	1,219.8

Notes:
1 Previously Commercial Activities.

Table 2
Base OM&A - Nuclear ($M)

Line No.	Resource Type	2007 Actual	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan	Test Period Percentage[1]
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	**Labour Regular**	880.4	902.9	901.3	898.7	908.9	941.8	76.7%
2	**Overtime**	57.9	62.6	52.0	29.9	31.1	32.6	2.6%
3	**Augmented Staff**	10.2	12.1	13.1	6.9	5.5	1.4	0.3%
4	**Materials**	81.4	88.9	78.3	80.3	81.9	80.7	6.7%
5	**License**	16.9	18.2	22.1	19.6	20.2	20.9	1.7%
6	**Other Purchased Services**	121.7	128.1	114.7	109.7	102.1	99.6	8.4%
7	**Other**	36.4	39.6	34.9	42.0	42.7	42.8	3.5%
8	**Total**	1,204.9	1,252.4	1,216.5	1,187.0	1,192.3	1,219.8	100.0%

Notes:
1 Test Period Percentage = Sum of Test Period Resource Costs divided by Sum of Test Period Base OM&A.

Table 3
OM&A Base Labour - Cost Escalation and Payroll Burden Change ($M)

Line No.	Function	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan	2012 Plan 53rd Week[1]
		(a)	(b)	(c)	(d)	(e)	(f)
	Operational Functions - Station						
1	Darlington NGS	4.2	3.6	(0.2)	10.5	7.9	4.8
2	Pickering A NGS	2.3	2.0	(0.1)	6.1	4.4	2.6
3	Pickering B NGS	4.1	3.6	(0.2)	10.6	8.2	4.8
4	**Total Stations**	10.6	9.2	(0.6)	27.1	20.5	12.2
5	**Operational Functions - Support**	5.1	4.3	(0.3)	12.4	9.5	5.6
6	**Total Nuclear Operations**	15.7	13.5	(0.9)	39.5	30.0	17.8
7	**Labour Cost Escalation**	24.4	25.8	47.5	28.2	28.6	
8	**Payroll Burden Change**	(8.7)	(12.3)	(48.4)	11.3	1.4	

1 The amounts shown for 53rd week in 2012 are additive to the 2012 cost escalation amounts in column (e).

Numbers may not add due to rounding.

Table 4
Nuclear Base OM&A by Function ($M)
Plan - Calendar Year Ending December 31, 2012

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				615.4
2	- Operations	77.6	46.9	66.9	191.4
3	- Maintenance	114.0	54.8	120.7	289.5
4	- Fuel Handling	32.4	16.3	21.7	70.3
5	- Rad Protection, Chemistry & Envrnt	17.3	2.9	19.0	39.2
6	- Pickering Common Services		8.2	16.7	24.9
7	Station Engineering	29.0	21.3	27.9	78.2
8	Work Management	12.0	10.9	10.9	33.8
9	Support Services	17.2	9.2	4.7	31.1
10	Tritium Removal Facility	18.3			18.3
11	Continued Operations			14.7	14.7
12	Pickering B Refurbishment			0.0	0.0
13	**Total Stations**	317.8	170.6	303.2	791.5
	Operational Functions - Support				
14	Engineering				56.5
15	Projects & Modifications				5.1
16	Facilities Management				43.4
17	Programs & Training				195.1
18	- Records and Admin				25.4
19	- Nuclear Programs & Training				110.1
20	- Security				59.5
21	Supply Chain				67.7
22	Performance Improvement & Oversight				9.4
23	Inspection & Maintenance Services				31.4
24	Commercial Services				1.4
25	Waste & Transportation Services				5.1
26	Nuclear Level Common				13.1
27	**Total Support**	0.0	0.0	0.0	428.3
28	**Total Nuclear**	317.8	170.6	303.2	1,219.8

Numbers may not add due to rounding.

Table 5
Nuclear Base OM&A by Function ($M)
Plan - Calendar Year Ending December 31, 2011

Line No.	Division	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				600.4
2	- Operations	68.9	44.9	64.3	178.0
3	- Maintenance	111.3	60.7	119.5	291.4
4	- Fuel Handling	31.1	15.4	22.8	69.2
5	- Rad Protection, Chemistry & Envrnt	16.8	2.9	18.2	37.9
6	- Pickering Common Services		7.8	15.9	23.8
7	Station Engineering	29.4	21.7	27.3	78.4
8	Work Management	11.5	10.7	11.0	33.2
9	Support Services	17.1	8.9	0.2	26.2
10	Tritium Removal Facility	15.9			15.9
11	Continued Operations			17.7	17.7
12	Pickering B Refurbishment			0.0	0.0
13	**Total Stations**	302.1	172.9	296.8	771.8
	Operational Functions - Support				
14	Engineering				55.8
15	Projects & Modifications				5.4
16	Facilities Management				42.5
17	Programs & Training				193.3
18	- Records and Admin				23.8
19	- Nuclear Programs & Training				108.0
20	- Security				61.5
21	Supply Chain				67.0
22	Performance Improvement & Oversight				9.2
23	Inspection & Maintenance Services				31.2
24	Commercial Services				1.3
25	Waste & Transportation Services				5.0
26	Nuclear Level Common				9.9
27	**Total Support**	0.0	0.0	0.0	420.6
28	**Total Nuclear**	302.1	172.9	296.8	1,192.3

Numbers may not add due to rounding.

Table 6
Nuclear Base OM&A by Function ($M)
Budget - Calendar Year Ending December 31, 2010

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				595.0
2	- Operations	66.7	41.5	61.2	169.4
3	- Maintenance	107.1	63.5	123.3	293.9
4	- Fuel Handling	31.5	14.9	22.6	69.0
5	- Rad Protection, Chemistry & Envrnt	16.3	3.9	19.3	39.5
6	- Pickering Common Services		7.7	15.6	23.3
7	Station Engineering	27.6	22.7	27.3	77.5
8	Work Management	11.6	13.1	12.4	37.2
9	Support Services	14.3	8.6	3.7	26.6
10	Tritium Removal Facility	16.4			16.4
11	Continued Operations			9.8	9.8
12	Pickering B Refurbishment			1.2	1.2
13	**Total Stations**	291.5	175.9	296.3	763.7
	Operational Functions - Support				
14	Engineering				56.6
15	Projects & Modifications				7.6
16	Facilities Management				41.5
17	Programs & Training				191.5
18	- Records and Admin				25.3
19	- Nuclear Programs & Training				104.1
20	- Security				62.2
21	Supply Chain				67.0
22	Performance Improvement & Oversight				9.1
23	Inspection & Maintenance Services				30.8
24	Commercial Services				1.7
25	Waste & Transportation Services				4.8
26	Nuclear Level Common				12.6
27	**Total Support**	0.0	0.0	0.0	423.4
28	**Total Nuclear**	291.5	175.9	296.3	1,187.0

Numbers may not add due to rounding.

Table 7
Nuclear Base OM&A by Function ($M)
Actual - Calendar Year Ending December 31, 2009

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(f)
	Operational Functions - Station				
1	Operations & Maintenance				612.6
2	- Operations	69.6	42.7	61.5	173.8
3	- Maintenance	112.8	66.2	120.9	299.8
4	- Fuel Handling	28.8	17.7	24.2	70.7
5	- Rad Protection, Chemistry & Envrnt	19.6	4.5	21.6	45.8
6	- Pickering Common Services	0.0	7.4	15.1	22.5
7	Station Engineering	30.4	23.8	29.7	83.9
8	Work Management	11.5	14.9	12.1	38.5
9	Support Services	17.8	10.2	7.1	35.1
10	Tritium Removal Facility	17.7	0.0	0.0	17.7
11	Continued Operations			1.6	1.6
12	Pickering B Refurbishment			4.3	4.3
13	**Total Stations**	308.2	187.3	298.2	793.7
	Operational Functions - Support				
14	Engineering				59.9
15	Projects & Modifications				13.9
16	Facilities Management				41.8
17	Programs & Training				198.4
18	- Records and Admin				26.0
19	- Nuclear Programs & Training				110.8
20	- Security				61.6
21	Supply Chain				63.6
22	Performance Improvement & Oversight				8.5
23	Inspection & Maintenance Services				38.1
24	Commercial Services				1.5
25	Waste & Transportation Services				4.2
26	Nuclear Level Common				(7.1)
27	**Total Support**	0.0	0.0	0.0	422.8
28	**Total Nuclear**	308.2	187.3	298.2	1,216.5

Numbers may not add due to rounding.

Table 8
Nuclear Base OM&A by Function ($M)
Budget - Calendar Year Ending December 31, 2009

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				603.1
2	- Operations	73.3	44.7	62.4	180.4
3	- Maintenance	116.6	56.4	115.1	288.1
4	- Fuel Handling	27.7	15.9	23.8	67.4
5	- Rad Protection, Chemistry & Envrnt	17.6	3.1	19.6	40.3
6	- Pickering Common Services		8.9	18.0	26.9
7	Station Engineering	32.4	29.6	29.2	91.2
8	Work Management	12.1	14.7	11.2	38.0
9	Support Services	16.3	10.0	14.5	40.7
10	Tritium Removal Facility	18.9			18.9
11	Continued Operations			0.0	0.0
12	Pickering B Refurbishment			0.0	0.0
13	**Total Stations**	314.9	183.3	293.7	791.9
	Operational Functions - Support				
14	Engineering				65.0
15	Projects & Modifications				10.0
16	Facilities Management				41.9
17	Programs & Training				189.4
18	- Records and Admin				33.9
19	- Nuclear Programs & Training				90.4
20	- Security				65.1
21	Supply Chain				75.6
22	Performance Improvement & Oversight				29.9
23	Inspection & Maintenance Services				48.3
24	Commercial Services				3.5
25	Waste & Transportation Services				5.5
26	Nuclear Level Common				12.1
27	**Total Support**	0.0	0.0	0.0	481.3
28	**Total Nuclear**	314.9	183.3	293.7	1,273.2

Numbers may not add due to rounding.

Table 9
Nuclear Base OM&A by Function ($M)
Actual - Calendar Year Ending December 31, 2008

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				613.3
2	- Operations	65.6	42.0	62.4	170.0
3	- Maintenance	117.3	69.4	116.5	303.2
4	- Fuel Handling	29.4	17.0	23.8	70.2
5	- Rad Protection, Chemistry & Envrnt	17.4	4.5	22.0	43.9
6	- Pickering Common Services		8.5	17.3	25.9
7	Station Engineering	33.1	26.9	31.0	91.1
8	Work Management	11.8	11.6	13.6	37.0
9	Support Services	16.0	7.7	19.9	43.5
10	Tritium Removal Facility	14.0			14.0
11	Continued Operations			0.0	0.0
12	Pickering B Refurbishment			9.0	9.0
13	**Total Stations**	304.7	187.6	315.6	807.9
	Operational Functions - Support				
14	Engineering				62.4
15	Projects & Modifications				12.2
16	Facilities Management				38.4
17	Programs & Training				169.5
18	- Records and Admin				32.3
19	- Nuclear Programs & Training				84.6
20	- Security				52.6
21	Supply Chain				77.0
22	Performance Improvement & Oversight				29.5
23	Inspection & Maintenance Services				45.6
24	Commercial Services				1.4
25	Waste & Transportation Services				5.7
26	Nuclear Level Common				2.9
27	**Total Support**	0.0	0.0	0.0	444.5
28	**Total Nuclear**	304.7	187.6	315.6	1,252.4

Numbers may not add due to rounding.

Table 10
Nuclear Base OM&A by Function ($M)
Budget - Calendar Year Ending December 31, 2008

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				600.6
2	- Operations	71.6	43.3	61.1	176.0
3	- Maintenance	117.3	59.3	112.5	289.0
4	- Fuel Handling	27.0	15.2	23.0	65.3
5	- Rad Protection, Chemistry & Envrnt	16.6	3.2	21.9	41.8
6	- Pickering Common Services		9.4	19.1	28.5
7	Station Engineering	33.1	28.5	30.3	92.0
8	Work Management	13.1	12.7	12.4	38.3
9	Support Services	15.7	6.9	17.3	39.9
10	Tritium Removal Facility	16.7			16.7
11	Continued Operations			0.0	0.0
12	Pickering B Refurbishment			6.2	6.2
13	**Total Stations**	311.2	178.6	303.9	793.7
	Operational Functions - Support				
14	Engineering				64.9
15	Projects & Modifications				9.7
16	Facilities Management				39.5
17	Programs & Training				176.6
18	- Records and Admin				34.2
19	- Nuclear Programs & Training				87.2
20	- Security				55.3
21	Supply Chain				79.7
22	Performance Improvement & Oversight				29.4
23	Inspection & Maintenance Services				46.3
24	Commercial Services				3.5
25	Waste & Transportation Services				5.3
26	Nuclear Level Common				14.2
27	**Total Support**	0.0	0.0	0.0	469.0
28	**Total Nuclear**	311.2	178.6	303.9	1,262.7

Numbers may not add due to rounding.

Table 11
Nuclear Base OM&A by Function ($M)
Actual - Calendar Year Ending December 31, 2007

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				576.0
2	- Operations	60.1	37.9	58.9	156.9
3	- Maintenance	122.3	58.7	111.2	292.2
4	- Fuel Handling	26.9	12.7	23.2	62.8
5	- Rad Protection, Chemistry & Envrnt	17.2	4.5	20.5	42.2
6	- Pickering Common Services	0.0	7.2	14.7	21.9
7	Station Engineering	29.8	27.4	30.8	88.0
8	Work Management	11.3	7.6	13.5	32.4
9	Support Services	14.1	6.5	14.6	35.2
10	Tritium Removal Facility	12.9	0.0	0.0	12.9
11	Continued Operations			0.0	0.0
12	Pickering B Refurbishment			23.3	23.3
13	**Total Stations**	294.6	162.5	310.7	767.9
	Operational Functions - Support				
14	Engineering				60.5
15	Projects & Modifications				10.7
16	Facilities Management				41.8
17	Programs & Training				160.1
18	- Records and Admin				33.5
19	- Nuclear Programs & Training				78.7
20	- Security				47.8
21	Supply Chain				80.2
22	Performance Improvement & Oversight				28.8
23	Inspection & Maintenance Services				37.7
24	Commercial Services				1.3
25	Waste & Transportation Services				4.8
26	Nuclear Level Common				11.1
27	**Total Support**	0.0	0.0	0.0	437.0
28	**Total Nuclear**	294.6	162.5	310.7	1,204.9

Numbers may not add due to rounding.

Table 12
Nuclear Base OM&A by Function ($M)
Budget - Calendar Year Ending December 31, 2007

Line No.	Function	Darlington NGS	Pickering A NGS	Pickering B NGS	Total
		(a)	(b)	(c)	(d)
	Operational Functions - Station				
1	Operations & Maintenance				585.2
2	- Operations	68.5	42.6	60.0	171.0
3	- Maintenance	114.5	53.2	115.2	282.9
4	- Fuel Handling	25.2	14.5	23.3	63.0
5	- Rad Protection, Chemistry & Envrnt	16.5	3.3	21.9	41.8
6	- Pickering Common Services		8.8	17.8	26.5
7	Station Engineering	32.1	28.3	33.6	94.0
8	Work Management	13.1	7.2	14.3	34.6
9	Support Services	15.7	11.4	15.7	42.8
10	Tritium Removal Facility	16.0			16.0
11	Continued Operations			0.0	0.0
12	Pickering B Refurbishment			21.6	21.6
13	**Total Stations**	301.6	169.3	323.2	794.1
	Operational Functions - Support				
14	Engineering				65.5
15	Projects & Modifications				7.8
16	Facilities Management				37.9
17	Programs & Training				167.0
18	- Records and Admin				32.9
19	- Nuclear Programs & Training				84.4
20	- Security				49.6
21	Supply Chain				84.4
22	Performance Improvement & Oversight				29.4
23	Inspection & Maintenance Services				37.5
24	Commercial Services				1.9
25	Waste & Transportation Services				5.2
26	Nuclear Level Common				14.0
27	**Total Support**	0.0	0.0	0.0	450.7
28	**Total Nuclear**	301.6	169.3	323.2	1,244.8

Numbers may not add due to rounding.

