ONTARIO POWER GENERATION

Internal Audit

Projects & Modifications Vendor Quality Audit

December 20, 2017

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	Quality oversight planning, documentation and monitoring activities are inconsistently performed across quality oversight teams.	Operational	X		
2	Project schedules provided by vendors do not sufficiently identify critical quality oversight activities for OPG personnel to achieve timely oversight.	Operational		X	
3	Project Management teams are inconsistently monitoring and tracking defective work by vendors.	Operational		X	
4	Lack of supporting tools for quality oversight activities may result in coverage objectives not being achieved.	Operational		X	
5	Project & Modifications portfolio and project level reporting on quality related Key Performance Indicators have not been established.	Operational			X
Total		**5**	**1**	**3**	**1**

1.2 Background

OPG's Nuclear Management System, mandated by the power reactor licenses, ensures that systems, equipment and activities are of the required quality throughout the life of nuclear facilities. Currently, Projects & Modifications ("P&M") manages over 200 projects within the Asset Investment Screening Committee ("AISC") portfolio with a value of approximately $447 million in 2017. The majority of contracts are Engineering, Procurement & Construction ("EPC") type contracts. The objective of vendor quality oversight in P&M is to ensure that regulatory and project quality requirements are being met throughout the project lifecycle.

As defined in OPG-STD-0148 'Project Management', oversight is the independent assessment necessary to ensure both OPG and project objectives are achieved. Quality oversight processes are implemented to monitor vendor performance in engineering, human performance, materials and field installation deficiencies and to better enable projects to be completed on time and on budget.

This was a risk based audit identified in Internal Audit's ("IA") 2017 Strategic Audit Plan, selected given the significant focus on quality and its impact on project cost and schedule.

1.3 Objective and Scope

The objective of this audit was to review the design and operating effectiveness of OPG's oversight processes and controls over vendor quality management plans that enable projects to be completed according to design specifications.

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

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

A. Oversight Governance Framework
• Quality standards/regulations were sufficiently outlined and communicated in the scope of work to vendors prior to the start of work; • PM's had a good understanding of contract mechanisms that could be leveraged to hold vendors accountable for quality issues; and • Key Performance Indicators ("KPI's") for reporting were defined.
B. Quality Oversight Planning
• A Project Oversight Plan ("POP") was prepared by the PM that included specific steps to guide OPG employees performing quality oversight; • Requirements/standards for the scope of work and quality related risks identified through a project risk assessment were addressed in the POP; • Higher risk activities were included for field surveillance; • Engineering designs submitted by vendors were signed-off and accepted by OPG prior to commencing work; • Input was provided by OPG into vendor Inspection Test Plans ("ITP") to ensure vendor quality oversight would meet expectations; • Specific hold and witness points were identified and signed-off for critical processes and components, incorporating the necessary regulatory oversight, as appropriate; and • Quality oversight activities were sufficiently planned and scheduled with the appropriate skilled resources assigned.
C. Quality Oversight Execution

• Quality oversight activities were executed in accordance with the POP;
• Results of quality oversight activities were sufficiently documented, including details of issues, tracking, and disposition of items;
• PM's reviewed progress and results of oversight activities to:
  ○ Determine mitigation/action plans for quality performance issues; and
  ○ Identify overdue planned quality oversight activities to assess the risks/actions;
• Quality related issues were consolidated to facilitate trending and reporting;
• Vendor completed quality documentation was reviewed and signed-off by both vendor and OPG in a timely manner (e.g. ITP, Available for Service ("AFS"));
• Vendor fault rework was not billed back to OPG; and
• Claims were made when vendors caused increased costs to projects (as allowed under contract terms).

