Recommendation for appropriate equity thickness for capital structure in OPG's 2022-2026 Payments Application

prepared for Ontario Energy Board staff by London Economics International LLC

May 14th, 2021

London Economics International LLC ("LEI") was retained by Ontario Energy Board staff ("OEB staff") to prepare an expert report following review of the analysis of risk set out in Ontario Power Generation's ("OPG's) 2022-2026 Payment Amounts Application (EB-2020-0290) and provide an independent opinion on the proposed equity thickness for OPG's regulated generation.

LEI believes an equity thickness of 47% is appropriate for OPG's regulated assets for the 2022-2026 period, given changes in risk relative to the previous period and the need to maintain an investment grade rating to facilitate ongoing financing needs. While indicative quantitative analysis suggests that an investment grade rating could potentially be supported at a lower level of equity capitalization, a cushion is warranted given the following factors: (i) if the quality of the province's finances declines, rating agencies may be less likely to give credit for its implicit support of OPG, (ii) an increase in perception of the potential for political interference, (iii) potential for higher inflation may compress margins based on timing of recovery and partial caps on rates. LEI's analysis focuses on credit metrics for the regulated assets; were OPG's unregulated activities to negatively impact credit metrics, ratepayers should not be responsible for providing further support. The Ontario Energy Board ("OEB") may want to consider imposing ring-fencing requirements to insulate ratepayers from any such negative impacts.

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List of acronyms

AECL	Atomic Energy of Canada Ltd
AER	Australian Energy Regulator
CANDU	Canada Deuterium Uranium
CAPM	Capital asset pricing model
CDPQ	Caisse de Depot et Placement du Quebec
CEO	Chief Executive Officer
CER	Canada Energy Regulator
CFO	Cashflow from Operations
Concentric	Concentric Energy Advisors
CRVA	Capacity Refurbishment Variance Account
DBRS	DBRS Morningstar
DERs	Distributed Energy Resources
DRP	Darlington Refurbishment Program
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
EHRC	Electricity Human Resources Canada
ERP	Equity risk premium
FFO	Funds from Operations
FOAK	First-of-a-kind
FRA	Financial Risk Assessment
FRS	Fair Return Standard
IPCC	Intergovernmental Panel on Climate Change
IPPs	Independent power producers
IRs	Interrogatory Requests
IRM	Incentive regulation mechanisms
KHNP	Korea Hydro and Nuclear Power Company
LEI	London Economics International, LLC
MENDM	Minister of Energy, Northern Development and Mines
Moody's	Moody's Investors Service
NERC	North American Reliability Corporation
NGTL	NOVA Gas Transmission Limited
NRC	US Nuclear Regulatory Commission
NSPI	Nova Scotia Power Inc.
O. Reg. 53/05	Ontario Regulation 53/05
OEB	Ontario Energy Board
Ofgem	Office for Gas and Electricity Markets
OPG	Ontario Power Generation
PBR	Performance-based regulation
PCE	Personal Consumption Expenditures
Pickering GS	Pickering Generation Station
PWR	Pressurized Water Reactor
PWU	Power Workers Union
QE	Quantitative easing
RDS	Regulatory document search
ROE	Return on equity
S&P	S&P Global Ratings
SMRs	Small Modular Reactors
TFP	Total factor productivity
VIX	CBOE Volatility Index
WEFOR	Weighted-Equivalent Generation Forced Outage Rate

1 Background

1.1 On whose behalf have you prepared this report and what is their interest in this proceeding?

London Economics International LLC ("LEI") has prepared this report on behalf of OEB staff as part of the 2022-2026 Payment Amounts proceeding. As noted in its March 10, 2021 letter, OEB staff retained LEI to provide a report presenting its review of OPG's evidence on the cost of capital proposed for setting payment amounts for its regulated facilities for the 2022-2026 period, including the evidence prepared by OPG's expert, Concentric Energy Advisors Inc., regarding the capital structure (i.e., equity thickness).[1]

1.2 Can you provide some examples of you or your firm's experience that is relevant to this proceeding?

LEI staff have relevant experience in cost of capital matters (including advising on equity thickness), reviewing regulatory dockets and supporting regulatory staff with filing interrogatories. A selection of pertinent previous work is highlighted below, and further information is included in the curriculum vitae for Mr. Goulding (Appendix D) and Mr. Pinjani (Appendix E).

- **LEI is familiar with OPG's business and has experience with previous proceedings on this topic**: In 2008, LEI was asked by OEB staff to develop an overall framework which can be used to evaluate the risk to equity and an appropriate capital structure for OPG's regulated assets, relative to other power sector assets for which capital structures and returns on equity have been determined or could be observed. Mr. Goulding served as the testifying expert. [OEB Proceeding No. EB-2007-0905]

- **LEI staff have conducted capital structure analysis in Ontario before**: LEI was engaged by a large Ontario gas utility to conduct an independent capital structure review to assess the reasonableness of the utility's common equity component. The project included assessment of the utility's business and financial risk profile compared to OEB filings and peers, examining information on utility capital structures, evaluating the utility's request, and providing recommendations on the same. Mr. Goulding and Mr. Pinjani led the engagement.

- **LEI has experience testifying before US and Canadian regulators**. Below are examples:
    - LEI was retained to provide regulatory support for Black Swan Energy in its response to the application of NOVA Gas Transmission Limited ("NGTL") to the Canada Energy Regulator ("CER"). LEI reviewed the application and assisted in

[1] Ontario Energy Board staff. *EB-2020-0290. Ontario Energy Board (OEB) Staff – Intention to File Expert Evidence.* March 10, 2021.

trial preparation. LEI prepared an expert report to form the basis of Black Swan's intervenor evidence, and responded to information requests ("IRs"). Mr. Goulding served as the testifying expert. [CER Proceeding No. RH-001-2019]

- LEI supported an electricity distribution company (ENMAX Power Corporation) in Alberta, Canada, in its application to restructure rates to move from cost-of-service to performance-based approach. LEI prepared a filing for the company's regulator proposing a formula-based tariff-setting scheme, based on LEI-developed formula for periodic adjustments to an average tariff metric based on an inflation factor, efficiency factor, the impact of capital investments, operational performance relative to defined metrics; and defined mechanisms for additional adjustments based on force majeure and financial performance outside a defined range. LEI team members provided strategic advice to the CEO and other senior managers on presenting the firm's proposal to the regulator and stakeholders; and provided expert testimony in support of the firm's filing to its regulator. Mr. Goulding served as the testifying expert. [AUC Application No. 1550487]

- LEI was engaged by the Nova Scotia Utility and Regulatory Board (NS UARB) to assist in setting performance standards for Nova Scotia Power Inc. ("NSPI") in respect of reliability, response to adverse weather conditions, and customer service for Nova Scotia. Mr. Goulding and Mr. Pinjani served as testifying experts. [Proceeding No. 2016 NSUARB 193]

- **LEI staff are familiar with incentive ratemaking in Ontario**: LEI was engaged by OPG to support OPG regulatory processes related to performance-based rates during a consultative process initiated by the OEB. LEI prepared a discussion paper on incentive regulation mechanisms ("IRM") currently in place in Ontario for electricity and natural gas distribution utilities and presented it at a technical workshop at the OEB. LEI staff, including Mr. Goulding, also made a presentation on the cost of capital and risk factors associated with OPG's regulated assets. [OEB Proceeding No. EB-2012-0340]

- **LEI staff are familiar with the OEB's cost of capital framework for regulated utilities in Ontario:** LEI has been engaged by OEB staff (since Fall 2019) to provide quarterly updates on the macroeconomic conditions facing the utility sector in Ontario, and their potential impact on the cost of capital parameters.

- **LEI staff have experience in regulatory practices across Canada**: For example, LEI was engaged by the Commission of Inquiry Respecting the Muskrat Falls Project to serve as an expert to the Inquiry. LEI prepared a report addressing the following topics: a comparison of Newfoundland and Labrador's electricity regulation system relative to other jurisdictions; assessing the system's ability to deal with challenges stemming from interconnection, including energy marketing; exploring the province's energy policy; recommending changes to the province's electricity pricing model; and assessing the

potential role for renewable energy generation expansion. Mr. Goulding served as the testifying expert. [LEI Report at Exhibit P-04457]

- **LEI has provided extensive analysis associated with financing/refinancing activities**: LEI has served as the independent market expert during the financing or refinancing of numerous zero-emitting resources in North America and other global jurisdictions. For instance, LEI has provided the independent market advisor report associated with refinancing of multiple hydro, solar, and wind assets owned by companies other than OPG across North America, as well as in Latin America and the Middle East.

1.3 What is OPG applying for in this proceeding?

Consistent with Ontario Regulation 53/05 ("O. Reg. 53/05"), OPG has requested payment amounts for its regulated facilities for the period 2022-2026 (see Figure 1 below).

Figure 1. Summary of payments amounts and potential rate impacts

Year	Nuclear payment amounts ($/MWh)	Nuclear payment rider ($/MWh)	Hydroelectric payment rider ($/MWh)	Typical residential monthly bill increase ($)
2022	$101.51	$2.34	$1.33	$1.04
2023	$105.13	$2.52	$1.33	$0.26
2024	$104.42	$2.33	$1.33	$0.27
2025	$106.70	$5.50	$0.69	$0.26
2026	$120.67	$7.72	$0.69	$0.23

Source: Ontario Power Generation. *EB-2020-0290. Exhibit A1-03-01. Summary of Application.* December 31, 2020 (Updated March 12, 2021). Pages 12-13 out of 15.

With regards to the capital structure, OPG is seeking approval of a cost of capital using a structure of 50% equity and 50% debt. The current return on equity ("ROE") is 8.34%, which is based on the most recent cost of capital parameters published by the OEB in in November 2020. OPG proposes to use "*the prevailing ROE specified by the OEB in accordance with the OEB's Cost of Capital Report as of the effective date of the Payment Amounts Order*". Consistent with the Board's decision in EB-2016-0152, OPG proposes to use this ROE for the entire application period.[2]

[2] Ontario Power Generation. *EB-2020-0290. Ex. C1-01-01.* December 31, 2020.

1.4 What equity thickness has OPG proposed for its capital structure?

OPG has proposed the requested ROE based on the rate published in the OEB's 2021 Cost of Capital Parameters[3] be applied to the regulated rate base using a capital structure of 50% common equity and 50% debt.

