ONTARIO POWER GENERATION

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Nuclear **Standard**

TITLE

PROJECT MANAGEMENT STANDARD

AUTHORIZATION

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PURPOSE

This standard provides direction on the expected Project Management requirements for the execution of Projects in Ontario Power Generation – Nuclear (OPG-N). This standard identifies the critical Project Management attributes and methodology required to manage projects throughout the Project Life Cycle.

This standard receives its authority from N-PROG-AS-0007, Project Management.

EXCEPTIONS

No revisions of this document shall be used until compliance date of November 30, 2012.

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1.0 DIRECTION

This standard describes the principles and requirements to support the safe, consistent, effective and efficient management of projects throughout the project life cycle. The requirements for effective management of a project are dependent on the level of risk inherent to the project. Projects are managed using a graded, risk based approach.

Portfolio or Program Management is the management of a set of projects coordinated to achieve strategic level objectives and benefits. Projects executed as part of a Portfolio or Program should implement additional levels of integration and oversight within the context of this standard.

Nuclear projects are initiated, funded, and executed by different organizations within OPG-N. It is acknowledged that the means by which the different executing organizations implement this standard may vary.

1.1 Project Management

Project Management is the discipline of planning, organizing, securing, and managing resources to bring about the successful completion of specific project goals and objectives. It is the application of a methodical and iterative approach for guiding a project from start to finish. It incorporates tools and processes to plan, execute, monitor, and control project activities to ensure requirements are met.

Managing a project typically includes:

(a) Identifying and documenting project requirements and deliverables to satisfy the project needs and objectives including key constraints and assumptions.

(b) Providing graded, risk based oversight of the project team, supporting departments, contractors, and suppliers.

(c) Addressing the various needs, concerns, and expectations of stakeholders.

(d) Developing project plans, estimates and schedules.

(e) Developing funding and contracting strategies.

(f) Monitoring, reporting, communicating, and controlling project performance.

(g) Documenting and managing project risks and implementing recovery plans.

(h) Planning, managing and directing the project execution.

(i) Managing and controlling project changes and priorities.

(j) Incorporating operating experience and lessons learned.

(k) Balancing competing project constraints including the following:

- Scope
- Schedule
- Cost/Budget
- Resources
- Risks
- Value for money.

1.1.1 The Project Manager has the overall accountability for the project and project management and shall use a graded, risk based approach when selecting the type and detail for Project Management processes and tools. The required level of Project Management and controls are a function of the project risk, complexity, duration, expected cost and project phase.

1.1.2 All work performed during a project shall:

(a) Maintain safety and quality as the overriding priority.

(b) Be executed by staff who are competent for the type of work.

(c) Be managed in phases and approved through a series of *Decision Gates* where project progress and performance is reviewed by management and validated to ensure project requirements and objectives are being satisfied.

1.2 Project Phases and Decision Gates

Project Phases are distinct chronological project stages separated by *Decision Gates.* The gated concept enables management oversight for each applicable project phase. It controls funding and progression approvals and shall be used to manage the project through the project life cycle. This process ensures that projects meet a consistent expectation of quality and performance. At each *Decision Gate,* the current phase deliverables and project performance are reviewed together with the plan and deliverables for the next phase(s). Project management key elements and processes establish work process flow and expectations for the project team. The key elements shall be implemented using a graded, risk based approach.

1.2.1 The project life cycle typically consist of the following five phases:

- Identification phase
- Initiation phase
- Definition phase
- Execution phase
- Close Out phase.

Figure 1, Project Phases and Associated Decision Gates, illustrates the typcial project phase and *decision gate* relationship.

