TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT4.1:

Reference(s): **1B-EP-2**
Appendix B of the DSC

To explain how THESL applies Appendix B of the Distribution System Code to evaluating multi-storey developments; how they would apply it in assessing developer contribution to the costs, within a general definition of costs.

RESPONSE:

Toronto Hydro recovers costs from load customers connecting to its distribution system in accordance with the connection and expansion rules of the Distribution System Code ("DSC"),[1] independent of building type or size features such as square footage or storeys.

For connections,[2] Toronto Hydro applies a basic connection allowance to the connection costs of all residential and non-residential customers.[3] Where the costs associated with the installation of connection assets exceeds the basic connection allowance, Toronto Hydro collects the balance through a variable connection charge from all customer classes.[4]

[1] Distribution System Code ("DSC", last revised March 27, 2024), ss. 3.1 and 3.2, respectively.
[2] In this context, "connection" refers to the process of installing and activating assets between the main distribution system and the ownership demarcation point with the customer, in accordance with DSC s. 1.2.
[3] Except micro-embedded generation facility customers, who are required to pay a basic connection charge. See DSC s. 3.1.5A.
[4] DSC s. 3.1.6

Where Toronto Hydro has to make modifications or additions to the main distribution system (defined as an "expansion" in the DSC)[5] to connect a customer to its distribution system, the utility performs an economic evaluation in accordance with Appendix B of the DSC.

An economic evaluation is a prescribed discounted cash flow model, which evaluates revenues and expenses generated by the customer connection over a twenty-five year revenue horizon. The revenue inputs include the net present values of revenues expected that from the load connection (e.g. billing revenue) and capital cost allowance ("CCA") tax shield contributions. The expense inputs include the net present values of the capital cost of the expansion work, attributable incremental operating and maintenance costs, and taxes associated with the expansion. Where the expenses exceed revenues, Toronto Hydro collects a capital contribution from the customer.[6] For expansions that require a capital contribution, Toronto Hydro also requires customers to provide an expansion deposit for up to 100% of the present value of forecasted revenues, in accordance with the DSC[7] and Appendix B. The purpose of the expansion deposit is to cover the forecast risk, i.e. the risk of a customer overestimating their load and therefore the capacity of the assets required for their connection.[8] As the forecasted load materializes over the applicable connection horizon (typically five years), Toronto Hydro returns the expansion deposit with interest.[9] If new customers connect to the newly built expansion assets during the applicable connection horizon, Toronto Hydro proportionally rebates the initial customer their original contribution and collects capital contributions from the new customers.[10]

[5] S. 1.2.
[6] DSC s. 3.2.6.
[7] DSC s. 3.2.20.
[8] DSC s. 3.2.21.
[9] DSC s. 3.2.23.
[10] DSC s. 3.2.27.

Toronto Hydro transparently identifies all inputs and outputs of calculations for connection charges, the economic evaluation, and expansion deposits within its offer to connect.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION

UNDERTAKING NO. JT4.2:

Reference(s): Response to 1B-EP-23, Part C

To clarify X-factor impact on the Revenue Growth Factor (Ref: Response to 1B-EP-23C).

RESPONSE:

If the X Factor in Toronto Hydro's Custom Revenue Cap Index had a total value of 0%, the revenue growth factor would fund annual increases from 2026 to 2029 equal to the difference between the current year's forecast revenue requirement, and the prior year's revenue requirement.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.3:

Reference(s): Exhibit 3, Tab 1, Schedule 1, Appendix C, Updated April 2, 2024

To confirm whether the updated CDM annual savings value in the April 2 update is an actual savings number or a forecast number.

RESPONSE:

Toronto Hydro confirms that the savings for 2023 are forecasted CDM savings based on the 2021-2024 CDM Framework targets.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.4:

Reference(s): Exhibit 3, Tab 1, Schedule 1, Updated April 2, 2024

To describe the impact on the load forecast of the new definition of "Weather Normal".

RESPONSE:

Toronto Hydro updated its 10-year weather average from 2013-2022 to 2014-2023, leading to slightly lower weather normalized loads.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.5:

Reference(s): Exhibit 6, Tab 1, Schedule 2

To provide, on a customer-class basis, a calculation of revenue at current rates versus the updated load forecast.

RESPONSE:

In reviewing transcript, Toronto Hydro notes that this undertaking does not capture the request made by the Vulnerable Energy Consumers Coalition. The scope of the undertaking is to provide the calculation of what the revenue would be at current rates, based on the updated load forecast, and to provide that calculation on a customer class basis.

See the table below for revenue by rate class at current rates and updated load forecast for 2025.

	Residential	CSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Revenue ($M)	341.0	44.1	134.2	221.9	68.9	33.8	19.0	4.0	867.0

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.6:

Reference(s): 3-SEC-79, Appendix A

(A) To explain the difference between 3-SEC-79 and evidence Appendix 2-IB, the impacts of EVs and DERs on the load forecast; (B) to provide two schedules: (1) showing figures that align with the original load forecast values; (2) showing figures that align with the updated load forecast.

RESPONSE:

The GWh values provided in 3-SEC-79 Appendix A were at the purchased level and are aligned with Table 1 in Exhibit 3, Schedule 1, Tab 1.

Please refer to Appendix A for a revised version of the original load forecast with GWh values at the distribution level, which aligns with the original Appendix 2-IB. A version aligned with the application update has also been provided in Appendix A.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.7:

Reference(s): 3-SEC-79, Appendix A

(1) To explain the change in the light duty electric vehicle forecast between the original application and the update; (2) to explain the change in the medium duty and heavy-duty electric vehicle forecast between the original application and the update.

RESPONSE:

There were two changes which drove the need to update the EV forecasts: (i) changes to EV targets, resulting from policy updates; and (ii) 2022 actuals. **Error! Reference source not found.** shows the two EV targets considered (Registrations and Sales) to produce the EV forecasts.

Table 1: Modelled Targets for EV Forecasts

Target Type	Original Application	April 2nd Update
EV Registrations	From City of Toronto Electric Vehicle Strategy (2019): • 2025 – 5% of total light-duty vehicles • 2030 – 20% of light-duty vehicles Assumed Adoption Rates: • 2025 – 13% of medium-duty and heavy-duty vehicles • 2030 – 31% of medium-duty and heavy-duty vehicles	From City of Toronto TransformTO Net Zero Strategy (2021): • 2030 – 30% of total vehicles (light, medium, and heavy)
EV Sales	From City of Toronto Electric Vehicle Strategy (2019): • 2025 – 15% of light-duty vehicle sales • 2030 – 40% of light-duty vehicle sales	From Canada's 2030 Emissions Reduction Plan: • 2026 – 20% of light-duty vehicle sales • 2030 – 60% of light-duty vehicle sales

		• 2030 – 30% of medium-duty and heavy-duty vehicle sales

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.8:

Reference(s): 7-VECC-88

To clarify the response to 7-VECC-88, Part B, with a spreadsheet calculation showing the change from status quo ratios for the cost allocation model to the revenue-to-cost ratios in the original application.

RESPONSE:

Please refer to Appendix A (JT4.8 App A – Rate Design) for the calculation of the proposed revenue to cost ratios.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION

UNDERTAKING NO. JT4.9:

Reference(s): N/A

To describe how EV charges in parking garages would be linked back and included as part of the suite metered load, or whether the charges would show up as part of the common load for the building, more appropriately attributable to one of the GS classes.

RESPONSE:

The billing of energy used by electric vehicle ("EV") chargers depends upon the metering arrangement chosen by the customer. Where EV chargers are behind and part of the common elements load of a Toronto Hydro suite metered building, the applicable charges would show up on the bill for the common elements load account. Where Toronto Hydro is individually metering EV chargers associated with a particular suite, the applicable charges would show up on the bill for the individual suite only. Where the customer has engaged a unit sub-metering provider ("USMP") to meter and bill suites and Toronto Hydro only bills the aggregate load of the building through a bulk meter, the applicable charges would show up on the bill for the bulk account.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.10:

Reference(s): **4-VECC-71**
4-VECC-72

Referring to 4-VECC-71 and 4-VECC-72, to identify drivers of increase in customer relationship costs.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not capture the request made by the Vulnerable Energy Consumers Coalition ("VECC"). The scope of the undertaking is, for the Customer Relationship Management segment, aside from human resources related increases, to provide the other major drivers of the increase in the segment. In addition, for the Human Resources and Safety Segment, to provide the drivers of the increase including the proportion being driven by labour as well as other cost drivers.

With reference to 4-VECC-71(a), Toronto Hydro notes that the compensation costs listed for the Customer Relationship Management ("CRM") segment include payroll costs for internal staff only and do not constitute the entirety of human resources costs for that segment. In fact, in addition to internal staff, this segment relies heavily on external third-party call centre and business processing staff to handle customer contacts over the phone, via email or live chat, as well as administrative activities related to customer moves. External staffing costs make up the majority of the difference between the compensation costs outlined in 4-VECC-71 and the total costs for the segment.

Other cost impacts in the 2020 to 2024 rate period include consulting costs related to the customer information system ("CIS") upgrade project, payroll compensation savings due to full time staff capitalized to the CIS upgrade project, and temporary staff costs to backfill for full time staff on the project. None of these costs or labour capitalization savings will persist into the 2025-2029 rate period.

In reference to 4-VECC-72, the two major cost drivers are increases to:

1. Human resources cost of $8.7M or 80% of the total $10.8M incremental spend from 2020 to 2029. The average annual incremental cost of human resources has increased by 6.6% over this 10-year timeframe which includes inflationary costs and incremental headcount.
2. Training costs/programs have increased by $2M or 20% of the total incremental $10.8M.

These main areas have increased to support both the growing employee population and Toronto Hydro's investment plan. Details by segment are outlined in Exhibit 4, Tab 2, Schedule 15, starting from page 14 to 28.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.11:

Reference(s): 1B-SEC-03

To clarify whether under the cause code of "Defective Equipment", Major Event Days are excluded.

RESPONSE:

On Toronto Hydro's corporate scorecard, the key performance indicators for SAIFI and SAIDI measure interruptions recorded with the cause code of Defective Equipment, which does not include Major Event Days ("MEDs").[1]

[1] Major Event Days (MEDs) as defined by the threshold computed by IEEE 1366 2.5 Beta

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.12:

Reference(s): **4-AMPCO-80**
1B-SEC-7

To consider whether to provide the requested audit documents, and/or audits attached to 1B-SEC-7.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not capture the full scope of the request made by AMPCO. The scope of the undertaking was to provide a) two audits referred to in interrogatory response 4-AMPCO-80(b) and b) four items referred to in the appendix to interrogatory response 1B-SEC-7.

For the two external audits referred to in interrogatory response 4-AMPCO-80(b), please refer to appendices A and B to this undertaking response.

The question with respect to 1B-SEC-7 referenced four specific observations from the internal audit summary provided in the appendix to that interrogatory response. Please refer to Appendix C to this undertaking response for more information about the referenced observations and the completed management action plans.

FINAL SUMMARY REPORT

PMO BEST PRACTICES ASSESSMENT

PURCHASE ORDER
4500064590

SUBMITTED BY:
Comtech Group Inc.

DATE SUBMITTED:
Feb 17th, 2022

Comtech

TORONTO HYDRO

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1 Executive Summary

Toronto Hydro is seeking to enhance its current Project Management Office (PMO) capabilities and practices through the development, documentation, and implementation of an integrated set of program and project management processes governance, and procedures leveraging current lessons learned and best practices from industry sectors.

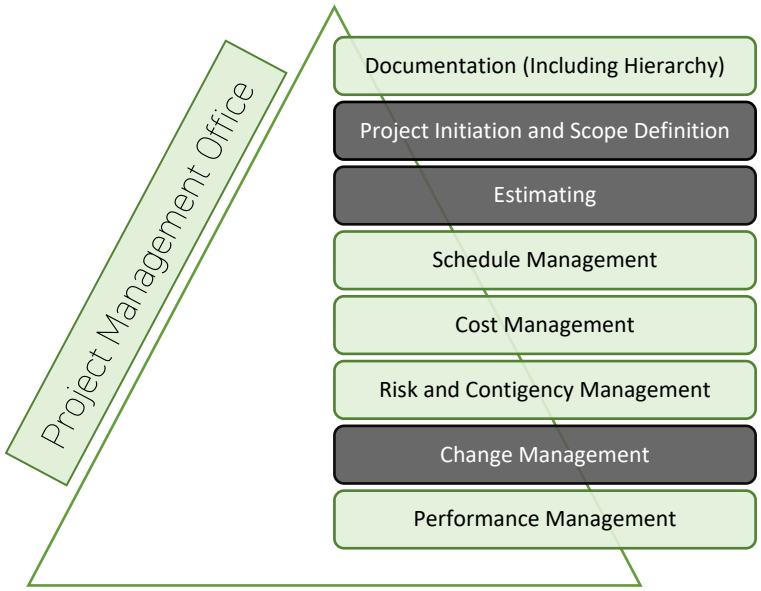
To support this goal, Toronto Hydro has engaged Comtech Group Inc. (Comtech) to perform an initial assessment of the PMO practices currently in place within the organization and to provide recommendations based on broad industry experience and best practices as well as share lessons learned from previous experience establishing and overseeing enterprise-level PMOs for large power generation and distribution companies within the energy and utilities sector.

It should be noted that the findings and associated recommendations of this assessment are based on information collected through interviews with key members of the Project Management Organization which is comprised primarily of Program Managers responsible for ensuring overall program delivery and not Project Managers responsible for individual projects.

1.1 Assessment Objective

This assessment is intended to provide practical recommendations that Toronto Hydro can apply in the short, medium, and long term to enhance its project management approach enabling the organization to better plan, organize, track, and manage its projects and programs through to successful completion. By evaluating current practices and ultimately providing key recommendations for enhancement, this assessment will help Toronto Hydro to enhance accountability and project success. The assessment focuses on benchmarking Toronto Hydro's current project management approach against industry-recognized practices as summarized in Figure 1.1 below:

Figure 1.1 – Scope of Assessment



**Subject matter areas shown in grey do not currently fall within the scope of the Toronto Hydro PMO but have been evaluated as part of the assessment.

1.2 Assessment Approach (Collecting Data)

To assess each of the subject matter areas identified in Figure 1.1 above, our team utilized a combination of:

- Review of key documentation
- Predetermined questionnaires
- Interactive sessions/interviews with key PMO staff

The assessment focused on the review of documentation (governance, job aids, flow charts, forms, and formats), people and practices, and tools and applications.

Please refer to Appendix N of this report for a summary of all the reference documentation provided by Toronto Hydro as part of this assessment.

The first step in the assessment process was to gather key documents, governance, policies, procedures, and other relevant background information necessary to adequately assess the current project management systems, processes, and overall capabilities. To support this assessment, the Toronto Hydro team shared a significant amount of typical program and project documents immediately following the kickoff meeting.

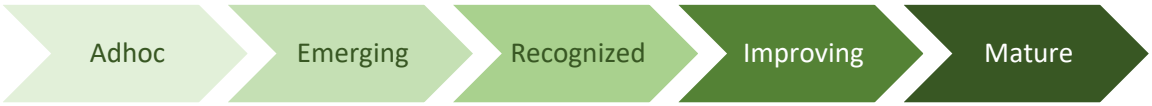
Virtual interviews were performed with key staff within the Toronto Hydro PMO to:

- Define key focus areas for the assessment
- Obtain first-hand feedback from the PMO team
- Identify additional documentation to be reviewed

1.3 Assessment Framework (Evaluation & Benchmarking)

The Project Management Maturity Model (OPM3) was used as a guideline for the framework against which the Toronto Hydro PMO practices were assessed. The framework presents pre-defined criteria to be used in the evaluation of each of the key subject matter areas (as listed in Figure 1.1) ranging in maturity as shown below in Figure 1.2:

Figure 1.2 – OPM3 Maturity Scale



Details relating to each level of maturity are summarized in Figure 1.3 below:

Figure 1.3 – Maturity Criteria

Maturity Level	Details
Mature	• Industry best practices are adopted and are being executed following a consistent, predefined, and documented process. PMO continues to actively look for process improvement and promotes responsibility, detracts poor procedural performance, and develops/adopts corrective actions. • PMO is staffed with resources who are trained and adopting routine practices which are aligned with the internal governance. • Project Management Information Systems (PMIS) are adopted, configured properly, and integrated within the organization. There are very few (if any) discrepancies between business processes within the tools and corporate strategic and tactical guidelines. • The tools are well configured, administrated, and allow for transparency of information and advanced data analysis. Usable dashboards are developed as standard deliverables for project meetings and forecasted trends can be identified and mitigated in short periods. • Single source of project "Truth" exists for all the stakeholders and is used as a basis for all strategic and project-level decision making. • Organization can efficiently plan, manage, and control multiple projects simultaneously.
Improving	• PMO has robust integration across governance, processes, practices, and systems. There is a strong corporate philosophy that drives the execution of programs/projects and sufficient resourcing is provided to guarantee that programs/projects will be delivered to the expected standards which have been in place for an extended period. • The PMO team knowledge and their routine practices are in alignment with the organization's guidelines with little to no deviations. • Dashboards and other program/project-related deliverables are utilized to monitor the health of certain procedures and to perform self-assessments (at a predefined frequency) to ensure procedures are implemented and followed. • Project information and performance measurement tools are developed on a routine basis and any observed deviations are identified and addressed in a timely manner. • Training programs are identified, developed, and delivered to maintain and improve the collective knowledge and skills of the PMO overall.
Recognized	• Methodologies are defined through guidelines, standards, job aids, and other related standard formats. Experienced personnel are responsible for the PMO's day-to-day practices and there is a widespread understanding of the PMO scope and level of responsibilities as well as scalability to the PMO services. • There are opportunities for improvement that can be identified as the organization develops and internal processes are rationalized. • Self-assessment checks are occasionally performed to ensure defined methodologies are being followed and PMO requirements are being met. • Reporting is performed periodically but not at the level of the corporate-wide reporting plan, while dashboards and regular project updates provide some trends to satisfy the forecasting needs. • PMO team's knowledge and routine practices are in alignment (with limited deviations) with the organizational guidelines. • PMIS are adopted, properly configured, and integrated. There are no (or very limited) discrepancies between business processes with the tools and corporate strategic and project level guidelines.

Maturity Level	Details
Emerging	• There are some governance and methodologies, but there is no evidence that they are consistently followed and are not fully meeting the requirements of the PMO, accordingly some PMO practices are not yet planned and developed. • PMO staff roles are clearly defined, but responsibilities are not defined and documented. • There are sufficient resources available to meet the program/project requirements, with training and skill improvement exercises provided. • PMIS are available, but with limited capacity and a lack of integration, often requiring significant amounts of manual data management. • Business processes and PMIS integration are maintained manually, and some business processes are simulated in the tools. • Dashboards and performance KPIs are at the early stages of development and not commonly used.
Ad-Hoc	• PMO processes are not documented and are implemented at a very basic level. Most of the practices are based on a predefined basis or an enterprise standard. • PMO team's roles and responsibilities are not defined clearly which results in redundant work or miscommunication with regards to responsibilities of individuals. Standard/predeveloped and easy to access forms and formats are missing or not fully developed/supported. • Training and skill enhancement programs (such as integrated training programs) are missing, and staff are not familiar with innovative methods of program/project management. • Project data is not centralized and exists in multiple sources requiring the PMO team to spend extensive effort to consolidate and verify the information.

1.4 Overall Observations

After completing the interviews, reviewing questionnaire responses, and supplied documentation, our team observed the overall maturity rating of the Toronto Hydro PMO to be at the "Emerging" level, typical of an organization that is actively executing projects but in the early stages of implementing formal and defined PMO practices. As shown in Figure 1.4 below, this report will outline key recommendations to enable Toronto Hydro to transition from Emerging to Improving on the maturity scale.

Figure 1.4 – Current and Future State

The detailed breakdown of the maturity assessment for each key subject matter area is provided in Figure 1.5 along with a summary of the key observations in Section 1.4.1.

Figure 1.5 – Current and Future State

Subject Mater Area	Ad-Hoc	Emerging	Recognized	Improving	Mature
Overall		◆			
Documentation (Governance, Guides, Formats, Including Hierarchy)	◆				
Project Initiation and Scope Definition		◆			
Estimating			◆		
Schedule Management	◆				
Cost Management (Budget, Cost Control, Forecasting)		◆			
Risk and Contingency Management			◆		
Change Management		◆			
Performance Management and Reporting		◆			

Given the planned capital expansion and investments that Toronto Hydro will pursue in the future, we highly recommend a step-by-step plan towards integrating our recommendations outlined in this report. Section 1.4.1 provides a high-level of all the key observations and recommendations for Toronto Hydro's consideration.

1.4.1 Key Observations / Recommendations

The observations and recommendations identified by the team have been grouped into four categories as shown in Figure 1.6 below:

Figure 1.6 – Classification of Observations and Recommendations

Well Established

Actions Toronto Hydro is doing well right now to support an integrated PMO and effective project delivery.

Short Term

Quick wins Toronto Hydro can implement to begin progressing towards its desired future state immediately.

Medium Term

Additional improvements which can be implemented, building on top of the short-term goals to further improve project organization and delivery.

Long Term

Longer-term actions to provide Toronto Hydro with a framework to support future expansion of its PMO capabilities and integration of other corporate functions.

Well Established

- Personnel interviewed showed a common and thorough understanding of PMO principles and guidelines already in place within Toronto Hydro and were aware of the importance of these standards to effective and efficient program/project management.
- Existing and documented process flows are stored under a centralized document repository which is readily accessible to all Toronto Hydro employees, providing an integrated and easy to access platform for additional PMO-related documentation and communications (please refer to Long Term Actions for more information).
- Project cost estimates are developed based on historical data (including actual costs incurred) from past projects of similar scope and complexity which provides a robust and integrated approach to estimate development.
- Projects finishing with delays or cost overruns are required to develop Project Variance Analysis (PVA) reports which will detail all the variances and their root causes (cost, scope, and schedule), lessons learned. This is a highly effective way of documenting critical information to contribute to future projects (i.e., incorporating lessons learned into the estimates, schedules, or risk logs for future projects).

- Toronto Hydro has been using SAP an Enterprise Resource Planning (ERP) tool for quite some time now. Some of the business processes, library data, and management information are stored within the ERP which can be used as inputs for future programs/projects as well as future expansions of the PMO functionality.

Observations and Short-Term Actions

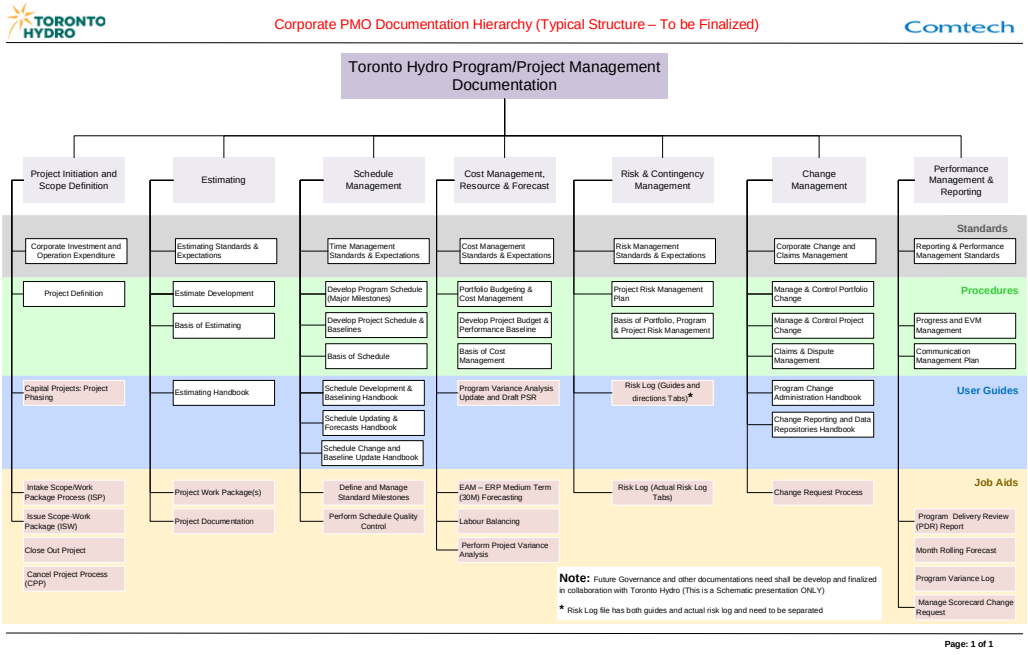
- Some of the PMO practices are documented as process flows, and we recommend Toronto Hydro prepare a singular overarching governance document (that comprehensively documents all expectations, guidelines, basis, references, and other background information regarding the PMO) and integrates and organizes all the individual emerging practices. Developing and keeping this document up to date should be a top priority for Toronto Hydro.
- Many of the PMO practices are still ad hoc and should be formally documented or integrated with each other. We recommend Toronto Hydro review the observations in this report and begin developing and implementing them within the PMO. An easy quick win would be to develop job-aids in the short term and then work on more formally documented procedures in the medium term. To achieve this goal, we recommend Toronto Hydro assign a dedicated team (with defined roles and responsibilities) to:
    - Develop, implement, and maintain a comprehensive set of PMO governance, processes, procedures, and supporting documentation.
    - Define the priorities for the required documentation, which will be driven by operations and capital plans as well as any long-term strategies Toronto Hydro has in place.
    - Establish a timeline for the development, review, approval, and roll-out of each set of documentation.
    - Ensure that each functional PMO discipline (i.e., scheduling, estimating, reporting, risk, etc.) has an organizational chart with defined roles and responsibilities.
    - Implement a training program to develop and monitor employee skills within their functional PMO disciplines.
- The majority of program and project schedules were just merely dates absent any logic connection/ties or calculated durations. In other instances, it was noted that some projects did not have any schedule at all, just an anticipated completion date. We recommend the adoption of a scheduling platform such as Microsoft Project or Primavera P6 for all projects being executed by Toronto Hydro to allow a more integrated and visual representation of all Responsibility Centers (RCs) and the Toronto Hydro program. Schedules can be developed at a high level, but with enough detail to keep the programs better organized. Scheduling is critical as it interlinks with cost management, performance measurement, and reporting practices. It should be noted that Toronto Hydro is performing time management on program levels and not projects.
- Physical percent complete progress/stages of work completion are not being used as a basis for calculating project and program progress. We recommend implementing a quick and simple methodology such as weighted milestones on a high-level schedule to be used as an initial basis of progress calculation. This will help organize the cashflows and required funding practices and overall help Toronto Hydro better track its incurred costs and upcoming funding requirements as well as to better understand the state of its projects at any given time.
- It is recommended to implement EVM practices on a project and phase level (initiation, estimating, engineering, procurement, construction, commissioning, and close out) to allow for more accurate performance tracking at the program and portfolio level as well.

- Forecasting should be enhanced by using % physical progress, EVM, weighted milestones, burn rates, contractual commitment, etc. which will also improve the consistency and accuracy of the Estimate at Completion (EAC) and Estimate to Complete (ETC) calculations. It is recommended that Toronto Hydro adopt one of the standard forecasting methods as a standard to apply to all projects.
- Presently, all program and project status update information and reports are developed using Microsoft Excel in a static tabular format. We recommend developing a standardized set of multi-layer reporting dashboards that summarize information from the project level and roll it up to the program level. Toronto Hydro could leverage existing tools already in use such as SAP BI and Tableau to develop the dashboards in question. While the development of the dashboards is a short-term action, automating that data retrieval to update the dashboards can be considered as a medium- or long-term action and is discussed further in the subsequent sections of this report.

Observations and Medium-Term Actions

- We recommend that Toronto Hydro develop a centralized list of all the required documents necessary to formally document all the governance, processes, and procedures in a central library. We recommend performing a study to identify missing items (such as schedule development practices, project performance metrics, EVM practices, etc.) and develop a comprehensive list. Figure 1.7 below illustrates the sample document hierarchy:

Figure 1.7 – Documentation Hierarchy



Please refer to Appendix A of this report for the full-size sample Document Hierarchy.

- A key best practice is to integrate cost and schedule to improve the quality and consistency of project execution and reporting. Integration of cost and schedule information will provide more effective project data to support better project decision-making. We recommend that Toronto Hydro implements a basic level of cost/schedule integration for all projects going forward. Refer to Sections 5 and 6 for more information.

- We recommend developing a centralized PMO training plan, including the development of training material, identifying critical, mandatory, and elective training, and tracking of resource qualifications. PMO/other related training is primarily provided to new hires at the time of their onboarding or on an Ad-Hoc basis as required.
- To better promote continuous improvement, we recommend that Toronto Hydro performs regular self-assessments (potentially with wider scope) to track progress on implementation of the improvements identified herein and to address new needs that may arise over time as the organization continues to grow and develop.
- We recommend that critical project management and project controls information be transitioned to a centralized "Single Source of Truth" system as opposed to storing and maintaining using local data management tools (i.e., Microsoft Excel). The use of Excel can pose multiple data-related risks (non-integrated data sources, cyber security, increased resource efforts to consolidate/validate data from multiple sources). For example, having estimating, cost, and schedule data integrated and organized in one database can allow for automated project reporting/dashboards or automated updates to project financials and schedules when Change Requests are processed, approved, and implemented.
- We recommend developing a centralized plan for a corporate-wide risk workshop as well as individual project risk workshops/brainstorming sessions (particularly for larger more complex projects) to ensure all risks are accounted for at the project and program levels. While the project risks are stored and managed under a centralized database, the risk identification process is performed in a somewhat isolated manner often involving a single or a limited number of participants.
- Project reporting is currently being performed using SAP BI and Tableau, which are very powerful tools. However, there is a lack of a central data repository. In the absence of a centralized library for reporting, project data is being handled locally through individuals' computers or emails. We recommend developing a transition plan to adopt a centralized project data source to contain all the project-related data necessary for reporting.
- We recommend continuing to enhance the program and project status tracking and reporting dashboards to incorporate additional features such as online/interactive Power BI reports which can be manipulated by the viewer to filter information as required. We also recommend establishing a centralized location for reporting data (reporting database). With a centralized set of data Toronto Hydro can then utilize automated data retrieval processes to populate the dashboards essentially enabling the dashboards to present live project information that is always up to date.

Observations and Long-Term Recommendations

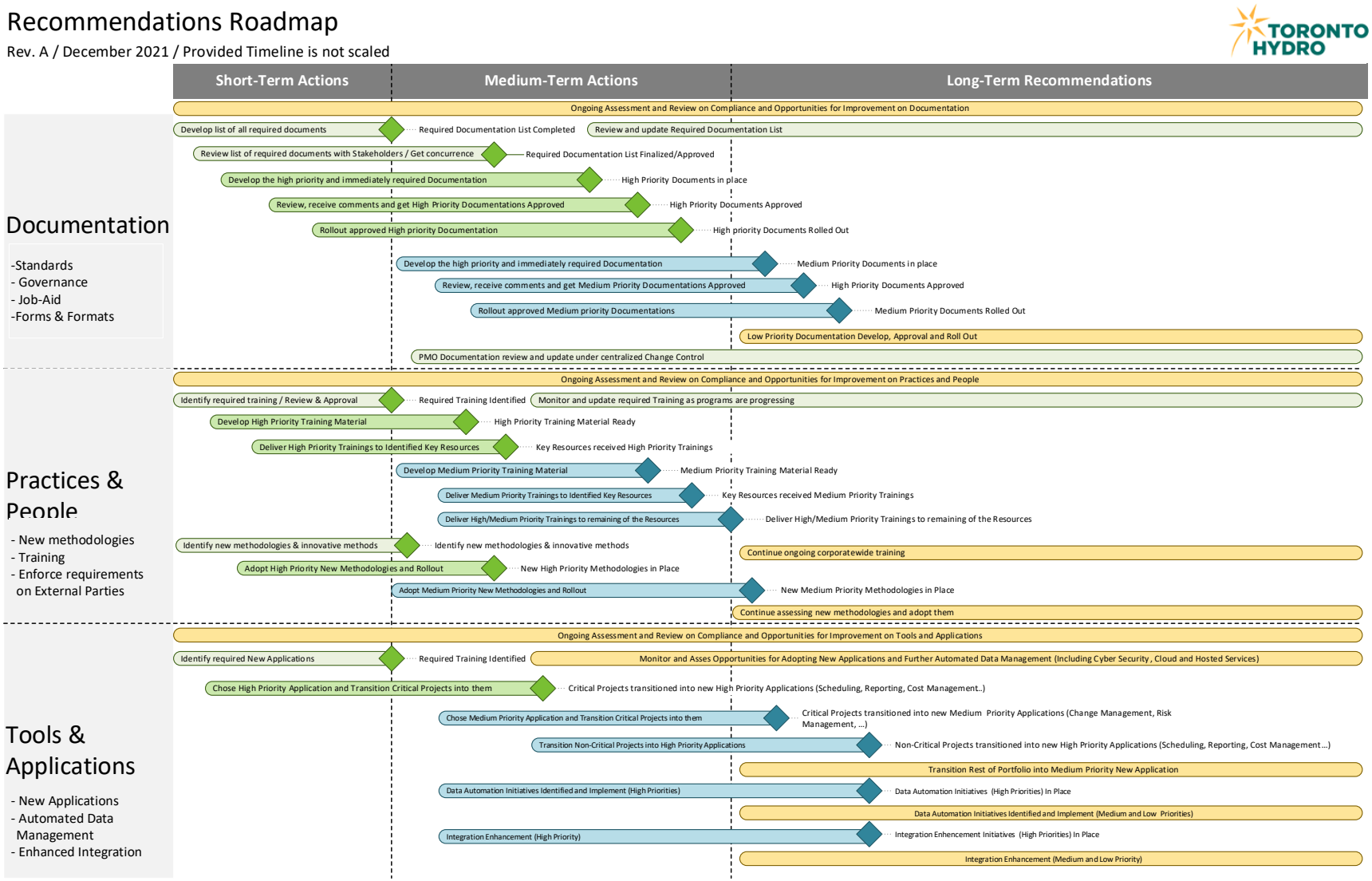
- Continue to identify, develop, document, and update processes as the organization grows and evolves. Ensure that all newly developed documentation is stored under a centralized and easily accessible repository.
- After achieving the basic level of schedule and cost integration, we recommend expanding the integration down to the major deliverables of the projects. This will allow for quick identification of risk areas or opportunities in terms of budget and schedule. A practical rule of thumb is to apply the 80/20 rule to integrate 20% of the major deliverables accounting for 80% of the cost and or schedule duration.
- We recommend transitioning away from single-user standalone scheduling platforms such as MS Project and leveraging enterprise planning tools such as Primavera P6 which can integrate

within Toronto Hydro's ERP system thus establishing an end-to-end program/project management PMIS.