1.5 What justification has OPG provided for its proposed capital structure?

OPG notes that this increased equity ratio (relative to the current approved equity ratio of 45% for 2017-2021) reflects "*the material increase in OPG's business and financial risks since EB-2016-0152, driven by the DRP, the retirement of the Pickering nuclear generating station, increased climate change risks, and the continued shift of OPG's rate base to reflect a greater portion of nuclear assets.*"[4]

Concentric Energy Advisors ("Concentric") was retained by OPG to evaluate whether the application of the cost of capital approved by the OEB in EB-2016-0152 (the prior proceeding) is an appropriate basis for setting OPG's payment amounts for 2022-2026 in this rate application. The analysis was focused on the capital structure, providing the following rationale: "*As the OEB has traditionally accounted for differences in risk through the deemed equity ratio for each regulated utility under its jurisdiction, rather than the authorized return on equity ("ROE"), Concentric's analysis specifically focuses on OPG's capital structure*."[5] Concentric concludes that OPG's risk profile will increase materially over the 2022-2026 timeframe, and that an equity ratio of "*no less than 50%*" be set for OPG.[6] To arrive at this conclusion, Concentric assessed three broad areas detailed in the following subsections.

1.5.1 Concentric's risk analysis for OPG

Key findings from Concentric's risk analysis were categorized as follows:

- **Current economic conditions**: the evolution of capital markets have "made investors more risk-adverse and safety conscious"; increasing utility betas over the past five years that are "well above their historical norms"; and the impact of OEB's reduction in allowed ROE for 2021 due to lower bond yields.[7]

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[3] In November 2020, the OEB published the 2021 Cost of Capital Parameter Updates effective January 1st, 2021. The OEB established an 8.34% ROE, 2.85% deemed long-term debt rate, and 1.75% deemed short-term debt rate. (Source: OEB. 2021 Cost of Capital Parameters. November 9, 2020.)

[4] Ontario Power Generation. *EB-2020-0290. Exhibit A1. Summary of Application.* December 31, 2020.

[5] Concentric Energy Advisors. *EB-2020-0290. Exhibit C1-1-1/ Ontario Power Generation Common Equity Ratio Study.* December 31, 2020. Page 1 of Attachment 1.

[6] Ibid. Page 7 of Ex. C1-01-01, Attachment 1.

[7] Ibid. Page 6 of Ex. C1-01-01, Attachment 1.

- **Changes to OPG's business and financial risk**: Concentric contends that OPG has seen an increase in its risk factors such as: variability in generation output due to Darlington Refurbishment Program ("DRP") and shutdown of Pickering; significant organizational changes as a result of nuclear transition; increased ratio of nuclear to hydro ratebase; climate change risk; and increased pressure on credit metrics.

1.5.2 Concentric's assessment of OPG relative risk and equity ratio to other utilities

Concentric compared OPG's equity ratio with two proxy groups of comparable utilities, actual book equity ratios and regulated authorized equity ratios. Concentric concludes that OPG's current equity ratio of 45% is below these groups (see Figure 2) despite having higher business risk, as well as OPG's status as the only generation-only utility in the peer group.

Figure 2. Comparative analysis results of peer groups

Figure 2: Summary of Comparative Analysis Results (Concentric Proxy Group)

Analytical Approach	Mean Equity Ratio	Median Equity Ratio
Holding Company Equity Ratios: 5-Year Avg.	45.7%	47.4%
Operating Company Equity Ratios: 5-Year Avg.	52.8%	53.0%
Operating Company Equity Ratios: Authorized	49.5%	49.6%

Figure 3: Summary of Comparative Analysis Results (Moody's Peer Group)

Analytical Approach	Mean Equity Ratio	Median Equity Ratio
Holding Company Equity Ratios: 5-Year Avg.	50.6%	49.1%
Operating Company Equity Ratios: 5-Year Avg.	55.9%	53.6%
Operating Company Equity Ratios: Authorized	50.7%	50.1%

Source: Concentric Energy Advisors. *EB-2020-0290. Exhibit C1-1-1/ Ontario Power Generation Common Equity Ratio Study.* December 31, 2020. P.6 (Page 9 of 131)

As part of this assessment, Concentric argues that, although O. Reg. 53/05 provides protection to OPG from some risks associated with the DRP, the legislative protections available to nuclear developers in South Carolina, Florida and Georgia should be considered in this context. Specifically, they argue that investors view the DRP in the context of project overrun risks that have occurred in other jurisdictions that had similar or even broader protections than O. Reg. 53/05.[8]

Concentric suggests that, because of OPG's risk relative to other peer groups, OPG belongs in the upper end of the risk spectrum and "*reasonably supports an equity ratio of 55-56%*." However,

[8] Ibid. Page 39 of Ex. C1-01-01, Attachment 1.

Concentric note that they "conservatively recommend an equity ratio of no less than 50%" in consideration of the increasing risk, and the Board's findings in EB-2016-0152.[9]

1.5.3 Consideration of previous OEB decisions/findings

In EB-2016-0152, the OEB determined that an adjustment to the equity ratio for the US proxy group used by Concentric (on behalf of OPG) and Brattle (on behalf of OEB staff) was warranted to account for "*substantially lower common equity ratios allowed*" in Canada.[10]

Concentric argues that an adjustment for US-derived equity ratios is not appropriate in this proceeding, and that business risk, including regulatory risk, for regulated utilities in the US and Canada is comparable, and "*the investment community's view is that any regulatory risk differential between the countries has narrowed significantly, if not disappeared*."[11]

[9] Ibid. Page 6 of Ex. C1-01-01, Attachment 1.

[10] Ontario Energy Board. *EB-2016-0152. Decision and Order. Ontario Power Generation Inc. Application for payment amounts for the period from January 1, 2017 to December 31, 2021.* December 28, 2017. Page 109.

[11] Concentric Energy Advisors. *Ontario Power Generation Common Equity Ratio Study. EB-2020-0290. Exhibit C1-01-01. Attachment 1.* December 31, 2020. Page 2 of Attachment 1.

2 Prior proceedings

2.1 What principles has the OEB used to approve similar applications?

Under section 78.1 of the *Ontario Energy Board Act, 1998*, the regulator sets payment amounts for the output of those of OPG's generation facilities that are regulated. O. Reg. 53/05 sets out the OPG assets that are subject to the Board's payment-setting jurisdiction: i.e. the nuclear generating stations (Pickering and Darlington) and OPG's baseload hydroelectric facilities listed in the regulation, together the "prescribed generation assets".[12] O. Reg 53/05 allows the Board to establish the "form, methodology, assumptions and calculations" to be used in setting payment amounts for the regulated generation assets.

Regulated electric and gas utilities filing rate applications either under the cost-of-service mechanism, or the multi-year rate plans (referred to as custom incentive rate-setting options, or "Custom IR" and price cap incentive rate setting) are subject to the OEB's annual parameter review process, whereby cost of capital and utility charges are determined. The current cost of capital methodology stems from a 2009 review, with case reference EB-2009-0084, through which a modified capital asset pricing model ("CAPM") methodology and an equity risk premium ("ERP") approach were adopted.

In the most recent proceeding (i.e., EB-2016-0152), the OEB observed that "*OPG's proposed plan for nuclear generation assets fits the Custom IR description. Further, … the OEB finds that OPG's multi-year proposal largely complies with the policies and expectations for a Custom IR plan as enunciated in the Rate Handbook*."[13]

2.2 How has the OEB decided on OPG's equity thickness proposals in previous proceedings?

In previous OPG proceedings, the OEB has established an equity thickness of between 45% and 47%. In EB-2007-0905, the OEB established that for OPG's 2008-2009 application, an equity thickness of 47% was appropriate. In its 2013 decision for OPG's 2014-2015 payment amounts application, an equity thickness of 45% was deemed appropriate – this was against a backdrop of an expanded scope for O. Reg. 53/05 which was intended to include the addition of 48 hydroelectric assets as well as the Niagara Tunnel Project to OPG's regulated assets, i.e. additional prescribed facilities.[14] Most recently, for the 2017-2021 OPG payment amounts application, the

[12] OEB staff. *EB-2012-0340. Report of the Board. Incentive Rate-making for Ontario Power Generation's Prescribed Generation Assets.* March 28, 2013. Page 3.

[13] OEB. *EB-2016-0152. Application for payment amounts for the period from January 1, 2017 to December 31, 2021. Decision and Order.* December 28, 2017. Page 110.

[14] OEB. *EB-2013-0321. Decision with Reasons.* November 20, 2014. Page 114.

OEB decided that an equity thickness of 45% was appropriate.[15] The table below summarizes OPG's applied for and approved equity thickness in the previous four proceedings before the OEB.

Figure 3. Historical rate cases and approved equity thickness

Rate case	Applied for	Approved
EB-2007-0905	57.5%	47%
EB-2010-0008	47%	47%
EB-2013-0321	47%	45%
EB-2016-0152	49%	45%

Source: OEB regulatory document search ("RDS")

2.3 How has the OEB defined/commented on change in business and financial risk in previous proceedings?

In EB-2016-0152, the OEB assessed the evidence of the changes in OPG's business and financial risk in the context of the Fair Return Standard ("FRS"), stating that *"[t]he OEB makes this finding based on the evidence regarding OPG's specific circumstances and the financial risks the OEB considers are actually faced by OPG, and a consideration of the level of equity that is appropriate for a Canadian utility to meet the fair return standard."*[16]

[15] OEB. *Decision and Order EB-2016-0152 Application for payment amounts for the period from January 1, 2017 to December 31, 2021.* December 28, 2017. Page 109.

[16] Ibid. Page 100.

The Fair Return Standard

The Fair Return Standard was articulated by the NEB in its RH-2-2004 Phase II Decision (related to TransCanada Pipelines Cost of Capital), when it stated that a fair or reasonable return on capital should:

- Be comparable to the return available from the application of invested capital to other enterprises of like risk (***the comparable investment standard***);
- Enable the financial integrity of the regulated enterprise to be maintained (***the financial integrity standard***); and
- Permit incremental capital to be attracted to the enterprise on reasonable terms and conditions (***the capital attraction standard***).

Source: National Energy Board. *RH-2-2004, Phase II Reasons for Decision, TransCanada Pipelines Limited Cost of Capital.* April 2005.

