Energy Probe Compendium

EB-2020-0290 OPG Oral Hearing

Table of Contents

Tab 1

EB-2020-0290 Decision on Issues List

DECISION ON ISSUES LIST
May 20, 2021

Small Modular Reactors (SMRs)

OPG has booked costs from 2020 and 2021 relating to SMRs in its Nuclear Development Variance Account (NDVA), yet OPG is not seeking any disposition of this account in the current proceeding. There was no agreement amongst parties as to whether SMR-related costs are an issue within the scope of this proceeding. As such, in the May 13 Letter, parties requested an OEB determination on whether SMR-related matters are in scope (or whether language describing the financial risks that are applicable to OPG related to SMR costs should be included in the Decision on Issues List).

AMPCO, VECC, OAPPA, QMA and Energy Probe all expressed concern regarding the amount of SMR-related costs recorded in the NDVA, with limited regulatory oversight or review. Parties also expressed concern about the quantum of SMR-related capital and non-capital costs that could potentially be incurred during the test period.

OPG objected and clarified that it was accepting the risks relating to SMR-related costs and that there is no requirement in O. Reg 53/05 that requires any of the expenditures to be pre-approved prior to booking in the NDVA. OPG took the position that SMR-related costs are being recorded in accordance with the scope of the account. Further, OPG stated that the balances would be subject to both a prudence review, and a review of whether the costs belong in the account at all, when OPG seeks disposition of such costs.

Findings

The OEB finds that SMR-related costs are within scope and subsumed within Issue 13.1 regarding the nature and type of costs recorded in DVAs and Issue 14.1 regarding OPG's annual RRR-type filings.

The OEB agrees with AMPCO that OPG raised the topic of SMR-related costs in its pre-filed evidence. OPG indicated that $272 million was to be recorded in the NDVA for expenses in 2020 and 2021.

The NDVA is addressed in O. Reg 53/05 and the account was approved as part of the EB-2007-0905 decision. However, there appears to be disagreement among parties regarding the appropriate use of the NDVA to record SMR-related costs.

This issue is before the OEB in this proceeding. There are financial risks to OPG's shareholder and ratepayers associated with ambiguity regarding an existing DVA. **The OEB will consider the narrow issue of whether OPG's SMR-related costs are consistent with the purpose of the NDVA and thereby appropriate to be booked in the account.**

Tab 2

Ontario Regulation 53/05

Sections 5.3 and 5.4

Ontario Energy Board Act, 1998
Loi de 1998 sur la Commission de l'énergie de l'Ontario

ONTARIO REGULATION 53/05

PAYMENTS UNDER SECTION 78.1 OF THE ACT

5.3 REVOKED: O. Reg. 312/13, s. 3.

Nuclear development variance account

5.4 (1) Ontario Power Generation Inc. shall establish a variance account in connection with section 78.1 of the Act that records, on and after the effective date of the Board's first order under section 78.1 of the Act, differences between actual non-capital costs incurred and firm financial commitments made and the amount included in payments made under that section for planning and preparation for the development of proposed new nuclear generation facilities. O. Reg. 27/08, s. 1.

(2) Ontario Power Generation Inc. shall record interest on the balance of the account as the Board may direct. O. Reg. 27/08, s. 1.

Tab 3

Ontario Regulation 27/08

ONTARIO REGULATION 27/08

made under the

ONTARIO ENERGY BOARD ACT, 1998

Made: February 13, 2008
Filed: February 19, 2008
Published on e-Laws: February 20, 2008
Printed in The Ontario Gazette: March 8, 2008

AMENDING O. REG. 53/05

(PAYMENTS UNDER SECTION 78.1 OF THE ACT)

1. Ontario Regulation 53/05 is amended by adding the following sections:

Nuclear development deferral account, transition

5.3 (1) Ontario Power Generation Inc. shall establish a deferral account in connection with section 78.1 of the Act that records, for the period up to the effective date of the Board's first order under section 78.1 of the Act, the costs incurred and firm financial commitments made on or after June 13, 2006, in the course of planning and preparation for the development of proposed new nuclear generation facilities that are associated with any one or more of the following activities:

1. Activities for carrying out an environmental assessment under the *Canadian Environmental Assessment Act.*
2. Activities for obtaining any governmental licence, authorization, permit or other approval.
3. Activities for carrying out a technology assessment or for defining all commercial and technical requirements to, or with, any third parties.

(2) Ontario Power Generation Inc. shall record simple interest on the monthly opening balance of the account at an annual rate of 6 per cent applied to the monthly opening balance in the account, compounded annually.

Nuclear development variance account

5.4 (1) Ontario Power Generation Inc. shall establish a variance account in connection with section 78.1 of the Act that records, on and after the effective date of the Board's first order under section 78.1 of the Act, differences between actual non-capital costs incurred and firm financial commitments made and the amount included in payments made under that section for planning and preparation for the development of proposed new nuclear generation facilities.

(2) Ontario Power Generation Inc. shall record interest on the balance of the account as the Board may direct.

2. Subsection 6 (2) of the Regulation is amended by adding the following paragraphs:

4.1 The Board shall ensure that Ontario Power Generation Inc. recovers the costs incurred and firm financial commitments made in the course of planning and preparation for the development of proposed new nuclear generation facilities, to the extent the Board is satisfied that,

i. the costs were prudently incurred, and

ii. the financial commitments were prudently made.

. . . . .

7.1 The Board shall ensure the balances recorded in the deferral account established under subsection 5.3 (1) and the variance account established under subsection 5.4 (1) are recovered on a straight line basis over a period not to exceed three years, to the extent the Board is satisfied that,

i. the costs were prudently incurred, and

ii. the financial commitments were prudently made.

3. This Regulation comes into force on the day it is filed.

Tab 4

Exhibit A, Tab 2, Schedule 1, Attachment 1, excerpt

OPG expects SMRs to be a key element of the energy sector, and the Province's, efforts to support decarbonization. As Canada's largest nuclear operator with extensive experience and a strong safety record, OPG is well-positioned to advance and secure acceptance of both grid-scale and off-grid SMRs across Canada and beyond. To that end, in 2020, OPG formed a joint venture with Ultra Safe Nuclear Corporation and the Global First Power, with the goal of developing a proposed Micro Modular Reactor™ SMR at the Chalk River Laboratories site. The joint venture is the first commercial partnership on the development of an SMR in Canada and can serve as a model for future off-grid SMR projects. The plan allocates noncapital expenditures of•••• toward OPG's portion of funding for this demonstrator reactor.