D. Quality Oversight Monitoring and Reporting
• Effectiveness of vendors' own quality oversight programs were assessed by monitoring vendors' correction actions to identify recurring trends, timely disposition of issues (i.e. Non-Conformance Corrective Action Reports ("NCARs"), Corrective Actions Reports ("CARs") and Non-Conformance Reports ("NCRs")); • P&M Project Oversight office provided oversight of project activity through monitoring of the corrective action process, trending and reporting; and • An escalation process existed to address/disposition significant and/or pervasive quality issues, which may involve Senior OPG and vendor leadership.
E. Fraud Considerations
• Vendors were intentionally providing inaccurate information/reports, or results of quality activities intentionally included false information.

The audit included reviewing P&M's quality oversight framework, as well as an assessment of the effectiveness of oversight activities performed by Project Managers ("PMs"), Field Engineering ("FE") and other interfacing oversight organizations where applicable.

Scope Period: The scope included activities associated with P&M projects from August 1, 2016 to August 31, 2017, and included some precursor activities from prior periods, as applicable.

1.4 Conclusion

Our review identified some issues in the quality oversight program which may prevent OPG from achieving its quality objectives. P&M should monitor vendor quality corrective actions, track defective work and make improvements in the planning and scheduling of critical oversight activities.

Positive Observation

- FE teams have extensive experience in executing field quality oversight. During our interviews with key stakeholders, we noted that PMs and Contract Management ("CM") both recognize and trust the technical expertise FE brings to project oversight; and

- P&M and FE management teams have made progress in remediating process gaps and educating project delivery personnel on standard operating procedures to manage quality oversight over Engineering Procurement Construction ("EPC") vendors, including governance revisions to Contractor Safety Management. Drivers for progress resulted from improvement areas identified in the Type II CNSC Quality Survey performed in the fall of 2016, and Bravo 2 evaluations performed by OPG and vendors.

Key Findings & Recommendations

- The planning and monitoring of quality oversight activities as required by governance were inconsistently performed across quality oversight teams. An Overall POP covering the entire scope of work for the project with regular updates was not always performed. Also, documentation supporting the review and acceptance of vendor's project quality plans was not available in some instances.

  We recommend that P&M communicate governance requirements to project teams (including requirements for POPs and regular updates), and create and roll-out detailed field oversight activity specific checklists;

- Critical oversight activities were not identified in the Primavera 6 ("P6") project schedules developed by vendors. The absence of this information can affect the ability of oversight groups to prepare and perform quality oversight activities in an efficient and timely manner, including coordination of efforts across multiple projects.

  Management should consider requiring vendors to include critical oversight activities such as critical hold, witness and verification points within vendor P6 schedules once ITP and Comprehensive Work Package ("CWP") reviews are complete; and

- Project teams were not consistent in following processes to monitor and track defective work. The majority of PMs and field engineers interviewed by IA were not aware the Defective Work Manual,

which was rolled out in March 2017. There was also no consolidated list or repository of defective work identified and managed by project teams, which would aid in monitoring whether OPG was inappropriately billed for rework costs. IA notes that CM was already aware of the lack of knowledge and adherence to the Defective Work Manual by PMs.

We recommend that CM complete their planned post-implementation effectiveness review and address identified gaps in order to ensure project teams understand and consistently follow established processes in managing vendor defective work. Management should also consider developing a consolidated log/repository of defective work identified and managed by project teams.

The findings noted in this report have been reviewed with management and they have committed to specific action plans. Please refer to Section 2.0 for specific details of above findings with 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. Quality oversight planning, documentation and monitoring activities are inconsistently performed across quality oversight teams.	**High**

OPG governance provides guidance on planning quality oversight activities from project planning through execution, and guidance over managing quality non-compliances. The Overall POP and Execution POP are tools for project teams to document and track the progress of planned oversight activities. During the audit, we observed the following inconsistencies related to the planning, monitoring, and dispositioning of quality oversight activities:

- N-MAN-00120-10004-OS-CON (Nuclear Projects Construction Oversight), N-MAN-00120-10004-OS-PLAN (Project Oversight Planning and Implementation) and OPG-STD-0148 (Project Management Standard) requires PMs to create an Overall POP that covers the full scope of work and regularly update the POP throughout the duration of the project. IA reviewed 10 projects and noted that two did not have an Overall POP (i.e. project specific POP) and no project had updated POPs:
    - Project 49158 'PB Fukushima Phase 1' had two Execution POPs, but not an Overall POP covering the entire project scope. IA notes that the two Execution POPs sufficiently address quality related risks to the project during construction;
    - Project 60203 'Pickering Waste Management Used Fuel Dry Storage Building 4', had two Execution POPs, but not an Overall POP covering the entire project scope. IA notes that the two Execution POPs sufficiently addressed quality related risks to the project during construction; and
    - For the remaining 6 projects that had an Overall POP we noted that the required POPs were created at the inception of the project. However, these POPs were not regularly updated through the duration of the project;
- Per governance N-MAN-00120-10004-OS-PLAN, PM teams have a responsibility to review and accept vendor Quality Assurance ("QA") / Quality Control ("QC") project specific plans to ensure it meets OPG quality requirements and the specific needs of the project. Three out of eight sampled projects did not have documented acceptance of these vendor quality plans; and
- Per governance N-MAN-00120-10004-OS-PLAN, FE teams have the responsibility of reviewing vendor CWPs and ITPs, and applying a risk graded approach to identify key OPG witness points ("WP"), hold points ("HP") and verification points ("VP").

  Although IA's review of field ITPs (for the five projects selected for field walk-downs) indicated the inclusion of HPs/WPs/VPs, we have also noted that a recent trending SCR (N-2017011395) identified missed hold points within ITPs as an adverse trend. Also, a FE Darlington 30 day trend report also identified some missing ITPs, WPs, and VPs in the master documentation for the 'DN Fukushima Phase II Mods' project.

Potential Cause & Impact
Potential Causes: • PM teams may not be fully aware of all requirements; • There were PM changes within projects and a full knowledge transfer from the previous PM to the new PM may not have occurred; and • Maintaining the latest version of approved CWP and ITP documentation may be a human performance issue. In some cases, the vendors may not have maintained the latest approved version of the CWP/ITP and in other cases, OPG project management teams may not have handed over the latest versions to vendor field personnel in a consistent manner. Impact: • The lack of an Overall POP, not regularly updating oversight plans through the duration of the project and missing HPs/WPs/VPs may cause downstream quality issues and delays to the project; and • The lack of visibility into vendor corrective actions prevents OPG from understanding impacts to interdependent tasks and risks to achieving quality standards.
Recommendations
1. Communicate to PMs the need to comply with OPG governance, with focus on preparation of a project specific POP, regularly updating POPs through the project lifecycle and documenting acceptance of vendor quality plans; 2. Review current projects to ensure that a project specific POP has been prepared for projects past the developmental phase; and 3. Management should consider creating detailed checklists to ensure HPs/WPs/VPs are identified and that key oversight activities are driven by program level guidance and manuals. During initial field walk-downs, the FE technician should review the field CWP and ITPs to confirm these are current and approved by OPG.

Management Action Plan
1. Management will provide change management training sessions for PMs on changing governance requirements for Contract Management and Project Management to ensure the roles and accountabilities between project execution and supporting groups (i.e., P&M, CM, FE) are understood, and to review available project tools (e.g., logs, reports, status reports, etc.). Action Owner: Slawek Gora, Director Project Controls Target Completion Date: October 31, 2018 2. Management will review all current projects to ensure that a project specific POP has been prepared for projects which are past the development phase. This review will be a recurring frequency. Action Owner: Jamie Lawrie, Project Director P&M Target Completion Date: April 13, 2018 3. PM Management will work with FE to develop and roll-out of WP/HP/VP checklists to all FE resources, and provide training on the use of the checklists. Action Owner: Jason Price, Project Director P&M Target Completion Date: February 28, 2018

2. Project schedules provided by vendors do not sufficiently identify critical quality oversight activities for OPG personnel to achieve timely oversight.	**Moderate**

Vendor generated Level 3 Primavera P6 ("P6") project schedules for the eight sampled projects did not identify, or contain duration (i.e. allocation of time) for vendor quality assurance activities through the course of the project. Specific examples include:

- Duration for hold and witness points on the critical path to be accepted by OPG or the Technical Standards and Safety Authority ("TSSA");
- Duration for documentation preparation and review prior to hydrostatic testing; and
- Documentation review and acceptance prior to AFS.