- We recommend that Toronto Hydro investigate cloud-based project management tools that would be accessible by all project stakeholders remotely thus reducing the effort required to collect and aggregate data by providing real-time data to support the decision-making process.
- Continue to invest in corporate training programs relating to PMO functions, this would not only improve the overall PMO functionality but also promote professional and personal development within the Toronto Hydro team.
- Develop a plan to implement a fully integrated suite of PMIS (including "One Source of Truth") which would equip Toronto Hydro with the tools and infrastructure for any future expansion programs.
- By this stage, program and project dashboards should be fully developed, communicated, and implemented within the organization. We recommend integrating the centralized reporting database into the overall centralized project data repository (single source of truth) to complete the collection and organization of all project data into one source. We also recommend that Toronto Hydro perform regular reviews and assessments of its reporting requirements and adjust the parameters displayed in the dashboards as required.

Figure 1.8 provides a high-level roadmap summarizing the key improvement actions recommended for Toronto Hydro. Please note, the recommendation road map is preliminary, intended illustrative purposes only, and will require further input from Toronto Hydro.

Figure 1.8 – Recommendation Roadmap



2 Documentation (Governance, Guides, Formats, and Hierarchy)

In this section, we have detailed the team's findings relating to the documentation Toronto Hydro has in place to formalize its internal PMO governance, processes, procedures, guides, template formats as well as the overall organization of these documents in the form of a document hierarchy. Additional details and samples are included in the appendices of this report.

2.1 Process, Governance, and Standards

It was clear through the interview process that Toronto Hydro stakeholders understand the critical importance of documenting PMO governance, processes, and procedures and have invested in producing process maps. While the team is focused on completing the necessary documentation, a high-level plan for identifying, developing, and implementing all the necessary documentation should be established. Most processes, which have been documented, are in the form of process flows which provide the sequence of actions to be performed but can be supplemented by additional tactical details necessary to execute the process or procedure correctly and consistently. This could begin with the preparation of a top-down hierarchical structure that organizes all documentation relating to governance, processes, and procedures. This hierarchy is a critical component as it will function as the roadmap to help Toronto Hydro organize all its PMO documentation and processes. We have included a sample hierarchy within the appendices to this report. Organizational Change Management (OCM) is currently being performed on an ad hoc basis without having a standardized process/approach which can make it difficult to effectively develop, implement, communicate, and ensure adoption of any organizational changes.

2.2 Practices and Resources

The majority of program and project stakeholders and individuals are aware of the existing documentation in place but are not necessarily familiar with all the required guides, standards, governance forms, and or formats. Members of the PMO who are responsible for developing and maintaining the documentation are extremely knowledgeable and have a thorough understanding of the internal Toronto Hydro PMO requirements and would be great resources to expand the knowledge base across other program and project stakeholders. Roles and responsibilities within the PMO should be formally defined to reduce duplication of effort, inconsistency with responsibilities regarding deliverables, mis aligned approval workflows, etc.

Many internal and program/project practices we found to be well defined, but sometimes varied on a case-to-case basis for example from project to project or from one internal PMO initiative to another. Implementing the additional documentation-related recommendations in this section will help bolster an enterprise-level strategy to deliver programs and projects under a uniform and standardized approach.

2.3 Applications and Tools

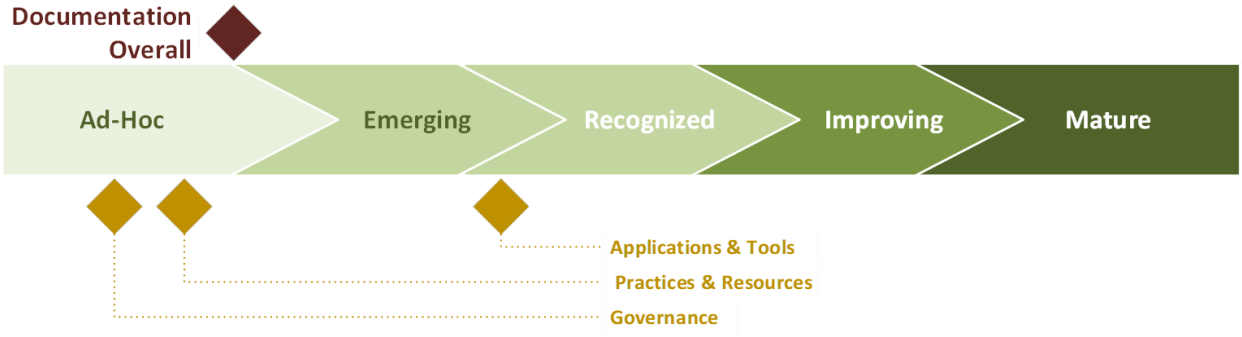
Currently Toronto Hydro is using its internal intranet as the central hub for storing and sharing its PMO documentation which is a great platform for sharing centralized information. Our team did however observe that the responsibility of developing PMO processes and procedures can often fall on individuals who are not part of the PMO itself. In cases such as this, there needs to be a protocol in place to identify which parts of a procedure are the responsibility of the PMO and which are the responsibility of other

functional groups within the organization to ensure continuity and that actions do not get lost in transition. Furthermore, it was noted that when individuals external to the PMO develop any PMO documentation, they did so without operating under the same PMO intranet site. This is an area of concern as data that isn't stored in a centralized location with proper revision control can often lead to duplication errors and conflicting information.

Some of the business processes were also found to be defined under SAP, Toronto Hydro's ERP, which contains some standard forms, formats, and library data. To properly apply the existing processes and standards forms within SAP, a documented set of processes and procedures need to be in place to reference this information and ensure the proper change control is applied when something is updated.

2.4 Conclusions and Recommendations

Figure 2.1 – Overall Documentation Rating



Based on the observations identified in the sections above, we recommend the following:

1. Develop and implement a corporate documentation plan which:
    a. Addresses requirements from corporate-wide standards down to individual template formats.
    b. Identifies roles and responsibilities of all parties involved.
    c. Established a timeline for the development, review, approval, and roll-out of each deliverable.
2. Define the priorities for the required documentation, which will be driven by operation and capital plans as well as any long-term strategies Toronto Hydro has in place.
3. Assign a team dedicated to the identification, development, and update/maintenance of PMO documentation.
4. Develop a plan to frequently review and update the documentation in place based on practical feedback collected (regularly) from engineering, procurement, construction, and other stakeholder teams.
5. Ensure that external stakeholders (i.e., contractors, suppliers, vendors, etc.) also comply with Toronto Hydro's program/project management standards and requirements (such as scheduling and reporting). This may require a transitionary period as Toronto Hydro's supply chain becomes familiar with the new requirements.

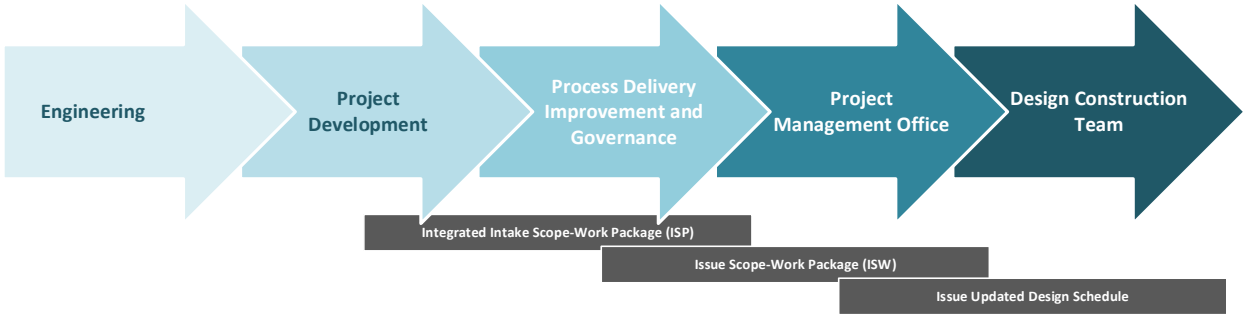
Please refer to Appendix A of this report for a proposed Document Hierarchy and Appendix C for a sample Integration Management Plan.

3 Project Initiation and Scope Definition

In this section, we have detailed the team's findings relating to the processes through which Toronto Hydro initiates its projects and defines the scope to be completed within each project. Although this responsibility falls to the individual project teams, the overall oversight of the process is performed by Toronto Hydro's PMO.

Figure 3.1 below illustrates the project initiation process flow which was observed during the assessment:

Figure 3.1 – Project Initiation Process



Project initiation begins with a high-level estimate being developed by the Engineering Team which is responsible for system planning and identifying various investment needs. The estimate gains more and more detail as it passes through the various work groups identified in Figure 3.1.

This process of project initiation is not currently standardized or documented in a singular integrated document such as governance that sets the guidelines around identifying how the need for projects is determined, stating the requirements to define a project, and the requirements for capitalization of the asset. We recommend a gated process be developed for the project initiation process which will define the requirements for information to be developed within each phase of the Project Delivery Report e as it progresses from engineering input through to the design construction team.

The following are currently available process flows that Toronto Hydro has in place to support scoping and project initiation:

1. Intake Scope/Work Page Process (ISP) – Owned by Process Delivery Improvement and Governance group (PDIG)
2. Issue Scope/Work Package (ISW) – Owned by the PMO
3. Issue Project – Owned by PMO

As evident in the list above, the responsibilities of project initiation are owned by two different working groups within Toronto Hydro and the individual steps are not linked together by an integrated document, which could lead to duplication of efforts or misalignment in terms of expectations concerning project initiation and definition.

3.1 Practices and Resources

Members of the PMO were aware of the process and were utilizing some prepopulated process flows and formats to oversee the project initiation process. However, they were not aware of the similar/duplicate efforts being performed in the Engineering and Project Development groups.

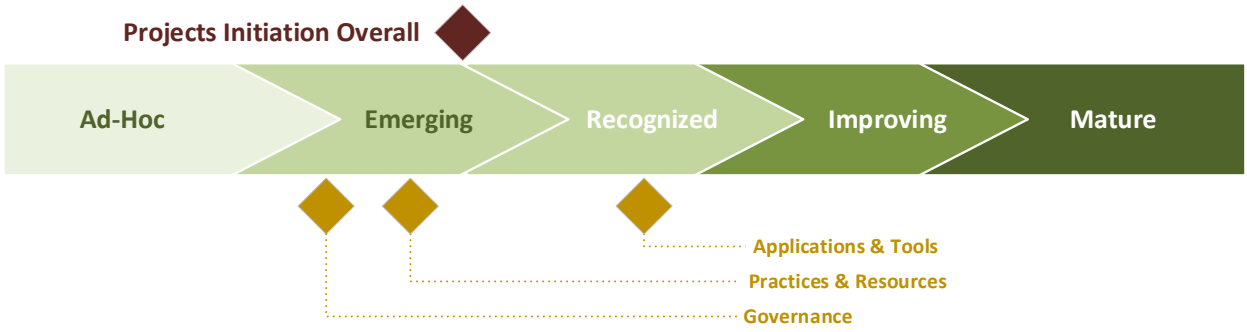
Although it was noted that the PDIG / PMO team members are required to collaborate on project initiation, there is no dedicated organizational chart or responsibility matrix developed for a formal Project Initiation Team and the roles and responsibilities of the individual team members have not been defined and documented. Furthermore, we did not observe any documented training and skill improvement plans for this subject matter area. Providing formal training on project initiation would help to align expectations between the PMO / PDIG and subsequent work groups and allow them to work together more coherently.

3.2 Applications and Tools

Project initiation is performed primarily using existing processes within SAP by the PDIG and through leveraging historical data from past projects into the development of new Scope of Work Packages, also stored under SAP. Within SAP, Toronto Hydro has mapped out the project lifecycle and associated business practices up to and including the design schedule development, however, processes beyond engineering have not developed.

3.3 Conclusions and Recommendations

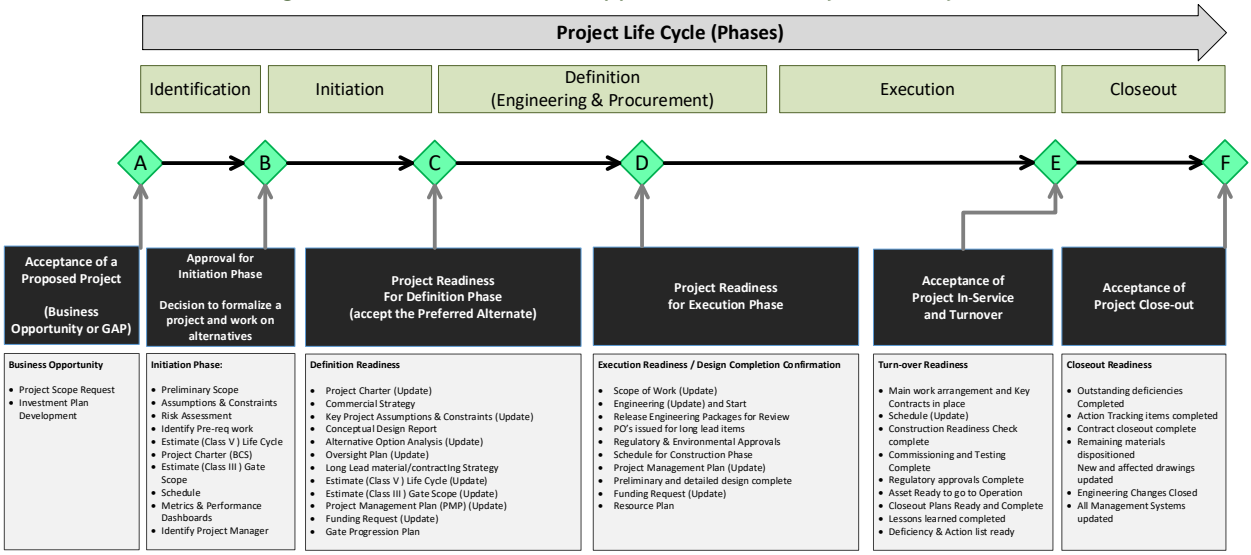
Figure 3.2 – Overall Project Initiation and Scope Defining Rating



Based on the observations identified in the sections above, we recommend the following:

1. Develop overarching governance for project initiation which covers the entire project lifecycle and integrates the responsibilities of the PMO / PDIG, and any other necessary work groups within Toronto Hydro.
2. Adopt a high-level gated process to enforce program/project management requirements across the complete project lifecycle. Figure 3.3 below illustrates a typical gated process which defines the necessary inputs to be defined at each stage of the project lifecycle from project initiation to closeout:

Figure 3.3 – Gated Process Approach to the Project Life Cycle



3. Develop and maintain dashboards to track and monitor projects across all points in their life cycle (active, yet to be initiated, in construction, in commissioning, capitalized/in-service, etc.) as this would provide an additional layer of portfolio management information to enable the team within the PMO to assign priorities to projects and better maintain the overall Toronto Hydro programs.

Please refer to Appendix B of this report for a generic sample Project Dashboard and Appendix D for a sample Scope Management Plan.

4 Estimating

In this section, we have detailed the team's findings relating to the estimating practices which Toronto Hydro uses to develop project and program budgets. As the estimating practices are not the responsibility of Toronto Hydro's PMO, a dedicated personnel interview relating to this subject matter area was not performed, however, it was included in the assessment as estimating is a critical process tied into other operations with the PMO.

4.1 Process, Governance, and Standards

It was observed that estimating practices are not documented under any Toronto Hydro governance currently in place. Typical estimate governance would include the following key subject matter areas to ensure consistency of this practice across the organization:

- Basis of Estimates
- Productivity Rates
- Units of Measures
- Standard Cost Breakdown Structure (CBS),
- Work Breakdown Structure (WBS)
- Work packaging
- Control accounts definition and levels
- Any other assumptions such as coding or library data.

4.2 Practices and Resources

As mentioned in Section 3, high-level estimates are primarily developed by the Engineering and Investment Planning team members, and more detailed input is typically provided by the Construction Team. Most of the estimating practices are performed and concentrated under SAP and the business processes relating to estimating are also already established under SAP. As a result, we found that the personnel was very familiar and aware of the expected processes and responsibilities relating to estimating further supporting the benefits of formally documenting processes and procedures to standardize project delivery across the organization.

Our team suggests that industry-accepted standards from the American Associated of Cost Engineers (AACE) or the Project Management Institute (PMI) be incorporated and referenced in estimating practices and to better leverage historical project data as a benchmark by collecting and organizing historical project data in a centralized database and using this data as a reference for planning and estimating future projects. Benchmarking against past projects (with actual incurred cost data) is a very effective way to improve the quality of estimates.

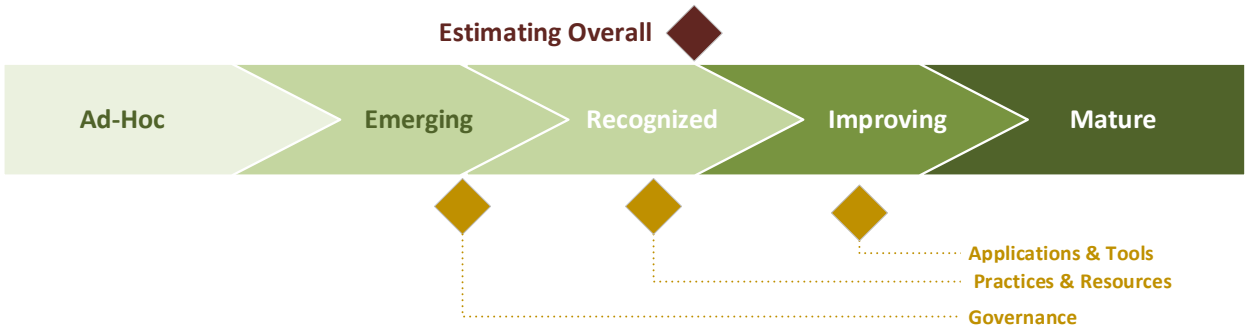
From an organizational perspective, a dedicated organizational chart and formalized estimating training plan could be instituted.

4.3 Applications and Tools

The estimating functions and associated business processes are largely performed and contained within SAP. Library data for past and ongoing projects is also contained within the SAP system including typical forms and templates which presents a great source of data to develop the centralized database of historical project data.

4.4 Conclusions and Recommendations

Figure 4.1 – Overall Estimating Rating



Based on the observations identified in the sections above, we recommend the following:

1. Perform a self-assessment to identify opportunities for further improvement to estimating practices such as increasing the reliance on benchmarking and historical project data as inputs into new estimates.
2. Investigate possible enhancements of the estimating tool within SAP for better performance.
3. Engage with industry organizations governing estimating practices (such as AACE) and develop a plan and adopt their best practices and standardized approaches.

5 Schedule Management

In this section, we have detailed the team's findings relating to the time management and scheduling practices within Toronto Hydro and how project schedules are developed, refined, maintained, and linked together on a macro scale (program level).

5.1 Process, Governance, and Standards

Integrated time and schedule management practices are not currently documented under any of Toronto Hydro's governance, and there are no related job-aids, process flows, forms or templates in place to support standardized scheduling practices at the program and or project levels. A typical well developed and comprehensive scheduling governance would include details regarding the following subject matter areas:

- Basis of Schedules
- Methodology for developing, updating, and maintaining schedules
- Scheduling library data such as calendars, codes, roles, resources, etc.
- Standard Work Breakdown Structure (WBS),
- Schedules quality management plans and practices
- Standard scheduling reporting

5.2 Practices and Resources

Our team observed that programs and projects were largely monitored based on significant target dates (i.e., completion of engineering, etc.) that are logged in a master table as opposed to physically developed schedules. A few of the project teams are using Microsoft Project to maintain and update schedules. However, schedule quality and reliability could be an area for enhancement to include logic ties between milestones, tracking of the critical path, resource management, tracking and calculation of percent physical completion, and EVM.

Lack of logic-tied schedules is preventing the teams from calculating their schedules and having a clear picture of all the dependencies within the tasks and forecasted completion dates. Cost flow (and effects of change) is performed at a very high level and could be better informed by using an integrated scheduling tool. Program and project milestones are not being identified and used in scheduling practices regularly. We believe that this is a simple corrective action that can be implemented relatively quickly. Having clearing milestones for each project will provide an improved level of accuracy for scheduling as well as progress measurement.

From an organizational perspective, a dedicated organizational chart with roles, and responsibilities and a formalized training plan in place for scheduling functions would be beneficial.

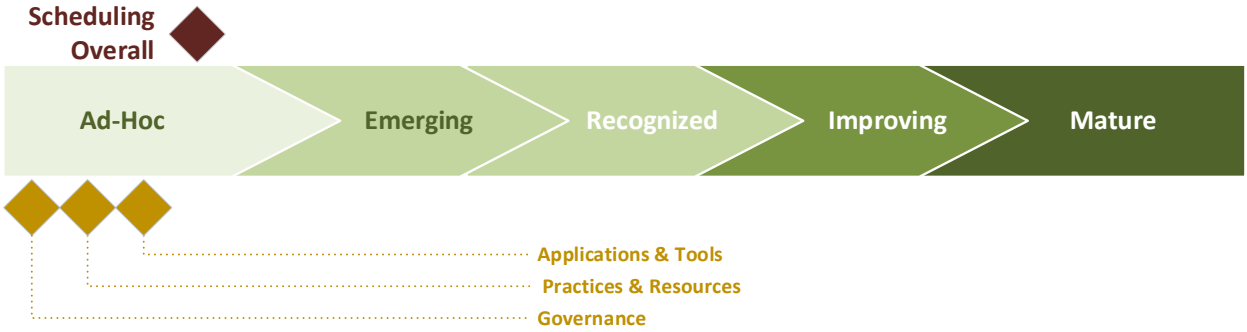
5.3 Applications and Tools

In summary, the time management and scheduling activities are performed in Microsoft Excel with a few cases (large more complex projects) being managed in Microsoft Project. Although these tools may be sufficient for Toronto Hydro's project delivery purpose there are many disadvantages to scheduling projects in this manner such as:

- A high level of manual effort is required to track and update schedules
- Inconsistent practices for time management
- Negative impact on forecasting accuracy and practices

5.4 Conclusions and Recommendations

Figure 5.1 – Overall Scheduling Rating

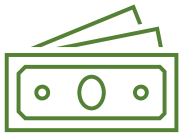


Based on the observations identified in the sections above, we recommend the following:

1. Adopt a scheduling tool to be used across the entire organization (i.e., Microsoft Project or Primavera P6) and provide training to all necessary staff. We recommend that Toronto Hydro take the following staged approach to implement an organization-wide scheduling platform:
    - Identify the scheduling requirements and document them
    - Identify critical projects (complex, long term, high investment, regulatory-related, etc.)
    - Phase 0 – Utilize Microsoft Project (standalone, non-enterprise solution)
    - Phase 1 – Move all schedules into a third-party enterprise scheduling environment
    - Phase 2 – Establish Toronto Hydro's Enterprise Scheduling Environment
    - Phase 3 – Transfer all the schedules into Toronto Hydro' Enterprise Scheduling Environment
2. Define and roll out a milestone management methodology to quickly develop a program/corporate time management system (providing internal, external, regulatory, strategic commitments clarity).
3. Investigate possible enhancement to the scheduling tool (for future phases) such as Primavera P6 for better performance and smother integration with the current SAP system.
4. Engage organizations responsible for standardized scheduling practices (such as AACE, PMI) and adopt their best practices on program and project time management.

Please refer to Appendix E of this report for a sample Schedule Management Plan.

6 Cost Management (Budgeting and Cost Control) & Resource Management



In this section, we have detailed the team's findings relating to Toronto Hydro's cost and resource management practices to assess how project costs are planned and tracked, when and how funds are released as well as how projects are staffed from a personnel perspective.

6.1 Process, Governance, and Standards

After a review of the provided documentation and interviewing of key relevant personnel, our team observed that Toronto Hydro would benefit from developing a standardized cost management plan/approach and or procedures to provide a standardized basis for how to perform cost management for both projects and programs. A typical set of cost management processes and procedures would include the following:

- Basis and methodology for developing and maintaining budgets
- Library of reference cost control data such as unit rates, escalation rates, cashflow functions roles, etc.
- Standardized WBS and CBS
- Standardized protocols for actual cost and accrual collection
- Standardized reporting formats for key cost indicators such as budget, forecast, actuals, etc.

The team did observe a degree of standardization amongst the practices concerning the cost management that was generally adopted amongst the teams, however, they were not formally documented or adopted across the entire organization. Currently, projects follow a simple process to track project costs against the planned budgets. If a project is over or under spent, the project teams need to submit a change request (typically performed every year) to reconcile the variance. The project teams develop the budgets and then track the actual incurred costs as per a typical WBS/CBS but like other elements, this process is not formalized under a controlled and documented process. There are process flow diagrams to summarize some of the cost management workflows, but they typically lack the detail necessary to standardize the approach to costing, scheduling, and cash flow, etc., which could lead to variance and discrepancies in how each project team performs these functions and as a result how the relevant project information is presented.

Resource management is performed on an enterprise or corporate level using a Project Resource Allocation Template (PRAT). The PRAT is populated by Program Management Consultants (PMC) and summarizes the inputs from each department within Toronto Hydro which is then combined into a Corporate Resource Plan. Similar to cost management, while there are certain processes and standards in place, Toronto Hydro would benefit from a central governing document that describes how resourcing is to be planned, tracked, and executed.

6.2 Practices and Resources

In general, the cost management processes being followed are considered general guidelines or practices by the project teams. In terms of documentation, the processes are logged as job aids or process flows containing minimal detail.

Any projects that exceed their budgets by 15% or more are flagged and required to go through a root cause analysis to determine the cause of the variance. PMCs are responsible for monitoring all the cost data for the projects within their portfolios. On an enterprise level, the PMO collects all the project cost data to track the portfolio performance against the annual budget.

Currently Toronto Hydro does not have a gated process through which to release funding to projects on a gradual level based on the project lifecycle. Furthermore, EVM and the tracking of physical completion progress are not employed. In general, the absence of formalized schedule practices, physical progress tracking, and EVM can result in deficiencies in the cost controlling of projects including:

- Improper cashflows that misrepresent the direct work planned to be executed
- Accurate communication and measurement of the accruals due to the lack of physical progress tracking
- Inconsistency in the alignment of cost forecasting with scheduled and planed work as well as EVM

Actual Costs are collected and administrated by Finance and logged under SAP (the same platform where estimated and budgets are stored however the invoicing is performed via email). Actual costs are monitored as Life to Date (LTD) and Year to Date (YTD). Currently Toronto Hydro is primarily tracking the cost incurred against the total project budget. This is a reactive approach as it does not provide enough detail to understand if a project is trending over budget to raise a flag before the budget is already exceeded. Similarly, with project schedules and dates, the projects are primarily tracked as either being complete or incomplete, with minimal focus on intermediate milestones to track progress. Tracking of actual costs against the budget and scheduled completion dates is logged in the Project Delivery Report (PDR) which is prepared by each PMC for their respective portfolio.

There is a monthly cash flow developed for all the projects which get reviewed against the budget. Typically, this review is performed for the top 10 most capitally intensive projects within the portfolio. For large-scale megaprojects (i.e., supporting mega-transit programs in Toronto), Toronto Hydro assigns each project its own dedicated PMO team which generally follows the same standards as the corporate PMO. As part of this audit, our team did not have access to any of the key personnel that was allocated to the mega projects, as such the team focused on the corporate PMO and its functions.

Overall, there are general guidelines to program and project cost management present within each of the project teams, there is no enterprise-level framework in place to ensure that cost management is being performed consistently across the entire organization.

From an organizational perspective, there is no dedicated organizational chart, defined set of roles and responsibilities, or formalized training plan in place for the cost controlling functions within Toronto Hydro.

In terms of resourcing, supply, and demand of resources, is managed through:

- Demand: Project Resource Allocation Template (PRAT), by developing the PRAT, projects identify and log their demand for resources. The PRAT provides information regarding the type and quantity of resources required and integrated the budget units, labour types, and scope as well.

- Supply: The Forecast Assumption Summary (FAS), comprised of inputs from each division, provides a summary of the available resources at any given moment.

Both of the above documents as well as resource management assumptions such as calendars, holidays, vacation, and sick leave are all logged as Microsoft Excel files. Currently, Toronto Hydro is in the process of transitioning to Business Planning and Consolidation (BPC) which is a module within SAP that provides more automated resource tracking, normalization, and balancing activities. Using the BPC functionality within SAP is a great step towards more effective resource planning as well as enabling more enterprise-wide functionality by levering the integration of SAP within other project management practices.

6.3 Applications and Tools

Currently Toronto Hydro stores both estimates and actual incurred costs within the SAP system, which is a very effective practice promoting enterprise-wide integration. However, budgets and all comparisons against planned, forecast, and actual values are maintained and managed through Microsoft Excel which requires a lot of effort to keep up to date and presents the potential risk for data errors.

Projects and their associated budgets are initiated as per the following steps:

- Engineering defines the project based on technical, regulatory, or capital investment need
- Engineering develops a high-level estimate of the major equipment, required labour, and durations (similar to a top-down approach)
- The estimate is then provided to the Planning Team who breaks the work up into sub scopes and provides additional detail into the estimate by using "Units of Work"
- The estimates are logged under SAP and will be used as the basis for material procurement
- The PMO receives the Work Packages and adds any required equipment information and additional resource requirements into them
- The PMO is then responsible for finding the available team to execute the project
- Work Packages will be transferred to execution Responsibility/Resource Centres (RC) to develop a detailed design estimate using a bottom-up approach.

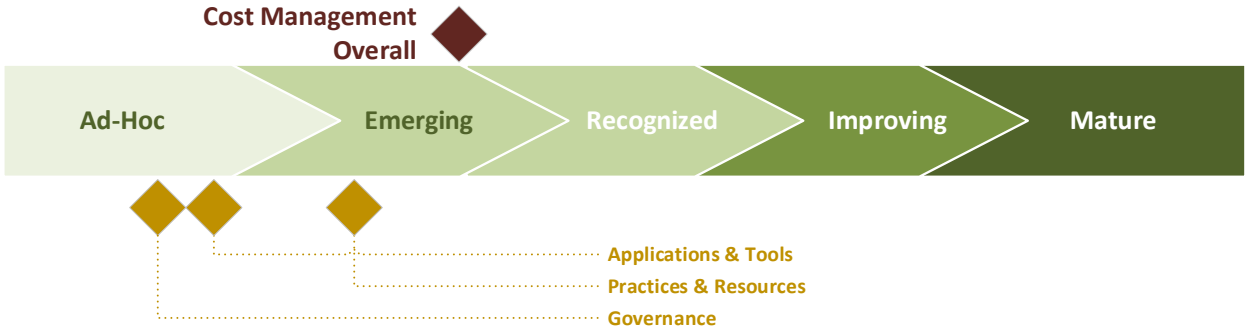
The budgets and forecasts are reviewed and approved by RC leaders, and there is a standard change request tool (SAP module), where projects can enter their last approved budget as well as their current change request.

Process and approval routes for the change requests are defined to go to different approving individuals based on the project and dollar value before it can be incorporated into the final project budget (50K$ for OPEX and 100K$ CAPEX triggers the change process). Change requests below the OPEX and CAPEX thresholds do not require a change request and can be processed through the project team directly.

All resource management-related activities are managed under Excel at this time, but Toronto Hydro is progressing towards implementing the BPC module with SAP in the near future.

6.4 Conclusions and Recommendations

Figure 6.1 – Overall Cost Management Rating



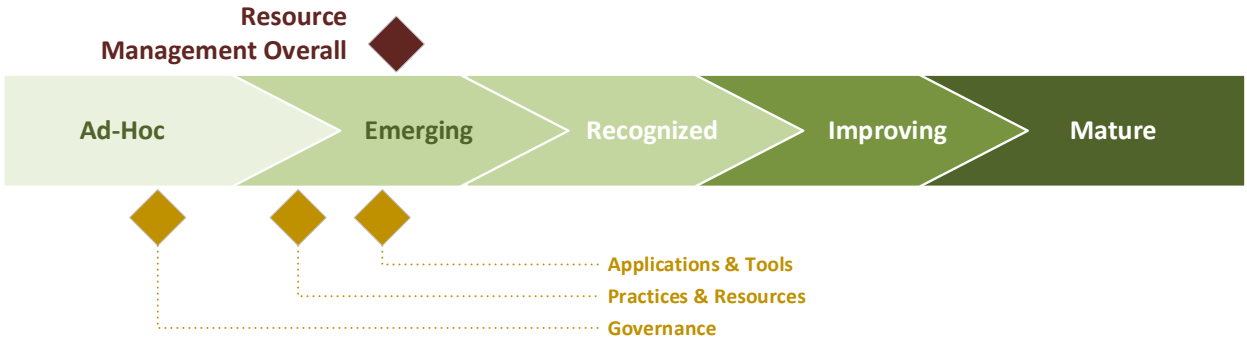
Based on the observations identified in the sections above, we recommend the following:

1. Adopt project-level cost and performance tracking methodology which can be implemented for each project lifecycle phase. Begin tracking progress against each phase in a binary manner (i.e., has the phase been completed yes, or no?) This will improve the accuracy and quality of forecasting and cost control with the Toronto Hydro portfolios.
2. Develop, implement, and provide training for a set of standard program and project dashboards which would provide cost control related information across different levels within the portfolio.
3. Plan for adopting an automated invoicing and cost collection application, there are several cloud-based options available that would get stakeholders (Vendors to enter the information into the system and follow predefined business rules and data quality).

