ONTARIO POWER GENERATION

Internal Audit

Darlington Nuclear Refurbishment Project Changes and Rework

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Report Rating: **Requires Improvement**

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1.0 EXECUTIVE SUMMARY

1.1 Report Rating and Summary of Findings

Report Rating: **Requires Improvement**

No.	Finding	Risk Type	Risk Rating[1]		
			High	Moderate	Low
1	Processes for tracking activities and costs related to correcting defective work or defective parts of a project ("rework") have not been formally implemented.	Operational	X		
2	Change management and rework governance is not accurate.	Operational			X
3	Some PO revisions do not accurately reflect approved cost and schedule changes in Project Change Authorizations and Consents To Proceed.	Operational			X
4	OPG and contractor change logs did not agree.	Operational			X
Total		**4**	**1**	**-**	**3**

1.2 Background

The Darlington Nuclear Refurbishment ("DNR") project bundles entered the execution phase in October 2016. As the detailed scope of work was being confirmed towards the end of the definition phase, revisions to existing contracts were being made to refine scope, schedule and cost of respective work.

As project acceptance and contract close-out activities occur, contractor rework may be required due to quality of performance, failed quality inspection test, changes in engineering requirements or other identified quality deficiencies. The cost of rework may be billable or non-billable to OPG as applicable based on contractual terms and conditions. For the purpose of this report, rework shall be defined as "work required to correct defective work or defective parts of a project".

This is a risk based audit identified in Internal Audit's ("IA's") 2016 Strategic Audit Plan, given the significant profile of the DNR Project and value of contractor managed activities involved.

1.3 Objective & Scope

The objective of this audit was to assess the design and operating effectiveness of controls and processes to ensure that:

- Project changes were executed according to the contractual change framework;
- Project cost and schedule reporting accurately reflected project changes;
- OPG configuration management requirements were met; and
- Rework activities were dealt with in accordance with applicable contract terms and conditions.

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

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

A. Governance and Communication

- Contractor issues were communicated, escalated and dispositioned through clearly established protocols and routed through designated project representatives;
- Requirements for notification, acceptance, disposition and closure of items requiring remediation, project changes or rework were clearly understood and aligned among all stakeholders; and
- Roles and accountabilities of OPG internal stakeholders (e.g., supply chain, contract management, planning & controls and the project team) in project change process for execution were clearly established and followed.

B. Project Changes

- Changes that could potentially impact the project scope, cost and/or schedule were tracked, validated and incorporated into the formal project change process;
- Cost impacts were assessed for project changes and agreed with the contractor;
- Project changes were approved by the designated OPG authority;
- Cost and schedule impacts of project changes were timely and accurately presented in reporting;
- Project changes were evaluated for engineering design impact to meet OPG configuration management requirements; and
- Project changes were processed with the Approved Project Change Directives ("PCD") / Project Change Authorizations ("PCA") and incorporated into contract or Purchase Order ("PO") amendments, as applicable.

C. Rework

- OPG quality acceptance criteria are contractually defined;
- Records from Quality Assurance activities were appropriately maintained;
- Rework activity was approved by the designated contract owner;
- Recovery plans were in place for significant schedule changes/delays due to rework and applicable penalties were applied for the correction of defects;
- Cost impacts for rework activity were addressed as per contract terms, with any applicable recoveries monitored;
- Hours related to rework activities were appropriately classified and documented;
- Project cost and schedule impacts of quality issue remediation and rework were monitored and reported through management metrics; and
- Rework events were tracked and trended to identify and address significant trends.

<u>Fraud Risk Considerations:</u>
Costs for project changes that should be the responsibility of the contractor are charged back to OPG.

The scope of the audit included DNR-funded projects as managed by the Refurbishment and the Projects & Modifications organizations between January 1, 2015 and June 30, 2016. Details of the projects reviewed are summarized in Appendix A.

1.4 Conclusions

Overall, management has not formalized expectations to ensure that costs associated with rework are appropriately tracked and are not incurred or charged back to OPG, where applicable. Improvements are required over the communication to Contract Owners of the expectations for correcting defective work.

Positive Observations

Management has designed a Program Change Management process across DNR-funded projects. While learnings have occurred as the project teams adapt the process, management is continually updating governance to reflect good practices and ensure clarity.

Key Finding & Recommendation

A review of a sample of projects noted that time associated with rework activities had either not been recorded or inconsistently coded in Oncore. In one of the projects, approximately $29,000 of rework that was approved for payment appeared to be non-billable based on the description and contract terms. Management is now pursuing the recovery of these costs. Management should also develop processes to ensure rework is accurately and completely recorded and tracked, from initiation to completion.

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

2.0 DETAILED AUDIT FINDINGS

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

1. Processes for tracking activities and costs related to correcting defective work or defective parts of a project ("rework") have not been formally implemented.	**High**

Under existing contractual obligations, contractors are required to pay for the costs associated with rework. These costs include:

- Incidental costs associated with the correction of defective work;
- OPG's fees and charges for engineers, architects, accountants; and
- Costs and charges with respect to the correction of any defective part of the project.

