UNDERTAKING J15.3

Undertaking

To provide the mandate or terms of reference for the Centre of Excellence group, if available.

Response

OPG established the Project Excellence Initiative in recognition of OPG's plan to invest significantly in the next ten years and into the foreseeable future in projects to sustain plant operations and as a primary vehicle for company growth. As part of this initiative, the Project Management Centre of Excellence (PM CoE) will be established with the goal of improving project outcomes across OPG. The PM CoE will leverage experience from the Darlington Refurbishment Program's Facilities and Infrastructure projects and Safety Improvement Opportunities, including implementing the lessons learned and corrective actions from the execution of the projects cited on pages 18-21 of the Second Quarter 2014 Supplemental Report to the Nuclear Oversight Committee by Modus/Burns & McDonnell (see Attachment 1).

A summary of the Project Excellence Initiative is attached as Attachment 2. In particular, the Terms of Reference for the PM CoE are found at page 4 of Attachment 2. As noted in the Terms of Reference, the primary objective is to develop and recommend to the Project Excellence Steering Committee strategies for establishing:

- A **common, scalable project delivery model** for all projects across all business units that focus on delivering projects safely, at the required quality, on time, and on budget, with all project goals met.
- A **Project Management Centre of Excellence** organization model where project management expertise, best practices, tools, processes and lessons learned are available to all OPG projects.

The Project Excellence Initiative, including in particular the PM CoE, formalizes the process by which the Projects and Modifications organization will adopt the key lessons learned observed by Modus/Burns & McDonnell in Attachment 1. For example, the Project Excellence Initiative specifically identifies the importance of the Gate Review Board and the Asset Investment Steering Committee, and the need to establish project management processes that support it (Attachment 1, pp. 19-20 and Attachment 2, p. 3).

As of March 2017, Nuclear Operations has officially launched the PM CoE, with a target to have the PM CoE fully operational by July 1, 2017.

Supplemental Report to

Nuclear Oversight Committee

2nd Quarter 2014

Darlington Nuclear Refurbishment Project

Burns & McDonnell
Modus Strategic Solutions

June 26, 2014

CONFIDENTIAL

I. Executive Summary

Burns & McDonnell Canada Ltd. and Modus Strategic Solutions Canada Company ("BMcD/Modus") provide the following Supplemental Report to the Nuclear Oversight Committee of the OPG Board of Directors ("NOC") regarding the status of the Darlington Nuclear Generating Station's Refurbishment Project ("Project" or "Refurbishment Project"). BMcD/Modus was requested by NOC to provide a Supplemental Report that summarizes our role, the oversight activities we are performing on the Project and major findings to date, while at the same time providing the broader context for these findings in light of the influx of new members to OPG's Board of Directors ("BOD") and NOC. In this regard, it is important that the comments and recommendations that BMcD/Modus made with respect to the Campus Plan Projects in our 2Q 2014 Report dated May 13, 2014 are viewed with the proper perspective. Additionally, BMcD/Modus provides NOC with an update on the issues raised in our reports to date and the Darlington Refurbishment Team's ("DR Team") responses and resultant actions to those issues.

In this Supplemental Report, we provide the following:

- Background of the Refurbishment Project including the pre-requisite Campus Plan Projects;
- Summary of BMcD/Modus's Oversight activities to date;
- Industry perspectives on critical issues that impact megaprojects like the Refurbishment Project;
- Summary of our NOC reports to date, highlighting our recommendations and the actions that OPG management has taken in response.

BMcD/Modus's engagement as the External Oversight team for the Project began on February 25, 2013. Since that time, we have provided NOC and the DR Team four reports, starting with an Initial Project Assessment report on August 13, 2013 that reviewed the DR Project's progression to the Release Quality Estimate ("RQE") in support of the Project. OPG has committed to providing the Shareholder with the RQE in October 2015. Subsequently, we provided three quarterly reports to NOC, each of which provided an assessment of the Project's current risks as well as more detailed "deep dives" into specific areas of interest. Our prior reports are attached as Exhibits 1-4.

As will be discussed in detail herein, BMcD/Modus has drawn the following major conclusions regarding the Project's current overall health:

- The Refurbishment Project is advancing at an appropriate pace toward the RQE milestone. The majority of the contracts for the Definition Phase have been awarded and essential preparatory work is moving forward. The upcoming 4d Cost Estimate will provide the DR Team with an essential "dress rehearsal" for RQE that will highlight gaps and challenges; these will require the Team's intense focus over the following year.
- The heart of the Refurbishment Project is the Retube & Feeder Replacement ("RFR") work which makes this the most significant risk. Prior CANDU refurbishments have suffered significant delays, cost overruns or both in this aspect of the work. The DR Team has incorporated in its planning the lessons learned from these prior refurbishments and other power megaprojects in order to mitigate the known risks. These mitigation activities include starting planning four years in advance of execution, completion of detailed engineering prior to the start of construction, and building a full scale mock-up to mitigate or avoid the issues that have adversely impacted prior refurbishments.
- The DR Team has devoted significant effort to locking down the Refurbishment Project's scope for RFR and other regulatory and non-regulatory life extension work, and is endeavoring to complete all detailed engineering by May 2015 in order to produce a high quality Project cost estimate for RQE. Engineering is currently challenged to meet this milestone. While it is implementing a plan to streamline its work, this will require intense monitoring and focus. The DR Team's approach toward scope management is a direct course correction from prior refurbishments including Pickering A Unit 4, and provides evidence that the team is inserting lessons learned into its plan.

- The DR Team has shown the willingness to change and evolve as issues have arisen. The DR Team determined that such key areas as scope development, schedule methodology, project reporting and the BOP procurement method required changes, and the DR Team has made those changes. Further management challenges will present themselves as OPG recognizes that a multi-year megaproject is a different endeavor than the company's day-to-day business practices. In our 2Q 2014 Report, we identified corporate procurement and hiring processes as areas for OPG to examine, as corporate policies and controls needed for the Project may vary from those used for OPG's core business.
- Project & Modifications' ("P&M") early management of the pre-requisite Campus Plan Projects, and in particular the D2O Storage Facility and Auxiliary Heating Steam system ("AHS"), exposed some critical project management gaps. The initial cost estimates for these two pre-requisite projects were poorly developed, thus the cost variances now reported are being compared to poorly developed baseline budgets. Senior management addressed these problems by making changes at the Project executive level, installing new leadership with proven ability, and altering the management model. While these pre-requisite projects will cost more than initially anticipated, and continue to present schedule threats to Refurbishment, P&M's new leadership has this work and other Campus Plan Projects on a much more predictable course. Moreover, many of the cost variances appear to be scope based, i.e. OPG is getting more value albeit for a higher cost.
- The causes of the cost overruns in the early Campus Plan Projects root from mistakes made by management that are not being repeated on the Refurbishment Project. There is no evidence we have seen to date that the problems we found in management of the D2O Storage and AHS projects represent a trend or a systemic failure for the Refurbishment Project.
- Both P&M and the DR Team have learned early and essential lessons from D2O Storage and AHS and are using these lessons to modify OPG's management plan for the entire Refurbishment Project. In particular, P&M is abandoning the "hands-off" contractor oversight strategy that was initially prevalent and is adopting an active management role, while the DR Team used these lessons to increase contractor accountability. It is important to note, however, that this is a cultural shift that will present on-going challenges to the organization in the short term.

At this time, the most significant question is whether the upper-end of the Refurbishment Project's anticipated $6-$10B[1] cost is at risk. In all, OPG believes that the cost variances from the Campus Plan Projects will be approximately $290-325M which equates to approximately 2.5-3% of the Refurbishment Project's total $10B working budget. Even if the Campus Plan Projects' overruns are 50% higher than current projections, the Refurbishment Project would still have preserved over $2B in contingency and management reserve remaining as part of its working budget. Since the Project is still in the Definition Phase, the cost estimates for the work, contingency and related scope decisions will remain under review until RQE.

