

NUCLEAR NON-ENERGY REVENUES

1.0 PURPOSE

This evidence describes OPG's non-energy revenue derived from its nuclear operations, the regulatory treatment of these revenues and the forecast of nuclear non-energy revenues (net of related costs) for the IR term. There are no non-energy revenues that are forecast to be derived from the DNNP facilities during the IR term.

2.0 OVERVIEW

OPG's actual and planned nuclear non-energy revenues (net of related costs) for the period 2020-2031 are presented in Ex. G2-1-1, Table 1. For the IR term, these amounts are forecast to be \$6.3M for 2027, \$32.7M for 2028, \$13.8M for 2029, \$13.5M for 2030, and \$23.6M for 2031. The revenues during the IR term are associated with isotope sales (Cobalt-60 at Pickering and tritium) and heavy water sales and processing. As in prior OPG applications, the forecast of such nuclear non-energy revenues for the IR term is included as an offset in the calculation of OPG's nuclear revenue requirements.

Isotope sales revenues fluctuate over the historical and bridge years and into the IR term due to the nature of outage work and timing of isotope harvesting. Isotope sales change year over year due to the scheduling of the Cobalt harvest windows, with sales of the final harvest to be produced before the Pickering refurbishment window expected to occur in 2027. Changes in heavy water sales and processing year over year are due to production fluctuations at the Tritium Removal Facility ("TRF") which are based on required outages as well as pricing assumptions. Isotope sales are discussed in Section 3.1 below and heavy water sales and processing revenues are discussed in Section 3.2 below. The related costs are discussed in Section 4.0.

Excluding ancillary services revenues and before the upward adjustment in the forecast revenues per the OEB-approved settlement proposal, OPG's nuclear non-energy revenues (net of related costs) are \$25.6M lower over the 2022-2026 period compared to OPG's EB-2020-0290 forecast. Ancillary services revenues are discussed in Section 3.3 below.

3.0 NUCLEAR NON-ENERGY REVENUE SOURCES

3.1 Isotope Sales

3.1.1 Cobalt-60 Production at Pickering

Cobalt-60 is a critically important medical isotope used for radiation therapy, sterilization of medical equipment, food irradiation and specialized industrial uses. OPG currently produces Cobalt-60 at Pickering (Units 6, 7, and 8) for use in the sterilization of surgical and medical supplies. OPG sells Cobalt-60 to Nordion (Canada) Inc., under a long-term agreement that currently expires after the sale of the final harvest to be produced before the Pickering refurbishment window.

Sales volumes are constrained by OPG's ability to produce Cobalt-60. The direct costs and other support costs for this activity are discussed in Section 4.0 below. There is no Cobalt-60 production at Pickering during the IR term with Units 5-8 scheduled to enter refurbishment, with sales of such final harvest expected to occur in 2027. Cobalt-60 production may restart following the refurbishment, pending technical, operational and economic feasibility reviews and implementation of required capital expenditures. Any associated revenues would occur outside of the IR term and OPG would bring forward a proposal regarding their treatment at that time. The annual revenues up to 2027 fluctuate primarily due to harvesting of Cobalt-60 being tied to Pickering's outage schedule.

3.1.2 Cobalt-60 Production at Darlington

In EB-2020-0290, OPG indicated it would bring forward a proposal regarding revenues, operating costs and capital amounts for the production of Cobalt-60 at Darlington in the next nuclear payment amounts application.¹

OPG is moving forward with the opportunity to produce Cobalt-60 at Darlington with the first harvest and corresponding sale expected in 2028. Neither the costs of the modifications made at Darlington to enable this production nor the associated ongoing operating costs are included in OPG's rate base or revenue requirement. Consistent with OPG's approach to the production of the Molybdenum-99 isotope accepted by the OEB in EB-2020-0290 through the approval of

¹ EB-2020-0290, Ex. G2-1-1, Section 3.1.1.1, pp. 2-3.

1 a settlement proposal² (as outlined in EB-2020-0290, Ex. F3-1-4, Section 4.0) and validated
2 by Elenchus Research Associates (Ex. F3-1-4, Attachment 1, p. 23), OPG is proposing to
3 establish an asset service fee associated with the production of Cobalt-60 at Darlington that
4 would reduce OPG's nuclear revenue requirement. Details regarding such asset service fees
5 and OPG's cost allocation methodology can be found in Ex. F3-2-1 and Ex. F3-1-4,
6 respectively. The proposed fees are included as a reduction to the asset service fees shown
7 in Ex. F3-2-1, Table 2.