Additionally, OPG is progressing preliminary planning phase work for grid-scale SMR development in Ontario and the renewal of the site preparation licence for the Darlington New Nuclear site, which can accommodate SMRs. In collaboration with other major utilities, OPG recently concluded a due diligence process and is working to advance engineering and design work with three grid-scale SMR developers. Subject to the OEB's approval, the preliminary planning phase costs are recoverable in the future through an authorized regulatory account. Prior to finalizing plans to proceed with grid-scale SMR development beyond the preliminary planning phase, OPG will seek approval from the Board and concurrence from the Province. The plan does not reflect project development expenditures or resource requirements beyond the preliminary planning phase.

Tab 5

Excerpt from June 2021 report by World Nuclear Association. The report is not paginated so page numbers are not available. The following section is at the beginning of the report. The link to the entire report is below.

https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx

WORLD NUCLEAR ASSOCIATION

Small Nuclear Power Reactors

(Updated June 2021)

- **There is strong interest in small and simpler units for generating electricity from nuclear power, and for process heat.**
- **This interest in small and medium nuclear power reactors is driven both by a desire to reduce the impact of capital costs and to provide power away from large grid systems.**
- **The technologies involved are numerous and very diverse.**

As nuclear power generation has become established since the 1950s, the size of reactor units has grown from 60 MWe to more than 1600 MWe, with corresponding economies of scale in operation. At the same time there have been many hundreds of smaller power reactors built for naval use (up to 190 MW thermal) and as neutron sources[a], yielding enormous expertize in the engineering of small power units. The International Atomic Energy Agency (IAEA) defines 'small' as under 300 MWe, and up to about 700 MWe as 'medium' – including many operational units from the 20th century. Together they have been referred to by the IAEA as small and medium reactors (SMRs). However, 'SMR' is used more commonly as an acronym for 'small modular reactor', designed for serial construction and collectively to comprise a large nuclear power plant. (In this information page the use of diverse pre-fabricated modules to expedite the construction of a single large reactor is not relevant.) A subcategory of very small reactors – vSMRs – is proposed for units under about 15 MWe, especially for remote communities.

Small modular reactors (SMRs) are defined as nuclear reactors generally 300 MWe equivalent or less, designed with modular technology using module factory fabrication, pursuing economies of series production and short construction times. This definition, from the World Nuclear Association, is closely based on those from the IAEA and the US Nuclear Energy Institute. Some of the already-operating small reactors mentioned or tabulated below do not fit this definition, but most of those described do fit it. PWR types may have integral steam generators, in which case the reactor pressure vessel needs to be larger, limiting

portability from factory to site. Hence many larger PWRs such as the Rolls-Royce UK SMR have external steam generators.

This information page focuses on advanced designs in the small category, *i.e*. those now being built for the first time or still on the drawing board, and some larger ones which are outside the mainstream categories dealt with in the Advanced Nuclear Power Reactors page. Some of the designs described here are not yet actually taking shape, others are operating or under construction. Four main options are being pursued: light water reactors, fast neutron reactors, graphite-moderated high temperature reactors and various kinds of molten salt reactors (MSRs). The first has the lowest technological risk, but the second (FNR) can be smaller, simpler and with longer operation before refuelling. Some MSRs are fast-spectrum.

Today, due partly to the high capital cost of large power reactors generating electricity via the steam cycle and partly to the need to service small electricity grids under about 4 GWe,[b] there is a move to develop smaller units. These may be built independently or as modules in a larger complex, with capacity added incrementally as required (see section below on Modular construction using small reactor units). Economies of scale are envisaged due to the numbers produced. There are also moves to develop independent small units for remote sites. Small units are seen as a much more manageable investment than big ones whose cost often rivals the capitalization of the utilities concerned.

An additional reason for interest in SMRs is that they can more readily slot into brownfield sites in place of decommissioned coal-fired plants, the units of which are seldom very large – more than 90% are under 500 MWe, and some are under 50 MWe. In the USA coal-fired units retired over 2010-12 averaged 97 MWe, and those expected to retire over 2015-25 average 145 MWe.

SMR development is proceeding in Western countries with a lot of private investment, including small companies. The involvement of these new investors indicates a profound shift taking place from government-led and -funded nuclear R&D to that led by the private sector and people with strong entrepreneurial goals, often linked to a social purpose. That purpose is often deployment of affordable clean energy, without carbon dioxide emissions.

Tab 6

Second excerpt from June 2021 report by World Nuclear Association. The report is not paginated so page numbers are not available. The following section is in the first quarter of the report. The link to the entire report is below.

https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx

Canadian support for SMRs

A June 2016 report for the Ontario Ministry of Energy focused on nine designs under 25 MWe for off-grid remote sites. All had a medium level of technology readiness and were expected to be competitive against diesel. Two designs were integral PWRs of 6.4 and 9 MWe, three were HTRs of 5, 8 and 16 MWe, two were sodium-cooled fast reactors (SFRs) of 1.5/2.8 and 10 MWe, one was a lead-cooled fast reactor (LFR) of 3-10 MWe, and one was an MSR of 32.5 MWe. Four were under 5 MWe (an SFR, LFR, and two HTRs). Ontario distinguishes 'grid scale' SMRs above 25 MWe from these (very) small-scale reactors.

The Canadian Nuclear Safety Commission (CNSC) has been conducting pre-licensing vendor design reviews – an optional service to assess a nuclear power plant design based on a vendor's reactor technology – for ten* small reactors with capacities in the range of 3-300 MWe. Two further agreements for design review are being negotiated for StarCore's HTR and Westinghouse's eVinci. In May 2021 it commenced a formal licence review of the 15 MWt MMR-5 for Global First Power (a joint venture between Ultra Safe Nuclear Corporation and Ontario Power Generation).

* Terrestrial Energy's IMSR; USNC's MMR-5 and MMR-10; LeadCold Nuclear's SEALER; ARC Nuclear's ARC-100; Moltex's Stable Salt Reactor; SMR's SMR-160; NuScale's Power Module; U-Battery's U-Battery, GE Hitachi's BWRX-300; X-energy's Xe-100.

In June 2017 Canadian Nuclear Laboratories (CNL) invited expressions of interest in SMRs. This resulted in many responses, including 19 for siting a demonstration or prototype reactor at a CNL-managed site. CNL aims to have a new SMR at its Chalk River site by 2026. Global First Power with its partners Ontario Power Generation and Ultra-Safe Nuclear Corporation was the first to get to the third stage of CNL's siting evaluation, with its MMR, a 5 MWe HTR. In February 2019 CNL announced that StarCore Nuclear and Terrestrial Energy had qualified to enter the due diligence (second) stage of its siting evaluation for their 14 MWe HTR and 195 MWe IMSR respectively.