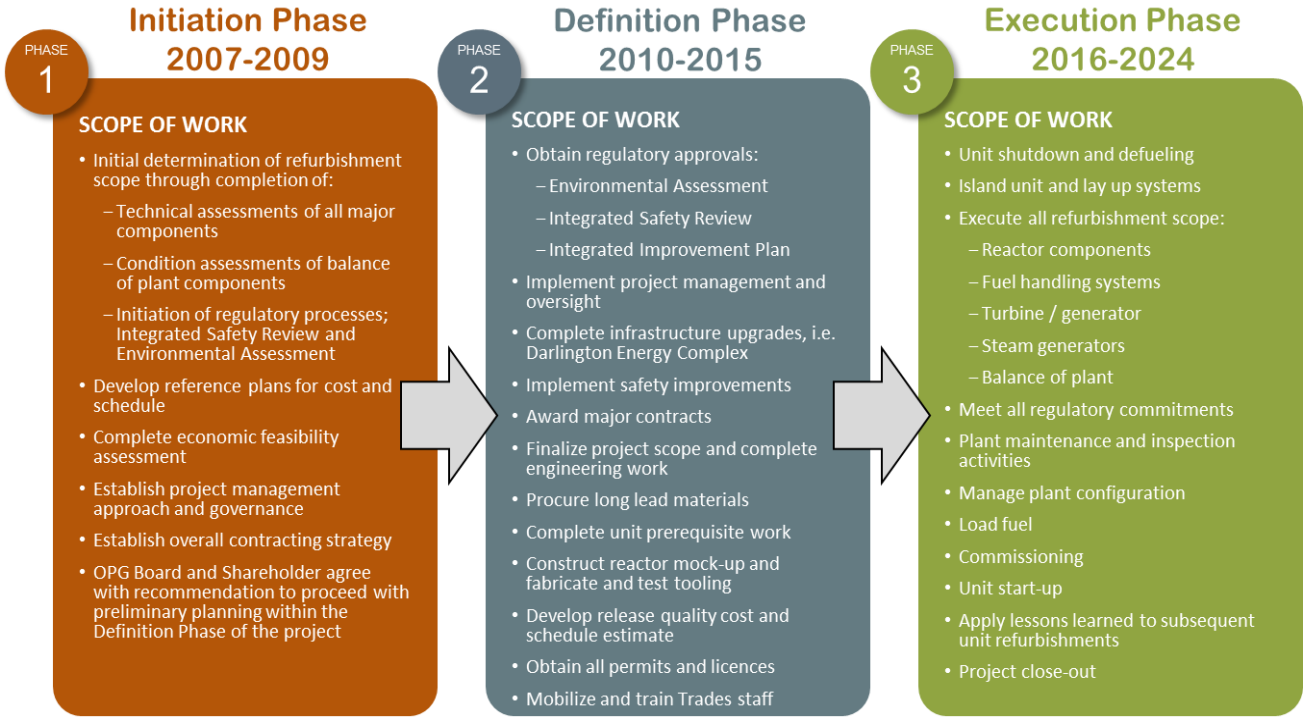
II. Background

A. The Project

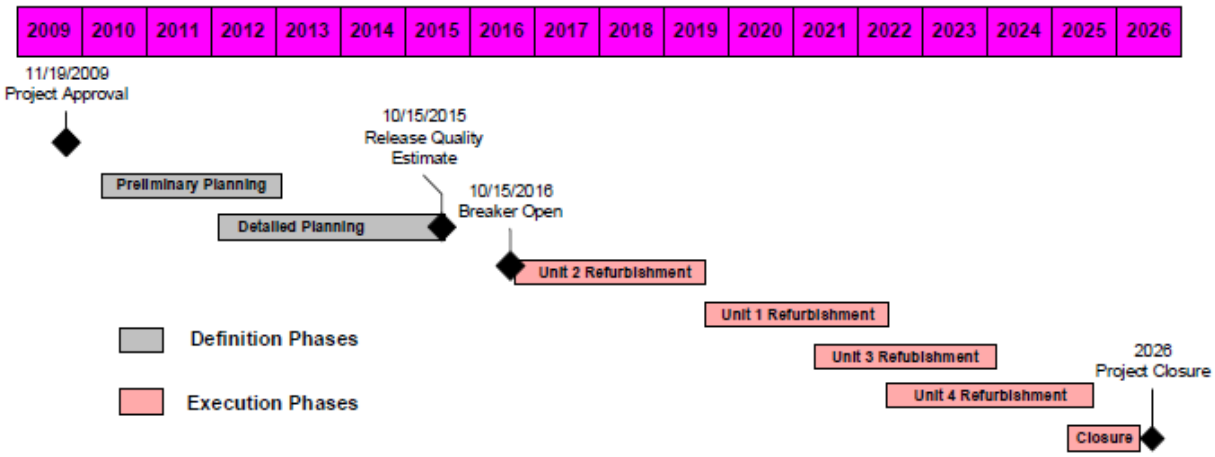
Due to the longevity of materials operating in high radiation fields, the Darlington Nuclear units are currently predicted to reach their nominal end of service lives in 2019 to 2020. However, various factors from Darlington operations could result in the units reaching the end of life earlier or later than the present predictions indicate. In June 2006, the Ontario Government directed OPG to begin feasibility studies regarding the refurbishment of the Darlington Nuclear plants in order to extend their service lives. In late 2007, OPG commenced "Phase I" of the Project called the "Initiation Phase" in order to determine the preliminary scope of work for the Darlington Refurbishment Project and to perform an

[1] This initial cost range for the Project was prepared and presented in 2009, and therefore is expressed in CAD $2009. Due to the length of the Project, escalation from market forces, cost of living increases, and other time-valued costs could not be calculated with confidence, and therefore is not included in the estimated cost.

economic feasibility assessment. Phase I was completed in 2009. The following graphic from the Refurbishment Team provides an overview of the Refurbishment Project's three phases:



The Refurbishment Project is currently in the Definition Phase, during which the DR Team anticipates completing award and negotiation of all vendor contracts, finishing detailed design, performing the front-end planning and locking down the Refurbishment Project's scope, budget and schedule. In addition, the Campus Plan Project work is to be largely completed in this period (with some work extending beyond RQE), as each of these various projects is needed in some manner before the breaker open of Unit 2. The phasing of the work depicted above allowed for the Project to proceed with its initial planning based on yearly incremental funding releases approved by the BOD with developmental targets and key milestones optimized for the completion of the RQE in October 2015. RQE will be the definitive estimate for the Execution Phase of the Project. Breaker Open for Refurbishment of Unit 2 (the first unit to be refurbished) is scheduled for October 2016 as depicted in the schedule below:



From the above schedule, it is worth noting OPG's major decision to "unlap" the execution of the first and second units. The Project's initial schedule required that the refurbishment of the second unit would begin before the first unit was returned to service. In the summer of 2013, Refurbishment Project management presented the current sequence that allows for the full "breaker-to-breaker" performance of Unit 2 prior to the start of the subsequent units. Management based this decision on the need for the first unit to be the singular focus of the DR Team during this time period and to allow adequate time to incorporate any lessons learned or process improvements into the next units' work. BMcD/Modus supported this decision, which was approved by the BOD as part of the 2014 Business Plan.

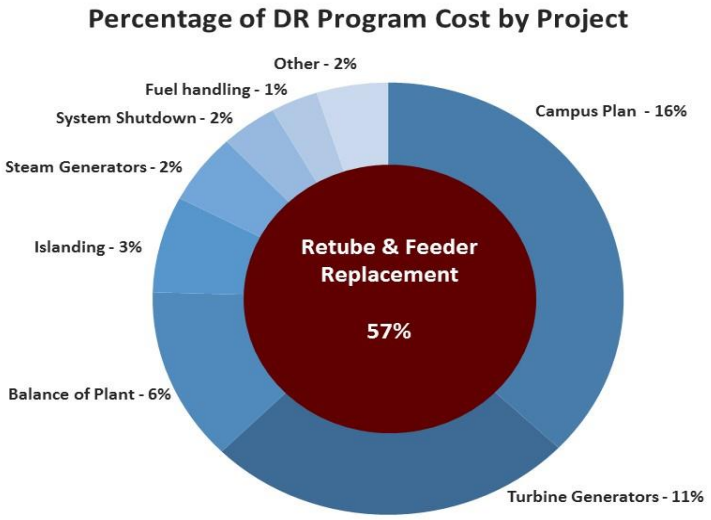
B. Project Management Model

OPG has chosen to manage the Darlington Refurbishment as a "Program." According to the Project Management Institute ("PMI"), "A Program is a group of related projects managed in a coordinated manner to obtain benefits and control not available from managing them individually." OPG's stated overall commercial strategy for the Program is premised on OPG acting as the General Contractor and Program Manager for the full Program. Within the Program, there are seven discrete Projects, each with its own project management team (including functions that are matrixed, such as engineers, commercial managers and project controls leads). The seven Projects (also known as "Project Bundles") encompass the following scopes of work:

- Retube and Feeder Replacement
- Islanding/Containment Isolation
- Fuel Handling/Defuelling
- Turbine Generator Maintenance and Controls Upgrade
- Boiler and Auxiliary Systems (Steam Generator Lancing)
- Shutdown, Layup and Services
- Balance of Plant

Each of these Project Bundles is being procured on an Engineer, Procure and Construct ("EPC") basis, meaning that a single contractor will be responsible for providing the all three services under a single contract. In addition to the Refurbishment Project, there is a significant amount of work (including the Campus Plan and other prerequisite projects) that needs to be completed and placed in service prior to the Execution Phase in order to support Refurbishment. The DR Team is responsible for planning and executing the bulk of the Refurbishment Project work. The P&M organization is responsible for completing the Campus Plan and other prerequisite projects. In contrast to the Program approach adopted by the DR Team, P&M is responsible for managing a Portfolio of hundreds of small projects for the Darlington and Pickering nuclear generating stations and the Western Waste Management facility.

In discussing specific aspects of the Campus Plan or the Project Bundles, it is possible to lose sight of the fact that the Retube and Feeder Replacement ("RFR") Project comprises the majority of the Refurbishment—in terms of schedule, budget and complexity, and as a result, comprises the most risk. As an example, for this Project, the major objective is the retubing and feeder replacement of Darlington's four nuclear units so that the plant can operate for another 30 years. All of the Refurbishment Project's other goals are subsidiary to the RFR work. Sixty percent (60%) of the Project's critical path is formed from the RFR scope; the remaining critical path work is either in preparation for RFR or commissioning and re-starting each unit after RFR completes. The following diagram depicts how much larger the RFR project is in comparison to all other project work, including the Campus Plan Projects:



Source: 4c Cost Estimate excluding contingency and functional costs, 2013; updates were made by BMcD/Modus to the RFR and Campus Plan Projects to reflect the most likely current estimates.

C. The Process for Developing RQE

Large, complex projects in general, and nuclear refurbishment projects in particular, have been challenged to meet their original budgets and schedule. For purposes of measuring the maturity of a project, the industry commonly uses project scope definition as a leading indicator of the underlying quality of a project's cost estimate and schedule. Projects can be at risk if they start construction prior to completing engineering, though this is a fairly common practice in the industry. For purposes of tethering its estimating effort to known industry standards, the DR Team has embraced utilizing the estimating standards from the Association for the Advancement of Cost Engineering ("AACE") and its guidelines for the classification of cost estimates[2]. These guidelines establish engineering and scope definition as the key underlying metric for developing certain "classes" of cost estimates from Class 5 (most conceptual with the largest range of potential variability) to Class 1 (most mature with the narrowest range of potential variability), as follows.

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges [a]
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Notes: [a] The state of process technology, availability of applicable reference cost data, and many other risks affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

[2] AACE's Recommended Practice No. 17R-97, Cost Estimate Classification System (November 29, 2011) and Recommended Practice No. 18R-97 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries (November 29, 2011).

Thus, RQE for Refurbishment is intended to be a Class 2 Estimate, a type of estimate that typically forms a project's "Control Budget." By utilizing this methodical approach to developing RQE, the DR Team should be able to produce a high-confidence estimate against which the Project's performance can be properly measured so long as each of the inputs are carefully vetted and understood. It is also important to understand and accurately characterize what each of the estimates represent prior to RQE within the context of the level of project definition and the accuracy range. It is not unusual on highly visible projects for actual project costs to be compared against early (i.e. Class 5) point estimates without a discussion of their accuracy ranges, which could mislead external stakeholders.

A concept within the estimate that is commonly misunderstood is the application of contingency. Contingency is included in the base estimate and refers to costs that will probably occur based on past experience. As a result, contingency is expected to be spent as the project progresses through its life cycle. The utilization of contingency is not an indication of poor management.