Table 13
Staff Summary - Nuclear Operations

Line No.	Group	2007 Actual (Headcount)	2008 Actual (Headcount)	2009 Actual (Headcount)	2010 Budget (FTEs)	2011 Plan (FTEs)	2012 Plan (FTEs)
		(a)	(b)	(c)	(d)	(e)	(f)
1	**Regular Staff**	7,281	7,348	7,332	7,155	6,808	6,659
2	**Non-Regular Staff FTEs (all years)**	733	720	732	400	247	161
3	**Total Staff Resources**	8,014	8,068	8,064	7,555	7,056	6,820

Table 14
Total Work Program Regular Headcount or FTEs

Line No.	Division	2007 Actual (Headcount[1])	2008 Actual (Headcount[1])	2009 Actual (Headcount[1])	2010 Budget (FTEs)	2011 Plan (FTEs)	2012 Plan (FTEs)
		(a)	(b)	(c)	(d)	(e)	(f)
	Nuclear Stations						
	Darlington NGS						
	Operations & Maintenance						
1	- Operations	400	412	436	398	385	397
2	- Maintenance	620	576	549	580	583	582
3	- Fuel Handling	141	142	149	183	170	169
4	- Rad Prot, Chemistry & Envrnt	94	98	98	97	98	98
5	Station Engineering	195	204	221	201	191	183
6	Work Management	73	73	70	71	68	68
7	Support Services	88	94	97	96	95	95
8	Tritium Removal Facility	91	96	104	103	101	101
9	Subtotal	1,702	1,695	1,724	1,730	1,691	1,693
	Pickering A NGS						
	Operations & Maintenance						
10	- Operations	255	271	242	255	257	256
11	- Maintenance	326	338	336	326	295	292
12	- Fuel Handling	105	96	93	96	91	91
13	- Rad Prot, Chemistry & Envrnt	21	23	26	23	20	19
14	- Pickering Common Services	41	44	43	50	50	50
15	Station Engineering	154	149	149	141	133	129
16	Work Management	60	74	82	68	51	50
17	Support Services	35	34	37	34	29	28
18	P2/P3 Safe Storage & Isolation	108	117	126	55	0	0
19	Subtotal	1,105	1,146	1,134	1,048	925	915
	Pickering B NGS						
	Operations & Maintenance						
20	- Operations	359	368	368	367	366	361
21	- Maintenance	627	563	602	658	641	631
22	- Fuel Handling	148	142	151	149	141	130
23	- Rad Prot, Chemistry & Envrnt	120	122	149	136	119	119
24	- Pickering Common Services	84	90	87	101	101	102
25	Station Engineering	227	218	226	206	187	179
26	Work Management	81	79	78	72	64	61
27	Support Services	102	99	38	43	38	38
28	Continued Operations	0	0	0	52	87	73
29	Pickering B Refurbishment	50	24	11	1	0	0
30	Subtotal	1,798	1,705	1,710	1,784	1,743	1,693
	Nuclear Support Divisions						
31	Engineering	308	310	331	311	289	269
32	Projects & Modifications	366	368	398	356	337	337
33	Facilities Management	163	181	184	193	194	189
34	Programs & Training	766	890	803	738	705	692
35	Supply Chain	431	385	381	370	362	353
36	PINO	69	63	57	57	57	57
37	Inspection & Mtce Services	539	570	579	537	476	431
38	Commercial Activities	8	9	7	8	6	6
39	Waste & Transportation Services	22	22	22	22	22	22
40	Nuclear Level Common	4	4	2	2	2	2
41	**Subtotal**	2,676	2,802	2,764	2,594	2,450	2,358
42	**Total Nuclear Operations**	7,281	7,348	7,332	7,155	6,808	6,659

Notes:
1 Total regular staff numbers reflect staff currently working in and being paid by Nuclear (non home-base assignment).

COMPARISON OF BASE OM&A – NUCLEAR

1.0 PURPOSE

This evidence presents period-over-period comparisons of base OM&A costs for the nuclear facilities for 2007 - 2012.

2.0 OVERVIEW

This evidence supports the approvals sought for nuclear base OM&A. Year-over-year changes and historical period variances to budget are presented in Ex. F2-T2-S2 Tables 1a-1c. The descriptions below report on changes or variances of 10 per cent or greater at the station or divisional 'operating function' level, subject to a minimum materiality limit of $1M.

Modest base OM&A increases are forecast between 2011 and 2012 and from 2010 to 2011. The year-over-year changes indicate that cost control efforts in most divisions are offsetting cost increases.

3.0 PERIOD-OVER-PERIOD CHANGES – TEST PERIOD

2012 Plan versus 2011 Plan

Ex. F2-T2-S2 Table 1c indicates an overall base OM&A increase of $27.5M (2.3 per cent) between 2011 and 2012, and indicates those operating functions with reportable changes.

This increase includes $47.8M of increases due to labour cost escalation, payroll burden increases and the impact of the 53rd fiscal in 2012 (Ex. F2-T2-S1 Table 3), partially offset by $20.3M in savings resulting from cost control efforts. The most significant cost increases are for Operations (+$13.4M), which primarily reflects escalation-related and 53rd fiscal week impacts noted above (+$8.8M) and Darlington pre-hiring of key operating staff to offset expected attrition (+$2.5M).

Within the stations, the reportable operating function level changes are:

- Support Services (+$5.0M) reflecting primarily Pickering B ($4.5M) for which a cost reduction commitment (-$4.5M) was centrally held in 2011. All cost reductions were

distributed to divisions in 2012 restoring Support Services to the appropriate budget level, which results in this apparent year-over-year change.

- Tritium Removal Facility (+$2.4M) reflecting increase in planned outage work in 2012.
- Continued Operations (-$3.1M) reflecting initiative work flow.

Within the support divisions, the only reportable change is Nuclear Level Common (+$3.2M) reflecting planned consulting services.

2011 Plan versus 2010 Budget

Ex. F2-T2-S2 Table 1c indicates a base OM&A increase of $5.3M (0.4 per cent) from 2010 to 2011, with reportable year-over-year changes for two station functions and three support functions.

Considering that this increase includes escalation and payroll burden changes of $39.5M (Ex. F2-T2-S1 Table 3), this year-over-year change indicates that cost control efforts in most divisions are offsetting $34.2M of the cost increases.

Within the stations, the reportable changes are:

- Work Management (-$4.0M) reflecting primarily discontinuation of the Vacuum Building Outage ("VBO") Department following completion of this activity in 2010.
- Continued Operations (+$7.9M) reflecting work flow of this initiative.
- Pickering B Refurbishment (-$1.2M) reflecting work completion in 2010.

Within the support divisions, the reportable changes are:

- Projects & Modifications (-$2.2M) reflecting decreased requirements for station outage support in 2011.
- Nuclear Level Common (-$2.7M) reflecting primarily the 2010 reserve for VBO support (-$4.1M), and ending of the P2/P3 electricity cost credits (+$0.7M).

4.0 PERIOD-OVER-PERIOD CHANGES – BRIDGE YEAR

2010 Plan versus 2009 Actual

Ex. F2-T2-S2 Table 1c indicates base OM&A decrease of $29.5M (-2.4 per cent) between 2009 and 2010, and indicates those operating functions with reportable changes.

The overall nuclear level decrease reflects the cost reduction efforts across all divisions that resulted from 2010 - 2014 business planning. Significant examples (in addition to reportable changes noted below) include: Station Engineering (-$6.4M), reflecting absorption of incremental programs back into base OM&A (e.g., backlog reduction efforts); redirection of Pickering B engineering staff to support Continued Operations; and, some early benefits of Fleet-Wide Initiative EN-02 (see F2-T1-S1). EN-02 also benefits Nuclear Programs & Training (-$2.1M), reflecting in part the impact of reduced engineering staff hires resulting from planned regular staff reductions.

Within the stations, the reportable changes are:

- Radiation Protection, Chemistry and Environment (-$6.3M) reflecting a change of cost treatment between base OM&A (where costs were collected in 2009) and outage OM&A (where costs are budgeted in 2010) that results in no net impact on OM&A costs.
- Support Services (-$8.5M) reflecting primarily Pickering B (-$3.4M) where cost reduction challenges are being centrally held until planning is complete; and, Darlington (-$3.5M) reflecting the transfer of shift outage bonus to Maintenance for 2010 and the test period (offset in Darlington Maintenance).
- Continued Operations ($8.1M) reflecting planned increase in work for this initiative.
- Pickering B Refurbishment (-$3.1M) reflecting planned work completion in 2010.

Within the support divisions, the reportable variances are:

- Projects & Modifications (-$6.3M) reflecting a change in handling of Sickness, Accident, Vacation and Holidays (“SAVH”) costs for project staff, which were charged to base OM&A in 2009, but are planned as project OM&A going forward (no impact on total OM&A).

- Inspection & Maintenance Services (-$7.3M) reflecting primarily labour cost reductions associated with discontinuation of services to Bruce Power and efficiency improvements (-$4.9M), transfer of Information Technology and Facilities function non-labour budgets to Corporate groups in 2010 (-$2.9M), and reduced temporary and augmented staff (-$1.0M); partly offset by reduced profit on non-Nuclear work in 2010 (+$1.1M). Nuclear Level Common ($19.7M) reflecting primarily the 2009 labour price under expenditure noted below ($10.2M total), one-time 2009 insurance premium rebate and P2/P3 safe storage project electricity credits ($3.0M), and 2010 CNO allocation for Pickering VBO support ($4.1M).

5.0 PERIOD-OVER-PERIOD CHANGES – HISTORICAL YEARS

2009 Actual versus 2009 Budget

Exhibit F2-T2-S2 Table 1b shows 2009 actual base OM&A was under budget by $56.7M (4.7 per cent), and indicates those operating functions with reportable variances.

While stations were essentially on budget, there are significant offsets reflecting temporary redirection of effort from Operations, Station Engineering and Support Services to the Maintenance functions to support more aggressive maintenance backlog reduction.

Within the support divisions, the total under expenditure of -$58.5M was driven primarily by lower than planned expenditures in Supply Chain, Inspection & Maintenance Services and Nuclear Level Common, supplemented by divisional cost reduction efforts/other savings as noted below.

Within the stations, the reportable variances are:

- Radiation Protection, Chemistry and Environment (+$5.5M) primarily reflecting a budget/actual mismatch, that has no impact on Nuclear level OM&A. Specifically, the Radiation Protection Support budget assumed overtime and temporary staff (funded by outage OM&A) while the work was actually done by seasonal regular staff (funded by base OM&A).

- Pickering Common Services (-$4.4M) reflecting reduced labour and purchased services to offset greater than planned costs of the Pickering A P941 outage.
- Support Services (-$5.7M) reflecting primarily Pickering B (-$7.4M) due to a budget transfer of the fire protection function to Maintenance during the year, which is offset in Maintenance.
- Continued Operations (+$1.6M) reflecting earlier than planned start of this initiative.
- Pickering B Refurbishment (+$4.3M) reflecting the fact that regulatory requirements continue to evolve, and it has taken greater than planned effort to meet CNSC expectations for the Environmental Assessment and Integrated Safety Review. This work will now be completed in 2010.

Within the support divisions, the reportable variances are:

- Projects & Modifications (+$3.9M) reflecting greater than planned base and outage support for stations, to address emergent work.
- Records & Admin (-$7.9M) reflecting primarily an organizational transfer that has no impact on Nuclear level OM&A (-$3.6M, for the organizational transfer of departmental administrative assistants to line organizations to drive cost efficiency); and, divisional cost control initiatives (-$3.1M).
- Nuclear Programs & Training (+$20.4M) reflecting primarily organizational transfers with no impact on total OPG OM&A, specifically: transfer in from Performance Improvement and Nuclear Oversight for improved alignment (+$21M); and, transfer out to Corporate Human Resources (-$2.0M) to allow consolidation of Leadership Training at the corporate level. A corresponding change is noted in Performance Improvement and Nuclear Oversight (-$21M).
- Supply Chain (-$12.0M) reflecting lower than planned inventory valuation and obsolescence provisions (-$7.9M), as defined in Ex. F2-T2-S1 section 2.2), and, labour and overtime cost reductions (-$3.2M) resulting from greater than planned attrition combined with aggressive vacancy management.
- Inspection & Maintenance Services (-$10.2M) reflecting primarily: transfer of Human Resources and Finance functions to Corporate (-$3.9M); change in treatment of Bruce-

related support costs from general indirect costs to IMS (non-energy revenue related) direct cost (-$4.4M); and, lower than planned staffing (-$2.0M).

- Commercial Services (-$2.0M) reflecting primarily lower than planned expenditures associated with Bruce lease renegotiation (-$2.0M).
- Waste & Transportation Services (-$1.3M) reflecting lower than planned conventional waste shipments, supplemented by divisional cost control efforts.
- Nuclear Level Common (-$19.2M) reflecting primarily: under expenditure on the labour price variance account (-$11.2M) as a result of actual labour costs being lower than plan due to the impact of senior staff attrition and junior staff hires and, lower actual overtime costs versus standard rates (e.g., greater than planned use of time-and-a-half versus double time work); P2/P3 safe storage project electricity credits and insurance premium rebate (-$3.6M); and, less than planned CNO level expenditures primarily due to unspent budget for nuclear level consulting contracts (-2.4M).

2009 Actual versus 2008 Actual

Exhibit F2-T2-S2 Table 1b shows that the 2009 actual base OM&A decreases by $35.9M (-2.9 per cent) relative to 2008 actuals, and presents those operating functions with reportable changes.

Considering that this year-over-year decrease includes labour cost escalation and payroll burden change of $13.5M (Ex. F2-T2-S1 Table 3), this year-over-year change indicates that cost control efforts are achieving gross cost reductions of $49.4M before escalation. Since most of these cost control efforts produce 10 per cent year-over-year changes at the operating function level, they are discussed in more detail below.

Within the stations, the reportable changes are:

- Pickering Common Services (-$3.4M) reflecting primarily completion of Waste Reduction and Waste Management Initiatives that had been undertaken in 2008.
- Support Services (-$8.5M) reflecting primarily Pickering B transfer of fire protection function to Maintenance in 2009 as noted above (-$7.4M).
- Tritium Removal Facility (+$3.7M) reflecting major planned outage work in 2009.

- Continued Operations (+$1.6M) reflecting initiative start-up in 2009.
- Pickering B Refurbishment (-$4.7M) reflecting project work plan.

Within the support divisions, the reportable changes are:

- Projects & Modifications (+$1.7M) reflecting primarily increased support for station outages.
- Records & Admin (-$6.2M) reflecting primarily the organizational transfer of departmental administrative assistants to line organizations to drive cost efficiency (-$3.6M, fully offset in station and support divisions), and divisional cost control initiatives (-$3.1M).
- Nuclear Programs & Training (+$26.2M) reflecting primarily a cost neutral organizational transfers from Performance Improvement and Nuclear Oversight to improve organizational alignment (+$21M), and an increase in CNSC operating license fees (+$3.9M). A corresponding change is noted in Performance Improvement and Nuclear Oversight (-$21M).
- Security (+$9.0M) reflecting continued progress in transitioning from contracted Durham Regional Police Services to a fully internal OPG security force, with 2009 reflecting a full year of incremental transition costs versus partial year in 2008.
- Supply Chain (-$13.4M) reflecting labour and overtime cost reductions (-$5.6M) resulting from the supply chain improvement initiative (Ex. F2-T2-S1 Attachment 4), and lower than planned inventory valuation and obsolescence provisions (-$7.4M).
- Inspection & Maintenance Services (-$7.5M) reflecting primarily: change in treatment of Bruce-related support cost from general indirect cost to IMS (non-energy revenue related) direct cost (-$4.4M); transfer of functions to Corporate Human Resources and Finance functions (-$2.1M), and profit from greater than planned work for non-nuclear customers (-$1.1M). Waste & Transportation Services (-$1.5M) reflecting reduction in planned heavy water ("D2O") shipments, supplemented by less than planned miscellaneous contract costs.
- Nuclear Level Common (-$10.0M) reflecting primarily P2/P3 safe storage project electricity cost credit and insurance premium rebate in 2008 (-$3.6M total), and labour price variance (-$6.8M) reflecting primarily the 2009 under expenditure noted above.

2008 Actual versus 2008 Budget

Exhibit F2-T2-S2 Table 1a shows that 2008 actual base OM&A is under budget by $10.3M **(-** 1 per cent), with greater than planned station expenditures ($14.3M, driven largely by increased Maintenance effort to achieve backlog reduction targets) offset by lower than planned expenditures in support divisions (-$24.5M spread across most divisions, including -$11.3M in Nuclear Level Common as noted below). Table 1a also indicates those operating functions with reportable variances, as discussed below.