In November 2019 CNL announced that Kairos Power, Moltex Canada, Terrestrial Energy and Ultra Safe Nuclear Corporation (USNC) had been selected as the first recipients of support

under its Canadian Nuclear Research Initiative (CNRI). This is designed to accelerate SMR deployment by enabling research and development on particular projects and connecting global vendors of SMR technology with the facilities and expertise within Canada's national nuclear laboratories. Recipients are expected to match the value contributed by CNL either in monetary or in-kind contributions.

In November 2018 the Canadian government released its SMR Roadmap, a 10-month nationwide study of SMR technology. The report concludes that Generation IV SMR development is a response to market forces for "smaller, simpler and cheaper" nuclear energy, and the large global market for this technology will be "driven not just by climate change and clean energy policies, but also by the imperatives of energy security and access." In October 2020 the Minister for Innovation, Science & Industry announced a C$20 million investment in Terrestrial Energy to accelerate development of its Integral Molten Salt Reactor (IMSR), the first grant from Canada's Strategic Innovation Fund.

In December 2019 Saskatchewan and New Brunswick agreed to work with Ontario in promoting SMRs to "unlock economic potential across Canada, including rural and remote regions" in line with the national SMR Roadmap. In August 2020 Alberta joined in, flagging the potential for SMRs to be used for the province's northern oil sands industry. The agreement is to also address key issues for SMR deployment including technological readiness, regulatory frameworks, economics and financing, nuclear waste management and public and indigenous engagement. In 2021 Alberta's largest oil sands producers formed an alliance to consider ways to achieve net zero greenhouse gas emissions by 2050, with SMRs being part of the means.

In October 2020 Ontario Power Generation (OPG) announced that it would take forward engineering and design work with three developers of grid-scale SMRs – GE Hitachi (GEH), Terrestrial Energy and X-energy – to support remote area energy needs. The focus is on GEH's 300 MWe BWRX-300, Terrestrial's 192 MWe Integral Molten Salt Reactor, and X-energy's 80 MWe Xe-100 high-temperature SMRs. All three are in phase 2 of the CNSC's vendor design review process. GEH is setting up a Canadian supply chain for its BWRX-300.

In November 2020 New Brunswick Power and Moltex Energy were joined by ARC Canada in setting up an SMR vendor cluster at Point Lepreau, and in March 2021 the Canadian government announced C$56 million support for this, mostly for the Moltex Stable Salt Reactor – Wasteburner (SSR-W) project.

Tab 7

Third excerpt from June 2021 report by World Nuclear Association. The report is not paginated so page numbers are not available. The following table is in the first quarter of the report. The link to the entire report is below.

https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx

Small reactors operating

Name	Capacity	Type	Developer
CNP-300	300 MWe	PWR	SNERDI/CNNC, Pakistan & China
PHWR-220	220 MWe	PHWR	NPCIL, India
EGP-6	11 MWe	LWGR	at Bilibino, Siberia (cogen, soon to retire)
KLT-40S	35 MWe	PWR	OKBM, Russia
RITM-200	50 MWe	Integral PWR, civil marine	OKBM, Russia

Small reactor designs under construction

Name	Capacity	Type	Developer
CAREM25	27 MWe	Integral PWR	CNEA & INVAP, Argentina
HTR-PM	210 MWe	Twin HTR	INET, CNEC & Huaneng, China
ACP100/Linglong One	125 MWe	Integral PWR	CNNC, China
BREST	300 MWe	Lead FNR	RDIPE, Russia

Small reactors for near-term deployment – development well advanced

Name	Capacity	Type	Developer
VBER-300	300 MWe	PWR	OKBM, Russia
NuScale	77 MWe	Integral PWR	NuScale Power + Fluor, USA
SMR-160	160 MWe	PWR	Holtec, USA + SNC-Lavalin, Canada
SMART	100 MWe	Integral PWR	KAERI, South Korea
BWRX-300	300 MWe	BWR	GE Hitachi, USA
PRISM	311 MWe	Sodium FNR	GE Hitachi, USA
Natrium	345 MWe	Sodium FNR	TerraPower + GE Hitachi, USA
ARC-100	100 MWe	Sodium FNR	ARC with GE Hitachi, USA
Integral MSR	192 MWe	MSR	Terrestrial Energy, Canada
Seaborg CMSR	100 MWe	MSR	Seaborg, Denmark
Hermes prototype	<50 MWt	MSR-Triso	Kairos, USA
RITM-200M	50 MWe	Integral PWR	OKBM, Russia
BANDI-60S	60 MWe	PWR	Kepco, South Korea
Xe-100	80 MWe	HTR	X-energy, USA
ACPR50S	60 MWe	PWR	CGN, China
Moltex SSR-W	300 MWe	MSR	Moltex, UK

Small reactor designs at earlier stages (or shelved)

Name	Capacity	Type	Developer
EM2	240 MWe	HTR, FNR	General Atomics (USA)
FMR	50 MWe	HTR, FNR	General Atomics + Framatome
VK-300	300 MWe	BWR	NIKIET, Russia
AHWR-300 LEU	300 MWe	PHWR	BARC, India
CAP200 LandStar-V	220 MWe	PWR	SNERDI/SPIC, China
SNP350	350 MWe	PWR	SNERDI, China
ACPR100	140 MWe	Integral PWR	CGN, China
IMR	350 MWe	Integral PWR	Mitsubishi Heavy Ind, Japan*
Westinghouse SMR	225 MWe	Integral PWR	Westinghouse, USA*
mPower	195 MWe	Integral PWR	BWXT, USA*
UK SMR	470 MWe	PWR	Rolls-Royce, UK
PBMR	165 MWe	HTR	PBMR, South Africa*
HTMR-100	35 MWe	HTR	HTMR Ltd, South Africa
MCFR	large?	MSR/FNR	Southern Co, TerraPower, USA
SVBR-100	100 MWe	Lead-Bi FNR	AKME-Engineering, Russia*
Westinghouse LFR	300 MWe	Lead FNR	Westinghouse, USA
TMSR-SF	100 MWt	MSR	SINAP, China
PB-FHR	100 MWe	MSR	UC Berkeley, USA
Moltex SSR-U	150 MWe	MSR/FNR	Moltex, UK
Thorcon TMSR	250 MWe	MSR	Martingale, USA
Leadir-PS100	36 MWe	Lead-cooled	Northern Nuclear, Canada

Very small reactor designs being developed (up to 25 MWe)

Name	Capacity	Type	Developer
U-battery	4 MWe	HTR	Urenco-led consortium, UK
Starcore	10-20 MWe	HTR	Starcore, Quebec
MMR-5/-10	5 or 10 MWe	HTR	UltraSafe Nuclear, USA
Holos Quad	3-13 MWe	HTR	HolosGen, USA
Gen4 module	25 MWe	Lead-bismuth FNR	Gen4 (Hyperion), USA
Xe-Mobile	1-5 MWe	HTR	X-energy, USA
BANR	50 MWt	HTR	BWXT, USA