OPG is taking significant steps in engineering and scope definition in order to provide a fundamental basis for RQE by: 1) utilizing the AACE guidelines to characterize the Project's scope and engineering maturity through a progression of cost estimates; 2) completing detailed engineering prior to the start of construction for all work; and 3) mitigating potential performance risk and estimating errors through construction and the use of a full scale mock-up for RFR. Proper planning of the execution phase of the Project will provide confidence in the reliability of RQE as well as minimize the risks of cost and schedule overruns during construction.

D. Timeline of Key Events

The following timeline of key events shows the parallel development of the Campus Plan Projects and the Refurbishment Project.

Date	Key Events
	Early Project Development – Initiation Phase (2006 to 2010)
2006 – 2010	• Feasibility studies for DNGS Refurbishment, leading to February 2010 announcement of Refurbishment Project • DR Program Charter approved • D2O Storage and Auxiliary Heat Steam system projects approved, then put on hold • Refurbishment Project's Scope Definition Phase begins, categorizing core and non-core scope • Environmental Assessment Studies submitted to the CNSC • Procurement process for RFR project begins
	Refurbishment Project Definition Phase (2011 to Current)
2011	• Bill Robinson retires; replaced by Albert Sweetnam as SVP of Nuclear Projects • Mike Peckham named VP of Projects & Modifications • OPG submits Integrated Safety Review (ISR) to CNSC • Environmental Impact Statement issued • Project charter for D2O Storage project issued August 2011; high-level scope and estimate of $210M provided to P&M management • Refurbishment Project' Release 4a Cost Estimate provided to Board of Directors
1Q 2012	• P&M negotiates and executes Extended Service - Master Service Agreements ("ESMSA") with two vendors – Black & McDonald and ES Fox – for use on Campus Plan Projects • SNC/Aecon Joint Venture selected as EPC for RFR project
2Q 2012	• D2O Storage Gate 3A conducted with revised EPC Project estimate - $108M • DR scope review conducted to identify potential scope to be deferred
3Q 2012	• AHS bid and award of EPC to ES Fox – total project estimate - $45.6M
4Q 2012	• P&M seeks full funding releases for D2O Storage and AHS • Refurbishment Project Release 4b cost estimate shows potential for upward pressure on budget

Date	Key Events
1Q 2013	• Refurbishment begins early gate review process for major projects • P&M publishes Lessons Learned report for D2O Storage – schedule overruns and multiple rejections of vendor's conceptual design lead P&M and Refurbishment to change model of development of project scope • Change in engineering strategy presented to NOC • Mr. Sweetnam leaves OPG • BMcD/Modus begins role as Independent External Oversight to NOC
2Q 2013	• Mr. Robinson returns as SVP of Nuclear Projects • DR Team management identifies early lessons learned from EPC model and moves to more direct oversight of contractors • Refurbishment scope review identifies priority ranking of project work • Refurbishment presents strategy to streamline Project by "unlapping" Unit 2, rationalizing project scope and deferring Turbine Generator controls to next unit • SNC/Aecon provides Class 4 project estimate for RFR project
3Q 2013	• Mr. Peckham leaves OPG • BMcD/Modus provides Initial Project Assessment to NOC • Refurbishment scope review performed based upon operational experience • Refurbishment revises procurement approach for Balance of Plant ("BOP") allowing direct award of work based on vendor qualifications • Soil conditions and underground utilities delay and increase cost of Campus Plan Projects within DNGS protected area • Refurbishment modifies scheduling approach for Definition and Execution Phases, embracing a level 3 integrated, resource loaded schedule
4Q 2013	• Integrated Implementation Plan (IIP) and Global Assessment report (GAR) submitted to CNSC • Release 4c Cost Estimate provided to BOD – overall cost estimate of $10B (with $2.1B contingency and $800M management reserve) with reductions in scope and unlapping • Results of the scope review by the Blue Ribbon panel reduces the Refurbishment Project's cost and defer execution of non-Refurbishment enhancements • Contractors release estimates showing variances to original contract values for D2O Storage and AHS after BOD approval of the 4c Cost Estimate.
1Q 2014	• Minister's Long Term Energy Plan released • Terry Murphy begins as VP of P&M • Refurbishment and P&M begin collaborative approach to engineering, scoping, planning and cost estimating of Campus Plan Projects and BOP work • Turbine Generator performance contract awarded to SNC/Aecon • P&M team provides root cause analysis of delays to D2O Storage; Mr. Robinson requests BMcD/Modus to provide independent assessment • Revised cost estimates for Campus Plan Projects provided by ESMSA contractors, leading to revisions to Business Cases • RFR mock-up facility completed
2Q 2014	• Revised BCSs presented to BOD for approval for Campus Plan Projects – AHS, Water & Sewer and OSB – management defers request for funds for D2O Storage, awaiting updated Class 2 estimate from vendor • BMcD/Modus provides assessment of Campus Plan Projects to NOC • SNC/Aecon produces Class 3 RFR Estimate for OPG's vetting

III. BMcD/Modus' External Oversight Role

After a thorough RFP and selection process that started in April of 2012, OPG contracted with BMcD/Modus to provide External Oversight services for the Refurbishment Project. This engagement began on February 25, 2013. BMcD/Modus assigned very senior level individuals with extensive experience and expertise in all aspects of nuclear project development, management and independent oversight. Our central role is to report to NOC and assist the SVP Nuclear Projects by providing independent assessments on the performance of the Refurbishment Project. At a high level, this involves:

- Reviewing and monitoring the definition, development and risk management of the Refurbishment Project;
- Monitoring progress of the Refurbishment Project against targets, including cost, schedule and risk;
- Reviewing execution performance of the Refurbishment Project; and
- Offering recommendations for improvement where appropriate.

The BOD approved our Work Plan for performing oversight activities on the Project in May 2013 and included both day-to-day monitoring of events and "deep dives" on critical areas that we believed would be indicative of the Refurbishment Project's health. We anticipated developing reports for NOC that would track the status of the Refurbishment Project's activities in an ongoing manner and provide our view of the Project's risks and potential gaps, as well as recommendations for mitigating those risks. Our focus during the Definition Phase has been to examine the DR Team's planning efforts related to the Project's development of scope, schedule, cost and risk identification which are the key inputs to RQE. To date, the cooperation from OPG and Refurbishment contractors has been excellent. The BMcD/Modus team has had the appropriate level of access to personnel, documents and meetings, which provides insight and clarity to Project activities and plans.

IV. Industry Perspective

In our engagement, we are relying on our team members' long history with large capital megaprojects, particularly in the nuclear industry. Megaprojects (generally defined as high-profile projects costing more than $1B) have a rhythm all their own and typically involve large sums of money, lengthy, multi-year project schedules and significant risks to the companies who engage in them. In 2013, the Project Management Institute ("PMI") produced a study for its Global Executive Council membership which demonstrated the high cost of poor performance on megaprojects. PMI's study found that 28% of project funding is at risk in organizations that do not properly plan and manage capital projects.[3] This figure is in comparison to 2% of the budget being at risk for high-performing organizations.

Gaining understanding of these common megaprojects' risks requires understanding of certain essential facts:

- Megaprojects like the Refurbishment Project need large, clearly visible objectives so that all participants and stakeholders can objectively measure progress towards these major goals. RQE is an example of such a major goal.
- Major project goals (cost, schedule, performance) need to be viewed as a whole, rather than as a sum of the parts. As such, megaprojects' risks need to be viewed at a macro level, as day-to-day assessments can be misleading and uninformative. As an example, an owner could chose to mitigate a larger risk to the overall project by accelerating a predecessor project at additional cost. Without the context of the larger project, the cost-benefit analysis to incur the additional cost could not be justified.

[3] Project Management Institute "2013 Pulse of the Profession™: The High Cost of Low Performance," October 2013.

- Engineering and scope identification are the most common leading indicators of a megaproject's success. Projects with loose scope or engineering errors, omissions and schedule delays are typically beset with large cost increases and additional downstream schedule delays. A common mistake that usually results in such increases is beginning work in the field without a completed design and appropriately sequenced work. This was a key factor in the cost overruns for Pickering A Unit 4 which OPG first addressed with Pickering A Unit 1 and now with the Refurbishment Project.
- Owners typically rely on large, sophisticated contractors with requisite experience for megaproject performance, and the contracting model owners typically default to is EPC. However, even when EPC contracts are on a firm, fixed-price (which the EPC contracts for the Refurbishment Project are not), the contractors never accept as terms of the contract all of the performance risk, as the premium a contractor would demand to shift such a large amount of risk would be untenable. Therefore, owners must decide their level of risk tolerance and negotiate for appropriate levels of transparency and control over the performance of the work. With the exception of the ESMSA, the EPC contracts for the Project were all negotiated with the specific scope of work for each Project Bundle in mind.
- Non-critical work on megaprojects needs to be properly calibrated to either facilitate or stay out of the way of the work that is on the critical path. Nuclear operations tends to insert processes, appropriate for the discipline and certainty required for an operating nuclear generating station however, in a project environment these same processes make work management exceptionally complex. A key part of our Independent Oversight role is identifying issues that could draw away the attention of management from the most critical work.

Our experience with megaprojects similar to the Refurbishment Project—including, for many on our team, the Return to Service of Pickering A Unit 1 a decade ago—allows BMcD/Modus to characterize the effort required and expended on this Project. There are three core nuclear industry principles that are essential ingredients to our oversight mission:

(1) In the nuclear community, there is wide acceptance of the need for ***continuous improvement*** based on learning lessons from operational experience ("OPEX"), which provide a basis for judging progress and effectiveness;

(2) Nuclear projects and operations are in a constant search for corrective actions which are specific recommendations for mitigating or recovering from problems; and

(3) When problems are identified and corrective actions attempted, it is essential to establish the extent of the condition to properly characterize the magnitude of any one problem or set of problems.

These concepts must work in unison; otherwise one can get an entirely false read of the significance of issues as they arise. As an example, during operations of a power plant, each "Station Condition Report" or "SCR" documents and reports events of all types with the same level of veracity. However, SCRs can range in significance from serious problems like a unit trip to a line worker slipping on the ice during winter. Thus, defining the extent of condition provides management with the appropriate characterization of a potential problem.