The lack of identification of critical quality assurance activities including related preceding activities in the vendor's schedule may affect OPG oversight personnel's ability to prepare for and perform oversight activities in an efficient and timely manner.

Potential Cause & Impact

Potential Cause:
P6 schedules provided by the vendors lack sufficient details beyond Level 3 work breakdown structure.

Impact:
- Projects may be delayed due to unavailable or delayed attendance by OPG or TSSA personnel that had not been scheduled or planned;
- Lack of sufficient lead time for OPG personnel to prepare for tests resulting in sub-optimal oversight; and
- Missed HPs/WPs/VPs by OPG or TSSA.

Recommendations

Management should require vendor baseline schedules to include known quality assurance activities. Vendors should also be required and directed to revise schedules with more detail once additional critical quality assurance activities identified as ITPs and CWPs are reviewed and accepted by OPG.

Management Action Plan

1. P&M will define quality related requirements that vendors need to include into P6 schedules, and work with Project Controls and Contract Management to determine the best method of communication to PMs to ensure the defined requirements are built into new scopes of work/contracts.

   Action Owner: Grant Howard, Project Director P&M
   Target Completion Date: May 15, 2018

3. Project Management teams are inconsistently monitoring and tracking defective work by vendors.	Moderate

Management of defective work is governed by N-MAN-09701-10003 (Contract Management - Managing Defective Work also referred to as 'Defective Work Manual') issued in March 2017. The PM team, FE and Contract Management ("CM") are to collectively capture, monitor and address defective work to ensure quality and to prevent OPG from being billed by vendors for costs related to correcting defective work.

We noted the following inconsistencies in processes and activities related to the monitoring of defective work:

- The majority of PMs and field engineers interviewed were not aware of the defective work manual and associated processes or did not use the manual and associated forms consistently. PMs in some cases only used SCRs, meetings, emails and other modes of communication to document defective work issues; and
- A consolidated list or repository of defective work identified and managed by each PM for their respective projects was not available. For the eight projects IA sampled, only one project provided an example of a completed Notice of Defective Work form. Two other projects demonstrated some evidence of capturing defective work via email communication and memos of defective work (in place of the Defective Work Notice).

CM management was aware of challenges with project teams implementing the Defective Work Manual. As a proactive measure, CM is planning to perform a post-implementation effectiveness review and will address any gaps that may arise as a result of the assessment.

Potential Cause & Impact

Potential Cause:

- Lack of awareness of the Defective Work Manual and associated processes.

Impact:

- OPG may be inappropriately billed and charged by vendors for costs related to correcting defective work; and
- A lack of tracking and understanding over the status of defective work may have an impact on quality of work.

Recommendations

Management should:

1. Complete the planned post-implementation effectiveness review and address identified gaps in order to ensure project teams understand and consistently follow established processes in managing defective work by vendors; and
2. Develop a consolidated log/repository of defective work identified and managed by project teams, including the status of how defective work items were dispositioned and billing/cost implications to OPG, in order to enhance understanding, visibility and monitoring of defective work.