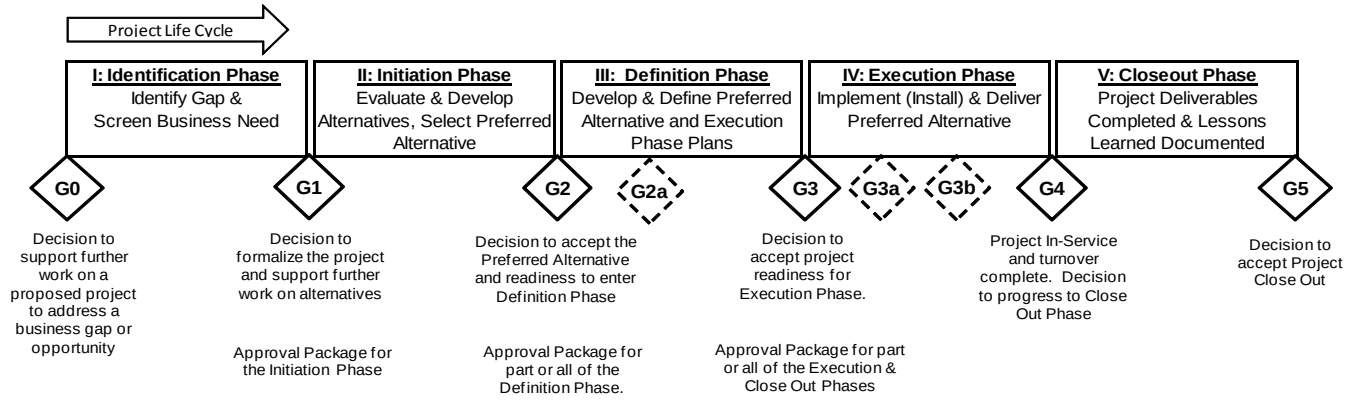

Figure 1: Project Phases and Associated Decision Gates

Note: There may be additional *Decision Gates* (e.g. G2a, G3b) within a project phase depending on project risk, funding release and execution strategy, and organization's process. Conversely, simpler projects may not require formal review and approval at every Gate. *Decision Gates* may be revisited when priorities or strategies change. In specific instances some projects will not be required to go through certain Gates. These projects will document why certain Gates are not applicable to their project.

The *Decision Gate* process includes a review of the current phase deliverables and project performance together with the plan and *Approval Package* for the next phase(s).

A project proposal begins at *Decision Gate* 0. During the period prior to Gate 0, a business gap, need or opportunity has been identified by the initiating organization. The Gate 0 decision is primarily focused on confirming strategic alignment and intended benefits with the initiating organization and OPG-N business objectives.

1.3 Identification Phase

The Identification Phase begins after Gate 0 and includes actions to assess the business need or gap. It also includes preparing the Gate 1 supporting documents for initial project funding to support further work on proposed solutions.

1.3.1 The Identification Phase deliverables typically include:

(a) Preliminary project scope, objectives, Sponsor, stakeholders and accepting organization identified.

(b) Initial project assumptions & constraints documented.

(c) Project Charter or equivalent created.

(d) Executing organization and Project Manager identified.

(e) Work for the next phase(s) defined and planned, complete with an estimate and schedule.

(f) Applicable Gate 1 *Approval Package* to support the next phase.

1.4 Initiation Phase

The project Initiation Phase includes the activities to develop and evaluate viable alternatives to resolve the business gap or need. The applicable Gate 2 supporting documents are prepared to summarize the alternatives analysis and rationale for the recommendation of the preferred alternative.

1.4.1 The Initiation Phase deliverables typically include:

(a) Alternative options evaluated and a preferred alternative recommended.

(b) Initial project contracting strategy.

(c) Preliminary Risk Assessment and mitigating plans.

(d) Initial total project cost estimate and schedule for the preferred alternative.

(e) Work for the next phase(s) defined and planned, complete with a detailed estimate and schedule.

(f) Project management plans and supporting documents.

(g) Applicable Gate 2 *Approval Packa*ge to support the next phase(s) activities.