Please refer to Appendix F of this report for a sample Cost Management Plan.

The assessment on resource Management and recommendations are as follows:

Figure 6.2 – Overall Resource Management Rating



Based on the observations identified in the sections above, we recommend the following:

1. Replace the current resource management excel spreadsheets with an enterprise resource management tool (as per the PMO team some planning is in place toward this requirement).
2. Develop and maintain a level of integration between resource planning and scheduling/budgeting for a higher level of efficiency and productivity.

3. Identify high-demand resources (overall or on some special period of year or projects) which can potentially create bottlenecks concerning staffing of projects. Develop a strategic plan to secure these types of resources.

7 Risk and Contingency Management

In this section, we have detailed the team's findings relating to Toronto Hydro's risk and contingency management practices to assess how project risks are identified and quantified, how mitigation strategies are developed as well as how contingency is quantified, allocated and released to projects.

7.1 Process, Governance, and Standards

Risk management practices within Toronto Hydro are performed by various teams depending on the stage of the project lifecycle. While there are generally accepted approaches to risk management within the organization, they have not been documented in the form of a Risk Management Plan to set the standard for this practice across the entire organization. The following common documentation is required to standardize risk management practices within a project, program, or across an entire organization:

- Risk identification, classification, mitigation, and response plans
- Documented quantitative and qualitative risk analysis methodologies and guidelines
- Standard Risk Breakdown Structure (RBS) and integration with WBS/CBS
- Documented contingency development and management methodologies

Toronto Hydro has standard practices developed and logged under a Microsoft Access database which is used as the organization's centralized risk management tool. When a project is initiated under the program, all identified risks will be logged under the risk management tool.

Currently, Toronto Hydro is grouping risks in two categories:

- Program Variance Log (PVL): Risks that have already occurred or have a probability of occurring that is greater than 70% (logged in an Excel spreadsheet)
- Enterprise Risk Log (ERL): Risks whose probability of occurrence is less than 70% (logged in an Access database)

All the risks are qualified and review regularly to quantify pre- and post-mitigation risk exposure. Once risks are closed out, they are no longer tracked for the project, but they are used as historical input on future projects. Considering that Toronto Hydro's current risk practices are fairly mature we believe that the organization would benefit the most from documenting this process formally as a procedure to ensure consistency and accuracy of the practice across the organization.

7.2 Practices and Resources

As mentioned above, Toronto Hydro has standard risk management practices developed and logged in a Microsoft Access database which services as the organization's centralized risk management tool. Project risks are defined during the project initiation stage and are logged with the PVL or the ERL depending on their probability of occurrence. Project risks are reviewed regularly until they are realized or closed out. Historical risk information is used as feedback and input into future project planning.

From an organizational perspective, Toronto Hydro does not have a dedicated team to manage risks on an enterprise level and to lead risk workshops to identify and quantify project risks and mitigation strategies.

Contingency development and tracking are performed by PMCs when they are developing the project budgets but there are no specific documented guidelines or defined roles and responsibilities to ensure contingency is allocated consistently.

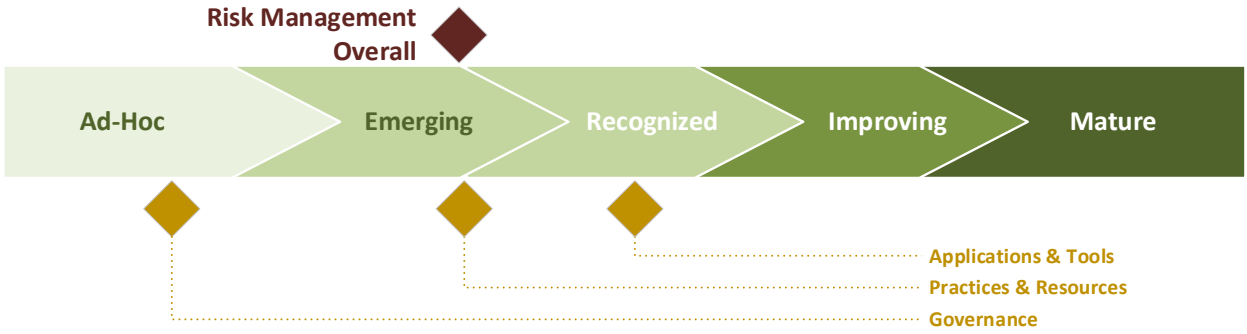
7.3 Applications and Tools

Risks, depending on their probability of the occurrence are logged either in Microsoft Excel (PVL) or within a Microsoft Access Database (ERL)

Toronto Hydro is aware of the need for adopting an integrated application for identifying, managing, and mitigating the risk on both the project and program levels. Although the two current platforms (Excel and Access Database) are sufficient to meet Toronto Hydro's needs, an Enterprise Risk Management platform could be considered if the project load is expected to grow in the future.

7.4 Conclusions and Recommendations

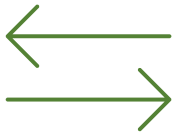
Figure 7.1 – Overall Risk and Contingency Management Rating



Based on the observations identified in the sections above, we recommend the following:

1. Develop and implement an Enterprise Risk Management (corporate-wide) strategy for all the Toronto Hydro divisions and stakeholders in charge of executing different phases of the projects.
2. Assure that Risk Management is covered under program and project dashboards including pre and post mitigated impacts, probabilities, and contingencies.
3. Plan for transitioning from current stand-alone MS-Access database and Excel spreadsheets into an Enterprise Risk Management tool (which could be hosted as a cloud service and accessible from different stations and construction sites).
4. Manage a multi-Layer contingency strategy by assigning and tracking the contingencies separately from project and program budgets, so that the management team would always have a clear picture of how much has been withdrawn from project contingencies or program reserve. Similar steps should be taken with regards to project schedule float or management reserves when it comes to program target dates.

8 Change Management



In this section, we have detailed the team's findings relating to Toronto Hydro's change management practices to assess how changes to project scope, schedule, and cost are communicated by the project teams, reviewed, assessed, approved, and implemented.

8.1 Process, Governance, and Standards

Currently, any potential changes to projects (scope, cost, schedule) are initiated, tracked, and managed using Toronto Hydro's SAP system as a centralized and integrated database system. While the use of SAP to manage project change is a generally accepted practice across the organization, Toronto Hydro would benefit from a documented change management process. A documented and standardized change management process would benefit Toronto Hydro through the following areas:

- All change-related information (requests, approval status, etc.,) will be logged in a standardized manner for ongoing and completed projects which will make project closeout easier.
- Project-level change information can be rolled up to the program and portfolio level to allow senior management to track high-level change trends to help inform strategic decisions.
- Having all the change information logged and organized will greatly support Toronto Hydro's abilities to mitigate any project claims should they arise.

The following common documentation is typically required to standardize change management practices within a project, program, or across an entire organization:

- Change management plan (Including forms, formats, level of authorities)
- Change initiation, assessment, and approval processes
- Change management roles and responsibilities (Authorized individuals for raising a change request to personnel with approval authority)
- Historical change management Information
- Claims and disputes mitigation and management plan

Currently, Toronto Hydro manages project change through a Change Request (CR) which, as mentioned above, is processed through SAP using standardized templates and formats. The level of authority required to approve a CR is determined by the financial impact of each change requested. The standard CR process under SAP covers various types of changes (scope, schedule, cost, etc.), comes with a pre-defined request/approval workflow already built-in, and allows for access to historical CRs on any given project all within the same module under SAP. Using SAP for change management is a great way for Toronto Hydro to keep all change data centralized and easily accessible and to ensure consistency in the change management process.

Internally to Toronto Hydro, if a certain project is nearing the limit of its budget and trending towards exceeding it, conditional approval to proceed is granted until the change request is approved for additional budget. Typically, the project will be instructed to proceed at a slower place under the CR is approved.

Externally, contractors, suppliers, and vendors are not authorized to proceed with any work at risk (beyond the approved budget) and must obtain an approved CR before continuing any further work.

The CR process has the following requirements and predefined thresholds:

- CAPEX projects: A change request is required if the total variance value is more than 100K$
- OPEX project: The threshold for the OPEX project is 50K$.
- Exemption: Changes less than the set threshold above don't need a change request.

The PMO actively monitors project budgets, actual costs, and forecasts frequently to track projects and flag potential upcoming change requests.

8.2 Practices and Resources

Internal project stakeholders submitting a CR are responsible for performing all the necessary follow-up activities to ensure the change request is processed, while the PMO is responsible to provide oversight over the process, making sure that it is followed. Any pending, in progress, or completed actions related to change requests are logged and tracked from initiation through to completion. An impact analysis is performed for the change request using the CLM 1/2/3 module within SAP to evaluate the potential effects of the CR on the given project before it is approved.

External project stakeholders (suppliers, vendors, contractors) change requests are managed by the Toronto Hydro contract administrators. The contract administrators receive change requests from the external party, log it under SAP, perform the necessary follow-up actions until the request is approved or rejected, and then communicate back to the external party.

While the change process itself is in place and functioning, Toronto Hydro has not implemented an organizational chart with roles and responsibilities to identify the individuals responsible for change management and has not provided any formal training to those responsible for this process.

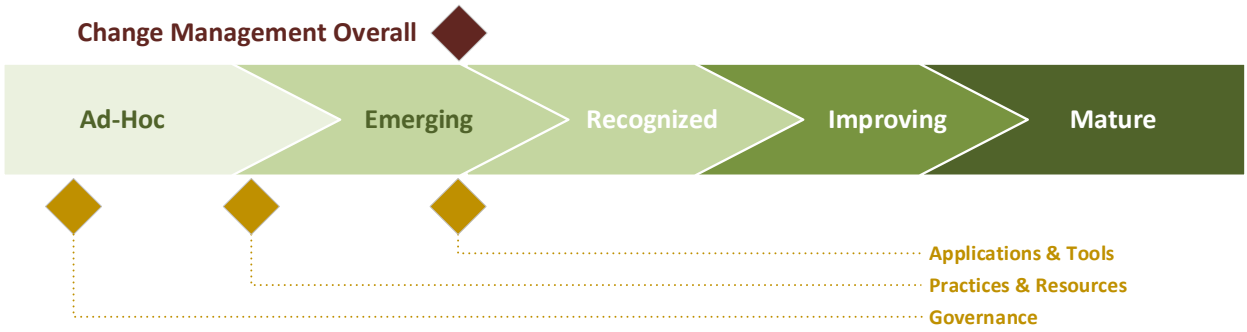
8.3 Applications and Tools

Toronto Hydro's CR process is entirely embedded within SAP and all internal stakeholders have access to change information (varying depending on their level of authority). All the historical change request information and data are easily accessible through the SAP system which presents a great opportunity to use this information for benchmarking and lessons learned initiatives for future projects. External change requests are communicated through Contract Administrators and processed through SAP as well, however, this process can create additional workload for Toronto Hydro to process the external requests.

Given that project data such as schedules, budgets and scopes are not stored under the same platform (centralized database) updating this data to reflect an approved change request is often a manual process that presents the risk of error during data entry.

8.4 Conclusions and Recommendations

Figure 8.1 – Change Management Rating



Based on the observations identified in the sections above, we recommend the following:

1. At this time, the PMO is just overseeing the change management process while it is performed by Contract Administrators (outside of the PMO). The disconnect between the PMO and the Contract Administrators could pose risks of not having the impacts of the change requests communicated up to the PMO for consideration from a portfolio perspective. We recommend that the change management process be brought entirely within the scope of the PMO.
2. PMO needs to add and update all the change-related information (at least the major ones) into program and projects performance management dashboards.
3. CRs are well maintained as a single element with SAP at this time, however, the PMO should consider further integration with scope, schedule, and cost to minimize the efforts and risk associated with manually updating project information every time a change is approved.

9 Performance Management and Reporting

In this section, we have detailed the team's findings relating to Toronto Hydro's performance management and reporting practices to assess how project performance is measured, assessed, and communicated throughout the various levels of the organization.

9.1 Process, Governance, and Standards

Currently, Toronto Hydro's performance management and reporting practices are not governed by a documented set of processes and procedures. Having this process formally documented and standardized would help better communicate the status of the corporate, program, and project goals concerning performance measurement and reporting. Comprehensive performance management and reporting framework typically include details relating to:

- Setting reporting requirements to provide management with the necessary strategic information.
- Performance calculation methods such as physical progress calculations, EVM, forecasting of the expected finish/required budget to complete/final cost of deliverables.
- Standard central data repository ("Single Source of Truth") provides all stakeholders with the necessary information for informed decision-making.
- Requirements for the project, program, portfolio, and enterprise-level dashboards (one-page report developed for different levels within Toronto Hydro) to provide a brief and up-to-date status of completed ongoing, and planned work.

9.2 Practices and Resources

Project and program performance management and reporting within Toronto Hydro is not performed by a centralized reporting team, rather different groups within the organization have responsibilities for different reporting functions as outlined below.

Toronto Hydro Supervisors are responsible for developing and maintaining the Management Controls and Reporting System (MCRS) which is a guideline providing details around reporting such as information to report, level of details, reporting frequency, etc. This is typically information that would be communicated through a reporting governance or procedure document. The team observed that the MCRS has been adopted across the entire organization which ensures a standardized approach to reporting. The MCRS covers reporting at the project level up to the program level and provides templates for generic reports. MCRS data is stored under a centralized library which includes historical action logs dating back up to five years, depending on project size. It was observed that Toronto Hydro also has an MCRS report, but it is not issued regularly, rather more on an as-required basis. The MCRS reports provide details at the project level, this information is then summarized in higher-level reports, discussed below.

PMCs are responsible for developing the Program Delivery Report (PDR) which essentially places them as the primary stakeholders in charge of developing reports for the PMO. PDR reports are developed by PMCs for their associated RCs (These reports are developed after the release of capital expense reports

monthly), and PMO gathers these reports and consolidates all the results under one package. The PDRs provide a summary of all projects with a particular RC portfolio.

Other reporting within Toronto Hydro includes:

- Design Readiness Reports – developed by Engineering
- Maintenance Summary Reports – developed by the Construction Team
- External stakeholder (suppliers, contractors, vendors) updates – provided through regular communication with the Contract Administrators who manually communicate any important details to the internal stakeholders within Toronto Hydro

From an organizational perspective, Toronto Hydro has not implemented an organization chart with roles and responsibilities to identify the individuals responsible for performance monitoring and reporting.

9.3 Applications and Tools

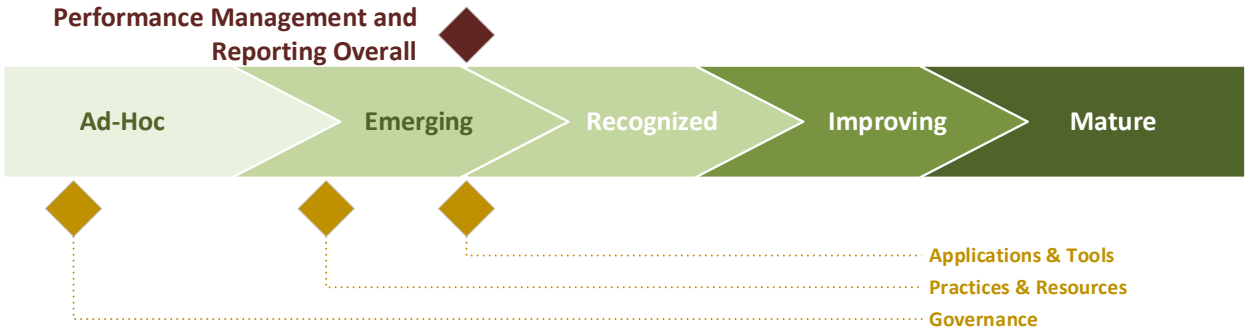
SAP and open TEXT are the primary data sources for reporting along with additional information which is extracted from various Excel spreadsheets and Access Databases. The data is then communicated through reports which are developed in SAP BI, Tableau, or Excel (primarily through Excel).

PMO-related reports are sometimes multi-layer (such as Planned Capital Project Completion Report or Design Readiness report). There are some additional dedicated reports for senior management which provide summarized data rolled up from the project level. In general, it was observed that the Toronto Hydro has formally documented any assumptions required for its PMO reporting requirements, and whenever ad-hoc reports are developed, assumptions for each report as also documented within the report so that whoever reads the report can understand how the information is being presented.

Toronto Hydro is currently transitioning the team (i.e., PMCs) from current manual reporting to using Tableau which allows them to leverage a lot of prepopulated/existing information.

9.4 Conclusions and Recommendations

Figure 9.1 – Performance Management and Reporting



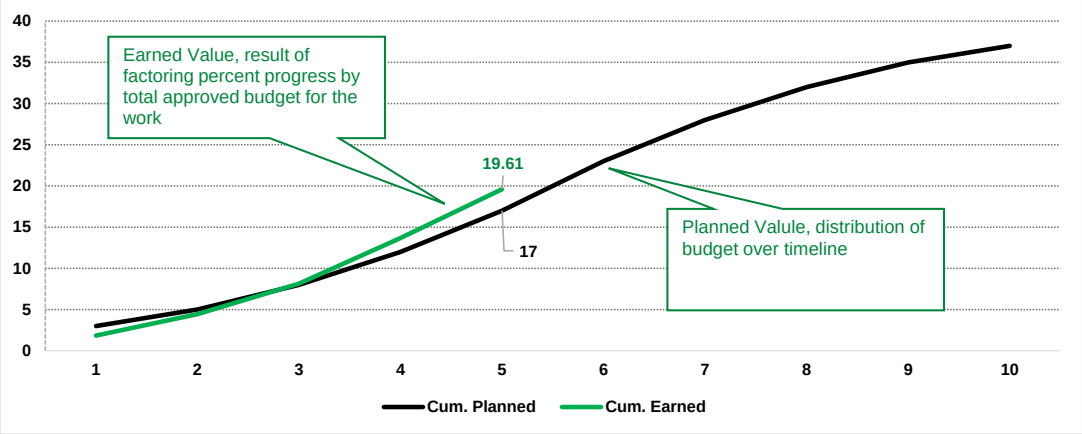
Based on the observations identified in the sections above, we recommend the following:

1. Adopt standardized performance measurement practices (even on a high-level basis) such as:
    a. Cost and schedule integration would result in alignment between budgets time spreads and work planned to be completed

b. Earned Value Management (for each phase of the project would be sufficient at this time) to support the status assessment, forecasting, and overall portfolio management.
c. Rule of Credit (It could be as simple as weighted milestones) to calculate project progress and roll it up into program levels.
d. Physical percent progress where progress is based on predefined rules of credit (such as tracking completed units against total quantities) as shown in the example in Figure 9.2 below:

Figure 9.2 – Performance Management (Physical % Progress)

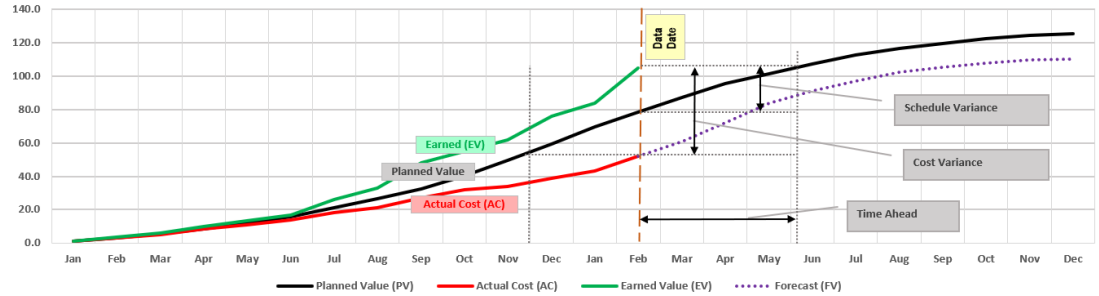
	Months									
	1	2	3	4	5	6	7	8	9	10
Planned Value	3	2	3	4	5	6	5	4	3	2
Progress	5%	7%	10%	15%	16%					
Earned Value	1.85	2.59	3.7	5.55	5.92					
Cum. Planned	3	5	8	12	17	23	28	32	35	37
Cum. Earned	1.85	4.44	8.14	13.69	19.61					



2. Include Cost Performance Index (CPI) and Schedule Performance Index (SPI) as key metrics for tracking the performance for projects (at least major/critical projects) and combine these KPIs into summaries for the program level dashboards. Implementing CPI and SPI will support the schedule variance calculations and great improve forecasting and recovery plan developments, see Figure 9.3 below:

Figure 9.3 – Performance Management (Physical % Progress)

	Year 1												Year 2											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planned Value (PV)	1.0	3.0	5.5	8.5	12.0	16.0	21.0	26.5	32.5	40.5	49.5	59.5	69.5	78.5	87.5	95.5	101.5	107.5	112.5	116.5	119.5	122.5	124.5	125.5
Actual Cost (AC)	0.9	2.9	5.1	8.4	11.0	14.0	18.0	21.0	27.0	32.0	34.0	39.0	43.0	52.0										
Earned Value (EV)	1.1	3.5	6.1	10.1	13.2	16.8	26.0	33.0	48.0	55.0	62.0	76.0	84.0	105.0										
Forecast (FV)														52.0	61.0	72.0	84.0	91.0	97.0	102.5	105.2	107.8	109.6	110.4
Schedule Variance (SV=EV-PV)	0.1	0.5	0.6	1.6	1.2	0.8	5.0	6.5	15.5	14.5	12.5	16.5	14.5	26.5										
Cost Variance (CV=EV-AC)	0.2	0.6	1.0	1.7	2.2	2.8	8.0	12.0	21.0	23.0	28.0	37.0	41.0	53.0										
SPI (EV/PV)	1.1	1.2	1.1	1.2	1.1	1.1	1.2	1.2	1.5	1.4	1.3	1.3	1.2	1.3										
CPI (EV/AC)	1.2	1.2	1.2	1.2	1.2	1.2	1.4	1.6	1.8	1.7	1.8	1.9	2.0	2.0										



3. Plan and transition toward a centralized data repository that can be updated from multiple sources (automated and manual) but will serve as the main data set for all reporting
4. Design, develop and use a series of dashboards that would serve as a simple and short way of visually communicating key reporting data.
5. Develop a centralized reporting team, corporate-wide, which will be in charge of collecting all required information, verifying the data sets, developing reports, administrating the update meetings, and maintaining the historical report repository for future needs.

10 Summary Remarks

Given Toronto Hydro's successful track record over the last 20+ years, it is evident that the organization already has the necessary knowledge and skills to manage and execute its portfolio of projects.

The most notable strengths highlighted by our team include:

- The level of interest and belief in standardized project management practices that exist with the Toronto Hydro team
- The abundance of project management practices (estimating, change management, project initiation, etc.) that are already in place within the organization
- The use of SAP (as highly capable and robust ERP) as the backbone of the program and project management practices with Toronto Hydro
- Clear channels of communication (regular meetings, data stored within SAP, reporting, etc.) are defined and followed throughout the organization which is a critical aspect of successful program/project management

Continuous improvement as an ongoing initiative for Toronto Hydro is one of the key drivers for this assessment. As such, below we summarized some of the key areas for improvement for Toronto Hydro to focus on to help improve its existing PMO capabilities:

- Although there are many project management practices in place within the organization, they are largely undocumented in terms of governance, guidelines, processes, and procedures. Formalizing existing processes already in place as well as identifying and developing any additional processes should be the top priority for Toronto Hydro as this proactive action will provide the most benefit in terms of standardizing and improving its overall project management capabilities.
- Scheduling as a practice is generally underdefined and not implemented within the organization consistently. We recommend scheduling be a second key area of focus for improvement for Toronto Hydro as it can impact other areas of project management such as cost, forecasting, change management, etc. Improving scheduling as a function will improve the overall project management capabilities of the organization as a whole.
- To help further develop its project management capabilities we also recommend Toronto Hydro engage with AACE and the PMI to adopt and remain up to date with modern and innovative program/project management practices.

Overall Toronto Hydro's already capable PMO can extract the most benefit from implementing organizational measures to formalize, document, and integrate all of the (existing and yet to be developed) processes and procedures as well as defining the organizational structure and roles and responsibilities for all of the functional disciplines within the PMO.

FINAL SUMMARY REPORT

PMO BEST PRACTICES ASSESSMENT

APPENDICES

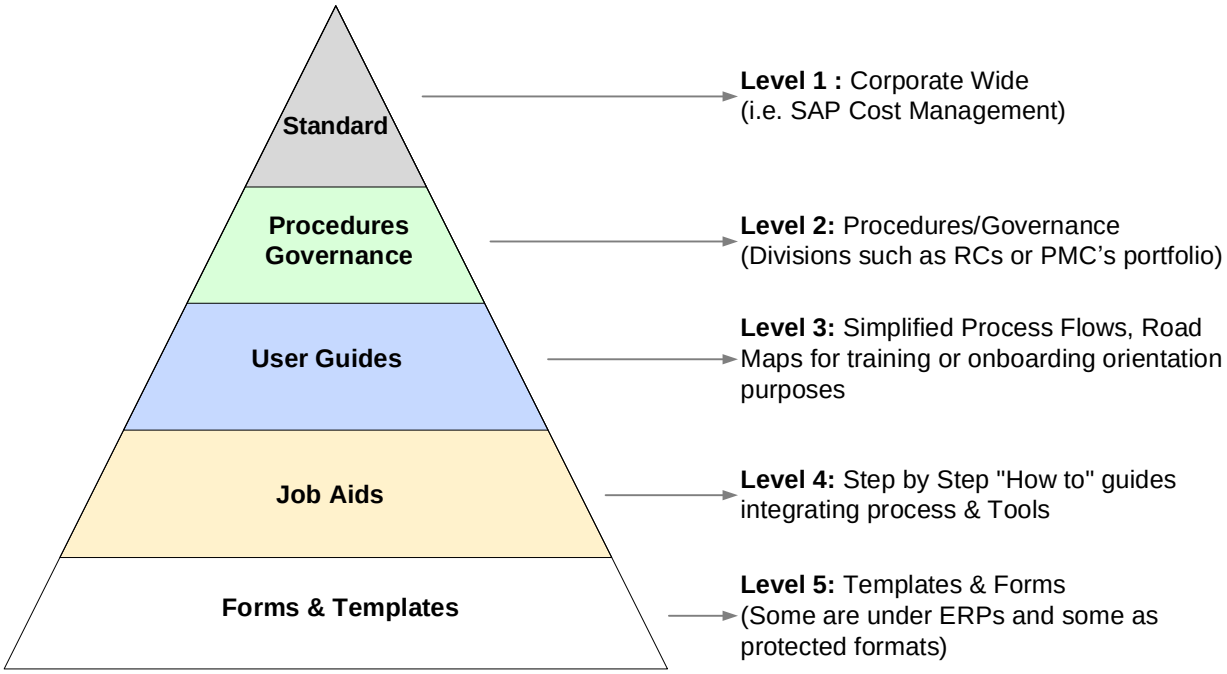
SUBMITTED BY:
Comtech Group Inc.

DATE SUBMITTED:
Feb 17th, 2022

Appendix A: Proposed Document Hierarchy

Any management system is required to adopt a breakdown for its documentation (governance & procedures down to forms & formats) to organize the compliance, alignment, and revision control at the enterprise level.

A typical documentation breakdown could be similar to the following model:



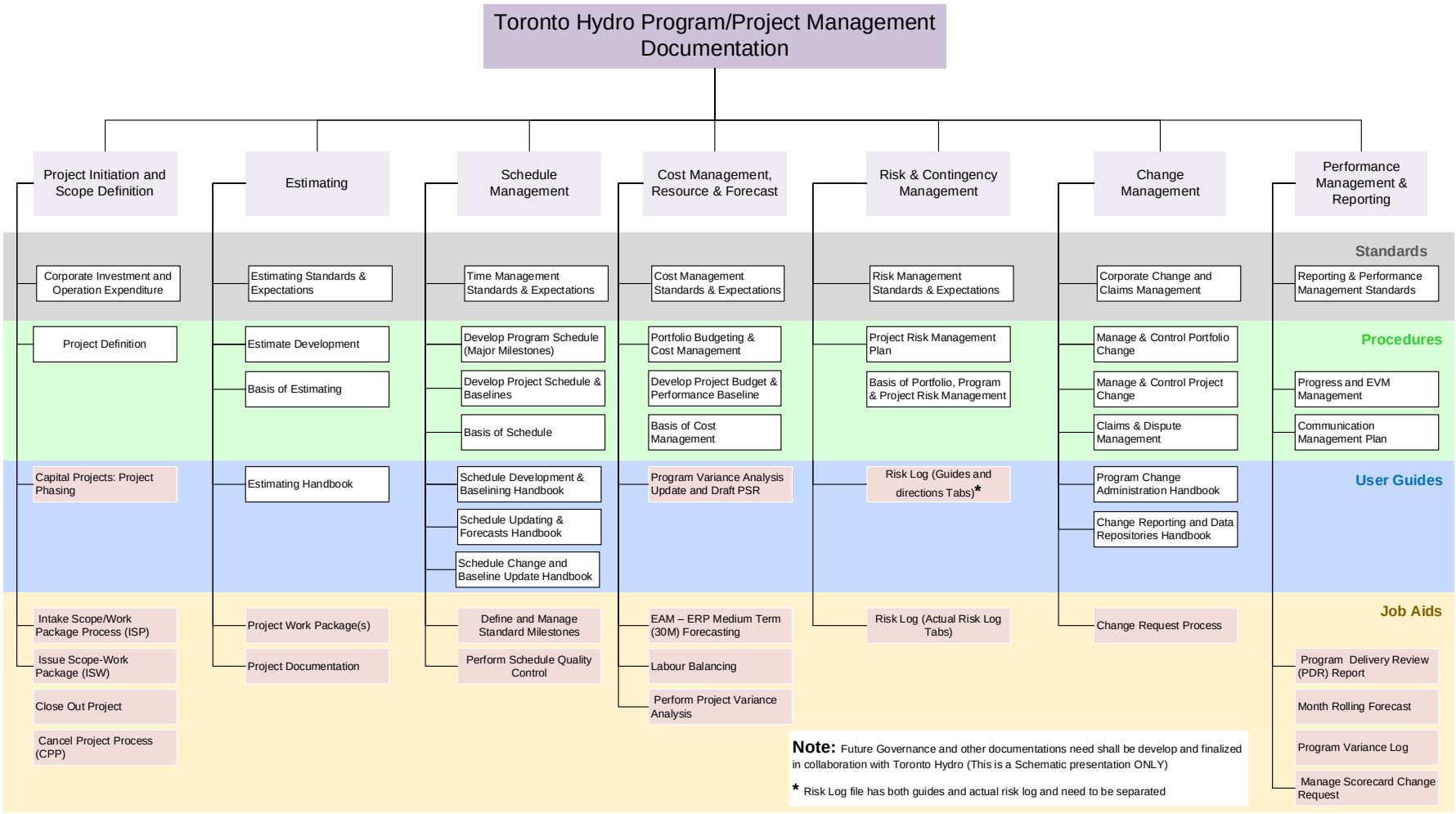
Our assessment team developed a schematic document hierarchy based on the breakdown above, which could be used as a guide to start a detailed review and planning with Toronto Hydro's team.

In the diagram that follows, red items are those documents that a copy of them is provided to the assessment team and white items are suggestions for new documentation.

TORONTO HYDRO

Corporate PMO Documentation Hierarchy (Typical Structure – To be Finalized)

Comtech



Appendix B: Sample Dashboard (Generic)

Project Management Review Package: PROJECT January 2022

Review Date: Jan 15th, 2022

TORONTO HYDRO

Safety

1 Discuss any project Safety Issues
2 Perhaps share a specific technical safety design issue challenging the project at each meeting
3

Executive Summary / Overview

30,000 ft

1 Overall, the RC's portfolio projects status, challenges, overall budget and cost
ENSURE TO ADDRESS KEY NEGATIVE VARIANCES FROM PLAN IN THE EXEC SUMMARY, IE. WHY THERE IS A VARIANCE, AND HOW YOU PLAN TO ADDRESS/RESOLVE IT.

Progress

			Planned	Completed	Earned	%
1	On Plan	Total Deliverables	230	218	-	95%
		To-Date Deliverables	532	495	-	93%
		Life-To-Date Workhours	34,000	28,500	27,900	82%

Priorities

1 Finalize the ongoing project charters and discussion with two major customers
2 Prepare deliverable-based **bottoms-up estimate** for XXX and ZZZ Projects
3 Finalize design basis for Project 1234 & 9876
4 Hire 5 resources to complete xyz by December to .....
5

Key Accomplishments this month

1 Issued all (5 of 5) Work packages for main challenging projects
2 Issued first WP related to xyz system
3 Held information session on. .....
4 Resolved xyz design inputs with Major customers
5 90% complete the specification for .....
6

Committed Accomplishments Planned in next Month

1 Complete .....
2 Start design substantiation of .....
3 Hire 3 process engineers
4 Issue 5 work packages for xyz Project .....
5 Brainstorming / whiteboarding session for xyz deliverable to .....
6

Resource Management

1 -10% Variance from Plan
2 Discuss Status of Resource ramp up - either internally at Toronto Hydro, or through partnerships / external engagement.

Explanation of Variance from Plan --> We are behind by 1 FTE's, 1 Civil/Structural to focus on preliminary engage for .....