8 9 3.1.3 Tritium Sales

10 Tritium is a by-product of electricity generation using Canadian Deuterium Uranium ("CANDU")
11 technology. It is produced by the irradiation of heavy water. In order to stay within specified
12 limits, and to lower radiation exposure to workers and the environment, tritium is removed from
13 the heavy water via the TRF.

14
15 OPG has entered into short-term contracts to sell tritium to government-approved and licensed
16 organizations. Commercial use of tritium includes safety and security products like land-mine
17 markers and emergency exit signs, tritium labeled chemicals for medical research and
18 research into future power sources.

19
20 Tritium sales have been relatively stable over time, with some variation due to competition,
21 fluctuating demand and variations in the value of the Canadian dollar. Total revenues from
22 isotope sales over the period 2020-2031 are shown in Ex. G2-1-1, Table 1. After the sale of
23 the final harvest of Cobalt-60 from Pickering in 2027, the isotope revenues reflect forecast
24 tritium sales. The direct costs and other support costs are described in Section 4.0 below.

25
26 Helium-3 is a byproduct of tritium decay. Laurentis Energy Partners, an unregulated subsidiary
27 of OPG, is continuing to pursue investment in new technologies for the purpose of extracting
28 Helium-3 located at Darlington. New and innovative equipment is required for the extraction.
29 Neither such equipment, owned and funded by OPG's unregulated subsidiary, nor the
30 extraction process impact OPG's ability to generate electricity or sell tritium. The costs of the

² Decision and Order, EB-2020-0290, November 15, 2021, Schedule A, pp. 41-43.

1 equipment and the extraction are not included in OPG's rate base or revenue requirement.
2 OPG has an agreement in place with its subsidiary, supported by OPG's cost allocation
3 methodology, which ensures an appropriate attribution of associated operating costs to the
4 subsidiary.

6 **3.2. Heavy Water Sales and Processing**

7 Heavy water is a manufactured product required for CANDU reactor operations. Heavy water
8 is required as a moderator for sustaining nuclear reactions and as a heat transport medium in
9 CANDU nuclear reactors.

11 **3.2.1 Heavy Water Sales**

12 OPG previously sought opportunities to sell surplus quantities of heavy water from its heavy
13 water inventory. Surplus quantities are defined as those quantities of heavy water not required
14 to meet OPG's current and future needs (including contractual obligations to Bruce Power).
15 This surplus makes up the sales pool inventory.

17 Based on current assessment, the sales pool has zero inventory of non-tritiated heavy water
18 available for sale. As such, no commercial transactions of non-tritiated heavy water are
19 expected over the IR term. Planned total revenues for heavy water sales and processing over
20 the period 2020-2031 are shown in Ex. G2-1-1, Table 1.

22 **3.2.2 Heavy Water Processing**

23 Heavy water processing is primarily comprised of tritium removal (detritiation) at the TRF. The
24 bulk of the heavy water processing revenue is earned from the provision of detritiation services
25 to Bruce Power. Opportunities to provide detritiation services to others are limited because of
26 storage and capacity restrictions at the TRF. The TRF is reaching its design end of life and
27 OPG is undertaking the TRF Major Component Replacement Program, consisting of multiple
28 projects over six outages between 2026-2038 (Ex. D2-1-3, Section 3.1.3). The forecast of
29 heavy water processing over the IR term is based on TRF availability assumptions that take
30 into account this work. As a result, revenues fluctuate from year to year. Provision of detritiation
31 services is also affected by the ability to ship heavy water to the TRF.

1 On occasion, OPG is able to lease/loan and sell small quantities of heavy water to third parties;
2 revenues from these transactions are also recorded under heavy water processing as “heavy
3 water services”. Planned total revenues for heavy water sales and processing over the period
4 2020-2031 are shown in Ex. G2-1-1, Table 1. Cost of goods sold and other support costs are
5 described in Section 4.0 below.

6 7 **3.3 Ancillary Services**

8 OPG’s nuclear assets are able to supply the IESO with reactive support and voltage control
9 service (“RSVC”). Reactive support service allows the IESO to maintain the reactive power
10 levels required by the IESO-controlled grid. Voltage control service allows the IESO to maintain
11 the voltage levels required by the IESO-controlled grid.

