Ontario Power Generation Inc (OPG) and DNNP LP

2027-2031 Payment Amounts Application

Ontario Association of Physical Plant Administrators (OAPPA) Interrogatories

C2-OAPPA-1

Ref: Exhibit C2 / Tab 1 / Schedule 1 / Page 31 of 32

"*As OPG has not yet developed comprehensive cost estimates for the future nuclear liabilities, for the DNNP facilities, and none have been recorded in OPG's financial statements, OPG has not reflected any corresponding amounts in the proposed IR term nuclear revenue requirements*".

Exhibit C2 / Tab 1 / Schedule 1 / Table 1 reflects OPG's revenue requirement for all its other Nuclear Liabilities, including Bruce which ranges from $270.2 MM in 2027 to $341 MM in 2031.

a) Please explain the absence of this cost information with as much detail and insight as possible.
b) Can you provide any guidance, or outside reference, that might better assist the Board in meeting its requirements under O'Reg 53/05 – specific to ensuring OPG collects its nuclear waste disposal costs for the DNNP - without having any basis for that potential cost, particularly with a new nuclear fuel type and generation technology?
c) Can OPG provide some basis for approximating or estimating the Nuclear Waste management costs for the DNNP? (e.g. estimated by unit – either $/MW or fuel bundle, comparison to known Candu fuel benchmarks, comparison to SMR vs Candu input fuel rates, as a % - or range of % - of the revenue requirements provided in Exhibit C2 / Tab 1 / Schedule 1 / Table 1 for 2027-2031, or, other).

D2-OAPPA-1

Ref: Exhibit D2 / Tab 1 / Schedule 3 / Attachment 1 / Tab 45 / Project 86910

"*The objective of this sustaining project is to improve the condition of the station lighting to a reliable and maintainable state. Original station lighting is made up of fluorescent bulbs and ballasts which are now obsolete*". And "*This project is to replace all remaining existing fluorescent light fixtures with LED in the remaining areas of the station not already covered under project 31516 or other projects".*

a) Please confirm that the anticipated capital cost of this program is $39.9 million and that it includes 14,000 LED fixtures (12,000 + 2,000). Kindly confirm that the unit cost per lighting fixture is thus $3,850 / unit.
b) Please identify the type of lighting fixtures being used, physical unit sizes, outputs (e.g. lumens) and any unique installation of the new fixtures or removal challenges of the existing. Any available pictures also invited.
c) Are the units being replaced on a like-for-like basis, or do the installations require new wiring, cable trays, fixtures, switches, etc.?

D2-OAPPA-2

Ref: Exhibit D2 / Tab 3 / Schedule 1 / Page 2

"Based on the significant effort undertaken to develop the RQE, OPG has a high level of confidence in the four-unit PRP cost estimate of $26.84B, which includes contingency, interest and escalation".

a) Can you normalize this in comparison to the estimated $12.8B cost to refurbish Darlington (i.e. common year comparison, such as 2015 or 2026 perhaps)?
b) What are the 5 major contributors to the higher total refurbishment cost estimate, versus Darlington's refurbishment cost, once normalized?

D2-OAPPA-3

Ref: Exhibit D2 / Tab 3 / Schedule 1 / Page 3 / Chart 1

a) Other than cost, which line items are different than they were for Darlington?
b) What are the principal drivers of those differences, if any, to the DNRP?

D2-OAPPA-4

Ref: Exhibit D2 / Tab 3 / Schedule 8 / Attachment 1, Page 1 of 17

"The Class 3 Estimate to refurbish the four units is $26,840 Million, with a projected levelized cost of electricity (LCOE) of $169/MWh (2024$) and a schedule that places all four units in service by 2034. This will provide critical supply with a capacity upgrade to 551 MW per unit to meet Ontario's growing electricity demand for an additional 30 years".

Currently PNGS units 5-8, are approximately 515 MW.

a) What is driving the increased capacity of the refurbished units?
b) What factors influenced the decision to not increase the capacity of the individual units to align with those at Darlington?
c) Is there sufficient room in the existing storage pools for the additional nuclear waste that will be produced from the plant's 30-year life-extension, or will new storage pools need to be constructed?

D2-OAPPA-5

Ref: Exhibit D2-4-2 / Attachment 3 / Page 16 of 31

"*The construction phase does not include any activities that require management of radioactive wastes, therefore there are no governance requirements for nuclear waste during this phase*".

a) Please describe how OPG will manage the radioactive waste when it occurs. Include details related to wet storage, transition to dry storage, timelines for each, storage location(s), fuel bundle differences, equipment and handling procedures. Please further

elaborate on comparisons and differences to known, existing Candu-reactor waste management including for example radioactivity levels, containment, and bundle sizes.

D2-OAPPA-6

Ref: Exhibit D2 / Tab 4 / Schedule 1 / Page 2

"*The BWRX-300 SMR is a 300 MW water-cooled, natural circulation design with passive safety systems*"

a) Please describe in detail, how the passive safety systems of the SMR function. Please confirm and detail redundancies, systems, shut down procedures, emergency procedures including containment and all necessary measures enabled, to prevent a melt-down of the reactors.
b) Are there any "reactive" safety measures or systems? Please describe in detail if so.
c) Please compare similarities and differences of the passive, and other, safety systems to known, existing Candu-reactor safety systems, including the requirement (or lack thereof) for a Vacuum Building.

D2-OAPPA-7

Ref: Exhibit D2 / Tab 4 / Schedule 1 / Page 5, Figure 2

a) Figure 2 does not include the existence of waste fuel storage facilities. Please provide additional information, including diagrams of any planned or required nuclear waste storage facilities.
b) A main control room is indicated. Describe any inter-connection, communication mechanisms or protocols, or other control room personnel interaction with existing Darlington Nuclear control personnel. Will DNNP control room personal require different training or have different skill sets from those in the neighbouring Candu facility? If so, what skill set redundancies will exist between the two control room settings for routine operational or particularly for any potential emergency matters?