The OEB is of the view that the FRS constitutes the over-arching principle for setting the cost of capital. Agreeing with the Federal Court of Appeal in the TransCanada decision, the OEB agrees that the process to determine the cost of capital "*aligns the private interest of the utility and its shareholders with the public interest.*"

Source: OEB, *Report of the Board on the Cost of Capital for Ontario's Regulated Utilities.* December 2009.

The FRS is the framework that OEB adheres to in setting the cost of capital for utilities. The OEB has established that the FRS framework, discussed in the textbox above, "*frames the discretion of a regulator…[m]eeting the standard is not optional; it is a legal requirement.*"[17]

In the most recent application by OPG, the OEB concluded that OPG's business and financial risk has not materially increased. A summary of Board's key findings associated with ***capital structure*** in its December 2017 Decision (for EB-2016-0152) is provided below in Figure 4.

[17] OEB. *EB-2009-0084. Report of the Board on the Cost of Capital for Ontario's Regulated Utilities.* December 11, 2009. Page 18.

Figure 4. Summary of OEB findings on change in business and financial risk in previous proceeding

Risk identified	Board findings	Relevant to current proceeding?
The change in OPG's portfolio between hydroelectric and nuclear generation due to Darlington Refurbishment Program (DRP) capital investments	*"The OEB does not accept OPG's argument that because the equity ratio was reduced to 45% due to the increase in hydroelectric generation in the last rates case, the spending on the DRP and Pickering Extended Operations (PEO) over the next few years must necessarily mean the equity ratio must be increased."*	✓
Consideration of OPG's cost recovery risk due to existing protections provided by O. Reg. 53/05 and established deferral and variance accounts	*"The OEB accepts the opinions of both experts that, in general, there are more business risks associated with nuclear generation than with hydroelectric. However…there are a number of factors that substantially mitigate that risk. These include the various protections provided by O. Reg. 53/05 and the variance and deferral accounts that allow OPG the opportunity to recover substantially all their unexpected or unforeseen costs."*	✓
The move to IRM from cost of service regulation for hydroelectric payments	*"In the previous OPG payment amounts decision the OEB expressly considered whether the move to IRM would increase risk to OPG and found that it did not. There is no new evidence in this case that the hydroelectric IRM will have any impact on risk"*	
Capital expenditures related to the DRP	*"O. Reg. 53/05 provides that the OEB must accept the "need" for the DRP, so there is no risk that the OEB will find in some later proceeding that it was not required and refuse to allow it to be added to rate base… The OEB finds that given the planning, the approval of the spending in this proceeding and the regulatory protections afforded OPG, the DRP does not materially increase OPG's business risk"*	✓
Pickering Extended Operations ("PEO")	*" …risks associated with Pickering Extended Operations, such as a determination that it may not proceed, and the risk of recovery of expenditures incurred in that event are unlikely to materialize. PEO also enjoys many of the same protections as the DRP."*	
Revenue deferred under rate smoothing	*"Rate smoothing is required by O. Reg. 53/05. The OEB finds there is no real risk…that having implemented a rate smoothing plan required by regulation, the OEB would not allow OPG to recover the deferred rates"*	✓
Recovery risk associated with pension and OPEB costs	*"The OEB is satisfied that [pension and OPEB costs] can and will be addressable in a timely manner, and hence that the risks identified by OPG and Concentric do not materially support any increase in risk or equity thickness"*	
Credit Risk	*"The OEB finds that …it is the credit rating agencies' assessment of those risks as to how they may affect solvency and liquidity….Further, based on OPG's history since its incorporation, the credit rating agencies have not made material changes to OPG's credit ratings, with the one downgrade being linked to a downgrade in the Province's credit rating.*	✓
OPG's equity ratio in comparison to other utilities selected by each expert	*"The OEB accepts that the fair return standard requires that similar utilities be comparable in terms of equity thickness as well as return on equity. However, the jurisdiction in which utilities operate and are regulated is also a factor that must be considered. [The Concentric bulletin] observes that the allowed ROE in the U.S. and Canadian have converged, but this is not true for common equity ratios….The OEB finds that an adjustment to the comparator group data should have been made by both experts to account for the substantially lower common equity ratios allowed regulated utilities in Canada"*	✓

Source: OEB. *Decision and Order EB-2016-0152 Application for payment amounts for the period from January 1, 2017 to December 31, 2021.* December 28, 2017

3 Risk assessment framework

3.1 Have OPG's business risks increased since the previous decision?

OPG's business risks have evolved since the decision in the prior proceeding (EB-2016-0152), primarily due to the following reasons: (i) the political environment in which OPG operates has shifted to a different government with fresh priorities for the energy sector in the province; (ii) the success of implementation of recommendations from a strategic review of the regulator is

unknown; and (iii) acceleration of DER growth leading to a long-term risk.[18] While there is little evidence of these factors contributing to a material increase in OPG's business risks, LEI nonetheless has evaluated them along with key business risks discussed in Concentric's report, and provided its independent evaluation. Figure 5 below summarizes LEI's findings associated with these risk factors.

Figure 5. Summary of business risk factors for Ontario Power Generation

Business risk	Summary
Role of COVID-19 pandemic	▪ Operation delays as a result of the COVID-19 pandemic were observed across various sectors and companies, including OPG.[1] ▪ Vaccination rollout means pre-pandemic operations may resume as early as 2022
Role of Darlington Refurbishment Program	▪ OPG is undertaking a large "megaproject" in the DRP and has successfully completed the first phase, on time and on budget ▪ Lessons learned from Unit 2 and other CANDU refurbishments will be helpful, and provisions in O. Reg. 53/05 reduce execution risks for OPG
Implications of changes in the generation mix	▪ OPG's nuclear ratebase will become the majority of OPG's total ratebase by the end of the application period ▪ However, forecasted share of revenues will remain consistent with current period due to rate smoothing
Implications of climate change	▪ Climate models suggest that potential impact to Ontario, while substantial, may fall below the national average ▪ Existing mechanisms protect OPG from risks related to extreme weather events and hydroelectric output variance
Role of political intervention	▪ Recent interventions at Hydro One and rates action during the COVID-19 pandemic have increased risk perception ▪ Although risk of intervention may be limited, future governments may continue trend
Evolution of the OEB	▪ OEB has recently undergone a strategic review following recommendations by the Modernization Review Panel ▪ Implementation of review recommendations introduces regulatory uncertainty
Implications of DER growth in Ontario	▪ OEB's DER impact study suggests over 2 GW by 2030 in the "Mid" case ▪ Limited risk in current application, but important to monitor in future proceedings

3.1.1 Role of COVID-19 pandemic

The past year witnessed a sharp economic decline due to the global pandemic resulting from COVID-19. The virus causing COVID-19 is a novel coronavirus, and many governments employed shutdown measures of varying severity to limit its spread. Since the first wave of the pandemic last spring, subsequent waves have required similar patterns of containment measures, which further limit economic activity. For Ontario, the recession, and expansionary budgets in response to the recession, may increase the potential for decline in the quality of implied provincial credit support to OPG if provincial deficits increase. For OPG's operations, the

[18] Additional risks that OPG potentially faces include adverse changes to credit metrics (if any) and potential for higher inflation compressing margins based on timing of recovery and partial caps on rates. These, along with some additional risk factors, are discussed later in Section 3.2, in the evaluation of 'financial risks'.

pandemic has meant disruption of operations at its construction sites and operating plants – it reported deferral and suspension of on-site project activities in its most recent annual report.[19]

However, earlier-than-expected availability of vaccines has been witnessed in Canada and around the world, following successful clinical trials of multiple vaccine candidates. Canada has procured access to vaccine supply several times its population and has set a target for making available a vaccine to all adult Canadians by end-of-September 2021.[20] This suggests that operations that resemble pre-pandemic conditions may be feasible by 2022.[21] Further, the DRP remains generally on time and nearly on budget. Unit 2 coming online in June 2020[22] suggests delays related to COVID-19 were minor, and did not have a material impact on project timelines.

LEI acknowledges OEB's determination that COVID-related impacts will be addressed during a payment amount proceeding.[23] However, there is no evidence that reasonable recovery of prudently incurred costs will be denied. Further, COVID-19 and related impacts are a residual issue for the 2017-2021 period, and are not a significant risk factor for the forthcoming period. Other specific concerns that may arise as a result of the response to the associated economic crises, such as inflation risk, are addressed separately in this report (see Section 3.2.2). LEI expects that once COVID-related shutdowns end, construction will continue at pre-pandemic levels.

[19] Ontario Power Generation. *Management's Discussion and Analysis.* December 31, 2020. Page 22.

[20] Scherer, Steve. *Canada keeps end-September COVID vaccination target despite Pfizer delay.* Reuters. January 15, 2021.

[21] Notwithstanding the unanticipated April-May 2021 Ontario shutdown, the expectation remains that the economy will fully re-open in late 2021.

[22] OPG notes that it completed Unit 2 just over three months later than its committed schedule, with the final two-and-a-half months occurring during the state of emergency declared in Ontario due to the COVID-19 pandemic. OPG also states that relative to approved amounts in EB-2016-0152, "there is a forecast variance of $132.7M or 2.5%." (Source: OPG. *EB-2020-0290. Ex. D2-02-02. Unit 2 Performance,* December 31, 2020. Pages 1-2)

[23] OEB. *EB-2020-0133. Letter regarding the applicability of the COVID-19 deferral account guidelines to certain utilities.* April 13, 2021.

Summary of COVID-19 business risk

- Since the previous application, the outbreak of COVID-19 has had a meaningful impact on business operation risk for all industries. However, an earlier-than-anticipated vaccine and the rollout of an immunization program suggests a return to pre-pandemic operations is forthcoming.
- While OPG has indeed had to curb some construction activities, it was able to complete Unit 2 generally on time and nearly on budget, suggesting the worst of the risk from COVID-19 may have passed.
- While Concentric suggests that COVID-19 is a 'black swan' event that will result in increased productivity and resource availability risk, LEI does not believe that impacts on the generation business will persist beyond 2021.