1.5 Definition Phase

The Definition Phase typically includes actions to further define the scope of the preferred alternative, including the completion of preliminary engineering or modification planning and Execution Phase planning. This phase may also include the completion of detailed engineering, and preparations for construction/installation field work.

1.5.1 Definition Phase deliverables typically include:

(a) Refined scope description and requirements.

(b) Preliminary engineering modification planning complete.

(c) Long Lead materials and services identified.

(d) Risk Assessment and mitigating plans.

(e) Regulatory Approvals identified and planned.

(f) Refined total project cost estimate and schedule.

(g) Work for next phase(s) defined and planned, complete with detailed estimate and schedule.

(h) Applicable Gate *Approval Package* with updated project plans to support the next phase(s) including Gate 3 approval to begin the Execution Phase.

1.6 Execution Phase

The project Execution Phase includes the main construction/installation and commissioning work. It may also include completion of detailed engineering and procurement.

1.6.1 Execution Phase deliverables typically include:

(a) Pre-installation and commissioning readiness.

(b) Quality Plan.

(c) Safety Plan.

(d) Regular reporting on project safety, quality, schedule and budget.

(e) Installation and Commissioning Work Plans (if applicable).

(f) Installation and Commissioning Execution Packages.

(g) Installation/construction, inspection/testing and commissioning complete.

(h) Project Close Out phase planned.

(i) Operations and Maintenance documentation updated.

(j) Next *Approval Package* with updated plans and schedule, if applicable, for a multi-unit/phase project.

(k) Available for Service (AFS) or Operations Acceptance approved (Gate 4).

(l) Gate 4 approval to begin Close Out Phase.

1.7 Close Out Phase

The Close Out Phase is the last phase in the project life cycle and includes the final actions to complete all activities and formally finish and close out the project. This phase should be completed as quickly as possible after final AFS in order to minimize project costs.

1.7.1 Close Out Phase deliverables typically include:

(a) Completion of any outstanding actions/deficiencies from final AFS and Gate 4.
(b) Project financials finalized and closed.
(c) Remaining project materials dispositioned as spares, surplus or obsolete.
(d) New and affected drawings updated, approved and issued.
(e) Records and documents filed.
(f) Information Managed Systems updated.

(g) Lessons Learned captured and documented.
(h) Regulatory actions dispositioned and/or completed as needed.
(i) Action Tracking assignments completed and closed.
(j) Completion and approval of project close out report (Gate 5).

1.8 Key Project Management Elements

Each executing organization shall have graded, risk based processes to incorporate the key project management elements.

The key project management elements include the following items:

- Safety
- Scoping
- Estimating
- Resource planning
- Risk management
- Scheduling
- Cost management
- Procurement and contract management
- Communication
- Quality management
- Project oversight
- Project controls.

The ability to influence the outcome and success of a project is greatest at the front end of the project lifecycle. The key Project Management elements shall be applied in a manner that minimizes the likelihood of encountering issues during the execution of the work. As the project progresses and matures, the planning products should be further developed and refined to reflect the latest project information.

The products of the key project Management elements are summarized in a project management plan. Any other elements unique to a particular project should also be specified in the plan.

1.8.1 Safety

Safety, including nuclear safety, radiological safety, environmental safety and conventional safety, is an overarching element in project management. Safety impacts people, quality, costs and schedule.

Each project shall consider safety in the planning, managing, controlling and execution of project deliverables.

1.8.2 Scoping

Project scoping involves defining the project objectives and deliverables based on business requirements, assumptions, constraints and value for money.

(a) Each project shall have a well defined project scope in order to produce an accurate estimate and schedule.

(b) The inputs to determining the project scope should include but are not limited to:

- Project Charter or equivalent
- Project stakeholders
- Station/System Health Reports
- Station Engineering (system engineer)
- Design Basis and Design Requirements
- Facilitated workshops and Value Engineering
- Regulatory requirements
- Field Walk Downs
- Lessons Learned (internal and external)
- OPEX and SCRs
- Governance
- Challenge and COMS meetings
- Risk mitigating plans.