D4-OAPPA-1

Ref: Exhibit D4 / Tab 4 / Schedule 8 / Attachment 1, Page 16 of 17

"Appendix 9 – Business Case Assumptions"

a) Fuel for the GE-Hitachi's BWRX-300 assumes $30 MM / year / unit in 2024$. Please confirm, or correct, the inferred per unit fuel cost from this table's assumptions, for a 315MW unit, operating at a UCF of 94%, yearly as being $11.57 / MWh. (i.e. $30 MM / 315 MW x 0.94 x 8769 hours). Please confirm the currency.

E2-OAPPA-1

Ref: Exhibit E2 / Tab 1 / Schedule 2 / Table 1b

a) Please explain how the Unit Capability Factor relates to the annual production of TWh.
b) Does a change in the Unit Capability Factor change the (annual) production forecast?
c) Assuming a change in the Unit Capability Factor changes the (annual) production forecast, please provide a table, reflecting the corresponding change in production for each of the 2027-2031 years under the following change to the Unit Capability Factors:
    i. +/- 0.5 %
    ii. +/- 0.75 %
    iii. +/- 1.0 %
    iv. +/- 1.35 %
    v. +/- 1.75 %
d) Please explain how the Unit Capability Rate (or also "Capacity Factor") does, or does not, relate to, or factors into the annual production estimates.
e) What is the formulaic difference (i.e. calculation details) between Unit Capability Factor and Unit Capability Rate (Capacity Factor)?

E2-OAPPA-2

Exhibit E2 / Tab 1 / Schedule 1 / Page 11 - 13

"*In planning for the VBO, OPG has reviewed lessons learned and benchmarked other utilities. In addition, OPG is utilizing innovative technology and drones to perform some of the vacuum building inspection work and planning to initiate projects that would provide opportunities in future VBO's. OPG's generation forecast reflects a planned duration of 45.9 days to execute the VBO*".

a) Please confirm that the Pickering VBO in 2022 lasted 30 days, 12 days ahead of schedule.
b) What were the major contributors to the accelerated VBO scheduling at Pickering?
c) Please identify any major differences of the 2022 Pickering VBO's planned activities versus those planned for Darlington's VBO in 2027.
d) Please confirm the planned duration of the key Emergency Coolant Injection valve replacements project(s), planned concurrently with the VBO.
e) If the Emergency Coolant Injection valves cannot be completed within the VBO timeframe, what other planned outages, if any, could these valves be replaced concurrently with?
f) Bruce's VBO in April 2024 appears to have only taken 16 days (as based on publicly available generation production data from the IESO), 9 days faster than its planned 25 days. Is OPG aware of any major planned activity differences to its Darlington VBO in 2027 and if so, what are those? Has OPG been able to incorporate any of the lessons learned from the Bruce VBO experience and if so, what were those?

F2-OAPPA-1

Ref: Exhibit F2 / Tab 5 / Schedule 1 / Page 5 of 18, Chart 2 – "*Fuel Costs per MWh (2024 Benchmark Report)*"

a) Please reconcile the $4.43/MWh for Darlington and $3.98/MWh for Pickering shown in this chart, versus the $4.65/MWh otherwise shown as the cost average for both, in the other Exhibit F2 Tables (for e.g. in F2 / Tab 5 / Schedule 1 / Tab 1b, line 2).

F2-OAPPA-2

Ref: Exhibit F2 / Tab 5 / Schedule 1 / Page 6

"*The OPG nuclear fuel supply objectives are to:*

- *Ensure security of supply: OPG must minimize the risk of its reactors being shut down due to lack of fuel bundles, including the risk that any step in the supply chain is substantially delayed due to a lack of materials from an earlier step.*
- *Minimize cost: OPG seeks to obtain its fuel supply at the lowest cost, consistent with its 21 fuel quality requirements".*

a) How does OPG quantify and consequently manage the supply risk associated with the DNNP, GE-Hitachi's BWRX-300 fuel supply from foreign-controlled sources, if different from domestic Candu fuel sources?
b) Is there any reliance on the current NAFTA, or other trade agreements that will ensure that the reliability of GE-Hitachi's BWRX-300 fuel supply? If so, please explain. Please describe any contingency plans.
c) Will the GE-Hitachi's BWRX-300 fuel supply be subject to tariffs or duties from the US? If there is a risk, how significant is it? Please describe any contingency plans.
d) Are the transportation requirements for the GE-Hitachi's BWRX-300 fuel supply different than those required for the Candu fuel bundles? Is so, please describe.
e) How does the current costing mechanism share nuclear fuel price risk between OPG and rate payers?

F2-OAPPA-3

Ref: Exhibit F2 / Tab 5 / Schedule 1 / Page 9

"OPG's financial coverage limits specify the maximum and minimum portion of supply to be under fixed-price or base-escalated arrangements, expressed as a percentage of OPG's aggregate amount under contract. OPG's financial coverage limits are unchanged from EB-2020-0290, with a minimum to maximum range of 45% to 65%".

a) Acknowledging that fixed-price arrangements are effective price insurance mechanisms, it is understood that they inherently include a cost, or premium, for mitigating volatile market price risk. Consequently, fixed price arrangements are more likely to affect higher fuel costs, over the longer term, all other things being equal. Could OPG opine on an alternative mechanism – perhaps, but not necessarily, analogously to how Enbridge currently manages its natural gas purchases for its "system gas" rate payers - such that both OPG and Rate Payers could be protected from market price volatility and lower fuel costs in the longer term?