3.1.2 Role of Darlington Refurbishment Program and first-of-a-kind risk

The DRP is a large-scale undertaking that will see OPG refurbish the four-unit Darlington nuclear station at a cost of $12.8 billion.[24] Concentric argues that, because this program comprises a first-of-a-kind ("FOAK") scope, OPG's business risks are elevated due to execution risk. Although the scale and scope of the project presents risks of overruns consistent with all "megaprojects", LEI observes that the experience and lessons gained from the successful Unit 2 refurbishment and other Canada Deuterium Uranium ("CANDU") projects may mitigate this risk. In addition, OPG is entitled to significant risk mitigation under O. Reg. 53/05, which protects the utility's risk related to the DRP.

Execution risk

OPG is undertaking a refurbishment program of the reactors at Darlington as part of the DRP. The utility will refurbish four units at Darlington over a ten-year period between 2017 and 2026. OPG has already completed the refurbishment of Darlington Unit 2, which was reconnected to the grid in June 2020.[25] According to OPG, it has "*collected more than 4,000 lessons learned during work on Unit 2 and have been applying them to Unit 3 to deliver significantly greater results*."[26] This suggests that latter stages of the DRP should see reduced project risk following a successful first phase. Ratings agencies also concur with this assessment – in its most recent credit rating report for OPG, S&P Ratings noted that OPG's "*on-time and on-budget record increases our confidence that*

[24] All currencies are assumed to be Canadian dollars unless specified.

[25] Ontario Power Generation website. *Darlington Unit 2 powers on. Refurbishment now complete on first unit*. June 4, 2020

[26] Ontario Power Generation website. *Refurbishment of Darlington Nuclear's Unit 3 now underway. OPG building on the success of Unit 2's completion.* September 3, 2020.

the other three [Darlington] units will also be completed without incurring project delays or materially higher costs."[27]

In addition, other CANDU reactors have undergone refurbishment in the past; the DRP is not the first refurbishment of this type of reactor. Specifically, the following two plant sites outside Ontario have undertaken refurbishments of CANDU reactors in the last 15 years:

- ***New Brunswick Power's Point Lepreau refurbishment***: although this refurbishment experience is deemed a "cautionary" tale, lessons from the experience can help others avoid a similar fate. Following a schedule delay of 35 months and cost overrun of $1 billion, an audit by Auditor General deemed the key project costs largely "reasonable".[28] In addition, in 2020, NB Power celebrated a new milestone of a full year of uninterrupted generation, for the first time since 1994, largely attributed to the refurbishment.[29]
- ***Wolsong Nuclear station refurbishment***: Korea Hydro and Nuclear Power Company ("KHNP") is a subsidiary of KEPCO that owns the four-unit Wolsong stations that utilize CANDU 6 technology.[30] In 2006, KHNP began an extended outage to retube and refurbish the Wolsong 1 reactor. Atomic Energy of Canada Ltd ("AECL"), was contracted by KHNP in 2006 to retube the unit and the work began in 2009 and successfully completed in 2011.[31]

The Concentric report asserts that new scope will be executed in refurbishment of Units 3, 1 and 4, notably "in the form of digital turbine controls and generator excitation controls."[32] In a response to OEB staff interrogatory #59, however, Concentric confirms that digital control systems have been implemented at OPG's thermal and hydroelectric stations. Although the response notes that these controls are "much simpler than those used for nuclear power plants",[33] the FOAK risk for this new scope may be overstated.

FOAK suggests that the technology or process has yet to be proven on a large scale at a commercial level. In the nuclear industry, the Westinghouse AP1000 Pressurized Water Reactor

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[27] S&P Global Ratings. *Ontario Power Generation Inc. Outlook Revised To Stable From Negative; 'BBB+' Rating Affirmed.* July 17, 2020. (Also filed by OPG as Ex. A2-03-01 Attachment 11.)

[28] Government of New Brunswick. *Point Lepreau Generating Station Refurbishment – Phase II. Report of the Auditor General.* 2014.

[29] Jones, R. Aging Point Lepreau nuclear plant is running like a newborn. CBC website. July 17, 2020. Accessed at: < https://www.cbc.ca/news/canada/new-brunswick/nb-point-lepreau-nuclear-plant-running-like-newborn-1.5652829>

[30] World Nuclear Association website. Nuclear Power in Canada. Updated December 2020. Accessed at: < https://www.world-nuclear.org/information-library/country-profiles/countries-a-f/canada-nuclear-power.aspx>

[31] World Nuclear News website. *Korean Candu restarts after refurbishment*. July 29, 2011.

[32] Concentric Energy Advisors. Ontario Power Generation Common Equity Ratio Study. December 31, 2020. Filed as Ex. C1-01-01 Attachment 1. Page 41.

[33] Ontario Power Generation. *EB-2020-0290. Exhibit L. C1-01-01-Staff-059. Page 2.* April 19, 2021.

("PWR") represents a true FOAK risk that was borne by Southern Company at its Vogtle expansion project. The expansion of Vogtle at Units 3 and 4 commenced in 2013, only two years after the US Nuclear Regulatory Commission ("NRC") issued the final safety evaluation report for the AP1000 standard plant design.[34] Upon completion, Units 3 and 4 will be the first AP1000 PWR units in the US, and only the third site in the world.[35]

Risk mitigation provisions in O. Reg. 53/05

Under the provisions of O. Reg. 53/05, subsection 6(2), the OEB is obligated to determine payments that substantially mitigate risk of the DRP:

> *"The Board shall ensure that Ontario Power Generation Inc. recovers* ***capital and non-capital costs and firm financial commitments*** *incurred in respect of the Darlington Refurbishment Project …, including, but not limited to, assessment costs and pre-engineering costs and commitments,*
>
> > *i. if the costs and financial commitments were within the project budgets approved for that purpose by the board of directors of Ontario Power Generation Inc. before the making of the Board's first order under section 78.1 of the Act in respect of Ontario Power Generation Inc., or*
> >
> > *ii. if the costs and financial commitments were not approved by the board of directors of Ontario Power Generation Inc. before the making of the Board's first order under section 78.1 of the Act in respect of Ontario Power Generation Inc., if the Board is satisfied that the costs were prudently incurred and that the financial commitments were prudently made."*[36]

This provision mitigates the risks of cost overruns that may arise following project execution insofar as OPG is able to substantiate its costs were prudently incurred, and the financial commitments were prudently made.

In practice, OPG would record any impact of cost overruns in the Capacity Refurbishment Variance Account ("CRVA"), which was established in EB-2007-0905. Its scope was affirmed to include the DRP in 2015, and it is defined as an account to "*record the financial impacts of variances between the actual capital and non-capital costs and firm financial commitments incurred to increase the output of, refurbish or add operating capacity to a prescribed generation facility*."[37] The CRVA ensures that OPG is able to promptly record the impact of cost overruns without additional regulatory burden, although there may be a lag between recording and recovery. This long-established

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[34] U.S. Nuclear Regulatory Commission. Office of Nuclear Reactor Regulation. *Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design Docket No. 52-006.* 2011

[35] Coffman Smith, A. *Westinghouse's 4th AP1000 reactor starts commercial operation in China. S&P Global Market Intelligence.* January 11, 2019.

[36] Ontario Energy Board Act. Ontario Regulation 53/05. *Payments Under Section 78.1 of the Act.*

[37] OPG. *Ex. H1-01-01. Deferral and Variance Accounts.* December 31, 2020. Page 16.

mechanism supports a reduced perception of project riskiness. This is consistent with the OEB's finding in EB-2016-0152 where it established that with the provisions in O. Reg. 53/05, i.e., "*regulatory protections afforded OPG*" that "*the DRP does not materially increase OPG's business risk.*"[38]

As part of its assessment, Concentric argues that, although O. Reg. 53/05 provides regulatory mitigation for the DRP, it is "not unique to OPG." Specifically, the evidence cites legislative examples for nuclear construction in South Carolina (for the V.C. Summer plant), Florida (St. Lucie and Turkey Point) and Georgia (Alvin Vogtle Units 3 and 4 expansion).[39] LEI contends that the presence of similar legislative protections such as O. Reg. 53/05 for a select group of utilities in the US does not diminish the risk-mitigation protection afforded to the DRP.

In some jurisdictions cited by Concentric, although these protections may exist, penalties to shareholders for overruns are also increasingly being considered. For example, for Georgia Power's Vogtle plant, the Georgia Public Service Commission ruled that the return on equity used to calculate the Nuclear Construction Cost Recovery tariff for Unit 3 costs will be reduced by 10 basis points per month after June 1, 2021, up to the utility's long-term cost of capital.[40] Similar penalties exist for Unit 4, beginning in June 2022. Following a recent setback in construction, it appears the utility is set to miss the June 2021 target.[41] Such penalties are not found in O. Reg. 53/05 with respect to the DRP.

Summary of risks associated with DRP

- The successful completion of the refurbishment of Unit 2, generally on time and nearly on budget, as well as the lessons learned from both Unit 2 and other CANDU refurbishment, support a lower risk profile for project execution in the subsequent units.
- Extent of FOAK risk is mitigated by the following factors:
  - OPG's reporting on Phase 1 of the refurbishment notes "4,000 lessons learnt during work on Unit 2" that they have been applying to subsequent phases.
  - Installations such as digital controls and excitation controls that are proposed for the DRP are not unique to nuclear plants and have been installed at OPG's other plants.
- In addition, risks associated with cost overruns are substantially mitigated by the implementation of O. Reg. 53/05 provisions, which allow costs to be passed to ratepayers

[38] Ontario Energy Board. *EB-2016-0152. Decisions with Reasons.* December 28, 2017. Page 105.

[39] Concentric Energy Advisors. *Ontario Power Generation Common Equity Ratio Study. EB-2020-0290. Exhibit C1-01-01. Attachment 1.* December 31, 2020. Page 41 (or Page 44 of 131 of Ex. C1-01-01, Attachment 1)

[40] Georgia Public Service Commission. *Docket No. 29849. Order on The Seventeenth Semi-Annual Vogtle Construction Monitoring Report for The Period January 1, 2017 Through June 30, 2017*. October 2018. Page 14.

[41] Power Magazine. *Southern Announces Delay in Testing at Vogtle.* March 19, 2021.