Within the stations, the reportable operating function variances are:

- Tritium Removal Facility (-$2.7M) reflecting delays in the TRF improvement initiative (Ex. F2-T2-S1 Attachment 4) and deferral of the planned D2O upgrading system outage.
- Pickering B Refurbishment ($2.8M) reflecting greater than planned effort to meet CNSC requirements for the Environmental Assessment and Integrated Safety Review.

Within the support divisions, the reportable operating function variances are:

- Projects & Modifications (+$2.4M) reflecting higher than planned base and outage program support for stations.
- Commercial Services (-$2.1M) reflecting deferral of the Bruce Lease renegotiation to 2009.
- Nuclear Level Common (-$11.3M) reflecting primarily that the planned CNO contingency was not spent (-$5.0M); less than planned labour price variance (-$5.3M) due to overtime cost rate variance; and, less than planned expenditures on nuclear level consultants (-$1.0M).

2008 Actual versus 2007 Actual

Exhibit F2-T2-S2 Table 1a shows a base OM&A increase of $47.6M (+4.0 per cent) from the 2007 actual, which includes escalation of $15.7M (Ex. F2-T2-S1 Table 1). Table 1a also indicates those operating functions with reportable year-over-year changes

Within the stations, the reportable changes are:

- Fuel Handling (+$7.5M) reflecting Darlington (+$2.6M) due to costs associated with improving fuel handling reliability and Pickering A (+$4.4M) due to costs associated with fuelling machine repairs and forced outages.
- Pickering Common Services ($4.0M) reflecting introduction of waste reduction and waste management initiatives. Work Management (+$4.6M) reflecting primarily Pickering A (+$4.0M) due to pre-requisite support for the 2010 vacuum building outage.
- Support Services (+$8.3M) reflecting primarily: Pickering B (+$5.3M) largely due to increased pressure tube inspection costs mandated by life cycle plan, and engagement of business performance consultants.
- Pickering B Refurbishment (-$14.3M) reflects primarily project work plan.

Within the support divisions, the reportable changes are:

- Projects & Modifications (+$1.4M) due to increased station requirements for base and outage support to address emergent work.
- Security (+$4.8M) due to costs of transition from Durham Region to OPG Security Forces, which began in 2008.
- Inspection & Maintenance Services (+$7.9M) reflecting the impact of planned staff increases (and associated indirect costs) to reduce reliance on augmented staff and improve the quality of work standards.
- Nuclear Level Common (-$8.2M) reflecting the ending of nuclear headquarters employee relocation expenses in Q1 2008, and the completion in 2007 of a major project management improvement consulting contract.

<u>2007 Actual versus 2007 Budget</u>

Exhibit F2-T2-S2 Table 1a shows that 2007 actual base OM&A is under budget by $39.9M (-3.2 per cent), with reportable variances in three station functions and four support functions.

With the stations, the reportable variances are:

- Pickering Common Services (-$4.7M) reflecting delays in waste reduction and chemical waste management initiatives (-$1.7M), savings on environmental and waste services contracts (-$1.5M), and savings due to unfilled staff vacancies.

- Support Services under budget (-$7.6M) reflecting primarily: Pickering A (-$4.9M) due to unbudgeted low level waste management credits (OM&A credits for generating less than planned levels of waste), and lower than planned expenditures on common services programs due to focus on forced outages; and, Darlington (-$1.6M) reflecting primarily staff vacancies and budget funding allocated to greater than planned outage work in other divisions.
- Tritium Removal Facility under budget (-$3.1M) reflecting delays in tritium removal facility improvement initiative (Ex. F2-T2-S1 Attachment 4) and unfilled staff vacancies.

Within the support divisions, the reportable variances are:

- Projects & Modifications (+$3.0M) reflecting higher than planned base and outage program support for stations to address emergent work.
- Facilities Management (+$3.9M) reflecting charges for previously under-billed utility costs (-$3.1M) and greater than planned fleet lease and maintenance costs.
- Nuclear Level Common under budget (-$3.0M) reflecting electricity cost credits associated with placing P2/P3 into safe storage (-$1.6M), and lower than planned spending on nuclear level consulting executive search and project management improvement contracts.

Table 1a
Comparison of Nuclear Base OM&A by Function ($M)

Line No.	Function	2007 Budget	(c)-(a) Change[1]	2007 Actual	(e)-(c) Change[1]	2008 Actual	(e)-(g) Change[1]	2008 Budget
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Operational Functions - Station							
1	Operations & Maintenance	585.2	(9.2)	576.0	37.3	613.3	12.7	600.6
2	- Operations	171.0	(14.1)	156.9	13.1	170.0	(6.0)	176.0
3	- Maintenance	282.9	9.3	292.2	11.0	303.2	14.2	289.0
4	- Fuel Handling	63.0	(0.2)	62.8	**7.5**	70.2	5.0	65.3
5	- Rad Protection, Chemistry & Envrnt	41.8	0.4	42.2	1.8	43.9	2.1	41.8
6	- Pickering Common Services	26.5	**(4.7)**	21.9	**4.0**	25.9	(2.6)	28.5
7	Station Engineering	94.0	(5.9)	88.0	3.1	91.1	(0.9)	92.0
8	Work Management	34.6	(2.2)	32.4	**4.6**	37.0	(1.3)	38.3
9	Support Services	42.8	**(7.6)**	35.2	**8.3**	43.5	3.6	39.9
10	Tritium Removal Facility	16.0	**(3.1)**	12.9	1.1	14.0	**(2.7)**	16.7
11	Continued Operations	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Pickering B Refurbishment	21.6	1.8	23.3	**(14.3)**	9.0	**2.8**	6.2
13	**Total Stations**	794.1	(26.3)	767.9	40.1	807.9	14.3	793.7
	Operational Functions - Support							
14	Engineering	65.5	(5.0)	60.5	1.9	62.4	(2.5)	64.9
15	Projects & Modifications	7.8	**3.0**	10.7	**1.4**	12.2	**2.4**	9.7
16	Facilities Management	37.9	**3.9**	41.8	(3.4)	38.4	(1.1)	39.5
17	Programs & Training	167.0	(7.0)	160.1	9.4	169.5	(7.1)	176.6
18	- Records and Admin	32.9	0.6	33.5	(1.3)	32.3	(1.9)	34.2
19	- Nuclear Programs & Training	84.4	(5.7)	78.7	5.9	84.6	(2.6)	87.2
20	- Security	49.6	(1.8)	47.8	**4.8**	52.6	(2.6)	55.3
21	Supply Chain	84.4	(4.2)	80.2	(3.2)	77.0	(2.7)	79.7
22	Performance Improvement & Oversight	29.4	(0.6)	28.8	0.6	29.5	0.1	29.4
23	Inspection & Maintenance Services	37.5	0.1	37.7	**7.9**	45.6	(0.7)	46.3
24	Commercial Services	1.9	**(0.6)**	1.3	**0.1**	1.4	**(2.1)**	3.5
25	Waste & Transportation Services	5.2	(0.4)	4.8	**0.9**	5.7	0.4	5.3
26	Nuclear Level Common	14.0	**(3.0)**	11.1	**(8.2)**	2.9	**(11.3)**	14.2
27	**Total Support**	450.7	(13.7)	437.0	7.5	444.5	(24.5)	469.0
28	**Total Nuclear**	1,244.8	(39.9)	1,204.9	47.6	1,252.4	(10.3)	1,262.7

Notes:
1 Bold font indicates variance 10% or greater.

Numbers may not add due to rounding.

Table 1b
Comparison of Nuclear Base OM&A by Function ($M)

Line No.	Function	2008 Actual	(c)-(a) Change[1]	2009 Actual	(c)-(e) Change[1]	2009 Budget
		(a)	(b)	(c)	(d)	(e)
	Operational Functions - Station					
1	Operations & Maintenance	613.3	(0.7)	612.6	9.5	603.1
2	- Operations	170.0	3.7	173.8	(6.6)	180.4
3	- Maintenance	303.2	(3.4)	299.8	11.7	288.1
4	- Fuel Handling	70.2	0.5	70.7	3.3	67.4
5	- Rad Protection, Chemistry & Envrnt	43.9	1.9	45.8	**5.5**	40.3
6	- Pickering Common Services	25.9	**(3.4)**	22.5	**(4.4)**	26.9
7	Station Engineering	91.1	(7.2)	83.9	(7.3)	91.2
8	Work Management	37.0	1.5	38.5	0.5	38.0
9	Support Services	43.5	**(8.5)**	35.1	**(5.7)**	40.7
10	Tritium Removal Facility	14.0	**3.7**	17.7	(1.2)	18.9
11	Continued Operations	0.0	**1.6**	1.6	**1.6**	0.0
12	Pickering B Refurbishment	9.0	**(4.7)**	4.3	**4.3**	0.0
13	**Total Stations**	807.9	(14.2)	793.7	1.8	791.9
	Operational Functions - Support					
14	Engineering	62.4	(2.5)	59.9	(5.1)	65.0
15	Projects & Modifications	12.2	**1.7**	13.9	**3.9**	10.0
16	Facilities Management	38.4	3.4	41.8	(0.1)	41.9
17	Programs & Training	169.5	**28.9**	198.4	9.1	189.4
18	- Records and Admin	32.3	**(6.2)**	26.0	**(7.9)**	33.9
19	- Nuclear Programs & Training	84.6	**26.2**	110.8	**20.4**	90.4
20	- Security	52.6	**9.0**	61.6	(3.5)	65.1
21	Supply Chain	77.0	**(13.4)**	63.6	**(12.0)**	75.6
22	Performance Improvement & Oversight	29.5	**(21.0)**	8.5	**(21.4)**	29.9
23	Inspection & Maintenance Services	45.6	**(7.5)**	38.1	**(10.2)**	48.3
24	Commercial Services	1.4	0.1	1.5	**(2.0)**	3.5
25	Waste & Transportation Services	5.7	**(1.5)**	4.2	**(1.3)**	5.5
26	Nuclear Level Common	2.9	**(10.0)**	(7.1)	**(19.2)**	12.1
27	**Total Support**	444.5	(21.7)	422.8	**(58.5)**	481.3
28	**Total Nuclear**	1,252.4	(35.9)	1,216.5	(56.7)	1,273.2

Notes:
1 Bold font indicates variance 10% or greater.

Numbers may not add due to rounding.

Table 1c
Comparison of Nuclear Base OM&A by Function ($M)

Line No.	Function	2009 Actual	(c)-(a) Change[1]	2010 Budget	(e)-(c) Change[1]	2011 Plan	(g)-(e) Change[1]	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Operational Functions - Station							
1	Operations & Maintenance	612.6	(17.6)	595.0	5.3	600.4	15.1	615.4
2	- Operations	173.8	(4.4)	169.4	8.7	178.0	13.4	191.4
3	- Maintenance	299.8	(5.9)	293.9	(2.5)	291.4	(1.9)	289.5
4	- Fuel Handling	70.7	(1.8)	69.0	0.2	69.2	1.1	70.3
5	- Rad Protection, Chemistry & Envrnt	45.8	**(6.3)**	39.5	(1.6)	37.9	1.3	39.2
6	- Pickering Common Services	22.5	0.8	23.3	0.5	23.8	1.2	24.9
7	Station Engineering	83.9	(6.4)	77.5	0.9	78.4	(0.2)	78.2
8	Work Management	38.5	(1.3)	37.2	**(4.0)**	33.2	0.6	33.8
9	Support Services	35.1	**(8.5)**	26.6	(0.4)	26.2	**5.0**	31.1
10	Tritium Removal Facility	17.7	(1.3)	16.4	(0.4)	15.9	**2.4**	18.3
11	Continued Operations	1.6	**8.1**	9.8	**7.9**	17.7	**(3.1)**	14.7
12	Pickering B Refurbishment	4.3	**(3.1)**	1.2	**(1.2)**	0.0	0.0	0.0
13	**Total Stations**	793.7	(30.0)	763.7	8.1	771.8	19.8	791.5
	Operational Functions - Support							
14	Engineering	59.9	(3.3)	56.6	(0.9)	55.8	0.7	56.5
15	Projects & Modifications	13.9	**(6.3)**	7.6	**(2.2)**	5.4	(0.3)	5.1
16	Facilities Management	41.8	(0.3)	41.5	1.0	42.5	0.9	43.4
17	Programs & Training	198.4	(6.9)	191.5	1.8	193.3	1.8	195.1
18	- Records and Admin	26.0	(0.7)	25.3	(1.5)	23.8	1.6	25.4
19	- Nuclear Programs & Training	110.8	(6.7)	104.1	3.9	108.0	2.2	110.1
20	- Security	61.6	0.6	62.2	(0.7)	61.5	(1.9)	59.5
21	Supply Chain	63.6	3.4	67.0	(0.0)	67.0	0.7	67.7
22	Performance Improvement & Oversight	8.5	0.6	9.1	0.1	9.2	0.2	9.4
23	Inspection & Maintenance Services	38.1	**(7.3)**	30.8	0.4	31.2	0.2	31.4
24	Commercial Services	1.5	**0.2**	1.7	**(0.4)**	1.3	0.1	1.4
25	Waste & Transportation Services	4.2	**0.6**	4.8	0.1	5.0	0.2	5.1
26	Nuclear Level Common	(7.1)	**19.7**	12.6	**(2.7)**	9.9	**3.2**	13.1
27	**Total Support**	422.8	0.6	423.4	(2.8)	420.6	7.7	428.3
28	**Total Nuclear**	1,216.5	(29.5)	1,187.0	5.3	1,192.3	27.5	1,219.8

Notes:
1 Bold font indicates variance 10% or greater.

PICKERING B CONTINUED OPERATIONS

1.0 PURPOSE

This evidence presents the Pickering B Continued Operations initiative and the status of the Pickering B Refurbishment project. It provides a summary of the associated actual and budgeted OM&A expenditures over 2007 - 2012. The business case supporting the Pickering B Continued Operations initiative is provided as Attachment 1.

2.0 OVERVIEW

The test period nuclear revenue requirement includes $92.9M of OM&A costs associated with the Pickering B Continued Operations initiative and $11.7M of OM&A costs associated with the Fuel Channel Life Cycle Management project. These amounts are included in the Base, Project and Outage OM&A evidence (as indicated in Chart 2). The Fuel Channel Life Cycle Management project supports both Pickering B Continued Operations and Darlington Refurbishment. OPG also seeks approval of a test period nuclear production forecast that reflects the incremental outage days associated with Pickering B Continued Operations, which reduce nuclear production by 1.9 TWh. There are no capital expenditures associated with Pickering B Continued Operations.

There are no test period costs or production impacts associated with the Pickering B Refurbishment project.

In Ex. H1-T2-S1, OPG seeks approval to recover the forecast December 31, 2010 balance in the Capacity Refurbishment Variance Account which includes amounts associated with Pickering B Continued Operations and Pickering B Refurbishment. These entries are detailed in Ex. H1-T1-S1 Table 8.

The initiation phase of the Pickering B Refurbishment project began in June 2006 following the direction from the Province requiring OPG to undertake feasibility studies on refurbishing its existing nuclear plants. OPG has decided not to refurbish Pickering B but to undertake the Pickering B Continued Operations initiative, with the objective of achieving a short-term

extension to the operating life of the Pickering B units. The Province concurred with this decision in a letter from the Minister of Energy and Infrastructure to OPG dated February 4, 2010 and provided at Ex. D2-T2-S1 Attachment 3.

The economic assessment of Pickering B Continued Operations contained in the attached business case (Attachment 1) shows that the initiative has substantial value to the Ontario electricity system. OPG estimates the net present value of this initiative to be approximately $1.1B (2010 dollars). This net present value is based on the difference between the estimated cost of Pickering B's output and the estimated cost of replacement generation. In addition, seeking to confirm its own estimates, OPG approached the Ontario Power Authority ("OPA") and requested that it provide an assessment of the system benefits associated with the Continued Operations initiative. In a letter from the OPA, which can be found at Attachment 2, the OPA concludes that:

> Based on the potential for substantial system benefits, the OPA supports a decision by OPG to proceed with an initial expenditure of funds in the period 2010 – 2012 to assess the feasibility of continued operation of Pickering NGS, and to maintain the option for continued operation should it prove to be feasible. System benefits should be re-assessed before committing additional funds required beyond 2012.

Section 3.0 provides background on the Pickering B Continued Operations initiative and Pickering B Refurbishment. Section 4.0 provides the status of Pickering B Refurbishment. Section 5.0 sets out the economic justification for the Pickering B Continued Operations initiative and section 6.0 sets out the risk assessment and a cost summary of the initiative.