Our reports incorporate these principles so that management and the NOC can understand the nature of a deficiency, see the recommended solution or corrective action that management is taking, and evaluate the extent to which this problem impacts the overall Project. In preparing our reports, BMcD/Modus intentionally seeks out areas where there are perceived gaps and we attempt to define and characterize the risks these problems may present to the overall Project.

V. Synopsis of BMcD/Modus Reports and Major Findings

As part of our NOC approved Work Plan, in August 2013, BMcD/Modus produced an Initial Project Assessment Report ("Initial Assessment Report") in which we established a baseline for assessing and measuring the DR Team's activities through the current Definition Phase. Subsequently, BMcD/Modus has produced three quarterly reports to NOC.

BMcD/Modus prepares these reports for NOC as a continuous progression of the Project's status in which we identify areas for the DR Team to focus and monitor their efforts to recover or fill gaps. Throughout, we have identified both gaps for the DR Team to address and positive developments from which the NOC should draw a measure of confidence that the team is working toward the Project's ultimate goals. The following summarizes the topic areas and major findings from each of our reports to date.

BMcD/Modus Reports to NOC as of 2Q 2014	
Report Summary	**Major Findings**

Initial Assessment Report – August 13, 2013
• Finalized BMcD/Modus Work Plan
• Benchmarked the Status of Key Planning Activities
• Benchmarked the Status of Major Project Bundles
  ○ Retube and Feeder Replacement (RFR)
  ○ Balance of Plant (BOP)
  ○ Campus Plan
  ○ Turbine Generator
  ○ OPG Critical Path Activities
	The Refurbishment Project is appropriately advancing at the time of this assessment toward the goal of producing RQE by October 15, 2015

4Q 2013 NOC Report – November 12, 2013 • Assessed RFR project's procurement and estimate development • Presented assessment of the 4c Cost Estimate presented to Board • Reviewed scope definition and planning assumptions • Addressed BOP procurement model changes • Assessed Campus Plan Project risks	DR Team's development of the 4c Cost Estimate meets appropriate level of definition; future cost estimates will require increased definition to match the Refurbishment Project's anticipated maturity growth
1Q 2014 NOC Report – March 2, 2014 • Analyzed Project's conformance to goals set by Minister of Energy's Long Term Energy Plan (LTEP) • Updated RFR risks • Provided summary of Project Risk Management • Performed a commercial risk review • Continued Campus Plan Projects' risk assessment	The Refurbishment Project complies with the LTEP though there are some gaps that can be addressed over time; RFR procurement, planning and Class 3 Estimate fell behind schedule and is in recovery mode; Campus Plan Project cost and schedule experienced variances to baseline
2Q 2014 Report to NOC – May 13, 2014 • Performed detailed assessment of Campus Plan Projects' risk and assessment of cost/schedule variances • Reviewed and monitored RFR recovery plan • Provided commercial risk update • Assessed RQE preparation	Campus Plan Projects' variances were caused by initial poor cost and schedule estimates; P&M's management model was flawed; P&M and Refurbishment Projects are responding to challenges and lessons learned from early Campus Plan Projects; RFR is recovering from early delays

With each quarterly report, BMcD/Modus provides NOC and the DR Team with our general observations regarding the Project's top risk areas as well as specific recommendations, as required. In addition, with each report, we provide more granular focus on specific "drill down" issues that were the subject of our prior quarter's activities. From these reports, we provide the DR Team with a series of specific recommendations and observations for their use.

The DR Team has a complimentary process through which it is documenting our recommendations and providing the team's actions needed to close out those concerns. We meet weekly with DR Team's point of contact who updates the log of recommendations and actions, and meet periodically with the Project's leadership team (the "Refurbishment Project Executive Team" or "RPET") as a whole. To date, we have seen the DR Team take action on many of the items we have raised, including: (1) taking the recommendations as written as well as the prescriptive actions we may have identified; (2) finding a middle ground for response and action; or (3) identifying how the DR Team plans to address such recommendations in the future. In our reports, we identify the team's progress and monitor both the sufficiency and the speed of its responses. Thus far, we have been satisfied with the DR Team and P&M organization's actions or commitments to providing responses to our recommendations.

VI. Summary of BMcD/Modus Reports and Current Status Update – 3Q 2013 through 2Q 2014

A. Initial Project Assessment – August 13, 2013

In our August 2013 Initial Project Assessment Report, BMcD/Modus provided NOC with an overview of the Refurbishment Project's status at that time and identified a number of key recommendations for the DR Team to consider. The Initial Assessment Report was intended to form a benchmark for the Project's progress, so it is appropriate to revisit our key observations from one year ago and measure the team's progress:

BMcD/Modus Initial Assessment Report August 2013	Current Status
BMcD/Modus believes the Refurbishment Project was appropriately advanced to support its major goal of producing a Release Quality Estimate ("RQE") for final Board of Directors and Shareholder approval by October 15, 2015. However, we noted that the DR Team needs to effectively and efficiently manage a number of significant risks in order to achieve the necessary level of definition and project maturity required for the RQE.	The Refurbishment Project has made a number of key advancements in the last year and remains on pace with RQE preparation. However, the required effort increases with the passage of time. The team's effort for the 4d Cost Estimate will provide a good indicator of the Project's overall readiness.
The DR Team needs to mature, break down silos and operate as an integrated Project Team for the Execution Phase.	Some progress has been noted in this regard though there is more work ahead. Recent leadership changes will have to be monitored for effectiveness though the leadership remains committed to moving the organization to the Execution Phase. The Project Team should be further optimized in this regard by the award of significant work packages (Containment Isolation and Turbine Generator) to the SNC/Aecon Joint Venture.
The EPC contracting model presents a significant challenge, as this model is new to OPG and will require a number of process and management changes. We noted that the DR Team's current growing pains are commonly experienced by owners who engage in large EPC contracts for the first time.	The P&M Team for the Campus Plan Projects struggled with the initial application of a hands-off oversight model paired with largely cost reimbursable target price contracts with vendors. The DR Team has learned from these early lessons and is moving forward with more active management of the work.
OPG's oversight of the Detailed Engineering and Planning & Assessing phases poses perhaps the most significant near-term risks, as these functions have typically been performed in-house by OPG on past projects. We recommend OPG consider "shoulder to shoulder" work with the EPC design partners to expedite the	Development of Detailed Engineering by the May 2015 deadline remains a milestone at risk. Engineering has modified its approach to a collaborative design process in which the engineering work on-going at vendors' home offices is subjected to OPG's more immediate review and resolution of outstanding issues. The goals for the collaboration are appropriate, though some delays in awarding BOP work are placing the design completion

BMcD/Modus Initial Assessment Report August 2013	Current Status
start of detailed engineering and constructability reviews.	milestone at risk.
OPG's most vital role during the Execution Phase will be to manage and coordinate the work of the multiple EPC contractors, a condition that typically provides a ready source of change orders, delays and commercial disputes on projects of this type.	The DR Team has taken this issue head-on and has instituted a number of key issues and initiatives that assert OPG's role as the integrator and as general contractor. Most notably, OPG has taken control of the detailed Level 3 Project schedule integration and coordination.
The final scope for the Refurbishment Project needs to be fully vetted and properly narrowed to meet the Project's goals of (1) replacement of life-limiting components (such as pressure tubes) and (2) replacement of components most efficiently done in an extended outage.	The DR Team instituted a "Blue Ribbon Panel" to perform an independent review of the Project scope. The Blue Ribbon Panel made several recommendations to remove project scope resulting in less project complexity (as well as reducing project risk) and lower cost. On an ongoing basis, any scope changes are reviewed by the Scope Review Board.

B. 4Q 2013 Report

The focus of this report was to progress the status of the Project from the baseline established by our Initial Assessment Report. In particular, the 4Q 2013 Report looked at the progress and risks of RFR and Balance of Plant, the 4c Cost Estimate, the development of the Project's scope and schedule and Campus Plan. We also reported at that time that the DR Team's senior leadership had positively responded to the recommendations in our Initial Project Assessment that we presented to the NOC in 3Q 2013.

BMcD/Modus 4Q 2013 Report December 2013	Current Status
The RFR Contractor is falling behind schedule for the Tooling and Definition Phase work	OPG's RFR Project Team required the RFR Contractor to develop a recovery plan to restore progress to plan. The RFR contractor's performance has since improved, and although it has not fully recovered the schedule, OPG is much more active in holding the contractor accountable to work its recovery plan and show improved progress.
The Class 3 Estimate for the RFR Project is at risk, and the RFR Contractor's metrics indicate that it is not expending enough hours to meet the Class 3 estimate delivery date in the contract.	The DR Team worked extensively with the RFR contractor to identify and communicate its expectations regarding its Class 3 estimate (which will be a significant input to OPG's own 4d release business plan) and is currently in the process of vetting the JV's estimate, but all indications are that the JV has met its contractual obligation.
The Facilities and Infrastructure Projects that are part of the Campus Plan remain a significant risk to the DR Project, particularly D20 Storage.	The DR Team's senior leadership is taking action to turn the performance around, including: • Additional focus on helping the ESMSA vendors' design partners' efforts by co-locating OPG resources as resident engineers; • Developing a plan to integrate all of the pre-requisite work into a master integrated schedule so that the ESMSA's can properly plan and resource load the work and OPG can manage the contractors' work load and performance. • Completion of work allocation to each of the vendors so that the ESMSA's can properly plan their work
Consider the 4d Cost Estimate that the DR Team will be presenting for next year's Business Plan a "dry run"	The DR Team has agreed with this recommendation and incorporated it into its 4d estimating plan. The 4d estimate

BMcD/Modus 4Q 2013 Report December 2013	Current Status
for RQE.	will be developed over the summer and will be submitted to the Board for approval in the November 2014 Board meeting. Additionally, the DR Team is focusing on improving traceability, sourcing, vetting and suitability of database information underlying the estimate.
Quality and consistency of the materials in Gate packages should be addressed. Gate review packages are often hastily assembled by the project teams and provided to the GRB only shortly before the gate review meetings.	The Refurbishment and P&M leadership have increased accountability by their respective project managers. Recent packages have been subjected to increased scrutiny and initial rejections. Management of both organizations has reiterated quality standards.
The development of the Level 3 schedule needs improvement. Since future contracts (most notably RFR and BOP) are based on target price arrangements, it is essential that the operative schedule is resource loaded; otherwise, the Project Team will lack an essential tool for holding the contractors accountable to their budgets. Project Controls will need management support to hold the work groups accountable for developing and utilizing the Master Schedule, including developing forums for discussion of the Execution Phase Master Schedule status and preparation.	The DR Team has made significant progress and adopted all of BMcD/Modus's recommendations for the development of the Project schedule. The Definition Phase schedule continues to mature and scheduling standards are being enforced with the contractors.
The next challenge for Engineering will be to morph into an organization that can manage the next phases of work, and here remains some concern. Engineering will have multiple roles, from design authority to reviewer of the various EPC contractors' work-product to developing the restart plan for the units. This will require a significant planning effort.	Meeting the May 2015 milestone for completion of detailed design is at risk, though OPG Engineering has taken significant steps by injecting increased front-end planning and collaboration with the vendors. The success of these efforts will be determined over the coming months.