3.1.3 Implications of changes in the generation portfolio

OPG's generation mix will be undergoing a transition with the optimized shutdown of the Pickering Generation Station ("Pickering GS"), which will see Units 1 and 4 taken offline by the end of 2024, and Units 5 to 8 taken offline by the end of 2025.[42]

This transition will see OPG's generation mix comprise a larger share of hydro generation, relative to historical amounts (see Figure 6). As a consequence, the generation mix will comprise a larger share of "revenue stable" hydro generation, as the OEB found in EB-2016-0152.[43] This is coupled with OPG's recent operating performance for its nuclear plants, which has improved to such an extent that it recently achieved a world record for continuous operation.[44]

Figure 6. OPG's actual and forecasted regulated generation production

Production	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast
Hydroelectric Production (TWh)	29.5	30.7	29.8	30.5	30.3	33.0	33.0	33.0	33.0	33.0	33.0
Nuclear Production (TWh)	45.6	40.7	40.9	43.5	43.8	38.3	33.2	30.8	33.3	30.2	21.5

Source: OPG Financial Results 2017, 2018, 2019, 2020; OEB. *EB-2016-0152, Application for payment amounts for the period from January 1, 2017 to December 31, 2021*. December 28, 2017; OEB. *Summary of Revenue Requirements and Revenue Deficiency*. December 31, 2020.

OPG's regulated generation portfolio will see a reduction in nuclear production and a slight increase in hydroelectric production. However, this change in the production share is less meaningful as the revenue share will remain consistent with the previous application, should OPG's filed payment amounts be approved, even with rate smoothing. Using a simple analysis of historical production and payment amounts, compared to forecasted production and proposed payment amount, we observe that the ratio of nuclear revenues declines slightly from an average of 72% for 2017-2021 (the previous application period) to a forecasted average of 69% for 2022-2026 (see Figure 7). Comparing the same periods, the output of nuclear falls from an average of 57% to 47%, indicating that, although output falls, the revenues remain relatively stable, mitigating this risk.[45]

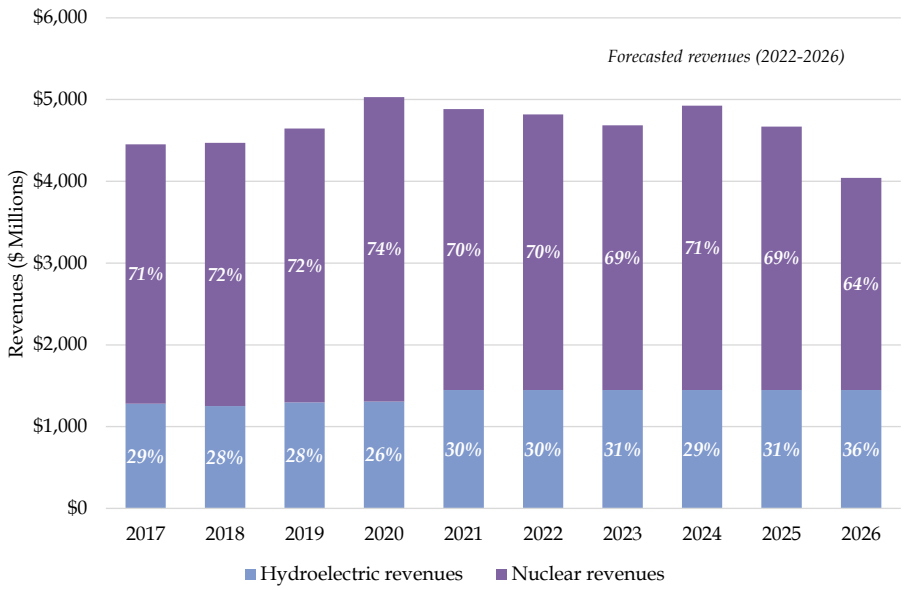
[42] OPG. *Ex. A2-02-01. OPG's Amended 2020-2026 Business Plan (redacted)*. October 19, 2020. Page 5.

[43] Ontario Energy Board. *EB-2016-0152. Decisions with Reasons.* December 28, 2017. Page 101.

[44] OPG website. *Darlington Nuclear's Unit 1 sets world record for continuous operation.* September 15, 2020.

[45] LEI notes that depending on the equity thickness chosen, revenues associated with nuclear may change. In addition, should the decision and order occur under the 2022 ROE that is different from currently applicable ROE of 8.34%, the nuclear revenues would change.

Figure 7. Illustrative revenue share of OPG production (2017-2026)



Source: OPG Financial Results 2017, 2018, 2020; OEB. *EB-2016-0152, Application for payment amounts for the period from January 1, 2017 to December 31, 2021*. December 28, 2017; OEB. *Summary of Revenue Requirements and Revenue Deficiency*. December 31, 2020.

Hydroelectric payment amounts under O. Reg. 53/05 are required to be frozen at the 2021 base rate for the application period (2022-2026).[46] For this reason, Concentric claims that, "*each MWh of nuclear generation will become more financially valuable to OPG as the nuclear generation output that recovers the nuclear revenue requirement is reduced, while continuing to be more financially valuable than each MWh of hydroelectric generation*" However, in the previous application, the OEB re-affirmed that hydroelectric assets are less risky than nuclear assets, meaning that, although the "more valuable" nuclear generation is in decline, a more "stable" form of generation remains. Specifically, the OEB noted that "*there was less risk as hydroelectric is more stable, from a revenue perspective, than nuclear generation*" because of "*the nature of the assets, and protections such as the Hydroelectric Water Conditions Variance Account required by O. Reg. 53/05*."[47] LEI notes that the OEB has established the different risks associated with nuclear and hydroelectric generation in prior proceedings as well.[48]

Asserting that nuclear is "riskier" than hydroelectric generation does not portray the magnitude of the difference in risk. The record has no quantitative evidence of such an assessment. LEI

[46] OPG. *Ex. A2-02-01. OPG's Amended 2020-2026 Business Plan (redacted)*. October 19, 2020. Page 9.

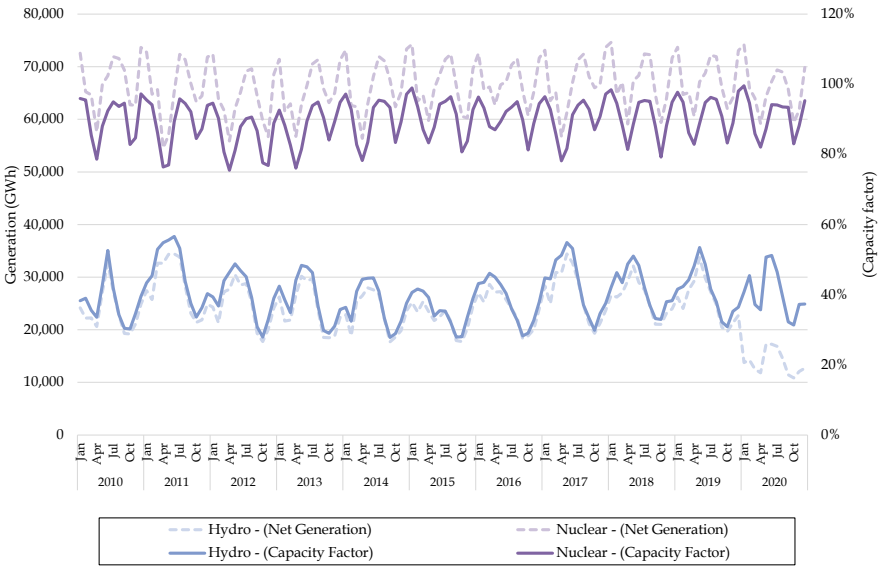
[47] Ontario Energy Board. *EB-2016-0152. Decisions with Reasons.* December 28, 2017. Page 101.

[48] See, for example, the OEB finding in the Decision with Reasons for EB-2013-0321, which states that "*The relative business risk of hydroelectric generation versus nuclear has been accepted by the Board as being lower in previous proceedings.*" (Source: OEB. *EB-2013-0321. Decision with Reasons.* November 20, 2014. Page 113.)

views risk to mean the degree of unpredictable and unhedgeable net revenue volatility. Based on this definition, it may be necessary to re-examine relative risk of nuclear and hydro generation. Nuclear risk may be a perception based on High Impact, Low Probability ("HILP") events – such HILP events have not occurred in North America since 1979, i.e., the Three Mile Island Accident. That incident, which was a partial meltdown of Unit 2 reactor of the Three Mile Island nuclear plant in Middletown, Pennsylvania, led to no loss of life and "*negligible effects on the physical health of individuals or the environment*."[49] This is not to suggest that the risk of a HILP event is zero, or that such events have not occurred outside of North America after Three Mile Island. Instead, it is intended as a reminder that some perspective is necessary when discussing relative risk.

Further, the perceived higher levels of risk of nuclear may not take into consideration that studies have shown nuclear generation stations have higher safety records relative to hydroelectric stations. Data shows that nuclear plants have resulted in fewer deaths than hydro.[50] Further, as illustrated in Figure 8 below, nuclear plants in the US are observed to have less volatile output over the last decade.[51] This monthly output data shows the volatility of the two technology types, as measured by the coefficient of variation (or standard deviation/average) of their capacity factors as 18% and 7% respectively for hydro and nuclear.

Figure 8. US generation and capacity factor for nuclear and hydro plants (2010-2020)



Source: S&P Market Intelligence data.

[49] US Nuclear Regulatory Commission. *Backgrounder on the Three Mile Island Accident.* June 21, 2018.

[50] Sovacool, Benjamin K., et al. "Balancing safety with sustainability: assessing the risk of accidents for modern low-carbon energy systems." *Journal of Cleaner Production* 112 (2016): 3952-3965.

[51] S&P Market Intelligence data.

Summary of risks associated with changes in OPG's generation mix

- The OEB's findings, in earlier decisions, on the lower riskiness of hydro generation coupled with OPG's improved nuclear performance means that the generation mix transition may change the composition of rate base, but would have limited impact on perceived riskiness.
- While Concentric contends that OPG faces increased business risk due to the decrease in more "valuable" nuclear generation due to shutdown of Pickering, LEI notes that the forecasted revenue share of nuclear compared to hydro remains similar due to rate smoothing.
- In addition, US data shows that, although nuclear plants may be perceived as riskier than hydroelectric stations, historically, nuclear plants have superior safety and performance/output records.