Name	Capacity	Type	Developer
Sealer	3-10 MWe	Lead FNR	LeadCold, Sweden
eVinci	0.2-5 MWe	Heatpipe FNR	Westinghouse, USA
Aurora	1.5 MWe	Heatpipe FNR	Oklo, USA
NuScale micro	1-10 MWe	Heatpipe	NuScale, USA

Tab 8

Sections of an SMR report on OPG Website.

https://www.opg.com/documents/smr-economic-feasibility-and-cost-benefit-study-for-remote-mining/

Small Modular Reactor (SMR) Economic Feasibility and Cost-Benefit Study for Remote Mining in the Canadian North: A Case Study

Prepared by:

François Caron and Luckny Zephyr, for MIRARCO

Megan Moore and Pronnapa Sanongboon, for CNL

Ashlea Colton on behalf of Megan Moore

David Zekveld, for OPG

Reviewed by:

Jennifer Abols, MIRARCO

Ali Siddiqui, CNL

Chris Deir, OPG

April 14, 2021

Summary of the Terms of Reference

The Canadian mining industry is well suited for deployment of very Small Modular Reactors (vSMRs) as a cost effective means for electricity and heat production while meeting climate change objectives. Typical energy demand (heat and electricity) for Canadian mineral mines are well aligned with the capacity of vSMRs. This research project identifies the specific electrical and thermal requirements of a representative mine site to evaluate the economic competitiveness of vSMR deployment under four scenarios: 1) diesel generators only; 2) vSMRs only; 3) vSMRs and diesel generators; and 4) vSMRs, diesel generators, wind turbines and battery energy storage.

The goal of this project is to determine vSMR requirements (e.g., electricity and heat demand curves / seasonality, life of mine) from the perspective of a mining company that operates in the far North (Arctic climate). The analysis has been performed by a team of nuclear and mining industry experts, including:

MIRARCO – Prepared and analyzed an economic model of the four energy scenarios at the mine site leveraging knowledge of the Canadian mining and nuclear industries;

Canadian Nuclear Laboratories (CNL) – Provided vSMR technical expertise and analyzed the four energy scenarios using the CNL proprietary Hybrid Energy System Optimization model to determine optimum mix of energy assets on site based on hourly energy demand and technology specifications/operating limits;

Ontario Power Generation – Provided nuclear operator insights, vendor cost data and weather corrected hourly thermal and electricity load data from the mine site, and reviewed analysis results; and,

Mining Partner – Provided mine operator insight and thermal and electricity data from the representative arctic mine site.

All data in this study is protected under the terms of the "Collaborative Research Agreement Regarding Mining and Small Modular Reactors Agreement no. CRA20200116" executed by July 15, 2020 by all four parties.

Tab 9

Exhibit H1, Tab 1, Schedule 1, Page 31

5.15 Nuclear Development Variance Account

The Nuclear Development Variance Account was established in accordance with Section 5.4 of O. Reg. 53/05. The account was originally approved in EB-2007-0905 and has been approved in all subsequent OPG applications. This account records variances between the actual non-capital costs incurred and firm financial commitments made in the course of planning and preparation for the development of proposed new nuclear generation facilities and those forecast costs and firm financial commitments reflected in the revenue requirement approved by the OEB.

The variance recorded in the account is calculated as between actual eligible non-capital costs and firm financial commitments and such forecast amounts reflected in the corresponding annual nuclear revenue requirement approved by the OEB. OPG proposes to continue this method of determining additions to the account as of the effective date of the payment amounts order in this proceeding.49

During 2018 and 2019, OPG continued to incur costs to maintain the license granted by the Canadian Nuclear Safety Commission, which preserves the option of considering Nuclear New Build in the future. For 2018 and 2019, these costs were higher than the forecast amounts reflected in the revenue requirements approved in EB-2016-0152, which resulted in debit entries of $1.0M in 2018 and $3.3M in 2019. Additionally, OPG incurred costs of $0.7M in 2018 and 2019 related to preliminary planning and preparation activities for an SMR generating station at the Darlington site that were recorded in the account. The derivations of the additions to the account for 2018 and 2019 is shown in Ex. H1-1-1, Table 10.

Tab 10

Exhibit F2, Tab 8, Schedule 1

NEW NUCLEAR AT DARLINGTON

1.0 PURPOSE

This evidence presents an overview of the activities and expenditures associated with New Nuclear at Darlington which includes work being undertaken at the Darlington site related to the planning and preparation for a new technology known as a Small Modular Reactor ("SMR").

2.0 OVERVIEW

OPG's nuclear revenue requirement for the IR term includes costs to preserve the option to build new nuclear generation at the Darlington site. This is consistent with prior government direction that OPG should continue with the environmental process and site licencing process given long lead times for nuclear procurement and construction.[1] OPG is seeking approval of annual OM&A costs of $2.2M, $2.2M, $2.3M, $2.3M, and $2.3M for the years 2022-2026, respectively, as presented in Ex. F2-1-1, Table 1. The forecast OM&A costs during the IR term are for work to preserve the option to build new nuclear at Darlington, and do not assume development of an SMR generating station, pending the investment decision on the project. Any differences between these forecasts and OPG's actual non-capital OM&A costs will be recorded in the Nuclear Development Variance Account ("NDVA"), in accordance with O. Reg. 53/05.[2]

In addition, OPG's 2020-2026 Business Plan is forecasting OM&A expenses of $66M in 2020 and $206M in 2021 for preliminary planning and preparation expenditures for an SMR generating station at the Darlington site. There was no forecast of planning and preparation expenditures for the development of an SMR included in EB-2016-0156. OPG will record the preliminary planning and preparation amounts in 2020 and 2021 related to the SMR project in the NVDA.

[1] EB-2016-0152, Ex. L-6.01-7 ED-017 and EB-2013-0321, Ex. D2-2-1, Attachment 1.
[2] The NDVA is discussed in Ex. H1-1-1.

Virtually all OM&A costs incurred prior to 2020 were to preserve the option to develop new nuclear at Darlington.[3] This included maintaining the environmental assessment for site license renewal and advancing a number of environmental assessment commitments necessary to be ready for eventual site preparation. These preservation and licensing activities continue, and their costs are included in the $272M in SMR planning and preparation costs in 2020 and 2021 described above.

Section 3.0 below provides a brief overview of the SMR project.