3.0 BACKROUND

The previously assumed nominal end of life for the Pickering B units was 2014 (for Units 5 and 6), 2015 (for Unit 7), and 2016 (for Unit 8). The nominal end of life estimate for the station was predicated on the nominal design life of the key major component (i.e., the pressure tubes). The nominal design life of the pressure tubes was originally projected to be 210k Equivalent Full Power Hours ("EFPH").

In June 2006, the Minister of Energy directed OPG to assess the feasibility of refurbishing Pickering B (see Ex. D2-T2-S1 Attachment 5). Following this direction, OPG began an assessment of all of the major components in the station. The assessment included a number of specific tasks including a Plant Condition Assessment, an Integrated Safety Review ("ISR"), and supporting work for the Environmental Assessment ("EA") process. As part of this broader set of work, OPG also explored the feasibility of achieving a short-term extension to the operating life of the Pickering B units beyond their nominal end of life ("Pickering B Continued Operations").

4.0 STATUS OF PICKERING B REFURBISHMENT

The initiation phase of the Pickering B refurbishment project began in June 2006 following the direction from the Province requiring OPG to undertake feasibility studies on refurbishing its existing nuclear plants.

OPG completed an EA which was accepted by the Canadian Nuclear Safety Commission ("CNSC") on January 26, 2009. The report concluded that: "taking into account the identified mitigation measures, the refurbishment and continued operation of Pickering B nuclear station is not likely to cause significant adverse environmental effects".

OPG also submitted an ISR, comprising more than 2,000 pages of documentation in a 20-volume report, and a Global Assessment to the CNSC in September, 2009. The purpose of the ISR was to assess the plant and the adequacy of programs as compared to current codes and standards (i.e., if a plant was to be constructed today, how would Pickering B compare against this new plant). OPG concluded that the existing Pickering B station demonstrates a high level of compliance with current codes and standards, and can be operated safely today and in the future, should the decision be made to refurbish the plant. The review of these documents is currently underway by the CNSC.

Further work on Pickering B refurbishment (i.e., beyond the EA and ISR) was put on hold in 2009 pending the decision on whether or not to proceed with the refurbishment project.

Based on previously completed work, management developed a good understanding of the regulatory requirements, environmental impacts, the scope of the project, the costs of refurbishment, and associated project risks. Concurrent with the refurbishment work, OPG examined and considered the feasibility of continued operations at Pickering B, an initiative which would extend the life of the Pickering B units by four or more years (from 2014/2016 to 2018/2020) by taking actions to maximize pressure tube life.

OPG has decided to pursue the continued operation work program on Pickering B rather than refurbish Pickering B. The major factors in this decision were:

- the economics of the Pickering B refurbishment
- the required lead time to procure steam generators and the resulting overlap with other refurbishments, the availability of resources to manage multiple refurbishments in the province
- the potential economic benefit of the continued operations of Pickering B
- the need to manage the overall availability of OPG's nuclear fleet

The Province concurred with this decision in a letter to OPG, as reflected in a letter from the Minister of Energy and Infrastructure dated February 4, 2010 (see Ex. D2-T2-S1 Attachment 3).

5.0 PICKERING B CONTINUED OPERATIONS

5.1 Background

The objective of the Pickering B Continued Operations initiative is to achieve a short-term extension to the operating life of the Pickering B units. With this initiative, OPG will be able to operate the Pickering B Units for a further four calendar years (i.e., Units 5 and 6 from 2014 to 2018 and Units 7 and 8 from 2015/2016 to 2020) beyond their previously assumed nominal end of life. OPG's 2010 - 2014 Business Plan includes a forecast of the expenditures and extensions to planned outages required for Pickering B Continued Operations.

The economic assessment contained in the attached business case (Attachment 1) shows that the initiative has substantial value to the Ontario electricity system. OPG estimates the net present value ("NPV") of this initiative to be approximately $1.1B (2010 dollars). This NPV is based on the difference between the estimated cost of Pickering B's output and the estimated cost of replacement generation. In seeking to confirm its own NPV estimates, OPG approached the OPA and requested that it provide an analysis of the system benefits associated with the Pickering B Continued Operations initiative. The OPA's assessment is that there could be substantial benefits to the Ontario electricity system from a short term extension to the operating life of the Pickering B units and that they are supportive of OPG proceeding with the Pickering B Continued Operations initiative during the test period, with a reassessment in 2012 when more information becomes available from the work being undertaken.

While OPG ultimately decided not to refurbish Pickering B, the assessment of continuing to operate Pickering B beyond its previously assumed nominal end of life showed promise. The assessment showed that with certain incremental maintenance, inspections and analytical programs, there was sufficient confidence that the Pickering B Units could be operated safely and reliably beyond 210k EFPH and that OPG could begin planning on this basis. As a result, the Pickering B Continued Operations initiative was included in OPG's 2010 - 2014 Business Plan.

The ability of OPG to operate the Pickering B Units beyond 210k EFPH also has implications for the two Pickering A Units. OPG has determined that when there are less than two Pickering B Units in operation, there are significant technical and economic challenges to the economic operation of the Pickering A Units. Pickering A's operation is linked to Pickering B through shared common systems and in particular, power supplies to a special safety system. Given the number of interdependent systems at the Pickering site, a shutdown of Pickering B would require that additional staff and support be assigned to the shut down Pickering B Units to allow the Pickering A Units to continue to safely operate. In addition, OPG would have to satisfy the CNSC that there were adequate redundancies in the electrical power supply to Pickering A in the event that the Pickering B station was not operating. While

it would be possible to operate Pickering A after end of life of Pickering B, OPG is not planning to operate the two units at Pickering A with Pickering B shut down.

OPG, as part of the Pickering B Continued Operations initiative, would extend the service life of Pickering B Unit 7 to 2020 through a combination of incremental maintenance and inspections work programs and potentially shutdowns (it should be noted that there are no shutdowns of Unit 7 planned for the test period). Extending the service lives of Units 7 and 8 at Pickering B until 2020 will allow the two Pickering A units to operate until at least 2020.

OPG will be undertaking incremental work effort for the Pickering B Continued Operations initiative during the 2010 - 2014 period. The required incremental work effort during the 2010 bridge year and the 2011 - 2012 test period is in the areas of:

- Additional Maintenance: OPG will carry out selected and well-defined additional maintenance to improve the material condition of the plant and to ensure the continued fitness-for-service of the plant's major components beyond 210k EFPH.
- Life Cycle Management Requirements: OPG will undertake additional inspections to confirm component fitness-for-service, increased Spacer Location and Relocation activities, increased pressure tube inspections, feeder inspections and a limited number of feeder replacements, boiler tube inspections and boiler water cleaning activities.

A portion of this incremental work effort must be undertaken during 2010 – 2012 (with the balance complete by 2014) and will impact the outage duration of the scheduled Pickering B planned outages during this period. If OPG attempted to delay this incremental maintenance and inspection work effort until later, i.e., closer to 2014, the Pickering B Continued Operations option would no longer be available to OPG. The impact on outage duration has been included in the 2010 - 2014 Business Plan with 167 additional planned outage days in the test period corresponding to a reduction of 1.9 TWh in the nuclear production forecast.

5.2 Economic Justification

OPG has completed a Pickering B Continued Operations business case (attached as Attachment 1) that demonstrates that extending the operating life of the Pickering B units

beyond 2014 - 2016 has substantial value to the Ontario electricity system. OPG estimates the net present value of this initiative to be approximately $1.1B (2010 dollars). This net present value is based on the difference between the estimated cost of Pickering B's output and the estimate cost of replacement generation. The analysis in the business case assumed operation of Pickering B Units 5 and 6 to 2018 and Pickering B Units 7 and 8 to 2020. The calculated benefit to the system includes the value of being able to operate the two units at Pickering A to 2020, estimated at approximately $400M.

OPG estimates that the net total additional generation resulting from the short-term extension to the operating life of the Pickering B (and Pickering A) units would be 105 TWh (see Attachment 1, Appendix B).

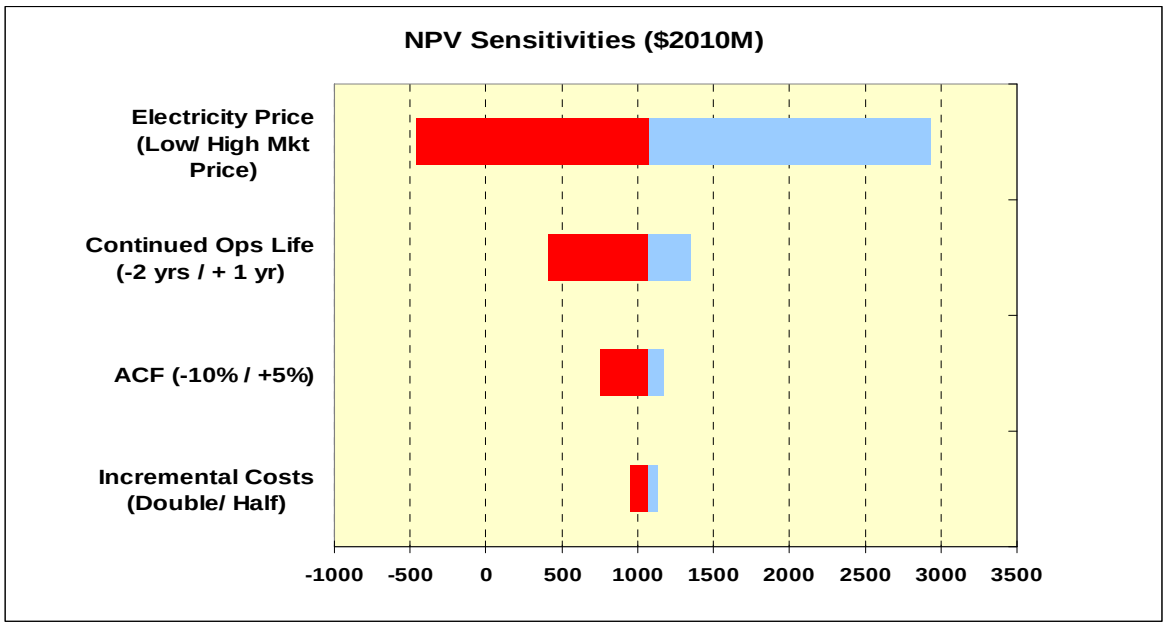
In addition, beyond the economic benefits included in the NPV calculation, OPG's business case identifies significant other benefits that flow from pursuing the Pickering B Continued Operations initiative, specifically:

- Improved reliability of supply by having Pickering B (and Pickering A) available to provide baseload generation during the period 2016 - 2020 while Darlington is scheduled to undergo refurbishment.
- Helping manage the uncertainties related to new nuclear in-service dates.
- Other benefits such as the deferral of adding new transmission infrastructure in the Oshawa area that would be required with the shut-down of the Pickering stations.

In addition to valuing Continued Operations based on the forecast value of replacement energy, OPG also assessed the value of the Pickering B Continued Operations initiative at its current nuclear rate. While current rates are not reflective of the future price of electricity in Ontario, they are a simple way of assessing the directional impact on rates from the initiative. OPG's analysis at current rates yields a positive net present value of approximately $70M. The $70M figure is lower than the $1.1B figure quoted above, because the current rate OPG receives for its nuclear output is lower than expected replacement power.

OPG also conducted a sensitivity analysis of its conclusion that Pickering B Continued Operations will have a positive benefit on a net present value basis. The sensitivity analysis considered the impacts of various circumstances on the NPV of the project. For example, the analysis considered the impacts on NPV if costs of the initiative were doubled, if the anticipated period of Pickering Continued Operations life were not achieved or if the generation performance of the units were lower than expected. The results of the sensitivity analysis, summarized in Chart 1 below, indicate that the benefits of pursuing Pickering B Continued Operations are quite robust.

Chart 1



In 2009, OPG engaged in discussions with the OPA for purposes of having the OPA assess OPG's conclusions concerning the positive benefit of Pickering B Continued Operations to the Province. The response of the OPA, which is provided at Attachment 2, confirms there could be substantial benefits to the Ontario electricity system from a short-term extension to the operating life of the Pickering B units. The OPA is supportive of OPG proceeding with the Pickering B Continued Operations initiative during the test period, with a reassessment in 2012 when more information becomes available from the work being undertaken.

5.3 Risk Assessment

OPG has identified risks to its ability to achieve the objectives of the Pickering B Continued Operations initiative. The two primary, but manageable, risks are the ability to demonstrate fitness-for-service for the pressure tubes (i.e., the risk that a major component does not continue to meet fitness-for-service requirements) and regulatory (i.e., the risk that OPG is unable to obtain CNSC approval of OPG's fitness-for-service assessment criteria for continued service life of the pressure tubes).

To address these risks, a component of OPG's work activity during 2010 - 2012 is designed to provide increased assurance that the units can be operated reliably until 2018 (for Units 5 and 6) and 2020 (for Units 7 and 8). This work includes the Fuel Channel Life Cycle Management Project, which is to be completed in 2012. This OPG-initiated industry effort is being coordinated through the CANDU Owners Group. Successful completion of this initiative would lead to greater certainty around the remaining service lives of all of the CANDU units in Ontario. OPG is also progressing in its ongoing discussions with the CNSC on regulatory issues related to determination of fitness-for-service. OPG needs to complete this work to satisfy the technological and CNSC regulatory issues associated with Pickering B Continued Operations. OPG expects that by undertaking this work activity, OPG will by late-2012 have a high level of confidence regarding its ability to extend the life of the pressure tubes at Pickering B.

A full description of the fitness-for-service, regulatory and other issues is provided in the business case for Pickering B Continued Operations which is attached as Attachment 1.

6.0 COST SUMMARY – REFURBISHMENT AND CONTINUED OPERATIONS

Chart 2, below summarizes OM&A actual and forecast expenditures on the Pickering B Refurbishment project and on Pickering B Continued Operations, from 2007 (Life to Date) to 2012. There are no actual or forecast test period capital expenditures over this period.

Chart 2

Pickering B Refurbishment and Continued Operations

Costs ($M)	Life-to-date 2007 (1)	Actual 2008	Actual 2009	Plan 2010	Plan 2011	Plan 2012	Information Source
Pickering B Refurbishment Project							
- Base OM&A	**35.9**	**9.0**	**4.3**	**1.2**	**0.0**	**0.0**	F2-T2-S1 Table 1
Pickering B Continued Operations Initiative							
- Base OM&A	0.0	0.0	1.6	9.8	17.7	14.7	F2-T2-S1 Table 1
- Outage OM&A	0.0	0.0	2.8	1.9	13.0	10.6	F2-T4-S1 Table 1
- Project OM&A	0.0	0.0	0.4	1.8	19.9	17.0	F2-T3-S1 Table 1
Subtotal Nuclear Operations OM&A (PB CO)	**0.0**	**0.0**	**4.8**	**13.5**	**50.6**	**42.3**	
Fuel Channel Life Cycle Management Project							
- Project OM&A	**0.0**	**0.0**	**2.5**	**9.7**	**7.7**	**4.0**	F2-T3-S1 Table 1

Note 1: F2-T2-S1 Table 2 shows 2007 actual costs, whereas this Chart presents all costs to year-end 2007.

6.1 Pickering B Refurbishment

There are no OM&A or capital costs budgeted for Pickering B refurbishment for the test period. The vast majority of Pickering B refurbishment Phase 1 activities have been completed as of the end of 2009, including preparation and approval of the EA and the ISR.

Pickering B Refurbishment base OM&A costs were $9.0M in 2008 and $4.3M in 2009. The 2010 - 2014 Business Plan includes expenditures of $1.2M in 2010 in order to obtain CNSC's acceptance of the final ISR report and to close out the Pickering B refurbishment project. The total actual and forecast costs for Phase 1 of Pickering B refurbishment is $50.4M as shown in Chart 2. Of this amount, $45.8M had been approved for release by the

OPG Board of Directors prior to April 1, 2008 and is therefore eligible for recovery under section 6(2)4 i of O.Reg. 53/05.

The overall project variance is primarily due to the fact that this was the first time the CNSC process was used to prepare an ISR. The completion of the ISR required more work than originally planned. The knowledge gained with Pickering B refurbishment will be valuable in the preparation of the ISR for the Darlington refurbishment project.

6.2 Pickering B Continued Operations

The cost of the Pickering B Continued Operations initiative in the test period is $92.9M, as summarized in Chart 2 above. There were no expenditures during 2008, $4.8M in 2009 and $13.5M is forecast for 2010. The initiative also requires 167.0 additional outage days during 2011 - 2012.

As noted above, the required incremental work effort during the 2010 bridge year and the 2011 - 2012 test period associated with the Pickering B Continued Operations initiative is in the areas of additional maintenance and additional inspections of life-limiting equipment.

