ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment – Program Oversight and Reporting Audit

November 9, 2017

Report Rating: **Generally Effective**

Table of Contents

1.0 EXECUTIVE SUMMARY 3

1.1 Report Rating and Summary of Findings 3

1.2 Background 3

1.3 Objective & Scope 3

1.4 Conclusion 5

2.0 DETAILED AUDIT FINDINGS 6

APPENDIX A – RISK RATING DEFINITIONS FOR AUDIT FINDINGS 9

APPENDIX B – PROCESS OWNER & DISTRIBUTION LIST 10

1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Generally Effective**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Certain vendors' forecasts of cost and schedule require improved accuracy.	Operational		X	
2	Inconsistent figures were noted in one stakeholder report.	Operational			X
Total		**2**	**-**	**1**	**1**

1.2 Background

The mission of the Darlington Nuclear Refurbishment ("DNR") program is the successful refurbishment of the Darlington Nuclear Generating Station ("DNGS") – safely, on time, on budget, with 100% of scope completed, and to the quality expected within a nuclear station.

The DNR program has applied industry experience on the planning and execution of major projects, including considerable project management expertise from other OPG operation groups. The Planning and Project Controls organization provides oversight to ensure the overall successful completion of the DNR program. The organization manages and monitors costs, forecasts and performance reports for the DNR program on a consolidated basis.

DNR management has recently implemented the 'hierarchical method' of reporting where information is summarized and adapted to meet the different needs of report recipients rather than the previous way of 'one detailed report' for all recipients. This will help ensure that only relevant information is given to recipients by reducing information overload.

This was a risk-based audit identified in Internal Audit's ("IA") 2017 Strategic Audit Plan, selected given the significant profile, dollar value, and criticality of the program oversight & reporting work streams to the overall DNR program.

1.3 Objective & Scope

The objective of this audit was to assess the design and operating effectiveness of key processes and controls relating to DNR program management and reporting to ensure the project is completed on time, on budget, and that the appropriate level of transparency is provided to stakeholders to facilitate effective oversight and decision-making.

[1] Please refer to Appendix A for risk rating definitions

In order to achieve the audit objective, we reviewed the processes and tested on a sample basis whether:

A. Management Oversight Framework
• Roles and responsibilities for Planning and Project Controls defined in governing documents Project Life Cycle Management, OPG-STD-0147 and Project Management, OPG-STD-0148 are being complied with.
B. Cost Management & Forecasting
• Project forecasts and re-forecasts were completed in a timely manner, reviewed for accuracy, and were reasonably achievable based on current performance; • Downstream impacts of re-forecasting have been assessed and schedules and cost estimates were adjusted accordingly; and • Changes were identified, categorized, and recorded in the cost management system in order to maintain an adequate audit trail against project and program baselines, and to track cost performance against approved plans and budgets.
C. Nuclear Refurbishment Reporting
• Information/ metrics reported to key stakeholders appropriately reflected actual activities, project progress (for example, CPI, SPI and level of effort), and were accurately calculated and based on valid assumptions; • Contingency use/releases were accurately reported to stakeholders; and • Monthly and quarterly reports met the needs of internal and external stakeholders (for example, CEO, CNO and Ministry of Energy) and key information on project progress, risks, and delays were consistent across the reports in order to provide sufficient level of transparency and enable appropriate decision-making accountabilities.
D. Program Management & Oversight
• The Change Control Board ("CCB") performed sufficient review of project submissions, including contingency funding requests, to ensure cost and schedule estimates were valid and reasonable before release of funds for a project to advance to the next phase; • Vendor performance meetings were conducted with key vendors supporting multiple projects across the DNR program (for example, Extended Services Master Service Agreements ("ES MSA") vendors) to discuss progress, performance issues and corrective action plans; • Station integration and coordination exists between project bundles and the station, and significant changes were reviewed, approved and impact to future project work was assessed and integrated; • DNR Management had an integrated process to review progress, forecasts and future project demands (e.g. labour, supplies, and materials); and • Issues/ actions to address declining trends in schedule, quality or cost performance identified in previous meetings were being addressed and tracked.
E. Fraud Considerations
• There was intentional misreporting of project status and information by modifying costs, work progress, schedule or financial information.

Scope Period: The scope included activities from August 2016 to August 2017.

1.4 Conclusion

The oversight and reporting controls and processes within the DNR program are generally effective. IA observed multiple layers of management oversight when assessing vendor performance and progress on DNR projects. For example, Project Managers ("PMs"), Project Directors, and executive management attend performance meetings and challenge vendors on the information and metrics provided. Overall, OPG heavily relies on vendor data and at times vendors are slow to produce information despite constant prompts from management. The key finding noted in the audit pertains to vendor produced forecasts, which are not reasonably predictive and requires further improvement.

