DARLINGTON NEW NUCLEAR PROGRAM
COSTS AND IN-SERVICE AMOUNTS

1.0 OVERVIEW

The Release Quality Estimate ("RQE") provides a high confidence estimate of the cost of Unit 1 based on the costs spent to date and estimated costs to completion, as derived from the detailed planning that has been undertaken. This is the first unit planned to be constructed as part of the planned four-unit Darlington New Nuclear Program ("DNNP").

On March 6, 2025, OPG's Board of Directors approved the RQE cost estimate and schedule to complete the design, procurement, construction, and commissioning of Unit 1 and Common Scope Facilities ("Unit 1"), a copy of which is attached as Attachment 1. With this approval, the project moved into the Execution Phase for Unit 1.

The RQE to complete the design, procurement, construction and commissioning of Unit 1, including scope common to the four-unit facility, is $7.7B including interest, escalation and contingency. The full amount of the RQE comprises capital costs.

This exhibit describes the process used for determining the RQE, along with the results of an independent review of the governance structures, processes and procedures used to develop the RQE. It also provides a breakdown of the RQE costing and resulting capital in-service amounts forecasted to enter rate base in 2030, and discusses the relationship of these amounts with the provisions of Ontario Regulation 53/05 ("O. Reg. 53/05") that provide for recovery of interest amounts in respect of the DNNP prior to the assets being placed in service.

2.0 UNIT 1 RELEASE QUALITY ESTIMATE

The purpose of the RQE is to produce a comprehensive description of Unit 1's scope, and a high confidence estimate of the cost and schedule to complete that scope. Importantly, the quality of an estimate is directly related to how well the project scope has been defined. For purposes of classifying its cost estimates, OPG relies upon the estimate accuracy classification

standards established by the Association for the Advancement of Cost Engineering International ("AACE").

Specifically, OPG developed and classified the RQE in accordance with AACE's Recommended Practice No. 18R-97,[1] which defines classes of cost estimates based on the level of engineering and scope definition completed. As seen in Chart 1 below, the estimate classes range from Class 5 (most conceptual with the widest range of potential variability) to Class 1 (most mature with the narrowest range of potential variability).

[1] AACE Recommend Practice 18R-97: "Cost Estimate Classification System – As Applied in Engineering, Procurement and Construction for the Process Industries" was originally published in 1997. It is the basis for OPG's estimating governance and has been used to classify OPG projects and major programs such as the Darlington Refurbishment Program. In 2022, AACE published a new Recommended Practice 115R-21: "Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Nuclear Power Industries", includes more stringent requirements for project definition maturity, which is a primary characteristic for estimate development, and wider accuracy ranges for estimates for nuclear industries (class 3 expected accuracy range of -10% to -20% on the low side to +20% to +60% on the high side). The +/- value represents typical percentage variation after the application of appropriate contingency for a given scope, essentially recognizing that nuclear projects inherently have greater accuracy variability.

As part of the development of RQE, OPG assessed its estimate under both AACE Recommended Practice 18R-97 and AACE Recommended Practice 115R-21, including meeting the more stringent estimate maturity requirements under AACE Recommended Practice 115R-21. Based on OPG's estimate maturity and scope definition at the time of RQE, OPG considered the RQE falling within the accuracy ranges presented in AACE Recommended Practice 18R-97. OPG will continue to refer to both recommended practices going forward as applicable.

Chart 1 - Generic Cost Estimate Matrix – AACE Recommended Practice No. 18R-97

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges at an 80% confidence interval
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

The Unit 1 RQE is a Class 3 estimate, and it is being used as the control budget for the delivery of Unit 1. Seventy-three percent of the estimated costs in the RQE meet or exceed the level of estimate accuracy corresponding to a Class 3, with the remaining 27% at Class 4. These estimate classifications, and the associated maturity of scope definition are considered during the risk analysis and contingency development. Generally, scope elements with a lower estimate class and greater uncertainty would generate a greater risk profile and need for contingency.

The expected accuracy range of a Class 3 estimate under the above AACE guideline is -10% to -20% on the low side to +10% to +30% on the high side.

OPG engaged Better Through Total Collaboration ("BTTC") to provide an independent review of the governance structures, processes and procedures used to develop the RQE. BTTC is an infrastructure consultancy with expertise in providing independent assurance services for major capital projects.

BTTC's review consisted of (1) an evaluation of the governance and processes used to develop the RQE, and (2) an assessment of how well OPG adhered to this governance and set of processes during the development of the RQE.

Overall, BTTC concluded that OPG has an effective set of governance, processes and procedures:

> The assurance review concluded that OPG and DNNP have established a suite of Effective management plans that are generally aligned with industry best practice across all Control Areas relevant to the development of the Release Quality Estimate. The review also concluded that DNNP have not only demonstrated alignment of management plans to AACE best practice but have generally implemented the requirements of the management plans fully, with only a small number of areas showing partial compliance. Where Risk Management is concerned, DNNP have demonstrated not only alignment to AACE best practice, but execution of compliance over and above what is stated in their suite of risk Management Plans.[2]

This conclusion provides an independent assurance of the quality and soundness of the Unit 1 RQE. BTTC's final report arising from this review is provided in Attachment 2.

As set out in their report, in relation to workstream (1), BTTC assessed the effectiveness of OPG's governance and processes against five control areas deemed fundamental to the development of a robust RQE: (1) basis of estimate; (2) development of cost estimate; (3) cost estimate classification; (4) reviewing, validating and documenting the estimate, and (5) developing a project risk management plan. As noted earlier, BTTC concluded that OPG had established a strong suite of governance, processes and procedures that are generally aligned with industry-recommended practices across all Control Areas related to the development of the RQE.

[2] Better Through Total Collaboration, "Third Paty Assurance Report: Governance, Process and Procedures" (April 30, 2025), p. 7.

With respect to OPG's application of the governance (or workstream (2)), BTTC developed a Compliance Assessment Framework to facilitate the clear identification of areas of strong and weak compliance. The compliance checks conducted across the selected areas indicate that OPG has generally adhered to the governance frameworks, processes, and procedures under review. For the small number of requirements where full compliance was not achieved, it was typically found that OPG had implemented alternative controls and governance processes that still demonstrated strong control environments. OPG has since taken steps to close any compliance gaps.

Across both workstreams, taking into consideration current status and any recommendations made, BTTC found that the progress to be positive for a project of this size and complexity.[3]

2.1 Cost Estimating Structure

For cost estimating purposes, the Unit 1 scope was divided into two components, reflecting the nature of the work and the commercial strategy: (1) costs covered by the Integrated Project Agreement ("IPA"), and (2) non-IPA project costs. The associated contingency, interest and escalation[4] were then determined for each category. Estimates for the RQE were developed for all the scopes identified for the project. These estimates can be mapped to the Work Breakdown Structure described in Ex. D2-4-5.

2.1.1 IPA Costs

This component of the RQE captures the capital costs for project scope that is covered by the IPA. This is work assigned to the NOPs (i.e., GE-Hitachi, AtkinsRéalis and AECON Kiewit). For additional detail of the planning performed during the Definition Phase and how that assisted the development of the RQE, see Ex. D2-4-4.

[3] *Ibid.*, pp. 7-8.
[4] Escalation for 2025 onwards was calculated on IPA and Non-IPA costs based on existing commercial agreements, supplier estimates, applicable collective agreements, or otherwise as reflected in OPG's business planning escalation assumptions (Ex. A2-2-1).

In general, this work covers the:

- Project Management and Digital Strategy
- Site-Specific Design Engineering
- Nuclear Island, Conventional Island, and Balance of Plant Major Work Bundle procurement and construction

The RQE used engineering inputs from GE-Hitachi's Baseline 2 design because:

- The design was sufficiently complete for construction planning, detailed component design, and equipment procurement/fabrication;
- The key system and component design documentation and calculations of record had been issued; and
- A comprehensive design validation and verification had been performed.

Quantities were developed from design drawings. Productivity rates were applied to the developed quantities to produce estimates for labour costs and construction equipment usage. Level of Effort estimates were used to develop the indirect construction costs.

For engineered equipment, the project team obtained vendor pricing where possible for the major cost items (e.g., reactor pressure vessel, steam turbine generator, condenser, feedwater heaters, moisture separator reheaters, condensate purification system equipment, polar crane, large pumps, and valves).

The direct costs of materials, construction equipment, and subcontractors were developed for each activity.

2.1.2 Non-IPA Costs

This component of the RQE captures capital costs for project scope that is outside of the IPA contractual framework.

In general, this work consists of the:

- Owner Program Management including project management, licensing, and engineering oversight
- Site Preparation and Early Works
- Power Block Standard Design Engineering
- Grid Connection
- Digital Infrastructure
- Commissioning and Start-Up

Additional details on these scopes of work can be found in Ex. D2-4-5.

OPG's program management labour and non-labour costs were developed by a Level of Effort assessment at the individual organizational level, while other non-labour costs were developed from inputs from the project team and contractors. Managers from each of the respective organizational units were tasked with building their estimates from a detailed evaluation of resource types and job families necessary to execute the work, including OPG labour, temporary staff, and staff augmentation. When deliverables were outsourced to a third party, the internal/labour programs were adjusted accordingly.

Staffing plans were integrated with their associated OPG function to optimize overall resources. Benchmarking of staffing levels against other OPG major projects and external benchmarks (as available) was also completed. The staffing plans were also subjected to a series of executive challenge sessions at which individual departments presented their plans to OPG senior management. These sessions led to refinements to the planned resource levels, durations, and department deliverables. The plans were also compared to previously approved estimates (Class 4) to provide another level of challenge.

3.0 UNIT 1 COST AND IN-SERVICE AMOUNT BREAKDOWN

Based on the RQE, the Application is requesting a capital in-service addition of $6,584.9M in 2030 for the placement of Unit 1 into commercial operation. A detailed breakdown of the components of this estimate is provided in Chart 2 below.

Chart 2 – Breakdown of RQE Budget and In-Service Additions for Unit 1 ($M)

#	Bundle / Scope	Total Cost	%
1	Owner Program and IPD PMO	1,041	13.5
2	Site Preparation	63	0.8
3	Design Engineering	449	5.8
4	Nuclear Island	1,257	16.3
5	Conventional Island	1,016	13.2
6	Balance of Plant	1,082	14.1
7	Digital Strategy	43	0.6
8	Commissioning and Start Up	145	1.9
10	**Sub-Total Major Work Bundles**	5,097	66.2
11	Contingency[1]	1,436	18.7
12	RQE Capitalized Interest	1,165	15.1
13	**Total Release Quality Estimate**[2,3]	**7,698**	**100**
14	Less: RQE Capitalized Interest after Jan. 1, 2026 (removed due to CCR)	(1,113)	
15	**Capital In-Service Addition**	**6,585**	

[1] Contingency is discussed in Ex. D2-4-8 and includes incremental protections through IPD profit-at-risk.
[2] Escalation is included in each of the Major Work Bundle in-service amounts and Contingency, and accounts for $485M of the Unit 1 RQE cost.
[3] There are no OM&A costs included in the Unit 1 RQE.

There are additional costs associated with placing the first unit in-service which will not be incurred in deploying the remaining three units. In particular, the Unit 1 cost includes all scope necessary to deploy and operate all common facilities such as Condenser Cooling Water intake and discharge structures, and common buildings such as administration, fabrication and security buildings, which are necessary to support the deployment of all four planned SMRs.

These common facilities are essential to enable Unit 1 operation and have been designed to accommodate four-unit operation.

3.1 Concurrent Cost Recovery

Chart 2 displays the RQE cost of $7.7B less the interest amounts included in the RQE, as interest amounts will be recovered prior to the assets being placed in service, pursuant to O. Reg. 53/05. The RQE was developed and approved prior to the O. Reg. 53/05 amendments that established these requirements. As discussed in Ex. I1-1-3, O. Reg. 53/05 has established a framework for recovery of interest amounts on capital expenditures for the DNNP prior to the assets being placed in service, effective January 1, 2026. The Application refers to this framework as concurrent cost recovery ("CCR"). Pursuant to this framework, the Application is requesting recovery of forecast interest amounts totaling $1,004.9M over the IR term in respect of Unit 1. The requested Unit 1 in-service addition therefore does not include capitalization of interest effective January 1, 2026. Detailed calculations of the forecast CCR interest amounts are provided in Ex. I1-1-1, Table 6. Any differences between the actual CCR interest amounts and such forecast amounts will be recorded in the Darlington New Nuclear Project Variance Account re Capital Cost Amounts in accordance with O. Reg. 53/05.

Program cost performance will be measured inclusive of CCR interest amounts, as well as the credit or charge associated with the outstanding Canada Infrastructure Bank debt held by OPG as discussed in Ex. C1-1-2, Section 4.5, against the RQE.

3.2 In-Service Envelope and Development Variance Account

While actual costs may ultimately be different than forecast for individual line items shown in Chart 2, OPG/DNNP LP is committed to completing the construction and commissioning of Unit 1 within the total in-service envelope budgeted for this purpose, being approximately $6.6B. To the extent there are deviations, OPG/DNNP LP will record, subject to O. Reg. 53/05, the associated revenue requirement impacts within the Darlington New Nuclear Project Variance Account re Development Variance Account, using the same process as for the DRP.

4.0 UNIT 1 MAJOR WORK BUNDLE COSTS BREAKDOWN

The total cost of the Major Work Bundles for Unit 1 is $5,097M, including escalation and excluding contingency and interest. As illustrated in Chart 2 above, the Major Work Bundles account for 66% of the total Unit 1 RQE cost. The cost estimate of each of the Major Work Bundles is detailed in the sections below, excluding contingency and interest.

The cost estimates for all Major Work Bundles are based on the detailed scoping, scheduling, and contingency development as discussed in Ex. D2-4-5, Ex. D2-4-6 and Ex. D2-4-7. Cost estimation processes are described in Section 2.1 of this exhibit and were employed for each of the work bundles. The scope of each Major Work Bundle is executed by Project Management Teams and Functional Teams, as discussed in Ex. D2-4-2.

4.1 Owner Program and IPD PMO

The Owner Program and IPD PMO major work bundle accounts for $1,041M of the forecast Unit 1 in-service amount. A breakdown of the Owner Program and IPD PMO cost estimate is set out in Chart 3 below.

Chart 3 – Owner Program and IPD Project Management Office Costs Breakdown ($M)

#	Category	Cost	%
1	Program Management and Support	315	30
2	EA Licensing and Support	155	15
3	Engineering and Support	181	17
4	PMO (GE-Hitachi)	134	13
5	PMO (AtkinsRéalis)	141	14
6	PMO (AECON Kiewit)	100	10
7	**Sub-Total**	**1,026**	**99**
8	Escalation[1]	15	1
9	**Total**	**1,041**	**100**

[1] Escalation on NOP costs only. Escalation on OPG costs is embedded within individual lines above.

This bundle primarily covers the project management support that is being provided to the DNNP.

4.2 Site Preparation

The Site Preparation Major Work Bundle accounts for $63M of the forecast Unit 1 in-service amount. A breakdown of the Site Preparation cost estimate is set out in Chart 4 below.

Chart 4 – Site Preparation Costs Breakdown ($M)

#	Category	Cost	%
1	Early Works and Site Preparation	49	77
2	Geotech	14	23
3	**Sub-Total**	**63**	**100**
4	Escalation	0	0
5	**Total**	**63**	**100**

This bundle covers work that OPG and its partners undertook to prepare the DNNP site prior to it being turned over to AECON Kiewit for the construction of Unit 1. This work has been substantially completed.

This bundle includes projects related to Site Preparation Early Works, Site Preparation – Main,[5] and geotechnical investigations needed for the Unit 1 design.

4.3 Design Engineering

The Design Engineering Major Work Bundle accounts for $449M of the forecast Unit 1 in-service amount. A breakdown of the Design Engineering cost estimate is set out in Chart 5 below.

[5] The Site Preparation – Main scope represents costs incurred in 2022 and 2023. The full scope transitioned under the IPA and is addressed in the Balance of Plant work bundle within Site Establishment.

Chart 5 – Design Engineering Costs Breakdown ($M)

#	Category	Cost	%
1	Power Block Site Specific (GE-Hitachi)	175	39
2	Grid Connection Switchyard – Engineering and Procurement (AtkinsRéalis)	1	0
3	CCW and Shoreline Protection – Engineering and Procurement (AtkinsRéalis)	56	12
4	Site Establishment (AtkinsRéalis)	9	2
5	Power Block Engineering (AtkinsRéalis)	76	17
6	Power Block Standard Design (GE-Hitachi)	121	27
7	**Sub-Total**	**437**	**98**
8	Escalation	11	2
9	**Total**	**449**	**100**

This Major Work Bundle is shared between GE-Hitachi and AtkinsRéalis. It includes design projects by GE-Hitachi such as Power Block Standard Design and Power Block Site Specific design work. AtkinsRéalis's work in this bundle includes design projects such as Grid Connection Switchyard – Engineering and Condenser Cooling Water and Shoreline Protection – Engineering.

4.4 Nuclear Island

The Nuclear Island Major Work Bundle accounts for $1,257M of the forecast Unit 1 in-service amount. A breakdown of the Nuclear Island cost estimate is set out in Chart 6 below.

Chart 6 – Nuclear Island Costs Breakdown ($M)

#	Category	Cost	%
1	Procurement, Construction and Commissioning (AECON Kiewit)	566	45
2	Procurement (GE-Hitachi)	370	29
3	Procurement (AtkinsRéalis)	67	5
4	Control Building, Radwaste Building, Service Building & Procurement (AECON Kiewit)	143	11
5	**Sub-Total**	**1,146**	**91**
6	Escalation	110	9
7	**Total**	**1,257**	**100**

This work bundle includes construction of the Reactor Building, Control Building, Radwaste Building, Service Building, nuclear systems, and instrumentation and controls. The work is shared between GE-Hitachi, AtkinsRéalis, and AECON Kiewit.

GE-Hitachi and AtkinsRéalis are primarily responsible for nuclear island design and procurement while AECON Kiewit is primarily responsible for construction and commissioning of the nuclear island.

4.5 Conventional Island

The Conventional Island Major Work Bundle accounts for $1,016M of the forecast Unit 1 in-service amount. A breakdown of the Conventional Island cost estimate is set out in Chart 7 below.

Chart 7 – Unit 1 Conventional Island Costs Breakdown ($M)

#	Category	Cost	%
1	Procurement, Construction and Commissioning (AECON Kiewit)	563	55
2	Procurement (GE-Hitachi)	134	13
3	Procurement (AtkinsRéalis)	201	20
4	Grid Connection Transmission and Station Modifications	29	3
5	**Sub-Total**	**926**	**91**
6	Escalation	90	9
7	**Total**	**1,016**	**100**

This work bundle includes construction of the Turbine Building, the turbine, the condenser and auxiliaries, the electrical system and the security building.

4.6 Balance of Plant

The Balance of Plant Major Work Bundle accounts for $1,082M of the forecast Unit 1 in-service amount. A breakdown of the cost estimate of the Balance of Plant is set out in Chart 8 below.

Chart 8 – Balance of Plant Costs Breakdown ($M)

#	Category	Cost	%
1	Condenser Cooling Water System– Procurement and Construction (AECON Kiewit)	472	44
2	Power Block (AECON Kiewit)	92	9
3	Site Establishment (AECON Kiewit)	444	41
4	Procurement (AtkinsRéalis)	14	1
5	**Sub-Total**	**1,023**	**95**
6	Escalation	59	5
7	**Total**	**1,082**	**100**

This work bundle is primarily the accountability of AECON Kiewit. Under this bundle AECON Kiewit is responsible for the procurement and construction of general facilities and site infrastructure (e.g., fabrication shop, warehouses, administration building and the pre-assembly building; Condenser Cooling Water System and Yard Construction).

4.7 Digital Strategy

The Digital Strategy major work bundle accounts for $43M of the forecast Unit 1 in-service amount. A breakdown of the Digital Strategy cost estimate is set out in Chart 9 below.

Chart 9 – Digital Strategy Costs Breakdown ($M)

#	Category	Cost	%
1	Digital Strategy (AtkinsRéalis)	18	40
2	Digital Strategy (AECON Kiewit)	9	22
3	Digital Infrastructure	13	31
4	**Sub-Total**	40	92
5	Escalation	3	8
6	**Total**	**43**	**100**

This major work bundle is shared by OPG, AtkinsRéalis and AECON Kiewit. The work includes information management during the life cycle of the project (e.g., documents, drawings, specifications, and other data) and the technology infrastructure necessary during construction including Local Area Networks and wireless network.

4.8 Commissioning and Start-up

The Commissioning and Start-up major work bundle accounts for $145M of the forecast Unit 1 in-service amount. A breakdown of the Commissioning and Start-up cost estimate is set out in Chart 10 below.

Chart 10 – Commissioning and Start-up Costs Breakdown ($M)

#	Category	Cost	%
1	Commissioning	72	50
2	Operations	73	50
3	**Sub-Total**	145	100
4	Escalation[1]	0	0
5	**Total**	**145**	**100**

[1] Escalation on NOP costs only. Escalation on OPG costs is embedded within individual lines above.

This work bundle contains the OPG scope necessary to commission and start up the Unit 1 facility. It also includes the equipment and tools necessary for commissioning and subsequent operation including radiation protection equipment, furniture and fixtures, and plant equipment and tools necessary for commissioning and start up.

5.0 UNITS 2-4 STATUS

As announced by the Province of Ontario, the DNNP is planned to deliver a four-unit SMR facility at the Darlington New Nuclear site.

In November 2023, OPG's Board of Directors approved a funding release of $110M for Definition Phase work for the three subsequent units ("Units 2-4"). This work included preliminary planning, procurement and site grading.

In March 2025, OPG's Board of Directors approved the release of additional funding in the amount of $411M to continue the Definition Phase work for Units 2-4, bringing the overall Units 2-4 release amount to $521M, inclusive of interest. This includes advancement of design and multi-unit engineering impact assessments; preparation and submission of a Licence to

Construct application for Units 2-4; advancement of project planning; and procurement of long lead materials.

The RQEs for Units 2-4 will follow in future years. None of Units 2-4 will enter commercial operation or have any associated forecast in-service amounts entering rate base during the IR term. Progressing with the Execution Phase of Units 2-4 requires future approval by OPG's Board of Directors, DNNP LP's Board of Directors and a Canadian Nuclear Safety Commission ("CNSC") Licence to Construct.

The Application is seeking recovery of forecast CCR interest amounts totaling $114.9M over the IR term related to the released funds for Units 2-4. Capital costs during the IR term that are beyond the currently released funding would result in incremental CCR interest amounts that will be recorded for future recovery in the Darlington New Nuclear Project Variance Account re Capital Cost Amounts.

6.0 IR TERM CAPITAL EXPENDITURES AND IN-SERVICE AMOUNTS

Capital expenditures for the DNNP for the historical years (actual) and for the 2025 to 2031 period (forecast) are provided in Ex. D2-4-8, Tables 1-3, based on the Unit 1 RQE and the released funds for Units 2-4. The associated capital in-service amounts are provided in Ex. D2-4-8, Tables 4-7. The figures in these tables do not include capitalization of interest effective January 1, 2026 as a result of the concurrent cost recovery framework under O. Reg. 53/05 providing for recovery of interest amounts prior to the assets being placed in service, as discussed in Section 3.0.

The sole in-service amount for the DNNP over the historical, bridge years and IR term is the $6,584.9M forecast for Unit 1 in October 2030. As this Application represents the first time that the capital budget for the DNNP will be before the OEB, there are no prior OEB-approved amounts.

LIST OF ATTACHMENTS

Attachment 1:	DNNP Unit 1 Execution Phase Funding Release and Units 2-4 Definition Phase Funding Release, March 2025
Attachment 2:	BTTC Third-Party Assurance Report on RQE

ONTARIO POWER GENERATION

OPG Confidential Exclusive

FOR APPROVAL by the Board of Directors

March 6, 2025

Darlington New Nuclear Project – Unit 1 Execution Phase Funding Release and Units 2-4 Definition Phase Funding Release

DECISION REQUIRED

The purpose of this memo is to provide a summary of the business case for the four-unit Darlington New Nuclear Project (DNNP) and request Board approval for the following:

- Approval to transition from the validation phase to the execution phase for the first unit of DNNP, including a release of **$5,755 Million** to complete the remaining Unit 1 and common site scope for the four-unit program. If approved, this would bring the overall Unit 1 release to **$7,698 Million**.

- Approval to release additional funding in the amount of **$411 Million** to continue with the definition phase of Units 2-4. If approved, this would bring the overall Units 2-4 release to **$521 Million**.

This release covers the full Unit 1 execution phase costs until October 2030, and Units 2-4 costs until the first quarter of 2027. If approved, the cumulative funding release for DNNP would be **$8,218 Million.**

The current program estimate, reflecting a Class 3 estimate to complete Unit 1 and common site scope, and Class 4 estimate to complete the remaining four-unit small modular reactor (SMR) program, is **$20,949 Million**, with a projected levelized cost of electricity (LCOE) of $149MWh (2024$) and a schedule that places all four SMR units in service by 2035. Each unit has an expected net output capacity of 315MW.

BACKGROUND

In December 2022, as part of the approval to proceed with the Unit 1 definition phase, the Board approved a cumulative funding release of **$1,299 Million** to proceed with planning, engineering, procurement and site preparations. Additional funding releases were approved in November 2023 (**$110 Million** for Units 2-4 preliminary planning, procurement and site grading) and November 2024 (**$643 Million** for Unit 1 procurement) resulting in a life-to-date release of **$2,052 Million.**

Since that time, OPG has progressed Unit 1 definition phase with completion of the standard plant design for major systems, procurement of all long lead items for Unit 1 and common site scope, completion of site preparation activities and submission of the License to Construct (LTC) application to the Canadian Nuclear Safety Commission (CNSC). OPG expects the CNSC to issue the LTC by mid-April 2025 enabling the project to progress into the nuclear construction for Unit 1. The start of nuclear construction in April 2025 is the current assumption built into the Class 3 estimate for Unit 1. As part of the planning process, OPG has updated the cost estimate, progressed schedule development, and performed an updated risk and contingency analysis with the following conclusions:

- There continues to be technical high confidence in the design and ability to construct and commission the first-of-a-kind BWRX-300 reactor plant technology.

- The Class 3 estimate to complete design, procurement, construction and commissioning of Unit 1, including site scope common to the four-unit program, is **$7,698 Million.** This estimate incorporates higher inflation and interest forecasts, improved scope definition, updated vendor and procurement estimates and contingency. The four-unit program estimate, incorporating a Class 4 estimate to complete Units 2-4, is **$20,949 Million**.

- The overall program schedule for commercial operations delivers all four units by the end of 2035, with the high confidence Unit 1 commercial operation date of October 15, 2030, providing critical supply to meet Ontario's electricity demand.

- Commercial operation of the four 315MW units continues to provide a cost effective source of baseload supply to the system. The projected LCOE of $149/MWh (2024$), [redacted]

- The four-unit DNNP will be financed using a combination of the corporate debt platform, operating cash flow and other potential sources, with project costs recovered as part of regulated assets.

- Delivery of the four SMR units at Darlington would provide significant long term economic and social benefits and help meet Ontario and Canada's carbon emission goals.

The project is adequately prepared for progression, and management is now requesting Board approval to proceed with the DNNP Unit 1 execution phase in order to progress the following major activities:

- Completion of the construction and commissioning of Unit 1.

- Submission of the Unit 1 Licence to Operate (LTO) application to the CNSC.

- Development of operations and maintenance procedures, and completion of staff training and certification.

- Submission of the LTC application to the CNSC for Units 2-4.

- Site establishment works for Units 2-4 including grading and distribution of site services such as water, power, and local area networks.

- Establishment of commercial agreements for Units 2-4, and advancement of procurement activities for long lead materials.

ANALYSIS

Throughout the definition phase, the project team has completed all major activities required to proceed with the next phase of the program:

- An Integrated Project Agreement (IPA) for Unit 1 was signed between the technology provider (GE-Hitachi or GEH), Architect Engineer (Atkins Realis), Constructor (AECON) and Owner (OPG) on January 1st, 2023. During the definition phase, an amendment to the IPA was negotiated ("Validation Amendment" or VA) including the target cost and fully detailed incentive and disincentive program between all parties to drive "best for project" behaviours. The VA also includes the addition of another vendor (Kiewit) as Constructor, jointly with Aecon. The VA agreement is agreed to by the parties and will be signed pending this approval and the issuance of the LTC by the CNSC, expected in mid-April 2025.

