ONTARIO POWER GENERATION

Manual

Internal Use Only	
Document Number: OPG-MAN-00120-0013	Usage Classification: Information
Sheet Number: N/A	Revision: R001

Title: **PROJECT COST MANAGEMENT**

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PROJECT COST MANAGEMENT

OPG-MAN-00120-0013-R001

2019-11-29

Project ID: N/A

Internal Use Only

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Revision Summary

Revision Number	Date	Comments
R000	2019-03-26	Initial issue.
R001	2019-11-29	Added note regarding Programmatic Board Releases and RQE

1.0 DIRECTION

The objective of cost management is to ensure that project cost is effectively estimated, monitored and controlled so that projects can be completed within the approved budget. Cost Management for all projects shall be performed in EcoSys, and *the Cost Breakdown Structure* (CBS) should include 100% of the scope and all elements of cost for the project (i.e. interest costs, staff expenses, cost contingency). The project manager is responsible for ensuring that the integrity and confidentiality of budget information is maintained throughout the life cycle of the project.

This document receives authority from Project Management standard [R1] and is a component of the overall Enterprise Project Management governance framework. The Enterprise Project Management governance is applicable to all projects planned and executed within OPG.

Each project needs to fulfil the specific cost management requirements for the different project levels as defined in the Scalable Project Delivery Model [R2]. This includes the use of established Project Management Information Systems (PMIS) tools and software for managing related project work.

> The Scalable Project Delivery Model [R2] provides a scaled application of project management principles and processes reflective of a projects complexity and cost. The model provides the minimum requirements for a project by knowledge area. It is expected that Project Managers will apply the intent of the knowledge area and exceed the minimum requirements as appropriate. The Business Unit Execution Line Management and/or Project Management Office may define additional requirements based on the specific project and portfolio requirements.

All project information and documentation that does not exist within the PMIS should be maintained and stored within SharePoint in a standardized project working folder structure. Related project records and controlled documents should be managed in accordance with the Project Communication and Stakeholder Management manual [R3].

Note: ***Strategic Projects and/or Programs*** may have additional or varied expectations or requirements for projects within the program, and for the overall program itself. These should be documented in a project controls plan (or equivalent) for the program.

1.1 Overview

Cost Management includes the processes, tools, roles and responsibilities to plan, estimate, budget, and control costs of a project to enable completion within its approved budget. The time, effort, degree of detail and extent of application of cost management elements should reflect the complexity and cost of the project.

The Project Cost Management processes are:

- Plan Cost Management (Section 2.1)
- Estimate Costs (Section 2.2)

- Determine Budget (Section 2.3)
- Monitor and Control Costs (Section 2.4)

Desktop guides and templates associated with this manual are available on the Enterprise Project Management website.

2.0 COST MANAGEMENT PROCESS

2.1 Plan Cost Management

Plan Cost Management is the process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled. The key benefit of this process is that it provides guidance and direction on how the project costs will be managed throughout the project. The plan cost management process is performed during the development phase and periodically updated during next phase planning.

2.1.1 The cost management plan should be included in the Project Management plan (PMP) as per Project Integration Management manual [R4], and assessed periodically throughout the project as needed.

2.1.2 The cost management plan should describe how the cost will be planned, structured and controlled. The level of detail in the plan, should be reflective of the projects cost and complexity, and should satisfy the requirements as defined in the Scalable Project Delivery Model [R2].

2.1.3 The project CBS should be aligned with the work breakdown structure (WBS) defined in Project Scope Management [R5]. The WBS provides the framework for the cost management plan, allowing consistency with the estimates, budgets, schedule and control of costs based on the approved scope. The CBS is used for project cost accounting which is performed at the *control account* or higher.

Note: The planned work is contained within the lowest level of WBS components which are called ***work packages***. A *work package* can be used to group the activities where work is scheduled, estimated, monitored and controlled. The level above a *work package* is a ***control account***. *Control account*s are used to group like *work package*s, and control and monitor project costs, and form the CBS.

2.1.4 For level A, B and C projects, cost **estimating** should be recorded at the *work package* level; and the cost budgeting **baseline** and **monitoring** should occur at the *control account* (project level A and B), Scope category e.g. PIEPCCC level (project level C); or project (project level D)) as defined in the Scalable Project Delivery Model [R2].