Planned FTE's	10
Actual FTE's	9
Variance from Plan	**-1**

Cost / Budget

$ '000

1 -1% Variance from Planned Cost Expenditure
2 Variance from plan is timing only, not execution related - represents delayed major projects approval to support Engineering. Expect to have the project back on track by Q3-2022

Planned Cost Expenditure	$	234
Actual Cost	$	232
Variance from Plan	**$**	**(2)**

Schedule Activities (** near-term ~3-6mos)

** Program Milestones to be tracked separately

#	Activity Description	days away	Plan	Forecast	Actual	Variance
1	Xyz deliverable mildly late	256	10/Sep/22	12/Sep/22	13/Sep/22	3
2	Finalize WBS	261	15/Sep/22	20/Sep/22		5
3	Xyz deliverable	264	18/Sep/22	18/Sep/22		0
4	Xyz deliverable	319	12/Nov/22	12/Nov/22		0
5	Xyz deliverable	324	17/Nov/22	17/Nov/22		0
6	Xyz deliverable	339	2/Dec/22	2/Dec/22		0
7	Xyz deliverable	342	5/Dec/22	8/Dec/22		3
8	Xyz deliverable that is really late	342	5/Dec/22	23/Jan/22		-316
9	Finalize Deliverable-based Estimate for Prelim Eng'g	367	30/Dec/22	12/Jan/22		-352
10	Finalize Deliverable-based Estimate for Prelim Eng'g	367	30/Dec/22	12/Jan/22		-352

Top 3 Issues and Actions to Resolve

#	Description	Action(s) to Resolve
1	COVID has negatively impacted supply chain and Toronto Hydro may have challenges with some major equipment purchase	Work on Long Lead and critical item list and develop priorities
2	Issue	What we are doing about it.....

Risk & Opportunities

#	Description	Action(s) tracked in MS Planner
1	Pandemic is negatively impacting the job market and availability of qualified resources	Action:
2	Risk:	Action:
3	Opportunity: to collaborate with ..... To resolve	Action:
4	STAFFING RISK - The Program will not achieve sufficient progress if resources are not planned and engaged pre the Program plan.	

Safety: In everything we do ------ Agile: Simplistic and Practical. Follow the 80:20 Rule ------ Accountability: Say It, Do It. One Team helping each other with Accountability ------ Make Progress: The secret to getting ahead is GETTING STARTED

Appendix C: Sample Integration Management Plan

Plan	Document Number:	Revision
Title: PROJECT INTEGRATION MANAGEMENT		

Project Integration Management Plan Template

[Document Number]
[Date]

Prepared by:

Reviewed by:

Approved by:

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Title: PROJECT INTEGRATION MANAGEMENT			

Revision Summary

Revision Number	Date	Comments
RError! Reference source not found.	YYYY-MM-DD	Describe the Revision Summary Information

1.0 DIRECTION

The Project Integration Management Plan delivers direction on the process of integration when it comes to establishing and functioning an effective program/project management environment from initiation of projects down to closeout process. This management plan is in alignment with the organization's standards for PMO and Project Controls practices.

2.0 INTRODUCTION

Integration Management covers all the required activities and functions when it comes to Project Controls and Management methods and harmonization of all responsibilities from involved stakeholders. The Integration Plan is the main protocol through which the management teams guarantee that all Project Management Office required steps and expectations, and deliverables are sufficiently established, harmonized, succeeded, and aligned.

3.0 INTEGRATION PROCESSES

The following practices are typically configured the integration process and are used when it comes to aligning and coordinating deliverables around project management requirements by the management team :

- Develop Business Case or Investment Plan
- Develop Project and other required Management Plan
- Accomplish Project Work
- Project Work tracking and controlling
- Implement and execute a Change Control Process
- Perform Project Closeout (Including all the required documentation)

3.1 Develop Business Case/Investment Plan

The investment plan (Business Case) is developed when management teams (most of the time led by the project manager) are initiating the Project to respond to a problem/need/expansion/regulatory obligation or other similar causes and define the project goals. The Investment Plan standard format is developed and shall be followed to facilitate the creation, review, and approval of the document and includes the following components:

- Historical, regulatory, expansion information in support of defining the project;
- List all those possible gaps or issues which the project is defined to address;
- Summary on financial requirements, high level, and target dates;
- Summary on potential Risks and Opportunities;
- Environmental, Regulatory and Safety Obligations;
- High-level resource and external vendors requirements;
- Results, deliverables which project would provide by its completion;

The investment plan must be reviewed and approved by:

- Investment Management (Capital, Operation, Regulatory);
- Engineering Team;
- Construction Team;
- Procurement Management (Focused on Long Lead Material);
- Program Management Office

Once approved, the investment plan turns into one of the major components of the Scope Management process.

3.2 Develop Project Management Plan (PMP)

The Project Management Plan (PMP) is initially developed during the Initiation phase and contains planned project work to be used to guide project execution. The Project Manager is responsible for developing PMP with support and contribution from all stakeholders as required.

PMP shall include the following areas:

- Project Summary;
- Regulatory, Safety and Environmental Obligations;
- Basis of Estimate / Financial Summary;
- Contract Management Strategy;
- Project Organization and Communication Plan;
- Scope Management;
- Schedule Plan;
- Cost Control Plan;
- Risk Management;
- Quality Management;
- Project Management and Control;
- Appendices and Related Documentation;
- Other supporting documentation;

As mentioned, the plan shall be developed as all stakeholders' contribution and needs to be acknowledged and followed by all parties. Past Similar completed projects information, lessons learned, and industry's best practices shall be considered in this when it comes to developing the plan.

Initial scope, high-level schedule, and required budget risks among their mitigation plans, and contingencies shall be recorded under the first revision of the Management plan and is updated as required. The management team needs to assure that they review and update (as required) the Project Management Plan as the project progresses and better definition of Engineering, Deliverables and detailed requirements are available to the project team.

The chart below shows the main steps toward developing a management and Investment plan.

3.2.1 Scope (Deliverables)

Scope documents shall include the deliverables (including services and other subjects) which the project will have completed by the end of it. Defining the scope (as detailed as possible) is a critical requirement for project success.
Sets of these activities consist the "Scope Management" and include the following areas:

- Project Objectives Definition;
- Requirements, basis, and assumptions;
- Scope Details (including a brief description of each scope item);
- Project Work Breakdown Structure (WBS) and deliverables identified under it;
- Scope Confirmation and possible gaps identification;

The scope document would be developed as per bottom-up practices; stakeholders would develop their deliverables list and communicate them with the management team (Project Manager as main responsible). The project Manager consolidates all the information, assures projects goals are met, required standards and regulatory obligations are considered, and maintains the single integrated Project Scope list.

Scope document shall be reviewed, and updated as required when the project progresses from initiation up to end of Detailed Design. It's preferred to freeze the scope document before construction (or installation) starts and manage any further updates through the change control process.

3.2.2 Work Breakdown Structure (WBS)

The work breakdown structure shall be in alignment with the needs and requirements of the organization and directed standard format. Codes, Deliverables, and Control Accounts shall be identified, verified, and confirmed by project stakeholders.

The Work Breakdown Structure shall cover:

- Programs: Corporate, Major Divisions, Project Bundles;
- Projects: Project, Phases, Sub-Phase, Control Accounts, Deliverables;

3.2.3 Schedule

The project schedule is the backbone of project management and control methodology, and all the PMO disciplines need to get integrated under the schedule. The schedule shall be detailed enough (considering the project phase and level of completion) so all parties would easily understand and use it as a communication basis over the project life cycle. The schedule needs to be developed based on a predefined WBS, contains interrelationships and dependencies among activities, and provides target dates for deliverables completion. The project team may use the WBS as CBS and post developing key activities, start/finish dates, durations and resources use the schedule for the basis of developing the budget.

The project team, under the project manager's lead, shall identify the project's "Critical Path" under the schedule, monitor the forecast dates on the critical path to keep the project on time.

Post Schedule and Budget development and agreed, a copy of them (Baseline) will be developed and used as a performance measurement basis for the whole project life cycle.

3.2.4 Contract Strategy

The project team is required to investigate all the possible options to complete the project as successful as possible and this would include an assessment on any requirements to outsource or hire team members for the project. The organization's capabilities, past completed projects, workload, risks, and other strategic factors shall be considered before finalizing the contract strategy for a project.

3.2.5 Estimate

The estimating team needs to start its support to the project and its management team right after the initiation phase is completed and approved. They're required to develop the estimates as per the organization's approved methods, following the approved Work Breakdown Structure and among with the Basis of Estimate. The Estimating team continues supporting the project until the performance baselines are developed.

The estimating team shall also be involved in any major change preparation plus after project completion needs to obtain all the actual quantities and incorporate the information in their library data and for future Estimate preparations.

3.2.6 Budget and Cost Control

The cost control team works closely with the project team (Project Manager, Estimating and Scheduling teams, other stakeholders), developing project budget based on the standard WBS, and down to deliverables (if the project maturity permits), developing all the Risk response fundings and assign them into dedicated accounts.

Post the project budget completion, the cost control team shall review, discuss and obtain approval on the budget from all stakeholders. Developing the project baseline (including direct, indirect, and cost-only elements) completes the cost control team's

deliverables. All further changes, including a possible required new baseline establishment, will be managed under the Change Control process.

3.2.7 Risk

Risk management practices, need to cover:

- Risk Identification;
- Risk probability and impact assessment;
- The risk score and priority development;
- Risk response and mitigation plan;
- Risk monitoring and tracking reports;

The risk management team shall perform listed activities above as per the list above and according to the corporate's Risk Management Standard.
Risks are required to be managed at the program and project levels.

3.3 Monitor and Control Project Work

Outputs from the Integration activities will cover change requests, performance dashboards and updates, updates on the project management plan, and project data repository updates.

The Project Control team is in charge of following, studying, and controlling project progress, changes and adjustments to meet performance purposes. Project performance tracking shall be completed through key performance indexes (KPIs) and approved performance baselines (Scope, Cost, and Schedule). Baselines for scope, cost, and schedule are established when funding is approved at each project's main phase such as initiation, conceptual design, preliminary design, detailed design, etc. Baselines shall be logged under Investment Plans, PMPs, and any other funding release documentation plus corporate source systems (i.e., SAP or Primavera).

The Reporting processes shall be performed as corporate's standards for communication and performance measurements. The project progresses, occurred and accruals costs, variances in comparison with performance baselines, risks, issues, and forecasting shall be the major components of any project report.

Project controls shall be applied throughout the entire life cycle of projects. New performance baselines may be established as the projects are progressing to reflect the newest approved target dates and released fundings.
The project team, as per the scalability level of Project Controls, has to identify and log the following setups (Sample values are provided):

No.	Discipline	Alignment Level	Source System
1	Scope	WBS (Or CBS), Control Accounts, Deliverables	SAP
2	Estimate	WBS (Or CBS), Control Accounts, Deliverables	SAP, Cleopatra
3	Schedule	WBS, Deliverables and Major Milestones	MS-Project, P6
4	Budget	WBS/CBS, Deliverables, Control Accounts	SAP, EcoSys
5	Risk	Deliverables as per WBS	SAP, ARM

No.	Discipline	Alignment Level	Source System
6	Changes	Deliverables as per WBS	EcoSys, SAP
7	Actions	Deliverables or Individuals, Stakeholders	Action Tracking, Other databases
8	Lessons Learned	Projects, Program, Deliverables, Phases	Any approved ERP or database
9	Closeout Documentation	Projects, Program, Deliverables, Phases	Any approved ERP or database

The planned work shall be progressed and managed as planned under the project management plan.
The following actions and communications are required to assure the proper progress and completion of the project:

- Schedule review meetings;
- Budget occurred cost and forecast review meetings;
- Performance(KPIs as SPI, CPI, Overall Progress) review meetings;
- Risk workshops and review meetings;
- Overall Oversight Meetings/Reviews;
- Develop and review multi-layer dashboards and metrics
- Program/Projects Change review and monitoring meetings/reports

Project Controls team members are the main supporting group to the Project Manager by performing the following activities as per corporate's standards:

- Planning and Time Management;
- Budgeting, Cost Controls and Forecasting;
- Dashboards and Reports Development;
- Risk and Contingency Management;
- Perform Integrated Change Control;
- Program/Projects Documentation;

3.4 Perform Integrated Change Control

The Change Control process includes recognizing, assessing, and supervision on changes all over the project life cycle. The change could impact scope, cost, schedule, or a mixture of all items. The change control process shall be designed and delivered as an integrated process that covers all the areas of project management and control. Key results of this change control process are:

- Project Change Log (With their status);
- Approved change requests (with supporting documentation);
- Project Management Plan and other project updates;

Not all the approved changes shall result in a baseline update and the process shall make all the information available to the management who is in charge of approving change requests.

Change control is not planned to rearrange a project plan due to low performance and over budget results; the process recommends when changes are allowed and the level of approval required.

3.5 Close Project or Phase

The integration process completes by logging the final project results, completed scope, and other deliverables.

The project shall go through a formal closing process which needs to include handing over all the assets and complete scopes to the final users (such as Operations), closing out all contracts, finalizing project costs and closing the accounts, ensuring all new or revised documentation (specifications, drawings, calculations, etc.) have been received and approved, documented, and finally, lessons learned are received and logged.

The Project Manager is the main responsible individual for closing the project with the support of all other stakeholders.

4.0 DEFINITIONS & ACRONYMS

4.1 Definitions

Performance is the proportional relation between the target value of progress over a certain period of time and the actual achieved progress.

Variance is the insignificant difference between planned and actual or forecasted progress or cost.

Work Breakdown Structure (WBS) work-breakdown structure is a major deliverable breakdown of a project into smaller and manageable components.

4.2 Acronyms and Shortenings

CPI Cost Performance Index
EV Earned Value
KPI Key Performance Indicator
PMP Project Management Plan
SPI Schedule Performance Index
WBS Work Breakdown Structure
CBS Cost Breakdown Structure

5.0 ARCHIVES AND REFERENCES

5.1 References

- Documents No. 11111-1
- Documents No. 11111-2
- Documents No. 11111-3

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- Documents No. 11111-5
- Documents No. 11111-6
-

Appendix D: Sample Scope Management Plan

Plan	Document Number:	Revision
Title: PROJECT SCOPE MANAGEMENT		

Project Scope Management Plan Template

[Document Number]
[Date]

Prepared by:

Reviewed by:

Approved by:

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Revision Summary

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RError! Reference source not found.	YYYY-MM-DD	Initial Issue

1.0 DIRECTION

Project Scope contains the set of deliverables based on the requirements defined for the project, assumptions, exclusions, and constraints.

Defining the project scope is an important phase of the project and a critical factor for project success as it creates the basis for the project cost, schedule, uncertainties and risks caused by them, contracts and commitments, and strategic moves within the organization.

A well defined and detailed project scope is a great input to estimating, scheduling and budgeting of that project and would eliminate lots of risks from the project path when it enters the execution.

The Project Manager is the main responsible for developing the scope and managing the collaborative process team work around it. The project manager remains as the owner of the scope for the whole project life cycle and shall include any possible update or changes in the scope document as they occur.

1.1 Outline

The main steps of defining and managing project scope are:

- Comprehend, communicate and well document the objectives for the project;
- Gather all requirements and supporting data;
- Identify and log constraints and assumptions for the project;
- Challenge scope and innovative options to enhance value for money;
- Align the scope element with the standard Work Breakdown Structure (WBS);
- Develop guidelines for scope completion verification and utilized them;
- Track and control the scope (including enforcing scope change management);

The scoping process shall be integrated with the project phases and completion. The scope of work for each consequential phase of the project shall be identified and logged plus being compared to the whole scope prior to starting that phase.

2.0 SCOPING PROCESS

2.1 Define Project Objectives

Project objectives are defined in response to:

- Need or gap (for example identified through a walkdown or a self assessment;
- Opportunity for improvement or enhancement;
- Regulatory, environmental or standard obligation;
- Strategic capital expansion program;
- Routine repair, replacement or inspection activities;
- Other required modifications;

These objectives shall be properly broken-down and being translated into elements of deliverables which they form the scope.

This is process is normally listed and approved under project charter, scope request forms or investment plans. It is vital that the need be attentive on the subject or opportunity and not a predetermined reason or indication. The purposes shall be defined on the anticipated end result with clearly recognised accomplishment standards.

Using predetermined reasons and resolutions can frequently change the concentration away from gaining the best value for money and perhaps from shaping the true cause and best resolution. This may possibly result in substantial scope changes and adversative cost and schedule effects. All scope changes shall be approved by the Project Sponsor through predefined processes and under the recognized tools. For less composite projects the scope may be predetermined, for example a "like for like" replacement which would skip phases like detailed engineering.

2.2 Gathering Requirements

Collecting requirements includes identifying all the limitations and necessities associated with addressing the need or opportunity. It contains identifying, documenting and responding to stakeholders' requirements and expectations concerning project purposes.

Required information around the scope could be gathered from a variation of sources including:

- Project Charter, Business Case or Investment Plan;
- Stakeholders (Project Sponsor, Engineering and System Engineers, Operation & Maintenance team, Supply Chain, Regulatory and Environmental Team, Contract Management, Subject Matter Experts, Contractors, etc.);
- Regulatory and Standards requirements and commitments;
- Asset Management information (System Health, Condition Assessment reports);
- Safety Reports and safety related incidents logs;
- Workshops and brain storming sessions;
- Lessons learned;
- Industry best practices;
- OPEX;
- Risk logs and response plans;
- Corporation governances;

Throughout this development it is significant to ensure value for money and to narrow the scope is considered and performed as much as possible. There must be agreement on the project purposes, limitations and prohibitions. The necessities form the foundation for which substitute selections and resolutions are established to accomplish the objectives.

Once the suggested substitute is corresponded by the stakeholders, the detailed scope, plan and cost requirements to deliver the scope must be determined.

2.3 Define the Scope Details

The scope and deliverables for the subsequent project phase must be planned and well-defined in detail. This process will be directed by the project manager and by the support of project stakeholders.

The scope and deliverables for the balance of the project may also be determined based on available information at the time. Typically, this is done at a high level and with far less detail as the specifics are yet to be developed.

The scoping process continues as additional details become known. Once the design is nearly complete, the scope and deliverables for procurement, installation and commissioning can be further defined in detail and finalized into work packages.

2.4 Project Components Supporting the Scoping Process

2.4.1 Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) is a deliverable-oriented breakdown of the project structure created to divide and organize the project's entire scope of work into a hierarchy of alliances for the main project deliverables.

The WBS will prescribe the construction of how the project scope is estimated, scheduled, monitored and controlled and therefore should be broken down to a suitable level of detail.

Areas to consider when producing the WBS include:

- Program/portfolio breakdown necessities;
- Common work that can be monitored as a group;
- Separating the project into major types or areas of work;
- The quantity of detail mandatory to successfully monitor the project;
- Contracting, design and construction strategies;

2.5 Scope Verification

Scope verification is the recognised corporation reception of the accomplished project scope deliverables. Confirmation is a continuous and periodic process through the project lifecycle. Scope confirmation and reception includes:

- Engineering Deliverables reviews, comments, approvals;
- Material and equipment receiving and acceptance;
- Inspection and walkdown reports and minutes;
- Manufacturing and vendor factory reports or inspection logs;
- Tests and Commissioning practices;
- In-Serve Acceptance and confirmation communications;

2.6 Tracking Scope

Project scope monitoring and control includes the identification and management of proposed changes to the approved project scope. Project scope changes have a high possible to impact the project performance baselines and overall value for money, therefore these changes must be carefully measured.

Project scope control is required to limit changes to only those that are unconditionally required to fulfill the project charter, business case, or investment plan. They must be efficiently communicated, understood, accepted, and align with the project purposes. Scope control must be managed with a balance of; flexibility for critical items "needs", and firmness against adding further "requirements", in order to minimize scope creep.

Some variations and supplementary scope may advance the project result and therefore should not be immediately rejected.

Possible scope changes may be identified through:

- Design reviews and self assessment;
- Stakeholders' updates and information;
- Reports and variance analysis;
- Proposals reviews and assessment;
- Performance and progress meetings;
- Field Changes;
- Regulatory or Standard changes;
- Corporate strategic changes or adjustments;

Some documents may need to be updated as soon as a scope change is happening:

- Project Charter, business case or investment plan;
- Project Management Plan;
- Basis of Estimate (BOE);
- Budgets, Cashflows or Contingency assignments;
- Performance baselines and major Milestones;
- Other Design, Procurement, Operational documents;

2.7 Scoping Applications

Scoping ERPs or databases shall be used for preparing and tracking project scope. It's expected to have business processes, standard forms and formats and the approval/assessment steps established and managed under the applications.

3.0 DEFINITIONS AND ACRONYMS

3.1 Definitions

Basis of Estimate (BOE) - Mandatory component of the cost estimate, as recommended by International standard practice organizations such as AACE or PMI. This document defines the scope and other information that forms the basis for the estimate, and eventually develops the basis for change management.

3.2 Abbreviations and Acronyms

AACE	The Association for the Advancement of Cost Engineering
BCS	Business Case Summary
BOE	Basis of Estimate
PMP	Project Management Plan
SME	Subject Matter Expert
WBS	Work Breakdown Structure

4.0 RECORDS AND REFERENCES

4.1 Records

List all the records used for the Scope Development under this section.

4.2 References

4.2.1 Performance References

List all the references used for the Scope Development under this section.

Appendix E: Sample Schedule Management Plan Template

Plan	Document Number:	Revision
Title: PROJECT SCHEDULE MANAGEMENT		

Project Schedule Management Plan Template

[Document Number]

[Date]

Prepared by:

Reviewed by:

Approved by:

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Revision Summary

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1.0 INTRODUCTION

The Project Schedule Management Plan determines how the schedule will be controlled throughout the life of the project. The schedule will be developed using the Schedule Development Process and is a part of the Schedule Management Plan. The schedule will be based on the Project WBS.

The **Project Schedule Management Plan** will include the following elements:

- The Project Schedule (Project Baseline)
- Schedule management accountabilities, Schedule Update Frequency, Schedule Monitoring and Controlling strategy, details
- The Project Schedule IT Specifications & Information Management System (IMS) Interface (identify schedule tool, produce the interface plan with all necessary project tools (cost, scope, quality, risk, etc.)).

- **Schedule Development** (as per PMBOK) is the process of defining the project components needed to produce the project deliverables, determining the order in which the components should be executed, estimating the amount of time required to complete each one, identifying significant milestones during the performance period of the project, and documenting the outcome.

- **WBS** is a Work Breakdown Structure. The project will be broken down into manageable pieces and is a deliverable-oriented hierarchical decomposition of the work that must be performed to accomplish the objectives and create the program deliverables. The lowest level of the WBS is called the "Work Package". The Project Schedule includes all Work Packages.

- **Work Package** is the lowest level of the WBS. A Project Manager should be able to assign an individual's name to the work package (deliverable) as accountable, as well as a cost per work package.

- **Milestones** are significant events during the Project (with time duration equal to zero) that are developed to monitor the schedule and drive the project team to meet key dates.

In this section, the Project Manager will write a summary describing the purpose of the Project Schedule Management Plan and how it will be used to communicate to the Project Team and stakeholders (consider the background information above to form the summary).

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1.0 PROJECT DESCRIPTION

In this section, the Project Manager describes the program, the program packages (based on the WBS), the program schedule and duration with major milestones.

- *Description of Project Scope, Purpose*
- *Work Packages (from WBS)*
- *Program Schedule, duration statement*

2.0 PROJECT SCHEDULE MANAGEMENT APPROACH

In the following sub-sections, the Project Manager explains the approach to communications management from the beginning to the close-out of the Project using the headings in the template. No writing is required in this Heading 1 section.

The following sections must be addressed in describing this approach:

2.1 Roles and Responsibilities

In this section, the Project Manager will outline the roles and responsibilities for each of the following team/stakeholder members of the program. This is a suggested list of roles. The Project Manager has the flexibility to reduce or increase the number of roles in this list, but all the responsibilities of risk management must be represented in this section.

- Program Manager
- Project Manager
- Project Controls Team
- Program Management Office
- Construction Management Team
- Engineering Management Team

2.2 Schedule Management Processes

2.2.1 Project Schedule Management Processes

*In this section, the Project Manager will identify the process that **Project Schedule Management** will follow and list all the documents that will be produced to support this plan.*

*The Project Manager will also identify the document expectations from all stakeholders and team members. **Include all document expectations in this section.***

For example:

Schedule Management Processes, Procedures

Schedule Expansion Planning	[Document Number]
Funding Request for Projects	[Document Number]
Schedule Management Plan	[Document Number]

2.2.2 Proposed Level 1 Schedule with Identified Critical Path

This is a high-level initial Level 1 schedule for the project that will be used to present with the Schedule Management Plan for the PMP. Follow the Schedule Development processes and procedures for guidance on the Level 1 schedule development and identification of the critical path to complete this component of the Project Schedule Management Plan.

In this section, the Project Manager will provide a written summary describing the overall Level 1 Schedule, highlighting the project scope and overall duration. The Project Manager should also list all known significant constraints that have affected the schedule development to date and categorize them (e.g., financial constraints, client date constraints, resource constraints, weather/environmental constraints, procurement lead time, etc.)

- ***The Project Manager will insert the Level 1 Schedule with Critical Path in Appendix A of this Schedule Management Plan.***

3.0 PROJECT SCHEDULE STRUCTURE

The project schedules will be constructed and maintained in a software tool. The Project Manager (together with the Project Controls functional team member) will define the technical structure for the project schedule to be integrated with the information management system (IMS) throughout the development and the life of the project, through to closeout.

If the project is part of a Program, the Program Manager (and Program Office) will write a Program Schedule Management Plan, specifying the structure and management strategy for all program projects. The project manager will follow this specified strategy.

The schedule structure and management strategy information must be completed by the Program Manager (if the project is part of a program) or the Project Manager, before any projects are set up in the software tool. The information will be given to all team members who are accountable for a part of the schedule accuracy and/or management.

Use the Schedule Structure Document. The Schedule Structure Document template includes the following information:

a) **Setting up the Schedule.** Specific, technical directions for the set up and rules regarding the set up of the program and projects in the software tool. Include any forms or software inputs that must be provided to set up a new project to the required standards.

b) **Schedule Mandatory Requirements.** Required and mandatory fields, codes, data, structure for all projects (including task duration guidelines, task inclusions, WBS guidelines, mandatory project milestones, mandatory project tasks, rules regarding open ends, constraints, etc.) The requirements will also include the instruction/procedure on how the schedule will be integrated and managed as an integrated schedule (if applicable).

The mandatory requirements **must** be received and understood by all team members, as well as communicated to contractors who may be responsible for providing any schedule data to the projects. It is important to specify this information **prior** to contract award, such that the appropriate data is requested as part of the contractual obligation. For example, if the project manager must calculate earned value but the contractors do not provide resource information or cost information at the level required, the earned value will be difficult to calculate, and the project metrics will be of little value.

c) **Schedule Accountability Matrix.** The Project Manager must complete the Schedule Accountability Matrix to identify areas of accountability when managing the schedule. This template will identify the individuals accountable for producing the project schedule, producing reports, accountability for schedule data and accuracy, accountability for approving changes in schedules, accountability for approving issued schedules, accountability for different sections of the schedule, etc.

In this section, the Project Manager will summarize the process to develop the schedule structure document, using the background information above and highlighting any specific and potentially difficult areas in the program schedule structure.

- ***The Program Manager will insert the schedule structure document in Appendix B of this Schedule Management Plan.***

4.0 RESOURCE REQUIREMENTS, CONSTRAINTS, AND CALENDARS

The Project Manager will determine the appropriate resources calendars to be used in the schedule software tool for all work performed in the Project. All project team members will receive these. If the Project is part of a program, the Project Manager must ensure the appropriate calendars are incorporated in the Program Schedule list of approved calendars.

In this section, the Project Manager will summarize the approach to scheduling, researching and leveling resources for the project.

The resource requirements summary begins as an estimate at the Project Level and will develop into a detailed requirements summary that can be obtained from the schedule management tool (software) or the information management system. This requirements summary will be updated in

this plan as the plan revisions are approved. The summary will provide the Project Manager with a view of all requirements from all projects and will assist in the management of resource risks, constraints and coordination at the Project Level.

- ***The Project Manager will insert the Resource Requirements Summary in Appendix C of this Schedule Management Plan.***
- ***The Project Manager will insert the Resource Calendars in Appendix D of this Schedule Management Plan.***

5.0 INFORMATION MANAGEMENT SYSTEM AND SCHEDULE INTEGRATION

The information management system (IMS) integration information must be completed by the Project Manager before the Project information is entered into the schedule software tool. The information will be communicated to all team members who are accountable for a part of the schedule accuracy and/or management.

The schedule will be integrated with an information management system. The Project Manager will provide an IMS and Schedule Integration Requirements document to all Team Members to outline all requirements for the schedule data to be managed through the information management system and how the project team will enter and manage the information to support the project information management system.

In this section, the Project Manage will summarize the overall information management systems to be used on the project and how the schedule will integrate with the system.

- ***The Project Manager will insert the IMS and Schedule Integration Requirements document in Appendix E of this Schedule Management Plan.***

6.0 SCHEDULE MONITORING AND CONTROL

Throughout the program, the Project Manager will need to monitor and control the Project Schedule:

Schedule control by the Project Manager is:

1) The ability to determine the status of the Project at any time
2) The ability to determine that the Project schedule has changed
3) Influencing factors that create the schedule changes
4) Managing the changes as they occur (not 'catching up' with the changes after they occur)

In this section, the Project Manager will describe how the schedule will be monitored and controlled, including a Project 'run stream' plan that specifies when the schedule will be updated

issued, scheduled throughout the life of the Project. This 'run stream' plan is likely to change and evolve several times throughout the Project, but it is important to document the run stream and communicate to stakeholders in order to manage the schedule adequately. The Project Manager should specify a run stream plan to communicate to all stakeholders, team members and a program office/program manager (if applicable). If the project is part of a program, it is likely the schedule run stream will be set by the Program Office and the project will need to adhere to the run stream. It is important to include information regarding the run stream to contractors, and possibly include in a legal contract if necessary to ensure the correct schedule data is received by contractors to manage the run stream effectively.

- ***The Project Manager will insert the Project Schedule Run stream document in Appendix F of this Schedule Management Plan.***

7.0 SCHEDULE REPORTING (METRICS AND REPORTS)

The Project Manager will provide reports and metrics to show schedule performance.

In this section, the Project Manager will outline the schedule reporting for the Project. This could include weekly Project report inputs, Project reports, Executive Board reports, external communication reports, etc. Specify which metrics and what specific information is required for each report and the person accountable to provide the information.

- ***The Project Manager will insert the suite of Project Schedule Metrics in Appendix G of this Schedule Management Plan.***

8.0 SCHEDULE MANAGEMENT PLAN APPROVAL AND REVISIONS

In this section, the Project Manager will outline the required approvals and revisions for the Project Schedule Management Plan.

The Project Manager will identify the person(s) who will approve the Schedule Management Plan and their position.

The Project Manager will update the signature page of this document (Project Schedule Management Plan Template) with the correct names and positions of authors and approvers, as well as removing the 'template' field.

The Project Manager will also identify the planned revision frequency and the strategy for updating the Schedule Management Plan in the PMP (i.e., mandatory updates).

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Title: PROJECT SCHEDULE MANAGEMENT			

APPENDIX A	LEVEL 1 SCHEDULE WITH IDENTIFIED CRITICAL PATH
APPENDIX B-1	SCHEDULE STRUCTURE DOCUMENT
APPENDIX B-2	SCHEDULE ACCOUNTABILITY MATRIX
APPENDIX C	RESOURCE REQUIREMENTS SUMMARY
APPENDIX D	RESOURCE CALENDARS
APPENDIX E	IMS AND SCHEDULE INTEGRATION REQUIREMENTS
APPENDIX F	SCHEDULE RUN STREAM
APPENDIX G	SUITE OF PROJECT SCHEDULE METRICS
APPENDIX H	LEVEL 1, 2, AND 3 SCHEDULE BASELINE
APPENDIX I	UPDATED RESOURCE REQUIREMENTS

Appendix F: Sample Cost Management Manual Template

Manual	Document Number:	Revision 1 of 7
Title: COST MANAGEMENT		

Cost Management Plan Template

[Document Number]
[Date]

Prepared by:

Reviewed by:

Approved by:

Manual	Document Number:	Revision	Page: 2 of 7
Title: COST MANAGEMENT			

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Title: COST MANAGEMENT			

Revision Summary

Revision Number	Date	Comments
R000	YYYY-MM-DD	Initial issue.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to establish the roles and responsibilities, processes, and tools for Cost Management of Projects.

Cost Management processes involve planning, estimating, budgeting, funding, monitoring and control, forecasting, and performance reporting.

1.2 Scope

This manual is applicable for all projects.

2.0 COST MANAGEMENT PLANNING

Cost Management Planning occurs early in the project lifecycle and establishes a cost management framework for the project. The following subjects shall be planned carefully:

a) **Cost Breakdown Structure (CBS)**. CBS is the work packages of the Work Breakdown Structure (WBS) that are used for the cost baseline, earned value, cost collection, and forecast.

b) **Cost Baseline.** Cost Baseline is the authorized time-phased Planned Values (PV) for the project on which the project cost performance is to be measured against. The baseline is established as the 'Original Budget (OB)' and once Change Control is applied, changes are captured into the 'Control Budget (CB)'.

   For Earned Value, Control Budget is typically used. The Original Budget does not change.

c) **Earned Value Rules.** Earned Value Rules shall be established as part of the Cost Baseline and earned in accordance with Appendix A of this Manual – Earned Value Management.

d) **Cost Collection.** The company source systems shall be set up properly to collect actual cost.

e) **Forecast.** The method for forecasting shall be planned in accordance with Appendix B of this Manual – Forecasting.

f) **Contingency.** Contingency shall be included in the overall budget. Contingency planning and estimating shall be in accordance with Risk Management Team. Separate Cost Account(s) shall be used to track contingency.

g) **Escalation.** Budgets for escalation due to inflation shall be included in the Cost Baseline. There should not be a separate Cost Account for escalation.

h) **Interest.** Budgets for interest shall be included in the Cost Baseline for all capital projects. Budget shall be estimated using a template developed or endorsed by Finance. Separate Cost Account(s) shall be used to track interest.

3.0 COST ESTIMATING

The Budget-at-Completion (BAC) of a project shall be supported by the Basis of Estimate, prepared in accordance with Estimating Team.