- Overall engineering is ~70% complete with over 95% of the major system deliverables for the BWRX-300 standard plant design issued.

- The two-part LTC public hearings successfully concluded in January 2025, marking a significant milestone in the approval of the BWRX-300 technology in Canada. Four out of five key regulatory issues discussed with the CNSC have been resolved. Resolution of the remaining open item on the Break Exclusion Zone (BEZ) is expected by June 2025 with no impact to issuance of the LTC.

- Fabrication of key long lead components is in progress, with delivery dates aligned to the construction schedule. This includes fabrication of the Tunnel Boring Machine (June 2025 delivery), Reactor Pressure Vessel (October 2027 delivery) and the modular steel structural system (referred to as the Diaphragm Plate Steel Composite (DPSC); May 2025 delivery of basemat structure.

- The Level 1 Execution Project Schedule depicting key components of Unit 1 and common site scope critical path, major scope, and integration logic has been developed. This is underpinned by a detailed resource loaded Level 3 working schedule which will be used to monitor and control Unit 1 construction and commissioning. The corresponding Class 3 cost estimate for Unit 1 has been developed.

- A comprehensive Indigenous Engagement Plan (IEP) for the DNNP was finalized in 2021 to cover the period from 2021-2024 with a focus on Site Preparation and LTC activities. The 2024-2028 IEP proposes to encompass the continued regular engagement regarding remaining LTC and LTO activities.

- The core Project team has been established with representation from across the IPD parties, with the execution teams in place to manage Unit 1 construction.

The definition phase has advanced scope, design maturity and vendor pricing on key contracts and materials through progression of detailed engineering deliverables, providing increased certainty on technical requirements and material quantities, and informing development of the Unit 1 cost estimate and schedule.

1. **The Release Quality Estimate (RQE) to design, construct, and commission the first SMR (Unit 1) including site scope common to the four-unit program is $7,698 Million including interest, escalation and contingency.**

The Class 3 estimate to complete the design, construction and commissioning of Unit 1 is **$7,698 Million** including **$1,650 Million** of interest and escalation and **$1,240 Million** of contingency. This estimate includes scope and costs to deliver common infrastructure facilities ($1,061 Million) that are necessary to deploy and operate all four units, including Unit 1. Since the definition phase Class 4 estimate (Unit 1) and Class 5 estimate (Units 2-4) provided to the Board in December 2022, the estimate has been updated to reflect higher inflation, associated interest impacts, improved scope definition, revised schedule durations, improved risk definition and quantification, and updated vendor estimates. The project cost estimate reflects interest costs based on OPG's current credit ratings. Details on the Unit 1 and the four-unit program cost by scope, is provided in **Appendix 1**.

The estimate was developed in accordance with OPG and industry practices and meets the Association for the Advancement of Cost Engineering (AACE) Class 3 definition. The estimate reflects engineering completion of over 70% (including standard plant design which is substantially complete), and a finalised IPA.

Contingency is derived through a detailed evaluation of the estimate uncertainties (cost and schedule) discrete risks (cost and schedule) and contingent work across the program. These inputs were loaded into a fully integrated Monte Carlo simulation to assist in estimating contingency requirements in consideration of the risk and uncertainty profile presented. As a result, the Unit 1 estimate includes **$1,240 Million** of contingency which is approximately 48% of the overall direct cost exposure at risk. The recommended AACE cost estimate range and accuracy for a Class 3 estimate is +30% to -20% (see **Appendix 2: SMR Unit 1 Estimate Classification**) which substantiates that the Unit 1 contingency requested is adequate given the estimate class. A comparison of the project cost exposure vs. contingency is provided in **Appendix 3**.

2. The estimate to execute the four-unit SMR Program is $20,949 Million including interest, escalation and contingency. The estimate is at Class 4.

The current four-unit SMR Program estimate is **$20,949 Million** [redacted] This Class 4 estimate reflects a Class 3 estimate for Unit 1 including common site scope, and a Class 4 estimate for the three subsequent units (Units 2-4). This estimate reflects higher inflation, associated interest impacts, improved scope definition, revised schedule durations and sequencing, improved risk definition and quantification, and updated vendor estimates. See **Appendix 1: Unit 1 and Four Unit Program Cost by Scope** and **Appendix 4: Overall Program Cost by Unit**.

[redacted]

The final Units 2-4 cost estimates will be confirmed during the respective Unit Release Quality Estimates (Class 3), incorporating previous unit performance and lessons learned.

3. An overall high confidence schedule to complete the four-unit SMR Program has been established, with Unit 1 in commercial operation by October 15, 2030 and all units in commercial operation by 2035. The schedule for Units 2-4 will be confirmed during respective RQEs.

As part of the definition phase, the IPD parties have integrated all vendor schedules for each scope component, determined the critical path for the project, and created a schedule for Unit 1 critical path (provided in **Appendix 5: Unit 1 Level 1 Working Schedule**). The IPD parties evaluated risks for each critical path element of the Unit 1 schedule, determined the amount of contingency required to deliver the project, and produced a medium confidence (P50) working schedule and high confidence (P90) schedule.

OPG will manage day-to-day project performance using the detailed, Level 3 resource loaded working schedule. This schedule will also be used to determine the IPD parties' incentives and disincentives and will form the basis of project-controlled schedule contingency.

A high confidence schedule includes contingency for certain schedule risks that may be encountered during construction or commissioning. This schedule will be the basis for external communication and measurement. The high confidence duration for Unit 1 construction and commissioning is 66 months.

Unit 1 durations considered civil construction and Boiling Water Reactor (BWR) commissioning operating experience (OPEX) and reflected project specific impacts such as the two-part License to Construct hearing and reactor pressure vessel fabrication timelines. [redacted] he final Units 2-4 schedule durations will be confirmed during the respective Unit Release Quality Estimates (Class 3), incorporating previous unit performance and lessons learned.

The four-unit high confidence schedule and Unit 1 working schedule is provided in **Table 1**.

Table 1: Four-Unit and Unit 1 Schedule

Unit	Start	Working Schedule		High Confidence Schedule		
		Finish	Duration (Months)	Contingency (Months)	Finish	Duration (Months)
Unit 1	15-Apr-25	30-Apr-30	61	6	15-Oct-30	67
[redacted]	[redacted]				[redacted]	[redacted]

** Units 2-4 schedules to be confirmed during the respective Unit Release Quality Estimates (Class 3), incorporating previous unit performance and lessons learned.*

An overview of the four-unit schedule for DNNP is provided in **Appendix 6: Four Unit Program Schedule**.

4. Building and operating a fleet of four SMRs at Darlington will provide a source of critical supply to help meet Ontario's electricity demand and generate economic benefits to the province.

The current LCOE for the four-unit SMR Program is projected at $149/MWh (2024$). . [redacted] efer to **Appendix 7: Levelized Cost of Electricity and Sensitivities** and **Appendix 9: Business Case Assumptions** for more details.

The IESO has projected electricity demand in the province to grow by as much as 75% by 2050. Along with the Pickering Units 5-8 Refurbishment project, DNNP is the only viable option for nuclear generation capacity to come online by the 2030s. The four-unit project is supported by the Province and has been included by the IESO as a source of incremental baseload supply in its most recent Annual Planning Outlook. Overall, DNNP is well positioned to cost effectively help meet Ontario's electricity demand and support grid reliability.

Building and operating a fleet of four SMRs at Darlington is expected to provide economic benefits to Ontario and expand Ontario's nuclear supply chain and presence within the global market. The Conference Board of Canada estimates that the SMR program is expected to boost Ontario's GDP by $15.3 Billion ($2019) over 65 years and is expected to sustain on average 2,000 jobs per year over the same period. With Ontario suppliers accounting for more than 80% of DNNP spending, building and operating a first-of-a-kind BWRX-300 reactor will position Ontario as a global leader in SMR technology.

5. Release Strategy

The project has established a release strategy that will further provide the Board with opportunities to review project performance, prior to allowing the program to proceed to the next phase. Funding will be sought on a unit-by-unit basis in accordance with the release strategy as depicted in **Appendix 8: Four Unit Program Release Strategy and Appendix 10: Release Strategy by Scope and Value.**

Management will seek the release of funds in advance of each unit's execution period to complete unit specific planning and mobilization activities.

Table 2 below shows the details of the current request, and the cumulative release amount for the program ($M):

Table 2: DNNP Release Strategy

Release	Total (Released)	Release (Request)	Contingency	Interest & Escalation	Total (Request)	Grand Total
5A	$2,052M	$3,466M	$1,069M	$1,632M	$6,166M	$8,218M

6. Financing and Regulatory Structure

Under the current rate-setting methodology, OPG will begin to recover project costs and earn revenue as the underlying assets enter service. OPG's next rate application, for 2027-2031, is expected to include a request for the OEB's approval of the forecasted in-service amounts of Unit 1 and common site scope as part of the four-unit program and their associated revenue requirement.

It is anticipated that a majority of the project costs will be financed using a combination of OPG's corporate debt platform and reinvestment of operating cash flows, with additional funding provided by the federal ITCs (subject to reintroduction of federal legislation) and other potential sources. OPG continues to pursue a range of financing solutions as part of its overall corporate funding strategy in support of energy transition.

7. Indigenous Relations

OPG recognizes that it must conduct its business in a manner that is both socially and environmentally responsible. OPG's demonstration of this commitment is found within the company's Reconciliation Action Plan that provides a framework for engaging (and consulting where appropriate) with the Indigenous communities and supporting programs, committees and community initiatives that reflect its tenets and puts the philosophy into practice.

Active engagement and consultation on various aspects of the DNNP continue, including design and architecture, site preparation and site establishment, environmental monitoring and restoration, provincial and federal permitting. Waste storage and management has also been identified as a key topic and a waste table has been established to address questions and to have open dialogue with the Michi Saagig Nations on the topic. Key advancements in 2024 include:

- The Michi Saagig Nations, with OPG's support, have advanced progress on the groundwork to create an Indigenous Knowledge Study which will inform a cumulative effects study and an augmented environmental monitoring plan.
- 17 permits have been reviewed and received following engagement with the Michi Saagig Nations.
- The commercial participation table has continued to meet bi-weekly.
- A new waste table was created to discuss overarching plans for the future of OPG waste. An environment table will also begin meeting in the first quarter of 2025.
- Advancements on aquatic offsetting and terrestrial restoration planning and execution.
- Letters on Intent to create a Project Agreement and a Long-term Relationship agreement were signed between OPG and the Michi Saagig Nations.

8. Key Program Risks

The key program risks used in the current analysis are as follows:

Risk Title	Risk Description	Mitigation
First-Of-A-Kind Design	First of a kind design challenges may lead to cost overrun and schedule delay	Tiered approach that includes design analysis, second/third party assessment, qualification, mock-ups/prototype testing and commissioning tests.
Regulatory Uncertainty	First of a kind design may increase regulatory requirements from the CNSC causing schedule delay	Implement early submission of information to facilitate CNSC staff reviews and feedback. Leverage CNSC memorandum of cooperation with the Nuclear Regulatory Commission (NRC) in the United States for joint reviews on select key areas.
Indigenous Relations	Indigenous opposition may impact regulatory timelines	Consistent and proactive consultation with Indigenous Nations, including economic reconciliation opportunities.
Tariffs	Potential impact of Global US and retaliatory Canadian tariffs or other trade restrictions may lead to cost overrun and schedule delay	Contingency does not currently factor for this black swan risk. Assessment of current and future potential US suppliers in the DNNP supply chain for both Unit 1 and Units 2-4. Monitoring of any tariff implementation by the US and Canada in conjunction with the use of scenario based planning to maintain equipment / material specific impact estimates.

RECOMMENDATION / RESOLUTION

That the Board of Directors approve:

1. The SMR Unit 1 RQE Class 3 cost estimate and schedule to complete design, procurement, construction, and commissioning of Unit 1, including site scope common to the four-unit program as set out in the memorandum.

2. Transition of the Unit 1 from the validation phase to the execution phase, including a release of **$5,755 Million** to complete the remaining Unit 1 and common site scope, and **$411 Million** to continue to progress Units 2-4 planning, design, and procurement, bringing the total life-to-date program funding release to **$8,218 Million**; and

3. Delegation of approval authority to the OPG President and CEO for approval of the various commercial agreements needed to support the project.

Recommended by:	**Approved for submission to the Board of Directors by:**
Subo Sinnathamby Chief Projects Officer	Nicolle Butcher President and Chief Executive Officer

This Board memo was reviewed and approved for submission to the Board of Directors by the Major Projects Committee at their meeting of March 5, 2025.

APPENDICES

1. Unit 1 and Four Unit Program Cost by Scope
2. SMR Unit 1 Estimate Classification
3. Cost Exposure vs. Contingency
4. Overall Program Cost by Unit
5. Unit 1 Level 1 Working Schedule
6. Four Unit Program Schedule
7. Levelized Cost of Electricity and Sensitivities
8. Four Unit Program Release Strategy
9. Business Case Assumptions
10. Release Strategy by Scope and Value

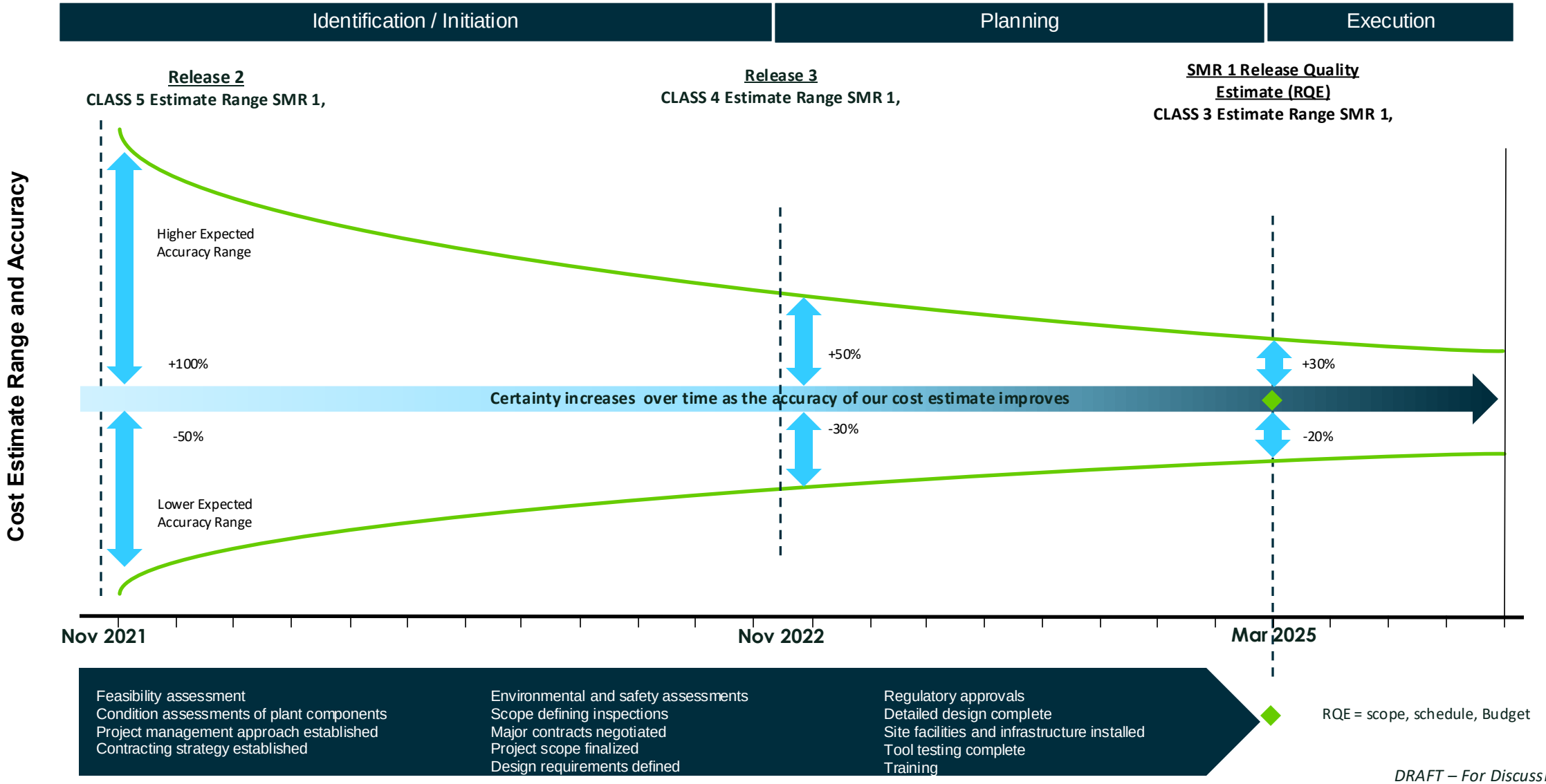
Appendix 1: Unit 1 and Four Unit Program Cost by Scope

Bundles/Scope ($ billions)		Current Estimate	
		Unit 1 (Incl Common) Class 3	Four Units Class 4
Power & Non Power Block (IPD)	Nuclear Island	1.0	[redacted]
	Conventional Island	0.9	[redacted]
	Balance of Plant	0.9	[redacted]
	Project Management	0.5	[redacted]
	Engineering	0.4	[redacted]
	Commissioning & Other Costs	0.02	[redacted]
		3.8	[redacted]
PMT & Functions (OPG)	Project Management Costs	0.3	[redacted]
	Functional Direct Support Costs	0.4	[redacted]
	Non IPD Project Costs	0.3	[redacted]
		1.0	[redacted]
Total before Contingency		**4.8**	[redacted]
Contingency		1.2	[redacted]
Project Sub-Total ($2024)		**6.0**	[redacted]
Financial	Escalation	0.4	[redacted]
	Interest	1.2	[redacted]
		1.6	[redacted]
Grand Total		**7.7**	**20.9**

1 Numbers may not add due to rounding

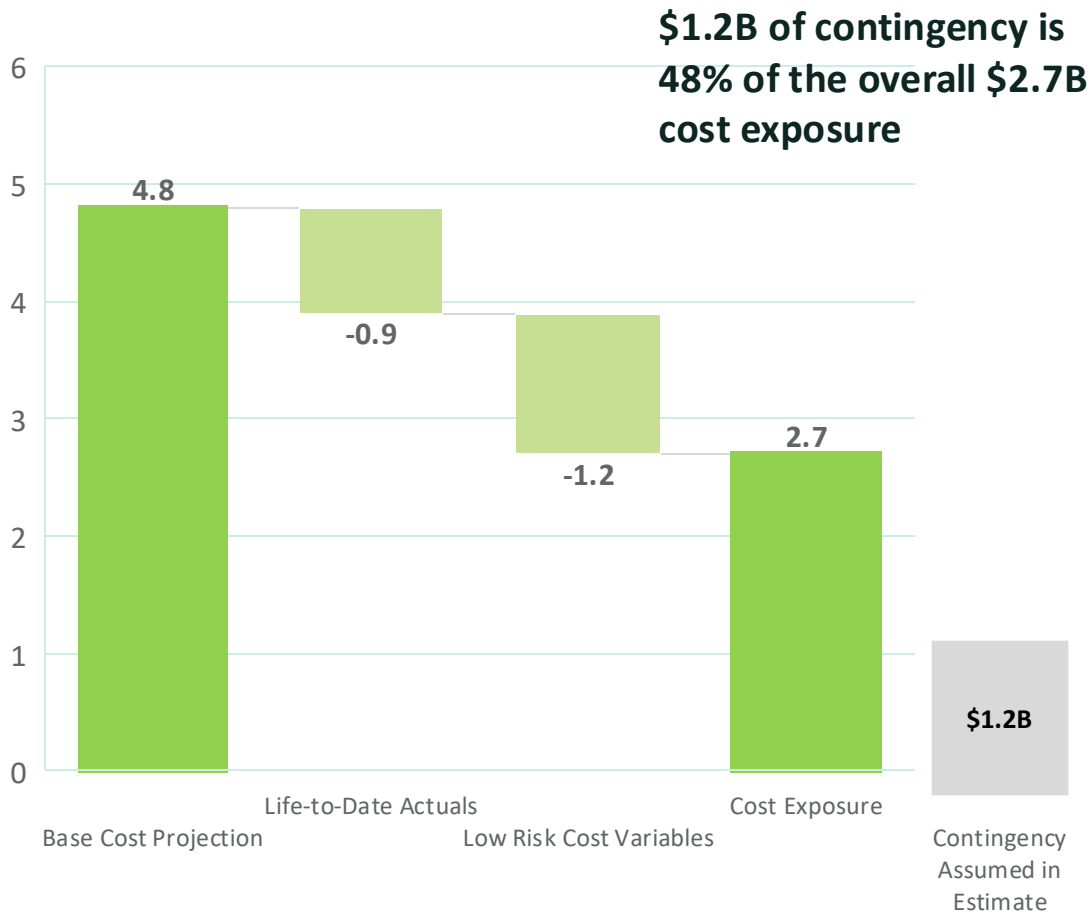
Appendix 2: SMR Unit 1 Estimate Classification

OPGs Estimate Classification is based on recommended practice by **Association for the Advancement of Cost Engineering (AACE) International**.



Appendix 3: Cost Exposure vs. Contingency

Comparison of Cost Exposure vs. Contingency ($B) |
Unit 1 and Common (Class 3) ONLY

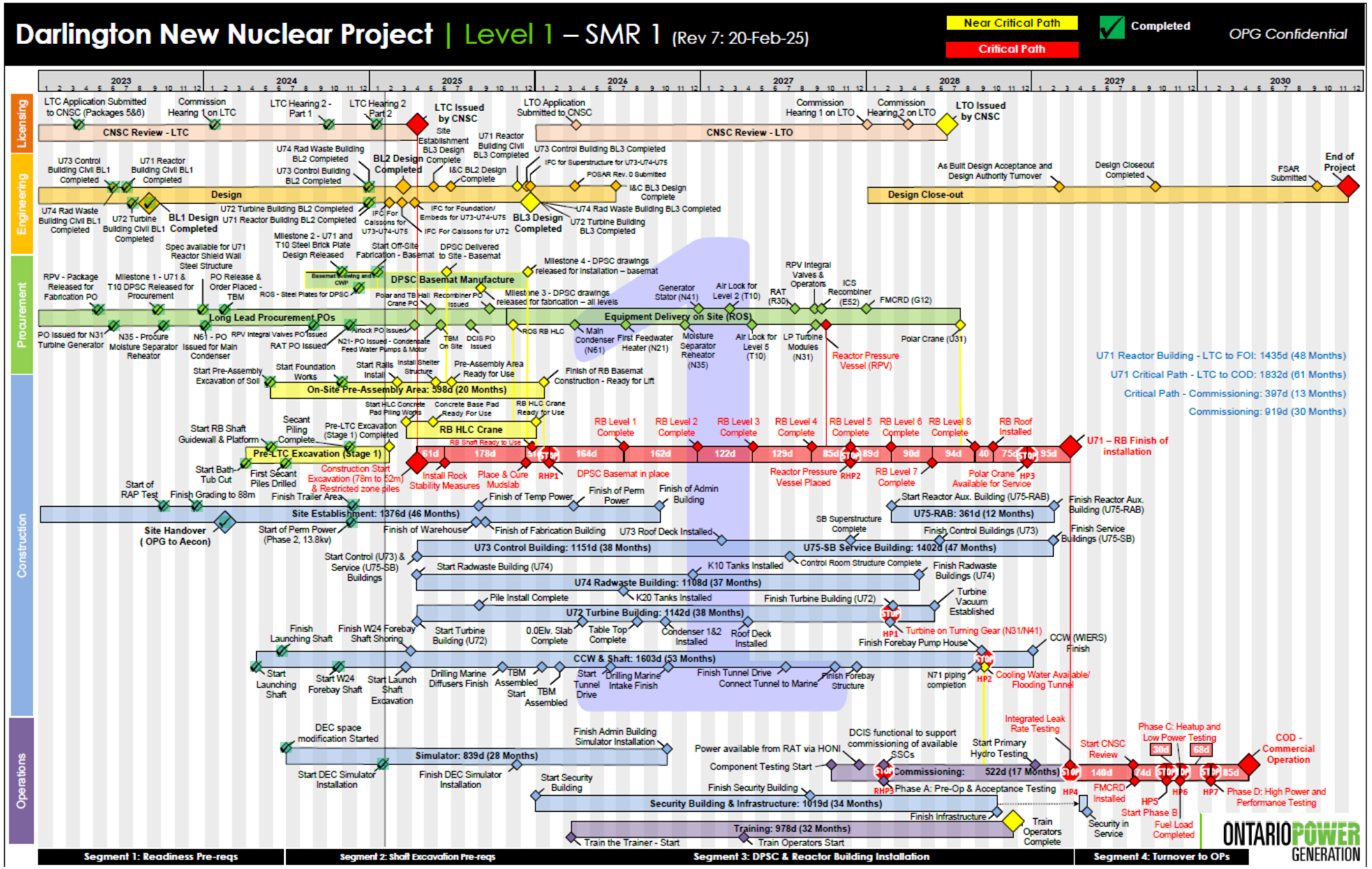


Comparison of Cost Exposure vs. Contingency ($B) |
Unit 1 and Common (Class 3) and Unit 2-4 (Class 4)

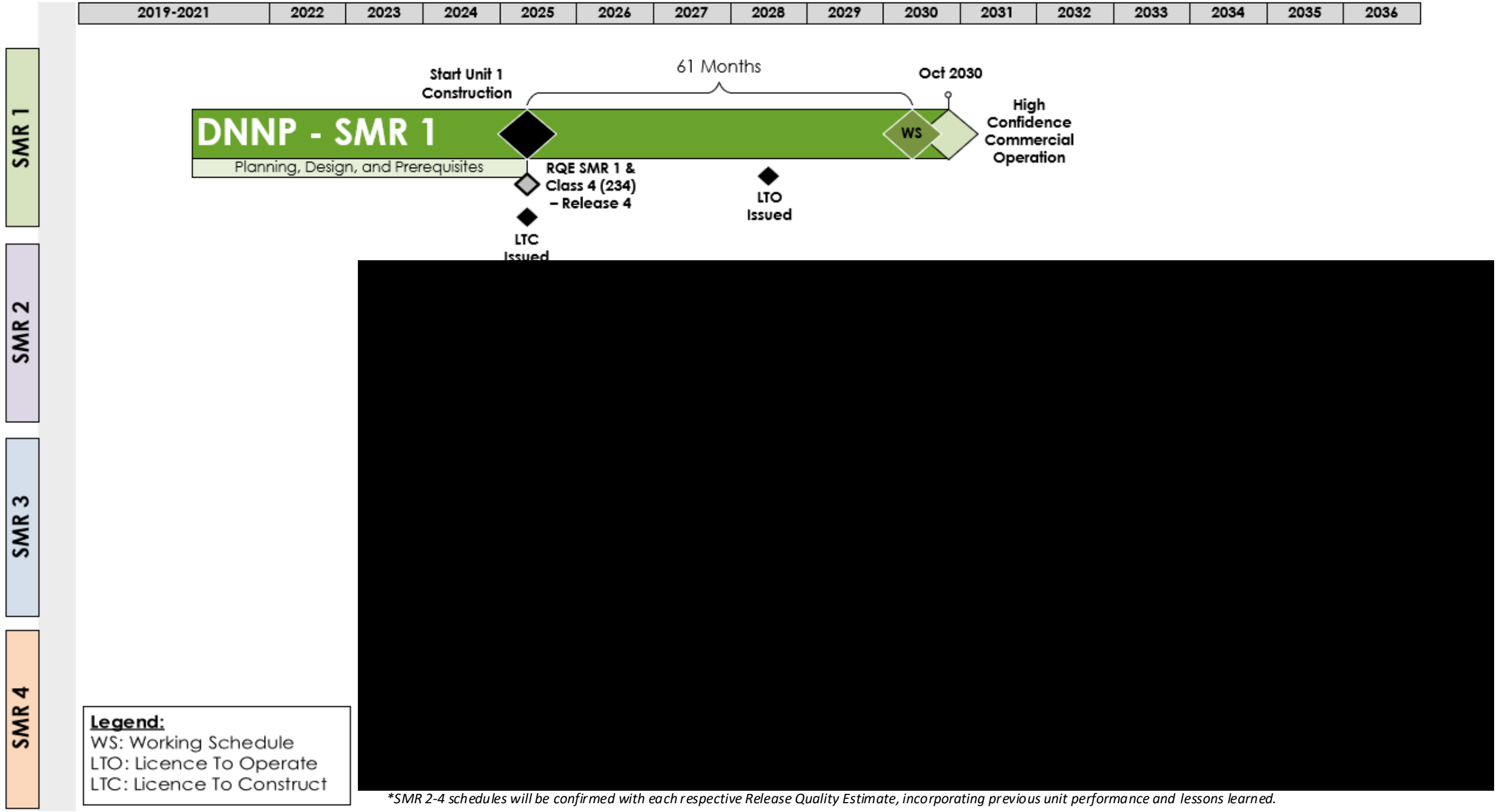
Appendix 4: Overall Program Cost by Unit