(c) There shall be a process and plan to deal with scope changes. Project scope changes shall be managed and controlled, with the impacts thoroughly understood, as they have the potential to affect the project risks, cost, schedule and stakeholders. Project scope changes require approval from the applicable authorization authority appropriate for the project. If changes are significant the project may need to be re-evaluated.

1.8.3 Estimating

Estimating is the process of quantifying the funding and resources required to complete the relevant project activities to achieve project objectives. An accurate cost estimate leads to a more precise project schedule and budget which forms the basis for project decisions, value and performance. Each project shall have a cost estimate and:

(a) Each project should create a cost estimate which includes the documentation of assumptions, constraints, deliverables, and other relevant information that the estimate is based on.

(b) Estimating should be repeated for each project phase or *decision gate* and should become more refined and accurate as the project scope and details mature.

(c) Estimating should be performed to determine the cost of changes including the addition of project scope.

(d) The estimate for the next immediate project phase should be of sufficient detail and accuracy to ensure thorough resource planning and cost control.

1.8.4 Resource Planning

Resource planning includes identifying the quantity and type of resources required for the successful completion of project deliverables.

(a) The Project Manager shall ensure that qualified personnel, equipment and material are available at each stage of the project, in order to meet the oversight, schedule, quality and technical requirements.

(b) Resource planning shall be graded and risk based and should be used as an input to develop the contracting and procurement strategies, and project schedule.

1.8.5 Risk Management

Risk Management is the process used to identify, manage and control project risks throughout the project lifecycle.

(a) The Project Manger shall ensure that project risk management is executed thoroughly to decrease the likelihood of unexpected issues occurring and adversely impacting the project and stakeholders.

(b) Risk Management includes:

- Identification and analysis of project risks
- Mitigation and/or avoidance of risks through preventive action planning and execution
- Determining the budget and schedule contingency required for residual risks
- Developing risk contingency plans to deal with residual risks that may materialize
- Monitoring and controlling risks throughout the project lifecycle.

1.8.6 Cost Management

Cost management includes the processes related to assessing and managing the actual cost of deliverables against the budget baseline. The budget or cost baseline is based on the resource loaded project schedule. Cost management includes:

(a) Establishment of the budget or cost baseline.
(b) Monitoring the status and trend of cost performance.
(c) Implementing corrective actions as required.
(d) Managing the use of contingency funding required to manage project risks.
(e) Forecasting future budget requirements.
(f) Managing required budget changes.

1.8.7 Scheduling

The project schedule outlines the deliverables and activities, their interrelationship and execution sequence. It is the main planning and monitoring tool used to communicate the execution of project deliverables.

Scheduling includes:

(a) Identification of key activities including their start and finish date, duration and resources.

(b) Activities that are deliverable based and communicate what needs to be done.

(c) The sequence and logical interrelationship of activities and milestones.

(d) Identification and optimization of the critical path.

(e) Regular monitoring and updating to track performance and initiate corrective action for schedule threats.

(f) Look ahead planning and strategizing to identify and manage priorities, opportunities, and threats.

(g) The inclusion and management of float in the schedule.

1.8.8 Procurement and Contract Management

Projects shall manage contracts and suppliers in accordance with N-STD-AS-0029, Contract Management Standard.

1.8.9 Communication

The project manager shall ensure that proper and effective communication practices are used throughout the project life cycle. This is to ensure that all project team members, stakeholders, contractors and suppliers understand the deliverables and are working with the required and most recent information.

The communication requirements include:

(a) Maintaining alignment between team members and stakeholders.
(b) Timely distribution and control of information, documentation and changes.
(c) Communicating targets and expectations.
(d) Regular project team planning and progress meetings.
(e) Informing stakeholders of project progress, risks and changes.
(f) Expediting support and issue resolution.
(g) Reporting on project performance.