Positive Observations

- Management has been aware that vendor forecasts need improvement and has been proactively working with vendors to improve their forecasting capability. For instance, instead of one meeting with all vendors present, management instituted separate vendor specific meetings in order to put greater focus on individual vendor performance and issues. Management continues to work with vendors to improve forecasts by establishing a process for PMs to review direct field labour work hours against Project Management Team for Construction & Commissioning Work packages, and further challenge vendors to improve Estimate to Complete ("ETC") forecasts by comparing actual workhour trends to weekly forecast.

- A 'Meeting Critic' is named at the start of each Site Integration Steering Committee Meeting, who provides feedback on what went well and what can be improved upon at the end of the meeting. IA observed that the meeting critic provided the facilitator with practical observations and recommendations to improve future meetings.

Key Finding & Recommendation

Vendors are not developing costs and hours forecasts that are accurate and reliable to facilitate management decision-making. IA reviewed monthly forecasts for three projects over a six-month period and noted significant variances between forecasted and actual cost and hours. Although management has made efforts to work with the vendors on their forecasting accuracy, management should continue to work with vendors to develop a forecasting methodology to produce more predictive results taking into account current work performance, capability, trends and remaining work.

The findings noted in this report have been reviewed with management and they have committed to a specific action plan. Please refer to Section 2.0 for specific details of the findings along with the associated risk impact, audit recommendations and management action plans.

2.0 DETAILED AUDIT FINDINGS

Internal Audit identified the following detailed findings and recommendations which have been risk rated based on the definitions outlined in Appendix A.

1. Certain vendors' forecasts of cost and schedule require improved accuracy.	**Moderate**

N-MAN-00120-10001-PC, Project Controls states that forecasting is performed by analyzing the work performed against the work planned, identifying trends, analysing remaining work and determining the impact of performance on the estimated cost and schedule going forward.

IA reviewed monthly cash flow forecasts for three projects (73113, 73512 and 73715) over a six-month period (March – August 2018) and noted significant variances between forecasted and actual cost and hours. Variances were as high as 90% in some months. The three projects were within the main project bundles of Retube Feeder Replacement ("RFR"), Turbine Generation ("TG"), and Balance of Plant ("BOP"). Management has been aware of the forecasting variances and implemented initiatives, including holding forecast challenge meetings with vendors to refine and improve their forecasts. The vendors have also been challenged by management to improve the scheduling of direct labour hours and timely submission of contingency change forms ("CCF").

Although management has implemented several initiatives with vendors to improve and refine the forecasts, there are still wide variations between monthly cash flow forecast and actual results for the three sampled projects.

Potential Cause & Impact

Potential Causes:

- Vendors are not effectively using a methodology that incorporates past performance and capabilities when developing forecasts;
- Real time changes in field and work coordination issues leading to deviations to forecast based on items discovered during execution that were not anticipated; and
- Delays in vendors submitting actual hours completed.

Impact:

Unreliable forecasts may limit management's ability in making decisions around planned and available resources, and early identification of the needs for contingency.

Recommendation

Management should continue to work with vendors to develop a forecasting methodology that produces more predictive results over the project lifecycle, and consider implementation of a review process to identify actual hours completed that have not been recorded/submitted by vendors.

Management Action Plan
Management has already been working with vendors on a forecasting improvement initiative, primarily focusing on improving weekly and monthly scheduling of direct field labour work hours. The initiative includes: a) Reviewing contract terms and advising on how to implement an electronic process to obtain actual hours from each vendor on a weekly basis; b) Developing and issuing a white paper on forecasting philosophy as it pertains to critical path gains and losses; c) Revising weekly vendor specific performance metric review packages to focus on actual work hour trends against forecast; d) Integrating Schedule & Cost within the Project Controls group to further improve forecasting capability and alignment between all Project Management Reporting tools (i.e. Primavera 6, Ecosys, Oncore, Business Intelligence, etc.); e) Developing a workable process for OPG & Vendor PMs to review the Weekly Performance Package prior to the meetings; and f) Developing a process for periodic PM review of Direct Field Labour Work Hours against Project Management Team work packages to facilitate better forecasting. After piloting the actions/processes above and performing an assessment of results, management will implement those actions/processes that are effective in enhancing vendor forecasts. a) Owner: Zeina Elhami, Project Director, Refurbishment Project Contract Management Target Completion Date: November 24, 2017 b) Owner: Ian Sansom, Director Project Controls Target Completion Date: November 20, 2017 c) Owner: Ian Sansom, Director Project Controls Target Completion Date: January 31, 2018 d) Owner: Ian Sansom, Director Project Controls Target Completion Date: December 15, 2017 e - f) Owner: Roy Martin, Project Director, Project Execution, Program Strategy Target Completion Date: January 31, 2018

2. Inconsistent figures were noted in one stakeholder report.	Low

The role of program and project reporting is to provide consistent, accurate and timely program and project status in order to enable effective decisions. Additionally, it provides internal and external stakeholders with appropriate information as required, including program and project progress, costs, risks and changes.