Summary of Capital Estimate ($B) by Unit | Unit 1 and Common (Class 3), Unit 2-4 (Class 4)

Appendix 5: Unit 1 Level 1 Working Schedule

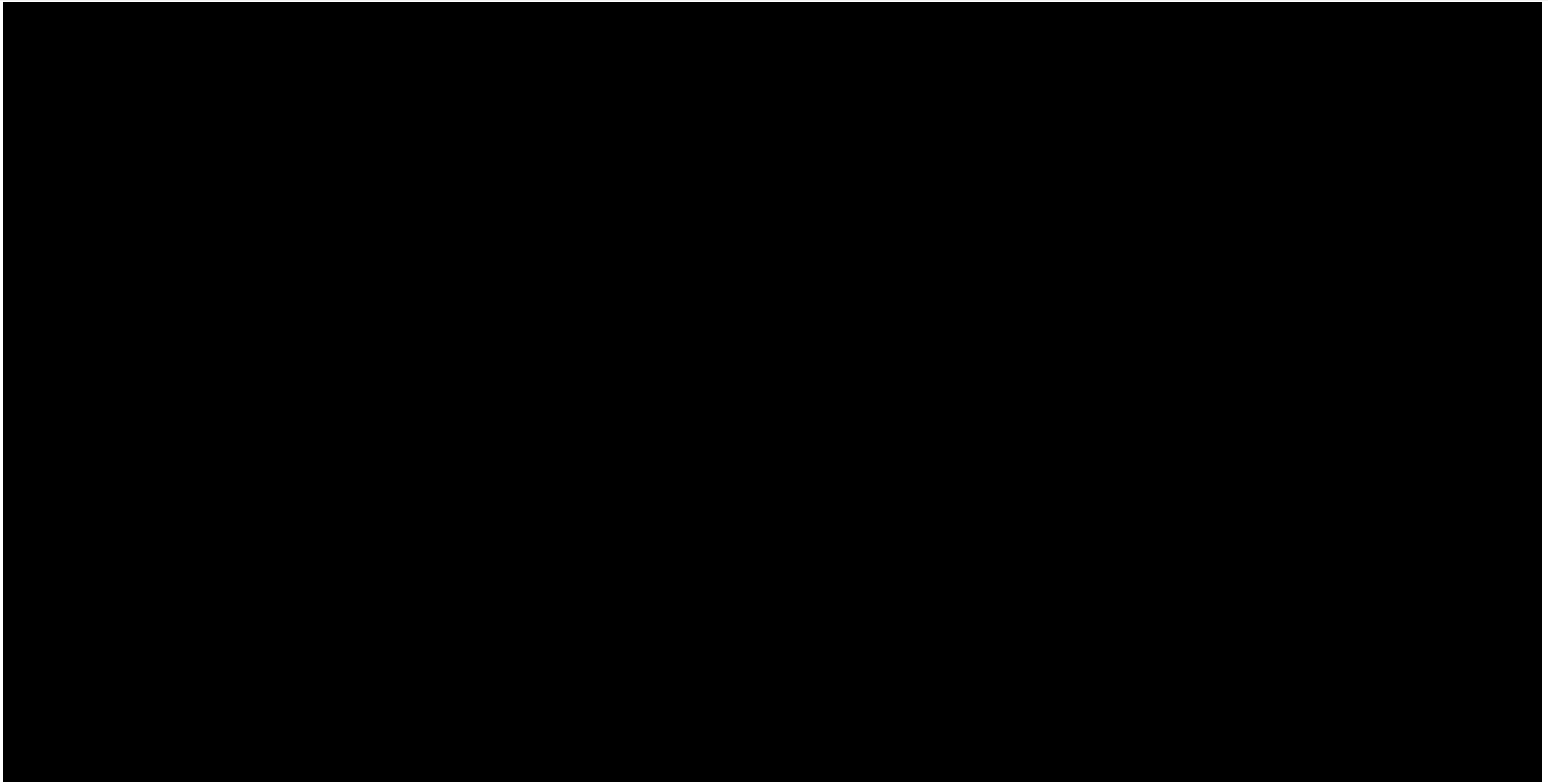


Appendix 6: Four Unit Program Schedule

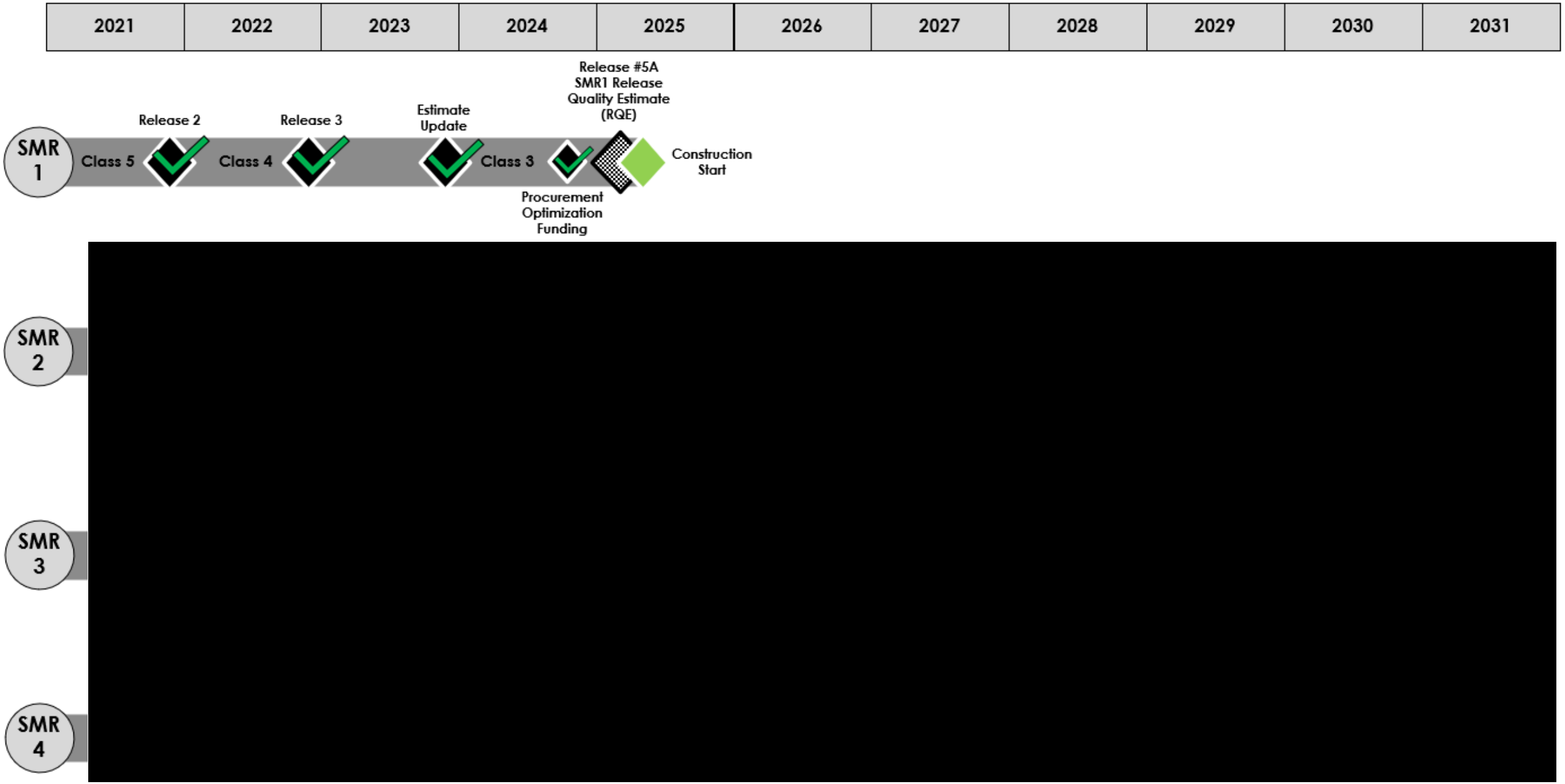


SMR 2-4 schedules will be confirmed with each respective Release Quality Estimate, incorporating previous unit performance and lessons learned.

Appendix 7: Levelized Cost of Electricity and Sensitivities



Appendix 8: Four Unit Program Release Strategy



Appendix 9: Business Case Assumptions

Category	Assumptions		
Procurement Escalation	**Materials & Equipment (uncommitted):** 5.0% trending down to 4.2% by 2031 **General Inflation:** 2.5%		
Labour Escalation	**Vendor Trades (EPSCA):** • 4.0% trending down to 2.8% by 2030	**Vendor Non-trades (ESMSA):** • 3.75% trending down to 2.50% by 2026	**OPG Labour:** • 2.75%
Interest Capitalization	• 5% corporate debt (long-term) • Existing Canada Infrastructure Bank facility for SMR 1 ($970M) • Assumed government debt funding support for Units 2-4 (~$2B at ~4%)		
15% Clean Electricity ITC, Other Government Funding	• ~75% of qualifying project costs (excluding capitalized interest) eligible for ITC • $56M Future Electricity Fund funding for Units 2-4 site preparation and planning		
Unit Output, Unit Life and Unit Capability Factor (UCF)	• 315 MW, 60 years, ~94% UCF • First unit outage at 12 months, progress to 24-month outage cycle • Ramp down to 2% FLR		
OM&A Costs ($2024)	• Base/Support: ~$150M/yr (4-units); Outage: ~$15M/unit/yr (average)		
Sustaining Projects ($2024)	• ~$300M/unit (lifecycle)		
Fuel ($2024)	• ~$30M/unit/yr (average; excl. initial fuel)		
LCOE Discount Rate	• 7%		
Discrete Risks Not Included	• No allowance for tariffs, major regulatory changes during subsequent licences or legal challenges		

Appendix 10: Release Strategy by Scope and Value

Release #	Major Deliverables	Timing	Estimated Request Value
Release #2A Preliminary Planning	• Commercial agreement/contracts • Conceptual design complete and early works planning, engineering and execution	Nov-21	**200 M**
Release #3A/B Detailed Planning and Design SMR1 | Class 4	• Detailed engineering progression and Standard Plant Design • Construction planning • Long lead procurement • Site preparation	Dec-22	**1,099 M**
Release #4A	• Preliminary planning, procurement and site grading	Nov-23	**110 M**
Release #4B	• SMR1 Procurement	Nov-24	**643 M**
Release #5A SMR1 RQE | SMR2-4 Class 4	• Full execution and closeout of SMR1 • Planning, design and procurement for SMR 2-4	Mar-25	**6,166 M**
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

**SMR 2-4 Release Quality Estimates will be established at time of release, incorporating previous unit performance and lessons learned.*

BTTC
Better Through
Total Collaboration

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Third Party Assurance Report

Governance, Process, and Procedures

30 April 2025

Document Control

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1. Introduction

1.1. Report Purpose

This report provides a comprehensive account of the Third-Party Assurance (3PA) Review undertaken by BTTC in relation to the Darlington New Nuclear Project (DNNP). It sets out the scope and objectives of the assurance activities, describes the methodology employed, and presents the executive summary, key findings, detailed assessment outcomes, and associated recommendations.

1.2. BTTC Introduction

BTTC is a high-performance infrastructure consultancy built on the belief that complex projects can be delivered Better Through Total Collaboration. With deep expertise in providing independent and third-party assurance, BTTC supports public sector clients and asset owners on some of the largest capital investment programs across Canada, the UK, and Europe.

We specialize in assurance services for major capital projects delivered through progressive and collaborative contracting models, including Integrated Project Delivery (IPD), Alliance, and Progressive Design-Build.

Our in-house capabilities enable us to provide public sector organizations with a fully developed, ready-to-implement framework of independent assurance activities.

1.3. Third Party Assurance Scope

BTTC was appointed by OPG to provide 3PA services in relation to the review and assessment of the Governance, Processes and Procedures (GPP) established and implemented by OPG to develop the Release Quality Estimate (RQE) for the DNNP.

The scope of work commissioned by OPG for the Third-Party Assurance Review was structured around two primary workstreams:

- **Assurance Workstream 1 (AW1):** This workstream focuses on evaluating the governance structures, processes, and procedures (hereafter referred to as Management Plans) that OPG has implemented for the DNNP in relation to the development of the RQE. The objective of this review is to determine whether OPG has established robust and effective Management Plans for the RQE, and to assess the extent to which these plans align with industry-leading best practices.
- **Assurance Workstream 2 (AW2):** This workstream focuses on assessing the extent to which OPG and DNNP have adhered to the Governance, Processes, and Procedures (collectively referred to as the Management Plans) established for the development of the DNNP RQE. The assessment was carried out by performing a comparative analysis of DNNP output deliverables and submittals against selected key Management Plans and their corresponding requirements.

2. Assurance Workstream 1 (AW1)

The following section provides details on the methodology implemented by BTTC for Assurance Workstream 1.

2.1. Outline Review Methodology

The diagram below illustrates the seven-step methodology employed by BTTC to conduct **Assurance Workstream 1**.

(1) Identify Control Areas

Control Areas (CA) have been identified to enable BTTC to assess if key estimating and risk development activities have been set out across a broad range of management plans at both organisation and project level. Control Areas can be found in Section 2.2 of this document.

(2) Develop Assessment Criteria

BTTC has drawn upon the Association for the Advancement of Cost Engineering (AACE) Recommended Practices and internal BTTC best practice to develop a comprehensive assessment matrix for each Control Area. Each Control Area is further broken down into multiple sub-areas, with clearly defined tests and checks tailored to evaluate specific aspects of governance, process, and procedural effectiveness. The full assessment criteria for each control area can be found in Appendix B – AW1 Detailed Assessment Record and Outcomes.

(3) Map OPG Management Plans

BTTC have mapped the OPG management plans to the Control Areas. As many OPG plans overlap across control areas and sub-category checks, this has enabled BTTC to assess the effectiveness of a broad range of management plans with differing levels within the hierarchy, against predefined control area assessment criteria. Detailed mapping can be found in Appendix A of this document.

(4) Maturity Assessment

A detailed assessment was conducted across all Control Areas using the established Assessment Criteria. This involved a systematic review of all relevant Management Plans that had been mapped to each Control Area. Following this evaluation, maturity ratings were assigned to each Control Area in accordance with the maturity framework outlined in Section 2.3.

(5) Validation Period

Validation of draft findings to ensure alignment on initial assessment. In some cases, additional evidence was provided in response to questions and observations for BTTC consideration.

(6) Update Assessment & Recommendations

Update and finalize assurance findings and recommendations.

(7) AW1 Complete

Final assurance activities and report production for AW1 is completed.

2.2. Control Areas

BTTC have identified five **Control Areas** (CA) which are fundamental to the development of a robust RQE. These Control Areas have been used to review the overall effectiveness of the management plans established by OPG. These Control Areas are:

ID	Control Area
CA1	Basis Of Estimate
CA2	Development of Cost Estimate
CA3	Cost Estimate Classification
CA4	Reviewing, Validating and Documenting the Estimate
CA5	Developing a Project Risk Management Plan

2.3. Maturity Ratings

BTTC has developed a maturity assessment framework to ensure consistency throughout the review process and enable DNNP to prioritize efforts effectively. To support both the overall maturity assessment and facilitate the ranking of individual findings by importance, two criteria sets have been established.

Control Area Maturity Rating

The below table sets out the Four Tier approach that has been used to assess the overall maturity of the individual management plans:

Maturity Rating	Maturity Description
(4) Optimized	Leading practices have been integrated into the specific governance, processes, and procedures, fully aligning with all recommended industry best practice guidelines in a comprehensive and optimized manner.
(3) Effective	Leading practices have been incorporated into the specific governance, process, and procedural areas, comprehensively addressing all recommendations outlined in industry best practice guidelines. However, the information is less integrated compared to those rated as 'Optimized', which may increase the risk of details being overlooked.
(2) Minor Improvements Required	Leading practices have generally been adopted across the relevant governance, process, and procedural areas. However, certain aspects may not fully align with the defined criteria outlined in industry best practice guidelines. As a result, minor improvements are recommended. These gaps are not expected to significantly affect the overall quality or confidence in the RQE.
(1) Major Improvements Required	There are significant gaps in the governance, processes, and procedures established for the RQE. Key management plans are either absent, poorly designed, or incorporate ineffective practices. As a result, major improvements are necessary. These deficiencies could have a fundamental impact on both the quality and confidence in the RQE.

Individual Recommendations

Each individual recommendation will be assessed and categorized based on their significance in relation to the possible impact it has on the robustness and quality of the RQE. The below table outlines these categories:

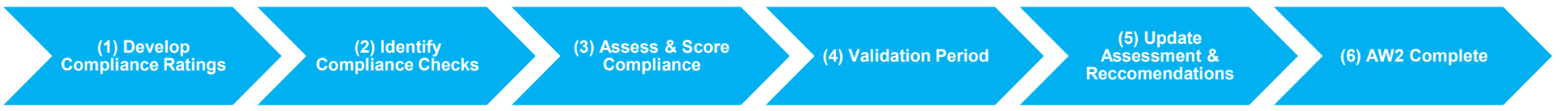
Category	Description
(A) Critical	Items that could significantly impact the level of confidence in final RQE and should be addressed as a priority.
(B) Important	Items that will have less of an impact than Category A items on the level of confidence in final RQE. These items could still have some impact the quality of the RQE and should be considered.
(C) Minor	Items that likely will not materially impact the level of confidence in the final RQE but should still be considered to minimize the risk.

3. Assurance Workstream 2 (AW2)

The following section provides details on the methodology implemented by BTTC for Assurance Workstream 1.

3.1. Outline Review Methodology

The diagram below illustrates the six-step methodology employed by BTTC to conduct **Assurance Workstream 2**.



(1) Develop Compliance Ratings

Established the compliance ratings and associated criteria used to assess how comprehensively OPG/DNNP has met specific requirements outlined in the management plan(s). Refer to section 3.2 for Compliance Ratings.

(2) Identify Compliance Checks

Developed a compliance assessment schedule detailing the specific areas within key management plans where **Compliance Checks** would be conducted. This stage also involved identifying the relevant OPG/DNNP submittals and output documents to be assessed against the requirements of the applicable management plans.

(3) Assess & Score Compliance

For each Compliance Check the relevant DNNP submittal / project deliverable was assessed for how well it complied with the specific requirements set out in the OPG/DNNP Management Plan.

(4) Validation Period

Validation of draft findings to ensure alignment on initial assessment. In some cases, additional evidence was provided in response to questions and observations for BTTC consideration.

(5) Update Assessment & Recommendations

Update and finalize assurance findings and recommendations.

(6) AW2 Complete

Final assurance activities and report production for AW2 is completed.

3.2. Compliance Ratings

BTTC has developed a Compliance Assessment Framework to promote consistency across the review process and facilitate the clear identification of areas of strong and weak compliance. In addition to assigning compliance ratings, each recommendation is categorized based on its potential impact on the RQE.

Compliance Ratings

The below table sets out the Four Tier approach that has been used to assess the overall compliance rating for the areas reviewed as part of AW2:

Compliance Rating	Compliance Rating Description
(4) Exceeds Compliance Requirements	Of the areas reviewed, the assurance review found that DNNP not only met, but **consistently exceeded** the requirements established in the relevant management plans. There is a clear culture of proactive continuous improvement and innovation in the implementation of compliance measures.
(3) Full Compliance	Of the areas reviewed, the assurance review found that DNNP **consistently met** all requirements outlined in the relevant management plans. Controls were well-defined and actively followed, demonstrating effective implementation and oversight.
(2) Partial compliance	Of the areas reviewed, the assurance review found that DNNP **met some requirements**, while others were not achieved. While controls exist, adherence is inconsistent or incomplete, resulting in moderate risk to the quality and confidence of the Release Quality Estimate.
(1) Significant Non-compliance	Of the areas reviewed, the assurance review found that DNNP exhibited **frequent or systemic violations of the minimum requirements** set out in the management plans. These compliance gaps pose a significant risk to the quality and confidence of the Release Quality Estimate.
N/A Not Applicable	This rating is used when management plans describe a process, procedure, or requirement that cannot be verified through the compliance activities undertaken. It does **not indicate** a **negative outcome**; it simply means that the requirement falls outside the scope of what can be assessed for compliance.

Individual Recommendations

Each individual recommendation will be assessed and categorized based on their significance in relation to the possible impact it has on the robustness and quality of the RQE. The below table outlines these categories:

Category	Description
(A) Critical	Items that could significantly impact the level of confidence in final RQE and should be addressed as a priority.
(B) Important	Items that will have less of an impact than Category A items on the level of confidence in final RQE. These items could still have some impact the quality of the RQE and should be considered.
(C) Minor	Items that likely will not materially impact the level of confidence in the final RQE but should still be considered to minimize the risk.

4. Executive Summary

The assurance review concluded that OPG and DNNP have established a suite of Effective management plans that are generally aligned with industry best practice across all Control Areas relevant to the development of the Release Quality Estimate. The review also concluded that DNNP have not only demonstrated alignment of management plans to AACE best practice but have generally implemented the requirements of the management plans fully, with only a small number of areas showing partial compliance.

Where Risk Management is concerned, DNNP have demonstrated not only alignment to AACE best practice, but execution of compliance over and above what is stated in their suite of risk Management Plans.

4.1. Assurance Workstream 1

The assurance review found that OPG and DNNP have established a strong suite of governance, processes and procedures that are generally aligned with industry-recommended practices across all Control Areas related to the development of the Release Quality Estimate.

Control Area Maturity Assessment

The 5 Control Areas were further broken down into 74 sub-elements with multiple criteria and checks undertaken in each sub-element. BTTC assessed the maturity of all 74 sub-elements and the overall maturity of each Control Area. The below table outlines the overall Maturity Rating across each entire Control Area. As demonstrated below, all Control Areas scored an overarching maturity rating of 3 (Effective), which BTTC believe to be positive for a project of this size and complexity.

ID	Control Area	Maturity Rating
CA1	Basis Of Estimate (CA1)	3
CA2	Development of Cost Estimate (CA2)	3
CA3	Cost Estimate Classification (CA3)	3
CA4	Reviewing, Validating and Documenting the Estimate (CA4)	3
CA5	Developing a Project Risk Management Plan (CA5)	3

The below table provides a view of the CA Sub-Area individual maturity ratings across each Control Area.

ID	Control Area	No. of maturity ratings			
		4	3	2	1
CA1	Basis Of Estimate (CA1)	3	16	1	0
CA2	Development of Cost Estimate (CA2)	5	21	3	0
CA3	Cost Estimate Classification (CA3)	1	2	0	0
CA4	Reviewing, Validating and Documenting the Estimate (CA4)	5	6	0	0
CA5	Developing a Project Risk Management Plan (CA5)	0	8	0	0

A summary dashboard can be found in Section 4.3 which provides a snapshot of all 74 CA Sub-Areas and their individual maturity assessment result.

Key Findings and Recommendations

The assurance review identified just **10** key recommendations for improvement across all control areas. The recommendations identified were categorized based on their possible impact to the quality and confidence of the RQE as outlined in Section 2.2 of the document. The assurance review identified **(Zero Cat A)**, (**Four Cat B)** and (**Six Cat C)** recommendations. Given the size and nature of the capital project, this outcome is considered both expected and reasonable.

Category of Recommendations	Number Raised
Category A (Critical)	**0**
Category B (Important)	**4**
Category C (Minor)	**6**

4.2. Assurance Workstream 2

The compliance checks conducted across the selected areas indicate that OPG and DNNP have generally adhered to the governance frameworks, processes, and procedures under review. In some cases, the requirements were not fully complied with, while in others, OPG exceeded the expected standards. For the small number of requirements where full compliance was not achieved, it was typically found that OPG had implemented alternative controls and governance processes. Although these differed from the prescribed requirements, they still demonstrated strong control environments.

Compliance Ratings

The 3 Plans were further broken down into 42 Sub-Areas, with BTTC assessing on whether they complied with the requirements outlined in the relevant management plans. The below table provides a view of the overall compliance ratings across each Plan.

Compliance ratings across each Plan.

Plan	No. of compliance ratings				
	4	3	2	1	N/A
Estimate Plan (DA1-IPD-NN-NN-TPLN-CE-0001)	**2**	**21**	**4**	**0**	**6**
Project Risk Management (OPG-MAN-00120-0015-005)	**1**	**4**	**0**	**0**	**0**
Functional Plan - Project Controls (DA1-IPD-NN-NN-TPLN-PM-0004)	**1**	**3**	**0**	**0**	**0**

A summary dashboard can be found in Section 4.4 which provides a snapshot of all 42 Compliance Ratings Sub-Areas and their individual rating.

Key Findings and Recommendations

The assurance review identified just **4** key recommendations for improvement across all control areas. The recommendations identified were categorized based on their possible impact to the quality and confidence of the RQE as outlined in Section 2.2 of the document. The assurance review identified **(Zero Cat A)**, (**Three Cat B)** and (**One Cat C)** recommendations. Given the size and nature of the capital project, this outcome is considered positive.

Category of Recommendations	Number Raised
Category A (Critical)	**0**
Category B (Important)	**3**
Category C (Minor)	**1**

4.3. AW1 Maturity Assessment Dashboard

An overview of the Control Area Maturity Assessment and maturity rating results for all 74 CA Sub-Areas assessed is provided in the below summary dashboard. Detailed review findings, evidence and ratings for each sub-area outlined below can be found in Appendix B of this report.

34R-05 Basis of Estimate	
Inputs to the BOE	4
Estimate Basis Format and Content	4
Methodology	4
Design Basis	3
Quantity Basis	3
Cost Basis	3
Planning Basis	3
Bulk Commodity Material	3
Labour	3
Allowances	2
Assumptions	3
Exclusions	3
Exceptions	3
Risks and Opportunities	3
Containments	N/A
Contingencies	3
Management Reserve	N/A
Reconciliation	3
Benchmarking	3
Estimate Quality Assurance	3
Estimating Team	3
Attachments	3

36R-08 Development	
Estimate Plan Development Process	4
Prepare Draft Estimate Plan	4
Estimate Plan Review	3
Estimate Plan Approval	3
Estimate Kick Off Meeting	2
Estimate Development Process	4
Estimate Plan Format and Content	4
Estimating Methodology	4
Process Equipment	2
Equipment Spares	3
Bulk Commodity Materials	3
Labour	3
Allowances	2
Offsite Fabrication/Assembly	3
Construction Indirect Costs	3
Commissioning and Start Up	3
Engineering and Home Office	3
Owner Costs	3
Qualifications and Assumptions	3
Exclusions	3
Exceptions	3
Late Changes	3
Escalation	3
Risk Analysis and Contingency	3
Management Reserve	N/A
Reconciliation	3
Benchmarking and Validation	3
Cash Flow	3
Estimate Development Schedule	3
Estimate Responsibility Matrix	3

115R-21 Classification (Nuclear)	
General Process	3
AACE Table 3 Assessment	4
Assessment Team	3

31R-03 Review and Validate	
Background	3
General Process	3
Estimate Review Cycles	4
Plan for the Estimate Reviews	4
Technical Scope Reviews	4
Estimating Team Reviews	4
Project Manager/Project Team Reviews	4
Management Reviews	3
Reviewing Estimates Prepared by Others	3
Documenting the Estimate	3
Feedback Loop	3

72R-12 Risk Management Plan	
General Process	3
Establishing Requirements and Objectives	3
Developing the Risk Management Plan	3
Strategy	3
Quantitative Risk Assessment	3
Qualitative Risk Assessment	3
Reporting	3
Risk Register	3

4.4. AW2 Compliance Assessment Dashboard

An overview of the Compliance Rating results for all 42 Sub-Areas assessed is provided in the below summary dashboard. Detailed review findings, evidence and ratings for each sub-area outlined below can be found in Appendix C of this report.