In addition to the Pickering B Continued Operations expenditures presented in Chart 2, expenditures for the Fuel Channel Life Cycle Management project support both Pickering B Continued Operations and Darlington refurbishment.

6.3 Capacity Refurbishment Variance Account

In EB-2007-0905, the OEB approved establishment of the Capacity Refurbishment Variance Account to record differences between actual and forecast costs, while in EB-2009-0174 the OEB approved continuation of this variance account for 2010. A description of the variance account is provided in Ex. H1-T1-S1.

OPG is seeking recovery of the variance between actual and forecast 2008 and 2009 costs for the Pickering B Refurbishment and the Pickering B Continued Operations initiative through the Capacity Refurbishment Variance Account as detailed in Ex. H1-T2-S1. OPG

also seeks to recover the forecast difference between 2010 expenditures and amounts underpinning current payment amounts, consistent with the methodology approved in EB-2009-0174. To the extent that costs vary from forecast in the test period, OPG also proposes that such cost variances be captured in this account. Further discussion of 2008 - 2010 entries in the Capacity Refurbishment Variance Account can be found at Ex. H1-T1-S1.

LIST OF ATTACHMENTS

Attachment 1: Business Case for Pickering B Continued Operations

Attachment 2: Letter from Amir Shalaby, Ontario Power Authority to Andrew Barrett, OPG. April 1, 2010. Re: Pickering NGS Continued Operation and Darlington Refurbishment

Note: Attachment 1 is marked “Confidential” because the original document was considered to be confidential. The document provided as pre-filed evidence is not confidential.

PICKERING B CONTINUED OPERATIONS

1. RECOMMENDATION:

1. Implement Continued Operations as the basis for Business Planning in order to extend the nominal end-of-life of the Pickering B units to 2018 and 2020.
2. Begin the major component work i.e. pressure tube inspections, Spacer Location and Relocation work, boiler maintenance and inspections to allow operation for an additional 4 years or 240,000 EFPH on the pressure tubes.
3. Review the progress of this plan as part of the annual business planning process.

OPG's assessment shows that there is substantial value, estimated at $1,110million NPV (2010$), to the Ontario electricity system of being able to operate the Pickering B units for an additional 4 years beyond the previous nominal operating lives of 2014/2016. This translates to approximately 105 TWh of additional power supplied to the province of Ontario. The value to the Ontario electricity system is based on the difference between the cost of Pickering B's output and OPG's evaluation of the likely cost of replacing that output with other sources of generation. This value includes an estimated $420 million due to being able to continue to operate the two Pickering A units until 2020.

The assessment includes the incremental work required to implement the Continued Operations option (e.g. pressure tube inspections, Spacer Location and Re-location, boiler maintenance and inspections, reactor components inspections), their associated costs, and a generation projection developed for the 2010 to 2014 Nuclear Business Plan. The assessment also includes an incremental impact of 266 planned outage days during the period 2010-2013 and additional costs of approximately $195 million over the period 2010-2014. The incremental costs and generation impacts associated with implementing the Continued Operations Option in the Business Plan period are shown below:

Financial / Generation	LTD	2010	2011	2012	2013	2014	Total
Funding Class - OM&A ($M)	4	14	51	42	37	47	195
Generation - Days	-	28	111	56	71	-	266
Generation - TWh	-	-0.3	-1.3	-0.7	-0.9	-	-3.2

While the Pickering B Continued Operations option is attractive economically, it also provides flexibility to OPG and to the electricity system in managing the availability of other nuclear units and potential capacity shortfalls in the 2014 to 2020 period.

Managing the risks around continued operations will be important in achieving success. Risks to being able to achieve Continued Operations fall into the following main categories:

1. Technical/Fitness-for-service Risks: i.e. risk that a major component does not continue to meet fitness-for-service requirements (e.g. being unable to demonstrate that the pressure tubes continue to be fit-for-service based on established technical criteria).
2. Regulatory: i.e. risk that the proposed disposition is not accepted by the CNSC or that there is a change to regulatory limits resulting in OPG being unable to demonstrate continued compliance.
3. Economic: e.g. risk that a previously unknown issue is discovered leading to expensive repair costs and early shutdown of the units .

In order to manage the technical risks on the major life limiting component, the pressure tubes, management has undertaken a comprehensive project, the Fuel Channel Life Management Project in order to progress the technical issues which are required to be resolved. This OPG-initiated industry effort is being coordinated through the CANDU Owners Group and with the participation of Bruce Power. Successful completion of this initiative would lead to greater certainty around the remaining service lives of all of the CANDU units in Ontario and would provide valuable information for other CANDU operators.

Specific to Pickering B, OPG is embarking on additional maintenance work on the Pickering B reactors to reduce the likelihood of technical issues from developing.

In order to manage the regulatory risks, Management is actively consulting with the CNSC to qualify techniques for demonstrating the fitness-for-service of the pressure tubes.

In order to manage the economic risks, OPG will perform inspections of life limiting equipment and continue to monitor operating experience from other units and industry reports. Also, a phased approach will be utilized to release funds and assess the progress of this plan as part of the annual business planning process.

Management believes all the issues associated with this initiative are manageable. When considering the issues with this initiative the overall risk is rated as medium.

This strategy will be reviewed in each business planning cycle to verify that the benefits will be achieved.

2. SIGNATURES

Submitted by:

March 9, 2010
Paul Pasquet — Date
Senior Vice President, Pickering B

Recommended by:

2010-04-01
Wayne Robbins — Date
Chief Nuclear Officer

Finance Approval:

April 12/2010
Donn Hanbidge — Date
Chief Financial Officer

Line Approval per OAR Element 1.3:

2010-04-13
Tom Mitchell — Date
Chief Executive Officer

3. BACKGROUND & ISSUES

In June 2006, the Minister of Energy directed OPG to assess the feasibility of refurbishing its existing Pickering B nuclear plant and to begin an Environmental Assessment in support of refurbishing and continuing to operate Pickering B.

OPG's feasibility assessment consisted primarily of a Plant Condition Assessment, an Environmental Assessment and an Integrated Safety Review, as well as, development of conceptual level refurbishment project costs and an economic feasibility assessment. As a part of the feasibility assessment, OPG also explored the continued operation of the Pickering B units beyond their current nominal operating lives. This assessment indicated the potential to operate the units for an additional four years beyond their current nominal operating lives.

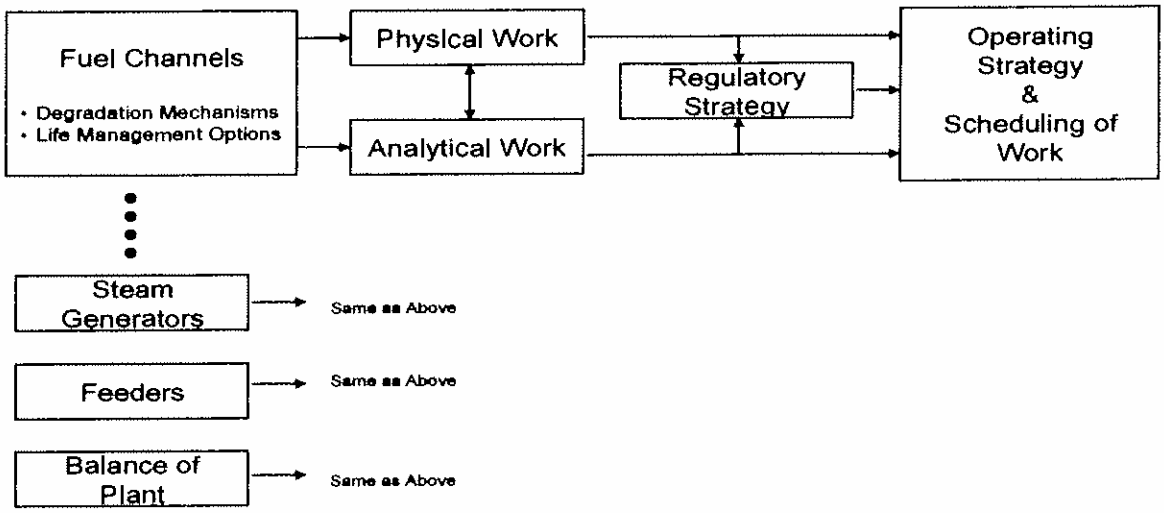
The nominal end-of-service life for the Pickering B units was based on the nominal design life of the key major component, i.e. fuel channels, and was projected to be when the units reached nominally 210,000 equivalent full power hours (EFPH). 210,000 EFPH is equivalent to 30 years operation at approximately 80% capacity factor. With the Pickering B units having come into service in the 1983 - 1986 period, the nominal ends of life of the Pickering B units were projected to be in the 2014 to 2016 period.

The decision on whether a nuclear unit is at the end of its life is primarily an economic one, as major life limiting components can be replaced and physical and procedural modifications implemented to ensure that the units are safe to operate and meet current regulatory codes and standards, if it is economically feasible to do so. For the Pickering B units, the technical life-limiting major components are the fuel channels. This technical life limit is reached when continued fitness-for-service of the leading fuel channels can no longer be assured.

During 2007 - 2009, in conjunction with the assessment of the economic feasibility of refurbishing Pickering B OPG also completed a preliminary assessment which indicated that there was potentially significant economic and strategic value in taking actions to continue to operate the Pickering B nuclear units by up to 4 calendar years beyond their nominal 30-year operating life, whether or not the units were eventually refurbished.

A planning scenario was developed for the continued operation of Pickering B as part of the 2009-2013 business planning process. The purpose of this planning scenario was to identify all of the work required over the remaining current operational life of the plant, necessary to provide confidence in the achievement of continued operation for 4 years beyond their current nominal operating lives. As a result, a team was established to identify the physical work (maintenance and inspections) required on the major components and balance of plant, as well as the analytical work required. The development of a regulatory strategy was also part of this work program. The intent was to scope out all of the work which would be required to provide confidence in the achievement of continued operation of the Pickering B units for 4 years beyond the current nominal operating life. Figure 1 provides a graphical overview of the approach adopted.

Figure 1: Schematic Overview of Work Plan to Develop Continued Operations Planning Scenario



Note: This is a simplified view. Much of the analytical work (e.g. NOP Trip set points) work involves assessing the interaction of the impact of co-incident degradation of multiple systems on the overall performance of the plant.

1.1. Major Components

The continued operation of Pickering B was assessed by OPG to be an economically attractive option for the Ontario electricity system. In addition, given the upcoming expected major refurbishment projects on the provincial fleet of nuclear units, OPG assessed that achievement of Continued Operations would provide significant flexibility to the Ontario electricity system in managing potential capacity shortfalls in the 2014 to 2020 period.

Continued Operation of Pickering B was also recognized as providing enhanced flexibility to OPG to support the management of the overall refurbishment schedule for the nuclear units.

A significant focus of the work scope was to better understand and address any risks to ensure that appropriate activities were built into the Continued Operations planning scenario to mitigate those risks. Some of the key issues with the major components and the balance of plant at Pickering B are discussed in the following sections.

Fuel Channels (Pressure Tubes)

Aging mechanisms affecting the pressure tubes are closely monitored by OPG technical staff and the results of that monitoring are subject to regulatory oversight. This type of regulatory oversight is normal for the nuclear industry. Aging mechanisms include changes in the physical dimensions of the pressure tubes and the ingress of hydrogen into the pressure tubes. The presence of hydrogen, which increases with operating time, leads to an increased potential for defect formation (if pressure tube to calandria tube contact exists) and aging of the material properties of the pressure tubes with time. Thus, OPG must have high assurance that the concentration of hydrogen in the pressure tubes is below certain specified limits.

The highest priority for assuring the integrity of the pressure tubes in Pickering B units is to avoid contact between the pressure tubes and calandria tubes. This requires ensuring that the spacers between the calandria tubes and pressure tubes are in the correct positions to ensure that there can be no contact. The Pickering B units' spacers have been repositioned in an operation known

as SLAR (Spacer Location and Relocation) to ensure that pressure tube to calandria tube contact up to 210,000 EFPH is precluded. In order to preclude pressure tube to calandria tube contact until at least 240,000 EFPH, an assessment was done to determine the number of channels which would need to be "Re-SLARed". In addition, once spacers are repositioned, there is a need for "re-visits" to the channels to monitor whether the spacers have moved. The proposed work plan for Continued Operations includes allowances in outage plans for both the SLAR work and the re-visits. During the examination of the replaced fuel channel A13 in Unit 7, it was noted that one of the four garter springs was worn. Additional inspections will also be required to measure the pressure tube to calandria tube gap directly.

The next most important aging issue which is being managed is known minor defects on pressure tubes. These defects, which are known to have occurred during commissioning activities, are being closely monitored. The impact of defects is to limit the number of thermal cycles on the pressure tubes (heat-up/cool-down). Defects need to be monitored to provide assurance that there are no additional defects developing, and the current ones remain unchanged. Mitigation includes working with the CNSC to gain acceptance of a methodology for characterizing the risks around known defects. Partial acceptance of that revised methodology has already been achieved. Currently, the number of thermal cycles on each unit is not considered to be life limiting. The work scope for Continued Operations includes actions to continue to gain broader acceptance of a revised methodology.

There are other pressure tube aging mechanisms and regulatory issues which are being managed. While the majority of these are not considered life limiting, these risks include the potential for changes to regulatory requirements and limits. Management has undertaken a comprehensive project, the Fuel Channel Life Management Project, in co-operation with the other operator of CANDU reactors in Ontario, and coordinated through the CANDU Owners Group, in order to progress the technical and regulatory issues which are required to be resolved. The risk table in Appendix B contains some additional details of pressure tube aging mechanisms and potential risks.

Steam Generators

The steam generators in the Pickering B units produce the steam used to drive the turbine-generator set. The tubes in the steam generators serve as a containment boundary as there is hot, pressurized heat transport fluid (heavy water) on the inside of these tubes. A leak in a steam generator tube could, therefore, result in tritiated heavy water entering the secondary side of the plant.

The steam generators at Pickering B have performed well for several years. Among the known aging mechanisms being managed is under-deposit pitting/corrosion of the steam generators tubes. In order to reduce the potential for steam generator tube leaks, the Pickering B Continued Operations work scope includes adoption of an enhanced maintenance regime which includes increased water-lancing to remove deposit build up on the steam generator tube sheets as well as more frequent and comprehensive inspections of the steam generator tubes. The Pickering B steam generators have been assessed to have a high probability of continuing to perform reliably during the Continued Operations period and beyond.

Feeders

The feeder pipes in a nuclear unit transport the heat transport fluid from the pressure tubes in the reactor to a common outlet header from which the fluid is piped to the steam generators and then back from the steam generators via an inlet header to the pressure tubes in the reactors in a closed loop. The primary aging mechanism of concern for the feeders is wall-thinning due to flow assisted

corrosion. Although feeder pipe cracking has been observed in another CANDU unit, there have been no such observations in OPG units, and the risk of feeder pipe cracking in Pickering B units is assessed to be low.

As the units age, additional feeders will require replacement as they approach the limit of fitness-for-service due to flow assisted corrosion. The Pickering B Continued Operations work scope includes an assessment of the number of feeders which will require replacement during the continued operations period as well as the requirements for on-going inspections. Feeders in the Pickering B units have been assessed to have a high probability of operating reliably during the continued operations period.

Reactor Components

Reactor components include the calandria vessel, the calandria tubes, the reactivity mechanism guide tubes, moderator relief ducts, and calandria external components such as end fittings, reactivity mechanism drives and cables and moderator inlet pipes. While some aging mechanisms are known, there is a limited inspection history within the CANDU industry on many of these components.

Some inspections were carried out during 2008 and 2009 in order to better understand the risks. One aging mechanism for which inspections are necessary during the next several years involves potential calandria tube / Liquid Injection Shutdown System (LISS) nozzle contact. Preliminary results based on a limited inspection are encouraging. Further inspections will be carried out to verify that this is not an issue for Continued Operation.

Risks will remain during the Continued Operations period that aging of some reactor components is taking place which could cause outages or threaten the life of the units. To mitigate these risks, information is being gathered through industry-wide projects being undertaken by the CANDU Owners' Group (COG) and also operational experience is being gathered from other refurbishment projects, e.g. results of calandria internals inspections at the Bruce A and Pt. Lepreau stations.

The Pickering B Continued Operations work scope includes an assessment of the work required to gain greater confidence in the condition of reactor components and the potential risks to reliability of the plant in the Continued Operations period. While there are unknowns, the confidence in achieving 4 years of continued operation for reactor components is generally considered high at this time.