C. 1Q 2014 Report

The issuance of our 1Q 2014 report coincided with the release of the Minister of Energy's December 2013 Long Term Energy Plan ("LTEP"). As a result, much of this report was dedicated to identifying any gaps or misalignment between the Project and the LTEP. Our report also identified recommendations for strengthening OPG's planning for completion of the Release Quality Estimate ("RQE").

BMcD/Modus 1Q 2014 Report March 2014	Current Status
RFR contract incentives and disincentives are based on 4 unit performance; the LTEP prioritizes the success of Unit 2 as a precursor for the other 3 units.	Refurbishment's senior management is committed to a thorough commercial review of the RFR contract's incentives and disincentives. Target price negotiations will provide a platform for negotiation of these essential provisions.
There is ambiguity in pricing risk for the RFR target price; the contract monetizes contingency as part of the target price, not before. This includes focusing on risk and contingency for the Project estimate to be included in the 2014-2015 Business Plan.	With the completion of its Class 3 Estimate, SNC/Aecon has committed to providing input to OPG for modeling contingency for the 4d Cost Estimate. Nonetheless, monetizing the associated contingency for RFR will require substantial effort.

BMcD/Modus 1Q 2014 Report March 2014	Current Status
The DR Team has struggled with defining its "oversight" role of the contractors. OPG needs to embrace "active management" of its contractors and apply lessons learned from early Campus Plan and RFR work regarding benefits of active management vs. passive oversight.	The DR Team and P&M have each made essential changes to their respective management models that incorporated these lessons learned. These changes include: • Increased collaboration for estimating, scoping, scheduling and planning of the work; • Increased vendor surveillance; • Managing the interfaces in the integrated schedule; • Increased management meetings with vendors and senior management to review and resolve open issues.
The DR Team's project controls are in an early stage of development and require testing and validation, including: Continued action on the part of the DR Team to strengthen schedule and budget controls, and continued development of the integrated level 3 schedule.	As noted, this is underway.
With respect to the RFR Class 3 Estimate, OPG needs to hold the RFR contractor accountable for meeting the required schedule dates.	The OPG team held SNC/Aecon accountable for developing a quality product for the Class 3 Estimate. OPG's team challenged multiple aspects of the estimate and required SNC/Aecon to change or further explain multiple elements of the plan embedded in the estimate.
Several Campus Plan Projects may delay breaker open if the delays are not mitigated; the lack of an integrated and resource loaded Level 3 schedule has made it difficult for P&M to evaluate Campus Plan Projects' work priorities, ESMSA resource needs and determine potential delays to the project pre-Refurbishment critical path.	The maturity of the P&M schedules is increasing; there are currently 14 projects with updated level 3 schedules including all work on the critical path. These updated schedules are allowing P&M's management to make appropriate decisions.
Capture lessons learned from Campus Plan and incorporate into management of BOP work in real time.	As noted in our 2Q 2014 Report, this is currently occurring on both the Campus Plan Projects and Refurbishment.
Evidence of P&M mismanagement of EPC contract terms with ESMSA could impact Refurbishment.	Refurbishment immediately injected the lessons learned regarding ESMSA performance. Refurbishment has increased collaboration with the ESMSA vendors and has made decisions regarding scope assignments based on vendor readiness and capability.
Early indicators of scope/pricing for the ESMSA BOP work have been mixed with examples of misunderstood scope and engineering requirements.	The BOP estimates that were initially out of line have been reviewed and scope is being aligned. The Refurbishment Project initiated an Options Review Board ("ORB") that provided additional vetting of scope and planning. The ORB has already uncovered poor initial planning and scoping of three BOP projects.
The Risk Management Program has initiated some improvements but has additional work to do to increase effectiveness; the current Program Management Plan is lacking in detail and clarity.	Risk Management's profile within the Refurbishment and P&M teams still needs to be raised. The Refurbishment team launched an RQE risk session that should increase the teams' focus.

D. 2Q 2014 Report

On May 13, 2014, BMcD/Modus presented to the NOC our Quarterly Report for 2Q 2014 (the "2Q 2014 Report") in which we provide a summary of our investigation of the causes of the cost and schedule variances in the Refurbishment Project's key pre-requisite Campus Plan Projects. This assessment was not initially in our scope, though in early 2014, the DR Team's senior management requested that we provide an independent review of the causes of these cost variances. Our 2Q 2014 Report raised a number of concerns that both NOC and senior management have taken very seriously. During the May 13, 2014 meeting, the NOC requested both BMcD/Modus and the DR Team's executives to provide an update of the issues we each raised regarding the Campus Plan Projects' performance and cost and schedule variances at the next NOC meeting. As part of this update, OPG senior management has asked us to assess:

- The current impact and extent of condition of the variances found in the budget and schedule for the Campus Plan Projects;
- The extent to which changes in management personnel and approach implemented for the Campus Plan Projects have been effective;
- Whether Refurbishment has benefitted from lessons learned from the Campus Plan Projects, and specifically whether the EPC contracting model for Refurbishment and the method OPG has chosen to manage the EPC contractors suffer from the same flaws as seen in the early Campus Plan Projects;
- Whether the Refurbishment Project's and Campus Plan Projects' contractors (in particular the Extended Services Master Services Agreement ("ESMSA") contractors ES Fox and Black & McDonald) are improving in their performance and incorporating lessons learned into their methods for planning, estimating, scheduling and executing the work; and
- Whether the Projects & Modifications ("P&M") and the Darlington Refurbishment organization ("DR Team") are committed to transparent reporting of the Refurbishment Project's progress.

The following is our analysis of these questions. We have been advised by the senior management of the DR Team and P&M that they intend to take into account our findings regarding the issues that impacted the early Campus Plan Projects, and are currently working to implement all of the lessons learned from these projects. We have been involved in several discussions with the DR Team and P&M with respect to their on-going and planned management actions and we have begun to see evidence of these efforts taking effect. Additionally, many of the issues that we identified with respect to the performance of the Campus Plan were the direct result of the fact that the P&M organization had not adopted many of the procedures developed by the DR Team for the Refurbishment Project. The legacy issues that caused the schedule and cost variances for the two key projects—D2O Storage and AHS—will continue to be a challenge, and will need to be closely monitored.

1. Extent of Condition – Budget and Schedule for the Campus Plan Projects

a. Management of the Work

As we have previously stated, the DR Team is responsible for planning and executing the bulk of the Refurbishment Project work. The Projects and Modifications organization is responsible for completing the Campus Plan and other prerequisite projects. It is important to note that Refurbishment and P&M are set up differently from both an organizational and process standpoint. Thus the issues impacting the prerequisite projects have manifested themselves differently and the necessary responses may also need to be different.

Each organization also exhibits a different level of maturity from a project management standpoint. As noted in our 2Q 2014 Report, P&M was an existing maintenance organization that handled minor modification work within the OPG stations. P&M's yearly volume was historically less than $300M. P&M was chosen to manage the Campus Plan Projects because the DR Team was in its embryonic stage. P&M negotiated the ESMSA contracts as generic commercial documents that could be assembled as EPC agreements as needed. In retrospect, had the Campus Plan Projects been in the same general size and complexity as the plant modification work, this plan may have had a greater chance of

success. However, the first of the Campus Plan Projects was D2O Storage, which is as technically and logistically complex as virtually any work on the DR Project, and this project was unfortunately used as a pilot project.

The Refurbishment Project has, from the start, proceeded with its major EPC contracts using a more direct management approach which has been further strengthened by internalizing the early lessons from D2O Storage and AHS and by changes in the senior management team. Since the inception of our engagement in late February 2013, we have witnessed a number of changes by the DR Team that incorporated lessons learned, notably the changes to the method for scheduling the work via a fully integrated Level 3 schedule, increased focus on necessary scope through a robust process with multiple checks and vetting, and adhering to the gate process for budget approval with greater rigor.

Moreover, the EPC contracting method selected for Refurbishment's major scopes of work—the RFR/Containment Isolation, Turbine Generator and Steam Generator projects—has been managed differently and much more effectively than the pilot Campus Plan Projects. Because of their timing, the pre-requisite Campus Plan Projects provided the DR Team with an opportunity to test its new EPC model and draw experience for the much larger Refurbishment effort. Thus, the Campus Plan Projects were intended to be a source of lessons learned. The area in Refurbishment where the lessons learned from D2O Storage and AHS are most salient is the Balance of Plant work: here too, Refurbishment has made essential changes to the procurement method, scope identification and instituted greater collaboration at a much earlier stage than seen from the Campus Plan Projects.

b. Overall Cost Impact

A critical aspect of our 2Q 2014 Report's examination was to identify the extent to which the early problems with D2O Storage and AHS spread and otherwise impacted the Refurbishment Project. From a budget standpoint, while the DR Team is still examining the extent of the cost impacts from each of the Campus Plan Projects, it would appear that approximately 67% of the overall variance from the 4c Cost Estimate approved by the Board in 2013 resides with these two troubled projects. The following chart illustrates the current budget status for the Campus Plan Projects:

Bundle	Project	Release 4C estimate	Current Forecast*
F&IP (Campus Plan)***	D_2O Storage	$110M	$276M**
	OSB Refurbishment	$45M	$53M
	Auxiliary Heating Steam	$46M	$85M
	Water and Sewer	$46M	$58M
	DEC	$87M	$87M
	R&FR Annex	$32M	$41M
	RPO	$89M	$100M
	Electrical Power Distribution	$14M	$13M
	Other F&IP Projects	$83M	$111M
Subtotal		**$552M**	**$824M**