Estimate Plan (DA1-IPD-NN-NN-TPLN-CE-0001)	
2.1 Coding Structure	3
2.2 Cost Estimate Approach	3
2.3 Quantity Development	3
2.4 Equipment, Bulk Material, and Subcontract Pricing	N/A
2.5 Equipment and Bulk Material Pricing	2
2.6 Subcontract Pricing	3
2.7 Offsite Fabrication	3
2.8 Offsite Module Assembly	3
2.9 Freight	2
2.1 Direct Labour Hours, Wage Rates and Productivity	N/A
2.11 Direct Labor Hours	3
2.12 Construction Labour Wage Rates	2
2.13 Construction Work Week and Overtime	3
2.14 Construction Labour Productivity	3
2.15 Indirect Labor Hours	3
2.16 Indirect Material	3
2.17 Indirect Construction Equipment	3
2.18 Construction Indirect Cost and Construction Management	3
2.19 Engineering and Project Management Cost Estimate	3
2.2 Home Office Services and Engineering Support	3
2.21 Field Services	3
2.22 Commissioning and Start-up Costs	3
2.23 Other Costs	3
3 Roles and Responsibilities	N/A
3.1 Executive Board	N/A
3.2 Project Leadership Team (PLT)	N/A
3.3 Project Management Team (PMT)	N/A
4 Resources and Tools	3
5 Communication and Co-ordination	3
5.1 Estimate Reporting	3
5.2 Estimate Assumptions	4
5.3 Exclusions	4
6 Estimate Reviews	2

Project Risk Management (OPG-MAN-00120-0015-005)	
2.2 Identify Risks	4
2.2 Identify Risks	3
2.3 Perform Qualitative Risk Analysis	3
2.4 Perform Quantitative Risk Analysis	3
2.5 Plan and Implement Risk Responses	3

Functional Plan - Project Controls (DA1-IPD-NN-NN-TPLN-PM-0004 DNNP)	
6.1 Plan Risk Management	3
6.3 Risk Assessment	3
6.3 Risk Assessment	4
6.4 Risk Monitoring and Control	3

5. Key Recommendations

5.1. Assurance Workstream 1

The below table captures the key recommendations proposed by the Third-Party Assurance team across each of the five control areas. Each recommendation has been assigned a category (A-C) based on the possible impact the finding / observation could have on the robustness and confidence in the RQE.

Control Area	ID	Finding / Observation	Recommendation	Benefit / Impact	Category (A-C)
Basis Of Estimate (CA1)	**CA1.1**	**Allowances:** **EST-DTG-001** Estimating Desk Top Guide Section 6, **BOE-TMP- 012** BoE Template for OPG Use and **NK054-PLAN-01210-00108** DNNP Estimate Plan (JUNE 2023) identify the potential addition of Allowances into an estimate both described as “normal estimating allowances”	AACE (34R-05 ‘Basis of Estimate’ and 36R-08 ‘Development of Estimate Plans’) is more detailed in its requirement and that any Allowances are identified and the levels and type used. AACE goes on to describe the common estimating allowances such as takeoff allowances, wastage, unmeasured items, overbuy, working height, site constraints, rework etc. - The Plans would benefit to being more prescriptive on what is deemed to be included in ‘normal estimating’ allowances.	This is a clarity and completeness area for the overarching OPG plans and procedures/manuals. Amplification on what constitutes ‘normal estimating’ allowances will prevent subjective views on estimating allowance parameters by different estimating teams and promote a consistent approach.	**C**
Development of Cost Estimate (CA2)	**CA2.1**	**Estimating Kick Off:** AACE treat the Estimate Kick Off meeting as a standalone requirement. **OPG-MAN-00120-0019** Project Phase Gate Management- Pre Gate Project planning Kick Off Meetings are required as part of the Phase gate management process. **DA1-IPD-NN-NN-TPLN-CE-0001** Estimate Plan Section 5 develop a road map for the development of the program cost estimate progression.	AACE 36R-08 ‘Development of Estimate Plans’ requires a discreet and defined hold point for Estimate Kick off Meeting prior to commencement of the activity to communicate goals, objectives and cost strategy. It is noted that an estimate Kick Off Meeting did occur for the DNNP, however the requirement to hold the meeting is unclear within the documents provided and therefore consistency in approach cannot be guaranteed. It is recommended that relevant management plans clearly indicate the requirement to hold an estimate Kick Off meeting at a specified point.	A separate estimate Kick Off Meeting will enable the appropriate team members to attend and ensure that sufficient time is available to communicate goals, objectives and cost strategy without being clouded by general project phase gate issues.	**C**
	CA2.2	**Process Equipment:** **–** AACE contains a detailed requirement that the estimated value of expected equipment should be based on budgetary / firm quotes, in-house pricing or another stated basis. Where quotes have been obtained, a summary of the bidding process should be provided including details on the minimum number of bidders and how bids are to be normalized for evaluation. **EST-DTG-001** Estimating Desk Top Guide Section 6.4 requires the Estimator to capture the cost of long lead materials as well as non-long lead materials. **NK054-PLAN-01210-00108** and **DA1-IPD-NN-NN-TPLN-CE-0001** requires the equipment to be listed, however none of the plans and procedures request bidding information and details of the procurement process.	The AACE guideline 36R-08 ‘Development of Estimate Plans’ is prescriptive on the requirement for a summary of the bidding process used to obtain market pricing. OPG and DNNP Estimate plan requirements are generic and therefore subject to estimating judgement. On a nuclear project, safety case analysis, equipment validation and qualification requirement criteria greatly affect the cost accuracy of the bids received and should be well documented. It is recommended that a summary of budgetary / firm cost information obtained from the market and used in the estimate is included as part of the estimate substantiation. The Scalable Project Delivery Criteria could have an added level of detail for information on required number of bidders, bid analysis and review depending on the size and complexity of the project.	Ensuring the procurement process is well planned and documented is essential in ensuring that the estimate pricing is based on the latest information and any gaps, or budgetary pricing can be identified. Analysis of received bids can assess the level of competition encountered in obtaining rates and prices from the marketplace and also the amount of normalisation necessary to compare bids which can be an indicator of scope certainty. The aforementioned points will aid in evaluating the accuracy of the estimates	**B**
	CA2.3	*Note: This recommendation is similar to Recommendation CA1.1, but it pertains to the development of a cost estimate rather than the basis of a cost estimate.* **Allowances:** **EST-DTG-001** Estimating Desk Top Guide Section 6, **BOE-TMP- 012** BoE Template for OPG Use and **NK054-PLAN-01210-00108** DNNP Estimate Plan (JUNE 2023) identify the potential addition of Allowances into an estimate both described as “normal estimating allowances”	*Note: This recommendation is similar to Recommendation CA1.1, but it pertains to the development of a cost estimate rather than the basis of a cost estimate.* AACE (34R-05 ‘Basis of Estimate’ and 36R-08 ‘Development of Estimate Plans’) is more detailed in its requirement and that any Allowances are identified and the levels and type used. AACE goes on to describe the common estimating allowances such as takeoff allowances, wastage, unmeasured items, overbuy, working height, site constraints, rework etc. - The Plans would benefit to being more prescriptive on what is deemed to be included in ‘normal estimating allowances.	This is a clarity and completeness area for the overarching OPG plans and procedures/manuals. Amplification on what constitutes ‘normal estimating’ allowances will prevent subjective views on estimating allowance parameters by different estimating teams and promote a consistent approach.	**C**
	CA2.4	**Risk Analysis and Contingency:** Requires the estimate to identify the method of risk analysis and contingency determination including software to be used. A	Recommend **NK054-PLAN-01210-00108** DNNP Estimate Plan and **DA1-IDP-NN-NN-TPLN-CE-00001** DNNP Estimate Plan be updated to include specific references to **OPG-MAN-00120-0015-005** Project Risk	While there are plans and procedures for managing risk and contingency, they aren't detailed or referenced in the Developing the Basis of Estimate section. The estimate plans	**B**

		summary of the risk analysis results should be included in a separate section of the basis of estimate with a cost risk profile chart **OPG-MAN-00120-0015-005** Project Risk management Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C). and state the type of risks that will be included in the QRA, Section 3.0 outline types of contingency assessment that can be used on the project, but it is not specific on what will be used on the project. **OPG-MAN-00120-0012** - Project Estimating management lists risk register as an input (App A item 3)	management and **OPG-MAN-00120-0012** Estimating Manuals. Estimate plans should inform where the risk information and contingency is held, how it's been treated, and its relationship to the main estimate.	offer limited information on risk and contingency. It's important to consider how the development of the estimate will influence risk and contingency, as it helps address any missing information or assumptions needed to fill design gaps.	
Cost Estimate Classification (CA3)	**CA3.1**	**General Process:** **OPG-MAN-00120-0012** Project Estimating Section 2 and **EST-DTG-001** Estimating Desk top guide Section 4. Both documents refer to AACE RP 18R-97 'Cost Estimate Classification for the Process Industry'.	These documents should be updated to incorporate AACE 115R-21 specifically for the Nuclear Industries as expected accuracy ranges differ and contains a more detailed estimate input checklist and maturity matrix. Further, OPG plans and procedures should reference the following AACE RP's where appropriate: • **56R-08 Cost Estimate Classification - Building and General Construction** for OPG Non-Nuclear (Normal Civils) • **18R-97 Cost Estimate Classification - EPC / Process** for OPG Non-Nuclear Complex Projects	AACE RP's ensures consistency in approach and that engineering deliverables stated within the RP's are in line with those likely to be encountered for the project at hand. Measures which flow from the engineering inputs such as estimating accuracy and range of outcomes will attract a higher level of confidence than would otherwise be the case.	**B**
	CA3.2	**Assessment Team and Documenting the Cost Estimate Classification Process** – AACE RP 115R-21 is not specific as to who should review and assess the classification of the estimate.	The OPG plans and procedures satisfy the AACE requirements as written. To further improve, OPG plans could require the involvement (and sign off) of a mix of senior project team members including the estimators, risk, PM and technical/engineering staff to review and assess completeness and maturity of the cost estimate.	Formal review and sign off prepares the estimate for future audit and potentially for any challenges arising from a Nuclear Governance requirement.	**C**
Reviewing, Validating and Documenting the Estimate (CA4)	**N/A**	No key recommendations identified.			
Developing a Project Risk Management Plan (CA5)	**CA5.1**	**General Process:** All risk management documents.	While overall, OPG risk management is of a good standard, to improve this suite of documents to a level of best practice, it is recommended that the team make references clear in the Risk Management Plan (RMP) to other documents such as the basis of estimate that contain important information.	This would improve the clarity of the overarching process and allow the demonstration of guidance in practice.	**C**
	CA5.2	**Quantitative Risk Assessment:** Define escalation, including the types of risks and how budget values are derived. **DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls:** Section 6.1 describes that budget values will be derived using the project schedule and estimate values.	This requirement is partially covered in the project controls plan, however, cost escalation on contingency is not clearly described across the suite of documents provided. It is recommended to make it clear how escalation is dealt with.	It is important that the project team, namely the risk and estimating teams, understand how escalation will be managed concerning risk. This will avoid under or over estimation of risk impacts on the project.	**B**
	CA5.3	**Qualitative Risk Assessment:** Describe the risk matrix used to assess the probability and impact/consequence of risks. **DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls:** Section 6.3 describes the risk matrix used for the assessment of impact/consequence.	Appendix A of OPG-MAN-00120-0015-005_Project Risk Management could include some information on how the risk matrix will be used in practice. It would also be beneficial to provide the evidence of what this scale is based on.	For the understanding of the project team, it would be helpful to be clear in how to use the risk matrix in practice; additionally, it would be beneficial to provide the traceability of the scoring mechanism for future reference.	**C**

5.2. Assurance Workstream 2

The below table captures the key recommendations proposed by the Third-Party Assurance team for Assurance Workstream 2. Each recommendation has been assigned a category (A-C) based on the possible impact the finding / observation could have on the robustness and confidence in the RQE.

DNNP Management Plan	ID	Finding / Observation	Recommendation	Benefit / Impact	Category (A-C)
DNNP Estimate Plan	**AW2.1**	**DA1-IPD-NN-NN-TPLN-CE-0001** Estimate Plan **Section 2.5** requires the source pricing will be identified, including supplier quotes, database pricing etc. 1. Equipment 2. Piping, speciality piping, cable, cable tray conduit 3. Structural steel, rebar, plate etc. 4. Control system components (control valves, I/O, transmitters, gauges etc.) The BOE/RQE does not detail/record what materials are the subject of supplier quotations and to what level (budget, firm, historical data etc.) - the RQE estimate does provide embedded information however it is limited in the flat extract of the estimate used in this study. A Summary table detailing information such as supplier name, firm quote/budget/database/number of bidders/sole source etc. would have been expected in the BOE. We have also been issued (29/04/25) with 3 summary files for equipment which record the maturity of the pricing/quotation but has limited vendor/supplier information, number of bidders, RFQ status etc. The vendor status description differs between DNNP partner information. As of 30/04/25 we have not received any information on Bulk materials	Equipment and bulk materials summary tables should be attachments to the BOE document. This would formally record and capture all the detailed requirements of the estimate plan, and the information used for pricing within the RQE. Recording and capturing this exact data within the BOE will allow greater audit and traceability of cost information contained within the RQE. Whilst reviewing work stream 2 with the DNNP team it is evident that a substantial amount of the information required by the DNNP estimate plan is available, however it is not centrally stored within a designated Class 3 records folder and has been difficult to retrieve easily and quickly.	Auditability and traceability of key pricing information. Ease of finding key information used within the class 3 estimate. Detailed records of vendors, number of bidders, quotes received, quotes status is important information as it captures the level of maturity, missing information, plug numbers etc for reporting movements from the estimate as pricing becomes firmer. Further, recording the source of cost information is an activity that is used when assessing the accuracy of cost data and facilitates the appropriate inclusion of design development and estimating uncertainty allowances.	**B**
DNNP Estimate Plan	**AW2.2**	**DA1-IPD-NN-NN-TPLN-CE-0001** Estimate Plan **Section 2.9** Freight Freight is generally included with material and equipment pricing. Separate shipments will be included as required. Special Loads will be identified and included as required. There is limited information captured within the BOE document and RQE estimate to identify what has been included in respect of freight. Our assessment of “Special loads” meaning within the estimate plan would be for the very large, specialist equipment and high value bulk materials. Also, due to size of the project many bulk materials will require a high number of separate shipments.	It is recommended that handling, shipping, transportation and storage of large equipment / modules warrants being captured in detail, with freight provisions further detailed and recorded by the project as a separate item within the RQE. Further, Incoterm requirements including duties/import tax, shipping options (factory to site, factory to port, port to site etc., and by which partner/vendor etc.), roles and responsibilities and transportation methods should all be detailed in the estimate reflecting the associated high cost and risk.	Detailing freight provisions separately allows auditability and traceability of included/excluded ownership, responsibility and cost provisions. It allows analysis of the full logistics trail for equipment and records the responsible party and facilitates accurate tracking and reporting the cost for the logistics and freight. For this type of project with its complexity and scale, freight will be a large cost outlay which covers a wide range of logistical operations under one heading. Therefore, separately recording in detail exactly what is covered by vendor quotes/prices will allow the full logistics process to be appropriately priced reflecting multiple part inputs during equipment/materials transportation to the site.	**B**
DNNP Estimate Plan	**AW2.3**	**DA1-IPD-NN-NN-TPLN-CE-0001** Estimate Plan **Section 2.12** requires the labour wage rates be based on craft mix and crew compositions.	Recommend assessment of craft mix and crew composition to ensure an appropriate blended hourly rate. For example, tray, trunking, conduit, hangers, de-scaling pipe and preparation, bevelling, cutting etc. would	Inclusion of craft and crew mix assessment embedded into the estimate file/software will improve accuracy of labour cost/trade and removes the requirement for a manual adjustment.	**B**

		The BOE does detail shift, rate source, productivity factors. We also recognise the BOE details the factor uplift for non-working foreman (FM and GM) which covers the element not included in the hourly rate, and the labour factors for productivity/complexity factors used to uplift the man hours. These are added within Hard Dollar and not visible on the RQE flat extract. The BOE has no section on crew mix and crew composition detailed. From our assessment of the RQE labour rates on Mechanical and Electrical sections have no crew mix and composition adjustment. These rates are based 100% of Journeyman level.	not be undertaken solely by Journeyman labour and would use a higher percentage of apprentices and general labour for these types of works. This hourly rate should be calculated and used directly against the labour hours embedded into the estimate workbook/software and detailed within the BOE document. Note: It is recognised that within the RQE (CBS 29 - Below the line adjustment) there are items for “adjusting labour cost for Apprentice composition”.	Including a craft and crew mix assessment allows tracking of estimated crew composition to actual as work progresses for reporting and tracking, records union requirements for Apprenticeship levels and is generally considered to be estimating good practice.	
DNNP Estimate Plan	**AW2.4**	**DA1-IPD-NN-TPLN-CE-0001 Section 6.0 ‘Estimate Reviews’** details a 5 step Estimate Review process including an Estimate Walk Through, Project Scope and Technical review, Contract Compliance review, and Estimate Team review and a Project Team Reasonability Review. Although a substantial and comprehensive estimate review process has been described in the Basis of Estimate and other associated documents, it is evident that the review process does not align with that stated in the Estimate Plan (as described above). The reviews undertaken as described in the RQE Roadmap and records of the Cost Challenge meetings are generally in alignment with the requirements of the Estimate Plan although there is a difference in activity terminology. Evidence was not received however for undertaking a Contract Compliance review as required by the Estimate Plan albeit it was noted that this may have been undertaken by the Commercial PMT as part of their review process.	The review process undertaken and described in the Basis of Estimate documents, (in addition to records of the Cost Challenge meetings), demonstrate a process which is appropriate for the scale and complexity of the project being delivered. The review process is not however in full alignment with that detailed in the Estimate Plan. It is recommended that the review process in the Estimate Plan be updated to reflect the project.	The Estimate Review process should be scaled to the size and complexity of the project and the resultant process be included in the Estimate Plan itself. This enables the RQE Roadmap to flow directly from the Estimate Plan and provides appropriate time and resource to be scheduled in good time for the estimate reviews to take place. Challenges to the proposed Estimate Review process can also be raised and changes implemented if considered necessary in advance of finalising the RQE Roadmap.	**C**

6. Appendix A – AW1 Control Area and Document Mapping

The below table outlines the OPG and DNNP management plans that BTTC assessed across the 5 Control Areas for Assurance Workstream 1.

Control Area (CA)	Basis Of Estimate (CA1)	Development of Cost Estimate (CA2)	Cost Estimate Classification (CA3)	Reviewing, Validating and Documenting the Estimate (CA4)	Developing a Project Risk Management Plan (CA5)
AACE Primary Recommended Practice	**34R-05**	**36R-08**	**115R-21**	**31R-03**	**72R-12**
OPG Management Plans	OPG-MAN-00120-0012 PROJECT ESTIMATING	OPG-MAN-00120-0012 PROJECT ESTIMATING	OPG-MAN-00120-0012 PROJECT ESTIMATING	OPG-MAN-00120-0012 PROJECT ESTIMATING	OPG-MAN-00120-0015 PROJECT RISK MANAGEMENT
	OPG-MAN-00120-0011 PROJECT SCOPE MANAGEMENT	OPG-MAN-00120-0013 PROJECT COST MANAGEMENT	EST-DTG-001 ESTIMATING DESKTOP GUIDE	EST-DTG-001 ESTIMATING DESKTOP GUIDE	COST-DTG-003 CONTINGENCY MANAGEMENT
	AN-00120-0010 PROJECT INTEGRATION MANAGEMENT	SCALABLE PROJECT DELIVERY MODEL	SCALABLE PROJECT DELIVERY MODEL	OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT	ACTIVATING RISK THREAT CHECKLIST
	BOE-TMP- 012 BOE TEMPLATE FOR OPG USE	OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT	NK054-PLAN-01210-00100-00015 DNNP (PROJECT CONTROLS) PROGRAM MANAGEMENT PLAN	OPG-MAN-00120-0010 PROJECT INTEGRATION MANAGEMENT	FOAK-FIAW Job Aid REV4 Oct8
	OPG-MAN-00120-0013 PROJECT COST MANAGEMENT	BOE-TMP- 012 BOE TEMPLATE FOR OPG USE	NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	BOE-TMP- 012 BOE TEMPLATE FOR OPG USE	COR-PROC-OPG-PROC-0094 ENTERPRISE RISK MANAGEMENT REPORTING
	EST-DTG-001 ESTIMATING DESKTOP GUIDE	EST-DTG-001 ESTIMATING DESKTOP GUIDE		OPG-MAN-00120-0017 PROJECT COMMS AND STAKEHOLDER MANAGEMENT	DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP)
	OPG-MAN-00120-0015 PROJECT RISK MANAGEMENT	OPG-MAN-00120-0011 PROJECT SCOPE MANAGEMENT		OPG-MAN-00120-0015 PROJECT RISK MANAGEMENT	DNNP ROC Presentation Apr30 2025
	OPG-REF-00120-0976041 ACTIVATING RISK THREAT CHECKLIST	OPG-MAN-00120-0010 PROJECT INTEGRATION MANAGEMENT		NK054-PLAN-01210-00100-0004 DNNP PROJECT ENGINEERING PROGRAM MANAGEMENT PLAN	DA1-IPD-NN-NN-TPLN-PM-0004 DNNP ROC and SUB TOR
	COST-DTG-003 CONTINGENCY MANAGEMENT	OPG-MAN-00120-0015 PROJECT RISK MANAGEMENT		DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP)	DNNP - Risk Register Template
	NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	DAI-IDP-NN-NN-TPLN-CE-0001 DNNP ESTIMATE PLAN		DAI-IDP-NN-NN-TPLN-CE-0001 DNNP ESTIMATE PLAN	
	DAI-IDP-NN-NN-TPLN-CE-0001 DNNP ESTIMATE PLAN	NK054-PLAN-01210-00100-00015 DNNP (PROJECT CONTROLS) PROGRAM MANAGEMENT PLAN		NK054-PLAN-01210-00100-00015 DNNP (PROJECT CONTROLS) PROGRAM MANAGEMENT PLAN	
		NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)			

7. Appendix B – AW1 Detailed Assessment Record and Outcomes

7.1. CA1 – Basis of Estimate

Recommended Practice AACE 34R-05	Control Area Maturity Rating	3

CA Sub-Area	Control Area Requirements / Content	OPG Management Plans	Assessment of Alignment with CA Sub-Area Requirements	Maturity Rating
Details the sub-areas assessed for each control area.	*Outline high-level content and information in accordance with Recommended Practices.*	*Reference Management Plans (s) used within the assessment of each CA Sub-Area*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 2.3 for Maturity Rating definitions.*
Inputs to the BOE	Scope of the estimate. Methodologies used to develop the estimate. Sources and quality of supporting data. All inputs to the estimate. All required outputs. Any areas of uncertainty within the estimate including significant risks.	OPG-MAN-00120-0012 Project Estimating OPG-MAN-00120-0011 Project Scope Management NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	OPG-MAN-00120-0012 - Project Estimate Document states that inputs to the estimate define estimate class - in Appendix A Estimate Input Checklist and Maturity Matrix it states the docs required for each class of estimate. OPG-MAN-00120-0012 - scope requirements are acknowledged. OPG-MAN-00120-0012 - Project Estimate doc suggests there's an understanding that the stated inputs are required for the BOE, which are: Project scope, strategy, risk, phases, schedule, WBS, shift, walk-down, assumptions, long-lead MRs/POs, work packages. Engineering: EWRRs, conceptual/design reports, modifications, changes, studies, budgets, specs, drawings, equipment list, BoM, spares, and all-discipline drawings. OPG-MAN-00120-0012 - states that all estimates should include a BOE 3.2.1. OPG-MAN-00120-0012 - BOE should consider the level of project definition, project cost, type of project, WBS, contracting strategy. OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured. OPG-MAN-00120-0012 - ensure that the estimate package (including the estimate calculations, BOE or notes and assumptions, and all relevant supporting documents) are recorded within the project working files. OPG-MAN-00120-0011 - Document provides thorough process for establishing and documenting the scope of work, very detailed within this plan under Section 3 Scope requirement, Section 4 Estimate Process, Section 5 Estimate development.	**4**

Estimate Basis Format and Content	Project Purpose – Describe the project, including type, capacity, location, and timing. Identify the estimate's purpose (e.g., approval, cost control update, project control, resource planning). Project and Estimate Objectives – Define alignment with cost, schedule, pricing, and risk strategies. Project Scope Description – Clearly outline included and excluded components, structured by work breakdown elements. Project Execution Plan Summary - Define execution assumptions, including labor, procurement, fabrication, and modularization strategies. Project Execution Plan Summary - Align cost and schedule assumptions., Project Execution Plan Summary - Identify schedule events impacting costs (e.g., outages, weather, planned downtime). Construction, Fabrication, and Operating Parameters - noting of assumptions, AACE classification with justification/reasoning.	OPG-MAN-00120-0010 Project Integration Management OPG-MAN-00120-0011Project Scope Management OPG-MAN-00120-0012 Project Estimating BOE-TMP- 012 BoE Template for OPG Use OPG-MAN-00120-0013 Project Cost Management NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023) DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	OPG-MAN-00120-0010 - requirement for early-stage classification and providing justification. OPG-MAN-00120-0011 - process for making / agreeing scope changes and applying these to relevant documents including the BOE. OPG-MAN-00120-0011 - Document provides thorough process for establishing and documenting the scope of work. OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured. BOE-TMP- 012 BOE Template for OPG Use - Covers OPG execution plan in 5.5.1 - covers methodology strategies around fabrication, demo, install, mock up etc. OPG-MAN-00120-0012 - scope requirements are acknowledged, OPG-MAN-00120-0012 - Classification. OPG-MAN-00120-0012 - Project Estimate Document discusses the requirements for the estimate to align to schedule which will result in it being cost loaded. OPG-MAN-00120-0013 - requirement for cost estimates should be time-phased by month and in alignment with the supporting schedule. NK0054-Plan-01210-00108 section 4.2 "the estimating team will have to meet the requirements of the Estimate Deliverable Maturity Matrix as outlined for DNNP based on AACE RP 115R-21". DA1-IDP-NN-NN-TPLN-CE-0001 is a well written plan and captures all requirements of AACE succinctly - and explains process to be followed.	**4**
Methodology	Identify primary estimating methodology used: Cost resources identified Historical data types and benchmarking Coding Structure	OPG-MAN-00120-0010 Project Integration Management OPG-MAN-00120-0011 Project Scope Management OPG-MAN-00120-0012 Project Estimating OPG-MAN-00120-0013 Project Cost Management EST-DTG-001, ESTIMATING DESKTOP GUIDE DA1-IPD-NN-NN-TPLN-CE-0001, Estimate Plan	OPG-MAN-00120-0010 - includes setting WBS and then utilising this to set CBS. OPG-MAN-00120-0011 - Covers WBS breakdown which later influences CBS. OPG-MAN-00120-0012 - Project Estimate Document discusses the coding structure of estimates and the requirement to align CBS and wbs. OPG-MAN-00120-0012 - includes the use of standard estimating template. OPG-MAN-00120-0012 - external estimate cost databases may be referenced for pricing. OPG-MAN-00120-0012 - Estimating tools (InEight or Excel templates). OPG-MAN-00120-0013 - includes importance of selecting and breaking down correct unit of measure. OPG-MAN-00120-0013 - includes alignment between cost management plan and wbs. Section 6 - Estimate Preparation details cost resource type for each major cost category. Well written plan and captures all requirements of AACE succinctly - and explains process to be followed.	**4**