3.1.4 Implications of climate change and unpredictable weather patterns

Relative to the previous proceeding, OPG's change in business risk related to climate change is limited, if any. The question is not whether climate change exists, but rather whether the impacts in the forthcoming application period can be anticipated and managed. Ontario's exposure to climate change impacts is largely in-line with national averages;[52] some aspects of climate change may have offsetting impacts (e.g., positive impact of increased precipitation on hydrology); and most related costs are pass-throughs (i.e., regulatory mechanisms exist that account for potential impacts).

While climate change poses risks, expected changes in Ontario's climate appear to be manageable for a company like OPG. Depending on the emissions scenario, projections for periods beyond the application period show annual mean precipitation increases for Ontario between 2031 and 2050 are at or below the Canadian average,[53] and in all but one metric (increased occurrence of 1-in-20 year precipitation events under a high-emissions scenario), Ontario is below the national average for increases in extreme precipitation events.[54] Annual mean surface air temperature increase in Ontario between 2031 to 2050 also matches the Canadian average,[55] however Ontario is generally above the national average on metrics of extreme temperature during this time period (e.g. increase in annual highest daily maximum and minimum temperatures).[56] While extreme temperatures negatively impact OPG, they can be planned for.

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[52] Cohen, Stewart et al. "Synthesis of Findings for Canada's Regions." *Canada's Changing Climate Report,* edited by Elizabeth Bush and Donald S. Lemmen, Government of Canada, 2019.

[53] Zhang, Xuebin et al. "Temperature and Precipitation Across Canada." *Canada's Changing Climate Report,* edited by Elizabeth Bush and Donald S. Lemmen, Government of Canada, 2019, p. 167.

[54] Ibid. p. 171.

[55] Ibid. p. 132.

[56] Ibid. p. 147.

In metrics such as precipitation, there is little evidence that the degree of variation around mean values has changed significantly since the previous regulatory period. The Prairie Climate Center's Climate Atlas of Canada has consolidated several Ontario-specific projections using the most recent Intergovernmental Panel on Climate Change ("IPCC") datasets.[57] Using precipitation data for Toronto, we observe that the extent of variation (measured by the coefficient of variation, which is standard deviation divided by the average) does not appear to be increasing (See Figure 9 below).

Examination of historical and modeled precipitation data shows that the coefficient of variation between 2011 and 2015, and between 2016 and 2020 decreased, although average precipitation increased. Looking at the forecasted data, the coefficient of variation is expected to decrease further in the 2021-2025 period. While any forecast can be wrong, it appears that variation in precipitation may be falling.

Figure 9. Historical and modeled precipitation data

Average precipitation	Average (millimetres)	Std Dev (millimetres)	Coefficient of variation (%)
2011-2015	668.8	55.0	8%
2016-2020	628.6	22.7	4%
2021-2025	633.3	9.4	1%

Source: Prairie Climate Centre. *Climate Atlas of Canada*. 2019

Beyond temperature and precipitation, other potential climate change impacts in Ontario, if they occur, are likely to be outside of the application period. The Government of Canada predicts that water levels in the Great Lakes may decline due to evaporation levels surpassing precipitation levels.[58] More recent modeling of changes to water levels in the Great Lakes predict, on average, small drops by the end of the 21st century, but also do not exclude the possibility of small rises.[59] Another climate-related metric is the increase in insured damage to property. However, this is attributable in part to rising property prices, demographic trends, and inflationary impacts, rather than solely to an increase in extreme weather events.[60]

Taken together, these findings indicate that OPG's operations in the province will not face an increased level of business risk due to climate change that is above-average compared to national

[57] Prairie Climate Centre. *Climate Atlas of Canada*. July 10, 2019.

[58] Cohen, Stewart et al. "Synthesis of Findings for Canada's Regions." *Canada's Changing Climate Report,* edited by Elizabeth Bush and Donald S. Lemmen, Government of Canada, 2019, p. 440.

[59] Environmental Law and Policy Center. *An Assessment of the Impacts of Climate Change on the Great Lakes*. 2019. p. 21

[60] "Much of this rise [in costly extreme weather] is due to greater exposure to the effects of such extreme events, as Canada's population and the value of its supporting infrastructure have both increased considerably." (Source: Zhang, Xuebin et al. "Temperature and Precipitation Across Canada." *Canada's Changing Climate Report,* edited by Elizabeth Bush and Donald S. Lemmen, Government of Canada, 2019, p. 174.)

conditions, and in some cases (i.e., Great Lakes water levels) may not face significant climate-related impacts. Any climatic changes will likely also evolve over a longer time horizon (beyond the next five years), providing opportunity for planned adaptation.

Furthermore, regulatory measures already exist to pr mitigate the impact of climate events. The Z-factor – discussed in Section 3.2.4 below – would allow for recovery of *force majeure* costs, while hydroelectric generation risk is protected by a variance account. Specifically, OPG has an established a variance account for any forecast risk due to weather conditions known as the Hydroelectric Water Conditions Variance Account, consistent with O. Reg. 53/05.[61] This account records the financial impact of differences between "*the actual production amount for the regulated hydroelectric facilities and the reference production amount, arising from changes in actual water conditions*." The scope of this account applies to 98% of all OPG's output from its hydroelectric facilities, helping to mitigate climate change risks.[62]

Finally, there is even the potential for some climate change phenomena to be beneficial for OPG. For example, recent research indicates that hydroelectric production potential in Ontario is likely to increase as a result of climate change, based on past climate trends.[63] Thus, climate change could lead to increased generation at OPG's regulated hydroelectric facilities and may serve to offset to some degree any potential risk due to adverse events. While regulators need to consider the implications of climate change seriously, climate change should not be employed as an unquestioned justification for capital expenditures or increases in equity thickness.

Summary of the implications of climate change

- While Concentric claims that OPG has been experiencing increased climate change risks to its nuclear and hydroelectric operations, research indicates that climate change risks in Ontario are in line with, or even lower than the national average; any impacts would apply across all industries and sectors, through different manifestations; and risks have not increased considerably from the previous regulatory period.
- The risks of extreme weather events and variance in water levels are mitigated as they are subject to regulatory protection through existing mechanisms such as the Z-factor and Hydroelectric Conditions Variance Account.
- Some aspects of climate change may also have offsetting positive impacts for OPG's business.

[61] OPG. *Ex. H1-01-01. Deferral and Variance Accounts.* December 31, 2020. Page 7.

[62] Ibid. Page 8.

[63] Amir Jabbari, Amirali and Ali Nazemi. "Alterations in Canadian Hydropower Production Potential Due to Continuation of Historical Trends in Climate Variables." *Resources* 8.163 (2019): 163. Digital.

3.1.5 Role of political intervention

OPG is fully owned by the Province of Ontario and is subject to business risk arising from political intervention. Political intervention may occur through Ministerial Direction from the Minister of Energy, Northern Development and Mines ("MENDM"). Under the *Ontario Energy Board Act, 1998*, the Minister of Energy, Northern Development and Mines may issue directives, approved by the Lieutenant Governor in Council, that OEB shall implement.[64]

Related to OPG specifically, between 1999 and 2008, the Ministry of Energy issued nine directives to the OEB. OEB notes that the directives "*required the OEB to implement and maintain certain conditions in the licences issued to OPG, the Independent Electricity Market Operator (as it was then known) and others to address issues that arise from the market share of Ontario Power Generation Inc. in the Ontario electricity sector… required the OEB to modify certain of the conditions of licence, largely in relation to the "price cap and rebate" mechanism and, in one instance, to facilitate implementation by OPG of the reduction in CO_2 emissions from the use of coal.*"[65] The lack of similar directives in subsequent periods shows that they have been used more sparingly since, and is one factor contributing to LEI's view that risk of adverse directives is relatively low for OPG. Nevertheless, the fact that they could occur means the potential for direct political interference is different in Ontario than in many US states.

Since the OEB's previous decision (EB-2016-0152) on OPG's payment amounts, there have however been other instances of political intervention impacting Ontario regulated entities, with the potential to increase the perception of political risk.

Following the 2018 provincial election, the newly elected government moved to fulfil a campaign promise to replace the CEO of Hydro One, a utility nearly majority-owned by the Province.[66,67] In addition, Hydro One, in agreement with the Ontario government, replaced its board of directors on July 11, 2018.[68] The action taken by the Government of Ontario suggests that current or future governments may act to intervene in the governance of provincially-owned utilities in response to public sentiment over matters that may be beyond the control of the leadership of these corporations.

Later, in response to the COVID-19 pandemic, the Government of Ontario introduced several mandates to hold electricity rates fixed, as summarized below in Figure 10.

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[64] OEB. *Directives issued to the OEB*.

[65] Ibid.

[66] Ontario Chamber of Commerce. *Ontario PC Party Platform 2018*. June 1, 2018.

[67] "Doug Ford's government strikes deal with Hydro One to force out CEO, board". *CBC News*. July 11, 2018.

[68] Hydro One Limited. *Hydro One Limited Announces Process for Board Renewal and Retirement of CEO*. July 11, 2018.

Figure 10. Summary of Government of Ontario rate actions during the COVID-19 pandemic

Date	Description
March 24, 2020 – May 31, 2020	• Government of Ontario indicated its intent to suspend time-of-use ("TOU") rates, holding off-peak prices to 10.1¢/kwh. • Minister of Energy, Northern Development and Mines stated reasoning: "provide additional relief to Ontarians who are doing their part to stay home"
June 1, 2020 – October 31, 2020	• Government of Ontario indicated its intent to further suspend TOU rates, holding off-peak prices to 12.8¢/kwh under the name COVID-19 Recovery Rate. • Minister of Energy, Northern Development and Mines stated reasoning: "supporting families and business-owners as we plan for the safe and gradual reopening of the province"
January 1, 2021 – February 22, 2021	• Government of Ontario indicated its intent to again suspend TOU rates in the wake of Ontario's Stay-at-Home Order, holding off-peak prices to 8.5¢/kwh. • Minister of Energy, Northern Development and Mines stated reasoning: "provide households, small businesses and farms with stable and predictable electricity bills when they need it most"

Source: Province of Ontario. *Ontario Providing Electricity Relief to Families, Small Businesses and Farms During COVID-19*. March 24, 2020; Province of Ontario. *Ontario Provides Consumers with Greater Stability and Predictability with Their Electricity Bills*. May 30, 2020; Province of Ontario. *Ontario Extends Off-Peak Electricity Rates to Provide Relief for Families, Small Businesses and Farms.* February 10, 2021.