* Current forecast amounts provided by the DR Team.
** The D2O estimate is currently being challenged and confirmed. This is an interim estimate that may not be reflective of the final Estimate at Completion.
*** Does not include SIO Projects

It is important to note that we believe that the majority of the cost increases with D2O Storage and AHS are due to maturation of these projects' scope definition, scope management, unforeseen subsurface conditions or flawed estimates. In other words, the increased budgets are simply reflective of the true project costs had they been estimated properly at the outset. Moreover, we have no issues with the project delivery approach (multiple-prime EPC, target price). We have seen the multiple-prime EPC approach employed successfully on other projects, and it is appropriate for OPG to act as the construction manager and design authority for a refurbishment project on an operating plant. Additionally, target pricing in this context is appropriate—particularly prior to the completion of detailed engineering—a

contractor would add a large premium to accept pricing risk. Our criticism in the 2Q 2014 Report stems mainly from the fact that the project management strategy originally employed by the P&M organization did not match the chosen commercial strategy, as both the multiple-prime delivery method and target pricing requires that OPG be fully engaged as the contract manager of the Refurbishment Project. As a result, P&M did not have the tools to determine the "true" costs of the project from the outset and communicate those costs to the Board of Directors. In particular, the P&M organization made several mistakes with respect to determining the projects' budgets, including:

- "Negotiation" of bid prices which gave a false sense of security regarding the accuracy of the cost estimates—too much emphasis was given to pricing during the bid evaluation phase rather than understanding the scope, execution plan and qualifications of the contractors;
- Assuming, without the proper vetting and review, that estimates provided by the contractors had a certain level of accuracy even though no design was complete and scope was still in flux – this resulted in significantly lower contingency than should have been applied to these estimates; and
- P&M's and the contractors' failure to regularly update the Estimate at Completion (EAC) once changes were known resulted in the budget shock occurring all at once with the presentation of revised Business Case Summaries ("BCSs").

Based on these practices, the budgets initially approved by the Board for D2O Storage ($108M) and AHS ($45.7M) were not sufficient for the planned scope of work. Moreover, had P&M appropriately classified these two project's cost estimates at a Class 5 (-50% to +100%) maturity level, it is very likely that these projects could have entirely avoided an overrun. At a minimum, under the current Refurbishment Project leadership, these cost estimates would not have been presented to the BOD for full funding release until reaching an appropriate level of maturity.

P&M has recognized the problems which caused these budget overruns to occur and is actively working to negate any repeated issues in the estimating of the remaining work. The BCS for AHS that underlies the authorization for additional funds approved by the Board at the May 2014 meeting was developed by ES Fox using sound estimating processes and vetted by OPG in an appropriate manner. Black & McDonald's estimating effort for D2O Storage is ongoing and this estimate is more problematic for reasons discussed herein. The P&M team has increased the level of rigor Black & McDonald applies in its preparation, though despite these efforts, it may take until later this quarter or early 3Q before the estimate is in shape for thorough review. Thus, at this time, P&M is proceeding with appropriate caution in how this estimate is being characterized.

c. Schedule Impacts – D2O Storage and AHS

Due to the extended time used for detailed engineering, and poor planning and scheduling practices deployed by P&M and the ESMSA contractors, there is much less contingency and schedule float available to complete the Campus Plan. While the Campus Plan Projects were initially helped by the one year change in Refurbishment's breaker open date (from October 2015 to October 2016), this additional time was not utilized in an effective manner. However, after the change in P&M's leadership in January 2014, detailed schedules have become a top priority for the Campus Plan Projects. As a result, P&M has more confidence in their time projections and is now able to evaluate ways to improve the schedule for the D2O and AHS buildings.

- The AHS project is currently projecting about 3 months behind schedule which could miss its completion milestone prior to the Vacuum Building Outage ("VBO"). Since our 2Q 2014 Report, P&M has taken action to try to improve these completion dates through:
    - Prioritizing the resolution of any remaining design issues;
    - Working double shifts on critical path work;

- Simplifying the design of the pipe chase to the plant by substituting a very difficult to construct underground pipe chase with an above-ground pipe rack, which should positively impact both the project's schedule and budget; and
- The DR Team is monitoring the schedule progress of AHS and is readying mitigation plans in the event that the VBO milestone cannot be met, including utilizing the existing construction boilers and/or procuring temporary back-up steam capacity if needed.

- D2O Storage remains the more challenging project from a schedule standpoint. The combination of underground utilities and poor soil conditions, significant design changes, engineering delays and contractor performance has pushed D2O Storage to a projected completion of April 15, 2016. This date has no float and is based on a mere 5 ½ months to erect and install the building's key piping systems. The P&M team is currently engaged on a number of fronts in attempts to reduce the complexity of this design and thus ease construction:
  - Value engineering of the piping design including rationalizing the aspects of the design to reduce work and potential productivity difficulties;
  - Elimination of the box drain below the foundation, which should improve the foundation work schedule by 4 weeks;
  - Review and rationalization of the design of the pipe chase to the existing TRF building;
  - Elimination of office space requested by the TRF personnel;
  - Elimination of the emergency back-up diesel generator.

As with the budget, these scope reduction initiatives and the schedule impacts are under review and are being assessed with increasing urgency.

The other Campus Plan Projects are being added to the integrated master schedule at this time. Currently 12 of the 28 pre-requisite projects have been added to the master schedule. Moreover, the projects that have shown potential for schedule variance are being given priority and mitigation plans have been developed to minimize impact. As an example, the Containment Filter Venting System ("CFVS") was initially scheduled to complete prior to the VBO, though, due to design issues, this work was delayed. Based on the schedule and the project's priorities, the team decided that completing this work at a later time posed no risk; thus the cost to accelerate the work was avoided. Similarly, P&M is looking to increase its understanding of the cost and schedule drivers for each project and work within projects to strategically accelerate only where the benefits are tangible.

2. Leadership Changes

The issues with respect to the Campus Plan Projects led to the departure of the VP of P&M in July of 2013. P&M's new leadership has put into place several important initiatives, and is intent on correcting the remaining issues around management and staff, including streamlining internal processes to enhance project performance. In addition, there has been increased accountability and integration between P&M and the Refurbishment Project, with P&M reporting and updating its project schedules and other metrics within the Refurbishment Project's reporting. In addition there has been increased sharing of resources between P&M and the Refurbishment Project: (1) the Refurbishment Engineering team is much more active in attempting to resolve the issues that have impacted design completion within the Campus Plan Projects; (2) a schedule "hit team" has been deployed by Refurbishment to help standardize the schedules for the Campus Plan Projects; and (3) there has been increased integration between the P&M and Refurbishment BOP teams. These measures have increased the DR Team's understanding of the importance of the Campus Plan Projects to Refurbishment and their likelihood of success.

3. Implementation of the Lessons Learned and Corrective Actions

As stated above, in order to put our 2Q 2014 report into the appropriate context, it is important to understand that the DR Team and P&M are two separate organizations within OPG. The DR Team is focused on planning for the successful

execution of the refurbishment and life extension of the four Darlington units. They are a single program organization that have implemented a very methodical approach to determining the Refurbishment Project's scope and implemented project management procedures and controls that meet our expectations for what we would typically see in the industry. P&M is a projects organization set up to manage a large portfolio of capital projects for both Pickering and Darlington. As such, the needs of the P&M organization are different to Refurbishment and it does not utilize the same procedures and controls developed for the Refurbishment Project. The P&M processes are geared towards multiple (hundreds) of small projects authorized within the OPG AIS-C funding stream. Due to the fact that the Campus Plan Projects had to start significantly ahead of the Refurbishment Project, and the fact that the DR Team did not have its construction execution organization in place, the Campus Plan Projects were handed over to the P&M organization to manage. Therefore, many of the issues experienced by P&M were never a threat to the Refurbishment Project, as appropriate controls had been developed.

As an example, one of the causes of the increased project estimates for Campus Plan is the increase and changes to scope. In contrast, our prior reports have documented the fact that the DR Team has taken a balanced approach to the development of the Refurbishment Project scope. The initial scope identification effort incorporated scope beyond that of refurbishment and life extension, potentially increasing the budget and project complexity. However, to even this out, the DR Team has continuously monitored and repeatedly tested the included scope through scope reviews and de-scoping exercises, including a detailed and intensive effort led by the Blue Ribbon Panel in 2013. Additionally, the DR Team has monitored scope definition through the Gate Review process and Health of Scope metrics. B&McD/Modus believes the DR Team has struck an important balance between overly limiting scope (and risking scope growth during execution) and being overly-inclusive (and risking excessive project budgets).

The Refurbishment Program has benefitted from the early start of the Campus Plan Projects because it has allowed Refurbishment to evaluate its management processes and procedures and make adjustments as necessary. It is not uncommon for an organization to have to adjust its commercial strategies, project delivery methodology, contractor incentive/disincentive structure, or other negotiated contractual provisions during the course of a long and complicated project to ensure that commercial considerations continue to drive the appropriate contractor behavior. Good project management organizations make such adjustments based upon the information that is known to them. As a result, we would expect that the DR Team would incorporate the lessons learned from the Campus Plan experience—and there is evidence that they are doing so—even before the issuance of our 2Q 2014 Report.

Below is an update as to the most significant issues raised in our 2Q 2014 Report. We have recorded the responses from both the DR Team and P&M, as there will necessarily be differences between the required planned management actions. For Refurbishment, the main actions are to implement the lessons learned and ensure its model will not be subjected to the same issues as seen with the Campus Plan Projects. For P&M, it will be to recover the on-going projects and to mitigate future risks.