12
13 OPG forecasts revenues for RSVC for 2027-2031 as per the terms of the agreement with the
14 IESO for RSVC Service effective for August 1, 2025-July 31, 2028. Under this agreement, for
15 the period starting in 2027, OPG will only earn revenue tied to production losses resulting from
16 provision of the RSVC service outside the standard capability range of the respective
17 resources. OPG does not expect any provision of RSVC service outside of the standard
18 capability range for the nuclear resources, and as such these revenues are set to zero for the
19 IR term.

20
21 While it is expected that the DNNP facilities will also be able to supply RSVC service, likewise
22 OPG does not expect any provision of RSVC service outside of the standard capability range,
23 and as such these revenues are set to zero for the IR term.

24
25 OPG’s nuclear ancillary revenues have been subject to the Ancillary Revenues Variance
26 Account – Nuclear Sub-Account. In view of the terms of the current RSVC agreement with the
27 IESO that is expected to result in no ancillary revenues from the nuclear resources and given
28 the relatively modest variance amounts historically settled through the sub-account, the
29 Application proposes to discontinue entries into the Ancillary Revenues Variance Account –
30 Nuclear Sub-Account as of the effective date of the payment amounts order in this proceeding.
31 This is further discussed in Ex. H1-1-1, Section 5.2.

4.0 OPERATING COSTS OF NUCLEAR NON-ENERGY BUSINESSES

The operating costs of OPG's nuclear non-energy business are made up of direct costs (costs directly associated with producing or generating the product or service) and other support costs (primarily labour costs associated with sales, administration and other overheads). The direct costs of the nuclear non-energy business are shown in Ex. G2-1-1, Table 1 on an aggregated basis and are discussed below. Other support costs continue to be included in Nuclear Base OM&A costs (Ex. F2-2-1, Table 1a, Operations and Project Support).

4.1 Cobalt-60 (Excluding Darlington)

The direct costs for Cobalt-60 production at Pickering include installation, removal, processing, storage, and packaging of Cobalt-60. Direct costs also include a cost item for the long-term storage of the spent (but still radioactive) Cobalt-60, as the third-party agreement provides for the return of the spent Cobalt-60 to OPG for storage as nuclear waste. Under the Amended and Restated Used Fuel Waste and Cobalt-60 Agreement between Bruce Power and OPG, OPG holds liability for the interim storage and future disposal of Bruce Power's spent Cobalt-60, and in return OPG receives payments from Bruce Power. The associated revenues are included in the Bruce Lease net revenues and are set out in Ex. G2-2-1, Table 2.

4.2 Tritium Sales

The direct costs for the tritium sales program are primarily Canadian Nuclear Laboratories' dispensing fees, packaging, and shipping costs. The product itself is a pure by-product of the detritiation process, and no production cost is attached to what is sold.

4.3 Heavy Water Sales

The direct costs for heavy water sales include labour for handling, testing, loading, unloading, and packaging, the cost of containers, and transportation costs. As discussed above, no such sales are anticipated over the IR term from the sales pool inventory.

4.4 Heavy Water Processing

Direct costs for heavy water processing services are for estimated incremental direct labour costs attached to processing heavy water for Bruce Power at the TRF and direct labour (e.g.,

- 1 handling, testing, packaging) and other costs (e.g., shipping) attached to the provision of other
- 2 services (e.g., loans, swaps, upgrading) to third parties.

Numbers may not add due to rounding.

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Exhibit G2

Tab 1

Schedule 1

Table 1

Table 1
Other Revenues - OPG Nuclear Facilities (\$M)

Line No.	Revenue Source	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)
	Non-energy Revenue:												
1	Heavy Water Sales & Processing	38.3	35.6	20.6	43.0	20.1							
2	Isotope Sales (Pickering Cobalt 60 + Tritium)	5.0	26.2	2.6	18.7	10.7							
3	Total Non-energy Revenues (line 1 + line 2)	43.3	61.8	23.2	61.7	30.8	49.6	42.9	16.4	43.5	24.4	23.8	34.5
4	Non-energy Direct Costs	7.1	6.4	11.0	12.4	11.4	10.5	10.3	10.1	10.8	10.6	10.3	10.9
5	Non-energy Contribution Margin (line 3 - line 4)	36.2	55.4	12.2	49.3	19.4	39.1	32.6	6.3	32.7	13.8	13.5	23.6
6	Ancillary Services	6.7	6.6	7.2	8.3	7.3	7.5	6.8	0.0	0.0	0.0	0.0	0.0
7	Total (line 5 + line 6)	42.9	62.0	19.4	57.6	26.7	46.6	39.4	6.3	32.7	13.8	13.5	23.6