Balance of Plant

A detailed Component Condition Assessment (CCA) of 70 systems, major structures and major components at the Pickering B station was completed in the first half of 2007. The recommendations from these CCAs were assessed to determine the potential impact on costs and reliability in the Continued Operations period. The conclusion of the assessment was that, with the implementation of increased preventive maintenance programs and additional inspections there would be minimal risks to equipment reliability over the Continued Operations period.

The cost of these programs has been estimated at approximately $58 million over the five year period 2010 – 2014. Electrical and motor maintenance are examples of balance of plant work for which incremental funding has been included.

Integrated Safety Review and Related Issues

A detailed assessment of Pickering B against modern codes and standards was carried out as part of the Integrated Safety Review process during the assessment of the refurbishment of Pickering B. While the evaluations were done on the basis of refurbishing and continuing to operate Pickering B for an additional 30 years, there are potential cost impacts on the Continued Operations period to address issues identified in the Integrated Safety Review. The economic assessment of Continued Operations includes incremental costs to fund these potential issues.

Impact on Pickering A Operation

Units 1 and Unit 4 are currently in operation at Pickering A. The current predicted end-of-service lives for Pickering A Units 1 and 4 are the end of 2021 and 2027 respectively, assuming independent operation from Pickering B is feaslble.

Pickering A's operation is linked to Pickering B through shared common systems and in particular, power supplies to some safety systems. OPG's assessment is that two units on the Pickering B station must be in operation in order to support the Pickering A units. As a result, significant modifications to systems to address this issue will be required to facilitate the operation of Pickering A in the absence of Pickering B. In addition to addressing the technical issues, these modifications and other mitigation actions would need approval by the CNSC.

While it would not be impossible to operate Pickering A after end of life of Pickering B, OPG at this time would not attempt to operate Pickering A with Pickering B shutdown. The costs to operate Pickering A independent of Pickering B would likely equal or exceed the system value.

Impact on Financial Outlook

Should the Pickering B Units be shutdown in the 2014-2016 time period, further review of the potential impact on depreciation costs, severance costs, and the decommission fund would be required.

4. ALTERNATIVES AND ECONOMIC ANALYSIS

The alternatives being analyzed are: (I) plan to operate Pickering B to 210,000 EFPH on the pressure tubes, then shut down the units versus (Ii) plan to operate the units to 240,000 EFPH before the units are shutdown. In order to have two units on the Pickering B station in operation to support the Pickering A units, the altemative of operating the Pickering B units to 240,000 EFPH includes an assumption of "modified" outages on Pickering Unit 7 in order to achieve the objective of aligning its life with that of Pickering Unit 8.

ALTERNATIVE 1 –NOMINAL LIFE CASE:
Plan to Operate all Pickering B Units until 210,000 EFPH on the pressure tubes.

In this alternative, no incremental inspections, maintenance, analytical or regulatory strategies would be put in place to try to continue to operate the units beyond 210,000 EFPH on the pressure tubes. The nominal predicted end-of-life dates for the Pickering B Units would be Q2 2014 for P5 and P6, Q1 2015 for P7, and Q2 2016 for P8. The assumption would be that, as 3 Pickering B units would be shutdown by Q1 2015, Pickering A Units 1 and 4 would also be shutdown in Q1 2015.

ALTERNATIVE 2 - CONTINUED OPERATIONS:
Plan to operate all Pickering B Units until 240,000 EFPH on the pressure tubes. Implement operating strategies to keep two Pickering B units operating to support Pickering A operation.

In this alternative, the incremental inspections, maintenance, laboratory testing, analytical work and regulatory strategies would be put in place to achieve continued operation of the Pickering B units beyond 210,000 EFPH with a target of achieving 240,000 EFPH. In addition, life management outages would be implemented to continue to operate Pickering Unit 7 to the shutdown date of Pickering Unit 8 (i.e. 2020) in order to have the station in a configuration which would support the operation of the Pickering A units for as long as possible.

The continued operations predicted end-of-life dates for the Pickering B Units would be Q2 2018 for P5, P6, and Q2 2020 for P7 and P8. Pickering A Units 1 and 4 would be shutdown co-incident with the shutdown of Pickering Units 7 and 8 in 2020.

The identified incremental work, its associated costs and the impact on generation throughout the 2010-2014 Business Plan period and beyond was assessed. A summary of the impacts of Continued Operations is shown in Appendix C.

Net present values of the alternatives were calculated based on forecast costs and revenues (performance and assumed electricity price). Results were calculated from an Ontario system perspective based on OPG's assessment of the value of the incremental energy and capacity to the Ontario system (OPG's 2009 forecast of System Energy Values (SEVs)).

For Alternative 1, 2010-2014 Business Plan costs and performance, excluding the Continued Operations work, costs and generation impacts, were used and extrapolated where required to current nominal end-of-life dates (2014/2016). For Alternatives 2, 2010-2014 Business Plan costs and performance, including the Continued Operations work, costs and generation impacts, were used and extrapolated to 2018/2020. The Continued Operations costs and performance impacts included such items as SLAR costs, enhanced water-lancing costs, increased planned outage days, and assumed increase in forced loss rates as units' lives are extended beyond the current nominal ends-of-life. In addition, increased costs were postulated during the Continued Operations period in order to maintain a conservative view of the value of Continued Operations. The Net Present Value of the Continued Operation initiative includes the value of continuing to operate the Pickering A units for nominally 4 additional years.

The economic assessment results showed approximately $1,110 million net present value (NPV) to the Ontario electricity system for additional energy from the Pickering B and A units compared to a 2014/2016 shutdown for Alternative 1. This value includes an estimated $420 million value of being able to operate the two units at Pickering A until 2020.

In addition, economic impacts that have not been quantified include:

- A positive NPV impact on the decommissioning liability for Pickering.
- NPV savings by deferring potential transmission upgrade costs which OPG believes will be required.

More details on the key risks and risk mitigation activities are provided in Appendix A. Each risk is also rated in terms of the confidence that these risks can be successfully mitigated.

Results of the economic assessment were tested for sensitivity to key inputs such as:

(i) assumed electricity price regime
(ii) the length of continued operation life achieved
(iii) generation performance
(iv) costs of incremental work such as SLAR, enhanced water lancing, and component condition assessment mandated work, etc.

Figure 2 shows the results of some of the key sensitivity analyses performed.

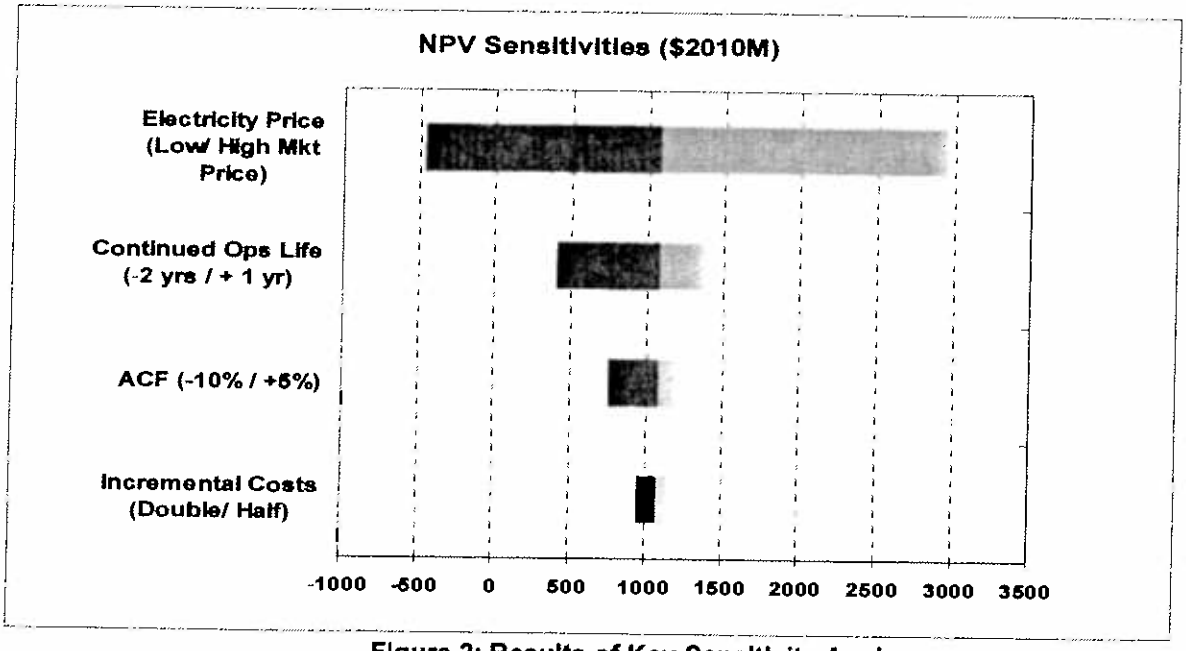


Figure 2: Results of Key Sensitivity Analyses

The sensitivity analysis shows that the expected value is insensitive to the cost of the incremental work, e.g. a doubling of the costs of all of the work reduces the expected value of Continued Operations by approximately $220 million. The expected value is, however, very sensitive to the assumed electricity price regime. In a high priced regime, the value of the output from Pickering A and B in the Continued Operations period could be as high as $2,850 million. A low priced regime is an extreme scenario resulting from low electricity demand and low gas prices

In addition, a sensitivity test was performed assuming a price equivalent to OPG's current regulated nuclear rate (minus one-time variance account adders) of $53/MWh real, i.e. unescalated for the period 2010 to 2020. This is equivalent to a price which is declining in nominal terms at the rate of inflation. At this price, the value of Continued Operations to the Ontario Electricity system was assessed to be $70 million.

As well, a sensitivity test was performed assuming a price equivalent to OPG's current regulated nuclear rate (minus one-time variance account adders) of $53/MWh nominal, i.e. escalated for the period 2010 to 2020. This is equivalent to a price which is flat in nominal terms. At this price, the value of Continued Operations to the Ontario Electricity system was assessed to be $580 million.

5. THE PROPOSAL

1. Implement Continued Operations in order to extend the nominal end-of-life of the Pickering B units to 2018 and 2020.
2. Begin the major component work i.e. pressure tube inspections, Spacer Location and Relocation campaigns, boiler maintenance and inspections to preserve the option to continue to operate the units for an additional 4 years or 240,000 EFPH on the pressure tubes.
3. Review the economic feasibility of this plan as part of the annual business planning process.

The work to be completed in the Continued Operations work program and the current estimated costs are summarized as follows:

- Life Cycle Management & Inspection Programs
- Other Planned Outage Activities
- Component Improvements (as a result of the Component Condition Assessments)
- Feeder Replacement (incremental feeders needing to be replaced to enable continued operations)
- Fuel Channel Life Management Project
- Enhanced Boiler Water Lancing
- Other Projects

6. QUALITATIVE FACTORS

Deferral of Potential Staff Reductions

By deferring the shutdown of the station by 4 years, there may be greater opportunities to smooth the redeployment of staff to the Darlington refurbishment project, as well as, to the Darlington New Nuclear project and operations, if that project proceeds.

Socio-Economic Impacts

Pickering Nuclear is a major employer within Durham Region. In 2009, approximately 2,700 people were directly employed at PNGS A and PNGS B. Pickering Nuclear and associated OPG facilities contribute significantly to the tax base of the City of Pickering. Pickering Nuclear has attracted nuclear related businesses, helping to establish a Durham Energy Industry Sector Cluster (e.g. Eastern Power, Eco-tech, Black and MacDonald, AREVA, New Horizons Systems Solutions, etc.). Continued operation of Pickering A and B defers the impacts of the shutdown of Pickering on the Durham Region by 4 years.

Air Emissions Impacts

If the Pickering plant is not in service there would likely be a greater demand for gas-fired replacement generation to be required to meet the electricity system load in the 2014 to 2020 period, with the associated impacts on air emissions.

Impacts on Decommissioning Liability

The current decommissioning liability for Pickering B is established based on shutdown dates in the 2013 to 2015 period. Should the station be shutdown at later dates, there would be a potential societal benefit due to deferral of the costs of decommissioning. However, note that should the shutdown of Pickering A be advanced to coincide with the shutdown of Pickering B, there would be

a slight increase in the present value of the Pickering A decommissioning liability relative to current estimates.

Transmission Impacts

A number of issues would need to be addressed when the Pickering B units are retired, including replacement supply, capacity of the Cherrywood transformers and the 230 kV system, system voltage support and security risk. Due to its importance to the GTA system, the transmission changes required would likely be complex and extensive. Such a decision would remove up to 3,000 MW (including Pickering A) of internal generation from the GTA. The combination of a third 500 kV supply line to Parkway T.S. and the Oshawa Area station could address the Pickering B retirement from a transmission supply perspective. However, the edditional loss of the Pickering A units would necessitate a review of generation development in the area as well as area load supply, possibly in the form of a third major supply line to Toronto.

Based on OPA plans, the development of the Oshawa Area TS (approximately $150M) would be required to be advanced from the 2018-2020 timeframe to the 2014-2016 timeframe if Pickering B were to shutdown at the present end of service lives.

These advancements of transmission infrastructure improvements have a net present value impact and are an additional benefit of Pickering B Continued Operations.

7. RISKS

Risks to being able to achieve Continued Operations of the Pickering B units fall into the following main categories:

1. Technical/Fitness-for-service Risks: i.e. risk that a major component does not continue to meet fitness-for-service requirements (e.g. being unable to demonstrate that the pressure tubes continue to be fit-for-service based on established for technical criteria).
2. Regulatory: i.e. risk that the proposed disposition is not accepted by the CNSC or that there is a change to regulatory limits resulting in OPG being unable to demonstrate continued compliance.
3. Economic: e.g. risk that a previously unknown issue is discovered leading to repair costs and early shutdown of the units for economic reasons.

8. POST IMPLEMENTATION REVIEW

The strategic work outlined in this Business Case is intended to provide greater certainty in the achievement of Continued Operations for Pickering B. The incremental work and expenditures required will be reviewed in each business planning cycle.

Physical Work (Inspections & Maintenance):

(i) Results of planned pressure tube inspection.

Technical Analyses / Regulatory Strategy:

(i) Verify that the Continued Operations work scope is being progressed.

Strategic Questions

(i) What is the current status of the plans for refurbishing the Darlington units and how have any changes to those plans affected the strategy for Pickering B Continued Operations?
(ii) How are the plans for new nuclear build progressing and how do any changes affect the strategy for Pickering B Continued Operations.