3.0 SMR PROJECT

SMRs are next generation nuclear reactors designed to have enhanced safety and economic benefits. Specifically, SMRs are smaller in both physical size and output than previous generations, modular in construction to enable shorter construction timeframes, and virtually emissions free. Small Modular Reactors are expected to have designed-in safety characteristics incorporating the learnings from the Fukushima events, to substantially reduce potential for off-site consequences from a nuclear accident and thus improve public confidence and social license. These attributes make SMRs extremely safe and quicker to build than traditional reactors, while providing the reliable baseload generation capability of other reactors.

Subject to approvals from the Canadian Nuclear Safety Commission ("CNSC"), OPG is planning to construct an SMR nuclear generating station at the Darlington site with a projected in-service by the end of this decade, meeting anticipated energy and capacity needs in Ontario with a clean energy source. Adding incremental, baseload, non-CO_2 emitting generation capability by 2030 will allow the system to meet the expected increased demand largely driven by modest growth in the residential, commercial and agricultural sectors, as well as the increased electrification of transportation. An SMR will also help to address projected summer capacity needs arising after the planned shutdown of the Pickering generation station and

[3] OPG incurred total costs of $0.7M in 2018 and 2019 related to preliminary planning and preparation activities for an SMR generating station at the Darlington site that were recorded in the NDVA. As discussed in Ex. H1-2-1, OPG is not seeking clearance of this amount in this application.

replace some of the baseload generation previously provided by Pickering. The need to begin this process now reflects the lead-time required to meet the projected in-service target.

The provinces of Ontario, New Brunswick, and Saskatchewan signed a Memorandum of Understanding ("MOU") in 2019 committing to collaborate on the development and deployment of SMRs in Canada.[4] Small Modular Reactors are seen as a source of safe, clean, reliable and low-cost energy for both on-grid and off-grid communities, driving economic growth and export opportunities across the country and around the world. OPG and the Province of Ontario are uniquely positioned to lead the emerging worldwide market for clean, zero-carbon SMRs. This opportunity presents economic benefits for the province's nuclear industry, creating jobs and supporting the retention of advanced manufacturing; while simultaneously meeting the province's capacity and energy needs.

The initial planning and preparation phase of SMR development includes the following tasks: 1) select a technology developer, 2) prepare for a construction license application, 3) develop the necessary project and engineering organizations, and 4) obtain more certainty on project costs, as outlined below, by the end of 2021. Progress on these activities will enable a decision whether to proceed with the next phase gated releases in order to meet an in-service date by the end of the decade.

More detail on the extensive and interconnected activities to be undertaken during the 2020-2021 period is provided below:

- Technology Developer Selection: There are many different SMR technology developers in the market currently. The first objective of this phase was to narrow the pool of potential technology partners to two or three SMR technology developers and determine which developers would provide the greatest overall benefit to Ontario. As of September 2020, this objective was completed. The next objective is to conduct further due diligence and

[4] On August 12, 2020 the Province of Alberta entered into the MOU with Ontario, Saskatchewan and New Brunswick to support the development of SMRs.

development work in order to arrive at a single technology developer by the end of 2021. OPG will fund activities to advance development and produce the necessary information for OPG to make a final technology partner selection. OPG forecasts that the cost of these activities and the preparation of a Class 5 cost estimate and project schedule will be approximately $190M.

- Licensing: OPG has an approved environmental assessment and holds a 10-year Site Preparation Licence ("SPL") for the Darlington site, which was issued in 2012 and expires in August 2022. The licence allows OPG to undertake site preparation activities required for new nuclear generation and is the first in a series of licences required in order to construct and operate any new reactor. The Licence to Construct ("LTC") is the second licence required, and an application for this licence would need to be submitted during the second quarter of 2022 in order to maintain the option of starting construction by the middle of the decade. On June 30, 2020 OPG submitted an application to the CNSC to renew and extend the existing Darlington SPL to ensure an SPL is in effect until such time as an LTC is approved. This recent SPL renewal application is more advanced and costly than the prior application as the preparation work moves from the option maintenance phase to actual development of the site. At the same time, significant effort is required for OPG to prepare the LTC application, which forms a material portion of the licensing costs. The estimated cost of licensing activities is approximately $20M.

- Project Development and Oversight: As owner of the SMR, OPG will manage the project and provide oversight. This includes developing a framework to address:

  - project management approach and governance;
  - project controls to ensure effective oversight of external parties (technology developer, engineering, procurement and construction contractor, etc.);
  - cost and scheduling; and
  - development of nuclear support functions.

Other activities will include preliminary engineering assessments of proposed developers' designs. The estimated cost of these initial planning activities is approximately $62M.

The activities described above are key components to developing a Class 5 estimate by November 2021 upon which an investment decision can be made for continued project development work, leading to an application for a LTC.

Tab 11

EB-2020-0290 Exhibit L, F2-08-Staff-247

Board Staff Interrogatory #247

Interrogatory

Reference:
Exhibit F2 / Tab 8 / Schedule 1 / p. 1

Preamble:

OPG noted that its revenue requirement for the 2022-2026 Custom IR term includes costs to preserve the option to build new nuclear generation at the Darlington NGS. This is consistent with prior government direction that OPG should continue with the environmental process and site licensing process given long lead times for nuclear procurement and construction.

OPG noted that it is seeking approval of annual OM&A costs of $2.2 million, $2.2 million, $2.3 million, $2.3 million, and $2.3 million for the years 2022-2026. OPG further stated that the forecast OM&A costs during the Custom IR term are for work to preserve the option to build new nuclear at Darlington NGS, and do not assume development of a Small Modular Reactor (SMR) generating station, pending the investment decision on the project.

Question(s):

a) Please provide a copy of the government direction referenced for the record of this proceeding.

b) For the same category of costs as requested in the current proceeding (i.e. preserving option to build new nuclear at Darlington NGS excluding any SMR-related costs), please provide the actual / estimated and OEB-approved amounts for the 2017-2021 Custom IR term. Please discuss any variances.

Response

a) The 2013 Long Term Energy Plan[1] provided direction to OPG to maintain the necessary approvals should future construction of new reactors at Darlington be required, as follows:

> Ontario continues to have the option to build new nuclear reactors in the future, should the supply and demand

[1] 2013 Long Term Energy Plan, Archived - 2013 Long-Term Energy Plan (ontario.ca)

> picture in the province change over time. The ministry will work with OPG to maintain the licence granted by the Canadian Nuclear Safety Commission, to keep open the option of considering new build in the future (p. 29).

The Province of Ontario has since approved OPG's business plans, which include these costs.

b) Chart 1 below provides the actual and estimated costs for preserving the option to build new nuclear at the Darlington site for 2017 to 2020, and the forecast costs for 2022-2026.