4.0 COST BUDGETING

Cost Budgeting is the process of time-phasing the BAC in order to establish the Cost Baseline.

The Cost Baseline shall align with the project schedule, payment schedule, and accrual requirements. There are two (2) types of budgets:

a) Original Budget represents the initial Cost Baseline; and

b) Control Budget represents the initial Cost Baseline plus – through Change Control – all approved changes.

Budget changes shall follow Change Management procedures.

5.0 FUNDING

Funding is the process to obtain authorization to proceed with the project and occurs in stages, dependent on the phase of the project. Funding Released is the portion of the approved lifecycle budget released to the project.

Contingency is usually included in the Funding Released, however the usage of contingency shall follow Change Management procedures.

6.0 MONITORING AND CONTROL

Cost Monitoring and Control is the process of monitoring the cost performance of a project and of ensuring controlled changes to the Cost Baseline. Cost monitoring shall include the monitoring and analyzing key performance indicators such as:

a) Cost performance indices (CPI);

b) Cost variances to Budgets; and

c) Estimate-at-Completion and Budget-at-Completion variance.

Mitigating actions shall be taken to correct any unfavourable cost performance.

7.0 FORECASTING

Forecasting is defined as the process of continuously predicting the outcome of the cost, time and resources required to complete a scope of work. It is achieved by examining the performance

history of the project and evaluating applicable information to predict the schedule and cost to complete the project.

With accurate forecasts, project teams can detect issues ahead of time and implement the appropriate corrective actions. Forecasting can also detect positive trends so projects may take further advantage of such trends.

Forecasting shall be in accordance with Appendix B of this Manual - Forecasting.

8.0 REPORTING

Cost performance reports will be part of the overall program and project performance reports.

9.0 ORGANIZATION, ROLES & RESPONSIBILITIES

- To be developed as per corporation's structure.

10.0 TERMS, ACRONYMS & DEFINITIONS

Actual Cost of Work Performed (AC) – Actual cost of work performed to date; the actual costs charged against the activities.

Cost Baseline (CB) – The approved time-phased cost plan. There are two (2) kinds of Cost Baselines based on budget type – Original and Control. For EVM purposes, the Control Budget baseline is used.

Cost Breakdown Structure – Derived from the work breakdown structure (WBS) primarily for cost management.

Cost Performance Index (CPI) – The cost efficiency ratio of Actual Cost to Earned Value calculated by dividing the Earned Value by Actual Costs. CPI = EV/AC.

Cost Variance (CV) – The difference between the Actual Cost and the Earned Value.

Earned Value (EV) – Earned value of accomplished work.

Estimate at Completion (EAC) – The forecasted cost of the project. It is continuously updated as the project progresses.

Estimate to Complete (ETC) – The forecast of remaining costs to be incurred to complete the project.

Planned Value (PV) – The total baseline costs budgeted for the activities scheduled or planned.

Schedule Performance Index (SPI) – The schedule efficiency ratio of earned value to planned value. The SPI represents the portion of the planned schedule that was accomplished. SPI = EV/PV.

Schedule Variance (SV) – The difference between the earned value and the planned value.

Scope Baseline – The approved Project scope, the associated execution plan, and its associated WBS and WBS dictionary.

Work Breakdown Structure (WBS) – The deliverable-oriented hierarchical decomposition of a project, broken down into manageable pieces of the work that must be performed to accomplish the objectives and create the program deliverables.

Appendix G: Program/Project Management Governance Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	✓
Brad Lueger	Program Management Consultant	✓
Jeremy Pasma	Supervisor, Program Management Office	×
Michelle Leung	PMO Supervisor	✓
Odilon Bondoc	Program Delivery Improvement and Governance Associate	✓
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Breakdown of Governance**: Is there any hierarchy defined when it comes (Standards, Governance, Guides, Forms, etc.)?	◆				
		Notes: - *There's a guide and document (i.e., Scope QA/QC), when PMO receives the request, they perform an overall review based on that.* - *Toronto Hydro PMO performs design review and makes sure all the phases are aligned and in line.* - *Change requests would be reviewed and PMO makes sure they will complete them in time.* - *There's a library of governance, but there's no hierarchy defined plus the overall need and requirements are not assessed and documented.* - *PMO Documents are published under the company's intranet (this information is internal) but the contract administrator will let the contractor know about the requirements and needs around this.* - *When an RFP is released (By execution group and not PMO) all the expectations are communicated by the execution team to the vendor.*					
	1.2	**Centralized Control**: Does the organization have a dedicated team in charge of governance development and updates?		◆			

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Notes: - *PMO is responsible for controlling the publication, release, and revisions of governance.* - *When a change is required, the document owner would communicate the need to PMO and request a change (through a service request form), this request will be assessed, a time frame will be developed (like a negotiation process) and then they agree on it. Most of the requests are coming from PEM (Planning, Engineering, and Modernization) but in some other cases, the requests could come from other teams.* - *The service for PMO is a matrix setup and they support operations with a PMC (Program Management Consultant) which is in charge of tracking the project performance. PMO supports non-project related (Operations) similar to Work control and inspection.* - *PMO keeps the governance library based on received requests plus checking future needs and other sources for possible improvements.*					
	1.3	**Governance development process**: What's the process for issuing a new or updating current existing governance?		◆			
		Note: - *When new governance (or process) is started, a team will contribute to this effort (matrixed to PMO).* - *All the process owners will review and approve new or updated processes/procedures.* - *The required funding for governance update/development will be sourced through CAPEX funding.* - *All the stakeholders will review/comment/approve any new procedure or updates.*					
	1.4	**Need Identification**: What's the process of identifying and requesting a procedure or governance need or update?	◆				

		Note:
		- *There are two major methods to start a process:*
		  ○ *Service Request*
		  ○ *Forecast*
		- *No planned review and update of governance was mentioned.*
		- *Roles and responsibilities for TH stakeholders against PMO governance are not defined.*					

	1.5	**End-End Governance**: Do the current set of Governance cover all the phases of projects (Initiation to Closeout) for all the PMO disciplines (Scope, Schedule, Estimate, Cost, Risk, Change)?	◆				
		Note: - *Current documents start from initiation and go to capitalization (by finance) such as project variance analysis.* - *For PMO disciplines sets of documents exist. For scope, schedule, estimate, cost, change they have a process map, but **Risk is missing**.* - *Some of the business processes are established under ERP but the rest don't have dedicated tools (except Risks which are managed under an Access database.* - *Contingencies are managed at the program level (to cover known-Unknown). In some scenarios, the contingency is located at the project level (sometimes a buffer is added into the project estimate).* - *Roles and responsibilities are not defined and followed.* - *PMO assists the operation team to execute the work (ISA: In-service addition and that's the moment which asset is in service, and depreciation starts).*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Training**: Is there any training program in place for client resources when it comes to PMO initiatives?		◆			
		Notes: - *There's no planned training program in place, new staff goes through some onboarding-related training (partially Computer Based); in addition, some PMO disciplines (i.e., Cost team) have extra orientation sessions.* - *PMO is responsible for rolling out and developing every process map plus PMO conducts introduction to process mapping when it's requested.* - *PMO provides pieces of training on how to align with processes (such as how to develop a change request or document an estimate in the system) if requested and on Ad-Hoc basis.*					
	2.2	**OCM**: What's the Organizational Change Management (OCM) when it comes to rolling out new or updated governance?			◆		
		Notes: - *PMO is involved in any new governance rollout.* - *There was no mention of planning for OCM and impact analysis.*					
	2.3	**Alignment and Enforcement**: What's the oversight and QC practice when it comes to assuring the PMO initiatives are followed?		◆			
		Note: TH defined some KPIs in place to make sure people are following the requirement: - Scope In Taking: PMO tracks how many scopes are back and if they're following the requirement - Change Request: PMO makes sure that all have adopted this and following. - PVA (Project Variance Analysis): Each project develops one PVA post the project is completed.					
	2.4	**Enterprise Approach**: Is there a central team in charge of all PMO initiatives and practices? This team shall be the SPOC for any questions.		◆			
		Note: - *PMO functions as a matrix service model, PMC (Program Management Consultant) will be responsible for making sure the initiatives are followed.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	2.5	**Other People notes:**					

Area	No.	Question	Undeveloped	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)	3.1	**Automated Integrity**: Is there a central repository location for all the PMO governance, procedures, guidelines, forms, and other related information?			◆		
		Notes: - *All the current documents are stored under TH Intranet and all the employees have access to them.*					
	3.2	**Accessibility of PMO team**: How could PMO team members access the governance and their related information?			◆		
		Notes: - *PMO documents are all accessible under Toronto Hydro's Intranet.*					
	3.3	**Automated Revision Control and History**: Is the main governance location that tracks the revisions, updates histories, changes?			◆		
		Note: - *The versions are tracked and maintained under the archives.* - *There's a naming convention that PMO follows to manage the revisions.*					
	3.4	**Data Flow:** What's the current data flow (Information distribution) through the tools?		◆			
		Note: - *There's a program documentation mailbox and they issue an update email to that.* - *When a new employee or vendor is joining TH, the manager or contract administrator is responsible to make sure those people are clear with the PMO requirements and assignments.* - *PMO is not directly involved in the orientation process but supports that.*					
	3.5	**Other Tools notes:**					

Appendix H: Schedule Management Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	✓
Brad Lueger	Program Management Consultant	✓
Jeremy Pasma	Supervisor, Program Management Office	×
Michelle Leung	PMO Supervisor	✓
Odilon Bondoc	Program Delivery Improvement and Governance Associate	✓
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Taylor Rohman	Planner	✓
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Basis of Schedule**: Do you develop and maintain this document?	◆				
		Notes: - *The basis of estimate is not developed.* - *A project table is developed and the major dates (i.e., Design Finish, Construction Start) are logged into that table.* - *The mentioned list lacks some general basis that is required to be documented and communicated with all the stakeholders such as Calendars, productivity rates, Global codes, reporting requirements, Standard WBS, etc.* - *There's one document per department.* - *The forecast document package covers resource management and a list of projects only.*					
	1.2	**Predefined Scheduling Practices**: - What is Scheduling related governance? - What are the documented Schedule quality control guidelines?	◆				

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature

		Notes:
		- *There's a System Planning (or Investment Planning) team which are in charge of identifying the needs. This includes sustaining the current customers plus all those new customers (This could be considered as the top-down approach).*
		- *The RCs (Responsibility Centers) will be in charge of breaking down the received funding into smaller components (Projects).*
		- *The PMC identifies when the project is required to be done (Just the start date), PMO translated that into when/where to be included in the portfolio.*
		- ***Schedule practices are not documented** in one single and integrated document.*
		- *Some Schedule templates exist (i.e., a certain duration for a certain type of project) which include required material and resources.*
		- ***There's no Schedule Quality control document**. There's a schedule adherence report which covers possible delays.*
		- *The existing MS-Project schedule is:*
		  ○ *More a resource planning schedule and not tracking the deliverables.*
		  ○ *Less than 10% of activities carry logical ties*
		  ○ *There's no Milestone included in the schedule*
		  ○ *Critical Path is not identified and tracked.*
		  ○ *The schedule is not calculatable.*					

	1.3	**Is the Schedule updating process covered under governance**? - Cyclical updates? - Review and accept progress? - Forecasting?		◆			
		Note: - *No governance is providing direction to update and reschedule the plans.* - *Review and acceptance of updated schedules are not considered.* - *Projects are tracked as per their single target dates and Actual Cost.* - *Forecasting is performed yearly and mostly covers the cost.*					
	1.4	**How much involvement the stakeholders (Internal and External) have in developing scheduling governance**: - Cover best practices - Involve lessons learned - Productivity rate and benchmarking - How are the external stakeholders' inputs/updates communicated with schedulers?	◆				
		Note: - *Scheduling practices are not performed and therefore there are no lessons learned.* - *Productivity rates and benchmarking are not performed.* - *External stakeholders are communicating single target dates with PMO.*					
	1.5	**Schedule templates and guidelines**: - Are schedule templates developed and used? - Are standard reporting layouts developed and used (All teams looking at the same set and arrangement of information)?	◆				

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Note: - *Some schedule templates exist (Manual and under Excel with few under MS-Project).* - *No standard scheduling report is developed the only report covering scheduling is Adherence which covers the target dates.*					
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Communications / Training**: - Is training provided to schedulers? - Is training planned or Ad-Hoc? - Are standards practices (same WBS, same rollout, etc.) promoted? - What are the documented scheduling communications (Within the schedulers and with external stakeholders)?	◆				
		Notes: - *General training is provided to newly hired resources, but it doesn't cover scheduling practices.* - *Few Job-Aids are developed and function as Ad-Hoc training.* - *No scheduling application is used as standard and therefore there's no room for practicing standard approaches.* - *On the program level, there are standard structures and for projects (CAPEX or OPEX project for example).* - *Usually, data communication is done manually. Target dates are stored under SAP (with email notifications capabilities).* - *There are standard schedule meetings on every project life cycle which could be considered as the standard method of communication between planners, but no formal documentation.*					
	2.2	**Sustainability / Staffing Plan**: - Is there a staffing plan and sustainment developed? - Is there a standard scheduling organizational chart? - Is there a roles/responsibilities document developed for the scheduling team?	◆				
		Notes: - *There's no specific document for the staffing plan but the PMO supervisor oversights the overall supply and demand of schedulers.* - *There's a high-level Organizational Chart for PMO which is not cover schedulers.* - *There's no roles and responsibilities document.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	2.3	**What's the scheduling process?** - Development - Resource loading - Baseline review and approval - Updates - Changes	◆				
		Note: - *Schedules are not resource loaded but resource balancing practices (which are done on the construction supervisor level) exist.* - *Baselines are not developed and just the target dates are covered under Excel.* - *Target Dates would get updated based on the project progress, but initial dates are always kept and shall be communicated under the PVA report.* - ***Updates**: on the program level the end date for major phases (design or construction) are tracked and updates are logged (Under Excel spreadsheets).* - ***Changes**: Changes are submitted formally as a change request, those changes within the same calendar year don't need a formal request but if the project is moving its completion dates from one year to another one, they need to submit and obtain approval. Changes would get incorporated in target-date tables, but original dates are not getting updated.*					
	2.4	**Schedule Consistency**: - Logic ties the schedules, calculates them, and updates? - Monitor the critical path, schedule floats, and changes? - Are program/project milestones identified, registered, and track? - Risk and inconsistency? - What-If scenarios? - Benchmark with other teams? - Pre-discuss, document, and utilize Rules of Credit? - Update remaining units and expected finish dates?	◆				
		Note: - *Project-to-project under programs are defined with sequence (but not logic ties), there are no logic ties under project or programs.* - ***Critical Path and floats are not monitored**.* - ***PMO does not use milestones**.* - *No risk on schedule **confidence** practice is performed.* - *The remaining units are not getting updated.* - ***Physical Percent Progress is not calculated and tracked.*** - ***EVM is not calculated and used.***					
	2.5	**Other People notes:**					

Area	No.	Question	Undeveloped	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)	3.1	**Scheduling Tool**: - Is there any standard scheduling application accepted for the company? - Where are the schedules residing? - Who is administrating the scheduling tool? - Is there any schedule quality control tool (ACUMEN) used?	◆				
		Notes: - *No scheduling tool is used, some divisions use MS-Project without logic-ties.* - *Excel files are used to log target dates and other scheduling information.* - *Considering no Enterprise scheduling tools being used, there's no Scheduling Administrator.* - *There's no centralized location for all the schedules.* - *No application is used for quality control of the schedules.*					
	3.2	**Scalability / Popularity / Consistency**: - What percentage of schedules are handled automated? - Are the tools set up to be used as a scalable platform? - What are the data consistency and accuracy improvement practices? - Are external stakeholders' information validated also?	◆				
		Notes: - *There's no automation on the schedules.* - *There's no scalability, most of the project's target dates are tracked under MS-Excel.* - *No data consistency or accuracy practice is performed.* - *No verification on received external data is performed.*					
	3.3	**Library Data**: - Is library data developed and used as a corporate-wide approach (Calendars, Codes, etc.)? - Are those library data review and updated frequently?	◆				
		Note: *- None of the standard practices are followed.*					
	3.4	**Automation / Integration**: - How are the schedule templates loaded into the tools? - Are schedules integrated with other PMO disciplines (i.e., Cost) automatically? - Are changes logged and kept under the scheduling tool (i.e., for possible future claims or disputes)?	◆				
		Note: - All scheduling is done under Excel or MS-Project and is manual practice.					
	3.5	**Other Tools notes:**					

Appendix I: Cost Management Questionnaire

Attendees:

Toronto Hydro		In the meeting?
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	×
Brad Lueger	Program Management Consultant	✓
Jeremy Pasma	Supervisor, Program Management Office	×
Michelle Leung	PMO Supervisor	×
Odilon Bondoc	Program Delivery Improvement and Governance Associate	×
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		✓
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Cost Management Plan**: Does Toronto Hydro develop and maintain a cost management plan for its portfolio and associated projects?	◆				
		Notes: - *Cost Management plans or other related documents don't exist (neither on the project level and nor on the program level).* - *Standard practice is in place which more or less all projects are following but it's not documented.* - *The cost control process is simple: If the project is overspent, the project needs to submit a change request, and if less they need to report.* - *The concept of WBS/CBS (Work and Cost Breakdown Structures) is defined and Toronto Hydro treats WBS as CBS.* - *Currently available documentations are in the form of Process Flows.*					
	1.2	**Estimating and Cost Management Interaction**: - What is the estimate-cost interaction management-related governance? - What are the documented cost management quality control guidelines? - What are the Estimating and Cost Management documented integration?			◆		

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Notes: - *Although none of the cost control processes are documented, a common practice is followed within the organization.* - *Estimates are developed by the Engineering planning team (developed by Engineers and approved by the Engineering Supervisor) as high-level estimates.* - *Post receiving the high-level estimates, they will be sent to PMO which performs a high-level portfolio level assessment on the quality and consistency of the estimate.* - *PMO forwards the high-level estimates to the Design-Construction team When the project reaches Detailed Design, and another round of estimate update is performed which will be more comprehensive (Detailed Level Estimate).* - *The detail design team has the option to review and modify the scope also. For example, if they find out that soil is contaminated, they can add the removal/decontamination into the scope.* - *The budget is getting frozen after Detailed Design and all other increases or decreases will be managed through the change control process.* - *The detailed estimate is also used as the basis for a quotation for the customer.* - *Toronto Hydro maintains an approved vendor list among their approved rates, post the detailed design Vendors could check and change the quantities of work but not the rates.* - *Escalations and inflation rates, including other changes, are included in the Estimate.*					
	1.3	**Is the cost management process covered under governance**? - Develop Cost baseline? - Collect Cost and Accruals? - Forecasting? - Cost Changes?		◆			
		Note: - *These processes are followed as a general practice, or maybe logged as a job aid but there's no overall governance or formal procedure for this purpose.* - *No forecasting (Estimate to Complete and Estimate at Completion) is performed, TH calls their actual project cost tracking forecast which it should not be mixed with forecasting practice.* - ***No Earned Value analysis is performed and accordingly, no Forecast based on standard methodologies is available.*** - *Costs are collected by Finance and logged under SAP (The same platform on which the Estimates and Budgets are stored).* - *Trending of cost is monitored as LTD/YTD Actual Cost vs. Budget among the completion dates (The PDR "Project Delivery Report" is prepared by each PMC covers this).* - *There's a monthly cash flow developed for the projects, and this gets compared monthly which just covers the top ten most expensive projects. There are no document or basis logged directions on Cost, Schedule, and Cashflows standardization or uniform approach.* - *Big infrastructure projects (i.e., Metrolinx) have their own dedicated PMO team which needs to follow the same PMO standards (transit and capital projects large are two examples). Comtech's report is not covering those projects.*					
	1.4	**How much involvement the stakeholders (Internal and External) have in developing cost management governance**: - Cover best practices - Involve lessons learned - Automated Cost Management - How are the external stakeholders' inputs/updates communicated with cost controllers?	◆				

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Note: - *No documentation is developed in this regard.* - *Cost Management is managed by the Contract Administration team and not PMO.* - *Any interaction with external and Internal stakeholders shall be managed through the Contract Administration team.* - *No Automated Cost Management tool is adopted at this time. Vendors are emailing their invoices to Toronto Hydro and then get them processed (High-Risk process when it comes to Cyber-Security requirements plus very manual, high effort and cost consuming process.*					
	1.5	**Standard Cost Management Practices**: - What breakdown is used to manage Cost? - Deliverable-based cost management? - Cost Adjustments? - At What level do you track cost (Project, Deliverables, Control Accounts)? - What's funding release administration			◆		
		Note: - *WBS is used as CBS but not for all the projects in the portfolio, but just* - *Cost (progress and EVM) is not monitored on the deliverables level.* - *Cost management is performed in Excel so, cost adjustment would be manual and consume lots of energy.* - *PMO tracks cost on portfolio level (LTD/YTD vs. total budget).* - *Contract administrators are dealing with Cost Management initiatives of stakeholders.* - *PMO's role is to monitor the cost (changes/risks/etc.)* - *Lessons Learned and other related information are communicated with Contract Management.* - ***Any project finishing with more than 15% of its budget needs to go through root cause analysis, it will be flagged.*** - *PMCs are responsible for projects and developing a list of their managed portfolio. PMO collects all this data and makes sure that the whole portfolio is within the annual budget.* - *There's no Gated process defined when it comes to releasing funding to the projects.* - ***Earned Value Management and Physical Progress tracking are not practiced.***					
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Communications / Training**: - Is training provided to cost controllers? - Is training planned or Ad-Hoc? - Are standards practices (same WBS/CBS, common cost control calendar, etc.) promoted? - What are the documented cost management communications (Within the cost team and with external stakeholders)?		◆			

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Notes: - *Cost Controllers go through training as part of their onboarding process when they start with TH with some Ad-Hoc orientation sessions.* - *There's no training and qualification tracking process.* - *Toronto Hydro has some Computer Based Training (CBTs) for its staff which covers a little part of PMO disciplines.* - *No documented governance was mentioned as a communication plan for the Cost Controller's internal information sharing.*					
	2.2	**Sustainability / Staffing Plan**: - Is there a staffing plan and sustainment developed? - Is there a standard cost organizational chart? - Is there a roles/responsibilities document developed for the cost team?	◆				
		Notes: - *There's no specific staffing plan developed for PMO while PMCs are developing hiring plans (under Excel) which may include some PMO roles.* - *There's a high-level Organizational chart for PMO but not detailed.* - *No roles and responsibilities documents are developed for PMO or Cost Controllers.* - *Design Supervisors and Contract Administrators have roles in the cost management process on the project level and PMO controls the portfolio.*					
	2.3	**What's the cost management process?** - Development (Converting Estimates to Budget and Cost Baseline) - Cashflows development - Baseline review and approval - Updates, Variance Analysis - Change Requests (Log, Acceptance, Approve/Reject)			◆		

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature

		Note:
		- *Projects and their associated budgets are initiated as per the following steps:*
		  ○ *Engineering defines the project based on technical, regulatory, or capital investment needs.*
		  ○ *Engineering develops a high-level Estimate (Including major equipment, required labor, duration) which could be considered a **Top-Down approach.***
		  ○ *Engineering provides the estimate to the Planning team for creating Work Packages and elaborating the estimate (Assembly Units are used to develop estimates). These estimates are logged under the SAP system and will be used as Material requirements identification and purchase.*
		  ○ *PMO receives the Work Packages, adding required equipment information and additional resources into them. Then finding the available team to execute the project.*
		  ○ *Work Packages will be transferred to execution RCs for detailed design estimate **Bottom-Up approach**.*
		  ○ *Projects have different phases: i.e., supplying power into an under-construction project and then post in service*
		- *There are placeholders under the program budget, PMCs (sometimes) add buffers (contingencies) into the received Estimate.*
		- *The budgets and forecasts are reviewed and approved by RC leaders.*
		- *There's a standard change request tool (a module under SAP), they need to enter the last approved budget for the project and the change request.*
		- *A process and approval route are defined to go to different approving individuals until it's incorporated in the final budget **(50K$ for OPEX and 100K$ CAPEX triggers the change process).***
		- *TH has Change orders when it comes to smaller items.*					

	2.4	**Budget Consistency**: - Known and Unknown Unknown identification and register? - Develop a risk log and have a budget for risk response? - Program vs. Project level contingency?		◆			
		Note: - *Estimates are not carrying the uncertainties, but the risk log does include this. This would create a big change for gaps.* - *RCs (Responsibility Centre similar to Department) have control over their portfolio and moving contingency, sometimes two RCs could offset the positive and negative contingencies.*					
	2.5	**Other People notes:**					

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)		**Cost Management Tool**: - What's your Budget Management Tool? - What's your Cost collecting tool? - Who is administrating the cost tool(s)?	◆				
	3.1	***Notes:*** - *Following reports and matrixes are developed and maintained under MS-Excel:* - *All the estimates are maintained under SAP and the budgets (Forecasts), and budgets are maintained under PSAT (Program Spend Allocation Table or spending balancing file).* - *Each PMC develops prepares its own PSAT for the managed RC.* - *PMO develops the "Forecast Summary Report" which is a consolidation of all RC PSATs.* - *Invoices are communicated by email and Contract Administrators are handling the invoices.*					
	3.2	**Scalability / Popularity / Consistency**: - What percentage of Budgets are handled automated? - What are the data consistency and accuracy improvement practices? - How external stakeholders are contributing to the Cost Management process? - Are external stakeholders' information validated also?	◆				
		Notes: - *All are under Excel, so the level of automation is low (projects are going to move everything under SAP).* - *Data validation currently is performed low and manual but all PSATs.*					
	3.3	**Library Data**: - Is library data developed and used as a corporate-wide approach (Control Accounts, Unallocated Cost, etc.)? - Are those library data review and updated frequently?	◆				
		Note: *- There's no enterprise cost system in place so no enterprise library data could be developed and maintained.* *- Not applicable*					
	3.4	**Automation / Integration**: - How is the Cost and Budget information loaded into the tools? - Are budgets integrated with other PMO disciplines (i.e., Estimates, Risk) automatically? - Are changes logged and kept under the cost tool (i.e., for possible future claims or disputes)?	◆				
		Note: - *There's no enterprise tool in place so no budget loading (automated) would be in place.* - *Integration between Schedule, Cost, and Risk is not established (or it's at the early stages of implementation).*					
	3.5	**Other Tools notes:**					

Appendix J: Resource Management Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	×
Aida Ahmadi		×
Brad Lueger	Program Management Consultant	✓
Jeremy Pasma	Supervisor, Program Management Office	×
Mahinthan Subramaniam		×
Michelle Leung	PMO Supervisor	×
Odilon Bondoc	Program Delivery Improvement and Governance Associate	✓
Rachel Fung	Program Management Consultant	✓
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
General	1.1	**Resource Management Plan**: - Is there universal resource management developed and maintained with Toronto Hydro, what about PMO? - What's the current existing governance around resource management? - What are the documented procedures to focus on organizational culture and promoting PMO initiatives?	◆				
		Notes: - *For projects/programs, the PMC develops PRAT (Project Resource Allocation Template) and corporate-wide every department provides input into Establishment Report (Corporate Resource Plan)* - *There's no document covering the resource management, some general guidelines exist plus the onboarding process. TH has the "Performance Contract document" which measures the PMO practices alignment.* - *There's a mission statement and core values for TH, but no document around PMO practices.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature

	1.2	**Need Identification:**
		- What's the documented process for identifying resource needs?
		- Is the basis for resource need identification documented and enforced between different business units (Calendars, total working hours per week, month, or year)?
		- Does the governance direct:
		  ○ A master resource management plan (short, medium, long term) being developed and maintained as a rolling plan (i.e., getting updated on a year-by-year basis)?
		  ○ Identification of sources for supplying resources as a strategic plan.
		- What tools and applications are used for this purpose?
				◆			

		Notes: - *Need: PRAT is the process for identifying the need document plus. This document specifically talks about people and integrates budgeted units, labor types, resources, and scope.* - *Supply: FAS (Forecast Assumption Summary) provides available resources.* - *All assumptions such as calendars, holidays, vacations are logged under the Excel tools.* - *Both PRAT and FAS are Excel spreadsheets. TH is in the process to transition to BPC (Business planning and consolidation) which is a module of SAP and provides more automated resource balancing capabilities.* - *Resource Management is synchronized with the schedules, Resource histograms and availabilities are not aligned with projects.*					
	1.3	**Supply Identification:** - What's the documented process for identifying resource supply (Currently available resources within the company and under contract)? - Is the basis for resource supply identification documented and enforced between different business units (Calendars, total working hours per week, month, or year)? - Does the governance direct: ○ The resource supply and need being integrated, compared, and monitored on a routine basis? - A resource sustaining plan being developed and maintained? - What tools and applications are used for this purpose?	◆				
		Note: - *Response.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	1.4	**Documented Training and Upgrading Resources:** - Is there a formal resource training plan (supported by governance) issued for the corporation? What about PMO? - What's the documented plan for hiring, training, and utilizing junior and newly graduated resources? - Is there a plan for supporting innovation methods of resource management supported by governance? - Is there any computer-based training?	◆				
		Note: - *New PMC would be walked through the forecasting process while getting on board.*					
	1.5	**Resource Alignment Process:** - What is the documented plan for checking alignment? - Is there a pre-developed and documented assessment process? - Are roles and responsibilities defined and documented? - Is Resource-Leveling, over-allocation, bottleneck expertise, and other similar roles studied, logged, and monitored? -	◆				
		Note: - *During the PPR the PMO alignment is performed.* - *The PPR process and templates are providing the alignment process.* - *Resource-Leveling on the project level is done.* - *Over allocation of resources is done (make sure a certain percentage is considered).* - *Bottleneck expertise identification and other similar roles studied are monitored but just a practice but not logged and monitored.* - *When not enough resources exist inside TH, they switch to contractors.*					
	1.6	**Other notes:**					

Appendix K: Risk Management Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	×
Aida Ahmadi		✓
Brad Lueger	Program Management Consultant	×
Jeremy Pasma	Supervisor, Program Management Office	×
Mahinthan Subramaniam		✓
Michelle Leung	PMO Supervisor	×
Odilon Bondoc	Program Delivery Improvement and Governance Associate	×
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Risk Management Plan**: How well the risk management practices are covered under current existing governance, guides, and job aids of Toronto Hydro?	◆				
		Notes: - *There's no Risk Management plan but sets of process flow supporting this area of PMO.* - *Integration and uniformity of the risk management process are not covered as documented guidelines.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature

	1.2	**Risk Identification:**
		- What's the current process of risk identification and recording directed by Governance?
		- Is there an integrated (centralized) risk log that covers all programs, projects, and other corporate-related business?
		- Do governances enforce:
		  ○ Quantitative Risk Analysis (Utilizing verifiable information to analyze the impacts of risk in relation to cost overruns, scope changes, resource consumption, and schedule delays)?
		  ○ Qualitative Risk Analysis (Subjective approach to risks by identifying risks to focus the likelihood of an explicit risk event happening during the project/program life cycle plus the overall impact)?
		- Do governance direct projects to develop risk scoring matrixes, define priorities and come up with mitigation plans?
		- Monitor risks before and post-mitigation?
					◆		

		Notes:
		- *As soon as the project is logged under the program, currently identified risks are identified and logged (The first one is developed by the Engineering Planning team and while they're developing the scope) and teams continue elaborating on that.*
		- *Two risk logs exist within TH (both developed within the company as MS-Access Database):*
		  ○ *Enterprise Risk Log*
		  ○ *Program Various Log*
		- *Quantitative and Qualitative risk analyses are performed (including probability and impact), the options are provided as drop-down lists (with pre-populated values).*
		- *All the risks are qualified and reviewed monthly*
		- *Risks are monitored and pre-and post-mitigation. When a risk is closed, no one reviews that anymore.*
		- *When developing a new project, people could have access to a historical risk log and use that as their starting point.*					

	1.3	**Risk Analysis Practices**: What's the governance direction on: - Method: Workshops, Brainstorming, other. - Frequency of performing risk analysis: How often? What combination of teams? - Repeating risk analysis at completion of each program/project phase? - Performing risk analysis on each change (pre-and post-approval)? - Utilizing Stochastic methodologies?		◆			

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Note: - *There's no governance directing to any specific method (i.e., workshop) when it comes to risk and developing their log.* - *Toronto Hydro has bi-weekly risk review meetings scheduled, in which project teams are directed to update and assess all the changes and their possible impacts.* - *Phase-by-phase risk review sessions are not very detailed and major reviews are happening at the end of Design and Construction (when two different teams are handing over the project to each other and reviewing it).* - *At any change, especially if the change is significant, the risk will be reviewed.* - *Yes, the governance is directed on probability assessment.*					
	1.4	**Risk Source**s: Is governance recommending to: - Collect internal and external risks and log them? - Did benchmark identify risks with similar projects within the corporation or from other utilities? - Identify event, cause, the impact for every single risk?			◆		
		Note: - *The contract administrator is responsible to deal with external contractors and has to make sure this exists, but they don't mandate having a risk log for the vendor.* - *Depending on the method by which risk was identified, TH in many cases uses the history information and performs benchmarking against past risk logs.* - *Identifying events, causes, the impact for every single risk is part of the risk practice.*					
	1.5	**Risk Administration**: Does Toronto Hydro: - Utilize external subject matter experts when it comes to assessing program or mega-projects associated risks? - Assign a risk single point of contact (SPOC) at the program or project level? - Provide pre-developed forms and formats to communicate risks? - Schedule meetings and communication channels to update and monitor risk logs? - Are opportunities are identified and monitored also?		◆			
		Note: - *The division uses other TH divisions Subject Matter Experts, but the team can't recall cases in which they used external resources.* - *PMO does have a SPOC for risks, but there's a corporate group (Enterprise Risk Management Department) in charge of corporate overall risk management.* - *There are pre-developed forms and formats in Toronto Hydro which individuals could use.* - *The enterprise risk management team has meetings and reports (on scheduled meetings reviewed and discussed).* - *The risk log (as a pre-defined drop-down box) provides the option to log opportunities also. At the beginning of Q3-Month, there's an opportunity log released which would get compared against risks and checked if TH could use those to mitigate risks.*					
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Communications / Training**: - Is training provided to PMO-Risk Staff? - Is training planned or Ad-Hoc? - Are standards practices (same analysis, approaches, formats, etc.) promoted? - What are the documented risk management communications?	◆				
		Notes: - *There's the onboarding training that all new staff goes through, but PMC takes some risk management courses (provided by external sources).* - *PMO holds monthly reviews and under those reviews, the risk is reviewed; this is the planned communication channel for risk. When risks are scaled up to a certain level, PMO will communicate them with the Enterprise team.*					
	2.2	**Sustainability / Staffing Plan**: - Is there a staffing plan and sustainment developed? - Is there a standard Risk Management organizational chart? - Is there a roles/responsibilities document developed for the Risk management team?	◆				
		Notes: - *There's no risk staffing plan within PMO since the PMCs are responsible for their associated risk.* - *PMCs are responsible for risk management, so they would appear in their Org chart. For Example, on construction, there's a staffing plan and it includes Risk resources but not the design side has the same process.*					