Appendix A: Summary of Key Technical, Regulatory, Reputation and Economic Risks Associated with Continued Operations

Risk Description	Consequence	Mitigation Strategy	Impact on Continued Operations	Prob. of Success (Very High, Medium, Low, Very Low Unknown	Industry Issue or unique to Pickering B?
Technical Risks – Pressure Tubes					
Pressure tube to calandria tube contact	Potential for defect formation	**Technical:** SLAR all channels to 240k EFPH. SLAR revisits to address potential for post-SLAR spacer movement. Currently, the risk is being managed by probabilistic assessments and targeted revisits.	Additional planned outage days in Generation Plan to execute SLARs and SLAR "re-visits" to assure contact-free operation to 240,000 EFPH.	2yrs - High 4 yrs – Med	Unique to Pick B and some other Candu units.
Pressure tubes - hydrogen ingress to body of tube and rolled joint	Embrittlement of pressure tubes	**Technical:** Sampling of P/Ts (Scrape) to trend ingress rates. Laboratory testing to demonstrate P/T integrity at higher hydrogen concentrations **Regulatory:** Provide evidence to regulator to obtain increased limits	Potential additional time in outages to conduct sampling activities If limits cannot be changed, potential to exceed limits near end of Continued Operations period	2yrs - High 4 yrs – Med	Industry
Pressure tube defects	Defect growth	**Technical:** Monitor in-service defects every outage; manage heat up/cool down cycles **Regulatory:** Gain acceptance of new assessment methodologies	Potential need to extend forced outages to inspect and disposition defects.	2yrs - High 4 yrs – High-Med	Problem more acute for Pickering B
Technical Risks –Reactor Components					
Calandria tube defects	Leaking calandria tubes – unit shutdown	Developing – Tooling, procedures and capability are in place in the event of future failures.	Judged to be low probability.	2 yrs – Very High 4 yrs - High	Industry
Liquid Injection Shutdown System Nozzle / Calandria tube contact	Leaking calandria tubes – unit shutdown	**Technical:** Inspections in upcoming outages and replacements of fuel channels if required. Tooling, procedures and capability are in place.	Could lead to a small number (less than 10) of pressure tube and calandria tube replacements .	2yrs – High 4yrs - High	Industry
Other Calandria Internals (e.g.): • Guide tubes spring de-tensioning • Moderator Inlet Nozzles • Moderator relief ducts	Failure to demonstrate fitness-for-service	**Technical:** Operating Experience from Bruce Power and NB Power refurbishments Planned inspections in Pickering A, B and Darlington over the next several years. Information sharing with COG and establishment of joint project to address inspection data.	Some components cannot be inspected except in a refurbishment outage. Unforeseen aging mechanisms can lead to a prolonged outage or shutdown.	2yrs – Very High 4 yrs –Very High	Industry

Appendix A: Summary of Key Technical, Regulatory, Reputation and Economic Risks Associated with Continued Operations

Risk Description	Consequence	Mitigation Strategy	Impact on Continued Operations	Prob. of Success (Very High, Medium, Low, Very Low Unknown	Industry issue or unique to Pickering B?
Technical Risks –Boilers					
Boiler tube leak • Under deposit pitting / corrosion	Unacceptable number of boiler tube leaks	**Technical:** Increased water lancing and inspections	Small release of tritium to the environment.	2yrs - High 4 yrs – High	Both
Technical Risks –Feeders					
Feeders • Feeder thinning	Failure to demonstrate fitness-for-service.	**Technical:** Well established program of feeder inspections and replacements each outage. **Regulatory:** Working with regulator to gain acceptance of Advanced Stress Analysis which can reduce the number of feeder replacements.	Number of feeders tends to vary from year to year but the proposed number to be replaced does not threaten the viability of the station.	2yrs - Very High 4 yrs – High	Industry (less of an issue at Pickering B)
Technical Risks –Balance of the Plant					
Balance of Plant • Turbine/generator • Emergency Power Generators • Screenhouse (algae management) • Electronic components	Possible derates or forced outage.	**Technical:** Combination of maintenance strategies, life cycle and project upgrades will ensure equipment is kept available.	Incremental costs, forces loss rates and outage delays	4 yrs - High.	Both

Appendix A: Summary of Key Technical, Regulatory, Reputation and Economic Risks Associated with Continued Operations

Risk Description	Consequence	Mitigation Strategy	Impact on Continued Operations	Prob. of Success (Very High, Medium, Low, Very Low Unknown	Industry issue or unique to Pickering B?
Regulatory Risks					
Integrated Safety Review and Environmental Assessment (Mandated Regulatory Upgrades to support continued operation) • Fish Impingement & Entrainment • Effects of Thermal Plume • CCA mandated upgrades • Safety Analysis / ISR	Fish Impingement and Entrainment must be addressed.	**Technical:** Implement modifications to address fish impingement and entrainment. **Regulatory:** Work underway with the CNSC to fully define potential requirements and develop an action plan. Prepare a plan to assess and potentially address thermal plume mitigation.	Regulatory (power reduction due to reduced operating margin is possible). May impact Base OM&A costs	2 yrs- High 4 yrs - Medium	Both, but Pickering B may be the focus
Regulator acceptance of the fitness-for -service approach to determining station end-of-life.	Regulatory attention; (for safety analysis, potential derates due to reduced operating margin is possible).	Work with regulator to continue to get acceptance to fitness-for-service approach.	Inability to obtain regulator acceptance could result in regulatory imposed shutdown prior to end of Continued Operations period.	4 yrs - High	Both, but Pickering B may be the focus
Scope / Economic					
Unforeseen major equipment failure.	Major outages for repairs or shutdown of a unit or entire plant prior to expected duration of continued operations period.	**Technical:** Where possible, perform inspections of equipment which fall into the category of potential life limiting; where not possible, continue to monitor OPEX from other units and refurbishment projects and sponsor industry technical assessments. **Economic:** Implement a phased funding strategy (minimize incremental investments in Continued Operations) until greater technical and regulatory certainty can be achieved.	Outages for unforeseen repairs or shutdown of a unit or the plant.	2 yrs – Very High 4 yrs – Very High.	Both

For Internal Project Cost Control

APPENDIX B: Impacts on Generation of Pickering B Continued Operations

Title: Pickering B Continued Operations

Work Program Impacts		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Pick B	Life Cycle Mgmt & Insp Programs	27	65	0	45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	137
	Other Planned Outage Activities	1	46	56	26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	129
	Total Incremental PO Days	28	111	56	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	266
	Total Incremental/Decremental TWh	-0.3	-1.2	-0.7	-1.1	4	9.5	14.4	14.2	11.3	6.4	3.4	61.9
Pick A	Total Incremental/Decremental TWh	N/A	N/A	N/A	N/A	0.6	7.8	7.6	7.7	7.8	8	3.3	43.1
PA & PB	Total Incremental/Decremental TWh	-0.3	-1.2	-0.7	-1.1	4.6	17.3	22.2	21.9	19.1	16.4	6.7	105

APPENDIX C: COST SUMMARY

ONTARIO POWER GENERATION

Summary of Estimate	Date	17-Feb-10
	Project #	NA

Facility Name:	**Pickering B**
Project Title:	**Pickering B Continued Operations**

Estimated Cost in Million $

Year	2010	2011	2012	2013	2014	2015	2016	Totals	%
Life Cycle Mgmt & Insp Programs	1.8	8.8	4.9	4.4	5.2			35.1	
Other Planned Outage Activities	1.3	8.3	9.7	4.8	2.5			26.6	
Component Improvements	8.6	13.6	10.6	15.6	9.5			57.8	
Feeder Replacements					8.9			8.9	
Fuel Channel Life Mgmt Project	1.3	4.9	3.9	2	0.5			12.5	
Enhanced Water Lancing		12	7.8	3.6	7.8			31.2	
Other Projects	0.5	3	5.3	6.3	3			18.1	
Interest	-								
Contingency									
Totals	**13.5**	**50.5**	**42.2**	**36.7**	**47.4**			**190.2**	

Prepared by:

Director, Business Support (Pick B)

Approved by:

Site Vice President, Pickering B

APPENDIX D: Financial Modelling – Assumptions

Cost Assumptions:

1. Base OM&A, Capital and OM&A projects, and Outage OM&A costs for Pickering B are consistent with the 2010-2014 Business Plans for those stations. These costs were extrapolated to the period 2015-2020.
2. Incremental costs for Pickering B Continued Operations are as shown in Appendix C.

Financial Assumptions:

1. Cost escalation rates used are consistent with those provided on the Corporate Finance Intranet.
2. A nominal discount rate of 7% was applied in all analyses.

Operating Life Assumptions:

1. Current nominal operating life of 210,000 Equivalent Full Power Hours (EFPH) for each of the Pickering B units was used in the Nominal Life Case. The Continued Operations Case was assessed at a nominal operating life of 240,000 EFPH (nominally 4 calendar years of Continued Operations).
2. Sensitivities on operating life were done at 225,000 EFPH and 248,000 EFPH, i.e. nominally for 2 and 5 calendar years of continued operations.

Energy Production Assumptions:

1. For the Base Case, energy production assumptions are consistent with the 2010-2014 Business Plan for Pickering B, but excluding the impact of outage extensions caused by Continued Operations for Pickering B.
2. For the Continued Operations Case:
   - » Energy production assumptions for the 2010 to 2014 period are based on the Business Plan for Pickering B, including the impact of outage extensions caused by Continued Operations, i.e. the incremental planned outage days shown in Appendix B. In addition, in the 2015-2018 period, 2010 – 2014 Business Plan period energy production levels were projected forward with some conservative assumptions added regarding energy production.
   - » Sensitivities on capability factors were performed for range of plus 5% to minus 10% around the nominal values.

Other Assumptions:

1. OPG 2009 median assumptions regarding future Ontario system development, gas prices etc, were used as the bases from which to evaluate the value to the Ontario electricity system. Sensitivities were run for a number of scenarios which would lead to for example a Low Price regime and also a High Price regime. Two special sensitivities were also run where the energy production from Pickering B was valued at a) 5.3 ¢/kWh real (current 2010 regulated rate, minus adjustments for variance accounts, assumed with no increases (i.e. only adjusted for inflation adjustment), and b) 5.3 ¢/kWh nominal (i.e. no adjustment for inflation) over the remaining life of Pickering A and B.
2. For the Continued Operations Case, it is assumed that life management of Pickering B Unit 7 would be implemented in order to be able to operate that unit to the nominal end of life date of the Unit 8, the unit with the longest remaining life. This is to ensure that two Pickering B units are in operation in order to facilitate continued operation of the Pickering A station for as long as possible.

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April 1, 2010

Andrew Barrett
Vice President – Regulatory Affairs and Corporate Strategy
Ontario Power Generation
700 University Avenue,
Toronto Ontario
M5G 1X6

Dear Andrew,

Re: Pickering NGS Continued Operation and Darlington Refurbishment

The purpose of this letter is to comment on proposals by Ontario Power Generation ("OPG") for the continued operation of Pickering NGS and the refurbishment of Darlington NGS.

Continued Operation of Pickering NGS

OPG has provided the Ontario Power Authority ("the OPA") with the following information regarding their proposal for the continued operation of Pickering NGS:

- Two of the four generating units that are currently in operation at the Pickering B Nuclear Generation Station ("Pickering NGS") are assumed to have a nominal end of life of 2014, and the remaining two units at that station are assumed to have a nominal end of life of 2016. In addition, OPG is not planning on operating the Pickering A units once there are less than two operating units at Pickering B. A work program is currently underway to establish the feasibility of extending the nominal life of the Pickering B units by four years. If determined to be feasible, it would enable the operation of two of the six generating units to be extended through the years from 2014 to 2018 and the operation of the remaining four generating units to be extended through the years from 2018 to 2020. The results of this work program are expected to be known in late 2012.

- To preserve the option of continued operation beginning in 2015, it will be necessary for OPG to incur $105 million in additional OM&A costs from 2010 to 2012 when the feasibility of continued operation is expected to be known. In addition, it will be necessary to increase the amount of time the generating units are undergoing planned outages during the period prior to 2015 in order to perform the necessary preparatory work. Details are outlined in the attached summary provided by OPG.

- Based on the information provided by OPG, the OPA has assessed that the continued operation of Pickering NGS will provide electricity at a price of approximately $50 per MWh.

The OPA believes that substantial system benefits could potentially arise from the continued operation of Pickering NGS during the period from 2014 to 2020. During this period, generating units at Darlington NGS and possibly at Bruce B NGS are expected to be out of service for refurbishment, and gas-fired generation will therefore be on the margin for many hours. Generation from Pickering NGS will replace generation from gas-fired resources or similarly-priced imports, and will result in lower overall system costs and emissions.

For example:

The incremental energy produced by Pickering NGS during the period 2014 – 2020 as the result of continued operation is forecast to be 104 TWh at a total incremental cost of 5.4 B$. This represents a unit cost of about 51 $/MWh (see attached information provided by OPG).

For gas prices in the range of 6 $/MMBtu to 8 $/MMBtu and an assumed carbon price of 20 $/ton, the variable operating cost for typical gas-fired generation with a typical heat rate of 7,000 MBtu/MWh would be in the range of 52 $/MWh to 66 $/MWh, which is up to 15 $/MWh higher than the cost of Pickering NGS energy.

Depending on the amount of gas-fired generation or similarly-priced imports replaced by Pickering NGS generation, the overall system benefit could be up to 1.6 B$ (104 TWh multiplied by 15 $/MWh) due to the reduction of system costs.

Although the above example illustrates the potential for substantial system benefits, there could be some conditions under which system benefits are substantially reduced or become negative. These include lower than expected system demands, lower than expected gas or carbon prices, or higher than expected continued operation costs.

Based on the potential for substantial system benefits, the OPA supports a decision by OPG to proceed with an initial expenditure of funds in the period 2010 – 2012 to assess the feasibility of continued operation of Pickering NGS, and to maintain the option for continued operation should it prove to be feasible. System benefits should be re-assessed before committing additional funds required beyond 2012.

If required, the OPA is prepared to provide more details on its assessment of integrated power system impacts of Pickering continued operation at a later date.

Refurbishment of Darlington NGS

The Integrated Power System Plan ("IPSP") filed with the Ontario Energy Board in August, 2007 outlines reasons why nuclear refurbishment is an attractive option. At Exhibit D, Tab 6, Schedule 1, Page 20, it states the following:

Subject to economic viability, refurbishment is an attractive option for the following reasons:

- *Compared to the new nuclear build option, refurbishment provides a shorter lead-time advantage as a result of unit refurbishment outages...;*

- *Refurbishment utilizes existing generation infrastructure, sites and transmission infrastructure thereby minimizing the associated environmental footprint;*
- *Local and surrounding community support for the continued operation of the Pickering, Bruce and Darlington generating stations is strong; and*
- *Experience from past and current refurbishment projects, both domestically and internationally, is leveraged on an on-going basis. This could result in improved project cost and schedules.*

With respect to Darlington NGS:

1. OPA re-affirms the position outlined in the IPSP evidence as applied to the refurbishment of Darlington NGS.

2. OPG has expressed a high degree of confidence that the project will have a Levelized Unit Energy Cost (LUEC) of between 6 and 8 cents per kilowatt-hour (2009$). If this proves to be the case, refurbishment of Darlington would be an economic alternative in comparison to the cost of other baseload resources.

   For example:
   The comparable LUEC of combined cycle gas turbines ("CCGTs") would be in the range from 10 to 15 cents per kilowatt-hour based on the following assumptions:

   - *a nominal overnight capital cost of 1,000 $/kw*
   - *a service life of 20 years*
   - *an annual capacity factor of 87%,*
   - *an average gas price of 8 $/MMBtu, and*
   - *average carbon prices ranging from 50 $/ton to 200 $/ton (a more appropriate assumption for the period 2020 to 2050.)*

   Above dollar amounts are in 2009 constant dollars.

   Other types of baseload resources such as new nuclear or renewable sources are also expected to have higher costs than Darlington refurbishment.

3. The OPA understands that the Darlington Refurbishment project will be subject to stringent project management controls which will require that certain milestones be achieved before proceeding to a subsequent phase and before authorizing the expenditure of funds associated with activities in that phase.

The OPA therefore supports the refurbishment of Darlington NGS based on expected electricity costs in the range of 6 to 8 cents per kilowatt-hour.

Amir Shalaby
Vice President – Power System Planning
Ontario Power Authority

INFORMATION RECEIVED FROM OPG REGARDING PICKERING NGS CONTINUED OPERATION

Decremental & Incremental Generation in 2010 to 2020 Due to Continued Operations (TWh)												
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
PA Energy (TWh)	N/A	N/A	N/A	N/A	1	8	8	8	8	8	3	44
PB Energy (TWh)	0	-1	-1	-1	4	9	14	14	11	8	3	60
Total	0	-1	-1	-1	5	17	22	22	19	16	6	104

Incremental Costs in 2010 to 2014 due to Continued Operations (M2010$)						
Year	2010	2011	2012	2013	2014	Total
PB Incremental Costs (M2010$)	14	50	41	35	44	184
PB Incremental Costs (M2010$) in data table sent to OPA on Jan 15, 2010	*14*	*50*	*41*	*35*	*158* [1]	

(1) Comprised of (a) $44 in incremental work associated with enabling Continued Operations and (b) $114 in estimated on-going OM&A costs in the Continued Operations case associated with the Continued Operations of P5, P6 & P7 during 2014.

Incremental Planned Outage Days in 2010 to 2013 due to Continued Operations					
Year	2010	2011	2012	2013	Total
PB Incremental Planned Outage Days	28	102	56	92	278

Incremental Cost of Pickering Continued Operation (M2010$)								
	2014	2015	2016	2017	2018	2019	2020	Total
Pickering A and B OM&A + Fuel Cost	224	746	1,022	1,060	982	859	349	5,242
Cost to Enable Continued Operation during 2010 - 2013								140
Total Continued Operation Cost								5,382

PROJECT OM&A – NUCLEAR

1.0 PURPOSE

This evidence provides a description of the Nuclear project OM&A budget for the historical years, bridge year, and test period.

2.0 OVERVIEW

The nuclear project OM&A expense for 2007 - 2012 is provided in Ex. F2-T3-S1 Table 1. The test period project OM&A expense of $135.9M and $132.2M in 2011 and 2012, respectively forms part of the OM&A expense in the revenue requirement. A description of the initiation, review and approval process for OM&A and capital projects in OPG Nuclear is provided in Ex. D2-T1-S1.