BMcD/Modus D2O Storage and AHS Findings	Refurbishment Approach	P&M Recovery
Scope for the projects was based on a performance specification; P&M relied on the contractors to develop and progress the design.	Scope for the EPC contracts is based on thorough Modification Design Packages (MDPs) developed by OPG Engineering and its OSS vendors; MDPs advance the design beyond the conceptual stage and provide the EPC contractor with a defined scope of work.	P&M has also adopted the MDP as the basis for scope definition for its remaining projects. OPG Engineering is fully engaged in developing, vetting and approving design work.
Contracts were bid between the two ESMSA vendors and low price was deemed the primary consideration for	Major EPC contracts were openly bid and qualifications, technical ability and performance record trumped price; after considering the subcompete used	Most of P&M's work was subjected to the sub-competitive bidding process; however, the packages each ESMSA vendor received after the

BMcD/Modus D2O Storage and AHS Findings	Refurbishment Approach	P&M Recovery
award.	by P&M for the Balance of Plant work, the DR Team changed its process to directly assign the work packages based on vendor qualifications.	initial pilot projects were more reflective of each contractor's capability.
P&M negotiated the cost reimbursable prices resulting in reduction of the base cost estimate prior to full scope definition.	Vendor pricing for the EPC contracts is being determined from a progression of cost estimates at prescribed points in project definition; final negotiation of target price contracts will only occur once the scope is known and estimates have matured.	P&M has abandoned previous practices and is now working collaboratively to develop reasonable cost estimates.
P&M misclassified the D2O Storage and AHS initial bids as "Class 2" and "Class 3" caliber estimates prior to the start of design work, which resulted in severe underestimation of project contingency.	Refurbishment built the classification of the estimates into the process for weighing the EPC contractors' progress; as an example, the RFR contractor has yearly (from 2011 to 2015) prescribed deliverables of Class 5/4/3/2 estimates that accompany different levels of the project's maturity. Moreover, contingency development is occurring under a defined interactive process in which OPG and the vendor must agree on risks, opportunities and monetization of those potential events.	P&M is following the Refurbishment gate process.
P&M's team was instructed to be "hands-off" and allow the contractors to develop their designs, and only after full development would P&M and the OPG stakeholders provide comments, changes and design input; this led to scope creep and an attenuated design process that has eliminated construction float.	Refurbishment has increased management focus and collaboration on engineering solutions, and is moving up critical constructability and design review cycles. As an example, the final price for RFR will be negotiated on the basis of final construction work packages and proving-out of the critical tool and construction operations in a full scale mock-up that simulates actual conditions.	P&M is instituting a collaborative approach to engineering reviews.
P&M presented the cost estimates it received as part of business case summaries for full project funding release at a very early phase of design definition.	Refurbishment is incrementally releasing funds through a gate process that measures progress on the basis of objective criteria and will seek full funding release only when the scope is fully defined, execution planning is completed and all risks are well-known.	P&M is adopting the Refurbishment gate process and will not submit projects for full release until a reliable estimate is prepared. P&M has chosen to hold off presentation of the revised D2O Storage BCS until it has confidence in the underlying estimate's accuracy.

BMcD/Modus D2O Storage and AHS Findings	Refurbishment Approach	P&M Recovery
As design and project definition progressed, the contractors and P&M failed to timely update the projects' cost estimates at completion (EAC), and only provided such updates when additional funds were necessary.	Refurbishment's gates and the yearly Business Plan cycles require the projects to update EAC on a timely basis. In recognition of the issues with D2O Storage and AHS, Refurbishment is imposing additional controls to require constant evaluation of each projects' maturity.	P&M has abandoned this practice and its team has been instructed to update EAC when new information is available.
Scope creep into these projects caused the design to become more complicated and difficult to build.	Refurbishment has instituted an Options Review Board chaired by the SVP that evaluates whether the maturing design meets the Project's needs.	P&M is currently engaging in value engineering reviews of the major projects to determine whether scope reductions are possible.
P&M gave the contractors complete latitude to develop their Project schedules and did not adequately vet these schedules' quality.	After initially considering a siloed Project schedule, Refurbishment is adopting a much more rigorous method of vetting and integrating the projects' schedules into a single, detailed Level 3 schedule that, once fully developed, will represent all of the work in the Execution Phase; Refurbishment is enforcing quality standards from each of the vendors.	P&M is instilling rigor into the schedule process and requiring the vendors to develop Level 3 schedules that depict their plans for the work. These schedules are being integrated with the Refurbishment schedules and must meet the same quality standards.
As an artifact of the poor practices that established and updated project budgets, P&M's reporting was inaccurate and not fully updated to reflect project status.	Refurbishment is establishing processes for data fidelity in its reports and continues to improve the quality of the reporting.	P&M is revamping its entire suite of metrics to align with the requirements of Refurbishment.
P&M managed the work in "silos" and didn't regularly engage the contractors in meaningful dialogue intended to remove barriers and fix problems.	Refurbishment is establishing multiple forums for interaction with the contractors. Each major contract has a Steering Committee made up of project executives that meets monthly, and the major EPC contracts engage in CEO-level meetings each business quarter.	P&M has instituted Steering Committee meetings as well as a monthly ESMSA Summit in which OPG and the two contractors can air any issues in an open manner.

The P&M and Refurbishment organizations have taken action to acknowledge the Campus Plan Projects' issues and incorporate lessons learned into their planning activities. However, implementation of these lessons learned and the related actions will take an on-going concerted effort that will not happen overnight. In fact, as P&M is working through all of the Campus Plan Projects to develop and vet proper estimates and schedules, additional issues may be uncovered. This will also require a high level of monitoring to ensure that the recovery efforts are successful.

Exhibit 1

3Q 2013 Initial Project Assessment Report

Supplemental Report to
Nuclear Oversight Committee
2nd Quarter 2014

Darlington Nuclear Refurbishment Project

This entirety of this report was filed at

L-4.3-1 Staff-072, Attachment 1, pp. 8-112

Exhibit 2

4Q 2013 Report

Supplemental Report to Nuclear Oversight Committee

2nd Quarter 2014

Darlington Nuclear Refurbishment Project

This entirety of this report was filed at

L-4.3-1 Staff-072, Attachment 2

Exhibit 3

1Q 2014 Report

Supplemental Report to Nuclear Oversight Committee

2nd Quarter 2014

Darlington Nuclear Refurbishment Project

This entirety of this report was filed at

L-4.3-1 Staff-072, Attachment 3

Exhibit 4

2Q 2014 Report

Supplemental Report to Nuclear Oversight Committee

2nd Quarter 2014

Darlington Nuclear Refurbishment Project

This entirety of this report was filed at

L-4.3-1 Staff-072, Attachment 4

Project Excellence Initative

The purpose of this document is to summarize the Project Excellence Initaitive Steering Committee (SC) roles and responsibilities as well as the role of each supporting Working Team (WT).

This document includes the following:

Table of Contents

TERMS OF REFERENCE Project Excellence Steering Committee	Issue Date: August 25, 2016

TERMS OF REFERENCE – PROJECT EXCELLENCE STEERING COMMITTEE

1. Background

Over the next 10 years and into the foreseeable future, OPG will continue to invest significantly in projects to sustain plant operations and as a primary vehicle for company growth. In recognition of this, the Executive Leadership Team (ELT) requested that an **Enterprise Level Initiative** be undertaken with a goal to improve project outcomes across OPG. As a result of this, a **Project Excellence Steering Committee** has been established to oversee a number of iniatitives, via Working Teams, that will contribute to this goal.

2. Objectives

The primary objectives of the Project Excellence steering committee is to oversee the individual initiatives undertaken within the Project Excellence framework and to 1) ensure that the working teams are adequately resourced to perform their work, and 2) provide direction and oversight to the team as they establish their objectives and deliver on their goals.

3. Scope

This initiative involves and applies to all organizations across OPG that execute projects and includes all aspects of delivering projects in order to achieve **Project Excellence**.

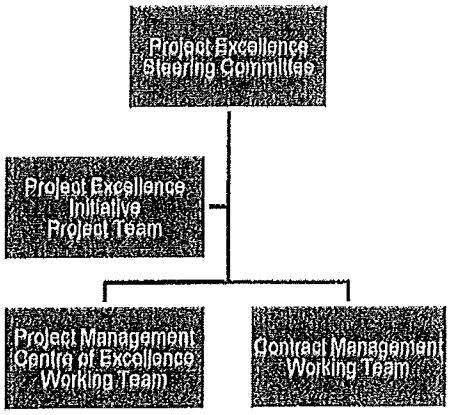
4. Approach/Strategy

For each major initiative, a **Working Team** (WT) will be established with the responsibility for developing a Project Management Plan for the initiative and for planning and coordinating activities necessary to produce the deliverables.

Each major initiative will have its executive sponsor(s) who are also members of this Steering Committee.

A change management lead will be assigned to the project to facilitate this change.

Currently, two Working Team's have been established. Others will be added when needed as determined by the Steering Committee.



5. Timing

This initiative on Project Excellence commenced in January 2016 and will continue through to the end of 2017 at which time it will be evaluated to determine whether the initiative should be extended or continued to be managed as part of the Project Management Centre of Excellence (PM CoE).

TERMS OF REFERENCE Project Excellence Steering Committee	Issue Date: August 25, 2016

6. **Deliverables**
   Deliverables will be identified at the Working Team level.

7. **Key Stakeholders**

   Project governing bodies such as the Gate Review Board (GRB) and the Asset Investment Screening Committee (AISC), as well as all organizations that execute projects, are considered key stakeholders of this initiative. As such, the deliverables and output of the initiative are intended to enhance the project management processes that support these bodies in fulfilling their roles.

8. **Committee Meetings**
   - Bi-Monthly Steering Committee commencing in August 2016.
   - Bi-Weekly Working Team meetings rotated at different lead locations. The Working Teams will report out at each Bi-Monthly Steering Committee meeting.

9. **Team**

   Steering Committee:

   - D. Reiner, SVP Nuclear Projects (Co-Sponsor/ Chair)
   - M. Martelli, President RGPM (Co-Sponsor/ Chair)
   - G. Jager, Nuclear President & CNO
   - B. Keenan, SVP People, Culture & Communications
   - S. Martin, SVP Business & Admin. Services
   - Ken Hartwick, SVP Finance Strategy Risk and CFO

   Project Excellence Initiative – Project Team

   - G. Rose, VP Project Planning & Control – Nuclear Projects (Co-Chair)
   - P. Burroughs, Director Project Management - RGPM (Co-Chair)
   - M. Attong, Refurbishment, Manager Planning & Control (Program Manager)
   - Jennifer Ankrett (Change Management)

   Working Teams

   - Each Working Team will be responsible for its own resources.

Approval:

Dietmar Reiner, SVP Nuclear Projects — Aug 29 2016 Date

Mike Martelli, President, Renewable Generation & Power Marketing — Aug 29, 2016 Date

TERMS OF REFERENCE **Project Management Centre of Excellence (PM CoE) Working Team**	**Issue Date:** August 25, 2016

PROJECT MANAGEMENT CENTRE OF EXCELLENCE (PM CoE) WORKING TEAM

1. Background

As part of the **Project Excellence** initiative, the Executive Leadership Team (ELT) requested that a key strategic initiative be undertaken to implement a **Project Management Centre of Excellence (PM CoE)** with a goal to improve project outcomes across OPG.