Chart 1 – Darlington New Nuclear OM&A

2017 OEB Approved	2018 OEB Approved	2019 OEB Approved	2020 OEB Approved	2021 OEB Approved
2.3	1.4	1.7	1.8	1.8
2017 Actual	**2018 Actual**	**2019 Actual**	**2020 Actual**	**2021 Budget**
0.7	2.4	4.3	5.7	5.0

Costs incurred in the 2017-2020 period and forecast for 2021 are for maintaining the existing approved Environmental Assessment and CNSC site preparation licence; and the development and submission of an application to renew the site preparation licence which will expire in August 2022. Variances are explained below.

2017 – The actual cost is lower than the EB-2016-0152 forecast based on a revised projection from the CNSC for the cost of the site preparation licence, and the cancelation of construction of an artificial nesting habitat for bank swallows when the location became unavailable.

2018 – The actual cost is higher than the EB-2016-0152 forecast as OPG investigated opportunities to accelerate the renewal of the site preparation licence in order to ensure the licence renewal timeline for 2022 would be met. This work included mobilizing staff and contractors, completing the Darlington New Nuclear Licence Mid-term Report required by the CNSC, and preparation for public review of the report. In addition, two alternative potential sites for bank swallows habitat testing were assessed.

2019 – The actual cost is higher than the EB-2016-0152 forecast as additional work was required to update the EA to reflect new baseline data, and update program documentation for current codes and standards to support the renewal of the CNSC site preparation licence.

2020 – The actual cost is higher than the EB-2016-0152 forecast due to a CNSC Licence renewal application that was filed in June 2020. The 2020 spending covers the staffing and expenses necessary to perform that work.

2021 – The projected higher spending is to prepare for the CNSC site preparation licence renewal hearing planned for June 2021.

Tab 12

EB-2020-0290 Exhibit L, F2-08-Staff-248

Board Staff Interrogatory #248

Interrogatory

Reference:
Exhibit F2 / Tab 8 / Schedule 1 / pp. 1, 3-5

Preamble:

OPG forecasted OM&A expenses of $66 million in 2020 and $206 million in 2021 for preliminary planning and preparation expenditures for an SMR generating station at Darlington NGS. There was no forecast of planning and preparation expenditures for the development of an SMR included in OPG's 2017-2021 Payment Amounts Proceeding. OPG stated that it will record the preliminary planning and preparation amounts in 2020 and 2021 related to the SMR project in the NDVA.

Question(s):

a) Please file the Memorandum of Understanding signed by the Government of Ontario with respect to the development of SMRs in Canada.

b) Please confirm that the total estimated costs of the preliminary planning and preparation expenditures of $272 million are broken down as follows: (i) Technology Developer Selection - $190 million; (ii) Licensing - $20 million; and (iii) Project Development and Oversight - $62 million.

c) Please confirm that if OPG's investment decision is to not go forward with the construction of an SMR generating station that it will write-off the amounts recorded in the NDVA related to the preliminary planning and preparation work (and not seek recovery of these amounts from ratepayers).

Response

a) See Attachment 1.

b) Confirmed.

c) Not confirmed. OPG expects to seek recovery of all prudently incurred costs related to preliminary planning and preparation activities for an SMR generating station at the Darlington site, irrespective of whether the project ultimately proceeds to construction. As discussed in Ex. F2-8-1, OPG will record these costs in the Nuclear Development Variance Account ("NDVA") pursuant to O. Reg. 53/05, section 5.4 (1) and seek their recovery in a future proceeding.

Tab 13

EB-2020-0290 Exhibit L, F2-08-Staff-248 Attachment

COLLABORATION MEMORANDUM OF UNDERSTANDING

THIS COLLABORATION MEMORANDUM OF UNDERSTANDING ("MOU") is made as of December 1, 2019 (the **"Effective Date")**

BETWEEN:

THE PROVINCE OF NEW BRUNSWICK

- and -

THE PROVINCE OF ONTARIO

- and -

THE PROVINCE OF SASKATCHEWAN

The Provinces of New Brunswick, Ontario and Saskatchewan are hereinafter referred to as the "Parties".

WHEREAS Nuclear is a cost-effective, reliable and non-carbon emitting form of energy;

AND WHEREAS Small Modular Reactor (SMR) technology is the next generation of innovative, versatile and scalable nuclear reactors that promise to further enhance the safety, economic and environmental benefits of nuclear energy;

AND WHEREAS the Parties were instrumental in the development of *"A Call to Action: A Canadian Roadmap for Small Modular Reactors"*, referred to as the "Canadian SMR Roadmap" (found at: http://smrroadmap.ca/);

AND WHEREAS Canada is a "Tier 1" nuclear nation with a full-spectrum nuclear industry that has a limited window of opportunity to lock in the significant strategic, economic and environmental benefits in this area of high-tech innovation by becoming one of the first-movers on SMR deployment;

AND WHEREAS the Parties are home to most of Canada's world-renowned nuclear industry and are interested in the introduction of SMRs in their respective territories.

NOW THEREFORE, in consideration of the mutual covenants contained herein, the Parties hereby agree as follows:

PURPOSE AND SCOPE OF MOU

1.0 **Non-Binding MOU.** This MOU is intended to constitute an expression and mutual understanding of the Parties' willingness to work collaboratively in support of the development and deployment of SMRs. None of the Parties intend this MOU will create any legally binding or enforceable rights or obligations, with the exception of **Sections 4.1, 5.1, 5.2, 5.8** (the **"Binding Provisions"),** which are binding and enforceable.

COMMITMENTS OF THE PARTIES

2.0 **Commitments.** The Parties commit to the following:

(a) To work co-operatively to advance the development and deployment of SMRs to address the needs of New Brunswick, Ontario and Saskatchewan with regards to addressing climate change, regional energy demand, economic development (e.g., supply chain, fuel manufacture, skilled employment and export opportunities) and research and innovation opportunities;

(b) To work co-operatively to address key issues for SMR deployment including technological readiness, regulatory frameworks, economics and financing, nuclear waste management and public and Indigenous engagement;

(c) To work co-operatively to positively influence the federal government to provide a clear unambiguous statement that nuclear energy is a clean technology and is required as part of the climate change solution;

(d) To work co-operatively to positively influence the federal government to provide support for SMRs identified in the Canadian SMR Roadmap and as requested by the Chief Executive Officers (CEOs) of Ontario Power Generation (OPG), Bruce Power, New Brunswick Power Corporation (NB Power) and SaskPower;

(e) To work co-operatively to positively influence the federal government to make changes as necessary to facilitate the introduction of SMRs;

(f) To work co-operatively to inform the public about the economic and environmental benefits of nuclear energy and SMRs; and

(g) To work co-operatively to engage with other interested provinces and territories to explore the potential for SMR deployment in their jurisdictions.