Design Basis	**Identifies Engineering and design deliverables, technical assumptions, and attachments such as:** Estimate Deliverables Checklist – Aligns with the company's project process. Engineering Drawings List – Includes revision details and other design information (e.g., specifications, equipment lists, and measurement units). Summary of Key Quantities	OPG-MAN-00120-0012 Project Estimating	OPG-MAN-00120-0012 - **Appendix A Inputs to the Estimate** Engineering: EWRRs, conceptual/design reports, modifications, changes, studies, budgets, specs, drawings, equipment list, Bills of Materials, spares, and all-discipline drawings. Appendix A - Inputs to the Estimate item 27 includes a Bill of Materials (BoM) Appendix A - Inputs to the Estimate item 30 includes all discipline drawings	**3**
Quantity Basis	Define Quantity Sources & Methodology: Material take-offs, sketches, standard designs, computer-simulated take-offs, or factored values. Specify Input Contributions: Vendors, discipline specialists, and project execution personnel. Clarify Design Stage & Allowances: State the design phase and calculation methods for quantity allowances. 3D Model Usage & Quality Control: Identify portions derived from 3D models and ensure safeguards for accuracy and completeness. Identify Non-Engineering Quantities: Sketch-based, software-forced, and factored quantities. Use a Summary Table: Provides a quick reference for quantity sources and development methods. External Assumptions: Ensure engineering and other external providers clearly document their quantity assumptions for the Basis of Estimate (BOE).	DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan OPG-MAN-00120-0012 Project Estimating NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023) OPG-MAN-00120-0013 Project Cost Management	Section 2 - Quantities will be developed using engineering documentation, such as Process & Instrumentation Diagrams(P&IDs), Equipment Lists, Electrical one-line diagrams, Valve lists, Instrumentation lists where possible. Section 2.3 Quantity Development. 3D model to support building sizing and bulk material quantification; OPG-MAN-00120-0012 - Project estimating doc discusses the requirement for estimates to split out time specific related costs and to quantity resource requirements such as LPM. 3.2.2 Resource Requirement - Quantities of resources such as labour, materials and equipment. note - Estimate template reference required Quantity and unit against line items. Section 5.0 Estimate development, Section 5.3 details how quantities will be approached. Table 5.1 details the quantity information to be developed and recorded. Section 10.2 Estimate assumptions - Depending on the level of scope definition, assumptions will be made and documented. 3.2.3 Estimate should be prepared in accordance with the level of project scope definition and utilize the appropriate estimate inputs (Appendix A Item 27 of the inputs is Bills of materials, Quantities etc). 2.1.5 - considers the importance of selecting and breaking down correct unit of measure.	**3**

Cost Basis	**The cost basis outlines the methods and sources used for determining material, labor, and subcontract pricing:** Pricing sources for all major equipment (vendor quotes, historical data, etc.). Bulk material and commodity pricing sources, including any discount strategies The pricing source for all labor hours, and all labor productivity adjustments. Provide appropriate detail if productivities vary by trade and/or location within the project (plant, etc.). All wage rates used (including crew/craft rates, craft mix, etc.). Identify all items included in all-in rates (if used). Pricing source and methodology for construction indirects. Pricing source for all start-up costs. Pricing source and methodology for all home office costs (project management, engineering, design, etc.). Document the basis for any contractor fee costs. Pricing source and methodology for costs such as freight, taxes, duties, etc. Pricing source for any owner's costs included in the estimate. Currency exchange rates if applicable, as well as the stability and/or volatility of rates. Escalation indices used, and the method of calculation (including duration). Contingency development and basis. Location factors used and the basis for these factors. Influence of local market conditions. Capital costs vs. expense costs, or another categorization as necessary. Any other pricing factors or external influences that may have a significant impact on project cost should be identified.	OPG-MAN-00120-0012 Project Estimating BOE-TMP- 012 BoE Template for OPG Use EST-DTG-001 ESTIMATING DESK TOP GUIDE BOE-TMP- 012 BoE Template for OPG Use EST-DTG-001 ESTIMATING DESK TOP GUIDE NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023) NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	OPG-MAN-00120-0012 - Project estimating doc - Escalation cost should be calculated by the Project Manager using the "Escalation Calculation Template", available on the Investment Management website. OPG-MAN-00120-0012 - shows awareness off calculating an appropriate level of contingencies as in accordance with Project Risk Management OPG-MAN-00120-0012 - external estimate cost databases may be referenced for pricing. OPG-MAN-00120-0012-Estimating tools (InEight or Excel templates) Section 5.5.1 Direct Labour cost. Includes labour rates source calculations and overtime rules, shift patterns, trade and crew mix and estimating factors for difficulty height, location etc. Local / international also. Section 6 - Estimate Preparation details cost resource type for each major cost category Section 10 Escalation BOE-TMP- 012 BoE Template for OPG Use - Currency exchange rates are covered in BOE template. Section 10 Escalation Section 11.1 Contingency Development Section 5.4 and 5.5 for material bulks and equipment, 5.10 and 5.11 for labour hours and labour wage rates, 5.14 productivity	**3**

Planning Basis	Outlines project management, design, procurement, and construction strategies. Details assumptions on work schedules (e.g., hours per day, shifts, overtime). Notes on constructability, modularization, and use of specialized equipment. Identifies the overall project schedule and key milestones.	BOE-TMP- 012 BoE Template for OPG Use OPG-MAN-00120-0012 Project Estimating NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 5.5.1 Direct Labour cost. Includes labour rates source calculations and overtime rules, shift patterns, trade and crew mix and estimating factors for difficulty height, location etc. Local / international also. Section 5.5.1 Construction execution plan, list of major fabrication, demolition/removal, and installation approach, mock up (if any) activities for major scope OPG-MAN-00120-0012 - Project Estimate Document discusses the requirements for the estimate to align to schedule which will result in it being cost loaded. Section 5.0 Estimate development, 5.7 off site fabrication, 5.8 offsite module assembly Section 5.12 and 5.13 cover hours, shifts etc	**3**
Bulk Commodity Material	Specifies the percentage of bulk material costs from various sources (quotes, in-house pricing). Differentiates between materials for fabrication and site installation. Differentiates between materials for fabrication and site installation. Notes special considerations (e.g., on-site concrete batch plants) and material responsibility (owner/contractor/sub-contractor).	EST-DTG-001 ESTIMATING DESK TOP GUIDE NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 6 - Estimate Preparation details cost resource type for each major cost category Section 6.4 - Estimating Procurement Cost (note materials costs not specifically mentioned) Section 5.4 and 5.5 for material bulks and equipment Also Section 5 detailed code and scope section details indirects for fabrication and site installation etc	**3**
Labour	Construction Labor Costs: Crew mix descriptions (apprentices, foremen, etc.), union/non-union factors, labor agreements Construction Labor Productivity: Basis for productivity calculations, including labor density, work conditions, site logistics, and other variables. Construction Work Week and Overtime: Specifies final labor schedules and overtime use.	EST-DTG-001 ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0012 Project Estimating BOE-TMP- 012 BoE Template for OPG Use DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 6 - Estimate Preparation details cost resource type for each major cost category Section 6.5 - Construction Costs Section 6.6 - Commissioning Costs Appendix A Item 7 - estimate input checklist requires the estimator to declare assumed shift patterns Section 5.5.1 Direct Labour cost. Includes labour rates source calculations and overtime rules, shift patterns, trade and crew mix and estimating factors for difficulty height, location etc. Local / international also. Section 2.10 Direct Labour Hours, Wage Rates and Productivity Covers all areas of AACE requirements	**3**
Demolition	Covers general demolition of decommissioned/abandoned facilities. Details revamp-related demolitions and how scope and cost were determined.	N/A		**N/A**

Allowances	Describe the level and types of allowances used in the estimate Examples include, wastage, unmeasured items, overbuy, working height, site constraints	EST-DTG-001 ESTIMATING DESK TOP GUIDE ESTIMATING DESK TOP GUIDE BOE-TMP- 012 BoE Template for OPG Use NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 6 - Estimate Preparation details cost resource type for each major cost category Section 6.5 - Construction Costs Table 8 includes difficulty and height factors but the origins of the factors are unclear. Section 6 - requirement to record any cost allowance assumptions made. Any significant impacts on costs including factors e.g. exchange rates Section 5.0 Estimating Development- The base estimates shall include the costs of all quantified in-scope work plus normal estimating allowances (i.e. Base Estimate = Base Scope Costs + Estimating Allowances).	**2**
Assumptions	Capture All Additional Assumptions: Include any assumptions not covered elsewhere in the estimate. Document all assumptions, regardless of their expected impact.	OPG-MAN-00120-0012 Project Estimating (Facility) BoE-00120 Template DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured Appendix A Item 9 - Project list of assumptions / constraints OPG-MAN-00120-0012 - ensure that the estimate package (including the estimate calculations, BoE or notes and assumptions, and all relevant supporting documents) are recorded within the project working files Section 5.2 Estimate assumptions - all assumptions shall be reviewed and validated by the scope owners prior to finalising the estimate. When assumption may lead to risks those are appropriately documented and monitored	**3**
Exclusions	Purpose of Exclusions Section: Identify costs that are not included in the estimate but might be expected to be	OPG-MAN-00120-0012 Project Estimating BOE-TMP- 012 BoE Template for OPG Use DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured Section 5.3 Exclusions	**3**
Exceptions	Identify any anomalies or variance to estimating practice Good practice is to provide a checklist as an attachment to the BOE	OPG-MAN-00120-0012 Project Estimating BOE-TMP- 012 BoE Template for OPG Use	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured Section 8 refers. General or project specific exclusions and exceptions	**3**
Risks and Opportunities	Significant risks identified are stated Risk modelling is described -if undertaken	OPG-MAN-00120-0012 Project Estimating OPG-MAN-00120-0015 Project Risk Management	Appendix A - item 3 Risk Register Section 2.2 refers to the Quality Risk Checklist OPG-REF-00120-0976041 Section 2.2 states that risk identification workshops should be performed on all level A and B projects during next phase planning, it also highlights that for level A projects going through Gate 2/3 and projects that require board approval, the workshops should be facilitated by a risk management SME from the Enterprise PMO. Section 2.3 outlines the steps in the process of qualitative risk analysis. Section 2.2 states the importance of the Project Manager involving the project team in risk identification activities. Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C).	**3**

			Sections 2.4.1. and 2.4.2 state the type of risks that will be included in the QRA. Section 2.4.1 highlighted that schedule and cost input will be included in the QRA for level A. Section 2.4.1 refers to a Monte Carlo input file, and to OPG-GUID-00120-10055 for instructions on how to complete the file.	
Containments	Cost elements which relate to mitigation and prevention of risks.	OPG-MAN-00120-0015 Project Risk Management OPG-REF-00120-0976041 Activating Risk Threat Checklist OPG-REF-00120-0976041 Activating Risk Threat Checklist	Section 2.5 lists and explains the applicable response strategies for both threats and opportunities. Section on actions defines threat response as mitigate, transfer or avoid.	**N/A**
Contingencies	Level of contingency identified Methods used to quantify contingency identified	OPG-MAN-00120-0012 Project Estimating COST-DTG-003 CONTINGENCY MANAGEMENT	OPG-MAN-00120-0012 - shows awareness off calculating an appropriate level of contingencies as in accordance with Project Risk Management Section 3.0 outline types of contingency assessment that can be used on the project, but it is not specific on what will be used on the project.	**3**
Management Reserve	Level of management reserve Purpose of management reserve Approval process and tracking of management reserve should be identified	N/A	OPG has advised BTTC that the allocation of management reserve is handled outside the RQE estimate production process and is managed at the OPG Program/Corporate level. As such, this requirement is not applicable.	**N/A**
Reconciliation	Overview of variances between current and previous estimate - scope, pricing, labour prod, estimate refinement etc.	BOE-TMP- 012 BoE Template for OPG Use	Section 9 - provide an overview of the major differences between the current and last submitted estimate. Cost impacts due to scope changes, pricing updates labour productivity estimate refinement etc	**3**
Benchmarking	Documents any comparisons made between current estimate and other data sources Variances to BM should be explained	EST-DTG-001 ESTIMATING DESK TOP GUIDE BOE-TMP- 012 BoE Template for OPG Use	Section 9 as part of estimate validation - project level benchmarks for engineering etc as a proportion of overall costs. Variances to be challenged and justified. Section 10 - compare project estimated costs against costs from historical data and industry norms. Justification of differences. Detailed benchmarking report	**3**
Estimate quality assurance	Identify all estimate reviews Review comments should be appended Future reviews documented External reviews should be documented	OPG-MAN-00120-0012 Project Estimating DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	OPG-MAN-00120-0012 - Project estimating document discusses the planning and documenting of the estimate review cycles, and the development from AACE classifications through stages. OPG-MAN-00120-0012 - doc proposes that in some cases third party estimate reviews are undertaken OPG-MAN-00120-0012 - estimate reviews should occur by the appropriate authority defined in the Scalable Project Delivery Model OPG-MAN-00120-0012 - Estimate review objectives - should confirm alignment with project goals, suitability for purpose, and shared understanding of the estimate's basis and uncertainties. Section 6.0 Estimate Review	**3**

Estimating Team	Identification of estimating team	OPG-MAN-00120-0012 Project Estimating	OPG-MAN-00120-0012 - Project estimating document discussed the requirements of the estimating team including the level of expertise required for the various levels.	**3**
Attachments	Estimate deliverables checklist Reference document - drawings, manuals, specs etc. Addition - reconciliation, benchmarking, risk analysis, escalation calc	OPG-MAN-00120-0012 Project Estimating DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Appendix A Item 7 - estimate input checklist requires the estimator to declare assumed shift patterns. Appendix A Misc items - estimate input checklist. AACE 115R-21 Input and maturity checklist referred to	**3**

7.2. CA2 – Development of Cost Estimate

Recommended Practice 36R-08	Control Area Maturity Rating	3

CA Sub-Area	Control Area Requirements / Content	OPG Management Plans	Assessment of Alignment with CA Sub-Area Requirements	Maturity Rating
Details the sub-areas assessed for each control area.	*Outline high-level content and information in accordance with Recommended Practices.*	*Reference Management Plans (s) used within the assessment of each CA Sub-Area*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 2.3 for Maturity Rating definitions.*
Estimate Plan Development Process	**Inputs to the Estimate Plan** Estimate Recipient and objectives Estimate Developer Scope and Execution Project and Estimate Schedule Coding Structures and Formatting Uncertainty - Risks and Opportunities Lessons Learned Benchmarking Review and validation Process Cash Flows Recasting	OPG-MAN-00120_0012 Project Estimating OPG-MAN-00120_0013 Project Cost Management NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	OPG internal - objectives stated by gate phasing Scalable defines who produces the estimate Section 3.1 Plan the estimate Section 3.2 - Develop the Estimate OPG-MAN-00120-0013 - requirement for cost estimates should be time-phased by month and in alignment with the supporting schedule The purpose of (this) Estimate Plan is to clearly define the strategies and processes associated with Darlington New Nuclear Project (DNNP) estimate progression, for the development of cost estimates and schedule for the execution of the first of a kind (FOAK) unit at Darlington site.	**4**
Prepare Draft Estimate Plan	Based on all the inputs available included related clarifications Other deliverables if part of a package should be stated Should be integrated with other planning processes such as schedule development, risk analysis and project Controls.	OPG-MAN-00120_0013 Project Cost Management OPG-MAN-00120_0012 Project Estimating Scalable Project Delivery Model (for type A projects) NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 2 - states that a Cost management plan includes estimate plan requirement as part of overall PMP. Prepared by Estimators [PMO] in conjunction with PM based on SoW. Estimator embedded within project team as required. Section 4.0 details the Estimate Plan, deliverables and inputs/sources/ detailed requirements	**4**
Estimate Plan Review	A set of review meetings is held to communicate defined requirements and responsibilities Imperative that everyone commits to meeting their assigned dates Issues and concerns are documented and planned to be resolved	OPG-MAN-00120_0013 Project Cost Management Scalable Project Delivery Model (for type A projects) DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan DA1-IPD-NN-NN-TPLN-PM-00004 DNNP functional Plan project controls	Section 2 - PMP is a formally approved document which is updated through each Phase Gate stage Reviewed by Estimators [PMO] [Peer Review] Estimate plan is prepared, reviewed and approved by members of the Alliance and Client team. 3.5 Role of the Project Controls	**3**

Estimate Plan Approval	Endorsed by the client team to indicate alignment and approval Occurs after other key stakeholders have signed to indicate buy in.	OPG-MAN-00120_0013 Project Cost Management DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	PMP is a formally approved document which is updated through each Phase Gate stage General - Estimate plan is prepared, reviewed and approved by members of the Alliance and Client team.	**3**
Estimate Kick Off meeting	Communication of the approved basis for proceeding Goals, objectives and cost strategy are highlighted	OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Pre Gate Project planning kick-off meetings are required as part of the Phase gate management process Section 5.0 details the requirement to produce an estimate development road map to 'be used as the primary communication tool for measuring the progression of the estimate to each release'.	**2**
Estimate Development Process	Extremely important to freeze the engineering inputs at some pre-defined point in the development process. Changes should be dealt with by Change Control Final version of the estimate plan may be used as the starting point for the Basis of Estimate by carrying over common elements and structure from the plan.	OPG-MAN-00120_0012 Project Estimating OPG-MAN-00120_0012 Project Estimating (Facility) BoE-00120 Template OPG-MAN-00120_0013 Project Cost Management DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 3.2 deals with develop estimate , obtaining inputs, quantifying the project scope, costing the scope, optimizing the project costs Appendix A Inputs to the Estimate Engineering: EWRRs, conceptual/design reports, modifications, changes, studies, budgets, specs, drawings, equipment list, Bills of Materials, spares, and all-discipline drawings. Appendix A - change list required on engineering changes Section 9 - note of the major differences between latest estimate and previous estimates Section 2.4 Control Costs - change control to the baseline budget principles is detailed in this section. More Post contract orientated but cross referenced to Project Estimating Manual Section 5.0 details the requirement to produce an estimate development road map to 'be used as the primary communication tool for measuring the progression of the estimate to each release'.	**4**

Estimate Plan Format and Content	Suggested topics and content for a class 3-1 estimate Purpose of estimate Project Scope Summary - major components aligning with the WBS / CBS Estimate Confidence - desired AACE estimate class and accuracy at 80% confidence after applying contingency Key Estimate Development Milestones - table of the key deliverables and planned dates Input Deliverables - expected level of project definition expressed as engineering deliverables PEP Summary - key project execution assumptions such as procurement route, weather windows etc Construction, Fabrication and Operating Parameters - checklist of applicable location parameters Social, Cultural, Environmental, Security and Sustainability Parameters	Scalable Project Delivery Model (for type A projects) OPG-MAN-00120_0013 Project Cost Management OPG-MAN-00120_0012 Project Estimating EST-DTG-001 ESTIMATING DESK TOP GUIDE	BOE - Prepared by Estimators [PMO] Section 5 Define Scope WBS Hierarchy (Basis for estimating [Work Package]) WBS Dictionary Validate Scope Control Scope PMP is a formally approved document which is updated through each Phase Gate stage Section 2 - PMP is a formally approved document which is updated through each Phase Gate stage Section 2.1 contains the cross reference to the AACE classification system with clear direction that the classification system should be used for OPG nuclear and OPG process industry projects Section 3.2 deals with develop estimate , obtaining inputs, quantifying the project scope, costing the scope, optimizing the project costs Section 6.0 'Estimate Preparation' describes how to prepare estimate for Project Management, Inspection, Engineering, Procurement, Construction, Commissioning, and closeout in a project. Each section is followed with a picture of the estimating template along with a table of examples. Examples describe the cost calculation method for each class of estimate using the proper estimating technique.	**4**

Estimating Methodology	Should include the anticipated use of cost resources, historical data and project benchmarking Estimating tools - software and how it is used Coding Structure - WBS and CBS Filing Structure - description of the filing structure used to organise the data. Filed and maintained according to the WBS and code of accounts Estimate Report format - format should be agreed with the owner before starting the estimate. Summary forms, detail and reference to quotes and in-house cost information. Benchmark analysis, reference design documents etc. Design basis - technical and project information via a company standard estimate deliverables checklist. MTO's Units of measure Currency and exchange rates Rounding Quantity basis - expected source of quants for each commodity (quants mapping) including detailed take offs CAD, vendor input. Quants should be applied neat with no allowances or factors supplied.	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template OPG-MAN-00120_0012 Project Estimating OPG-MAN-00120-0011-R005 PROJECT SCOPE MANAGEMENT OPG-MAN-00120-0010-R006 PROJECT INTEGRATION MANAGEMENT OPG-MAN-00120-0011-R005 PROJECT SCOPE MANAGEMENT DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 6.0 'Estimate Preparation' describes how to prepare estimate for Project Management, Inspection, Engineering, Procurement, Construction, Commissioning, and closeout in a project. Each section is followed with a picture of the estimating template along with a table of examples. Examples describe the cost calculation method for each class of estimate using the proper estimating technique. Section 9 as part of estimate validation - project level benchmarks for engineering etc as a proportion of overall costs. Variances to be challenged and justified. Section 10 - compare project estimated costs against costs from historical data and industry norms. Justification of differences. Detailed benchmarking report Section 3.2.14 - use of InEight or .xls generated templates. **2.4.1** - The project manager should create a project WBS in accordance with the Standardized WBS [Appendix A]. **2.4.3** - The SoW document (including the WBS and associated dictionary) should be developed early in the project planning process and is an input into the Project Estimating process **2.4.5** - The minimum WBS requirements are identified in the Scalable Project Delivery Model The WBS is translated into the scheduling system and rolled up into the cost breakdown structure (CBS) for implementation within the cost system. **Section 1.1** Documentation of project scope is represented by the Project Management Plan (PMP), while documentation of product scope is represented by the Requirements Traceability Matrix (RTM) or similar. **Section 2.6** Control Scope is the process of monitoring the status of the project and product scope and managing changes to the scope performance measurement baseline. The project manager should ensure that, as a result of the scope change, all affected documentation is updated as required. This may include but is not limited to the project charter, PMP, basis of estimate (BoE), BCS, and design documents Section 4.0 Resources and tools captures the proposed software to capture each work scope item Section 5.1 - Estimate outputs are reported in specific outputs for analysis and comparisons.	**4**
Process Equipment	Expected equipment to be based on firm quotes, budgetary quotes, in-house pricing or other basis. Summary of the **bidding process** such as minimum number of bidders and how bids are to be normalized for evaluation.	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023) DA1-IPD-NN-NN-TPLN-CE-0001	**Section 6.4** - Estimating Procurement Cost. Estimator should capture cost of long lead material as well as non-long lead material in this section. Material cost can be estimated using past projects information, Cat IDs, Quotations, estimating database, etc **Section 5.4** - Procurement refers list of equipment and spare parts to be provided by vendors and procurement summary Section 5.4 and 5.5 for material bulks and equipment Table 2.1, item 3.1 List of Equipment Section 2.5 Equipment and Bulk Material Pricing table 5.2	**2**

Equipment Spares	Costs determined for each type of spare Capital spares / critical spares per owner and vendor requirements Maintenance spares Commissioning or start up spares Initial inventory to start the facility Stock inventory	Estimate Plan (Facility) BoE-00120 Template NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 5.4 - Procurement refers list of equipment and spare parts to be provided by vendors and procurement summary Section 2.23 Warranty/spare parts. Spare parts and similar construction consumables required to support startup/commissioning will be estimated.	**3**
Bulk Commodity Materials	Expected % of materials which will be from budget quotes, firm quotes, in house pricing or other sources.	EST-DTG-001 ESTIMATING DESK TOP GUIDE NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023) (Facility) BoE-00120 Template	Section 6 - Estimate Preparation details cost resource type for each major cost category Section 6.4 - Estimating Procurement Cost (note materials costs not specifically mentioned) Section 5.4 and 5.5 for material bulks and equipment Section 5.4 - Procurement list of equipment and spare parts to be provided by vendors and procurement summary	**3**
Labour	Details of crew mixes and union / non-union rates. Benefits and other factors used to build up labour rates How Labour productivity will be determined including location, complexity etc Work schedule and overtime parameters including seasonal influences	EST-DTG-001 ESTIMATING DESK TOP GUIDE EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template	**Section 6.5 'Estimating Construction Costs - Direct Field Cost.** This section captures the trade hours or cost for installation. An estimate can be a factor based (class 5) or it can be a quantity-based estimate. A class 3 estimate can be prepared by adding installation hours or costs against each line of Bill of Materials (BOMs). **Section 6.5 'Estimating Construction Costs** - Table 8 example of a class 3 estimate description 'Removing existing lights in turbine hall (***considering difficulty factor of 2.1 and height factor of 1.2***)'. Origins of the difficulty and height factors are not stated. Section 5.5.1 Direct Labour cost. Includes labour rates source calculations and overtime rules, shift patterns, trade and crew mix and estimating factors for difficulty height, location etc. Local / international also.	**3**
Allowances	Matrix showing estimating allowances including: MTO allowance (allowance for unmeasured items) Waste Equipment design development Rework	(Facility) BoE-00120 Template NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 6 - requirement to record any cost allowance assumptions made. Any significant impacts on costs including factors e.g. exchange rates Section 2.0 Methodology - The base estimates shall include the costs of all quantified in-scope work plus normal estimating allowances (i.e. Base Estimate = Base Scope Costs + Estimating Allowances). Section 10.2 Estimate assumptions - Depending on the level of scope definition. assumptions will be made and documented	**2**
Offsite Fabrication / Assembly and associated Logistics / Freight	Handling, unloading, temporary works, road closures	(Facility) BoE-00120 Template NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 5.4 - any % / flat rates in the estimate to account for freight / taxes etc Section 5.5.1 - provide a construction execution plan, list of major fabrication and installation approach activities for major scopes of work. Section 5.5.2 - list of construction direct support work (incl temp facilities) Section 5.7, 5.8 and 5.9 covers Off site, Modules and freight	**3**

Construction Indirect Costs	Field Staff Temporary Facilities Temporary Services Utility Consumption Construction Equipment Small Tools Consumables Scaffolding Camp and travel	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template OPG-MAN-00120-0012 Project Estimating NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 6.5 - Indirects is a function of the Construction Costs Section 6.1 - Project Management Section 6.2 Inspections Section 6.3 Engineering Costs Section 5.5.1 Direct Labour cost. Includes labour rates source calculations and overtime rules, shift patterns, trade and crew mix and estimating factors for difficulty height, location etc. Local / international also. Section 3.2.3 WBS reference Appendix B - PM / Engineering / Inspection costs. Schedule based estimate per org chart. Section 5.18 details Indirect cost and construction management	**3**
Commissioning and Start Up	Reference to definitions of completion, testing requirements (contractor and owner)	(Facility) BoE-00120 Template EST-DTG-001 ESTIMATING DESK TOP GUIDE	Section 5.6 - including estimating methods for commissioning working costs, testing FAT / SAT allowances and exclusions Section 6.6 - Estimating Commissioning Costs	**3**
Engineering and Home Office	Front end or sunk costs Estimated work week for home office staff Site visit, vendor inspections etc As built drafting	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template	Section 6.2 Inspections Section 6.3 Engineering Costs Section 6.6 - Estimating Commissioning Costs Section 5.6 - including estimating methods for commissioning working costs, testing FAT / SAT allowances and exclusions	**3**
Owner Costs	Management staff Engineering Permits and licences Supervisory staff Land, taxes Utility diversions or periodic payments Direct construction works	EST-DTG-001 ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0011 PROJECT SCOPE MANAGEMENT NK054-PLAN-01210-00108 DNNP ESTIMATE PLAN (JUNE 2023)	Section 8 - Work package descriptions in the cash flow include OPG costs A.4 Standardized control accounts categories include OPG engineering oversight, project controls, PM, H&S OPG procurement, tools, long lead packages. Section 5.23 Other costs and Section 6.0 Owners costs, 7.0 Non IPD costs	**3**
Clarifications, Qualifications and Assumptions	Rationales to be provided	OPG-MAN-00120-0012 - Project Estimating Management (Facility) BoE-00120 Template	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured. OPG-MAN-00120-0012 - ensure that the estimate package (including the estimate calculations, BoE or notes and assumptions, and all relevant supporting documents) are recorded within the project working files Appendix A Item 9 - Project list of assumptions / constraints	**3**

Exclusions	All known estimate exclusions should be listed with an explanation of why.	OPG-MAN-00120-0012 - Project Estimating Management (Facility) BoE-00120 Template	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured Section 8 refers - Please provide General or project specific exclusions and exceptions and reasons if applicable	**3**
Exceptions	Identification of any anomalies or variances to the organization's standard estimating procedures and practices. Good practice involves providing a checklist as an attachment to the BOE that will document any exceptions that are identified.	OPG-MAN-00120-0012 - Project Estimating management (Facility) BoE-00120 Template	OPG-MAN-00120-0012 - BOE parallel with the estimate to ensure that any changes in assumption, exclusions or exceptions are captured. Section 8 refers - Please provide General or project specific exclusions and exceptions and reasons if applicable	**3**
Late Changes	Detailing how late changes subsequent to the estimate deliverable cut-off date will be handled.	OPG-MAN-00120_0012 Project Estimating NK054-PLAN-01210-00100 DNNP PROGRAM MANAGEMENT PLAN	Appendix A - change list required on engineering changes Section 2.5 - DNNP scope change management throughout project lifecycle Section 2.9 Change Management	**3**
Escalation	Basis of how escalation will be determined including the base date. Description of the intended escalation calculations As a minimum should be broken down into major categories of equipment, materials, labour and engineering. Reference to amounts included in Risk Quantification section if appropriate	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template	Section 10 - Interest and escalation calculations "Escalation Calculation Template", available on the Investment Management website. Section 6 escalation rates used based on historical information or other data stated	**3**
Risk Analysis and Contingency	Identify the method of risk analysis and contingency determination including software to be used See other AACE RP's (40R-08, 62R-11, 63R-11)	OPG-MAN-00120-0012 - OPG-MAN-00120-0015-005_ Project Risk Management	Appendix A - item 3 Risk Register Specifies both PMIS and SharePoint will be used for the storage of information and documentation. Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C). Section 3.0 outline types of contingency assessment that can be used on the project, but it is not specific on what will be used on the project. Sections 2.4.1. and 2.4.2 state the type of risks that will be included in the QRA.	**3**
Management Reserve	Allowance for anticipated changes in scope - intended use should be identified as well as approval process and tracking.	N/A	OPG has advised BTTC that the allocation of management reserve is handled outside the RQE estimate production process and is managed at the OPG Program/Corporate level. As such, this requirement is not applicable.	**N/A**
Reconciliation	Template to show the major differences between the current estimate and the last published estimate for the project.	(Facility) BoE-00120 Template	Section 9 - provide an overview of the major differences between the current and last submitted estimate. Cost impacts due to scope changes, pricing updates labour productivity estimate refinement etc	**3**