2. Objectives

The primary objectives of the **PM CoE Working Team** are to develop and recommend to the **Project Excellence Steering Committee** strategies for establishing:

- A **common, scalable project delivery model** for all projects across all business units that focus on delivering projects safely, at the required quality, on time, and on budget, with all project goals met.
- A **Project Management Centre of Excellence** organization model where project management expertise, best practices, tools, processes and lessons learned are available to all OPG projects.

Once the recommendations are accepted by the **Project Excellence Steering Committee**, the **PM CoE Working Team** will develop a plan and implement the approved strategies.

3. Scope

This initiative involves and applies to all organizations across OPG that execute projects.

4. Approach/Strategy

The Working Team (WT) will be established with the responsibility for developing a Project Management Plan for the initiative (Program). The WT will also be responsible for planning and coordinating activities necessary to produce the deliverables. Key aspects of the strategy being considered for the PM CoE initiative are outlined in Appendix A.

Recommendations for implementation will be presented to the **Project Excellence Steering Committee** for approval. Upon approval, the WT will lead the implementation.

A change management lead has been assigned to the Project Excellence initiative to facilitate the changes being made by each Working Team in a common manner.

5. Timing

This initiative on Project Excellence commenced in January 2016 and will continue through to the end of 2017. The work of this WT began in May 2016 and will culminate with the official launch of the PM CoE on July 1, 2017. Once established, the PM CoE will be an ongoing function within OPG.

6. Deliverables

A list of deliverables and milestones for this initiative is included in Appendix B.

7. Committee Meetings

- Bi-Weekly Working Team meetings rotated at different lead locations.

8. Team

Project Management Centre of Excellence (PM CoE) Initative Executive Sponsors:

- D. Reiner, SVP Nuclear Projects (Co-Sponsor)
- M. Martelli, President RGPM (Co-Sponsor)

TERMS OF REFERENCE **Project Management Centre of Excellence (PM CoE) Working Team**	**Issue Date:** August 25, 2016

Working Team

- G. Rose, VP Project Planning & Control – Nuclear Projects (Co-Chair)
- P. Burroughs, Director Project Management - RGPM (Co-Chair)
- M. Attong, Refurbishment, Manager Planning & Control (Program Manager)
- Project Organizations:
  - K. Kaczmarczyk (RGPM)
  - Kim Bosselle and Mike Benjamin (CIO)
  - Terry Doran (Real Estate)
  - Jerry Keto (Decommissioning)
  - Terry Chong (P&M)
- Support Staff:
  - Silviu Idita (People & Culture - Training)
  - Silvester Wong (Investment Planning)
  - Darlene McVeity (People & Culture)

Approval:

Dietmar Reiner, SVP Nuclear Projects — Aug 29, 2016 Date

Mike Martelli, President, Renewable Generation & Power Marketing — Aug 29, 2016 Date

TERMS OF REFERENCE **Project Management Centre of Excellence (PM CoE) Working Team**	**Issue Date:** August 25, 2016

Appendix A: Approach/Strategy

Key aspects of the PM Centre of Excellence initiative will involve establishing:

- A **Common, Scalable Project Delivery Model** for all projects across all business units to enable the delivery of projects that consistently meet Safety, Quality, Schedule and Cost goals. This includes:
  - Establishing cost and schedule **baselines** and **managing changes** to plan.
  - **Common** processes, tools, portfolio/program/project tracking and reporting. **Management control and oversight** throughout project lifecycle.

- A **PM Centre of Excellence** organization model to support that includes:
  - A **common knowledge base** comprising industry best practices, processes and tools, including the use of benchmarking, and provides a forum for network/ support for PMs.
  - **Centres of Expertise** for estimating, scheduling, cost management, risk management, other critical areas – with expert project resources in place to support projects.
  - **Quality Standards** - quality criteria and expectations for the project management framework, processes and documents.
  - **Competencies Development** – PM Development and training for core project roles including Project Managers, Risk Managers, Schedulers, Estimators, Cost Managers.
  - A **model for providing Project Services** to projects across OPG, including assignment of **specialized resource support** for core project roles on projects.
  - **Continuous Improvement** – periodically assessing the effectiveness of key processes and activities, identifying improvement opportunities/ gaps, and implementing actions to address.
  - **Project Excellence Culture** – a culture of excellence that enables and motivates stakeholders (internal and external) to apply their knowledge and abilities for the success of the project.

TERMS OF REFERENCE **Project Management Centre of Excellence (PM CoE) Working Team**	**Issue Date:** August 25, 2016

Appendix B: Deliverables and Milestones

#	Deliverable	Milestone
1	Develop a Corporate Level Policy on Project Management.	August 15, 2016
2	Governance Review/gap analysis performed and Implementation Roadmap including supporting IT Strategy developed. Includes assessment of governance against CII and other best practice.	September 30, 2016
3	Set of Program metrics established. Includes determining methods for measuring performance improvement.	September 30, 2016
4	Common Cost and Performance Management Tool and Reporting in place.	Nuclear – Q3, 2016 OPG – Q2, 2017
5	Project Manager Capability Program Rolled out Across OPG.	Q3 – Q4, 2016
6	Establish CoE including centres for cost management/ estimating, scheduling, risk management, other critical areas.	Q1 2017
7	Quality Standards - quality criteria and expectations for the project management framework, processes and documents.	Q1 2017
8	Common knowledge base comprising industry best practices, processes and tools. Include the use of benchmarking.	Q2 2017
9	Common governance in place across OPG. Considered as a Program Launch point.	July 1, 2017
10	Peer Review performed.	August 30, 2017
11	Continuous Improvement process covering initiatives at the Enterprise, BU and major Project level.	Q4 2017, Ongoing

TERMS OF REFERENCE Contract Management Working Team	Issue Date: August 25, 2016

CONTRACT MANAGEMENT WORKING TEAM

1. Background

As part of the **Project Excellence** initiative, a sub-initiative will be undertaken to review how OPG develops contracting strategies, manages the execution and administration of contracts, and closes out contracts. A **Contract Management Working Team (Working Team)** is being established to perform this review.

2. Objectives

The primary objectives of the Working Team are to:

1) Assess North American industry for Contract Management models
2) Select the best model for OPG,
3) Recommend the "best" model to the Project Excellence Steering Committee.

Once a model is accepted by the Steering Committee, the Working Team will:

1) Perform a gap assessment of the 4 models currently used within OPG,
2) Make recommendations to close the gaps with the preferred model. At a minimum, this will include recommendations for Contract Management Governance, Oversight, Support, and Performance models.
3) Develop an implementation plan.
4) Assist the Line Organizations with the Implementation.

3. Scope

This initiative involves and applies to all organizations across OPG that execute Projects and perform Contract Management.

4. Approach/Strategy

To achieve the objectives, the Working Team will:

- Assess industry practices and recommend a scalable Contract Management Model for use by all project executing organizations within OPG.
- Define, determine and establish processes for effective Contract Management (including Administration) of contracts within OPG, integrated with the Project Management framework being implemented by the Project Management Centre of Excellence (CoE) Working Team, including scalability to different project types, sizes, and risks.
- Consider the application of Contract Management tools, like Ecosys, to effect efficiency, transparency, and predictability in the overall project management process.

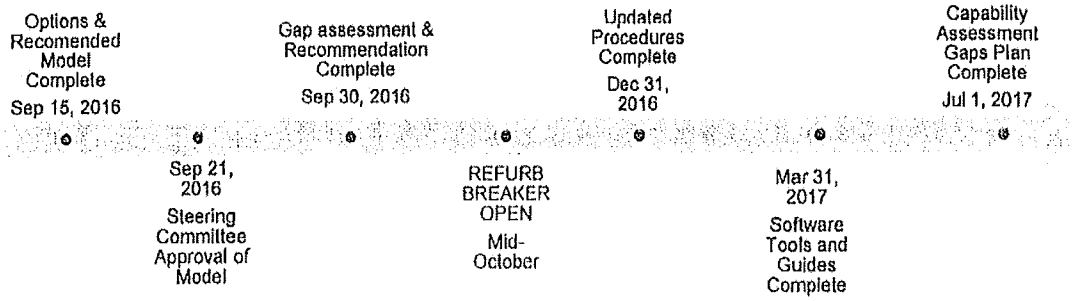
Recommendations for implementation will be presented to the Project Excellence Steering Committee for approval. Upon approval, the Working Team will assist the Line Organizations with implementation.

The Project Excellence initiative will provide a Change Management Lead to facilitate the changes in the Implementation Plan in a common manner.

5. Timing

The work of this Working Team will begin in August 2016 with a target complete implementation across OPG of July 1, 2017. A number of steps, for the Darlington Refurbishment Program only, pre-date Breaker Open in mid-October 2016. The timeline is shown in the line diagram below.

TERMS OF REFERENCE Contract Management Working Team	Issue Date: August 25, 2016



6. Implementation Plan

A list of deliverables is included below. This list will be refined as the Working Team performs their work.

#	Deliverable	Milestone
1	Recommended Contract Management Model including roles and accountabilities and where they reside. Includes consideration as to how this integrates with the Project Management Centre of Excellence.	September 15, 2016
2	Gap assessment of current OPG practices against the Contract Management Model and recommendations to close.	September 30, 2016
3	Updated Contract Management procedures. Selected software tools confirmed.	December 31, 2016
4	Approved Contract Management guides / instructions for software tools.	March 31, 2017
5	Contract Management capability development assessment and plan.	July 1, 2017

7. Team

Contract Management Initative Executive Sponsor:

- S. Martin, SVP Business & Admin. Services

Working Team

- P. Reinert, VP Supply Services OPG Projects (Chair)
- G. Rose (Nuclear SPOC)
- P. Burroughs/ K. Kaczmarczyk– (RGPM SPOC)
- M. Attong (Integration)
- E. Prokopieva (Legal SPOC)
- L. Saagi (Finance SPOC)
- Terry Doran (Real Estate SPOC)
- Kim Bosselle/ Mike Benjamin (CIO Observers)

TERMS OF REFERENCE Contract Management Working Team	Issue Date: August 25, 2016

Approval:

Scott Martin, SVP Business and Administrative Services — Date