Management has not formalized expectations to ensure that costs associated with rework are appropriately tracked and are not incurred or charged back to OPG, as applicable.

For 11 of 13 Station Condition Records ("SCRs") judgmentally selected from the SCR database that necessitated rework, no evidence was provided by management to substantiate the existence of a consistent end-to-end process or defined responsibilities for identifying, tracking and trending rework. IA was also not able to reconcile these SCRs to applicable non-billable time entries in Oncore.

IA reviewed Oncore and noted time associated with activities to correct defects had not been consistently coded using the applicable non-billable ("NB") rework code. The use of NB coding allows OPG and Contractors to track rework in Oncore, while also imposing a contractor rate of $0.00 in the system, which prevents OPG from being erroneously billed for non-billable rework. The following were observed:

- Less than 1% of Oncore time entries for the period January 1, 2015 – June 30, 2016 for the Vault Vapour Recovery Systems Project ("VVRS"), Emergency Power Generator 3 Project ("EPG3") and Heavy Water Storage Facilities Project ("D2O") included the NB code. Given the volume of SCRs on these projects related to rework, and the project team's understanding of rework that has been performed to date, this percentage should be higher;
- Although significant rework was performed for the EPG3 project, no "non-billable" rework time was recorded in Oncore or shown to IA to be incorporated as part of a settlement for other work; and
- A search for the term "rework" in the Oncore data provided identified approximately $29,000 of rework associated with the VVRS project executed between 2/22/2016 and 3/2/2016 that was approved and paid by OPG. Based on the commentary noted in Oncore, these charges should have been non-billable.

Potential Cause & Impact

Potential Causes:

- Contractors not understanding requirements for non-billable rework time entry into Oncore;
- Discussions are still on-going with contractors regarding disposition of rework costs; and
- OPG expectations for identifying, monitoring and dispositioning rework and rework costs have not been communicated.

Impacts:

- OPG may be paying for rework that is actually non-billable.

Recommendation	Management Action Plan	Owner & Target Completion Date
1. Develop a process for identifying and tracking rework and related rework costs. This should include: • Clarifying expectations and documentation requirements with Project Managers in monitoring costs for correcting defects; including ensuring that OPG is not paying for direct cost incurred by the contractor to correct the defects; • Clarifying roles and accountabilities of the various stakeholders involved in negotiating and disposition of rework, including field oversight accountability for identifying potential rework activities; • Potential rework activities should be logged with disposition appropriately documented, including written communication to contractors to confirm agreement on disposition and closure if not tracked in Oncore; and • Having the project organizations trend rework and defective work in SCRs, and take appropriate corrective actions with the contactors to reduce occurrence of defective work. Educate Contractors on the requirement for coding non-billable rework in Oncore using the NB code and monitor compliance (e.g. when approving time entries) to help capture costs associated with correcting defective work. 2. VVRS project management should conclude the recovery of the costs to correct defective work on the project.	1. OPG will develop and communicate guidance clarifying processes related to billings for the correction of defective work to address the recommendations. 2. OPG will complete the settlement with [redacted] on the costs of the defective work on VVRS.	1. Riyaz Habib, Director Contract Management March 31, 2017 2. Scott Guthrie, Project Director Balance of Plant January 31, 2017

2. Change management and rework governance is not accurate.	**Low**

N-MAN-00120-10001-PC-12 (R001, April 22, 2016), Nuclear Refurbishment – Program Change Management, outlines specific roles and responsibilities within the change process. A Discrepancy was noted in the manual. *CCB chair and "red" level Change Control Form (CCF) approval:* Section 5.10 of the manual notes that the VP, Refurbishment Execution chairs the CCB, but Section 7.4.1 indicated that the SVP, Nuclear Refurbishment chairs the CCB. Based on discussions with management, the individual referred to in both positions is the same incumbent who had held different roles within the DNR program.

Additionally, section 1.5.5a of N-INS-00150-10001 R001 states that rework shall be reviewed and approved by the Contract Administrator ("CA") and Contract Owner ("CO") in advance of rework performance. Based on IA's discussions with management, this instruction does not accurately reflect actual processes or management expectations as rework can, should and does occur prior to CA and CO approval.

Potential Cause & Impact

Potential Cause:
Changes in how the process is actually executed have not been reflected in the manual.

Impacts:
- Change management activities are not controlled in a manner consistent with OPG expectations; and
- Oncore instructions are not reflective of management expectations.

Recommendation	Management Action Plan	Owner & Target Completion Date
Clarify and update governance to ensure consistency in definition of roles, responsibilities and management expectations.	1. N-MAN-00120-10001-PC-12 will be updated to reflect change in CCB chair title. 2. N-INS-00150-10001 R001 will be updated to remove contract administration issues.	1. Ian Sansom, Director Project Controls March 31, 2017 2. Darryl Fairbarn Senior Manager Shared Financial Services Systems February 28, 2017

3. Some PO revisions do not accurately reflect approved cost and schedule changes in PCAs and CTPs.	**Low**

After OPG and Contractors agree to changes in PCAs and Consents To Proceed ("CTP"s), the revised PO value should agree with the approved PCAs/CTPs. To facilitate agreement, current practice is for the preparer of the PO revision to communicate the draft PO to the Contract Owner prior to sending it to the vendor. For two of the 25 PCAs/CTPs selected for testing, differences were noted between the schedule impacts in the PCAs/CTPs and the schedule impacts in the PO revisions:

- EPG3 PCA-132 showed no schedule impact, whereas PO 228375 Rev 009 showed this PCA added two weeks to schedule completion; and
- EPG3 PCA-135 showed two weeks of schedule impact, whereas PO 228375 Rev 009 showed this PCA added four weeks.