In addition to the Government of Ontario's actions to protect customers in response to the COVID-19 pandemic, two other actions taken by the Government of Ontario impacted OPG:

- First, passing legislation that influenced collective bargaining between OPG and the Power Workers Union ("PWU"). In 2018, the Government of Ontario passed legislation prohibiting any strike or lockouts between OPG and PWU and directing that mediation/arbitration be used to conclude the collective agreement.
- Second, imposing a freeze on the base salary, and restricting the pay-for-performance of OPG employees at the Vice President level or higher. This action was implemented as the *Compensation Framework Regulation 406/18* under the *Broader Public Sector Executive Compensation Act, 2014*.

LEI notes that the interventions related to COVID-19 were short-lived, and will likely have only minor long-term impacts, if any, on OPG.

Ratings agencies DBRS Limited and S&P Global Ratings, in their most recent rating reports, also conclude that, while the Province of Ontario has committed to having OPG run independently, the risk of political intervention still exists.[69,70] For example, the risk of a provincially owned entity (even in cases where provincial ownership is partial) being subject to "political considerations" was cited by the Washington Utilities and Transportation Commission's decision to block Hydro One's acquisition of Avista in 2018. The regulator stated that it was "*evident that decisions affecting Hydro One's and Avista's … are subject to political considerations that may motivate*

[69] OPG. *Rating Agency Reports*. December 31, 2020.

[70] Mayur Deval et al. "Why We See Ontario's Electricity And Gas Regulatory Framework As Strong". *S&P Global Rating*. January 13, 2021.

one provincial leader or another to make decisions and take actions … instead of promoting the best interests of Avista."[71] This perception of an active rather than passive provincial shareholder is relevant for Crown corporations. While political intervention can at times be in the Crown corporation's favor, the uncertainty surrounding the conditions and timing of when it occurs increases, albeit in the case of Ontario moderately, overall uncertainty surrounds the firm.

Summary of political intervention business risk

- Since the OEB's last payment decision, there have been instances of the Government of Ontario's intervening in the energy sector, most notably the replacement of Hydro One's CEO and board of directors as well as fixing electricity rates in response to COVID-19 pandemic.
- While the risk of future political intervention may be limited, two rating agencies concluded that the risk of further political intervention exists.
- Concentric does not explicitly address political intervention as a business risk, but rather uses it as a tool in comparing the similarity in risk of Canadian and US utilities.

3.1.6 Evolution of the OEB

Under the *Ontario Energy Board Act, 1998,* the OEB is authorized to determine the payment amounts to be made to OPG for the output of specific generation facilities. Since OPG's last rate application (EB-2016-0152), the OEB's governance structure has evolved to separate the administrative and adjudicative functions of the organization.

In 2017, the Ontario government appointed a panel of experts to conduct a review of the OEB. The purpose of the review was to examine best practices from other jurisdictions and synthesize findings into a report to provide recommendations to the Minister. In 2019, the Review Panel published their findings in the Ontario Energy Board Modernization Review Panel Final Report ("OEB Modernization Report").[72] The Review Panel made eight recommendations (see Figure 11).

[71] S&P Global Market Intelligence. *Wash. regulator puts brakes on Hydro One's acquisition of Avista.* December 5th, 2018.

[72] Ontario Energy Board Modernization Review Panel. *Ontario Energy Board Modernization Review Panel Final Report*. October 2018.

Figure 11. Summary of recommendations made by Review Panel

Recommendation	Description
1	Establish a new governance framework that includes a Board of Directors with a non-executive Chair, a President, and a Chief Commissioner. Furthermore, the Panel recommends renaming the OEB to the Ontario Energy Regulator (OER).
2	The OER should ask the President and the Chief Commissioner to propose a plan to enhance the independence, the certainty and the efficiency of the adjudication process.
3	The OER should inform the Legislative Assembly of their plans, priorities, and performance one year after the appointment of the Board and then every three years after that.
4	The OER should develop new key performance indicators (KPIs) that focus on decision cycle time, stakeholder satisfaction, and organizational excellence.
5	The OER should develop and maintain a prioritized list and schedule of emerging policy issues that the they plan to address.
6	The OER should ask the President to undertake a financial review of the OER to ensure best practices are implemented and that expenditures are appropriate for delivering priorities.
7	The OER should enhance the Annual Report to include additional operational, financial and performance information.
8	The OER should develop a human capital plan that ensures the staff skillset is sufficient for responding to challenges facing the regulation of the energy sector.

Source: Ontario Energy Board Modernization Review Panel. *Ontario Energy Board Modernization Review Panel Final Report*. October 2018.

Following the release of the report, the Ontario government moved to implement one of the findings to amend the governance structure of the OEB through Bill 87. This legislation passed in May 2019,[73] and resulted in key governance changes to the OEB as follows:[74]

- Creation and appointment of a Board of Directors responsible for governance and strategic oversight of the regulator. Notably the OEB Chair will "be accountable" to the Minister of Energy, Northern Development and Mines to ensure "independence and effectiveness of the OEB's adjudicative process";

- Establishing a role of a Chief Executive Officer ("CEO") for operational and policy aspects of the OEB; and

- Creation of commissioners who would "assume an adjudicative role in hearing and determining matters" that are within the OEB's jurisdiction. The Chief Commissioner

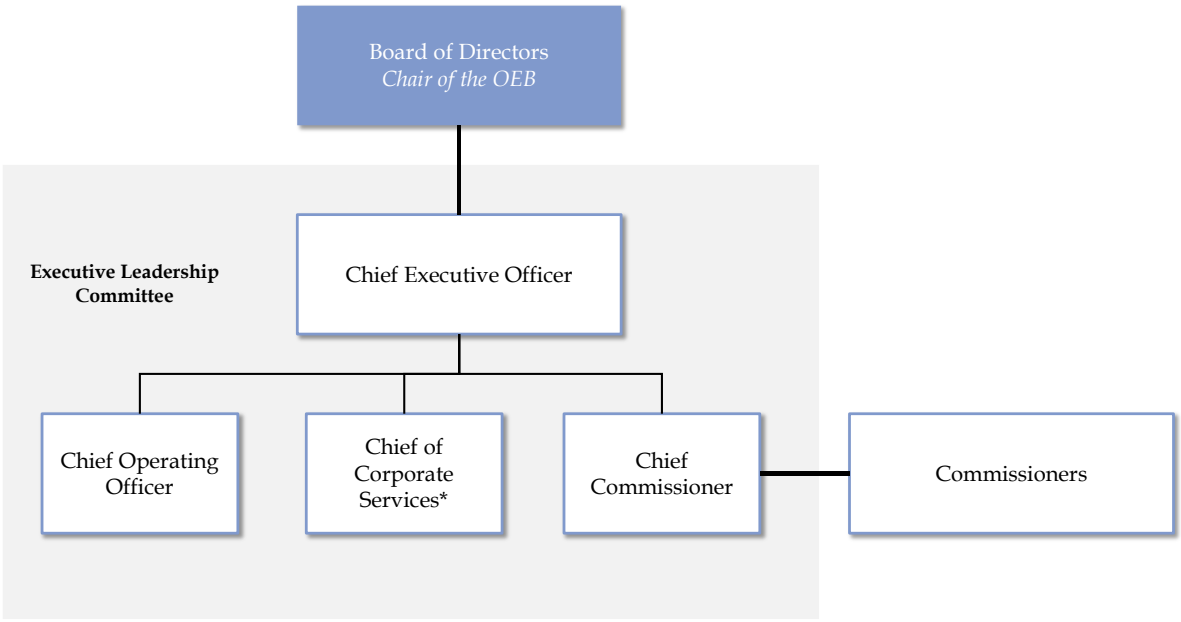
[73] The relevant provisions were proclaimed into force October 1, 2020.

[74] Ontario Ministry of Energy, Northern Development and Mines. Backgrounder. *Building a Modern, Efficient, and Effective Energy Regulator for Ontarians.* March 21, 2019.

would be accountable to the CEO, responsible for "ensuring timeliness and dependability" of regulatory processes.[75]

Figure 12 below illustrates the governance structure at the OEB.

Figure 12. Governance structure of the OEB



* Role now combined with General Counsel.

Source: Chart developed by LEI based on its review of OEB website. *Who We Are*. Accessed on May 7th, 2021.

One of the stated intentions of the transition was to improve independence of the OEB.[76] The recommendations of the OEB Modernization Report were welcomed by some commentators.[77] However, the separation of operational and adjudicative roles i.e., Commissioner and CEO, is distinct from the way in which many North American peer regulators are organized, and it remains to be seen whether the objectives of the reorganization will be achieved. LEI believes that, while the risks to OPG from this organizational change, if any, are likely to be minimal through the application period, it is only through the passage of time that its effectiveness will become known.

[75] Note that the Chief Commissioner is a new role; however, the Commissioners' adjudicative role is not new, other than a change in nomenclature from Board Members to Commissioners.

[76] Ontario Ministry of Energy, Northern Development and Mines. Backgrounder. *Building a Modern, Efficient, and Effective Energy Regulator for Ontarians.* March 21, 2019.

[77] Fremeth, A., Holburn, G. & Rivard, B. *Regulating in the public interest: Moving beyond the recommendations of the OEB Modernization Review Panel.* Ivey Energy Policy and Management Centre. April 2, 2019.

Summary of the evolution of OEB business risk

- The government's response to the Ontario Energy Board Modernization Review Panel resulted in a reorganization of the OEB.
- It remains to be seen how the change in the governance framework of the OEB will operate in the future, as this structure is relatively unique in North America.
- Concentric acknowledges the role that the OEB plays with respect to OPG but does not examine the specific risks associated with OEB as a regulator.

3.1.7 Implications of DER growth in Ontario

At present, Distributed Energy Resources ("DERs") are a small fraction of overall load. However, the landscape for DERs in Ontario is evolving – the OEB's DER impact study conducted in late 2020 suggests a cumulative ~1.5 GW of solar PV and 1 GW of battery storage by 2030 in the "Mid" scenario,[78] which assumes "average or neutral" levels for critical inputs such as technology cost and operations and maintenance cost estimates, as well as implementation of some supporting policy mechanisms." While these projections are indicative, they suggest that a meaningful uptake of DERs is plausible by 2030, and even the "Low" case suggests installation of 1 GW solar PV and ~600 MW of batteries. LEI believes the regulated business will gradually face *de facto* competition, which will increase over time.