3.0 PROCEDURAL FRAMEWORK

3.1 The Parties direct their respective ministries ("Energy Ministries") to undertake the following:

(a) The three Energy Ministries will hold a meeting in the January 2020 - March 2020 timeframe ("Winter Meeting") to discuss strategies that will best advance the development and deployment of SMRs, including engagement with the nuclear regulator, nuclear operators, supply chain companies, academic and research experts, technology vendors and the Federal Government.

(b) By Summer 2020, informed by the Winter Meeting, the three Energy Ministries in cooperation with the respective CEOs of OPG, Bruce Power, NB Power and SaskPower will prepare a feasibility report, including a business case for the development and deployment of SMRs in their jurisdictions.

(c) By Fall 2020, the three Energy Ministries will develop a strategic plan for deployment of SMRs, including market opportunities across Canada and globally, based on the outcomes of the Winter Meeting, and report back to their respective Premiers on next steps.

4.0 TERM AND TERMINATION

4.1 The term of this MOU commences on the Effective Date and will terminate upon the first to occur of:

(a) termination by mutual written agreement of the Parties;

(b) 18 months after the Effective Date, unless extended by mutual written agreement of the Parties.

5.0 MISCELLANEOUS

5.1 **Intellectual Property.** No licence or other rights of or in the intellectual property of any Party are granted by any Party in connection with this MOU.

5.2 **Assignment.** Neither this MOU nor any of the rights, entitlements, duties or obligations arising from it may be assigned in whole or in part by any Party without the prior written consent of the other Parties.

5.3 **Notices.** Any notice given by a Party to another Party or the other Parties shall be in writing and (a) delivered personally, or (b) sent by facsimile or other similar means of electronic communication to the other Party or Parties at the following respective address:

If to the Province of New Brunswick:

Department of Natural Resources and Energy Development
Hugh John Flemming Forestry Centre
1350 Regent Street Fredericton, NB E3C 2G6
Attention: Hon. Mike Holland
Minister of Natural Resources and Energy Development
Facsimile No: (506) 444-4367
E-mail: Mike.Holland@gnb.ca

If to the Province of Ontario:

Ministry of Energy, Northern Development and Mines
77 Grenville Street, 10th Floor
Toronto, Ontario M7A 1B3
Attention: Hon. Greg Rickford
Minister of Energy, Northern Development and Mines and
Minister of Indigenous Affairs
Facsimile No: (416) 327-0665
E-mail: Greg.Rickford@ontario.ca

If to the Province of Saskatchewan

Minister of Environment, Minister responsible for SaskPower
Room 348, Legislative Building
2405 Legislative Drive, Regina, SK, Canada, S4S 0B3
Attention: Hon. Dustin Duncan
Minister of Environment, Minister responsible for SaskPower
Facsimile No. (306) 787-1669
E-mail: env.minister@gov.sk.ca

Any such notice so given shall be deemed conclusively to have been given and received when so personally delivered or sent by facsimile or other electronic communication. A Party may from time to time change its address hereinbefore set forth by notice to the other Parties in accordance with this Section.

5.4 **Publicity.** This MOU will be made public at the Council of the Federation meeting on December 2, 2019.

5.5 **Certain Rules of Interpretation.** In this MOU, (i) words importing the singular include the plural and vice versa (ii) headings are for convenience of reference only and shall not affect the construction or interpretation of this MOU, and (iii) unless otherwise indicated, references to a Section or

Schedule followed by a number or letter refer to the specified Section or Schedule of this MOU.

5.6 **Entire Agreement/Amendment.** This MOU is the entire agreement between the Parties and supersedes all prior communications, understandings, negotiations and agreements, whether oral or written, express or implied, with respect to the subject matter hereof. This MOU may not be modified, varied or amended except as agreed in writing signed by the Parties.

5.7 **Governing Law.** This MOU is governed by and shall be construed in accordance with the laws of the Province of Ontario, Province of New Brunswick, Province of Saskatchewan and the laws of Canada applicable therein, without regard to conflict of laws rules.

5.8 **Successors and Assigns.** This MOU is binding upon and ensures to the benefit of the Parties and their respective successors and permitted assigns.

5.9 **Counterparts and Electronic Delivery.** This MOU may be executed in counterparts, each of which will be deemed an original and all of which together will constitute one in the same instrument. Executed signature pages delivered by facsimile or electronic mail will be deemed for all purposes to be original counterparts of this MOU.

IN WITNESS WHEREOF this MOU has been executed by the Parties as of the Effective Date:

FOR THE PROVINCE OF NEW BRUNSWICK

Hon. Blaine Higgs
Premier

FOR THE PROVINCE OF ONTARIO

Hon. Doug Ford
Premier

FOR THE PROVINCE OF SASKATCHEWAN

Hon. Scott Moe
Premier

Tab 14

EB-2020-0290 Exhibit L, F2-08-AMPCO-156

AMPCO Interrogatory #156

Interrogatory

Reference: Ex A2-2-1 Attachment #1 P10

The evidence states:

"OPG expects SMRs to be a key element of the energy sector, and the Province's, efforts to support decarbonization. As Canada's largest nuclear operator with extensive experience and a strong safety record, OPG is well-positioned to advance and secure acceptance of both grid-scale and off-grid SMRs across Canada and beyond. To that end, in 2020, OPG formed a joint venture with Ultra Safe Nuclear Corporation and the Global First Power, with the goal of developing a proposed Micro Modular Reactor™ SMR at the Chalk River Laboratories site. The joint venture is the first commercial partnership on the development of an SMR in Canada and can serve as a model for future off-grid SMR projects. The plan allocates noncapital expenditures of•••• toward OPG's portion of funding for this demonstrator reactor.

Additionally, OPG is progressing preliminary planning phase work for grid-scale SMR development in Ontario and the renewal of the site preparation licence for the Darlington New Nuclear site, which can accommodate SMRs. In collaboration with other major utilities, OPG recently concluded a due diligence process and is working to advance engineering and design work with three grid-scale SMR developers. Subject to the OEB's approval, the preliminary planning phase costs are recoverable in the future through an authorized regulatory account. Prior to finalizing plans to proceed with grid-scale SMR development beyond the preliminary planning phase, OPG will seek approval from the Board and concurrence from the Province. The plan does not reflect project development expenditures or resource requirements beyond the preliminary planning phase".

a) Are any costs related to the joint venture included in this application? If yes, please provide details of the costs.

b) Please provide details of the due diligence process. Please identify the other major utilities OPG collaborated with.

c) Please identify the three grid-scale SMR developers.

d) Has OPG entered into any agreements with the three grid-scale SMR developers? If yes, please provide details.