Management Action Plan
1. CM will complete a post-implementation effectiveness snapshot self assessment and develop an action plan for the identified gaps to support project teams to manage defective work by vendors in a scalable approach, complete the planned post-implementation effectiveness review and address identified gaps. Action Owner: Garry Lam, Manager Strategic Contract Management Target Completion Date: May 15, 2018 2. CM will develop a scalable template for project teams to record and manage a consolidated log/repository of identified defective work, including the status of how defective work items are dispositioned (billing/cost implications to OPG), in order to enhance understanding, tracking and monitoring of defective work. Action Owner: Garry Lam, Manager Strategic Contract Management Target Completion Date: May 31, 2018

4. Lack of supporting tools for quality oversight activities may result in coverage objectives not being achieved.	**Moderate**

A proactive approach to the planning and monitoring of oversight activities is critical to achieving coverage objectives. During our review, we observed the following inconsistencies over monitoring and executing quality oversight activities:

- Project teams do not maintain a consolidated list or a tracking log of planned, on-going and completed oversight activities. Not having an aggregated overview may result in oversight teams missing routine and strategic oversight activities; and
- IA sampled five projects to conduct field walk-downs. During the field walk-downs, we noted that field oversight personnel did not use activity specific quality checklists to perform oversight activities or a consistent methodology to note field observations. This may result in inconsistent oversight being performed across projects and disciplines (i.e. electrical, mechanical, civil etc.). It should be noted that an 'Oversight Report Checklist/ Standards Reference' document is available to OPG staff and can be leveraged for performing and documenting oversight activities.

Potential Cause & Impact

Potential Causes:

- Separate tools and systems exist to log issues and results of oversight activities (i.e. Oversight Reporting System ("ORS"), SCR, Risk Management Oversight ("RMO")) instead of a single repository to track and manage all quality oversight activities; and
- Field personnel may not be aware of tools and resources available to them when performing oversight activities.

Impact:

- Some oversight activities may be overlooked, resulting in quality non-compliances and cost and schedule overruns to correct issues; and
- Lack of comparability between results if oversight activities are performed inconsistently or facilitate trending of deficiencies.

Recommendations

Management should:

1. Consider requiring the maintenance of a consolidated log of planned, on-going and completed oversight activities; and
2. Provide training and templates to Field Engineers to use standardised activity specific checklists for repeatable oversight activities. For certain oversight tasks where activity specific checklists are not available, use resource field expertise to develop detailed checklists and provide training on their use.

Management Action Plan
1. As a result of other initiatives, management is already taking action to integrate the maintenance of a real-time project specific log of planned, on-going and completed oversight activities with PMs. Action Owner: Grant Howard, Project Director P&M Target Completion Date: January 12, 2018 2. FE Management will roll-out detailed activity specific check-lists to all FE resources and provide training on their use. For oversight activities where a checklist is currently not in place, FE Management will develop these checklists and deploy to the field. Action Owner: Wayne Bowes, Section Manager Field Engineering Target Completion Date: February 28, 2018

5. P&M portfolio and project level reporting on quality related KPIs have not been established.	**Low**

OPG governance OPG-STD-0048 (Project Management Standard) requires projects to report on KPIs including quality metrics. However, P&M portfolio and project level quality related KPIs and metrics have not been established as a tool for assessing performance. As a result, there is no consistent P&M project reporting on quality metrics to compare period over period performance between projects, and in aggregate for the P&M project portfolio as a whole.

Potential Cause & Impact

Potential Causes:
The establishment of quality related KPIs was prioritized as low due to competing commitments.

Impact:
Decision makers may not have consistent information or potential insights when assessing project portfolio performance and comparing project performance.

Recommendations

Management should define a standard suite of KPI's that would add value to the oversight process, and to provide specific performance indicators to measure overall performance of the P&M portfolio. Potential vendors' KPIs/metrics could include, but are not limited to: (i) types and time to resolve non-compliances by vendor and by discipline; (ii) time to resolve non-conformances by discipline and by vendor; and (iii) number of issues by discipline by vendor; etc.

Management Action Plan

1. Management will define project level and portfolio level KPIs for vendor quality, and incorporate these KPIs into regular reporting.

   Action Owner: Slawek Gora, Director Project Controls
   Target Completion Date: April 30, 2018

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

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