2.1.5 For level A, B and C projects, the cost management plan should define following cost requirements:

- **Unit of measure.** Each unit used in measurements (i.e. person-hours, staff days, or weeks for time measures; meter, tones, or cubic yards for quantity measures; or lump sum in currency form) should be defined.

- **Rules of performance measurement.** Earned value management (EVM) rules of performance measurement should be set and documented. This includes the establishment of EVM techniques to be employed (e.g. weighted milestones, fixed formula, percent complete etc.). Rules of performance measurement should be documented within the WBS Dictionary template in accordance with Project Scope Management [R5]. Ensure reported progress and actuals are captured consistently in the Earned Value calculation.

Note: For level A, B and C projects, EVM methodology should be used to quantify and measure project progress, performance, and is a primary tool for cost management. For level D projects, EVM is not required.

2.1.6 The CBS should ensure that *control account*s are separated by release. Contingency packages and interest packages at the project level are for the project life cycle and are not required to be separated by release.

2.2 Estimate Costs

Estimate Costs is the process of developing an approximation of the cost of resources needed to complete all of the project scope. The key benefit of this process is that it determines the monetary resources required for the project. The process is performed throughout the project to support project planning and to assist in decision-making, and is a requirement of the Phase-Gating process.

2.2.1 Estimates should be prepared in accordance with the Project Estimating manual [R6] which defines *estimate classes*, the level of detail required, methodology for estimate preparation, the basis of estimate documentation, and the frequency.

Note: All estimates are analyzed and estimate accuracy classified as per the recommended practice from the Association for the Advancement of Cost Engineering International (AACEi).

2.3 Determine Budget

Determine Budget is the process of aggregating the estimated costs of individual activities or *work package*s to establish an authorized *cost baseline*. The key benefit of this process is that it determines the *cost baseline* against which performance can be monitored and controlled.

The *cost baseline* is the approved version of the time-phased project budget which can only be changed through the process defined in the Project Integrated Change Control manual [R7]. It is used as a basis for comparison to actual results, and is a summation of the approved budgets for the different scheduled activities.

2.3.1 The cost estimates should be aggregated by *work package*s in accordance with the WBS. The *work package*s are then aggregated for the higher component levels of the CBS (such as *control account*s, scope categories (e.g. *PIEPCCC* or project) based on Scalable Project Delivery Model [R2]).

2.3.2 The cost estimates should be time-phased by month and in alignment with the supporting schedule. Both schedule and cost estimates should utilize the common project WBS for easy integration of scope, schedule and cost.

2.3.3 Three budget types and two funding types are contained in EcoSys as follows:

Budget Types	
Original Budget (OB)	• The initial time-phased *cost baseline established at gate via BCS approval*
Control Budget (CB)	• The OB updated to include all approved changes • The basis for earned value calculations
Target Budget (TB)	• The CB updated to include Consent to Proceed (CTPs) and final underspend adjustments aligning to actual cost at the end of a gate • Is not the basis for earned value calculations
Funding Types	
Released	• The amount of funds released to the project to spend via approval of the Business Case Summary (BCS) by the OAR - Non time-phased • Defined at the lowest level of the CBS
Unreleased	• The amount of funds identified in the BCS which will be requested at future gate decision meetings and BCS approvals - Non time-phased • Defined at the lowest level of the CBS

Additional information on cost management and the application within EcoSys is provided in the Project Controls EcoSys End User Training Manual [R8].

Note: The use of TB for Strategic Projects/Programs such as the Darlington Refurbishment and Pickering Safe Storage may vary depending on project/program requirements.

Note: Program Level Funding Release for Strategic Projects/Programs - The aggregated cost estimates form the basis of the Program Funding Release submission to the Board of Directors (BOD). The BOD approves the Program life cycle budget and the funding released to the Program. This includes, Nuclear Refurbishment, Pickering Safe Storage and Pickering 2024. Release Quality Estimates (RQE) are also required for Nuclear Refurbishment (Approved 2015) and Pickering Safe Storage.

2.3.4 Life cycle cost estimates should be entered into EcoSys in multiple budget files, each representing a specific phase of the project. Interest and contingency should have their own separate budget file, spanning all project phases.

2.3.5 Following phase-gate approval, and subsequent BCS approval, the *cost baseline* for the project life cycle will be approved in Ecosys. The released value for all *control account*s within the current release will be set in accordance with the funding approved by the OAR.

Note: The *cost baseline* must be aligned with the project schedule baseline to ensure proper progressing and earned value measurement.