	2.3	**Risk and Contingency Management**:
		- Are identified and high-priority risks always correlated with appropriate contingency and management float?
		- What's the method of tracking, returning, and re-assigning contingency?
		- Does Toronto Hydro perform schedule uncertainty, Monte-Carlo simulation, and the following measures to manage schedule risks:
		  ○ Criticality: Measures the probability that an activity is on the critical path.
		  ○ Significance: Measures the relative importance of an activity.
		  ○ Sensitivity: Measures the relative importance of activity taking the criticality into account.
		  ○ Cruciality: Measures the correlation between the activity duration/cost and the total project duration/cost.
			◆				

		Note: - *Yes, all the risks are correlated with a contingency. PMC (as per general experience) adds up to 15% into the duration received from estimating team (Contingencies are logged at the Program level and not projects and possibly their associated deliverables).* - *There's no integrated scheduling process in place, so management floats are not developed and flagged.* - *Contingencies are not monitored for PMCs.* - *No Monte-Carlo analysis is performed around schedules since PMO is dealing with program schedules and not a detailed project.*					

	2.5	**Other People notes:**

Area	No.	Question	Undeveloped	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)	3.1	**Risk Management Tool**: - What's your Risk Management Tool? - What's your Risk Communication tool? - Who is administrating the Risk tool(s)?			◆		

		Notes:
		- *There's an MS-Access Database that is used as a central tool for risk management.*
		- *The MS-Access database has a dedicated DBA.*
		- *There are two Risk logs:*
		  ○ *PVL (Program Variance Log): Those risks which we know could occur with more than 70% probability or has already happened (An Excel spreadsheet).*
		  ○ *ERL (Enterprise Risk Log): Enterprise Risk Log (An MS-Access Database which everyone is using)*					

	3.2	**Scalability / Popularity / Consistency**: - What percentage of risks are linked to actions and have an owner? - What are the data consistency and accuracy improvement practices? - How external stakeholders are contributing to the Risk Management process and tools? - Are external stakeholders' information validated also?			◆		
		Notes: - *Risks have owner and action is assigned to a team member for the identified risks.* - *The monthly review performs data validation and verification.* - *The tools are internal only and external stakeholders would need to communicate their updates with their PMC (This brings manual work for the Toronto Hydro team).*					
	3.3	**Library Data**: - Is library data developed and used as a corporate-wide approach (Risk and Opportunities Categories, Mitigation Methods, etc.)? - Are those library data review and updated frequently?			◆		
		Note: - *The MS-Access database has some library data incorporated in it.*					
	3.4	**Automation / Integration**: - How is the Risk information loaded into the tools? - Are Risks integrated with other PMO disciplines (i.e., Estimates, Cost) automatically? - Are Risks around changes logged and kept under the risk tool (i.e., for possible future claims or disputes)? - Are Risk modeling applications utilized?			◆		
		Note: - *MS-Access has the capability of uploading MS-Excel spreadsheets, but no automation practice was mentioned during the interview.* - *The risk description has the link to PMO discipline (also OPEX or CAPEX).*					

Area	No.	Question	Undeveloped	Emerging	Recognized	Improving	Mature
	3.5	**Other Tools notes:**					

Appendix L: Change Management Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	×
Brad Lueger	Program Management Consultant	×
Jeremy Pasma	Supervisor, Program Management Office	×
Michelle Leung	PMO Supervisor	×
Odilon Bondoc	Program Delivery Improvement and Governance Associate	×
Mahinthan Subramaniam		✓
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Change Management Plan**: Is there governance developed in Toronto Hydro to guide: - Change Management Process - Change Management Key Resources (Including their roles and responsibilities) - Frequency of Change Review process - The structure (components) of the change request forms and formats	◆				
		Notes: - *No documentation or governance is developed for Change Management and just a few process flows are available.* - *The change management in Toronto Hydro is called CR (Change Request) process which a process is developed for it.* - *The "Change Request" process is established under SAP and all standard templates, forms are stored under SAP also.*					
	1.2	**Change Request/Review Development:** As per current governance: - Who could raise a change request? - What forms or formats shall be used? - Who is authorized to review/accept/reject changes? - Who is authorized to approve changes? - Who will incorporate the approved changes?	◆				

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Notes: - *Depending on the change, the level of authority changes (The level is measured by $ amount) plus Project teams. A standard change request tool under SAP is developed, which covers all types of change requests (Scope, Schedule, Cost) and it comes with a pre-defined request/approval process.* - *All the change requests (regardless of their status of rejected/approved or even Draft) could be retrieved under SAP.* - *Toronto Hydro is not directing its stakeholders to continue the work under the risk of not being approved budget (In case more funding is required to complete the project). If a project is nearing getting over budget, conditional approval to proceed is granted until the change request is approved.* - *TH Management may direct the execution teams to slow down the project until the change request is approved.* - *The External Contractors **are not** authorized to proceed to work at risk of being over budget.* - *For a CAPEX project, we need a change request if the total value is more than 100K$ and for the OPEX project the threshold is 50K$. for changes less than the threshold there's no need to process a change request. PMO team keeps monitoring the budget, actual cost, and forecast to make sure if a change request is required or not.*					
	1.3	**Actions Post a Change**: As per current governance: - Who has the action? - Do we document all the actions related to changes? - Do we perform/document impact analysis? - Do we update the risk log? - Are Vendors involved in the process?	◆				
		Note: - *Any individual submitting a change request is responsible to perform all the follow-ups to make sure the change is processed. PMO's responsibility is to oversight the process and assure there's no deviation.* - *All the actions related to change requests are logged and tracked.* - *Impact analyses are performed (under CLM1/2/3 under SAP) which covers the impact assessment.* - *The PMC usually updates the risk log when receiving a change request. Most of the time, the change request initiator provides an early heads up to PMO/PMC to discuss the change and assess it even before it is submitted.* - *For external vendors (contractors): The contract administrator needs to submit and follow up until the change is approved.* - *TH processes change requests for cases in which projects/programs are forecasted to finish under budget or ahead of their target completion date.*					
	1.4	**Other Change Subject**: - What if a change is not approved, do we continue with variance? - Is change control centralized and integrated?		◆			
		Note: - *If a change is rejected the project will need to either fully stop or get canceled.* - *The Change Administration is centralized.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	1.5	**Future Steps**: - Is there any monitoring in place? - How often do you assess the requirements? - Do we monitor the changes-Contingencies' interaction?		◆			
		Note: - *The only plan is to improve the change management process and they're looking for opportunities for improvement as they're going ahead with their projects. i.e., some new roles are added to the TH Organizational chart and now they need to align the process with this.* - *TH performs monthly audits, and the results could trigger changes.*					
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Communications / Training**: - Is training provided to PMO-Change Staff? - Is training planned or Ad-Hoc? - Are standards practices (same approach, same data, formats, etc.) promoted? - What are the documented change management communications?	◆				
		Notes: - *Same as other PMO disciplines.*					
	2.2	**Sustainability / Staffing Plan**: - Is there a staffing plan and sustainment developed? - Is there a standard Change Management organizational chart? - Is there a roles/responsibilities document developed for the Change management team?	◆				
		Notes: - *Staffing is covered under PMO.* - *There's no roles and responsibilities document.* - *There's no organizational chart.*					
	2.3	**Other People notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)	3.1	**Change Management Tool**: - What's your Change Management Tool? - What's your Change Management Communication tool? - Who is administrating the Change Management tool(s)?			◆		
		Notes: - *Change Request tool is SAP*					
	3.2	**Scalability / Popularity / Consistency**: - What level are changes managed on (Project/Deliverables/Program)? - What's our quality plan for changes? - Is there any overall change report developed for divisions?		◆			
		Notes: - *Refer to earlier sections.*					
	3.3	**Library Data**: - Are the definitions and assumptions around changes gathered as one documented?			◆		
		Note: - *Library is developed under SAP*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	3.4	**Automation / Integration**: - How much automated change is defined?	◆				
		Note: - *Under SAP*					
	3.5	**Other Tools notes:**					

Appendix M: Performance Management/Reporting Questionnaire

Attendees:

Toronto Hydro		**In the meeting?**
Ade Plumptre	Supervisor, Program Delivery, Improvement, and Governance	✓
Alisa Studzienny	Supervisor Program Management Office	×
Aida Ahmadi		✓
Jeremy Pasma	Supervisor, Program Management Office	×
Michelle Leung	PMO Supervisor	×
Odilon Bondoc	Program Delivery Improvement and Governance Associate	×
Mahinthan Subramaniam		✓
Rachel Fung	Program Management Consultant	×
Soumya Srivatsa		×
Trudy Chu	Supervisor, Program Management Office	×
Comtech		**In the meeting?**
Pasha Mohsenin	Director / Project Controls - Energy and Utilities	✓

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
1. Governance	1.1	**Reporting Management Plan**: Is there governance developed in Toronto Hydro to guide: - Reporting Structure - Review meetings attendees (Including their roles and responsibilities) - Frequency of report review meetings - The structure (components) of the reports (KPIs, Safety, Changes, Forecast)	◆				
		Notes: - *MCRS (Management Controls and Reporting System) defines the administration around reporting and frequency of status review meetings but it's no governance or procedure.* - *MCRS is corporate-wide and covers both project and program levels, it has some templates attached to it also which put a kind of standing around that.* - *There's an MCRS library that includes all the history action logs, depending on the size of the project TH has all the history MCRS stored under one place (it could go as far as 4 to 5 years in the past).* - *MCRS report is not developed on a regular frequency and is more like an Ad-Hoc report.*					

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	1.2	**Report Development:** As per current governance: - Who's in charge of reporting? - What are the data sources? - Are data sources integrated? - Is there a data date (reporting cut-off date) defined? - Are vendors contributing to the reporting? - What are the identified reporting tools?		◆			
		Notes: - *Most of the reporting is PMC's responsibility (PDR: Program Delivery Report).* - *MCRS is usually developed by a supervisor on an as-required basis development.* - *SAP is the main data source for data, open text is another source. Excel, Risk log (MS-Access) for program level (Project Status reports could be used as data sources).* - *For the Project level, there is a project status report, but they are not in the scope of this assessment.* - *Reports are developed by PMCs for their associated RCs, PMO gathers these reports and consolidates all the results under one package.* - *PDR reports are developed on a certain time (post-release of capital expense report) and monthly basis.* - *Regular meetings are held with contractors to obtain updates on their scope* - *Design Readiness or Maintenance Summary reports are developed by one single responsible team.*					
	1.3	**Actions Post a report**: As per current governance: - Is there an action assignment in place during the report review meeting? - How are the actions logged and tracked? - Is there a pre-developed agenda for meetings + MOM? - Is there a repository of all past reports for reference? - Is there a review/approval process in place for the report release?	◆				
		Note: - *There's an action log that gets reviewed and a designated person is maintaining it.* - *Actions get reviewed at the end of each meeting.* - *MCRS captures the agenda, action log, follow up and steps to be taken during the meeting.* - *Yes, there's a repository for all the MCRSs.* - *PMCs take the data from all PDRs, consolidate them, review the results with stakeholders and then release it. There's a hierarchy of review and approval for the reports.* - *PMO produces KPIs (on monthly basis) and adds it into the scorecard (Schedule adherence is tracked by complete or not complete status of the projects, the percentage is based on the actual cost over budget.*					
	1.4	**Other Reporting Subject**: - Are reports enterprise covering projects/programs under one group? - Do we cross-check the reports with teams?	◆				

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
		Note: - *Reports depending on Project or Program level are prepared by different teams and do not necessarily cover all the portfolios for a division.* - *During the PDR meetings, each PMCs would walk the team over the report but may receive comments from other stakeholders (i.e., the numbers could be interpreted differently between two teams)*					
	1.5	**Future Steps**: - Considering the ongoing effort, are you considering changes on reports? - How often do you assess the requirements?	◆				
		Note: - *No major change is considered for reporting at this time. SAP remains the main source of data (with some manual data handling) and feeds BI or other dashboard or report developing platforms.* - *PMO is responsible for developing Score Cards, while PMC is developing their report (such as PDRs) which includes lots of PMO initiatives. On a year-by-year basis, the PMO reviews the reporting with stakeholders and check the needs.* - *PDRs (which are more or less the same template) is the basis for all the performance reporting. PMO reviews all the PDRs on monthly.*					
	1.6	**Other Governance notes:**					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
2.People / Practices	2.1	**Communications / Training**: - Is training provided to PMO-Reporting Staff? - Is training planned or Ad-Hoc? - Are standards practices (same KPIs, metrics, formats, etc.) promoted? - What are the documented report management communications?	◆				
		Notes: - *Same as other disciplines.*					
	2.2	**Sustainability / Staffing Plan**: - Is there a staffing plan and sustainment developed? - Is there a standard Report Management organizational chart? - Is there a roles/responsibilities document developed for the Report management team?	◆				
		Notes: - *Same as other disciplines.*					

Area	No.	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	2.5	**Other People notes:**					

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
3. Tools (Project Management Information Systems)	3.1	**Report Tool**: - What's your Reporting Tool? - What's your Report Communication tool? - Who is administrating the Reporting tool(s)?		◆			
		Notes: - *Excel, SAP BI, Tableau, PowerPoint are the tools for reporting.* - *Emails, Team meetings, and messages. There is notification (Such as SAP BI sending weekly notification).* - *Reporting tools are not enterprise and there is no administrator*					
	3.2	**Scalability / Popularity / Consistency**: - Are reports multi-layers? - Do we develop special reports for higher management? - Do we share reports with external stakeholders? - Do we incorporate any comments from external stakeholders in the reports?		◆			
		Notes: - *PMO-related reports are sometimes multi-layer (such as Planned Capital Project Completion Report or Design Readiness report).* - *There are some dedicated reports for senior management and provide rolled-up and summary reports.* - *For a specific and standalone large project, they may share the TH developed reports with external stakeholders (Ade was not sure about this) but PMO develops reports that are not shared with external resources.*					
	3.3	**Library Data**: - Are the definitions and assumptions around the report develop documented? - Are there pre-defined values for developing reports (Library Data)?	◆				
		Note: - *The assumptions (i.e., thresholds) are documented internally within PMO plus if there's an external report (like PCR), they will document and communicate these reports with other stakeholders.* - *Most of the information is pre-calculated or populated and this could be considered as library data. Such as Conditional formatting under Excel.* - *TH is transitioning the team (i.e., PMCs) from the current manual to Tableau so lots of pre-populated information is available and used.*					
	3.4	**Automation / Integration**: - How much automated reporting is defined?	◆				
		Note: - *Most of the effort is manual and there's no opportunity for automation.*					

No.	Area	Question	Ad-Hoc	Emerging	Recognized	Improving	Mature
	3.5	**Other Tools notes:**					

Appendix N: References

No.	Document Title	Document Details
1	4.1 X 18364 Project Documentation	A predefined format from SAP
2	30M Forecasting Process-Sep25.	Spreadsheet for tracking all projects with their major dates and budgets
3	Issue Scope-Work Package (ISW) level 3 Process Map (1.0)15-Nov-2021	Process flow for issuing scope work packages
4	Capital Projects Project Phasing Job Aid	Guide on how to break the projects down.
5	Manage Scorecard CR(MSC) Process Map	Process flow for managing scorecards
6	Close Out Project (PPP8.0) Level 3 Process Map (v3.0)	Process flow for closing projects
7	RC 3110 DCE PDR Report September 2019	Sample "Monthly Program Delivery Review" report /cover for all the projects under one RC's portfolio
8	Cancel Project Process Map (v5.0)	Process flow for project cancellation
9	Managing Material Requirements Process_1.2	Project flow for material management
10	Perform PVA level 3 Process Map (v1.0) 25-Nov-2021	Process flow for the development of project variance analyses complete with descriptions and directions
11	Change Request (CR) Process Map (v2.0)	Process flow for developing change requests and approvals under SAP with details regarding approvers, thresholds, etc.
12	Intake Scope-Work Package (ISP)level 3 Process Map(D)	The process follows for intaking of scope work packaged with details regarding key stakeholders and required actions within SAP
13	Work Package PWN 17019	A detailed document providing quantity and cost estimate, logging risks, identifying the work condition
14	PVA Update and PSR	Development guide for the program variance analysis report
15	2019 V3.1 Program Variance Log (PVL)	Over 2000 projects are listed under this Excel spreadsheet which logs all the variances
16	EWP Risk Log (ERL)	Process and log for risk management

Appendix 0: Acronyms

Acronym	Description
CAPEX	Capital Expenditure
CBT	Computer Based Training
CPP	Cancel Project Process
DBA	Database Administrator
DCE	Design Construction East (Toronto Hydro Division)
DCW	Design Construction West (Toronto Hydro Division)
ERL	Enterprise Risk Log
ISA	In-Service Additions
ISP	Integrated Intake Scope-Work Package
ISW	Issue Scope-Work Package
KPI	Key Performance Indicator
MCRS	Management Controls and Reporting System
OCM	Organizational Change Management
OE	Organizational Effectiveness
OPEX	Operating Expenditure
PDIG	Process Delivery Improvement and Governance
PDR	Monthly Program Delivery Review (PDR) Report
PEM	Planning, Engineering, and Modernization
PMC	Program Management Consultant
PMO	Program Management Office
PPP	Project Planning Process (Distribution)
PRAT	Project Resource Allocation Template
PSAT	Program Spend Allocation Table
PSP	Project Planning Process (Stations)
PVA	Program Variance Analysis (Report)
PVL	Program Variance Log
RC	Responsibility/Resource Centre
SCP	Scorecard Change Process
SPOC	Single Point of Contact

Project Variance Analysis (PVA)
Process Review

Final

For Toronto Hydro
May 10, 2022

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Executive Summary

Toronto Hydro (TH) requested that John Hollmann, owner of Validation Estimating LLC (Consultant) review their Project Variance Analysis (PVA) process. The specific scope is to assess the PVA percentage cost variation trigger thresholds for alignment with standards (e.g., AACE® International) and best practices. The assessment includes a review of the PVA process of data collection, analysis, review and reporting. This report includes recommendations for practice improvement.

The PVA process uses a fixed threshold range derived from AACE Recommended Practice (RP) 18R-97: *Cost Estimate Classification System – As Applied in Engineering, Procurement and Construction for the Process Industries*. This report notes that the ranges in this and other AACE classification RPs are not intended for such use. The AACE ranges are indicative only for the purpose of illustrating relative class-to-class variation, not absolute range values for any particular project or portfolio. Research shows that actual ranges often vary quite significantly from the AACE reference.

The Consultant recommends that Toronto Hydro apply *internal* benchmarking to assess variance given that there are no reliable off-the-shelf external metrics. Valid external benchmarking requires a significant investment of resources working with a 3rd party benchmarking firm or similar. If the goal is to improve practices and outcomes over time (rather than a competitive analysis against peers), internal benchmarking serves the purpose.

Internal benchmarking requires study of Toronto Hydro's actual distributions or range. The revised +/- percent threshold(s) would be based on this study and adjusted each year with the objective of improvement. For example, the threshold might be updated each year based on the 80 percent confidence interval (i.e., p10/p90 range) of the updated historical dataset. A preliminary study of this nature is included in the report's Appendix.

The current PVA process uses a measure of the percent of projects outside the fixed threshold (%PVA) as a year-to-year performance metric. That requires fixed thresholds. By re-setting the threshold annually at say the p80 confidence interval of past data, the %PVA would be more or less fixed (i.e., by definition, 20 precent of projects fall outside the 80% confidence interval). The threshold would have the sole purpose of sizing a representative sample of variant projects for capturing lessons learned. Performance would then be measured using a *direct* measure of variability such as the p10/p90 *span* (e.g., p90 percentage variance plus the absolute value of p10) each year. Study of the actual variance distribution will also show the *pattern* of variance; i.e., the shape of the distribution illustrates behavior driven by the PVA process which may or may not be desirable. For example, the Appendix study shows that the current distribution profile is discontinuous; i.e., most projects are constraining their variance within the threshold bracket; how that is being accomplished should be studied (e.g., better estimating practices will generally not result in a discontinuous distribution).

The study in the Appendix also shows that variance is strongly correlated with project size. Therefore, the report recommends setting thresholds by project size categories. The

historical data indicates a need for at least two categories: less than and greater than $200,000 is suggested (continue to exclude projects under $50,000 which have extreme random variability).

The report includes two main recommendations as follows:

1. Set the threshold using internal benchmarking. Study the last 5 years of variance metrics to set a baseline for threshold determination. Set the thresholds at the 80 percent confidence interval (i.e., p10/p90 values)[1]. Update the study annually to track any improvement or other trends, and to directly observe distribution pattern changes if any.
2. As part of the study in recommendation (1), also study the *variance vs. project size* and determine if the PVA process is biased towards small projects and whether multiple thresholds for different project sizes make sense. The Appendix study suggests the following initial 80 percent confidence interval thresholds[2]. Toronto Hydro should confirm these with its own refined study aligned with its needs:
    - $50,000 to $200,000 estimates: -31/+40%
    - >$200,000 estimates: -20/+26%

The report also includes the following secondary recommendations:

3. Study cost versus duration variance to see if there is a correlation (i.e., is cost variance an artifact of scheduling practice?). This can be done as part of the study in recommendation (1).
4. Study whether the use of the total cost variance, and the wide range of the secondary material cost and labor hour variances (-50/+50%) are allowing some larger projects with significant (but <50%) account-level variances to bypass PVA assessment and over-emphasizing the smallest projects that have less opportunity for offsets. The distribution of actual material cost and labor hour variances should be studied as part of recommendation (1).

[1] The AACE Classification RPs, and general industry practice, is to report ranges using the 80 percent confidence interval. This is used because values outside this range tend to reflect aberration (i.e., tails go asymptotic). Since the purpose of the PVA thresholds is to flag aberration, it is suggested as an objective range criterion in this report.

[2] If the range resulting from the 80 percent confidence interval is felt to be too wide for aspirational performance target setting purposes (which Is not the stated PVA objective), the threshold range criterion could be set to a tighter confidence interval. The study showed for example that the 60 percent confidence interval range was -14/+18% and -13/+16% for the $50,000-$200,000 and <$200,000 projects respectively. This would result in more projects being flagged for study (i.e., 40% in this case).

Introduction

Toronto Hydro (TH) requested that John Hollmann, owner of Validation Estimating LLC (Consultant) review their Project Variance Analysis (PVA) process. The specific scope is to assess the PVA percentage cost variation trigger thresholds for alignment with standards (e.g., AACE® International) and best practices. The assessment includes a review of the PVA process of data collection, analysis, review and reporting. This report includes recommendations for practice improvement.

Background

This section reviews the existing PVA process. The primary sources of information include:

- Virtual meetings on March 25 and 28, 2022;
- PVA Level 3 Process Map dated November 25, 2021 (v1.0);
- PVA PSR slide deck dated March 16, 2022;
- Several project PVA report examples;
- An Excel file with PVA variance values from 2017-2021

Organization

The PVA process is managed by the Toronto Hydro Program Delivery Improvement and Governance (PDIG) organization. The PVA process owner is the Director of the Enterprise Program Management Office (EPMO). The PDIG process also involves:

- Operations (OPS) leaders who meet in a Master Production Planning (MPP) meeting where PVA findings are reviewed and actions are followed up on;
- Investment planning in the various business units who judge the quality of PVA reports;
- Execution responsibility centers (RCs) including directly responsible persons (DRPs) who prepare the PVA reports.

PVA Strategy

The scope of this review does not include the overall strategy of the EPMO or PDIG organizations (e.g., no review of estimating, scheduling, funding, risk analysis, or other related processes). This is just a review of the PVA process including the strategy, measures and reports regarding planned versus actual project cost variance.

The PVA approach as reviewed is directed towards understanding and improving project cost *predictability* only. Typically, capital programs have two key cost performance indicators: cost effectiveness (achieve lower absolute cost for a given scope) versus predictability (accuracy or variance; i.e., spending what was budgeted). The word “versus” is used because predictability or accuracy can be achieved at the expense of effectiveness via over-estimation combined with laxity in project-level control. However,

because effectiveness is difficult to measure, and business and finance stakeholders are often mostly focused on reliability of forecasts, most company portfolio management processes observed by the Consultant only measure predictability.

Some capital programs also measure both cost and schedule (time duration) variability because cost and schedule are often traded (e.g., expend resources to preserve completion milestones) and hence may be significantly related. It was indicated that PDIG has measures of project schedule duration variability but they are excluded from this review.

PVA Process

It is assumed by the Consultant that the PVA process is part of an overall, ongoing strategic deployment process. The usual process starts with strategic objectives that are agreed, putting processes in place to deploy the strategy developed at an appropriate organizational level, taking measurements of the process performance, and noting variances and taking correction actions. It is also assumed that other non-PVA measures are used and cross-learnings with PVA are assessed (e.g., cost/schedule trading behavior, change management, etc.).

The PVA Level 3 process reviewed measures the following:

- Percent of projects for which costs and/or hours are outside established thresholds (Business Requirements Planning (BRP) Metric 1-calculated by PDIG) triggering requirement to prepare a PVA "cause" report.
    - BRP Metric 1 = percent of projects for which either:
- cost variance [(actual cost/packaged estimate cost (PEC))/PEC x 100%] is outside the -15/+20% threshold range.
- hours variance [(actual hours/estimated hours)/estimated hours x 100%) is outside the -50/+50% thresholds[3].
- Likely causes of variation (identified by the execution RC with input from the DRPs) (*narrative*)
- Quality, including timeliness, of the PVA "cause" reports prepared by the RC (BRP Metric 2 – calculated by the Investment Planning group)
    - BRP Metric 2 = score based on quality check guidelines where 80% is based on quality and 20% on timeliness.

The PVA Level 3 process results in the following deliverables:

- PVA cause reports for individual projects outside the BRP Metric 1 threshold (a PVA Report template is provided to the teams by PDIG).

[3] The team reported that the material cost variance was similarly being used; however, the documented process reviewed by the Consultant did not show that.

- From the collective RC-identified likely causes, overall "lessons learned (LL)" are documented, recommendations for improvement are made and actions are planned in "inter-RC" lessons learned workshops.
- From the quality metric, (BRP-2), for low quality reports, "feedback" is given to the RC/DRP for their consideration and sharing.
- A PVA Project Status Review (PSR) report is developed for MPP review and follow through.

In a nutshell, the PVA process flags projects with significant variance so that lessons learned can be extracted from this sample of variant projects by responsible parties for MPP consideration. The flagging or trigger metric (%PVA) is used as an indicator of variance performance over time; however, no direct statistical measures of variance are applied or studied.

Observations and Findings

Establishing a Threshold; Measuring Variance

The PVA process uses an indirect "trigger" measure of cost variance that uses threshold limits to flag projects for variance cause (lessons learned) analysis. The process captures a measure of the percentage of projects requiring a PVA (% PVA) and uses this as a "performance" metric. This is an indirect measure; it does not directly measure the cost variance itself. The use of %PVA to measure performance is problematic because it constrains threshold setting as is discussed later.

For the cost variance trigger, the PVA process uses a *fixed* threshold range derived from AACE Recommended Practice (RP) 18R-97: *Cost Estimate Classification System – As Applied in Engineering, Procurement and Construction for the Process Industries*. The various AACE classification RPs provide a range-of-ranges. The PVA uses the most extreme range (-15/+20%) from the RP's table 1 for Class 2 estimates. Class 2 estimates are those based on full scope definition, with full estimate detail, and with budgets *usually based on a contractor tender* (i.e., assumes some risk transfer to the contractor at that gate).

The Toronto Hydro phase-gate scope development process and scope definition requirements were not reviewed to determine if Class 2 appropriately reflects TH projects at sanction. While this report finds that Class RPs should not be used for PVA threshold criteria, the question of Class is important because research shows the most significant driver of accuracy or variability is the level of scope definition. It is generally understood in industry that the best practice for achieving predictability is maintaining rigor in the phase-gate scope development process (making sure the estimate and all other deliverables meet requirements). Using the lessons learned from the PVA process in phase-gate checklists or similar practices would be part of such a quality (and variability) improvement process. The scope of this review also did not include studying the lessons learned or how they were actually used.

It should be noted that all AACE classification RPs state that "*While a target range may be expected for a particular estimate, the accuracy range should always be* ***determined through risk analysis of the specific project and should never be predetermined***." While this statement is directed towards risk analysis (e.g., contingency setting, etc.), the principle of always using *specific* analyses in regards to accuracy or variability applies to the PVA threshold setting.

Further, the RPs state that the ranges exclude major risk event impacts. Further still, an ambiguous *range-of-ranges* approach was implemented by the AACE technical committee in part to minimize the inappropriate use of the RPs. There is no AACE accuracy range "standard"; the range-of-ranges are indicative only. They are primarily intended to show the *relative* change from class-to-class, not *absolute* values. In short, these ranges often have little relevance to the variance on any particular project or project type. Evidence of this fact is shown in the study in this report's Appendix.

While it is understood that an external benchmark or "standard" is desired by PDIG (and most companies), the Consultant is not aware of any such *off-the-shelf* measure. All quoted ranges in literature are indicative or anecdotal at best and rarely match any particular situation. There are external project cost benchmarking sources that develop more specific measures, but these are proprietary and require the parties to participate in benchmarking of their project systems at some investment of time and resources (e.g., Independent Project Analysis, Inc.). Another form of benchmarking is called reference class forecasting, but that also requires special study of comparable industry projects (the reference class) which requires significant multi-party effort and often relies on suspect public domain data.

There is one consistent practice in industry, and the AACE RPs in respect to range and that is the confidence interval used. The AACE Class RPs call for using the 80 percent confidence interval for reporting range. This practice is common in industry. Later, this report will recommend using the confidence interval as the objective criteria for selecting the range.

The Consultant has supported focused accuracy studies including for power transmission projects of Canadian provincial hydropower companies.[4] As an example of the limitation of the AACE Class range-of-ranges, that study found that the accuracy range of actual Class 3 estimates for the study participants was -29/+54% at an 80 percent interval (80 percent, representing the p10/90 range which is the typical reported interval for accuracy range). However, the RP 96R-18 (and 18R-97 for process industry) Class 3 estimate worst-case range is only -20/+30%. In that study, the actual variability (span of the p10/p90 range) of the transmission projects was 1.7X the worst-case in RP 96R-18[5]. While Class 2 estimates were not studied, it is reasonable to assume that the magnitude of this gap

[4] Hollmann, et.al., "Variability in Accuracy Ranges: A Case Study in the Canadian Overhead Power Transmission Industry", AACE Cost Engineering Journal, Sept/Oct 2018.

[5] 83 percent span (54+29) versus 50 percent span (30+20) is a 1.7X multiplier.

between indicative ranges from the literature (AACE RPs or otherwise) and industry reality is not uncommon.

Further, research by the Consultant of project cost growth and accuracy[6] shows that small project systems (i.e., projects managed as portfolios with cost less than 5-10 million dollars, <2 years duration) often have much different accuracy range distribution profiles than larger, more strategic projects do. In particular, small project systems often show more distortion in their distribution (i.e., they are often discontinuous and do not fit well with any "natural" distribution). This distribution distortion is driven by how portfolio projects are estimated, controlled and accounted for; e.g., each individual project has very limited resources applied for these project control tasks. For example, industry small project systems tend to skew to more underruns (over-estimation) than large projects. Figure 1 from the Consultant's book shows an actual/estimate distribution for a typical small project system (based on studies by the Consultant); the example shows a sharp drop-off or discontinuity in overruns at +10% because this is often set in industry as a "threshold" or hard-stop above which a project must be re-reported to management; an experience teams will seek to avoid by whatever means. The resulting distribution does not reflect natural cost performance, but rather it is an artifact of a system with the main goal of annual portfolio budget predictability; in this case avoidance of overruns. This is typical of ongoing portfolio management as opposed to major project organizations which focus more on the competitiveness of individual strategic investments.

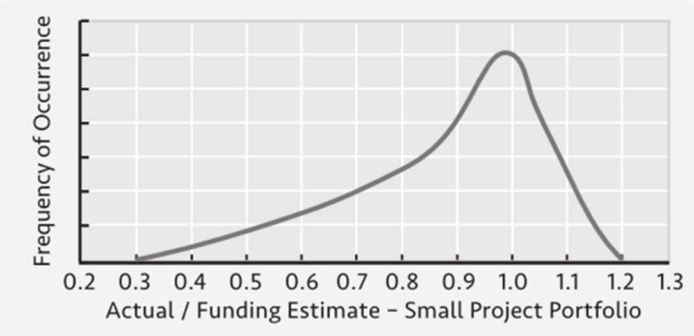

Figure 1: Typical Small Project System with Underrun Profile (Over-estimation)[3]

This illustrates a challenge of benchmarking is that "one gets what is measured"; i.e., if the main objective is to avoid overruns exceeding 10% as shown in Figure 1, then the process will naturally evolve in subtle (and not always desirable) ways to avoid that outcome. The study in the Appendix indicates that the PVA process is driving behavior at Toronto Hydro, but in this case the variance results are not just a high-side limit, but low-high bracketing (-15% and +20%). The process management questions for PDIG are what practices are being used to achieve this discontinuous distribution and whether those practices are consistent with objectives? For example, if the lower threshold were removed, would more projects underrun (as in Figure 1) and would that be desirable so long as funds are returned? If the actual range distribution were directly studied every

[6] Hollmann, J. Project Risk Quantification, Probabilistic Publishing, 2016.

year, there would be sufficient evidence to spot over-estimation trends with setting a hard-coded threshold that incentivizes spending excess funds.