Benchmarking and Validation	Identification of all of the estimate reviews to take place. Comparisons to overall estimate metrics incl key quants, ratios historical data and industry data	EST-DTG-001 ESTIMATING DESK TOP GUIDE (Facility) BoE-00120 Template	Section 9 as part of estimate validation - project level benchmarks for engineering etc as a proportion of overall costs. Variances to be challenged and justified. Section 10 - compare project estimated costs against costs from historical data and industry norms. Justification of differences. Detailed benchmarking report	**3**
Cash Flow	Cash flow in a table format according to the intervals required by the owner Describe how the cash flow is formulated e.g. progress, milestones, earned value	EST-DTG-001 ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0012	Section 10 - Escalation - Escalation calculation template is available OPG-MAN-00120-0012 - Project Estimate Document discusses the requirements for the estimate to align to schedule which will result in it being cost loaded.	**3**
Estimate Development Schedule	Integration of the estimate plan with other phase deliverables for tracking. Keeps focus on the engineering and execution development activities required to meet the objectives for that phase and the desired estimating accuracy. Keeps focus on the engineering and execution development activities required to meet the objectives for that phase and the desired estimating accuracy.	EST-DTG-001 ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT	Section 4.0 Estimate Classification - Estimates should be prepared in accordance with the level of project scope definition and utilize the appropriate estimate inputs required to achieve an estimate class. This includes technical deliverables, schedule information, WBS, historical cost information (as applicable) Section 2.1 - Project Lifecycle phases Section 2.2 - Gate deliverables including estimate deliverables Section 2.1 - Project Lifecycle phases Section 2.2 - Gate deliverables including estimate deliverables	**3**
Estimate Responsibility Matrix	Matrix indicating which documents will be used in the estimating process, who will provide them, the expected level of completion and the date. Useful tool in planning and managing the key estimating deliverables.	OPG-MAN-00120-0010-R006 PROJECT INTEGRATION MANAGEMENT OPG-MAN-00120-0012 NK-054-01210-00100-00015 (project Controls) Programme management plan	App A Scalable Project Delivery model - details responsibility for inputs and reviews during estimate development through phase gate process. App A Project Estimate Input Checklist - list of all inputs and deliverables to be used in estimate production. section 4.2 refers to 115R-21 and the Input deliverables Matrix. DNNP Program will develop a Roadmap that identifies all the necessary activities that are required for development of the program cost estimate progression. The roadmap will reference each function responsible for producing/managing a part of the estimate. A detailed plan will be updated when the project reaching towards Release Quality Estimate.	**3**

7.3. CA3 - Assessing the Cost Estimate Classification

Recommended Practice 115R-21	Control Area Maturity Rating	3

CA Sub-Area	Control Area Requirements / Content	OPG Management Plans	Assessment of Alignment with CA Sub-Area Requirements	Maturity Rating
Details the sub-areas assessed for each control area.	*Outline high-level content and information in accordance with Recommended Practices.*	*Reference Management Plans (s) used within the assessment of each CA Sub-Area*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 2.3 for Maturity Rating definitions.*
General Process	Table 3 Matrix within the AACE document maps the extent and maturity of estimate input information (deliverables) against the 5 estimate classification levels. General Project data: Not required (NR), Preliminary (P) Defined (D) Technical deliverables: Not required (NR), started (S), Preliminary (P), Complete (C) Assessment criteria to be used - Preliminary vs defined, Started vs preliminary	OPG-MAN-00120-0012 Project Estimating EST-DTG-001 Estimating Desk top guide NK-054-01210-00100-00015 (project Controls) Programme management plan NK054-PLAN-01210-00108 DNNP Estimate plan DA1-IPD-NN-NN-TPLN-CE-0001	Section 2.0 - The OPG plan, recognises importance of the classification as recommended by AACE. We note that 115R-21 is missing, 18R-97 whilst not using the designation number, is referred to "for Process Industry" For "OPG Non-nuclear building projects 56R-08 should be used. The document Explains the 5 classes of estimate maturity levels to be used. Appendix A contains the Estimate Input checklist and maturity matrix and Appendix B Estimate Classification checklist which is the standard document check list for OPG , however under the Scalable Project Delivery Model allows project specific decisions to use the AACE (115r or 18R etc) if the Project team feel this is more applicable for larger complicated projects. Section 4 - As per the Association for the Advancement of Cost Engineering International Recommended Practice No.18R-97(Cost estimate Classification for Process Industries), cost estimates are categorized by four characteristics: maturity level of project definition deliverables (primary), end usage, estimating methodology, and expected accuracy. Section 2.7 Class 4 Progression followed the guidelines of AACE recommended practices 18R-97 Cost estimate classification. This Maturity matrix will be updated for Class 3 estimate in reference to the new recommended practice 115R-21 Cost Estimate Classification System as applied tin Engineering, Procurement and Construction for the Nuclear Power Industries Section 4.2 An assessment of the class of estimate achieved by each project scope will be performed by the estimating team based upon OPG Governance and AACE recommended practice. The general estimate accuracy scales as outlined in AACE RP 18R—07 and in addition the estimating team will have to meet the requirements of the Estimate Deliverable Maturity Matrix as outlined for DNNP based on AACE RP 115R-21 DA1-IPD-NN-NN-TPLN-CE-0001 section 1.2.1 Estimate progression is aligned with the guidelines of AACE Recommended Practises 115R-21 Cost Estimate Classification System as applied in Engineering, Procurement and Construction for Nuclear Power Industries	**3**

AACE Table 3 Assessment	Completed Class 3 AACE Classification matrix (table 3 - 93 deliverables) - assessment on completeness and maturity of required deliverables. Where deliverables not at AACE required maturity show how overall "score" was calculated	OPG-MAN-00120-0012 Project Estimating EST-DTG-001 Estimating Desk top guide NK-054-01210-00100-00015 (project Controls) Programme management plan NK054-PLAN-01210-00108 DNNP Estimate plan	Section 2.1 The required inputs to achieve an estimate classification are provided in the Estimate Input checklist and maturity matrix (Appendix A) - Appendix A which contains the deliverables list and Appendix B check list is not from 56R-08, 18R-97 or 115R-21 and is far less detailed Section 4.0 Maturity Matrix (table 2) - this table is far less detailed than the AACE requirement and has 27 deliverables, 3 less than appendix A which lists 30. OPG need to have a consistent maturity list from AACE within their procedures Section 2.7 Class 4 Progression followed the guidelines of AACE recommended practices 18R-97 Cost estimate classification. This Maturity matrix will be updated for Class 3 estimate in reference to the new recommended practice 115R-21 Cost Estimate Classification System as applied in Engineering, Procurement and Construction for the Nuclear Power Industries Section 4.2 An assessment of the class of estimate achieved by each project scope will be performed by the estimating team based upon OPG Governance and AACE recommended practice. The estimating team will be required to meet the requirements of the Estimate Deliverable Maturity Matrix as outlined for DNNP based on AACE RP 115R-21	**4**
Assessment Team	The AACE document does not specifically state who should review and assess.	OPG-MAN-00120-0012 Project Estimating Scalable Project Delivery Model (For type A project) NK054-PLAN-01210-00108 DNNP Estimate plan	Section 2.0 Document states "The cost estimator, in accordance with the Scalable Project Delivery Model [R2], should determine the estimate class based upon the maturity level of project definition based on the status of specific key planning and design deliverables" Estimate Classified by Estimators (PMO) Section 4.2 An assessment of the class of estimate achieved by each project scope will be performed by the estimating team based upon OPG Governance and AACE recommended practice	**3**

7.4. CA4 - Reviewing, Validating and Documenting the Estimate

Recommended Practice AACE 31R-03	Control Area Maturity Rating	3

CA Sub-area	Control Area Requirements / Content	OPG Management Plans	Assessment of Alignment with CA Sub-Area Requirements	Maturity Rating
Details the sub-areas assessed for each control area	*Outline high-level content and information in accordance with Recommended Practices.*	*Reference Management Plans (s) used within the assessment of each CA Sub-Area.*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 2.3 for Maturity Rating definitions.*
Background	Ensure that all parties agree on and understand the estimates basis, content and outcome including the estimates probabilistic characteristics (e.g. range, cost distribution etc.) The quality review determines if the estimate is: Suitable for given purpose Address stakeholder requirements Ensure all parties agree on basis, content and outcome	OPG-MAN-00120_0012 EST-DTG-001	**Section 3.3** states ' the key benefit of this process is an agreement and an alignment on the total estimate package by the estimator and project team and confirmation that the estimate meets the project and organisation requirements **Section 3.3.2** - reviews should confirm that the estimate a - reflects the project strategy b - is suitable for the given purpose c - ensure all parties agree on basis, content and outcome First step noted in section **9.0 'Validation'** is to ensure that the proper estimating technique was used relative to the class of estimate.	**3**

General Process	The level of detail and diligence used during the estimate review cycle will vary with strategic importance, total value and purpose of the estimate. Review is typically qualitative Validation is typically quantitative	OPG-MAN-00120_0012	Section 3.3 - Review, Validate and Document the Estimate - Review, validate and document the estimate is the process of formally verifying the details of the estimate including the BoE. The key benefit of this process is an agreement and an alignment on the total estimate package by the estimator and project team, and confirmation that the estimate meets the project and organization requirements. The end result of an estimate review should be a set of consistent, clear and reliable documentation (i.e., the estimate and its backup) that has the concurrence and understanding of the project team and management and follows industry standards or best practices (e.g., for authorization, control, bid etc.) Each project team member must accept and take ownership of those parts of the estimate and budget for which they will be responsible Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur. It is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team revies, project team reviews and management reviews Section 3.3.2 Estimate reviews should confirm the estimate: a) reflects the project strategy, objectives, scope and risk b) is suitable for a given purpose (e.g., cost analysis, decision making, control, bidding etc.) c) ensures that all parties agree on and understood the estimate basis, content, and outcome including the estimate probabilistic characteristics (e.g., range, cost distribution etc.) Section 3.3.3 - the level of detail and diligence used during the estimate review should be commensurate with strategic importance total value and purpose.	**3**
Estimate Review Cycles	Review process **should** be used at every phase of the project scope Multiple reviews are performed with varying purposes, scope and participants e.g. internal estimating, engineering reviews, project team reviews, management reviews etc.	OPG-MAN-00120_0012 OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT	**Section 3.3.1** - estimate reviews should occur by the appropriate Authority defined in the Scalable Project Delivery model for A and B projects. PMO estimator peer reviews should occur. Section 2.1 - Project Lifecycle phases Section 2.2 - Gate deliverables including estimate deliverables	**4**

Plan for the Estimate Reviews	A person **must** be made responsible for the planning and managing the review process Review team will consist of the lead estimator, lead scheduler and planners and those that provided significant cost input for the part of the estimate being reviewed. In some cases the project or client may require that an independent third party be involved in the review or prepare an independent check estimate The BoE is a key estimate review input….describe(s) all of the basis documents that served as an input to the estimate ….critical and required for effective change management	DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP) OPG-MAN-00120_0012 OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT OPG-MAN-00120-0010-R006 PROJECT INTEGRATION MANAGEMENT OPG-MAN-00120-0012 DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 3.5 Project Controls PMT - Lead business case development and estimates; Manage and implement gated review process for bundles Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur Note- it is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team revies, project team reviews and management reviews Section 2.1 - Project Lifecycle phases Appendix A Scalable Project Delivery Model - estimates for all Project Classifications are reviewed by the estimating team as part of the PMO (including peer review) or the PM for lower value projects. Appendix A Inputs to the Estimate Engineering: EWRRs, conceptual/design reports, modifications, changes, studies, budgets, specs, drawings, equipment list, Bills of Materials, spares, and all-discipline drawings. Section 6.0 - Estimate reviews states 'The IPD Project Control team and Estimating team will establish, collaboratively with area leads and the PMT team, an oversight plan that outlines the approach, participation level, review process, feedback and documentation of observations.	**4**
Technical (Engineering / Design) / Scope Reviews	First review is by the technical team - in some cases the technical team will manage the works so they must buy in to the estimate Technical team must develop confidence that the information in the BoE deliverables has been qualified in the estimate. The estimate should be checked to ensure it is integrated with the schedule	OPG-MAN-00120_0012 NK-054-PLAN-01210-00100 - Project Engineering Program Management Plan OPG-MAN-00120-0012 DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP) DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur Note- it is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team revies, project team reviews and management reviews Section 2.3.3 DNNP Engineering must ensure that appropriate interface and oversight protocols are maintained throughout the design, procurement, installation, commissioning and close out phases.... additionally, this ensures compliance with design requirements and managed systems OPG-MAN-00120-0012 - Project Estimate Document discusses the requirements for the estimate to align to schedule which will result in it being cost loaded. Section 9. Estimate Reviews - Responsibility, areas to be addressed, flow chart of review process, Section 6.0 - Estimate Reviews, Stage 2 in the proposed Estimate Review process includes a Technical Review including team sign off of scope	**4**
Estimating team reviews	Functional checks by the estimating team including comp check. Potential use of a peer review team for fresh eyes. Estimating team check consistency with the Basis of estimate document Estimating team ensure that the estimate was prepared in accordance with appropriate guidelines.	OPG-MAN-00120_0012 EST-DTG-001 DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP) DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur Nore- it is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team reviews, project team reviews and management reviews First step noted in **section 9.0 'Validation'** is to ensure that the proper estimating technique was used relative to the class of estimate. Section 9. Estimate Reviews - Responsibility, areas to be addressed, flow chart of review process, Section 6.0 - Estimate Reviews, Stage 4 in the proposed Estimate Review process includes an Estimating Team Review including consistency with BoE documents and adheres to project, contract and BP guidelines.	**4**

Project Manager / Project Team reviews	Objective is to gain the entire project teams support of the estimate, especially that of the PM Ensure that the estimate is presented in an understandable manner and that is complete, consistent, repeatable, traceable and defendable. Validation - **should** include estimate review metrics that summarises and compares several key benchmark ratios and factors vs historical values from similar projects The goal of validation is to **ensure** that key metrics from the estimate are in line with (or an improvement on)the same metrics from similar projects. Validation considered to be a top-down review The PM **should** agree with the risks that were identified, their assessment, probabilistic outcome and contingency amounts Gaining credibility by clearly explaining the differences and reasons for differences with preceding estimates - can be at high level but back up should be available Variances with preceding estimates may trigger additional reviews	OPG-MAN-00120_0012 EST-DTG-001 (Facility) BoE-00120 Template OPG-MAN-00120-0019 PROJECT PHASE GATE MANAGEMENT (Facility) BoE-00120 Template DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP) DA1-IPD-NN-NN-TPLN-CE-0001 Estimate Plan	**Section 3.3.4** - Estimates including the BoE and supporting documentation should be accepted by the Project Manager Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur. It is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team revies, project team reviews and management reviews. Section 3.3.4 - Estimates including the BoE and supporting documentation should be accepted by the Project Manager **Section 9.0 'Validation'** seeks to ensure the estimated costs are within acceptable benchmark ranges (tables noted within the DTG). If not within these ranges, the estimated costs should be challenged and justified. Section 10 - compare project estimated costs against costs from historical data and industry norms. Justification of differences. Detailed benchmarking report **Section 2.1** Project life cycle phases and gate reviews See 3.3.4 PM sign off above which should cover this item Section 9 - provide an overview of the major differences between the current and last submitted estimate. Cost impacts due to scope changes, pricing updates labour productivity estimate refinement etc. Section 3.5 Project Controls PMT - Lead business case development and estimates; Manage and implement gated review process for bundles Section 9. Estimate Reviews - Responsibility, areas to be addressed, flow chart of review process, Section 6.0 - Estimate Reviews, Stage 5 in the proposed Estimate Review process includes a Project Team Review including checks for consistency, traceability etc. (as detailed in AACE RP)	**4**

Management Reviews	The level of management review varies with strategic importance and size of project Aim to demonstrate that metrics for the correct estimate are in line with data from other similar projects **Emphasis** on cost risks and escalation, drivers and market forces Responsibility to set contingency and escalation values in accordance with the level of confidence they want	OPG-MAN-00120_0012 EST-DTG-001 EST-DTG-001 ESTIMATING DESK TOP GUIDE OPG-MAN-00120-0017 Project comms and stakeholder management OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0017 Project comms and stakeholder management OPR-MAN-0120-0019 Phase Gate Management DA1-IPD-NN-NN-TPLN-PM-0004 DNNP FUNCTIONAL PROJECTS CONTROL PLAN (PCP)	Section 3.3 - Review, Validate and Document the Estimate - Review, validate and document the estimate is the process of formally verifying the details of the estimate including the BoE. The key benefit of this process is an agreement and an alignment on the total estimate package by the estimator and project team, and confirmation that the estimate meets the project and organization requirements. The end result of an estimate review should be a set of consistent, clear and reliable documentation (i.e., the estimate and its backup) that has the concurrence and understanding of the project team and management and follows industry standards or best practices (e.g., for authorization, control, bid etc.) Each project team member must accept and take ownership of those parts of the estimate and budget for which they will be responsible Section 9.0 'Validation' seeks to ensure the estimated costs are within acceptable benchmark ranges (tables noted within the DTG). If not within these ranges, the estimated costs should be challenged and justified. Section 10 - Interest and escalation calculations “Escalation Calculation Template”, available on the Investment Management website. Section 3.3.1 - Estimate reviews should occur by the appropriate authority defined in the scalable project delivery model. For A and B projects, PMO estimator peer reviews should occur. It is recommended that anyone that provided significant input to the project estimate and/or that was involved in its preparation, and /or will be responsible for managing some element of the costs should be considered as a review team participant at the appropriate phase and step. This may include technical (engineering/design)/scope reviews, estimating team revies, project team reviews and management reviews Section 2.1 states that the risk management plan should be tailored to the project size, complexity, importance and development approach. It also mentions that FOAK/FIAW projects are inherently riskier, and the approach considers this. Section 3.3.3 The level of detail and diligence used during the estimate review should be commensurate with the Strategic importance, total value, and purpose of the particular estimate. Section 2.1 Project life cycle phases and gate reviews. Initiation phase and development phase cover hard gate sign off as a pre-requisite to progression to the next stage Phase Gate Road map - table clearly defines class of estimate to be reviewed on Initiation, development and definition stages Section 3.5 Project Controls PMT - Lead business case development and estimates; Manage and implement gated review process for bundles Section 9. Estimate Reviews - Responsibility, areas to be addressed, flow chart of review process, Section 2.2 - 'when executive management carefully considers…provide a standardised, comprehensive review of project scope schedule, risk, cost and quality.	**3**

Reviewing Estimates Prepared by Others	**Using the existing principles** Basis of estimate - well organised and complete? Estimating personnel - level of estimating experience Methodology - appropriate for the level of information Documentation - appropriate level of detail Validation Metrics - report and benchmark ratios Detail Spot check on selected areas to withstand greater scrutiny	(Facility) BoE-00120 Template OPG-MAN-00120_0012 OPG-MAN-00120-0010-R006 PROJECT INTEGRATION MANAGEMENT	Comprehensive BoE checklist - used for all estimates Section 3.2.10 Vendor prepared estimates (e.g. bid proposals) may require validation of the estimate and class by a PMO estimator (as defined in Scalable Project delivery model). The PMO Estimator should confirm the integrity of the bid by verifying estimating methods, assessing the assumption, and making sure that the adopted ground rules are consistently applied throughout the submitted estimate/bid	**3**
Documenting the estimate	Findings **should** be recorded and actions assigned to address any errors If changes required are significant, all or some part of the estimate review cycle may need to be repeated **Ensure** the BoE is updated to reflect the current basis	OPG-MAN-00120_0012 OPG-MAN-00120_0017 Project Communication and Stakeholder Management	**Section 3.3.4** - Estimates including the BoE and supporting documentation should be accepted by the Project Manager **Section 3.3.12** All estimates should include a BOE or equivalent documentation to record how the estimate was derived Section 3.2.13 The project manager should ensure that the estimate package, (including the estimate calculations, BoE or notes and assumptions., and all relevant supporting documents) are recorded within the project working files as per the Project Communications and stakeholder management. The estimate package should be complete, retrievable and auditable App D states the BoE template and the estimating template should be filed within the project documentation folder.	**3**
Feedback Loop	**Important** that the learnings of the review and validation process be incorporated back into the overall estimate The review process **should** include a feedback loop that ensures the major comments that require corrective action have been incorporated into the final estimate. **Should** be a structured process	OPG-MAN-00120_0012 OPG-MAN-00120-0010-R006 PROJECT INTEGRATION MANAGEMENT	**Section 3.3.4** - Estimates including the BoE and supporting documentation should be accepted by the Project Manager **Section 2.5.1** - The project manager should ensure that project knowledge, including lessons learned is shared and integrated into the project throughout the project life cycle.	**3**

7.5. CA5 - Developing a Project Risk Management Plan

Recommended Practice AACE 72R-12			Control Area Maturity Rating	3
CA Sub-area	**Control Area Requirements / Content**	**OPG Management Plans**	**Assessment of Alignment with CA Sub-Area Requirements**	**Maturity Rating**
Details the sub-areas assessed for each control area	*Outline high-level content and information in accordance with Recommended Practices.*	*Reference Management Plans (s) used within the assessment of each CA Sub-Area.*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 2.3 for Maturity Rating definitions.*
General Process	The risk management plan should be part of an overall project execution plan The plan should describe the processes, procedures, organization, tools, and systems for effective risk management. The plan should address risk management objectives for all stakeholder and project requirements The plan should establish a basis for good risk management practices. The risk management plan should be organized logically and be applicable to the specific project.	OPG-MAN-00120-0015-005_Project Risk Management COST-DTG-003 CONTINGENCY MANAGEMENT COST-DTG-003 CONTINGENCY MANAGEMENT OPG-MAN-00120-0015-005_Project Risk Management COR-PROC-OPG-PROC-0094-006 COR-PROC-OPG-PROC-0094-006 DA1-IPD-NN-NN-TPLN-PM-0004 DNNP ROC and SUB ROC TOR OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 OPG-MAN-00120-0015-005_Project Risk Management	Section 2.1 states that the risk management plan should be included in the PMP. Section 2.2 refers to a list of other documents that input into the risk identification process. Section 6.0 refers to the PMP and Business Unit Specific Authorization Memos to identify approval levels. Sections 5.0 and 6.0 effectively describe the process of contingency allocation and drawdown on the project. Section 1.1 gives a good overview of the definition of risk management. Section 2.0 on enterprise risk management process aligns the risk management process to OPG's strategic plan. Section 3.0 outlines the enterprise roles and responsibilities of teams. Section 6.0 aligns the risk management process to project requirements considering DNNP. The 'objective' section covers this requirement in detail. Section 1.1 gives a good overview of the types of risk that make up the overall project risk as well as a definition of risk management Section 6.0 gives a comprehensive view of risk management on the project. Section 2.1 states that the risk management plan should be tailored to the project size, complexity, importance and development approach. It also mentions that FOAK/FIAW projects are inherently riskier, and the approach considers this. Section 2.3 highlights what is required when qualitatively assessing risks at each project level.	**3**
Establishing Requirements and Objectives	Identify stakeholders and their expectations, requirements, and objectives for risk management. Make general project requirements more specific to guide risk assessment, treatment, and control. The risk management process should be aligned with the organizations culture, processes, structure, and strategy. Consider both external and internal contexts to ensure all important factors are included.	OPG-MAN-00120-0015-005_Project Risk Management OPG-POL-0004 DA1-IPD-NN-NN-TPLN-PM-000 OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 COR-PROC-OPG-PROC-0094-006 DNNP ROC Presentation DNNP ROC Presentation DNNP – Probing Questions	Section 2.2 outlines some of the responsibilities of the risk owner and portfolio manager. The accountabilities section of this document covers the organisational responsibilities for risk. Annex G contains a detailed RASCI. Section 2.3 highlights what is required when qualitatively assessing risks at each project level. Section 6.0 covers this requirement in detail, including stages of identification, phase-gate monitoring and control. Section 2.0 on enterprise risk management process aligns the risk management process to OPGs strategic plan. Section on SMR-X culture charter aligns with the organizational culture. There is evidence of this process in the program and bundle risk distribution.	**3**