1.8.10 Quality Management

Quality management processes are required to control human performance, engineering, work planning, materials, and field work, in order to meet the requirements of the project.

(a) Each project shall have a quality program.

(b) The quality program includes the methods that will be used to measure the project actual performance against the defined quality requirements.

(c) The project quality program should demonstrate the following elements where applicable:

(1) Quality planning to determine the type and frequency of internal and external quality standards and monitoring required for project success.

(2) Quality Assurance to plan a systematic pattern of means and actions designed to provide confidence that items or services will meet specified requirements and perform satisfactorily in service. These include quality systems, instruction, training, qualification and checklists.

(3) Quality Control processes to ensure that specified requirements are met through monitoring, inspections, testing, examinations or verifications. This includes the documentation of non-conformances and corrective actions.

Refer to N-STD-AS-0031, Field Engineering Standard, for projects using OPG-N's quality program.

1.8.11 Project Oversight

Projects using a contractor's or vendor's quality management system shall implement oversight in accordance with N-STD-AS-0030, Project Oversight Standard.

1.8.12 Project Controls

(a) Projects shall have control processes established to support key project management elements including but not limited to:

(1) Planning support.
(2) Monitoring of key project performance indicators (i.e. metrics).
(3) Schedule and cost variance and indicator analysis.
(4) Forecasting of project costs and schedule.
(5) Risk management.
(6) Project reporting to communicate project health and facilitating oversight.
(7) Contingency development and control.
(8) Safety and quality monitoring and reporting.
(9) Change management.
(10) Document control and records management.

(b) Project performance shall be measured, on a regular basis, in comparison to the baseline deliverables and milestones approved in the applicable project gate *Approval Package*.

(c) The monitoring and reporting of key performance indicators shall allow for the detection of at risk deliverables and support the direction of any corrective actions needed to recover performance. Analysis and corrective action shall support consideration of both project performance and business planning.

(d) Changes to scope, cost, and schedule shall be managed and controlled through the applicable executing organization process.

2.0 ROLES AND ACCOUNTABILITIES

None.

3.0 DEFINITIONS AND ACRONYMS

3.1 Definitions

Approval Package is a general term for a prescribed assembly of documentation prepared by the Project Manager and submitted for approval at a *Decision Gate*. The *Approval Package* forms the basis for authorizing authority consideration and subsequent approval for the project to proceed to the next phase. The content, structure, and rigor of the *Approval Package* will vary at each *Decision Gate* depending on a number of factors including organizational process, scope and complexity of the project and project stage.

Decision Gate is a management hold and review point in the Project Life Cycle where project attributes such as readiness, quality, value, risks and funding requests may be reviewed prior to approval of project advancement to the next phase or stage.

3.2 Abbreviations and Acronyms

AFS	Available For Service
COMS	Construction Operations Maintenance Safety stakeholder review process
OPEX	Operating Experience
OPG	Ontario Power Generation
OPG-N	Ontario Power Generation - Nuclear
SCR	Station Condition Record

4.0 RECORDS AND REFERENCES

4.1 Records

None.

4.2 References

4.2.1 Performance References

N-PROG-AS-0007, Project Management
N-STD-AS-0029, Contract Management Standard
N-STD-AS-0030, Project Oversight Standard
N-STD-AS-0031, Field Engineering Standard

4.2.2 Developmental References

A Guide to the Project Management Body of Knowledge (PMBOK Guide) 4th Edition
Association for Advancement of Cost Engineering (aace)
INPO 09-002, Excellence in Nuclear Project Management

N-PROC-MP-0083, Constructability, Operability, Maintainability, and Safety
N-PROC-MP-0090, Modification Process
OPG-PROC-0056, Post Implementation Review
OPG-PROG-AS-0006, Records and Document Control

5.0 REVISION SUMMARY

This is a non-intent revision.

- Compliance date and Exceptions revised.