Given the lack of reliable external metrics, and the limited applicability of any published range metrics to given project situations, the Consultant recommends that the PVA process be based on *internal* benchmarking. In that approach, PDIG would benchmark cost variance against Toronto Hydro's own past performance with the goal of improving said performance over time.

This internal approach requires a baseline benchmark study of the variance statistics for projects completed in the last 5 years or so. From that, the mean and p10/p90 values or some other confidence interval values could be determined for use in setting target thresholds. A similar study could potentially be done for material cost and labor hours variance (for which PDIG has set a much wider -/+ 50 percent tolerance).

A benefit of internal benchmarking is that, if the study is updated every year, PDIG will have a direct variance range measure to gain more learnings about its project portfolio process. For example, measure BRP-1 does not convey any information about whether estimates are biased and in which direction (i.e., it does not indicate if there are distortions resulting from portfolio management process that may affect achievement of company objectives).

The first recommendation then is to conduct such a benchmarking study and update it annually. An initial example study is included in the Appendix. The study includes an example direct measurement of range by year.

Use of the Threshold and a Variance Metric or KPI

As discussed, the PVA process is using the range threshold to trigger the preparation of PVA reports that serve as a source of variance cause information (lessons learned). It is primarily a sampling devise, not a performance metric per se. However, the % PVA is being used as a key performance indicator (KPI), including looking at annual trends. Unfortunately, this dual use means the threshold percentages must be fixed for all time.

The recommended internal benchmarking approach would instead set the threshold at a fixed confidence interval range of the baseline history, and these baseline percentage values would be updated from time to time as the baseline, objectives, processes and conditions change or targets are set (i.e., hopefully to improve). The threshold would be set for the purpose of getting a reasonable sample of lessons learned in a way that avoids unnecessarily or unfairly burdening projects with reporting requirements that are not adding much value. The 80 percent confidence interval is suggested because the AACE Classification RPs, and general industry practice, is to report ranges using the 80 percent confidence interval. This is used because values outside this range tend to reflect aberration (i.e., tails go asymptotic). Since the purpose of the PVA thresholds is to flag aberration, it is suggested as an objective range criterion in this report

A trigger threshold range set on confidence interval criteria means the %PVA (or sample size) would always be more or less fixed (e.g., 20% of projects if 80% confidence interval

is the criteria). To measure the year-to-year change in variability, a direct measurement of variation is recommended rather than %PVA. The direct measure could be the span (high percentage plus the absolute value of the low percentage). The Appendix provides an example of how that can be done. This measure would also provide directional information related to the process (e.g., is variation biased on the low or the high side and is that bias changing?).

If the range resulting from the 80 percent confidence interval is felt to be too wide for aspirational performance target setting purposes (which Is not the stated PVA objective), the threshold range criterion could be set to a tighter confidence interval. This would result in more projects being flagged for study.

Other Observations

The following are other observations in respect to improving the PVA process and metrics. These are mostly focused on assuring the process is value-adding, economical with team resources, and fair in how it treats various projects that may or may not be flagged for significant variances.

Cost versus Duration

Projects will sometimes trade cost for schedule; i.e., when schedule is slipping, they may spend more money to protect the completion milestone. Therefore, it is useful to compare cost and duration variance to see if there is a correlation. A scatter plot with cost variance on one axis and duration on the other gives a good visual indication. This may be a lesson learned in its own right (which is often not detected otherwise); i.e., is cost variation an artifact of scheduling practice?

Randomness; Predictability vs. Project Size

An attribute of small projects is that there are a relatively small number of significant cost items in the scope. As such, if one item overruns on a small project, there is less opportunity for counter-balancing underruns (and vice-versa) than on larger projects. Therefore, unless there is over-estimation bias with weak control, small project systems may have wider range of variance than larger projects. A “direct” study of cost variance as discussed previously would examine the variance vs. size and determine if a single threshold for all project sizes makes sense (i.e., is the PVA process biased towards assessing the smallest projects that in the end have little impact on overall capital spending?). The Appendix includes such a study and shows that indeed, size is a driving factor.

Offsetting Plus and Minus Variance

The PVA trigger process may not be flagging some larger projects that have variability issues worth reporting. For example, a project may have a material cost overrun, but a labor cost underrun, such that its overall variance is within the threshold; in that case, its material cost problem will be overlooked. However, another project with the same material cost overrun, but no counterbalancing labor underrun, will fall outside the variance threshold and be subjected to the PVA reporting regime. Are some projects with

variability issues "lucking out" of having to prepare a PVA report? A study of a sample of larger projects (not done in this report) with variance within but near the threshold, would indicate if major variances are balancing out (i.e., are the range thresholds used for labor hours and material cost variance appropriate?).

Significance: Explain 90% of Variance?

The PVA process "rules" (PVA Process Quality Check Guidelines) states that for identifying the root cause of variance, "*the gap analysis must explain 90% of the variance between the packaged estimate and the actual construction costs*." As discussed above in regards to offsetting variances, is the rigorous PVA process requirement to explain 90% of the variance a value-adding criterion? Perhaps teams should be given some leeway to focus on the most significant drivers (e.g., just say "most" or "majority" of the variance).

Minor Observations:

The following are some minor items seen in the documents:

- In report graphics, use trend lines only where trend is being measured; i.e., some PVA PSR charts use trend lines between data points that have no relationship.
- Chart of cost variance has a line showing the absolute values (e.g., is PDIG saying a 15 percent underrun is worse than a 5 percent overrun?). See the recommendations for preferred distribution and variance range illustrations that give better insight into the process and performance.
- The PVA Level 3 Process Map does not show poor quality reports being recycled for improvement.

Recommendations

These recommendations are focused on better understanding the variance profile, the variation causes and to support improvement efforts year by year. They also help assure the PVA process is value-adding, economical with team resources, and fair in how it treats various projects that may or may not be flagged for significant variance items.

Recommendation 1 and 2 are most significant; 3 and 4 are secondary:

1. Set the threshold using internal benchmarking. Study the last 5 years of variance metrics to set a baseline for threshold determination. Set the thresholds at the 80 percent confidence interval (i.e., p10/p90 values) based on AACE RP use of this criteria for range reporting. This study should be done annually to track any improvement or other trends in the variance range and mean year-to-year, and to directly observe distribution (e.g., estimation bias) changes even if the mean and range are not changing. See the Appendix for an initial study.
    a. This could also be done at the account level (e.g., material, labor hours, etc.) to set thresholds for those accounts. The account level was not studied in this report.

b. Discuss the value of having a lower bound; are underruns being discouraged by PVA reporting requirements (i.e., are excess funds being spent to keep off the radar?). By directly observing the distribution, any over-estimation would be observed without setting a hard-coded threshold that incentivizes spending excess funds.

2. As part of the study in recommendation (1), also study the *variance vs. project size* and determine if the PVA process is biased towards small projects and whether a single threshold for all project sizes makes sense. See the Appendix study for an initial examination.

    a. The Appendix study suggests the following initial thresholds by size based on an 80 percent confidence interval:

        - $50,000 to $200,000 estimates: -31/+40%
        - >$200,000 estimates: -20/+26%

    b. If the range resulting from the 80 percent confidence interval is felt to be too wide for aspirational performance target setting purposes (which Is not the stated PVA objective), the threshold range criterion could be set to a tighter confidence interval. For example, the Appendix study showed for example that the 60 percent confidence interval range was -14/+18% and -13/+16% for the $50,000-$200,000 and <$200,000 projects respectively. This would result in more projects being flagged for study (i.e., 40% in this case).

3. Study cost versus duration variance to see if there is a correlation (i.e., is cost variance an artifact of scheduling practice?). This can be done as part of the study in recommendation (1). Such a study is not included in this report.

4. Study whether the use of the total cost variance, and the wide range of the secondary material cost and labor hour variances (-50/+50%) are allowing some larger projects with significant (but <50%) account-level variances to bypass PVA assessment and over-emphasizing the smallest projects that have less opportunity for offsets. The distribution of actual material cost and labor hour variances should be studied as part of recommendation (1).

APPENDIX – INTERNAL BENCHMARKING STUDY

This is a preliminary analysis of variance data pursuant to recommendations #1 and #3. The purpose is to determine appropriate cost variance threshold levels based on internal benchmarking. PDIG provided an Excel workbook with 5 years (from 2017 to 2021) of project cost variance data for this purpose.

For this initial study, the data fields used were the year, the estimated cost (for sorting by size)[7], the total cost variance percentage (the main metric of interest), and the flag whether a PVA report was required (used for BRP Metric-1). PDIG may desire to conduct more in-depth analysis using other fields for sorting/segregating data.

The Consultant uses a low-cost Excel add-on called "Analyse-It" for statistical studies (e.g., histograms, curve fitting, etc.). This software is the source of the graphics and tables.

Data Preparation

PDIG provided the data in separate annual spreadsheets; these were combined into a 5-year dataset (with year as a field). Records with -100% or no variance (or crossed out by the client) were deleted for this study. The remaining data was sorted by the variance value. Based on observation, "outliers" were segregated and not included in the overall distribution; these outliers were projects with <-80% variance and >250% variance based on the assumption that such variations were few and likely not the result of an ongoing process problem; PDIG may wish to apply other criteria for outliers.

Overall Variance Distribution

Figure A-1 shows the variance histogram for projects of <u>all</u> sizes. The statistics in Table A-1 apply to that distribution:

Number	2,447
Mean	4.3%
Std Dev	+/-37%
P50	-0.9%
P10	**-31%**
P90	**+41%**

Table A-1: Variance Statistics: All Project Sizes

Observations about the profile:

- The red-curve shows the nearest fit Normal distribution based on the mean and std. dev. The actual distribution (histogram in green) shows a compression of

[7] It appears that PDIG has exempted small projects from PVA requirements. However, the exemption was made using the actual cost. It is recommended that estimated cost be used for the exemption; using actuals results in only overrun causes being examined and not underruns.

values between -15/+20% which is obviously not a "natural" distribution; i.e., not the result of a natural variation in project system performance.

  - Teams are apparently able to exert control to minimize cost outcomes outside the PVA thresholds of +20/-15%. The study did not examine project behaviors that could explain this, or whether those were desirable.

- The Consultant also looked at this data by year; this same distribution pattern was seen consistently for each year's data.

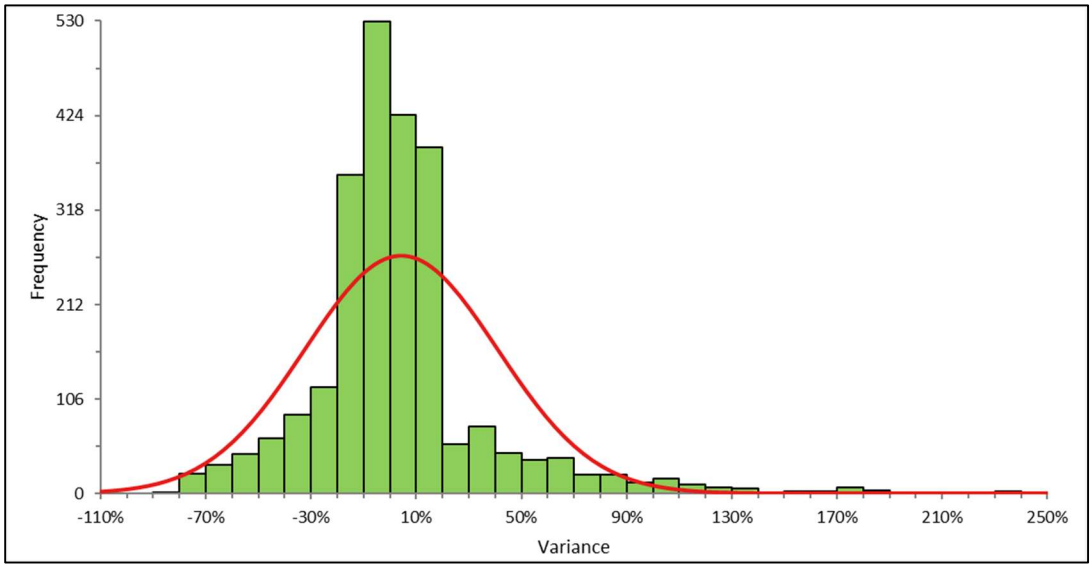

Figure A-1: Variance Distribution: All Project Sizes

It was observed that PDIG exempted projects <$50,000 from PVAs. Therefore, the statistics in Table A-2 apply to the projects with estimates >$50,000. The distribution for this project size range is visually the same pattern as Figure A-1; however, the statistics evidence a tighter range for the larger projects (i.e., the small projects are more variable).

If a single threshold range was set, the p10/p90 values in Table A-2 would be suggested. However, as shown in the next study section, this is not recommended because of the high sensitivity of variance to project size; i.e., the wide threshold in Table A-2 would be exempting most larger projects from PVA reports.

Number	2,025
Mean	3.5%
Std Dev	+/-31%
P50	-0.4%
P10	**-26%**
P90	**+34%**

Table A-2: Variance Statistics: Estimates >$50,000

Variance Distribution by Size Range

Table A-3 breaks the project data statistics into three datasets with estimates <$50,000, from 50,000 to $200,000 and >$200,000. While the <$50,000 projects are exempted, the statistics are shown to illustrate the strong variance range-to-size relationship. Small project costs are much more variable.

The $200,000 value was chosen based on examining the variance vs. project size regression shown in Figure A-2. Notice the sharp reduction in scatter for projects greater than about $200,000 (dashed vertical red line). Further, notice the "bounding" of variance for the larger projects at about +20/-15% (dashed horizontal blue lines). Would more projects underrun if there was no bound on the low end? Finally, notice that the mean variance (slanted line) is correlated with project size with underruns more common for larger projects (the regression t-score indicates a strong significance to this relationship).

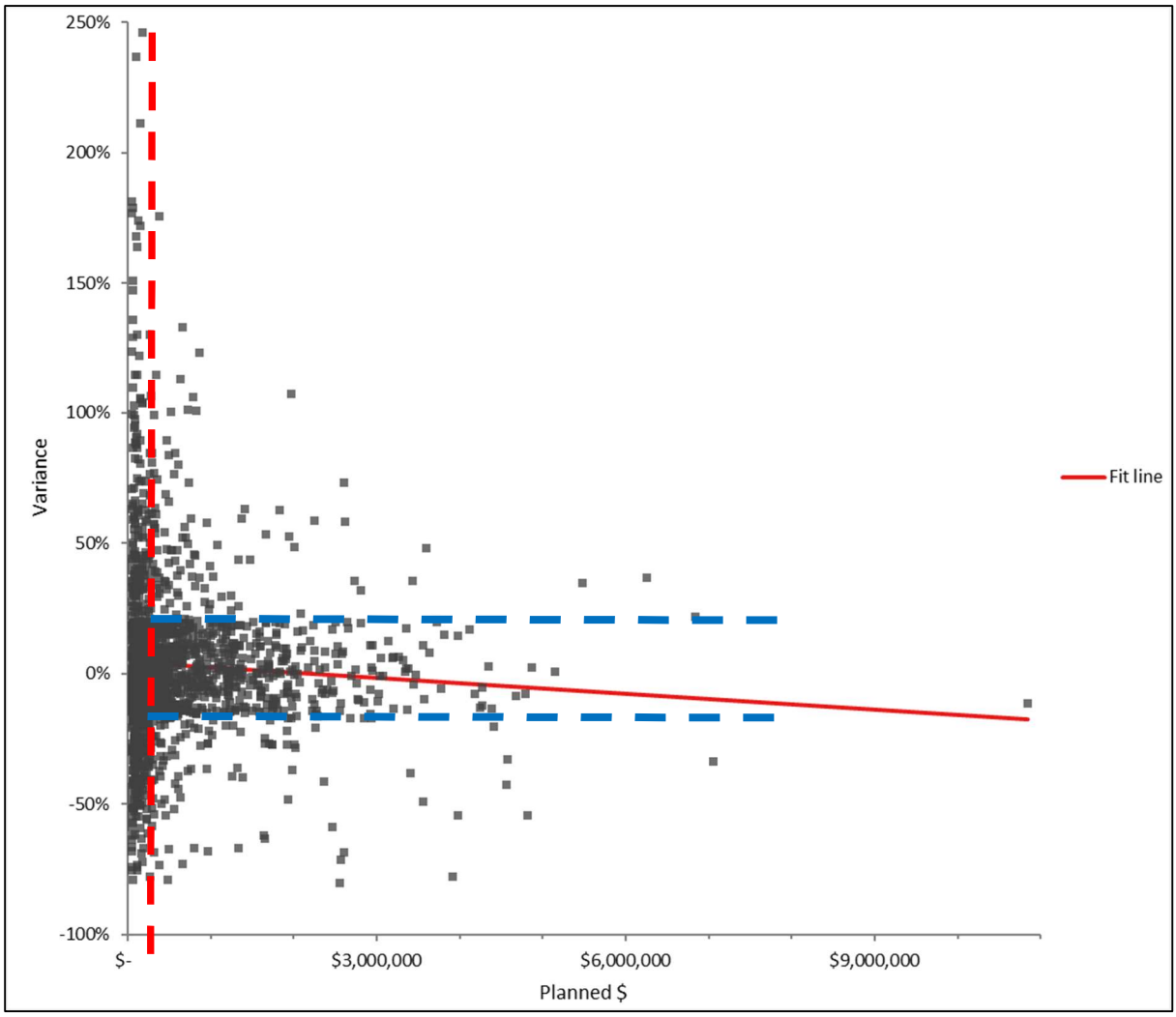

Figure A-2: Variance vs. Project Size

Estimate Size Range	<$50,000	$50,000-200,000	>$200,000
Number	422	859	1,166
Mean	8.2%	4.6%	2.6%
Std Dev	+/-56%	+/-37%	+/-26%
P50	-4.9%	-1.2%	0.05%
P10	**-51%**	**-31%**	**-20%**
P90	**+78%**	**+40%**	**+26%**
% of projects for which PVA was required with +20/-15 threshold	N/A	24%	16%

Table A-3: Variance Statistics: By Size Ranges

This data confirms that PVAs for projects <$50,000 would not be value adding; the practice of excluding them should be maintained. However, it also suggests that the variance threshold range should vary with project size. At a minimum, distinguishing between projects less than or greater than $200,000 is suggested. Doing this will help assure that smaller projects are not over-emphasized, and that larger projects are given proper attention. Based on this preliminary study, the resulting thresholds set at an 80 percent confidence interval initially would be:

- $50,000 to $200,000 estimates: -31/+40%
- >$200,000 estimates: -20/+26%

As to whether the p10/p90 range, which industry and AACE Class RPs use to represent estimate accuracy (i.e., 20% of projects are expected to fall outside this range), is appropriate as a threshold needs to be considered by PDIG. 20% of roughly 400 projects per year is about 80 PVA reports (less any exempted “reactive” projects); PDIG would need to decide if is this an adequate sample to capture key lessons learned.

If the range resulting from the 80 percent confidence interval is felt to be too wide for aspirational performance target setting purposes (which Is not the stated PVA objective), the threshold range criterion could be set to a tighter confidence interval. The study showed for example that the 60 percent confidence interval range was -14/+18% and -13/+16% for the $50,000-$200,000 and <$200,000 projects respectively. This would result in more projects being flagged for study (i.e., 40% in this case).

The use of the threshold should be as a trigger to obtain lessons learned. Using % PVA may not be the best metric of variance performance over time.

Variance Distribution by Year

Table A-4 and Figure A-3 compares the variance p10/90 range by year (for estimates >$50,000) to illustrate how a direct analysis of range differs from looking at % PVA only.

Of perhaps most interest, the March 16, 2022, 2021 PVA PSR report (slide 7) stated in the notes that the "*2021 [% PVAs] spike in all RCs due to COVID-19 additional costs (e.g., overtime/premium time), material cost increases and city restrictions)*". However, the Figure A-3 chart indicates that the number of underruns increased as well. An alternate explanation is that while there were indeed incidental COVID-19 increases, there is possibly and underlying, longer-term trend towards underrunning (i.e., over-estimation). This explanation is speculative, but illustrates the value of the improved measure and something for PDIG to examine further.

Another trend is the decreasing proportion of projects <$200,000 from 2017 to 2021 which may in part explain the decreasing percentage of projects requiring a PVA (i.e., apparent improvement is really just an artifact of project size mix; with 2021 being a remarkable exception).

	TOTAL	2017	2018	2019	2020	2021
Number	2,025	485	546	377	330	287
Mean	3.5%	4.9%	3.0%	3.7%	1.7%	3.7%
Std Dev	+/-31%	+/-31%	+/-31%	+/-33%	+/-25%	+/-35%
P50	-0.4%	-0.6%	-0.2%	-0.4%	-1.0%	0.1%
P10	**-26%**	**-18%**	**-28%**	**-27%**	**-15%**	**-33%**
P90	**+34%**	**+37%**	**+34%**	**+34%**	**+19%**	**+44%**
Span (P90-P10)	60%	55%	62%	61%	44%	77%
%<$200K		52%	50%	37%	35%	28%
%PVA		24%	21%	14%	12%	27%

Table A-4: Variance Statistics by Year (Estimates >$50,000)

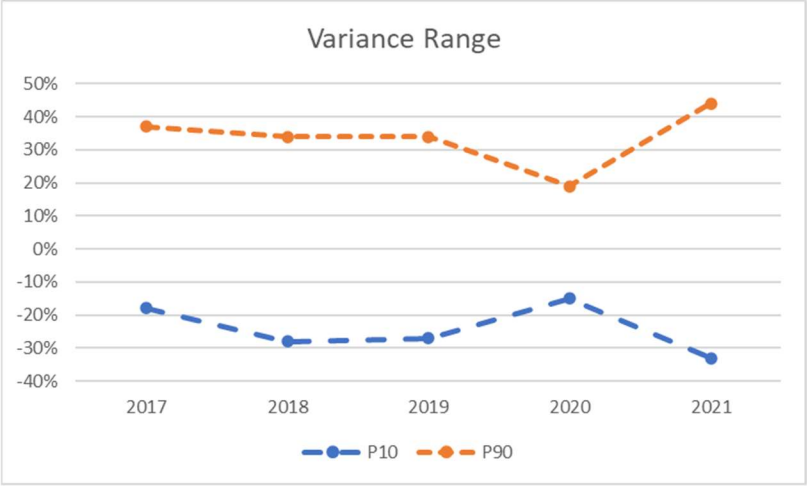

Figure A-3: Variance p10/p90 Range by Year

Rather than use the %PVA metric as a predictability performance metric, an alternative is to measure variance directly. For example, the "span" of the p10/p90 (P90-p10) could be used as a metric. This metric, in comparison to the current %PVA, is shown in Figure A-4.

Note that the actual range span increases from 2017 to 2019, but the %PVA decreases. The values of %<$200K in Table A-4 indicate that this reduction in %PVA was likely the result of having proportionally fewer small projects in the portfolio, not the result of practice or process causes.

Note that this direct span metric would always be based on the same p-values year-to-year (e.g., p10/p90) regardless of what p-values were used for the PVA reporting trigger threshold. The threshold can be varied for the purposes of getting a good sample of PVAs (you can vary the trigger for reporting year to year without affecting the reporting of the variation trend).

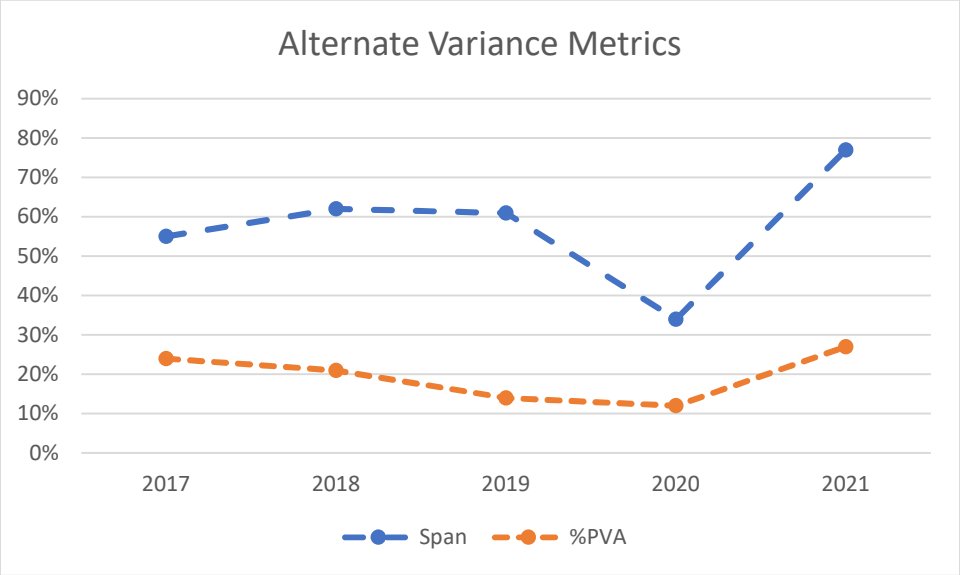

Figure A-4: Comparison of P10/P90 Span versus %PVA

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date	Agreed Management Action Plans	Remediation Actions Taken
19-Nov-20	Engineering, Capital Planning & Execution - Phase 1	Enhancing the Budget Review Process (Note 1)	An opportunity exists to enhance the existing review process for the key budgetary documents including the Capital Expenditure Budget, In-Service Additions Budget and Capital Model	**Completed**	31-Dec-20	Management will enhance the budget review processes by ensuring that the extract of the final Capital Model is signed off by the Supervisor, Capital Planning and final results of the In-Service Additions Budget and Capital Budget that form part of the Business Plan presentation are signed-off by the Chief Financial Officer and Controller prior to the board meetings. Final versions of these documents will be signed off with electronic signatures and retained on the shared drive to support the audit trail and control documentation. Internal Audit has reviewed the remediated actions and confirm that they were completed on time.	Management has enhanced the budget review processes by ensuring that the extract of the final Capital Model is signed off by the Supervisor, Capital Planning and final results of the In-Service Additions Budget and Capital Budget that form part of the Business Plan presentation are signed-off by the Chief Financial Officer and Controller prior to the board meetings.
07-Feb-23	Capital Planning & Execution	Approval for Changes to Capital Projects	Capital Project Change Requests, pertaining to project cost, scope and schedule, are not consistently submitted and approved prior to execution and / or on a timely basis	**Completed**	30-Jun-23	The Manager of Engineering (EPMO) will improve the communication of outstanding change requests with the Execution RC's by increasing the frequency of reminders and automating reminder e-mails to ensure Execution RC's are aware of outstanding change request submissions prior to the monthly reporting cycle of the Change Request Latency KPI. The Manager of Engineering (EPMO) will evaluate holding education sessions on a predefined frequency throughout the year and will share the recorded sessions with the Execution RC's to communicate change request process timelines. The Manager of Engineering (EPMO) will review outstanding change request submissions with Execution RC's during monthly divisional operational meetings (i.e. MPP, IOP meetings). The Manager of Engineering (EPMO) will evaluate including EPMO's departmental KPI for ensuring timely approval for project changes on the BRP scorecard, which is issued and reviewed during monthly divisional operational meetings. The Directors of Execution RC's will develop a process to communicate to their teams the requirement to submit and approve change requests on a timely basis. The existing Change Request Latency KPI feedback will be used in monthly departmental OSR meetings or at the individual performance level. Internal Audit has reviewed the remediated actions and confirm that they were completed on time.	1. The frequency of the email communications to the CR approvers has been increased in the system. If any CRs are pending approval, the CR approvers will get two emails every week as reminders. 2. Education sessions were organized by EPMO related to CR process and the importance of timely submission and approval of CRs with all Execution teams. 3. BRP scorecards now have two metrics related to CR latency. One is for CR not yet submitted and other one is for CRs that are not yet approved. These metrics are reported on each month and sent to all RC leaders for discussion in their respective OSRs. 4. RC leaders have confirmed that they have been using the BRP metrics for CRs in their OSRs on a regular basis.
07-Feb-23	Capital Planning & Execution	Reporting Root Causes for Change Requests	A formal process to document and report root causes for Capital Project Change Requests (CR) has not been established, however, is required to support the precision and accuracy of capital project scoping and costing within the Capital Plan	**Completed**	30-Nov-23	The Manager of Engineering (EPMO) will develop and implement a quarterly process to report the root cause of the differences between the high-level scope/work packages and detailed design estimates to the Investment Planners. The first report will be developed by March 31, 2023 and will be shared with the Execution RC's and Investment Planners. The report format will be finalized by June 30, 2023 and will be used to develop a formal feedback loop process between the Execution RC's and Investment Planners to monitor the quality/precision of scope/work packages issued for capital projects. A formal feedback loop process will be documented and reviewed by the EPMO and Investment Planning Manager and will be fully implemented by November 30, 2023. Internal Audit has reviewed the remediated actions and confirm that they were completed on time.	Following steps were taken by EPMO team: 1.Monthly reporting on the "Scope Quality/Accuracy" metric on the BRP scorecard to get planning to improve scope estimates. 2.Quarterly attainment reports are being issued – these are being used to identify root causes for CRs. 3.Quarterly attainment review meetings are held every quarter to review CR root causes and recommendations – terms of reference of meeting are formally documented which indicate participation of all Ops and Engineering leadership along with EVPs for respective BUs. 4.Formal feedback loop has therefore, been set to have root causes identified, discussed and implemented. Following additional steps have been taken by the System Planning team to improve the process of work packaging and reducing the likelihood of change orders: • Work Package Checklist (During Creation): For "Project Development" team to ensure key items are not missed while creation • Field Inspections: Ensure scoped work is field inspected before finalizing work package • Overhead & Inflation costs: Capture overhead and inflation costs to the estimate. • Work Package Review Checklist (During Engineer Review): To aid engineers with enhancing their reviews and capturing critical items. Formal documentation of the new improvements to the existing process documentation has also been completed.
07-Feb-23	Capital Planning & Execution	Capital Planning Process SOP Documentation	Some areas of the long-term and short-term capital planning process are not formally documented	**Completed**	30-Sep-23	As part of the activities underway to improve asset management processes within the ISO55001 project, the Manager of Engineering (IPPR) will engage with all stakeholder groups to document the SOP's as they relate to the long-term Investment Planning and Portfolio Reporting (IPPR) process. The Manager of Engineering (EPMO) will engage with all stakeholder groups to document the SOP's as they relate to the short-term capital planning process and development of Executable Work Program. Internal Audit has reviewed the remediated actions and confirm that they were completed on time.	Business has developed the process maps and associated task sheets for the IPPR and EWP process. These process maps and task sheets are approved by the directors (Integrated Planning & EPMO) and are published on plugged in.
(Note 1)	The title of the observation was originally mentioned as "Reporting Root Causes for Change Requests" in 1B-SEC-7. However, the actual title of the observation is "Enhancing the Budget Review Process". The Agreed Management Action Plans and Remediation Actions Taken are relevant to the correct observation title.						

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.13:

Reference(s): 4-AMPCO-87

To provide historical results in terms of percentage achievement of incentive pay targets and payments for each year 2020-2024, and assumptions for 2025-2029.

RESPONSE:

In reviewing transcript, Toronto Hydro notes that this undertaking does not capture the request made by AMPCO. The scope of the undertaking is to provide performance pay achievement assumptions for 2025-2029 and to provide historical data that Toronto Hydro relied upon for these assumptions.

Toronto Hydro applied a performance pay achievement assumption of 129.7% to derive the 2025-2029 forecasts. This assumption was based on the 2020-2022 historical data shown in Table 1 below. The 2023-2024 data was not available when determining the forecasts.

Table 1: Historical Incentive Pay Achievement Data

2020	2021	2022
132.8%	131.5%	125.0%

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.14:

Reference(s): 4-AMPCO-89

Regarding 4-AMPCO-89, to identify any other one-time costs in the two periods 2020-2024 and 2025-2029 that could be ring-fenced.

RESPONSE:

Table 1 below shows one-time OM&A costs and savings for 2020-2024. One-time savings are shown in negative/credits. Toronto Hydro does not have any one-time OM&A costs in the 2025-2029 period.

Table 1: 2020-2024 One-time OM&A Costs/(Savings) by Program ($ Millions)

Programs	Actual				Bridge	Total
	2020	2021	2022	2023	2024	
Disaster Preparedness Management Program (COVID)	3.9	3.6	3.8	-	-	**11.3**
Control Centre Operations – UWPC implementation	1.1	-	-	-	-	**1.1**
Customer Care – COVID Bad-debt Expense	17.2	-	-	-	-	**17.2**
Customer Care – CC&B labour capitalization	**-**	0.1	(2.0)	(1.1)	(1.2)	**(4.2)**
Total	**22.2**	**3.7**	**1.8**	**(1.1)**	**(1.2)**	**25.4**

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.15:

Reference(s): 2B-Staff-261

To provide data in relation to Appendix 2-AA on an In-Service Additions basis.

RESPONSE:

Please refer to Appendix A to this response which provides OEB Appendix 2-AA on an in-service additions-basis and reflects the 2020-2023 actuals and 2024-2029 forecast in-service additions as set out in Exhibit 2A, Tab 1, Schedule 2, Appendix 2-BA (Updated April 2, 2024).