Potential Cause & Impact

Potential Cause:
Human errors when revising POs to ensure consistency with approved changes.

Impact:
Discrepancies in documentation may result in potential disputes should there be significant delays beyond the anticipated schedule impacts.

Recommendation	Management Action Plan	Owner & Target Completion Date
The Senior Manager of Supply Services for Projects and Modifications should reinforce process expectations and ensure POs agree with approved changes.	Senior Manager of Supply Services for Projects and Modifications reviewed the finding with the team and reinforced expectations at Department meeting.	Scott Lo Supply Services Project Manager Completed

4. OPG and Contractor change logs did not agree.	**Low**

Change logs are used by the project management teams to track and monitor the status of key change activities. For the D2O, EPG3 and VVRS projects, OPG and Contractors have created their own change logs. Minor inconsistencies between OPG logs and Contractor logs were observed for the EPG3 and VVRS projects as follows:

- **EPG3** – For the approved changes in October 2016, logs differed by $2,000 total ($66,168,549 total approved changes in OPG's log, versus $66,170,549 total in Contractor's). The delta stems from PCA-159. Management confirmed the error was in OPG's log and that the Contractor approved amount was correct; and

- **VVRS** – For the approved changes, the two logs generally agreed. One difference exists in PCA018: OPG's log shows $322,941 while [redacted] log shows $313,354. The approved amount on the PCA form shows $322,941. Management confirmed the error was in the Contractor's log and that the OPG approved amount was correct.

Additionally, the change logs for the three sample projects are structured differently and do not track the same type of information. The structure and type of information included in each of the in-scope project change logs is included in Appendix B.

Potential Cause & Impact

Potential Causes:
- Typos due to manual entries;
- Lack of regular reconciliation between OPG's and Contractors' change logs; and
- No standardized approach within OPG to log changes.

Impacts:
- Inconsistencies in change logs may result in disputes with the contractors; and
- Management may rely on or use inaccurate information in decision-making activities.

Recommendation	Management Action Plan	Owner & Target Completion Date
1. Management should continue with Ecosys implementation efforts, providing necessary education and communication on change management process expectations. 2. Management should ensure that Ecosys facilitates approved change management work-flows (e.g. Approval, analysis and review sequencing).	Ecosys Phase 1 has been implemented and traceability of all changes is in place.	Ian Sansom Project Controls Director Completed

APPENDIX A – SUMMARY OF CHANGES FOR SAMPLE PROJECTS

Project	PO#	Initial PO Value	Approved PCAs/CTPs	Total Approved (Initial + Approved)	# of Approved PCAs/CTPs	Pending PCAs/CTPs	# of Pending PCAs/CTPs
Heavy Water Containment (**D2O**)	215088	$146,192,341	$742,343	$146,934,684	13 Project Change Notices (PCN)s	$2,329,867 (Note: some PCNs have values TBD)	49 PCNs
3rd Emergency Power Generator (**EPG3**)	228375	$41,369,627	$66,168,549	$107,538,176	24 PCAs, 24 CTPs	$16,379,476	17
Vault Vapour Recovery System (**VVRS**)	236278	$12,009,963	$1,891,468	$13,901,431	9 PCAs, 3 CTPs	$1,528,577	7 PCAs, 3 CTPs

APPENDIX B – CHANGE LOG DETAILS

	D2O		EPG3		VVRS	
	OPG	**Contractor**	**OPG**	**Contractor**	**OPG**	**Contractor**
Change ID	Included	Included	Included	Included	Included	Included
Change Description	Included	Included	Included	Included	Included	Included
Value / Cost Impact	Included	Included	Included	Included	Included	Included
Schedule Impact	Included					
Contractor's Submission Date	Included	Included		Included	Included	
OPG's Approval Date	Included	Included		Included	Included	
Status	Included	Included		Included	Included	Included
Disposition (CCF / PO Rev#)	Included				Included	
Comments	Included	Included				

APPENDIX C – 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 presents a risk that could potentially have severe/major impact on financial sustainability (≥$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations.
Moderate Risk	The finding presents a risk that could potentially have a moderate impact on financial sustainability ($500K to <$5M), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. If not remediated, this risk could escalate to high risk.
Low Risk	The finding could potentially have a minor impact on financial sustainability (<$500K), operational excellence, project excellence, safety, environment and reliability, reputation, regulatory relationship, or compliance with laws and regulations. Recurring "low risk" findings may be elevated to medium risk status.

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.