IA reviewed information and performance metrics within the following key reports for consistency:

- Monthly Cost Alignment Review meeting report;
- Weekly Vendor Performance Meeting report;
- Monthly Darlington Refurbishment Committee (“DRC”) report;
- Bi-monthly Ministry of Energy (“MOE”) report;
- Monthly Risk Oversight Committee ("ROC") meeting report; and
- Monthly Key Results meeting report.

IA noted one inaccuracy in the January 2017 DRC report. The forecasted total budget for Unit 2 was reported as $3,147 million in the financial summary table while the written details accompanying the table reported the forecast as $3,417 million ($270 million variance between the amounts). The inconsistency appears to be a transposition error limited to the financial summary table within the DRC report. IA notes that the correct forecasted total of $3,417 million was reported in the prior DRC report in December 2016 and subsequent DRC reports that were sampled (March and May 2017). As a result, the transposition error would not have introduced new information to stakeholders with regards to the forecast and total budget for the Unit 2 refurbishment.

Potential Cause & Impact

Potential Cause:

Human performance error related to quality checks on data within key reports.

Impact:

Inconsistencies may cause confusion among stakeholders as to the correct information being reported.

Recommendation

Management should perform cross-referencing checks within the reporting process, and reinforce quality expectations and standards to staff and reviewers who are part of the reporting process.

Management Action Plan

For the last two quarters, the DNR reporting organization has established a preparation and review process for management reporting that incorporates:

- Automating report generation using source data, where possible, to eliminate the potential for human error in report compilation;
- A formal schedule for draft report preparation, reviews and final submissions has been created to ensure that adequate time is allocated for the report generation process;
- A standardized approach has been adopted to create the draft report, incorporate feedback from impacted organizations, complete cold body reviews, and to obtain senior management input, prior to report issue; and
- A comparison to prior reporting and checks for alignment between various reports.

Owner: Art Maki, Director Project Controls, Project Services
Target Completion Date: Completed

APPENDIX A – RISK RATING DEFINITIONS FOR AUDIT FINDINGS

Ratings are derived through professional judgment by the audit team and discussion with management. The ratings for individual control findings are outlined below.

Rating	Definition
High Risk	The finding results in levels of risk exposure for the organization that, if not mitigated, could have a potentially severe/major impact on safety, project excellence, operational excellence and reliability, regulatory compliance, social license, environment, or financial results. The finding requires immediate attention.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on safety, project excellence, operational excellence and reliability, regulatory compliance, social license, environment, or financial results. If not remediated, the risk could escalate.
Low Risk	The finding could potentially have a minor impact on safety, project excellence, operational excellence and reliability, regulatory compliance, social license, environment, or financial results. Implementation of the recommendation may lead to improvement in the quality and/or efficiency of the area or process being audited.

OVERALL REPORT RATING SCALE

An overall report rating has been assigned as an indication of the overall design, existence and effectiveness of the components of the internal control structure that was subject to the internal audit. The internal audit rating should be considered in conjunction with the definitions noted above.

- *Effective:* control and risk management practices provide reasonable assurance that business process objectives will be achieved and may include minor improvements and/or opportunities for improvement.
- *Generally Effective*: control and risk management practices require more than minor but less than significant improvements to provide reasonable assurance that business process objectives will be achieved.
- *Requires Improvement*: control and risk management practices require significant improvements in high risk and/or core areas to provide reasonable assurance that business process objectives will be achieved.
- *Not Effective:* control and risk management practices are not designed and/or are not operating effectively.

APPENDIX B – PROCESS OWNER & DISTRIBUTION LIST

Distribution:

Dietmar Reiner
SVP, Nuclear Projects

Gary Rose
VP Planning & Project Controls

Michael Allen
SVP Nuclear Refurbishment

cc:	Jeff Lyash	President & Chief Executive Officer
	Ken Hartwick	SVP Finance, Strategy, Risk and Chief Financial Officer
	John Blazanin	VP Nuclear Finance
	Carla Carmichael	VP Project Assurance & Contract Management
	Adam Chiarandini	Director Enterprise Risk Management
	Janice Ding	Director Internal Audit
	Zeina Elhami	Project Director, Refurbishment Project Contract Management
	Michael England	Director Project Assurance
	Zar Khansaheb	Director Operations & Maintenance, Darlington
	Mark Knutson	Director Nuclear Oversight
	Art Maki	Director Project Controls, Project Services
	Roy Martin	Project Director
	Ian Sansom	Director Project Controls, Refurbishment
	Boris Vulanovic	Director Operations & Maintenance, Refurbishment
	Jennifer Ennis	Manager Program Support & Integration
	Susan Lemieux	Manager Refurbishment Management System Oversight