2.3.6 As the project progresses though the phase-gates and BCS approval, the budget files for future releases are updated by the project team to reflect updated estimates for the remaining scope of work on the project. Budget files for previous releases are not re-opened to preserve the integrity of historical data; however, the Target Budget and released value will be updated (increased or decreased) to reflect the final spend for previously released scope.

The aggregate of the released value by CBS component will reflect the approved released amount documented within the BCS.

2.3.7 Any changes to project budgets (OB, CB and TB) and drawdown of contingency should be managed in accordance with the Project Integrated Change Control manual [R7].

2.4 Control Costs

Control Costs is the process of monitoring the status of the project to update the project costs and managing changes to the *cost baseline*. The key benefit of this process is that the *cost baseline* is maintained throughout the project providing a reliable source for measuring project performance.

2.4.1 The project manager should perform effective project cost controls regularly, and at a minimum monthly. Activities include:

(a) Monitoring, justifying and documenting potential changes to the authorized *cost baseline*

(b) Ensuring that all change requests are acted on in a timely manner

(c) Monitoring the cost expenditures against approved *cost baseline*s, including Finance business plans. Cost variances at the WBS level should be understood to determine the key drivers to the variances

(d) Monitoring cost performance to isolate and understand variances from the approved *cost baseline*

(e) Monitoring work performed against funds expended

(f) Preventing unapproved changes from being included in the reported cost or resource usage

(g) Informing appropriate stakeholders of all approved changes and associated cost

(h) Bringing expected cost overruns within acceptable limits

2.4.2 The project manager should ensure that all project performance discussions and data entry within the PMIS occur as per the month end schedule defined in Project Integration Management [R4]. This includes but is not limited to: invoice approval and accruals; progress calculations and schedule updates; earned value calculations, and cost forecasts.

Note: Submission of accruals (for work completed however not invoiced) and reversals (for work previously accrued) is required to ensure that actual cost collected within PMIS reflect the total cost. Incomplete actual costs as a result of late or deferred invoicing can

result in overstated cost performance, and inaccurate forecasting. Accruals should be completed in accordance with generally accepted accounting principles (GAAP) and invoice approvals should be completed in accordance with the Invoicing Procedure [R9].

2.4.3 The project manager, with support from the business unit PMO, should monitor and analyze work performance information compared to the *cost baseline*. Variances in the work performed and the cost of the work should be evaluated at the *work package* and *control account* level, and should be documented as per the standardized reporting requirements. For projects using earned value analysis (level A, B and C projects), the following key performance indicators are documented and included in standardized work performance reports.

Cost Performance Index (CPI)	• A measure of the cost efficiency of budgeted resources expressed as the ratio of earned value to actual cost. A CPI of 1.0 means the project is exactly on budget and that the work actually done so far is exactly the same as the cost so far • CPI = EV / AC
Cost Variance (CV)	• The difference between the value of work completed to a point in time, usually the data date, and the actual costs to the same point in time • CV = EV – AC
Estimate at Completion (EAC)	• The expected total cost of completing all work expressed as the sum of the actual cost to date and the estimate to complete • EAC = (BAC / CPI). Used if no variances from BAC (or) project will continue at the same rate of spending. = same as AC + ((BAC – EV) / CPI) • EAC = AC + Bottom-up ETC. Used when original estimate was fundamentally flawed. AC + a new estimate for remaining work. • EAC = AC + (BAC – EV). Used when current variances are thought to be **a typical** of future. AC + (remaining value of work at **budgeted** rate). • EAC = AC + [(BAC – EV) / (CPI*SPI)]. Used when current variances are thought to be **typical** of future. AC + remaining **budget modified by performance.**

To Complete Performance Index (TCPI)	• A measure of the cost performance that must be achieved with the remaining resources in order to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the budget available • $TCPI_{BAC}$ = (BAC – EV) / (BAC – AC) **To Complete Performance Index** – How efficient must the project team be to complete the remaining work within the BAC? • $TCPI_{EAC}$ = (BAC – EV) / (EAC – AC) **To Complete Performance Index** – How efficient must the project team be to complete the remaining work within the EAC?
Variance at Completion (VAC)	• A projection of the amount of budget deficit or surplus, expressed as the difference between the budget at completion and the estimate at completion • VAC = BAC – EAC

Note: Standardized project performance reporting is described in Project Communication and Stakeholder Management [R3].