3.0 PROJECT OM&A EXPENDITURES

OM&A projects are those work activities that meet the criteria to be categorized as a project, as outlined in Ex. D2-T1-S1 section 2.0, and are classified as OM&A by the capitalization policy found at Ex. A2-T2-S1.

Exhibit F2-T3-S1 Table 1 presents Nuclear project OM&A expenditures by sponsoring division and category for the period 2007 – 2012. Consistent with the categorization of capital projects and definitions provided in Ex. D2-T1-S1, these project OM&A expenditures have been sub-divided into released facility projects, facility projects to be released, listed work to be released and non-portfolio projects.

In addition, there are items unique to project OM&A, as follows:

- “Infrastructure” which includes four elements:
  - Project support funding for staff whose responsibilities support the entire nuclear project portfolio (e.g., portfolio management and reporting staff whose efforts cannot appropriately or efficiently be charged to individual projects and non-project-specific support provided by the Modifications Department).
  - An allocation for minor modifications at each of the three nuclear sites, inspection and

maintenance services, and for the centrally-managed facilities function (including security and simulator functions). Minor modifications are initiatives identified in the project identification phase which have low cost (generally, less than $200k per generating unit) and for which the full project management process is unwarranted. For administrative efficiency, these initiatives are funded via a drawdown of the minor modifications budget allocated to each station and central facilities.

- A provision for conceptual funding to undertake project initiation work, as identified in Ex. D2-T1-S1, section 2.1.
- The actual cost of capital project cancellations or write-offs. OPG's accounting policy requires that if a capital project is cancelled, its value is written-off to OM&A in the year the cancellation decision is made. The practice in nuclear is to account for these write-off amounts as part of project OM&A infrastructure costs. As the write-off occurs in the year of the cancellation decision and cannot be predicted, there is no budget for these items.

- Non-portfolio projects are listed separately from the nuclear project portfolio due to their extraordinary nature, Non-portfolio projects include the P2/P3 Isolation Project (discussed in Ex. D2-T1-S1), and the Pickering B Continued Operations Projects, Pickering B Refurbishment Project and Fuel Channel Life Cycle Management Project (discussed in Ex. F2-T2-S3).

In addition, the Nuclear project OM&A expenditures for released facility projects have been categorized in Ex. F2-T3-S1 Table 2 as regulatory, sustaining or value enhancing/strategic.

As indicated in Ex. D2-T1-S1, the nuclear project portfolio budget is approved through the OPG business planning process, with the OPG Board of Directors approving the OM&A and capital project portfolio budget which is then administered via the portfolio management process. As part of the 2010 - 2014 business planning process and as indicated in Ex. D2-T1-S1, section 2.0, the OPG Board of Directors approved $108.3M (2011) and $111.2M (2012) for the OM&A project portfolio, as well as specific incremental amounts for the P2/P3 Isolation Project, Pickering B Continued Operations and the Fuel Channel Life Cycle Management Project.

Exhibit F2-T3-S1 Table 1 presents the following trends over the 2007 - 2012 period:

- The project OM&A portfolio (shown on line 9 of the table) remains in the $108M - $111M range throughout the bridge year and test period. As indicated in Ex. D2-T1-S1, a comparison of "net" project OM&A (i.e., removing the accounting adjustment for "SAVH" Sickness, Accident, Vacation and Holiday) shows a significant reduction from the approved budget of $118M for 2008/2009 to a level of $101M - $105M. This reduction, intended to support OM&A cost control efforts, has resulted in a significant deferral of planned work to beyond the current test period. Achieving the approved budget levels will require continued careful assessment and prioritization of work across Nuclear.
- Within the project OM&A portfolio, "Infrastructure" costs decrease to approximately $33M and remain stable for the bridge year and test period. The test period forecast includes approximately $2.5M for conceptual funding, $12M for project support and $19M for minor modifications. Lower planned amounts for the bridge year and test period, relative to the 2007 - 2009 period, primarily reflect the fact that the 2007 - 2009 period included amounts for project write-offs. Potential write-off amounts are not budgeted in advance, and would only be incurred if specific capital projects were identified for cancellation or write-off in the future.
- Also within the project OM&A portfolio, the negative number shown for "Listed Work to be Released" in 2010 indicates the need to reprioritize planned project work (including deferral to future years) to achieve the approved budgeted levels.
- "P2/P3 Isolation Project" work increases in 2009 and 2010 reflecting peak project activity, with project completion planned for 2010.
- The trend in "Pickering B Continued Operations Projects" and the "Fuel Channel Life Cycle Management Project" costs reflect the planned annual expenditures for this work, as outlined further in Ex. F2-T2-S3.

Ex. F2-T3-S3 presents further details of OM&A projects.

3.1 OM&A Project Drivers

Regulatory projects have historically been a major factor in project OM&A expenditures, and remain so throughout 2010, largely due to projects related to Darlington environmental

qualification and the probabilistic risk assessment upgrade project. Beyond 2010, sustaining projects provide the single largest driver for identified major project OM&A costs. However, the potential exists for emergent regulatory project requirements.

Table 1
Project OM&A Summary - Nuclear ($M)

Line No.	Facility Projects	2007 Actual	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)
	Facility Projects (Released)						
1	Darlington NGS	26.8	28.2	38.2	30.5	4.0	0.4
2	Pickering A NGS	12.5	9.3	6.7	7.8	3.3	0.7
3	Pickering B NGS	22.0	37.2	15.0	17.3	2.6	0.1
4	Nuclear Support Divisions[1]	3.6	8.6	19.0	8.6	4.4	2.1
5	**Total Facility Projects (Released)**	65.0	83.4	78.9	64.3	14.4	3.3
6	**Facility Projects to be Released**	0.0	0.0	0.0	43.8	40.2	37.5
7	**Infrastructure**	37.1	39.6	39.4	33.0	33.0	33.1
8	**Listed Work to be Released**	0.0	0.0	0.0	(29.4)	20.7	37.4
9	**Subtotal Project OM&A (Portfolio)**	102.1	123.0	118.3	111.7	108.3	111.2
10	**P2/P3 Isolation Project**	9.5	13.5	22.5	20.6	0.0	0.0
11	**PB Continued Operations Projects**	0.0	0.0	0.4	1.8	19.9	17.0
12	**PB Refurbishment Project**	0.0	0.0	0.0	0.0	0.0	0.0
13	**Fuel Channel Life Cycle Mgmt Project**	0.0	0.0	2.5	9.7	7.7	4.0
14	**Total Project OM&A**	111.6	136.5	143.7	143.8	135.9	132.2

Notes:

1 Nuclear Support Divisions includes Engineering, Projects & Mods, Supply Chain, Programs & Training, Inspection Mtce and Commercial Services, Facilities and PINO.

Numbers may not add due to rounding.

Table 2
Project OM&A Summary - Nuclear Facility Projects (Released + To be Released) ($M)
By Project Category

Line No.	OM&A Project Category	2007 Actual	2008 Actual	2009 Actual	2010 Budget	2011 Plan	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)
	Facility Projects						
	(Released + To be Released)						
1	**Regulatory**	16.0	21.7	40.5	56.1	16.7	5.0
2	**Sustaining**	48.5	58.4	31.7	51.9	37.9	35.8
3	**Value Enhancing/Strategic**	0.5	1.5	6.9	0.0	0.0	0.0
4	**Total**	65.0	81.6	79.1	108.0	54.6	40.8

COMPARISON OF PROJECT OM&A – NUCLEAR

1.0 PURPOSE

This evidence presents period-over-period comparisons of Nuclear project OM&A.

2.0 PERIOD-OVER-PERIOD CHANGES - TEST PERIOD

Year-over-year variances are presented in Ex. F2-T3-S2 Table 1c and are explained below.

2012 Plan versus 2011 Plan

Planned project OM&A spending decreases in 2012 (-$3.7M), reflecting a planned increase in the portfolio level (+$2.9M), offset by planned reductions in the Pickering B Continued Operations initiative and the Fuel Channel Life Cycle Management project.

2011 Plan versus 2010 Plan

The decrease in planned spending in 2011 (-$7.9M) reflects a reduction in the project OM&A portfolio (-$3.4M) due to a business planning decision to reduce the portfolio budget in favour of other higher priority OM&A activities. The balance of the decrease in 2011 is primarily due to the 2010 completion of the P2/P3 Isolation project (-$20.6M), partly offset by a planned increase in the Pickering B Continued Operations initiative (+$18.1M).

3.0 PERIOD-OVER-PERIOD CHANGES – BRIDGE YEAR

Year-over-year variances are presented in Ex. F2-T3-S2 Table 1c, and explained below. More detailed project information is contained in Ex. F2-T3-S3.

2010 Plan versus 2009 Actual

There is no change in total project OM&A in this period. Project portfolio expenditure decreases are offset by the planned increase in spending for the start-up of the Fuel Channel Life Cycle Management project.

4.0 PERIOD-OVER-PERIOD CHANGES – HISTORICAL PERIOD

Year-over-year variances are presented in Ex. F2-T3-S2 Tables 1a and 1b and are explained below.

2009 Actual versus 2009 Budget

The total project OM&A expenditures in 2009 are over budget (+$6.6M), primarily due to greater than planned expenditures on the P2/P3 Isolation Project (+$8.4M) as a result of work previously scheduled for 2008 being deferred into 2009 due to regulatory delays, deferral of planned projects on hold (-$5.1M) pending the Pickering B Refurbishment decision, and expenditures to initiate the Pickering B Continued Operations initiative that were not in the plan for 2009**.**

2009 Actual versus 2008 Actual

The increase in total project OM&A costs (+$7.3M) is due to greater than planned effort on the P2/P3 Isolation Project in 2009 as noted above.

2008 Actual versus 2008 Budget

The under expenditure in 2008 (-$8.2M) is primarily due to greater than planned portfolio expenditures (+$5.0M) offset by delays in the P2/P3 Isolation Project as a continuing result of the Canadian Nuclear Safety Commission ("CNSC") requirement for an environmental assessment, as noted below (-$13.1M). The project OM&A portfolio variance consists of a large number of offsetting variances, with a key driver being the unplanned effort for the Pickering B Unit 7 Calandria Tube Replacement project (+$17.7M) which displaced planned steam generator maintenance work**.**

2008 Actual versus 2007 Actual

The increase in planned spending in 2008 (+$24.9M) reflects an increase in project OM&A portfolio spending (+$20.9M) and an increase in P2/P3 Isolation project effort (+$4.0M). The increased portfolio work effort is related to a number of OM&A projects, with the most significant increases associated with Pickering B boiler maintenance projects (locking tab repair and water lancing).

2007 Actual versus 2007 Budget

Project OM&A was under-spent in 2007 (-$25.8M), primarily due to delays in the P2/P3 Isolation project (-$17.5M). As noted in Ex. D2-T1-S1, P2/P3 Isolation project delays reflect the deferral of construction and maintenance ramp-up (to allow greater progress on engineering/assessment activities), and the new CNSC requirement for an environmental assessment for the project which caused a deferral of potentially-impacted activities. The balance of the variance (-$8.2M) reflects the net impact of positive and negative variances resulting from day-to-day decisions and execution challenges across the 124 OM&A projects that were managed in 2007.

Table 1a
Comparison of Project OM&A - Nuclear ($M)

Line No.	Facility Projects	2007 Budget	(c)-(a) Change	2007 Actual	(e)-(c) Change	2008 Actual	(e)-(g) Change	2008 Budget
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Facility Projects (Released)							
1	Darlington NGS	27.3	(0.5)	26.8	1.4	28.2	6.7	21.5
2	Pickering A NGS	19.5	(7.0)	12.5	(3.2)	9.3	0.6	8.7
3	Pickering B NGS	22.6	(0.6)	22.0	15.2	37.2	14.5	22.7
4	Nuclear Support Divisions[1]	5.1	(1.5)	3.6	5.0	8.6	1.3	7.4
5	**Total Facility Projects (Released)**	74.5	(9.6)	65.0	18.4	83.4	23.0	60.3
6	**Facility Projects to be Released**	0.0	0.0	0.0	0.0	0.0	(11.8)	11.8
7	**Infrastructure**	36.2	0.9	37.1	2.5	39.6	10.2	29.4
8	**Listed Work to be Released**	(0.4)	0.4	0.0	0.0	0.0	(16.5)	16.5
9	**Subtotal Project OM&A (Portfolio)**	110.3	(8.2)	102.1	20.9	123.0	5.0	118.0
10	**P2/P3 Isolation Project**	27.0	(17.5)	9.5	4.0	13.5	(13.1)	26.6
11	**PB Continued Operations Projects**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	**PB Refurbishment Project**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	**Fuel Channel Life Cycle Mgmt Project**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	**Total Project OM&A**	137.3	(25.8)	111.6	24.9	136.5	(8.2)	144.6

Notes:

1 Nuclear Support Divisions includes Engineering, Projects & Mods, Supply Chain, Programs & Training, Inspection Mtce and Commercial Services, Facilities and PINO.

Table 1b
Comparison of Project OM&A - Nuclear ($M)

Line No.	Facility Projects	2008 Actual	(c)-(a) Change	2009 Actual	(c)-(e) Change	2009 Budget
		(a)	(b)	(c)	(d)	(e)
	Facility Projects (Released)					
1	Darlington NGS	28.2	10.0	38.2	24.1	14.1
2	Pickering A NGS	9.3	(2.6)	6.7	6.0	0.7
3	Pickering B NGS	37.2	(22.2)	15.0	2.9	12.1
4	Nuclear Support Divisions[1]	8.6	10.4	19.0	17.0	2.0
5	**Total Facility Projects (Released)**	83.4	(4.5)	78.9	49.9	29.0
6	**Facility Projects to be Released**	0.0	0.0	0.0	(24.4)	24.4
7	**Infrastructure**	39.6	(0.2)	39.4	10.4	29.0
8	**Listed Work to be Released**	0.0	0.0	0.0	(35.7)	35.7
9	**Subtotal Project OM&A (Portfolio)**	123.0	(4.6)	118.3	0.3	118.0
10	**P2/P3 Isolation Project**	13.5	9.0	22.5	8.4	14.0
11	**PB Continued Operations Projects**	0.0	0.4	0.4	0.4	0.0
12	**PB Refurbishment Project**	0.0	0.0	0.0	(5.1)	5.1
13	**Fuel Channel Life Cycle Mgmt Project**	0.0	2.5	2.5	2.5	0.0
14	**Total Project OM&A**	136.5	7.3	143.7	6.6	137.1

Notes:

1 Nuclear Support Divisions includes Engineering, Projects & Mods, Supply Chain, Programs & Training, Inspection Mtce and Commercial Services, Facilities and PINO.

Numbers may not add due to rounding.

Table 1c
Comparison of Project OM&A - Nuclear ($M)

Line No.	Facility Projects	2009 Actual	(c)-(a) Change	2010 Budget	(e)-(c) Change	2011 Plan	(g)-(e) Change	2012 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Facility Projects (Released)							
1	Darlington NGS	38.2	(7.7)	30.5	(26.6)	4.0	(3.5)	0.4
2	Pickering A NGS	6.7	1.1	7.8	(4.5)	3.3	(2.6)	0.7
3	Pickering B NGS	15.0	2.4	17.3	(14.7)	2.6	(2.6)	0.1
4	Nuclear Support Divisions[1]	19.0	(10.4)	8.6	(4.2)	4.4	(2.4)	2.1
5	**Total Facility Projects (Released)**	78.9	(14.6)	64.3	(49.9)	14.4	(11.1)	3.3
6	**Facility Projects to be Released**	0.0	43.8	43.8	(3.6)	40.2	(2.7)	37.5
7	**Infrastructure**	39.4	(6.4)	33.0	0.0	33.0	0.0	33.1
8	**Listed Work to be Released**	0.0	(29.4)	(29.4)	50.1	20.7	16.7	37.4
9	**Subtotal Project OM&A (Portfolio)**	118.3	(6.7)	111.7	(3.4)	108.3	2.9	111.2
10	**P2/P3 Isolation Project**	22.5	(1.8)	20.6	(20.6)	0.0	0.0	0.0
11	**PB Continued Operations Projects**	0.4	1.4	1.8	18.1	19.9	(2.9)	17.0
12	**PB Refurbishment Project**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	**Fuel Channel Life Cycle Mgmt Project**	2.5	7.2	9.7	(2.0)	7.7	(3.7)	4.0
14	**Total Project OM&A**	143.7	0.1	143.8	(7.9)	135.9	(3.7)	132.2

Notes:
1 Nuclear Support Divisions includes Engineering, Projects & Mods, Supply Chain, Programs & Training, Inspection Mtce and Commercial Services, Facilities and PINO.