Toronto Hydro notes that for the forecast years, where forecasted expenditures are on a program basis, the utility used historical conversion rates of capital expenditures and CWIP to in-service additions. For large discrete projects, Toronto Hydro uses the latest projections of expected completion dates to forecast in-service amounts. Please refer to Toronto Hydro's response to 2B-SEC-60 for additional information on the approach used.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT4.16:

Reference(s): 1A-CCC-01, Appendix A

To review Appendix A, Slide 13, to confirm objectives of this plan; if the goal is not 40 percent, to provide the number; to state whether the plan includes hybrid vehicles.

RESPONSE:

Toronto Hydro plans to electrify 50% of its Fleet by the end of the 2025-2029 rate period, as indicated in Exhibit 1B, Tab 3, Schedule 1, on page 37, lines 15-16 and interrogatory response 1B-Staff-97(a). The plan includes hybrid vehicles, please refer to Toronto Hydro's response to interrogatory 1B-Staff-97(b) for more information.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO CONSUMERS COUNCIL OF CANADA

UNDERTAKING NO. JT4.17:

Reference(s): 4-SEC-89

Referring to the chart in 4-SEC-89, to explain the lack of corresponding trade-offs between increases or decreases in capital costs and OM&A with respect to the Distribution System Plan.

RESPONSE:

Toronto Hydro does not expect significant trade-offs between increasing or decreasing capital costs and OM&A costs during the 2025-2029 period. The impacts of an expanding capital program on System O&M programs, such as Corrective Maintenance, are discussed in Exhibit 2B, Section E4.1.6.1, with further details provided in Toronto Hydro's responses to interrogatories 2B-Staff-180 and 2B-SEC-40. Additionally, while Corrective Maintenance can delay the need for asset replacement, the rate of investment is insufficient to significantly influence the timing of necessary renewal investments for managing system performance over the 2025-2029 period. Furthermore, Corrective Maintenance addresses priority deficiencies which may not be directly linked specifically to asset performance, such as nomenclature updates and trip hazards which are pertinent to employee and public safety. As stated throughout its application, Toronto Hydro is seeking to maintain reliability performance and hence, the system renewal capital programs and maintenance programs are setup to achieve this objective.

Certain O&M programs, such as Asset and Program Management or Work Execution Program, are positively correlated with an expanding capital program as additional

resources are required within these areas to support the planning and delivery of a larger capital program. In addition, Toronto Hydro expects that the increasing complexity of the distribution grid, driven by electrification, will also place upward pressures on certain O&M programs. Exhibit 2B, Section E4.2.6 provides additional details of key drivers of increases in System O&M program expenditures.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO CONSUMERS COUNCIL OF CANADA

UNDERTAKING NO. JT4.18:

Reference(s): 1B-CCC-19

Referring to 1B-CCC-19, the discussion of distribution rate impacts: to calculate residential rate increases without the X-Factor in the overall Revenue Requirement.

RESPONSE:

The below table displays the distribution bill impacts for residential class without the 0.6% X-Factor in the overall revenue requirement.

		Change in Bill	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed
Residential (without X-Factor)	Base Distribution (Excluding Rate Riders)	$/30 days	49.71	52.26	54.42	59.16	61.37
		%	9.7%	5.1%	4.1%	8.7%	3.7%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$46.12	$49.72	$53.66	$57.94	$61.21
		%	8.0%	7.8%	7.9%	8.0%	5.6%

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.19:

Reference(s): Exhibit 1B, Tab 3, Schedule 1, p. 24

To file 2023 performance statistics for the categories Escalations and Connections.

RESPONSE:

The Customer Escalations Resolution result for 2023 was 100%.

The New Services Connected on Time performance for 2023 was 99.78%.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.20:

Reference(s): Exhibit 1B, Tab 3, Schedule 1, Table 7 at p. 24

To explain the differences between customer additions over the period and the number of low-voltage customer connections of about 57,000 a year or more.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not accurately capture the data point underlying the request by OEB Staff. The reference in Table 7 on page 24 of Exhibit 1B, Tab 3, Schedule 1 refers to 5,700 low voltage connections per year.

For the purposes of the New Services Connected on Time performance incentive metric, Toronto Hydro has adopted the definition of "new service" in the Distribution System Code ("DSC"),[1] which refers to any connection that requires an Electrical Safety Authority certificate and therefore includes connections associated with service upgrades, temporary connections, or the conversion of unmetered connections into metered connections. The forecast of approximately 5,700 low voltage connections, approximately 120 high voltage connections, and approximately 180 distributed energy resource connections per year referred to in Exhibit 1B, Tab 3, Schedule 1, Table 7 at page 24 reflects that DSC definition.

[1] Distribution System Code (last revised March 27, 2024), s. 7.1.

Toronto Hydro presumes that the reference for the customer additions figure for the 2025-2029 period is Exhibit 3, Tab 1, Schedule 1, Table 2 at page 3, which reflects net new customers connecting to the system for the first time and does not include service upgrades, new temporary services, or metering conversions.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.21:

Reference(s): Exhibit 1B, Tab 3, Schedule 1, Page 25, Lines 8-11

QUESTION (A):

a) To explain and give an example of a complex connection;

RESPONSE (A):

Toronto Hydro's reference to '*increasing complexity of connections-related work'* was used to described the increasing complexity of load connection work and not a distinct customer connection type. Exhibit 2B, E5.1.3.1 provides further details about the *'complexity of customer connections due to ongoing growth and development in the city*'. Typical challenges that describe a complex connection include but are not limited to:

- areas of overloaded or congested assets (feeders, cable chambers, vaults)
- areas of limited real estate with respect to road allowance (shared by the City of Toronto utilities, natural gas, communications, and transit above and below ground level)
- Insufficient safety clearances to existing assets
- Connections to legacy configurations/systems (e.g. 4.16 kV distribution)
- Work within the restricted transit corridor
- Complexity in scheduling and coordination among multiple projects and stakeholders
- Increasing requests for custom solutions

To resolve these challenges the utility may have to consider various options including but not limited to upstream expansions, load transfers, configurations that require connections from multiple stations, investments in complex control and protection schemes (fusing, switches, relays, etc.), relocation of existing assets, and development of new standards.

QUESTION (B):

b) To explain whether complex connections are distinct from DER connections;

RESPONSE (B):

As described in part (a), the complexity referred to in the evidence was in the context of load connection and therefore distinct from DER connections. However, Toronto Hydro notes that with increased penetration, DER connections may face increasingly complex connection configurations as well.

QUESTION (C) AND (D):

c) To provide the number of complex connections Toronto Hydro has experiences in the last five years, and Toronto Hydro's timelines in making those connections;

d) To provide a forecast of anticipated complex connections in the upcoming forecast period.

RESPONSE (C) AND (D):

As noted in the response to part (a), the statement regarding the 'increasing complexity' of connections does not refer to a specific type or size of connection. As a result, the utility is unable to provide the requested information. Toronto Hydro's performance relative to timeliness in making connections can be found in Exhibit 1B, Tab 3, Schedule 1, Section 2.21.

Additionally, as described in its response to 2B-AMPCO-49 and in Exhibit 2B, Section E5.1.4 at page 19, Toronto Hydro's load connections forecast is developed on the basis of historical capital expenditures. As such, the utility does not have a forecasted list of anticipated complex connections.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO DISTRIBUTED RESOURCE COALITION

UNDERTAKING NO. JT4.22:

Reference(s): 1B-DRC-1

To canvass the record and provide a summary of information on future customer preferences for EVs and DERs, and to point to where the information may exist on the record.

RESPONSE:

Toronto Hydro's evidence on customer outcomes and priorities with respect to the adoption and integration of technologies like DERs, EVS, solar power and battery storage, as well as net zero and the energy transition can be found in the response to 1B-DRC-1(c) and (e and f). Information about the ways in which Toronto Hydro more generally engages with its customers, including EV stakeholders and other DER customers, can be found in Exhibit 1B, Tab 5, Schedule 1, Section 3 (Page 11).

While Toronto Hydro does not have evidence on the record that speaks to *future* customer preferences on EVs and DERs, the utility's 2025-2029 Investment Plan is responsive to changing customer preferences with respect to EVS and DERs as noted in the following evidence:

- **Exhibit 2B, Section D4 (System Peak Demand Forecast):** Specifically:
    - **Section D.1.1.4 (Pg. 4):** discusses the forecasted impact of light-duty, medium-duty and heavy-duty EVs in Toronto Hydro's system peak demand forecast.

- **Section D4.1.4 (Pg. 8):** discusses the Generation Capacity and Capability Assessment
- **Section D4.2:** discusses Capacity Planning and the Energy Transition.
- **Section D4, Appendix A and B:** provides the Future Energy Scenarios modelling which depicted a wide range of DER and EV uptake scenarios for the next decade and beyond.

- **Exhibit 2B, Section E3 (System Capability Assessment for Renewable Energy and Conventional Generation):** Specifically:
  - **Section E3.**1 (Pg. 1-2): discusses trends in customer applications to connect DERs.
  - **Section E3.2 (Pg. 3) and Exhibit 2B, Section E5.1** (**Pg. 15)**: provides the 2023-2029 DER connection and capacity forecast which considers historical trends and project pipelines and discusses customer trends and preferences regarding the type of DERs being installed (e.g. energy storage in Section E3.2.2 at page 5).
  - **Section E3.2.4 (Pg. 6-7):** provides the list of policies and economic factors that may affect customer choice.
- **Exhibit 2B, Section E5.5 (Generation Protection Monitoring and Control, Pg. 4):** discusses factors influencing customer uptake of DERs and the rate of uptake historically and projections used.
- **Exhibit 2B, Section E7.2 (Non-Wires Solutions):** Toronto Hydro's approach to Non-Wires Solutions, including leveraging customer-owned DERs
- **Exhibit 3, Tab 1, Schedule 1:** provides Toronto Hydro's revenue load forecast, including describing the methodology used to incorporate EVs and DERs.
- **Exhibit 4, Tab 2, Schedule 18 (Public, Legal and Regulatory Affairs):** ensures sufficient organizational capacity to provide expert legal, regulatory, communications, policy, government relations and public affairs services to

respond to public policy, technological advancement and customer driven evolutions.

- **Exhibit 4, Tab 2, Schedule 8 (Customer Operations, Pg. 22):** Toronto Hydro's key account's team provides direct and tailored service to critical load customers, many of whom have Environmental Social & Governance Goals (ESG) and are considering incorporating new technologies such as alternative energy sources, renewable energy, and electric vehicles.
- **Exhibit 4, Tab 2, Schedule 14 (Customer Care):** Toronto Hydro is investing in its technology, services and customer care teams to ensure capacity and knowledge to respond to and address evolving customer needs, including those related to increased adoption of EVS and DERs.
- **Exhibit 4, Tab 2, Schedule 7 (Control Centre):** Toronto Hydro is developing an Energy Centre (also known as DERMS) and gaining experience with managing DERS on the distribution system.
- **Exhibit 4, Tab 2, Schedule 9 (Asset and Program Management)** specifically**:**
    - **The Capacity Planning and Grid Innovation function** (Pg. 15) is responsible for planning future load requirements and requisite connection capacity to accommodate current and forecasted levels of DERs.
    - **The Grid Modernization function** (Pg. 16) is responsible for coordinating the development and implementation of long-term grid strategies, including providing leadership in the development of longer-term demand scenarios and capability roadmaps related to understanding and accommodating electrified loads and DERs.
    - **The Standards and Policy segment (Pg. 22)** is responsible for studying local impacts of evolving customer usage and technologies and modifying

construction standards and connections service policies to effectively accommodate changing demands.

- **The Flexibility Services program (Pg. 26, see also Exhibit 2B, Section E7.2)** identifies opportunities and use cases in addition to funding demand response programs that can leverage customer-owned resources as non-wires solutions.

Toronto Hydro also explored a number of specific issues around EV's and DERs through the following IRs:

- **2B-Staff-252**: EV Load by Station Forecasted for the Downsview Area for 2023 – 2029.
- **1B-PP-05 and 08:** Toronto Hydro actions to enable electrification
- **1B-DRC-02(e):** Toronto Hydro's approach to ensure sufficient capacity, should the high projection scenario in the FES report materialize.
- **2B-ED-11:** Enablement of EV chargers
- **2B-ED-25:** EV chargers in multi-unit residential buildings.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO DISTRIBUTED RESOURCE COALITION

UNDERTAKING NO. JT4.23:

Reference(s): **Ministry of Energy news release titled, "Ontario and Toronto Planning for the City's Growing Electricity Needs"**
https://news.ontario.ca/en/release/1004428/ontario-and-toronto-planning-for-the-citys-growing-electricity-needs

THESL to review today's [April 11, 2024] announcement from the Minister of Energy regarding the Integrated Regional Resource Plan and a public engagement process and advise whether it appropriately falls within the context of this proceeding and whether it can comment.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not fully capture the request from the Distributed Resource Coalition ("DRC"). The scope of the undertaking is to confirm whether the release from the Ministry of Energy entitled "Ontario and Toronto Planning for the City's Growing Electricity Needs" appropriately falls within the context of this proceeding or not and comment, from that perspective, on whether it carries any significant impact for the proposals contained in the application with respect to: (1) demand forecasts, (2) public advocacy or approach to public consultations and (3) the need for infrastructure investment generally covered in the application.

On April 11, 2024, the Ministry of Energy issued a news release titled, "Ontario and Toronto Planning for the City's Growing Electricity Needs". The news release and the associated event, attended by the Minister of Energy, the Mayor of Toronto, and the President & CEO

of the IESO, among others, announced the kick-off to this cycle of updating the Integrated Regional Resource Plan ("IRRP") for Toronto. Toronto Hydro is involved in the IRRP as set out in Exhibit 2B Section B3.2.3 and Section E2.4.1. The event does not have any incremental impact on this application.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO BUILDING OWNERS AND MANAGERS ASSOCIATION

UNDERTAKING NO. JT4.24:

Reference(s): 2B-BOMA-1

To clarify the general locations, the general distribution of the data centres throughout the territory.

RESPONSE:

Data centers are generally located within Toronto Hydro's Horseshoe distribution region (i.e. outside of the downtown core).

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO BUILDING OWNERS AND MANAGERS ASSOCIATION

UNDERTAKING NO. JT4.25:

Reference(s): 3-BOMA-3

To provide the monthly peak information by rate class from the forecasting perspective used to derive the Coincident Peak and Non-coincident Peak figures for 2025.

RESPONSE:

Please refer to Appendix A for the monthly peak information by rate class for 2025.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO BUILDING OWNERS AND MANAGERS ASSOCIATION

UNDERTAKING NO. JT4.26:

Reference(s): 3-BOMA-03

To provide a comparison of capabilities of the AMI 1.0 and 2.0, with respect to the requested data.

RESPONSE:

For general information on predicted AMI 2.0 capabilities and use cases, please refer to Exhibit 2B, Section D5, subsection D5.3.1; Exhibit 2B, Section E5.4, pages 10-13; and interrogatory response 2B-Staff-194. Toronto Hydro expects that AMI 2.0 will provide greater granularity of customer consumption data, allowing the utility to gain insights into customer load profiles and key consumption drivers such as electric vehicles, heating and cooling equipment, etc. These insights would help provide more information at a local and distribution system level to feed into Toronto Hydro's load forecasting. Enhanced data granularity would also allow more accurate measurement of coincident peaks.

In order to effectively manage AMI data, Toronto Hydro will need to undertake significant investments to achieve effective analytics. As part of the AMI 2.0 strategy, the utility intends to implement an analytics platform to leverage the AMI data for various use cases, including load forecasting.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO BUILDING OWNERS AND MANAGERS ASSOCIATION

UNDERTAKING NO. JT4.27:

Reference(s): 3-BOMA-4

To provide a breakdown of the table at 3-BOMA-4 into the three GS classes.

RESPONSE:

Please see Appendix A for a breakdown of the table at 3-BOMA-4 into the three GS classes.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO BUILDING OWNERS AND MANAGERS ASSOCIATION

UNDERTAKING NO. JT4.28:

Reference(s): 3-BOMA-04

To determine whether the load profile information of the multi-residential class includes a breakdown based on number of customers, or based on kilowatt-hours, and if so, to provide the information.

RESPONSE:

As set out in 2B-ED-25, there are an estimated 7,161 MURBs in Toronto Hydro's service territory. Approximately 365 of these are classified as Competitive Sector Multi-Unit Residential Service (CSMUR) and are customers directly suite metered by Toronto Hydro. Please refer to JT4.25 for CSMUR 2025 load profile information.

The remaining MURBs are within a mix of Residential and General Service accounts. The MURBs customers within the General Service classes may be metered by sub-metering companies. As such, Toronto Hydro does not have information on the number of units or the load profiles associated with those accounts.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.29:

Reference(s): JT3.35

To inquire of Scott Madden to provide the formulas as applicable, and as necessary define the parameters for the attrition relief mechanisms.

RESPONSE (PREPARED BY SCOTTMADDEN):

ScottMadden's jurisdictional review relied on the formulas and defined parameters described in the materials cited in the table below.

Utility (Jurisdiction)	ARM Formulaic Approach
ATCO Electric (Alberta)	Details of the ARM formula are provided in: Alberta Utilities Commission, *Decision 27388-D01-2023*, 2024-2028 Performance-Based Regulation Plan for Alberta Electric and Gas Distribution Utilities, October 4, 2023, p. 1 Key variables include: Inflation factor, productivity factor, capital funding provisions Link to Decision: https://efiling-webapi.auc.ab.ca/Document/Get/794425
Hawaiian Electric (HI)	Details of the ARM formula are provided in: Docket No. 2018-0088, Decision and Order No. 37507 Instituting a Proceeding to Investigate a Performance-Based Regulation, Hawaii Public Utilities Commission, December 23, 2020, p. 14 Key variables include: Inflation factor, productivity factor, customer dividend, exogenous cost factor Link to Decision: https://puc.hawaii.gov/wp-content/uploads/2020/12/2018-0088.PBR_.Phase-2-DO.Final_.mk_.12-22-2020.E-FILED.pdf
Eversource (MA)	Details of the ARM formula are provided in:

Utility (Jurisdiction)	ARM Formulaic Approach
	D.P.U. 22-22, Petition for Approval of a General Increase in Base Distribution Rates for Electric Service and a Performance Based Ratemaking Plan, November 30, 2022, p. 15 Key variables include: Inflation factor, productivity factor, customer dividend, exogenous cost factor, capital funding provisions Link to Decision: https://www.eversource.com/content/docs/default-source/investors/nstar-electric-dpu-22-22-final-order-11-30-22.pdf?sfvrsn=c5739f9e_1
UK RIIO	Details of the ARM formula are provided in: Ofgem, RIIO-ED2 Final Determinations Overview Document, November 30, 2022, p.35 Key variables include: Uncertainty mechanisms Link to Decision: https://www.ofgem.gov.uk/sites/default/files/2022-11/RIIO-ED2%20Final%20Determinations%20Overview%20document.pdf

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TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.30:

Reference(s): JT4.1

To explain the interaction of the Revenue Cap and the Economic Evaluation Model.

RESPONSE:

The total revenue cap, and specifically the Demand-Related Variance Account (DRVA) that forms part of the proposed revenue cap framework, ensures that variances in cost and revenues, which are primarily driven by changes in customer demand, are reconciled so that neither customers nor the utility gain an unfair advantage/disadvantage from these variances during a time of greater uncertainty with respect to customer demand. There is no direct interaction between the Economic Evaluation Model (EEM) and the Custom Revenue Cap Index. Capital contributions are established through the EEM on the basis of customer-specific costs relating to new connections and service upgrades, and customer-specific revenues. The inputs to the calculation of capital contributions are not impacted by the proposed revenue cap approach. On the other hand, distribution revenue and net capital variances resulting from changes in the volume, type and mix of customer connections, including changes in capital contribution rates, will be captured in the DRVA.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.31:

Reference(s): 1B-Staff-12

For the projects identified in Part D, to update the figure and the table in Part A for the IRM scenario to illustrate the funding that would be available under the Capital Module.

RESPONSE:

The table below shows the funding associated with IRM plus Advanced Capital Module (ACM) associated with the projects identified in 1B-Staff-12(d).

$ in million	2025	2026	2027	2028	2029	Total
2025	978	991	1,005	1,019	1,034	5,028
2026		9	9	9	9	38
2027			11	11	11	33
2028				9	9	17
2029					6	6
Total	978	1,001	1,026	1,048	1,069	5,122

The table in 1B-Staff-12(a) is updated below including an additional line for IRM + ACM.

Revenue Requirement ($ million, two decimal places)	2025	2026	2027	2028	2029	Total
2025-2029 Investment Plan	978	1,031	1,077	1,176	1,221	5,483
IRM	978	991	1,005	1,019	1,034	5,028
IRM + ACM	978	1,001	1,026	1,048	1,069	5,122
Current Custom IR Formula (CPCI)	978	1,015	1,047	1,127	1,154	5,321
Proposed CRCI	978	1,024	1,061	1,152	1,186	5,401

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.32:

Reference(s): EB-2018-0165, Exhibit 1B, Tab 4, Schedule 1, Table 2

To consider and advise how the three factors, the Capital Factor, and the Scaling Factor, as shown in EB-2018-0165, Exhibit 1B, Tab 4, Schedule 1, might apply to this application; to provide an updated copy of the table referred to, if revision is necessary; if not to explain whether there is a difference.

RESPONSE:

Consistent with EB-2018-0165, Exhibit 1B, Tab 4, Schedule 1, Table 1 below provides the calculation of the capital factor, and Table 2 below provides the calculation of the scaling factor under the Custom Price Cap Index (CPCI) CIR1.0 framework which was presented in the response to 1B-Staff-12(b).

Table 1: CPCI Capital Factor Calculation

Revenue Requirement Component ($ in million)	**2025**	**2026**	**2027**	**2028**	**2029**
Rate Base	5,899.1	6,279.3	6,703.2	7,162.0	7,590.1
Interest Expense	142.9	152.1	162.4	173.5	183.9
Return on Equity	220.9	235.1	251.0	268.1	284.2
Depreciation	290.4	303.9	322.7	344.0	356.9
PILs/Taxes	28.9	31.1	20.7	56.5	48.3
Capital-related RR (A)	**683.0**	**722.2**	**756.8**	**842.1**	**873.2**
OM&A	343.0	358.0	370.1	385.5	399.6
Revenue Offsets	- 48.2	- 49.2	- 50.2	- 51.2	- 52.2
Total RR (B)	**977.8**	**1,031.0**	**1,076.7**	**1,176.4**	**1,220.6**
Cn = $(A_{yx} – A_{y(x-1)}) / B_{y(x-1)}$		**4.01%**	**3.35%**	**7.92%**	**2.65%**

Table 2: CPCI Scaling Factor Calculation

Revenue Requirement Component ($ in million)	**2026**	**2027**	**2028**	**2029**
Interest	152.1	162.4	173.5	183.9
ROE	235.1	251.0	268.1	284.2
Depreciation	303.9	322.7	344.0	356.9
PILs/Taxes	31.1	20.7	56.5	48.3
Capital-related RR (A)	**722.2**	**756.8**	**842.1**	**873.2**
OM&A	358.0	370.1	385.5	399.6
Revenue Offsets	- 49.2	- 50.2	- 51.2	- 52.2
Total RR (B)	**1,031.0**	**1,076.7**	**1,176.4**	**1,220.6**
S_{cap} = A / B	**70.05%**	**70.29%**	**71.58%**	**71.54%**

In the Custom Revenue Cap Index (CRCI), growth is an element of the escalation index. The CRCI escalates revenues which are subsequently used to establish rates on the basis of a customer and load forecast that includes growth. Toronto Hydro is unable to provide the calculation for the growth-factor for the CPCI, since the utility did not compute a similar top-level growth factor for the 2025-2029 period. For the purpose of the table provided in the response to 1B-Staff-12(b), the CPCI scenario assumes a growth factor that is identical to EB-2018-0165, (i.e. a 0.2% growth factor which is treated as a passthrough as shown in the response to Undertaking TCJ4.33).

Furthermore, as part of this undertaking Toronto Hydro was asked to confirm whether there was a typo in the tables provided in response to 1B-Staff-12(b) with respect to the rows titled **I x Scap**. Toronto Hydro confirms that this is not a typo. The reason why the values for I x Scap are different in 2028 and 2029 compared to 2026 and 2027 is because the scaling factor (i.e. the proportion of capital-related revenue requirement to total revenue requirement) is larger in the outer years as shown in Table 2 above.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.33:

Reference(s): 1B-Staff-12

To provide the calculation of one year of escalation, with unrounded numbers.

RESPONSE:

See the Table 1 below for the calculation of 2026 under the 2020 CIR framework.

Table 1: 2026 Revenue Requirement under 2020 CIR Framework

		Revenue Requirement ($ Millions)	
2025		972.4	A
CPCI	3.76%	36.6	B=A*3.76%
Growth	0.20%	1.9	C=A*0.20%
2026		1,010.9	D=A:C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.34:

Reference(s): N/A

To provide evidence references for a discussion of the influence and operations of the DRVA and its two sub accounts, and the Innovation Fund Variance Accounts.

RESPONSE:

With respect to the DRVA, pages 37 to 46 of Exhibit 1B, Tab 2, Schedule 1 provide significant detail regarding the uncertainties affecting programs included in the DRVA Expenditure Sub-Account. The manner in which such uncertainties materially influence Toronto Hydro's operations is best addressed in the following excerpt on page 41 of the same reference:

> "When faced with incremental distribution investment needs as a result of external drivers, Toronto Hydro must typically defer necessary expenditures in other investment priority areas, such as System Renewal, System Service and General Plant. Yet, to the extent Toronto Hydro does not carry out the planned investments in these areas, there could be significant reliability, safety or environmental risks that remain unmitigated, or customer needs and outcomes that are unmet. The proposed Expenditures Variance Subaccount, if approved, would enable Toronto Hydro to respond to unforeseeable increases in demand-related investment needs without having to defer other priority work within the plan and put customer outcomes at risk."

With respect to the Innovation Fund Variance Account, as noted on page 17 of Exhibit 1B, Tab 4, Schedule 2, the amounts recorded in the proposed variance account would depend on the actual expenditures incurred to execute the select pilot projects in accordance with the governance framework. The Innovation Fund expenditures materially impact operations by enabling Toronto Hydro to pilot new technologies and advanced distribution capabilities before scaling them into cost-effective programs or solutions for addressing distribution system needs or providing distribution services.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.35:

Reference(s): **1B-Staff-41**
1B-SEC-16

To provide a demonstration of the calculations that created the table at 1B-SEC-16.

RESPONSE:

Toronto Hydro utilized the weather normalization methodology outlined in Exhibit 3, Tab 1, Schedule 1, page 9 to adjust the actual load data spanning from 2016 to 2023. This process involved applying regression coefficients obtained from the OEB-approved rate application load forecast equivalent for the years approved. These coefficients serve as quantitative indicators of how weather conditions influence actual load by accounting for all relevant weather determinants and related revenues, and effectively isolating the impact of weather. Appendix A (excel file *JT4.35 App A Example Weather-Normalized Calculation*) shows a demonstration of the weather-normalization calculations outlined in Table 2 of 1B-SEC-16 for 2022 GS<50 kW rate class.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.36:

Reference(s): 4-Staff-306

To provide actuals by program for the data in the response to 4-Staff-306.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not capture the request made by OEB staff. The scope of the undertaking is to provide OEB Appendix for 2JA and 2JC for 2018 and 2019, including for the program described in 4-Staff-306.

Please see Toronto Hydro's response to undertaking no. JT4.37.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.37:

Reference(s): 4-Staff-306

To provide further information on departmental budgets, beyond JT4.36, if possible.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not capture the request made by the OEB staff. The scope of the undertaking is to provide OEB Appendix 2JA and 2JC for 2018 and 2019 actuals which is filed as an appendix to this undertaking.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.38:

Reference(s): Exhibit 6, Tab 1, Schedule 2

In the file THESL_2A_T01_S02, OEB Appendix 2-BA, Tab 2-BA, 2025, to show the calculations of monthly averages for one year.

RESPONSE:

Please see Table 1 within Appendix A to this response, which provides the calculation of monthly averages of Gross Fixed Assets and Accumulated Depreciation included in the 2025 Revenue Requirement Workform filed on April 2, 2024, in Tab "3. Data_Input_Sheet".

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.39:

Reference(s): Exhibit 6, Tab 1, Schedule 2

For each of the OEB capital categories, System Access, System Renewal, System Service, and General Plant, to provide a high-level average of depreciation; to include the types of equipment that typically go into the four categories.

RESPONSE:

Please see Table 1 below for the investment category level depreciation associated with the 2025-2029 forecasted in-service additions and Table 2 for the major assets included in the forecasted in-service additions for each category.

Toronto Hydro notes that the allocation of in-service additions to asset classes for distribution capital programs are based on averages derived from historical in-service additions. Additionally, derecognition expenses are not included in below amounts.

Table 1: 2025-2029 Depreciation from 2025-2029 In-Service Additions by OEB Investment Category ($ Millions)

Category	2025	2026	2027	2028	2029
System Access	2.0	7.4	13.3	19.1	24.4
System Renewal	3.0	10.8	19.1	28.1	37.6
System Service	0.4	1.6	2.6	3.4	4.4
General Plant	5.2	17.6	33.2	51.7	68.1
Other	0.0	0.0	0.0	0.1	0.1
Total	**10.6**	**37.5**	**68.2**	**102.4**	**134.5**

1 **Table 2: 2025-2029 In-Service Additions Breakdown % by Major Asset Category**

Category	Acct	OEB Account Description	2025	2026	2027	2028	2029
System Access	1840	Underground Conduit	28%	27%	27%	29%	31%
	1845	Underground Conductors and Devices	33%	32%	31%	33%	36%
	1860	Meters	15%	16%	17%	12%	8%
		Other Assets	25%	25%	25%	25%	25%
		Total System Access	**100%**	**100%**	**100%**	**100%**	**100%**
System Renewal	1830	Poles, Towers and Fixtures	10%	9%	8%	7%	7%
	1835	Overhead Conductors and Devices	10%	10%	8%	8%	7%
	1840	Underground Conduit	22%	22%	23%	25%	25%
	1845	Underground Conductors and Devices	24%	24%	25%	25%	25%
	1850	Line Transformers	22%	21%	19%	20%	19%
		Other Assets	12%	13%	17%	15%	17%
		Total System Renewal	**100%**	**100%**	**100%**	**100%**	**100%**
System Service	1609	Capital Contributions Paid	30%	49%	10%	4%	36%
	1805	Land	0%	0%	16%	0%	0%
	1808	Buildings and Fixtures	0%	0%	0%	0%	12%
	1840	Underground Conduit	13%	12%	18%	24%	13%
	1845	Underground Conductors and Devices	32%	29%	44%	60%	32%
	1955	Communication Equipment	19%	5%	2%	2%	1%
		Other Assets	6%	5%	9%	10%	6%
		Total System Service	**100%**	**100%**	**100%**	**100%**	**100%**
General Plant	1611	Computer Software	42%	34%	47%	31%	24%
	1908	Buildings and Fixtures	13%	21%	17%	26%	30%
	1920	Computer Equipment - Hardware	24%	22%	22%	24%	26%
	1930	Transportation Equipment	11%	10%	5%	8%	6%
		Other Assets	9%	14%	9%	11%	13%
		Total General Plant	**100%**	**100%**	**100%**	**100%**	**100%**
Other	1940	Tools, Shop and Garage Equipment	100%	100%	100%	100%	100%

Note: Rounding variances may exist.

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.40:

Reference(s): 4-SEC-92

To clarify the services provided by a third-party provider integrated with the Toronto Hydro workforce, and working together; to describe the breakdown, a best-efforts basis.

RESPONSE:

The FTE employees listed in the response to interrogatory 4-SEC-92 at Table 1 represent internal Toronto Hydro employees associated with the Supply Chain Services program (Exhibit 4, Tab 2, Schedule 13). The Supply Chain Services program consists of two interrelated functions: (i) Demand and Acquisition Services; and (ii) Warehouse and Logistics. Each of these functions relies on a mix of internal and external resources to carry out the critical functions of the Supply Chain program described in Exhibit 4, Tab 2, Schedule 13.

Demand and Acquisition Services is enhancing its procurement procedures to incorporate sustainable practices, encompassing Diversity, Equity, and Inclusion ("DEI") as well as Environmental, Social, and Governance ("ESG") considerations. A strategic focus has been placed on realigning the allocation of resources between internal capabilities and 3PP partnerships to better align with this objective. This recalibration aims to enhance the long-term resilience of the supply chain, while concurrently ensuring the resource execution agility needed to navigate evolving needs and requirements with respect to procurement functions. Table 1 below summarizes the relative work and responsibilities undertaken by internal versus external service providers in this program.

1 **Table 1: Summary of External and Internal Resource Work and Responsibilities**

Function	External Service Provider	Internal Resources
Demand and Acquisition Services	Responsible for repeatable processes and day-to-day operational work responsibilities, which includes managing inventory codes, issuing purchase orders, and conducting solicitations.	Responsible for strategic endeavours to secure a reliable supply of materials and equipment and to mitigate supply chain challenges. This includes implementing system enhancements and upgrades to enable better decision making, optimizing inventory schedules with suppliers, improving and embedding material demand planning across the organization, conducting frequent short interval control meetings to share information with operational leaders, and creating critical asset forecasts.
Warehouse and Logistics	Responsible for the majority of material receipting and warehousing (storage). This includes fulfillment of planned (and some reactive) requirements and distributing material to either external contractors, or to Toronto Hydro warehouses for distribution to internal crews. Also responsible for the replenishment of inventory for the industrial vending machines on-site at each Toronto Hydro work centre, and performing inventory management tasks such as cycle counting. Facilitation of material returns from contractors back into inventory.	Facilitate prompt material issuance to the crews departing from the three Toronto Hydro work centres for timely response to emergency response needs and for capital projects constructed by Toronto Hydro crews. With increased volume in capital projects, resources are needed to support increased material movements, including receiving and distribution of materials, arranging for equipment repairs or replacement to be returned to vendors, handling excess material returns, and performing daily inventory cycle count activities.