2.4.4 Cost forecasting should occur monthly in accordance with the project management month end process, and should be reflected in EcoSys. In addition to being a key component of project cost control, project forecasts are an input into Portfolio Management and the business planning process per the Project Management program [R10].

> Forecasting the estimate at complete (EAC) involves making projections of conditions and events in the projects future based on current performance information and other knowledge available at the time of the forecast. Forecasts are generated, updated, and reissued based on work performance data that is provided as the project is executed. EACs are typically based on the actuals costs incurred for work completed, plus an estimate to complete (ETC) the remaining work. ETCs are usually bottom-up assessments however can be generated in conjunction with earned value analysis.

Methods for calculating and entering project forecasts into EcoSys are detailed in the Project Controls EcoSys End User Training Manual [R8].

2.4.5 Project forecasts should be prepared in accordance with the following requirements:

(a) Performed at the *work package* level and aggregated to the CBS

(b) Reflective of both total cost and time-phased

(c) Aligned with schedule forecasts and work progression to date

(d) Reflective of the complete project scope with a focus on released work

(e) Include all known scope and high probability items (i.e. risks that are virtually certain with a chance of occurrence greater than 80% post mitigation)

2.4.6 Requested changes to the *cost baseline* as a result of project performance analysis shall be processed for review and disposition through the Project Integrated Change Control process [R7].

3.0 ROLES AND RESPONSIBILITIES

3.1 Project Manager

(a) Ensures project costs are planned, monitored, controlled, forecasted and reported within the enterprise PMIS for cost management (Ecosys).

(b) Ensures that the integrity and confidentiality of budget information is maintained throughout the life cycle of the project.

3.2 BU PMO

(a) Supports the Project Manager in cost management including developing baselines, monitoring and analyzing work performance and variances, estimating, budgeting and forecasting.

(b) Sets-up and administers the project in EcoSys.

3.3 Enterprise PMO

(a) Acts as single point of contact for cost management methodologies, processes and associated tools and templates.

(b) Acts as owner for cost management tool (Ecosys), including delivering training and support for budget, earned value, and forecasting.

(c) Performs technical checks/oversight on the change control process.

4.0 DEFINITIONS AND ACRONYMS

4.1 Definitions

Control Account	Used to group like *work package*s, and control and monitor project costs.
Cost Baseline	The approved version of the time-phased project budget which can only be changed through the process defined in the Project Integrated Change Control manual.
Cost Breakdown Structure	Used for project cost accounting which is performed at the *control account* or higher.
Work Package	Groups activities where work is scheduled, estimated, monitored and controlled.

4.2 Abbreviations and Acronyms

AACEi	Association for the Advancement of Cost Engineering International
BCS	Business Case Summary
CB	Control Budget
CBS	Cost Breakdown Structure
CPI	Cost Performance Index
CV	Cost Variance
EAC	Estimate at Completion
ETC	Estimate to Complete
EVM	Earned value management
GAAP	Generally Accepted Accounting Principles
OAR	Organizational Authority Register
OB	Original Budget
PIEPCCC	Project Management, Inspection, Engineering, Procurement, Construction, Commissioning & Close-out
PMIS	Project Management Information Systems
PMO	Project Management Office
PMP	Project Management Plan
SME	Subject Matter Expert
TB	Target Budget
TCPI	To Complete Performance Index
VAC	Variance at Complete
WBS	Work Breakdown Structure

5.0 REFERENCES

5.1 Performance References

Ref #	Document Number	Document Title
R1	OPG-STD-0148	Project Management Standard
R2	OPG-MAN-00120-0010	Project Integration Management - Appendix A: Scalable Project Delivery Model
R3	OPG-MAN-00120-0017	Project Communication and Stakeholder Management
R4	OPG-MAN-00120-0010	Project Integration Management
R5	OPG-MAN-00120-0011	Project Scope Management
R6	OPG-MAN-00120-0012	Project Estimating
R7	OPG-MAN-00120-0016	Project Integrated Change Control
R8	OPG-CMT-77678-00000	Project Controls EcoSys End User Training Manual
R9	OPG-PROC-0026	Invoicing Procedure
R10	OPG-PROG-0039	Project Management

5.2 Developmental References

Association for the Advancement of Cost Engineering International (AACEi)

Construction Industry Institute (CII)

Project Management Institute. Project Management Body of Knowledge (PMBOK)