Developing the Risk Management Plan	Organize the plan in a logical manner and make it specifically applicable to the project. Consider the requirements and determine how each will be addressed in the context of the project. Include the following topics: scope, strategy and objectives, definitions, roles and responsibilities, qualitative risk assessment, quantitative risk assessment, risk management schedule, KPIs, communications, reporting, critical success factors, closeout and lessons learned, reference documents, software, and risk management plan revision control.	OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls OPG-MAN-00120-0015-005_Project Risk Management COR-PROC-OPG-PROC-0094-006 DA1-IPD-NN-NN-TPLN-PM-0004 DNNP ROC and SUB ROC TOR	The plan is organized in a logical manner and is made applicable to the project. 6.0 relates how the risk process fits in the context of the project. Section 3.0 details each role involved in risk management and their respective responsibilities. Section 2.0 on enterprise risk management covers the strategy and scope of risk. Section 2.2 highlights the phase-gate management but should have a risk management schedule that applies to the cycle. Section 6.4 includes a KPI/reporting strategy using a monthly scorecard to highlight and cascade outstanding actions. The 'committee structure' section of this document covers risk communications by establishing meeting occurrences and attendees.	**3**
Strategy	Define the purpose and objectives of the project in respect to risk management. Define project strategies and how they translate into risk management strategies. Define the company's risk appetite for qualitative and quantitative analysis. Define the project's priorities (e.g., cost, schedule, scope/quality).	DA1-IPD-NN-NN-TPLN-PM-0004 COST-DTG-003 CONTINGENCY MANAGEMENT OPG-MAN-00120-0015-005_Project Risk Management OPG-POL-0004 DA1-IPD-NN-NN-TPLN-PM-0004	Section 6.1 details the plan for risk management in alignment with the project requirements and objectives. Section 4.0 refers to the allocation and approval of time-phased contingency being driven by the project's strategy Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C). The requirements section of this document details the risk appetite on an OPG level, including risk tolerance. Section 6.1 refers to the project's strategy regarding priorities and how this relates to the risk management process.	**3**
Quantitative Risk Assessment	Describe the method to be used for cost and schedule risk analysis (e.g., range estimating, Monte Carlo simulation). Define contingency and reserves, including the types of risks included in their determination and how budget values are derived. Describe the types of risks that will be included in the analysis to determine contingency and reserve amounts. Define escalation, including the types of risks and how budget values are derived. The document recommends that integrated cost and schedule risk analysis be performed. Identify any special forms to be used for quantitative risk assessment,	OPG-MAN-00120-0015-005_Project Risk Management COST-DTG-003 CONTINGENCY MANAGEMENT OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls	Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C). Appendix E details the Monte Carlo Analysis Process Timeline Section 3.0 outline types of contingency assessment that can be used on the project, but it is not specific on what will be used on the project. Sections 2.4.1. and 2.4.2 state the type of risks that will be included in the QRA. Section 6.1 describes that budget values will be derived using the project schedule and estimate values Section 2.4.1 highlighted that schedule and cost input will be included in the QRA for level A. Section 2.4.1 refers to a Monte Carlo input file, and to OPG-GUID-00120-10055 for instructions on how to complete the file. Specifies both PMIS (ePMX) and Sharepoint will be used for the storage of information and documentation. Section 6.3 states that @risk will be used to run QRAs	**3**

	whether corporate standard or project-specific. Specify software to be used.			
Qualitative Risk Assessment	Describe the process for identifying risks. This might include brainstorming sessions, checklists, expert judgment, or other techniques. Define who is responsible for risk identification. Define when risk identification activities will occur (e.g., at project initiation, during planning phases, regularly throughout the project). Describe how identified risks will be documented and tracked. This usually involves a risk register or database. Define how changes to risk information will be controlled and versioned. Explain any coding or categorization system used for risks. This might involve assigning risk categories (e.g., technical, management, external) or using a Work Breakdown Structure (WBS) to organize risks. Define the risk statuses that will be used (e.g., open, closed, in mitigation, monitored). Describe how risk status will be updated and tracked. Describe the risk matrix used to assess the probability and impact/consequence of risks. Define the scales used for probability and impact (e.g., low, medium, high; numerical scales). Explain how risk levels will be determined based on the matrix (e.g., high-priority risks). Define the categories of risk responses that will be considered (e.g., avoid, mitigate, transfer, accept, exploit, share, enhance).	OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management COR-PROC-OPG-PROC-0094-006 OPG-MAN-00120-0015-005_Project Risk Management COST-DTG-003 CONTINGENCY MANAGEMENT OPG-MAN-00120-0015-005_Project Risk Management COR-REF-OPG-REF-00120-0976041 OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management DA1-IPD-NN-NN-TPLN-PM-0004 DNNP Functional Plan Project Controls OPG-MAN-00120-0015-005_Project Risk Management FOAK-FIAW Job Aid REV4 Oct8 OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management COR-REF-OPG-REF-00120-0976041 OPG-MAN-00120-0015-005_Project Risk Management	Section 2.2 states that risk identification workshops should be performed on all level A and B projects during next phase planning, it also highlights that for level A projects going through Gate 2/3 and projects that require board approval, the workshops should be facilitated by a risk management SME from the Enterprise PMO. Section 2.3 outlines the steps in the process of qualitative risk analysis. Section 2.2 states the importance of the Project Manager involving the project team in risk identification activities. Section 2.2 outlines the fact that risk identification is an iterative process, and the frequency of iteration and participation will vary by situation. Section 2.2 states the risk register will be held on SharePoint. Section 2.6 explains how risks will be monitored (tracked), this is for both overall and individual project risks - reviewing and ensuring the implementation of risk response plans, tracking identified risks, identifying and analyzing new risks and evaluating risk process effectiveness throughout the project. Section 2.5 covers risk monitoring and reporting. Section 2.2 states the risk register will be held on SharePoint - SharePoint provides version control capabilities and version history. Section 4.0 describes assigning contingency to the WBS by work package type Section 2.2 highlights how to categorise the risk event using the RBS. Appendix D details the risk breakdown structure categories. Section on closing risk highlights categories used for status. Section 2.6 outlines some categories used once a risk has been closed. Section 2.6 explains how risks will be monitored (tracked), this is for both overall and individual project risks - reviewing and ensuring the implementation of risk response plans, tracking identified risks, identifying and analyzing new risks and evaluating risk process effectiveness throughout the project. Section 6.3 describes the risk matrix used for the assessment of impact/consequence. Appendix A.1.0 details the project risk assessment matrix considering probability, financial impact and schedule impact on a scale of 1-5 for both strategic projects and portfolio projects. Appendix A.2.0 does the same for opportunities. This document categorizes FOAK risk factors to consider when identifying risks and assigns a score to allow the project to assess the impact to the project. Appendix B contains risk heatmaps to assign each risk a score based on a scale of impact x probability. Section 2.5 lists and explains the applicable response strategies for both threats and opportunities. Section on actions defines threat response as mitigate, transfer or avoid. Section 2.5 details the process of planning and implementing risk responses, including communication, assigning roles and responsibilities, response timing, resources/budget/schedule, interaction of risk and response and ensuring response actions are SMART	**3**

	Describe how response strategies will be selected.			
Reporting	Address the specifics of reporting, including what is to be reported, who is to write the reports, when they are to be issued, and how they are to be reported. Define if reports are stand-alone or part of an overall project report. KPIs that may be defined: Treatment plans developed and approved within the required time period Timing from identification to assessment and treatment Percentage of risks with action or treatment due dates being met For risks that have occurred, the severity of the actual consequence vs identified consequence Identify critical success factors that ensure risk program success. Closeout and lessons learned.	COST-DTG-003 CONTINGENCY MANAGEMENT OPG-MAN-00120-0015-005_Project Risk Management COR-PROC-OPG-PROC-0094-006 DA1-IPD-NN-NN-TPLN-PM-0004 DNNP ROC and SUB TOR OPG-MAN-00120-0015-005_Project Risk Management	Section 8.0 outlines the type of contingency reporting including a brief description on what is contained in the reports. Appendix C.1.0 and C.2.0 and C.3.0 and C.4.0 show risk management deliverables at each phase gate including responsible leads and timescales of review meetings. Section 2.5.2 mentions a consolidated risk report, but this should be referred to in the RMP with specific reference to how this will be managed and whether it will be a part of another report. Section 6.4 includes a monthly scorecard for traceability of actions. The section on Scope details key performance indicators reported upon in the quarterly committee meeting. Section 2.6 states that at project closure, all risks should be given a closeout description and categorization.	**3**
Risk Register	Describe how the risk register will be maintained. Detail quality assurance procedures for the risk register. Include a risk register template in the appendix.	OPG-MAN-00120-0015-005_Project Risk Management OPG-MAN-00120-0015-005_Project Risk Management DNNP - Risk Register Template	Section 2.6 explains how risks will be monitored (tracked), this is for both overall and individual project risks - reviewing and ensuring the implementation of risk response plans, tracking identified risks, identifying and analyzing new risks and evaluating risk process effectiveness throughout the project. Section 2.2 refers to the Quality Risk Checklist OPG-REF-00120-0976041	**3**

8. Appendix C – AW2 Detailed Assessment Record and Outcomes

Estimate Plan (DA1-IPD-NN-NN-TPLN-CE-0001) Reference	Requirements / Content	DNNP IPD Basis of Estimate RQE Reference	Evidence of meeting Requirements	Compliance Rating
Details the sub-areas assessed for each control area	*Outline high-level content and information required in accordance with OPG / DNNP Management Plans*	Document (s) Title and section reference	*Comments on alignment with the requirements of the AACE Record and actions / recommendations or queries*	*See Section 3.2 for Compliance Rating definitions.*
2.1 Coding Structure	Cost Structure Hierarchy for This Estimate: Bundle: Overall group of individual projects (e.g., NI, CI, BoP). Project Number: 5-digit identifier within a bundle. Control Account: 10-digit identifier where scope, budget, actual cost, and schedule are integrated for cost and performance management. Account: Cost types used to segregate the estimate into distinct work groups. System: Hierarchical structure of plant-level documentation, structures, and systems (MPL) for BWRX-300. Subsystem: Placeholder code used as required for further cost segregation.	4.4.10 4.4.10.1 to 4.4.10.5	**Section 4.4.10** States Estimate activities are tagged in accordance with the defined coding structure so the estimate can be grouped into the following: Account; Area; System; Bundle and Partner. Additional coding will be implemented when the RQE is baselined and transitioned into Project Control space for budget monitoring and control (Control Accounts). As these Accounts were still in development at the time of estimating Control Accounts were not broadly used inside the RQE. The inclusion of code listings below represents a snapshot of the coding used at the time the RQE was developed. As the coding structure is defined at the project level inside design documents and deliverables and is a structure that continues to evolve as the design matures, the lists are included for reference only and should not be used as the defining coding structure for the project.	**3**

2.2 Cost Estimate Approach	This section outlines the cost estimate approach, including code of accounts, quantity development, pricing for equipment, bulk material, and subcontracts; construction inputs (craft labor hours, wage rates, construction material and equipment); home office services, field services, and other costs. It also includes qualifications, assumptions, and planned estimate reviews. A risk-based cost estimate approach will be applied to minimize risk and uncertainties, aiming to identify and conceptually design/size structures, systems, and equipment that most reduce project risk and uncertainty.	4.4.2 4.4.7 4.4.8 4.4.9	**Section 4.4.2 States** - Aecon assembled a multidisciplinary team of estimators from relevant divisions to perform the construction portion of the RQE. Each estimator or group was responsible to create a discipline estimate for each account. Quantities were primarily derived through manual take-offs from drawings and models and compared to engineering extracts where possible (as of the time of RQE, the models, drawings and engineering metadata therein was not complete enough to generate fully reliable Bills of Materials (BOMs) and Bills of Quantities (BOQs) Productivity rates were applied to the developed quantities to produce estimates for labor and construction equipment usage. Level of Effort (LOE) estimates were used to develop construction indirect costs. The direct costs of materials, construction equipment, and subcontractors are shown for each estimate activity where applicable. Individual Discipline estimates were compiled into the master estimate using inEight ("Hard dollar") software. Table 4-1 Details Estimating Methods by Scope All discipline-level estimates were compiled using inEight (Hard Dollar) software, with summarized outputs exported to Excel for presentation. Estimating tools and trade-specific productivity units were selected to accurately reflect the nature of each scope. **Section 4.4.7** States Labour productivity analysis is performed based on Aecon's standard productivity calculation template and assessed for each trade i.e., —piping, electrical, mechanical, structural, and concrete. **Section 4.4.8** details Integrated Digital Delivery **Section 4.4.9** details Estimating Tools	**3**
2.3 Quantity Development	To reduce risk and uncertainties, the following approaches will be applied depending on the system or structure: • Detail Quantities and Technical Parameters – Bulk material and equipment quantities are based on conceptual design details, using quantity and technical parameters. • Quantity Allowance – Quantities are an "engineered" allowance from conceptual design, with corresponding parameters. • Ratio-Based Estimate ($/SF) – Uses supplier quotations or in-house pricing metrics; representative areas are developed for each system to support the estimate.	4.4.3 Section 5 (page 42 to 255)	**Section 4.4.3** States Piping Quantities were derived from General Arrangement (GA) and P&ID drawings. Electrical quantities were developed from GA drawings and other documents listed in (refer attachment 1), Concrete quantities were derived from the GA drawings and 3D model dimensions. Building quantities were derived from GA drawings and from the 3D model. Process equipment installation estimates were based on component list provided, P&IDs, GA and coordination with design partners and the major equipment key vendors, (particularly the RPV and Turbine vendors on installation sequence details) **Section 5** (page 42 to 255) Basis of estimate for each Account - where applicable has description and details / sizing , structures and buildings dimensions for concrete, steel and rebar densities, drawings used are referenced and general calcs used for the estimate. - Very Detailed 213 pages of information recording the basis of estimate. Assumption, allowances and exclusions are also listed by account.	**3**
2.4 Equipment, Bulk Material, and Subcontract Pricing	General heading covering many compliance areas.			**N/A**

2.5 Equipment and Bulk Material Pricing	Budgetary pricing for equipment and bulk materials will be obtained. Items will include; equipment such as reactor vessels, pumps, heat exchangers, piping, structural steel, control system components. Pricing includes all freight to the jobsite with equipment and materials delivered under hook or to the appropriate laydown area. **Source of pricing will be identified including supplier quotes, database pricing, etc**.	4.3.1 4.3.2	**Section 4.3.1** States In support of the project estimate, an equipment list has been developed to identify the major equipment and long lead items. The equipment list identifies the associated major pieces of equipment, technical requirements (quality classification and codes/standards), potential suppliers, cost, and the bases for the cost. The general approach as of the RQE development was as follows: •Equipment purchases for items that require iterative engineering input, (e.g. large pumps, major electrical components, large valves, complex vendor skids) will be largely done by one of the design partners. •Off-the-shelf and other commercially available equipment (e.g. tanks, hoists, smaller more standard valves) will be purchased by the construction partner. Equipment costs in the estimate are based on a combination of vendor provided budgetary quotations, in-house equipment pricing from recent nuclear projects and budgetary plug estimates. Where updated pricing was not available from the market; cost escalation has been applied on Class IV equipment prices to bring the cost to 2024 dollars. Sourcing of equipment will be based on a combined, extensive, global supply network, with an emphasis to the greatest extent possible, on Canadian suppliers, including OPG's approved suppliers' list. More details on equipment procurement is provided in Account 99 in Section 5.0. **Section 4.3.2** States Construction bulk materials, including pipe and pipe fittings, electrical connecting material including electrical connection materials (e.g., cable and cable trays), fabricated steel, concrete, and other civil materials will be primarily procured by the construction partner. Material pricing for commodities is based on a combination of quotations from Canadian suppliers and in-house historical information. Material cost escalation since the Class IV estimate has been considered and included in the RQE. Most materials and commodities for the DNNP project can be sourced from the Canadian market. The material pricing in the estimate is current with no future escalation included beyond the date of the estimate. Material/commodity pricing will continue to fluctuate based on market demands. It is standard practice to monitor commodity pricing quarterly to support ongoing projects.	**2**
2.6 Subcontract Pricing	Subcontractor pricing will be itemized per the CBS breakdown, including: • Structural Steel Fabrication & Erection • HVAC • Fire Protection • Insulation • Painting • Building Cladding & Roofing • Architectural Finishes • Reinforcing Steel Fabrication and Installation • Piping Flushing & Cleaning Services • Field Erected Tanks • Refractory Work Budget quotes, unit prices, or recent pricing from similar projects may be used.	4.4.5 4.4.9	**Section 4.4.5** States Key subcontractors have been engaged for the following scopes: HVAC, HVAC controls, and sheet metal for ducting; Fire protection and detection; Structural steel fabrication (budget unit prices); Reinforcing steel for concrete (budget prices); Insulation for process systems (budget unit prices); Fiber optic and wireless systems (budget price); Lightning protection; Communication systems and Public Address systems; Building elements: cladding, roofing, architectural finishes; Concrete supply. **Section 4.4.9** States Estimating tools (software) and productivity units were used to prepare the individual trade estimates. The various tools and productivity units listed [in table 4-2] were used to best represent the nature of work for each of the trade disciplines. Pricing for Site Work, Foundations, Structural, and Architectural Building scopes was based on subcontractor inputs where available.	**3**

2.7 Offsite Fabrication	Offsite fabrication will be considered for the following and further defined in the Basis of Estimate. It may include: • Pipe Fabrication • Process Skids • Steel Bricks Forming Systems • Form Work Assemblies • Reinforcing Steel Assemblies • Structural Steel	4.4.6 5.4.2.8 5.8.2.4	**Section 4.4.6** States Off-site fabrication for piping and DPSC modules is performed through Aecon as the leading organization. In addition, Aecon will be working with a strategic subcontracted partners to industrialize and supply an integrated, level loaded DPSC plan. Engagement of outside resources for some of the DPSC fabrication scope will be performed through the DPSC JV with E.S. Fox. to leverage excess capacity and evaluate economics of various logistical options, such as road, rail, and barge transport. Early investment for tooling and shop configuration works will be required and is assumed to be provided to support off-site fabrication. Investment in such tooling and equipment is required 18 months prior to the scheduled start of fabrication. **Section 5.4.2.8** States This estimate for the off-site fabrication of DPSC modules is based on version 31 of the DPSC model, relevant DBRs that were available up to mid-August 2024, and details conveyed through the weekly design review meetings. **Section 5.8.2.4** States The piping estimate is underpinned by a portion of the work that is performed in an offsite shop setting then shipped to site for final field integration and installation.	**3**
2.8 Offsite Module Assembly	Offsite and on-site module assembly will be considered and further defined in the Basis of Estimate. Offsite module assembly may include: • DPSC modules • Process skids • Formwork assemblies • Reinforcing steel assemblies • Structural steel assemblies On-site module assembly may include: • DPSC modules • Formwork assemblies • Reinforcing steel assemblies • Structural steel assemblies The estimate will include costs for on-site module assembly area(s) and temporary fabrication shop(s).	4.4.1 5.4.2.7	See 2.7 above for offsite module assembly. Section 4.4.1 States Offsite fabrication will be used to the extent practical with consideration that all fabricated components will be shipped by road. Consideration for rail or water shipments may be considered with the next phases of project execution. Section 5.4.2.7 States Presentation describes the plan for DPSC work from start of manufacturing to installation at site. On-Site Fabrication Shop for Wing Walls, Floors, Bioshield, Fuel and OC Pools. Individual sub-assemblies from off-site are assembled into modules for lifting into pit. 2 overhead gantry cranes (20T each) in fabrication shop. 4 work areas available in fab shop. Pre-assembly area for Basemat, outer shaft walls, SCCV Walls, SCCV Top Slab, Reactor Building (RB) Roof. Individual sub-assemblies from off-site are assembled into modules for lifting into shaft. Pre-assembly roof cover runs on rails to open for lifting operations. Mobile crane (80T) operating in pre-assembly area. Parallel work between OSW and SSCV possible.	**3**
2.9 Freight	Freight is generally included with material and equipment pricing, separate shipments will be included as required. Special loads will be identified and included as required	5.8.2.4	**Section 5.8.2.4 States** The piping estimate is underpinned by a portion of the work that is performed in an offsite shop setting then shipped to site for final field integration and installation. Applicable cost rates per FDI were then applied to each weld for: f) Freight to site No further information is included in BOE and within RQE freight is not recorded.	**2**
2.10 Direct Labour Hours, Wage Rates and Productivity	Header			**N/A**

2.11 Direct Labor Hours	The following information will be developed to estimate the number of hours needed to install the quantities. Construction Installation unit rates by commodity. Site Productivity (to adjust applicable installation unit rates); and For equipment/component the installation hours will be estimated with the support of construction using either weights, historical metrics, or based on a crew size and duration to complete the work	5.7.2	For productivity see **section 2.14** of this table. **Section 5.7.2 States** The installation hours for major equipment were developed based on industry experience and past performance on similar reference projects.	**3**
2.12 Construction Labour Wage Rates	To determine labour cost, composite wage rates by commodity code will be developed which will account for OT, crew staffing of general foreman/foreman/journey man, apprentice and the percent each trade contributes to a commodity crew. To support this effort the following info will be collected: • Wage bulletins/Summary • Craft mix and crew compositions; and • labour information including recommended work week and incentives to • attract labor (e.g., overtime; per diem; travel allowance; bonuses for safety, • longevity and construction successes; etc.) • Construction wage rates will be in accordance with EPSCA agreements • EPSCA travel and subsistence amounts will be shown separately	4.4.11.2 DA1-OPG-NN-NN-TREP-PS-0003 Basis of Estimate	**Section 4.4.11.2** States All rates are per the published Electrical Power Systems Construction Association (EPSCA) rate tables updated for 2024 (May 1, 2024, to April 30, 2025). The BOE has no section on crew mix and crew composition detailed. From our assessment of the RQE labour rates on Mechanical and Electrical these have no crew mix and composition adjustment. These are based 100% of Journeyman Rate only (so no apprentices or general labour which would lower the average rate) as example tray, trunking, conduit, hangers, de-scaling pipe and prep, bevelling, cutting etc. would not be by 100% Journeyman labour and would utilise apprentices and general labour for these types of works. We do however recognize that the RQE does have an adjustment for apprentices to mitigate this somewhat. A full analysis including craft mix and crew composition (general labour and other semi-skilled trades below journeyman) would increase accuracy.	**2**
2.13 Construction Work Week and Overtime	Overtime basis for purpose of the estimate is expected as follows: refer table 2.13 Final construction work weeks, shift patterns will be further developed and included in the Construction Work Packages (CWPs). Overtime assumptions and shift patterns will be reviewed and adjusted as required once estimate and schedule details are developed.	4.4.11.1	**Section 4.4.11.1** States Construction Shifts, Calendars, Overtime, and Productivity All work, except for the Reactor Building excavation and construction, is assumed to occur on 5d x10hr shifts. Overtime costs are incurred as follows: Daily: 8hrs standard time (1.0x) + 2hrs overtime (1.5x) Weekly: 40hr standard time (1.0x) + 10hr overtime (1.5x) Overtime cost is calculated per the above factors. Note that all work over and above 10-hour days would be calculated at 2.0 x the base rate, if required. The following shifts are considered and included inside the RQE cost Day Shift: applied to all scopes Afternoon Shift: applied to select scopes including Reactor Building construction (specifically DPSC field labour), Account 6 Mechanical field labour, Account 7 Piping field labour, Account 8 Electrical field labour. For the labour categories listed here it was assumed that 1/3 of the total hours would be performed on the afternoon shift A shift premium of 1/7 (14.3%) was included in the labour costs for the afternoon shift in line with EPSCA labour agreements Work associated with the tunnels scope will be performed on a 5x12 hour - two shift operation with an additional 5 hours on Saturday.	**3**

2.14 Construction Labour Productivity	Construction labour productivity will be assessed and included as required. Productivity will be assessed for items which may include: • Congestion and stacking of trades • Location of support facilities affecting walk time for breaks etc. • Labour and skill level available • Overtime productivity effects • Height factor • Labour productivity factors will be shown separately in the estimate which allow assess and finalize the effect of productivity factors in the man hours / cost and schedule	4.4.11.3	**4.4.7 Labour Productivity & Shift Patterns** Labour productivity analysis is performed based on Aecon's standard productivity calculation template and assessed for each trade, i.e., piping, electrical, mechanical, structural, and concrete. Productivity analysis includes "wrench time" analysis, weather, and other productivity effects such as congestion, site conditions, and expected labour resources. Base shift pattern is 5d x10hr day shifts for most scopes, except RB shaft excavation and DPSC installation (RB structure), which is based on 5d x 20hr shifts. For both shift patterns, Aecon assumes that the 10 hours per week of premium time is paid at 1.5x base rate (i.e., 5d x 8hr with two hours of overtime per day at "time and a half"). Labour agreements attract a marginally higher rate for second shift base wages, and that is included in the estimate. The estimate includes second shift premium only for one third of the Mechanical, Piping, Electrical & Instrumentation (MPEI) process work scope. Work associated with the tunnels scope will be performed on a 5x12 hour - two shift operation with an additional 5 hours on Saturday. **Section 4.4.11.3** States, The following productivity factor is being applied to direct trade labour hours to account for various productivity factors at site, - see figure 4-4. A detailed analysis can be provided separately. From the base value that was calculated, a management adjustment was applied to arrive at the factors outlined below, see table 4-6. Different factors were applied to different trades to account for the unique working conditions inherent in various types of work and estimating methodology.	**3**
2.15 Indirect Labor Hours	Craft labor hours for indirect construction and startup/commissioning activities will be estimated based on the project execution schedule and crew-based estimates, considering: • Number of workers in crew • Number of months performing activity • Hours per month on site • Number of shifts per day • Crews per equipment (e.g., cranes) for some accounts A back-pass will confirm total distributable hours align with historical metrics. Wage rates for indirect craft labor will follow the same approach as direct wage rates, using trade rates for certain activities (e.g., equipment operators) instead of composite crews. Final labor hours and wage rates will be based on local expertise in the construction execution plan.	4.4.11(.1 to .3) Section 5.14	**Section 5.14** lists items included under Construction Indirects: e. Site Support Labour i. Labourer clean up - trailer area ii. Labourers clean up - plant areas iii. Warehouse attendants iv. Tool & consumable crib attendants v. Equipment operators vi. Crane operators vii. Teamsters viii. Mechanic ix. Receiving/inspection x. Care and preservation yard xi. Confined space attendants, FME support, rescue team xii. Electricians - temp power maintenance xiii. Painters f. Site Support Labour - Scaffolding i. Site Security (i). Security/Watchman (using teamster rate)	**3**

2.16 Indirect Material	The construction execution and utilization plans will define indirect (distributable) materials and facilities to support construction and startup/commissioning, including trailers, warehousing, test and inspection shops, support facilities (trash, toilets, water, break/lunch rooms), scaffolding, and laydown areas with installation materials.	Section 5.14 (.1 and .2) Account 83 and Z03	Section 5.14 lists items included under Construction Indirects: a. Temporary Construction Facilities i. Trade trailers ii. Staff trailers iii. Washroom facilities iv. Office furniture v. Office equipment to use vi. Tool and consumable crib vii. Temporary fab areas - civil viii. Temporary fab areas - piping ix. Temporary fab areas - electrical x. Installation & removal of temporary facilities xi. Temporary enclosure assembly, retractable, over the Reactor Building construction area xii. Mechanic shop b. Site Utilities Install/Maintain/Remove i. Drinking water site wide ii. Waste disposal ix. Salt/sand ix. Receiving/inspection x. Care and preservation yard First Fills: estimated cost of $1M CAD as an allocation Scaffold Materials/Rentals	**3**
2.17 Indirect Construction Equipment	The construction execution plan will define indirect (distributable) construction equipment based on installation approach, work front locations, laydown areas, and delivery points. Equipment includes light, medium, and heavy-duty cranes; all on-site trucks (including personnel carriers/vans); earth-moving equipment (if self-performed); portable lifts; welding equipment; and special tools over $2,000. Fuel, lubrication, and monthly repair estimates will be based on identified equipment and operating months.	limited Section 5.14 (.1 and .2) Account 83 and Z03 - no real details although list of indirect is detailed on 5.14	Section 5.14 lists items included under Construction Indirects: d. Site Vehicles & Maintenance i. Road maintenance/grading/snow removal ii. Loader iii. Dump Trucks iv. Dust Control/Water trucks v. Site Truck /flat deck vi. Truck (tractor shunter) vii. Truck trailers viii. Mechanic Shop k. Cranes & Lift Equipment, including Self-Propelled Modular Transporter (SPMT) l. External Rentals not included in direct estimates m. Site Fab Equipment for DPSC 4. Small Tools & Consumables: Based on a percent of trade labour cost. 5. Medium Tools (larger than small tools, smaller than large equipment): Based on a percent of trade labour cost	**3**

2.18 Construction Indirect Cost and Construction Management	Construction Indirect Costs will be developed as a level-of-effort estimate based on trade support requirements and schedule. Categories may include: Temporary Facilities: Site office, trade lunch/washroom, tool cribs, storage (note: site fabrication shops and construction warehouse included in direct estimate). Trade Support Labor: Clean-up, tool crib and warehouse attendants, site transportation. Trade Support – Scaffolding: May be subcontracted or self-performed; includes labor, materials, rentals. (Concrete-related scaffolding is direct; piping/electrical/mechanical scaffolding is indirect.) Construction Equipment: Cranes, forklifts, boom trucks, heavy equipment moving, site trucks. Construction Equipment Civil Site Work: All work for civil/site construction will be included as a direct cost within the civil/site work account estimate, including; Excavation, paving, and material handling equipment. Project Support: First aid, rescue team, site security. Utility Requirements: Installation, maintenance, and consumption (water, power, communication) from OPG terminal point. Small Tools & Consumables: Percentage of trade labor, shown separately as indirect. Small Equipment: Value greater than small tools/consumables, less than construction. Rental-based, between small tools and major equipment in value; shown separately as indirect. Temporary Heating & Hoarding: Includes heating and hoarding for buildings and concrete/excavation winter work (may include weather-related additives). **Construction Management:** **Estimated by level of effort against schedule. Includes project planning, travel, and subsistence.** Direct labor includes General Foremen and below; other roles are construction management, grouped per OPG estimate template: Project Management, Project Controls, EH&S and QA/QC, Staffing & Training. Inspections: Third-party quality inspections categorized by account (e.g., concrete, soils, NDE). Quality reporting and documentation handled by Construction Management QA/QC personnel.	5.14.1	**Section 5.14.1** States Construction indirect costs have been priced based on experience with similar or proportional scopes of work. These include indirect costs associated with construction equipment, tools, trailers, consumables, and indirect support personnel. A list of indirect costs that have been included or accounted for are: Temporary Construction Facilities; Site Utilities Install/Maintain/Remove; Site Utility Charges; Site Support Labour; Site Support Labour - Scaffolding; Site Buildings - Temporary Building Heat & Hoard; Concrete/Excavation Work - Heat & Hoard; Site Security; Safety Facilities; Cranes & Lift Equipment; External Rentals; Site Fab Equipment for DPSC; Weather Cover for RB; First Fills; Small Tools & Consumables; Integrated Digital Delivery **Construction management detailed in 2.19 below**	**3**