Response

a) There are no costs related to the joint venture included in this application.

b) See Ex. F2-8-1, pp. 3-4 regarding OPG's technology developer selection process. The names of the major utilities that OPG collaborated with are not relevant for this proceeding (see Ex. F2-08-AMPCO-159).

c) The three grid scale SMR developers are GE Hitachi, Terrestrial Energy, and X-energy.

d) See Ex. F2-08-AMPCO-159.

Tab 15

EB-2020-0290 Exhibit L, F2-08-CCC-048

CCC Interrogatory #48

Interrogatory

Reference: Exhibit F2/T8/S1/p. 1 – 2019 OPG Annual Report, p. 9

In the 2019 Annual Report (p. 9) there is reference to the following: OPG's goal is to deploy at least one SMR facility in Ontario, and support deployment of two in other Canadian jurisdictions that currently rely on coal:

a) Please explain what is meant by the comment OPG will "support" deployment of two SMRs in other Canadian Jurisdictions that currently rely on coal;
b) Will these activities by undertaken by the regulated operations, the unregulated operations within OPG or through an affiliate? Please explain;
c) Please explain why Ontario ratepayers should be required to fund the development of SMR facilities outside of Ontario.

Response

a) OPG is in the initial planning and preparation phase of assessing the feasibility of a grid-scale SMR in Ontario. Other provinces have also expressed interest in SMR technology. The provinces of Ontario, Saskatchewan, Alberta, and New Brunswick have signed a Memorandum of Understanding to co-operatively explore the development of SMRs. Saskatchewan and Alberta are exploring the use of SMRs as an option to assist them in reducing their reliance on coal. OPG is collaborating with SaskPower and Bruce Power on an SMR technology review process designed to identify technology partners that would facilitate a fleet approach to grid-scale SMR deployment across Canada. The benefits of a fleet approach could include efficiencies related to training, operations and maintenance, and engineering and licensing, which may reduce the ongoing costs for a SMR at the Darlington site.

b) As indicated in Ex. F2-8-1, OPG is in the initial planning and preparation phase of SMR development at the Darlington site, and an SMR proposal or business case has not yet been developed. Other than the SMR technology review process identified in part a) above, no decisions have been made at this time on OPG support for SMR activities outside of Ontario. See also Ex. L-F2-08-Environmental Defence-23, part d).

c) OPG is not seeking any funds in this application toward development of SMRs outside of Ontario.

Tab 16

EB-2020-0290 Exhibit H1, Tab 1, Schedule 1, Table 10

Numbers may not add due to rounding.

Updated: 2021-03-12
EB-2020-0290
Exhibit H1
Tab 1
Schedule 1

Table 10

Nuclear Development Variance Account

Summary of Account Transactions - 2018 and 2019 ($M)

Line No.	Particulars	Note	Actual 2018	Actual 2019
			(a)	(b)
1	**Forecast Costs**	1	1.4	1.7
2	**Actual Costs**	2	2.4	5.0
3	**Addition to Variance Account** (line 2 - line 1)		1.0	3.3

Notes:

1. Cols. (a) and (b) as per EB-2016-0152 Payment Amounts Order, App. G, p. 15.
2. Includes $0.7M incurred in 2018 and 2019 in connection with preliminary planning and preparation activities for a small modular reactor generating station at the Darlington site. As noted in Ex. H1-2-1, Table 2, Note 12, OPG proposes to defer the clearance of this amount to a future application

Tab 17

EB-2020-0290 Exhibit F2, Tab 1, Schedule 1, Table 1

Table 1
Operating Costs Summary - Nuclear ($M)

Line No.	Cost Item	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Budget	2021 Budget	2022 Plan	2023 Plan	2024 Plan	2025 Plan	2026 Plan
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
	OM&A:											
	Nuclear Operations OM&A											
1	**Base OM&A**	1,267.5	1,301.1	1,255.5	1,265.6	1,310.0	1,311.3	1,322.7	1,313.3	1,298.2	1,069.5	616.3
2	**Project OM&A**	89.1	122.7	119.1	106.1	107.9	122.3	89.1	85.0	80.6	76.7	62.0
3	**Outage OM&A**	306.7	317.4	344.9	264.3	292.1	431.2	279.1	361.2	212.4	192.6	61.3
4	**Subtotal Nuclear Operations OM&A**	1,663.4	1,741.3	1,719.4	1,636.0	1,710.0	1,864.8	1,690.9	1,759.5	1,591.2	1,338.8	739.7
5	**Darlington Refurbishment OM&A**	3.1	36.1	31.3	1.7	12.3	42.9	24.2	23.6	29.3	25.0	8.4
6	**Darlington New Nuclear OM&A**	0.8	0.7	2.4	5.0	66.0	206.0	2.2	2.2	2.3	2.3	2.3
7	**Allocation of Corporate Costs**	360.5	377.0	368.6	361.7	380.3	396.1	387.9	380.0	375.3	334.3	252.9
8	**Allocation of Centrally Held Costs**	306.0	242.9	256.2	238.6	164.7	197.2	184.5	161.6	143.9	98.9	14.7
9	**Asset Service Fees[1]**	34.1	35.6	37.0	47.8	57.1	54.6	51.5	55.2	65.1	69.7	65.3
10	**Subtotal Other OM&A**	704.5	692.3	695.6	654.8	680.4	896.8	650.3	622.6	615.9	530.2	343.6
11	**Total OM&A**	2,367.9	2,433.6	2,415.0	2,290.8	2,390.4	2,761.5	2,341.2	2,382.0	2,207.1	1,869.0	1,083.3
12	**Nuclear Fuel Costs**	262.1	225.2	231.6	244.5	238.2	202.5	178.3	182.1	209.4	188.6	148.2
	Other Operating Cost Items:											
13	**Depreciation and Amortization**	281.6	366.1	324.1	333.0	452.1	545.2	553.0	471.5	578.7	521.6	568.6
14	**Income Tax**	(39.5)	(27.7)	(4.2)	33.1	66.8	(17.6)	(16.5)	(16.3)	(16.4)	(16.1)	(15.9)
15	**Property Tax**	14.1	13.0	12.7	12.5	12.0	12.6	12.9	13.2	13.6	12.7	9.8
16	**Total Operating Costs**	2,886.2	3,010.2	2,979.2	2,913.9	3,159.4	3,504.2	3,068.9	3,032.6	2,992.4	2,575.8	1,793.9

Notes:

1 Includes asset service fees of $2.3M (2022), $2.2M (2023), $2.0M (2024), $3.5M (2025) and $3.2M (2026) charged to Laurentis Energy Partners for the use of Darlington reactors to produce Molybdenum-99 (Ex. F3-1-4)