2.19 Engineering and Project Management Cost Estimate	Engineering costs will be detailed and broken into Engineering, Engineering Project Management, and Licensing. Project Management costs will be shown separately, based on staff, manhours, and associated costs. (**from 2.18 above**) Construction Management: Estimated by level of effort against schedule. Includes project planning, travel, and subsistence. Direct labor includes General Foremen and below; other roles are construction management, grouped per OPG estimate template: Project Management, Project Controls, EH&S and QA/QC, Staffing & Training. Inspections: Third-party quality inspections categorized by account (e.g., concrete, soils, NDE). Quality reporting and documentation handled by Construction Management QA/QC personnel.	4.1 5.12 5.15.1 5.15.2 5.15.3	**Section 4.1** States The effort of an integrated PMT, including expenses to support the duration of the single-unit SMR facility have been accounted for as part of this cost estimate. The PMT will be responsible for managing its respective organization, and tactically feeding the governance to the project executive board, ensuring decisions are made rapidly, and project issues are dispensed efficiently. The PMT will comprise of construction management staff, which will include site support roles up to the superintendent level. The resources are aligned to the project Organization Breakdown Structure (OBS) and are supporting delivery of the appropriate 'Bundles' of scope. The specific bundles of scope and responsible organization is determined based on a best athlete approach, i.e., the organization that has the capability and available resources (labour, systems, etc.) to efficiently perform the work. This allocation of resources will be subject to change throughout the duration of the project. The hours are estimated using a level of effort (LOE) approach and are based on our historical experience and project specific requirements, such as scope of work, project duration, anticipated contracting structure, delivery schedule, etc. Discrete labour rates have been assigned to each position. **Section 5.12** States 5.12.1 States Account 81 includes costs associated with project leadership, project management, and construction management. The costs associated with this account were estimated by preparing a staffing plan over the entire project schedule. This staffing plan considers all the staff necessary to manage the engineering resources and the number of craft onsite. 5.12.2 The Aecon PMT estimate was developed using a comprehensive load board of roles and loading over the course of the full project. Rather than reproduce the extensive details of the load board itself, a copy of the Excel file containing the details is available as the Basis of Estimate File: Aecon Lifecycle MFL - All Bundles R9 - Frozen Nov11, 2024.xlsx 5.12.3.1 GEH Project Management Team consists of individual project managers for specific scopes of work allocated to GEH through the project division of responsibility. These project managers assigned at site and home office are responsible for performing the functions outlined in the GEH quality program. 5.12.3.7 Project Management costs have been estimated as a level of effort for the project team based on the schedule duration, utilizing the current labour rates build and accepted by ATRL. The project management team structure is as defined in the overall project estimate summary load board. **Section 5.15 Account 91 Engineering (pages 196 to 234) -** Very detailed narrative provided on Engineering and design scope included	**3**

2.20 Home Office Services and Engineering Support	Home office services will be estimated to include primary and detailed engineering, procurement, resident engineering, and support for construction and commissioning. A staffing plan will define hours by labor classification, with applicable overtime, travel, per diem, relocation, and other costs (software, hardware, facilities, materials).	4.2 5.15.2.2 5.15.4.1.1	**Section 4.2** States Hours required for engineering support of procurement, construction, and commissioning have also been included in the estimate. Engineering support of procurement is based out of the home office. Except for the Switchyard/Transmission Line Infrastructure EPC scope, which is assumed to be remote, engineering support of construction starts at home office and transitions to site. Engineering support of commissioning is based out of site. **Section 5.15.2.2** States GEH provides design authority level of effort engineering support for construction and commissioning. This engineering support is primarily located at site with home office support via a dedicated Fix-it-Now team. **Section 5.15.4.1.1** States GEH provides design authority level of effort engineering support for construction and commissioning. This engineering support is primarily located at site with home office support via a dedicated Fix-it-Now team. The estimate duration is based on construction schedule. GEHL's site engineering activities include the following: 1. Aligning with construction and test organization for efficient completion of work. 2. Point of contact for GEH engineering queries 3. Respond to field RFIs related to GEH's SOW 4. Process Field Change Requests 5. Provide support for on-site GEH supplied equipment activities to the IPD during construction and erection, commissioning, and start-up. 6. Resolving technical issues during the project. 7. Coordinate with Home Office engineering for approval of Design Changes	**3**
2.21 Field Services	A field services staffing plan will be developed based on the project and construction execution schedules, covering construction and start-up/commissioning. The estimate will include hours by labor classification, overtime, travel, per diem, relocation, and other costs (software, hardware, facilities). Unlike the home office estimate, field services will involve more relocations. Site facilities and office materials will be included as indirect (distributable) costs.	5.15.5.1.2 5.13.1 5.15.5.1.1	**Section 5.15.5.1.2** States Commissioning estimate comprises the following: Resident/field engineering support for commissioning: i. Support turnover from construction. ii. Support issue troubleshooting iii. Amend design using Field Initiated Changes (FIC). Estimate for Field Engineering support assumes use of ATRL design engineering process for construction package issuance and field change process. Estimate used resident engineering support during commissioning of U3 TGR Project as reference. The below assumptions are in relation to the Field Technical Specialists: 1. Owns Advanced Authorized Process, but not CWP / ITP Development (by Project Coordinators) 2. Provides senior technical support to the bundles in coordination with PCs 3. No support included for Start-up and Testing 4. Avg 50 CWPs / FTS	**3**

2.22 Commissioning and Start-up Costs	Pre-commissioning and commissioning will be customer-led, with support available on a rate basis pending agreement on effort. Pre-commissioning begins after construction testing and system turnover to OPG Operations. Construction testing starts post-installation and ends at turnover, specifics detailed in the Installation Specifications or supplier documentation. Initial station spare inventory will be estimated.	5.13.1 5.15.5.1.1 5.15.5.1.2	**Section 5.13.1** States Start-Up and commissioning of the unit will be the responsibility of the Owner. Only trade labour support has been included in the estimate to support the Start-Up and Commissioning effort. 5.13.2 Allowances, Assumptions, and Exclusions 1. Trade labour support has been estimated on the following basis: 2. Pre-Operational Testing Support for six months = 130 days @ 10hrs/day 3. Commissioning Support for another six months = 130 days @ 10hrs/day 4. The following crew of Journeyman trades has been included to support both efforts: a. Qty 3 Boilermaker b. Qty 3 Carpenters c. Qty 3 Electricians d. Qty 3 Ironworkers e. Qty 3 Labourers f. Qty 3 Millwright g. Qty 3 Pipefitters h. Qty 3 Teamsters 5. A labour factor of 1.25 has been applied to the Journeyman trade labour hours to account for Foreman and General Foreman supervision required **Section 5.15.5.1.1** States GEH Startup and Commissioning Support Team consists of Technical Advisors to support the Owner's completion of Pre-operational and Startup testing on site. GEH support for test deficiency reports, test report reviews and/or approvals, temporary modifications is provided by GEH engineering. Pre-operational Test Specification/Procedure and Startup Test Specification/Procedure development are included in the Engineering estimate. The Owner is responsible for integrated commissioning strategy and GEH is responsible to provide sequencing of system to be commissioned. Constructor (Aecon) will plan and execute the Check and Test activities. Check and Test is defined as activities that confirm individual equipment is correctly installed, set up, and configured using local (temporary) power and/or instrument air, hydrostatic pressure testing, equipment/piping cleaning, etc. Commissioning equipment and testing costs are included in Construction and Owner budget. Constructor and Owner are responsible for Turnover from Construction to Commissioning Owner is responsible for Handover from Commissioning to Operations prior to Fuel Load. **Section 5.15.5.1.2** States ATRL will provide the commissioning specification and procedures for Circulating Condenser Cooling water, Pumphouse and Water intake, and Switchyard and Transmission lines.	**3**

2.23 Other Costs	Other estimated costs include: Insurance: OCIP project; craft wage adders included for DIC Insurance. Bonds: Surety bond costs included if required. Escalation: Excluded; all pricing is overnight. Contingency: Determined at a P(x) value using AACE risk-based methods; included in Class 3 estimate. Fee: Not included. Warranty/Spare Parts: Estimated for startup/commissioning support.	Section 1 Section 5.18.2 Section 5.19.2 Section 6	**Section 1 States** This BOE documents the allowances, assumptions, and exclusions that define the scope and pricing basis for the 2024 overnight RQE of a stand-alone single-unit SMR facility. The estimate does not include contingency, escalation, bonds, insurance, treasury fees, and/or loans. **Section 5.18.2 States** The following cost estimates for commercial and insurance products by Aecon are included in the RQE as documented in the Integrated Project Agreement (IPA). Insurance - $200,000 Letter of Credit - Construction 2023-2029 - $4,070,400 Letter of Credit - Construction (between Substantial & Final Completion) - $80,000 **Section 5.19.2 States** No contingency cost or budget has been included in the Class IV construction estimate. A risk budget is being proposed as a separate cost and analysis but has not been included in the construction cost estimate directly. **Section 6 States** The RQE estimate is based on 2024 Canadian Dollars. No cost escalation beyond 2024 has been included in the estimate. Estimates for Engineering, Project Management, and Trade labour include base labour (i.e., salary) costs, fringe benefits and burdens, overhead and fee. Estimates for equipment, materials, subcontractor costs (excluding ATRL affiliates in post-validation phase) include a fee and exclude overhead. Other expenses such as travel costs and ATRL affiliates (post-validation phase) are pass through and do not include fee or overhead. The following expenses have been included in the estimate: Project management staffing is comprised of both local hires and staff that will be commuting to site. Travel cost for the commuting staff has been included in the estimate. The local hires and the staff that relocate to site do not attract travel cost. An allowance for software licenses (e.g., SmartPlant, Tekla, Solid Edge, Safety and Design Analysis) have been included in the estimate. A project management allowance to account for meetings, trainings, and other project expenses. Where costs or quotes were received in a currency other than Canadian Dollars (CAD), the following exchange rates are applied to convert costs to CAD [refer to Table 6-1] Escalation rates for engineered equipment have been applied to historical costs to bring the estimate to 2024 Canadian dollars (for more detail refer to Section 4.3 Procurement and Section 5, account 99).	**3**
3 Roles and Responsibilities	Header only.			**N/A**
3.1 Executive Board	The Executive Board will provide overall management and executive-level guidance to achieve the Project Objectives.	Attachment 3	No identifiable deliverable associated with 'overall management and executive level guidance' and therefore an associated reference in the estimate report would not be expected. More generally, Attachment 3 details the Integrated DNNP Unit 1 Organisation chart showing the relationship between the Executive Board, The Project Leadership Team and the Project management Team, providing information of structure, roles and names in each case.	**N/A**

3.2 Project Leadership Team (PLT)	The PLT will provide management-level guidance to achieve Project Objectives, chaired by a designated Owner member. It will direct the Parties and PMTs, create and mentor PMTs, and monitor Project progress, developing benchmarks, metrics, and evaluation standards.	Attachment 3	No identifiable deliverable associated with 'management-level guidance to achieve project objectives' and therefore an associated reference in the estimate report would not be expected.	**N/A**
3.3 Project Management Team (PMT)	Will be multiple PMTs with the primary functional units covering all Project aspects, including risk management, design, engineering, licensing, construction, and commissioning. They will make day-to-day decisions to achieve the Project Objectives.	Attachment 3 Section 10	Attachment 3 details the Integrated DNNP Unit 1 Organisation chart showing the relationship between the Executive Board, The Project Leadership Team and the Project management Team, providing information of structure, roles and names in each case. Section 10 States The Class IV cost estimate was produced by a multidiscipline team across multiple organizations and all team members have extensive experience in the preparation of estimates for nuclear and non-nuclear projects. Table 10-1 to 3 States the Key Contributors to RQE Estimate from GEH/ATRL/AECON	**N/A**
4.0 Resources and Tools	The following tools will be used to prepare the estimates, with the master estimate summarized using Hard Dollar: Construction Estimate (including site work, buildings): Hard Dollar Process Systems: Accubid (imported to Hard Dollar) Trade Support: Excel (imported to Hard Dollar) Project Management: Excel (imported to Hard Dollar) Bulk Materials: Included with each estimate software used Process Equipment: Excel summary (imported to Hard Dollar) Master Integrated Estimate: Hard Dollar/Excel Owner's Cost Estimate: Excel Operating Cost Estimate: Excel	4.4.9	**Section 4.4.9** States The following estimating tools (software) and productivity units were used to prepare the individual trade estimates. The various tools and productivity units listed below were used to best represent the nature of work for each of the trade disciplines. The Master estimate file was summarized using Hard Dollar (In-eight) software. Summary information from the Hard Dollar was exported in an excel format for presentation purposes. **Table 4-2**: Estimating Tools by Scope summarises the estimating tools for each work scope.	**3**
5.0 Communication and Co-ordination	The DNNP Program will create a Roadmap outlining activities for program cost estimate progression, serving as the primary communication tool for tracking estimate progress. It will reference responsible functions and be updated as the project approaches the Release Quality Estimate in 2024. Regular communications will occur through established venues: 1. Program and Project interface meetings 2. Project Controls meetings 3. Executive and leadership updates 4. IPD/vendor partner meetings Meeting frequency and participants will be documented in the master calendar and determined on an ad hoc basis.	SMRRBB_Oct_RQE_v1	A comprehensive Roadmap has been produced to detail the progression and review of the RQE in line with the Estimate Plan. Further meetings held which satisfy the communications requirements of the Estimate Plan have been evidenced by way of clarification session with the project team. Meetings discussed include: • T minus meetings (includes Project Controls swim lanes review) • Estimating Team update meetings • PLT cost update meetings • Executive meetings (Discipline VP's) • Board deep dives A suggestion for future estimate plans was made to align the meeting title terminology between the estimate Plan and the Roadmap to establish clear compliance.	**3**

5.1 Estimate Reporting	Estimate outputs will be reported for analysis and comparison. All estimates should be presented with the ability to roll up by scope and phases (Project Management, Engineering, Procurement, Construction, Commissioning, and Closeout). For estimates prepared by the IPD team for power block and non-power block scopes, the following reports will include labor hours, labor costs, subcontractor costs, and material costs by Project, Area, System, Account, and responsible organization. Cash flows for the project lifecycle will also be provided.	RQE InEight / HardDollar outputs SMRRBB_Oct_RQE_v1	InEight / HardDollar functionality facilitates all of the stated estimate output requirements and is able to be presented in terms of scope and phase WBS / CBS. Note that InEight / HardDollar does not itself produce an 'Estimate Report' as indicated by the Estimate Plan section title but provides the data on which reports can be based. The production and delivery of cashflow forecasts are noted as discreet deliverables on the RQE Roadmap.	**3**
5.2 Estimate Assumptions	Assumptions are used to bridge gaps in scope or estimate basis, allowing completion of the estimate. They are documented based on scope definition and help bound scope, schedule, and cost estimates. All assumptions will be reviewed and validated by scope owners, with risks documented and monitored.	Section 5 (page 42 to 255)	**Section 5** (page 42 to 255) Basis of estimate for each Account - where applicable has description and details on Allowances, assumptions and exclusions - **Detailed 213-page Basis of estimate section - clearly identifying information and a thorough record of the scope of works**	**4**
5.3 Exclusions	Project exclusions define what is explicitly not included in the project scope. These exclusions should not arise from a lack of information; instead, assumptions should be made to address missing details. Exclusions do not necessitate corresponding assumptions or risk entries. If an exclusion requires a risk entry, it may not truly be an exclusion. Exclusions should not duplicate work covered elsewhere within the program or project scope. When exclusions exist, the project manager must demonstrate how these issues will be managed.	Section 5 (page 42 to 255)	**Section 5** (page 42 to 255) Basis of estimate for each Account - where applicable has description and details on Allowances, assumptions and exclusions - **Detailed 213-page Basis of estimate section - clearly identifying information and a thorough record of the scope of works**	**4**
6.0 Estimate Reviews	The IPD Project Control team and Estimating team will establish, collaboratively with area leads and the PMT team, an oversight plan that outlines the approach, participation level, review process, feedback and documentation of observations. Estimate Review Process includes: 1. Estimate Walk Through - Reports and Data 2. Project Scope and Technical Review 3. Contract Compliance Review 4. Estimate Team Reviews: Peer, Quality, Vetting and Validation 5, Project Team Reasonability Review ('Final review' which determines the reasonability of the estimate)	Section 10 Cost Challenge meetings SMRRBB_Oct_RQE_v1	**Section 10 States** The estimate has been **reviewed extensively by the project team and internal subject matter experts from the Engineering, Project Management, Construction, Commissioning, Quality Assurance, and Procurement disciplines**. Estimate peer checks and reviews have taken place to review estimating methodologies and cross check cost model calculations. An extensive series of Cost Challenge meetings has been undertaken including separate reviews of Civils, Project Management, Field Co-ordination, Procurement, Productivity, Project Controls, Quantities, Site Preparation, Circulating Cooling Water, Indirect Costs, NI PMT, QA, Structures, Other Direct Costs. Consolidated list of actions arising out of the Challenge sessions has been produced. RQE roadmap details 'Final (estimate) Package for Exec Review' and further 'ELT Review' and 'CEO Update' which can be assumed to align with the Project Team Reasonability Review / Final Review. Also noted are PLT Challenge Sessions. Although a substantial and comprehensive estimate review process has been undertaken, it is evident that the review process does not align with that stated in the Estimate Plan (as described in the text to the left of this box). The review process undertaken and described in the Basis of Estimate documents, (in addition to records of the Cost Challenge meetings), demonstrate a process which is appropriate for the scale and complexity of the project being delivered. Therefore, and as discussed in the clarification meetings with the project team, it is considered that the review process in the Estimate Plan itself may need to be updated.	**2**

Project Risk Management (OPG-MAN-00120-0015-005)	Requirements / Content	Evidence of Meeting Requirements	Compliance Rating
Details the sub-areas assessed.	*Outline high-level content and information required in accordance with OPG / DNNP Management Plans.*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 3.2 for Compliance Rating definitions.*
2.2 Identify Risks	Section 2.2 highlights how to categorise the risk event using the RBS - *Risk owners should categorize the risk event using the Risk Breakdown Structure (RBS) list (Appendix D) provided in ePMX. The RBS should be applied to categorize the EVENT, not the cause. This allows for trending of risks against a project or portfolio to understand common themes and trends.*	This has been evidence in the ePMX screenshot provided, demonstrating the compulsory drop down menu for Risk Category.	**4**
2.2 Identify Risks	Section 2.2 specifies both PMIS (ePMX) and Sharepoint will be used for the storage of information and documentation.	Evidence of the use of Sharepoint for Risk documentation and ePMX for the Risk Register has been provided.	**3**
2.3 Perform Qualitative Risk Analysis	Section 2.3 highlights what is required when qualitatively assessing risks at each project level - *Qualitative risk analysis should follow the following process:* *• Step 1: Rate each risk based on its probability of occurrence and its potential impact in accordance with the standardized Project Risk Assessment Matrix scales (Appendix A). The impact rating should be assessed for both cost and schedule (NOTE: the higher of the two ratings will drive the overall score).* *• Step 2: Calculate the overall risk score by multiplying the probability rating by the highest impact rating (cost or schedule).* *For project level A, B, and C, the risk score should be calculated for the following:* *• Current score – Reflects the current state of the risk and is reviewed and updated regularly per the requirements of the Scalable Project Delivery Model [R2].* *Current score = Current Probability x Current Impact (Highest).* *• Post score – Post Score is used to specify the estimated residual impact of the risk after all response actions have been successfully implemented, and changes throughout the course of the life cycle of the risk.* *Post score = Post Probability X Post Impact (Highest).*	Evidence of this is provided in the DNNP Risk Register - 11 Apr in columns DQ – EE. Evidence of this is provided in the DNNP Risk Register - 11 Apr in columns BM – CA. ePMX screenshot also provided to show how the calculation is performed in the source Risk Register.	**3**
2.4 Perform Quantitative Risk Analysis	Sections 2.4.1 and 2.4.2 describe the methodology to be used depending on the project level, Monte Carlo (A and B) and EMV (C) - *Performed by the PMO Risk Management SME based on project schedule, cost and risk input. Contingency estimate for the project is calculated based on three contributors – discrete risks (known unknowns), cost uncertainty and (for Scale A projects going to gate 3) schedule uncertainty. This process takes into account probabilistic or project-wide effects, such as correlation between risks, interdependency, and feedback loops, thereby indicating the degree of overall risk faced by the project.*	@risk model file provided demonstrates that all 3 contributors have been accounted for in the QRA, including discrete risks, cost uncertainty and schedule uncertainty This model also evidences the use of a correlation coefficient.	**3**
2.5 Plan and Implement Risk Responses	Section 2.5 lists and explains the applicable response strategies for both threats and opportunities - *Threat* *Avoid - Risk Avoidance is a risk response strategy whereby the project team acts to eliminate the possibility of the threat or protect the project from its impact(s). This may involve changing some aspect of the management plan or changing the objective that is in jeopardy in order to eliminate the threat impact entirely.* *Mitigate - Risk Mitigation is a risk response strategy whereby the project team acts to reduce the probability of occurrence and/or impact(s) of a threat.* *Transfer - Risk Transference involves shifting responsibility of a threat to a third party to manage the risk and to bear the impact(s) if the threat occurs. Examples* *include purchasing insurance or contractual arrangements with vendors to* *transfer the project risk.* *Accept - Risk Acceptance is a risk response strategy whereby the project team decides to acknowledge the threat and not take any further action unless or until the event occurs. Contingency or fallback plans may be developed ahead of time, to be implemented if the risk presents itself.*	Evidence of this is provided in the DNNP Risk Register - 11 Apr in columns CB – CC.	**3**

Functional Plan - Project Controls (DA1-IPD-NN-NN-TPLN-PM-0004 DNNP)	Requirements / Content	Evidence of Meeting Requirements	Compliance Rating
Details the sub-areas assessed.	*Outline high-level content and information required in accordance with OPG / DNNP Management Plans.*	*Document evidence demonstrating alignment with requirements, including specific management plan references. Identify any gaps, concerns, or issues, and provide corresponding recommendations.*	*See Section 3.2 for Compliance Rating definitions.*
6.1 Plan Risk Management	Section 6.1 describes that budget values will be derived using the project schedule and estimate values - *Contingency is determined at the program level until Release Quality Estimate, based on project schedule, cost, and risk profile, through processes as defined in the OPG-MAN-000120-0015, Project Risk Management manual. Contingency will be determined and assigned at the Project level at RQE, and the drawdowns are tracked.*	The project provided the following statement, which is accepted as evidence due to the Risk Register being an iterative process and not yet at the final version - The project team provided their Basis of 3-point rationale for discrete risks with the best available information during the contingency calculation. The basis of 3-point rationale typically comes from their experience, known information, and knowledge of the project plans (Estimate and Schedule). As the project moves forward and more information is being known, the project team will continuously update the basis of rationale.	**3**
6.3 Risk Assessment	Section 6.3 states that @risk will be used to run QRAs.	@risk model provided and reviewed.	**3**
6.3 Risk Assessment	Section 6.3 describes the risk matrix used for the assessment of impact/consequence - *Figure 6.1: Risk Heat Map.*	The ePMX screenshot provided shows the categorization outlined in the Risk Matrix, this is a compulsory drop down selection for probability, finance, and schedule.	**4**
6.4 Risk Monitoring and Control	Section 6.4 includes a KPI/reporting strategy using a monthly scorecard to highlight and cascade outstanding actions - *The Enterprise Project Risk team shall provide periodic oversight commensurate for the level of risk and interface with the DNNP Program Team to review the risks for quality and ensure the ePMX tool is being updated as per the existing risk management governance. These reviews will ensure the risk and mitigating actions are up to date. Risks that are successfully mitigated or are no longer relevant or have occurred, shall be closed with a proper closure rationale. In the event a risk has occurred, an issue needs to be created.*	Evidence of reporting is provided in the EPPR Dashboard - 11 Apr. It demonstrates a monthly report on risks by score, bundle, accepted risks, top priority risks and activated risks.	**3**

Numbers may not add due to rounding.

Filed: 2025-12-12
EB-2025-0297
Exhibit D2
Tab 4
Schedule 8
Table 1

Table 1
Capital Expenditures Summary - Darlington New Nuclear Program ($M)

Line No.	Category	2020 Actual	2021 Actual	2022 Actual	2023 Actual	2024 Actual	2025 Budget	2026 Budget	2027 Plan	2028 Plan	2029 Plan	2030 Plan	2031 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	DNNP Capital												
1	**Unit 1 & Common Scope Facilities**	0.0	0.0	163.4	236.2	528.9	1,215.9	1,455.5	1,410.4	896.7	304.7	373.2	0.0
2	**Unit 2 - 4**	0.0	0.0	0.0	0.0	39.4	66.7	178.0	210.3	0.0	0.0	0.0	0.0
3	**Total DNNP Released Capital**	0.0	0.0	163.4	236.2	568.3	1,282.6	1,633.5	1,620.7	896.7	304.7	373.2	0.0

Numbers may not add due to rounding.

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Exhibit D2
Tab 4
Schedule 8
Table 2

Table 2
Comparison of Capital Expenditures - Darlington New Nuclear Program ($M)

Line No.	Business Unit	2022 Actual	2023 Actual	2024 Actual	2025 Budget	2026 Budget	2027 Plan	2028 Plan	2029 Plan	2030 Plan	2031 Plan	2022-2026 Actuals & Budget	(m)-(k) Change	2027-2031 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
	DNNP													
1	**Unit 1 & Common Scope Facilities**	163.4	236.2	528.9	1,215.9	1,455.5	1,410.4	896.7	304.7	373.2	0.0	3,599.9	(614.9)	2,985.0
2	**Unit 2 - 4**	0.0	0.0	39.4	66.7	178.0	210.3	0.0	0.0	0.0	0.0	284.0	(73.7)	210.3
3	**Capital - Released DNNP Total**	163.4	236.2	568.3	1,282.6	1,633.5	1,620.7	896.7	304.7	373.2	0.0	3,884.0	(688.7)	3,195.3

Numbers may not add due to rounding.

Updated: 2026-03-10
EB-2025-0297
Exhibit D2
Tab 4
Schedule 8
Table 3

Table 3
Capital Project Listing - Darlington New Nuclear Program Facility Projects
Projects ≥ $30M Total Project Cost

Line No.	Facility	Project Name	Project Number	Description of Asset Being Placed in Service	Category	Start Date	Final In-Service Date	Total Asset Cost (M$)	1st Execution Business Case ($M)	Total In-Service ($M)	In-Service LTD ($M)	In-Service IR Term ($M)	In-Service 2025 ($M)	In-Service 2026 ($M)	In-Service 2027 ($M)	In-Service 2028 ($M)	In-Service 2029 ($M)	In-Service 2030 ($M)	In-Service 2031 ($M)
	(a)	(b)	(c)		(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(q)	(r)	(s)	(t)	(u)	(v)	(w)
1	DNNP	DNNP Unit 1 & Common Scope Facilities	Various	Unit 1 In-Service	DNNP Unit 1 and Common Scope Facilities	Jan-22	Oct-30	6,584.9	6,584.9	6,584.9	0.0	6,584.9	0.0	0.0	0.0	0.0	0.0	6,584.9	0.0

Table 4
Capital Project Listing - Darlington New Nuclear Program Facility Projects
Projects $10M - $30M Total Project Cost

Line No.	Facility	Project Name	Project Number	Description of Asset Being Placed in Service	Category	Start Date	Final In-Service Date	Total Asset Cost ($M)	In-Service IR Term ($M)	In-Service 2025 ($M)	In-Service 2026 ($M)	In-Service 2027 ($M)	In-Service 2028 ($M)	In-Service 2029 ($M)	In-Service 2030 ($M)	In-Service 2031 ($M)
(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
		No proejcts in this category														

Numbers may not add due to rounding.

Table 5
Capital Project Listing - Darlington New Nuclear Program Facility Projects
Projects < $10M Total Project Cost[1]

Line No.	Sponsoring Division	Number of Projects	Total Project Cost ($M)	Average Cost of All Projects ($M)	In-Service IR Term ($M)	In-Service 2025 ($M)	In-Service 2026 ($M)	In-Service 2027 ($M)	In-Service 2028 ($M)	In-Service 2029 ($M)	In-Service 2030 ($M)	In-Service 2031 ($M)
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
1	No projects in this category											

Numbers may not add due to rounding.

Table 6

Comparison of In-Service Capital Additions - Darlington New Nuclear Program ($M)

Line No.	Business Unit	2025 Budget	(c)-(a) Change	2026 Budget	(e)-(c) Change	2027 Plan	(g)-(e) Change	2028 Plan	(i)-(g) Change	2029 Plan	(k)-(i) Change	2030 Plan	(m)-(k) Change	2031 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
1	**Unit 1 and Common Scope Facilities**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,584.9	6,584.9	(6,584.9)	0.0
2	**Total Unit 1 & Common Scope Facilities**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,584.9	6,584.9	(6,584.9)	0.0
3	**Minor Fixed Assets**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	**Total In-Service Capital Additions**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,584.9	6,584.9	(6,584.9)	0.0