While the current level of DERs in Ontario does not pose a risk for OPG's upcoming regulatory period, LEI views DER growth as a potential long-term threat. This is because OPG's recovery of its revenue requirement for the regulated assets assumes continued existence of a critical mass of customers who continue to take service under regulated rates. Accelerated DER uptake in Ontario may eventually increase stranded asset risk. This business risk could materialize as customer uptake of DERs increases, and the number of customers paying regulated rates declines. Customers that leave the grid create a risk of cost shifting to other customers, as fewer customers pay for the same amount of output from OPG's plants. Although this is unlikely to materialize during the forthcoming application period, it is an increased risk relative to the previous application, and LEI notes that it may begin to be a concern in subsequent applications.

[78] ICF. *Ontario Distributed Energy Resources Impact Study*. Submitted to the OEB. January 18, 2021.

Summary of the implications of DERs

- OEB's DER impact study estimates that by 2030, around 1.5 GW of solar PV and 1 GW of battery storage may be installed in Ontario, assuming "neutral" changes to key assumptions.
- An accelerated uptake may be a business risk for OPG in the long-term as greater market penetration by DERs could result in stranded asset risk.
- Although this is unlikely to be a significant risk for the forthcoming application period, it is an important trend to monitor going forward.

3.2 Have OPG's financial risks increased since the previous application?

When discussing financial risk in the context of a utility's capital structure, it is important to note that all utilities – private or public - must raise financial capital to pay for their investments. As such, both fairness and practical considerations dictate that investors who provide these capital funds must be adequately compensated.[79] This notion is consistent with the principles of the Fair Return Standard identified in Section 2.3 above.

Financial risks are primarily linked to a company's ability to continue to finance its capital needs. For a regulator considering a regulated utility's financial risks in setting the cost of capital under the FRS, three requirements must be met: comparable investment, financial integrity, and capital attraction. Further the OEB has previously established that among these requirements, "*none ranks in priority to others*."[80]

Since the previous decision of the OEB regarding OPG's payment amounts, the financial climate for OPG has evolved, including the impact of the COVID-19 pandemic on financial markets. Figure 13 below provides a summary.

[79] Cannon, D. *Cost of Capital – Presentation at CAMPUT's 2014 Energy Regulation Conference.* Queen's University. July 1, 2014.

[80] OEB. *EB-2009-0084. Report of the Board on the Cost of Capital for Ontario's Regulated Utilities.* December 11, 2009. Page 19.

Figure 13. Summary of financial risk factors for Ontario Power Generation

Financial risk	Summary
Credit ratings metrics and potential impact on rating	▪ Recent rating agency reports of OPG have a consensus view of a stable outlook for the utility ▪ LEI's analysis suggests that, going forward, key credit metrics are anticipated to support investment grade ratings through 2026
Role of inflation	▪ The degree of liquidity from monetary policy/stimulus programs is unprecedented; exogenous factors may compound this risk ▪ Increased bond yields can put pressure on ROE metrics and possibly the cost of capital
Betas and perceived market volatility	▪ Market volatility is currently above historical levels, driven by uncertainty in the short term; in the long-run, betas may return to historical levels as economies recover from impact of pandemic ▪ Utility betas may be more meaningful for discussions related to cost of equity (instead of equity thickness)
Role of OEB regulatory framework	▪ OPG is operating within a strong regulatory framework that provides cost recovery, and ensures revenues remain stable and predictable ▪ Although there is a heightened risk of political interference, it poses only moderate risks to OPG's debtholders
Implications of green bond program	▪ OPG has raised over $2 billion of debt since the prior proceeding for expansion ▪ OPG's successful issuances through its Green Bond program suggests that there are significant sources of debt financing available

3.2.1 Analysis of OPG's credit metrics and potential impact on rating

OPG is currently rated by three credit rating agencies including S&P Global Ratings ("S&P"), DBRS Morningstar ("DBRS") and, as of 2019, Moody's Investors Service ("Moody's").

In its application, OPG stated that as of December 2020, it had a long-term credit rating of BBB+ by S&P, A (low) by DBRS and A3 by Moody's. As stated by the utility, "*there have been no changes to OPG's credit ratings since the EB-2016-0152 payment amounts application*" other than the addition of Moody's to the ratings entities (see Figure 14).[81]

[81] Ontario Power Generation. *EB-2020-0290. Ex. A2-03-01. Rating Agency Reports.* December 31, 2020. Page 1.

Figure 14. Summary of OPG's recent credit ratings

Issuer	OPG rating (EB-2016-0152)	OPG rating (EB-2020-0290)	Comments
DBRS Morningstar	*A (low)* *(April 2016)*	*A (low)* *(April 2020)*	▪ **Stable** trend ▪ Strengths include indirect support of province, a dominant market position, a reasonable regulatory framework and limited nuclear waste liabilities ▪ Challenges cited include significant capex program, risks of complexity associated with nuclear generation, political intervention and increased exposure to non-regulated operations
Moody's Investor Service	*N/A*	*A3* *(December 2020)*	▪ **Stable** outlook ▪ Strengths cited include stable generation cashflows from both regulated and non-regulated facilities, support of the province and diversification benefits ▪ Challenges include nuclear refurbishment execution risk, debt-financed acquisitions, risks associated with merchant generation and hydrology risk
S&P Global Ratings	*BBB+* *(July 2015)*	*BBB+* *(July 2020)*	▪ Outlook **revised to stable** from negative ▪ 2016 rating had been revised down from A- to BBB+ following the downgrade of the Province of Ontario ▪ Business risk outlook revised upwards to strong from satisfactory ▪ Financial outlook revised upwards citing "*operational improvements, effective cost management, and reduced capital spending*" ▪ Challenges in outlook derived from strategy of growth through debt-driven acquisitions

Sources: Ratings reports filed in Exhibit A2-03-01 (S&P Global Ratings; DBRS Morningstar; Moody's Investor Service)

A review of credit reports filed by OPG in this application affirm key characteristics of OPG that substantiates the view of a stable outlook, such as support from the Province of Ontario, a significant share of regulated revenues, and limited nuclear liabilities. Business risks cited include execution risk of the DRP,[82] political intervention and debt-financed growth risk. Overall, the most recent annual ratings reports from the three agencies have all retained a stable outlook for OPG.[83,84,85]

[82] However, as discussed earlier in Section 3.1.2, rating agencies have cited the execution risk to be lower given the on-time and on-budget refurbishment of Unit 2.

[83] DBRS Morningstar. *Ontario Power Generation Inc.* April 16, 2020. Page 1 of 20 (Filed as Ex. A2-03-01. Attachment 4)

[84] Moody's Investors Service. *Ontario Power Generation Inc. Update to credit analysis*. 21 December 2020. Page 1. (Filed as Ex. A2-03-01. Attachment 6)

[85] S&P Global Ratings. *Ontario Power Generation Inc. Outlook Revised To Stable From Negative; 'BBB+' Rating Affirmed.* July 17, 2020. Page 1 (Filed as Ex. A2-03-01. Attachment 11).

Maintaining an investment grade rating is important for OPG to be able to finance DRP on reasonable terms. However, ratepayers should not be responsible if activities/expansion associated with unregulated assets were to negatively impact credit metrics, and in turn OPG's rating.

If an investment grade rating is lost, the pool of investors allowed to invest can drop.[86] An issuer is deemed "investment grade" based on the evaluation of both business and financial metrics. For example, S&P deems an overall rating of "BBB-" as the lowest investment grade by market participants.[87] An entity may achieve a BBB- rating with a financial risk profile of "highly leveraged", i.e., the worst score, but would require an "excellent" business risk profile rating (see Figure 15). Conversely, it is not possible to achieve a BBB- rating under the worst business risk profile, i.e., "vulnerable", regardless of the financial risk profile.[88]

Figure 15. Matrix of business and financial risks and associated ratings

	Financial risk profile					
Business risk profile	**1 (Minimal)**	**2 (Modest)**	**3 (Intermediate)**	**4 (Significant)**	**5 (Aggressive)**	**6 (Highly leveraged)**
1 (Excellent)	AAA/AA+	AA	A+/A	A-	BBB	BBB-/BB+
2 (Strong)	AA/AA-	A+/A	A-/BBB+	BBB	BB+	BB
3 (Satisfactory)	A/A-	BBB+	BBB/BBB-	BBB-/BB+	BB	B+
4 (Fair)	BBB/BBB-	BBB-	BB+	BB	BB-	B
5 (Weak)	BB+	BB+	BB	BB-	B+	B/B-
6 (Vulnerable)	BB-	BB-	BB-/B+	B+	B	B-

Investment grade Below investment grade

Source: S&P Global Ratings. *Corporate Methodology: Ratios And Adjustments.* November 19, 2013

A meaningful change in OPG's perceived riskiness by credit rating agencies may result in a ratings downgrade and increase the cost of borrowing as well as access to capital markets for borrowing needs. In a previous decision, the Board has found that "*credit risk is not an independent*

[86] For example, academic papers note that credit rating levels affect whether "*particular investor groups such as banks or pension funds are allowed to invest*" in the entities' bonds. (Source: Kisgen, Darren J. "Credit ratings and capital structure." The Journal of Finance 61.3 (2006): 1035-1072.)

[87] S&P Global Ratings. *Guide to Credit Rating Essentials. What are credit ratings and how do they work?* 2019. Page 14.

[88] S&P Global Ratings. *Corporate Methodology: Ratios And Adjustments.* November 19, 2013

factor in assessing whether business risk has changed – it is the credit rating agencies' assessment of those risks as to how they may affect solvency and liquidity."[89]

Looking ahead at the application period, LEI has undertaken an illustrative forecast analysis, focusing on estimating credit metrics for the regulated assets only. Specifically, LEI considered the following five key metrics that are observed across the three agency reports: (i) Debt/EBITDA, (ii) Funds from Operations ("FFO")/Debt, (iii) FFO/Interest, (iv) Cashflow from Operations ("CFO")/Debt, and (v) EBIT/Interest.[90,91]

Figure 16 provides a description of these metrics and the benchmarks or expectations for supporting an investment-grade rating by the rating agencies. As noted earlier, an issuer is deemed "investment grade" through a combination of the evaluation of both business and financial metrics. In practice, this means that although a utility may fare worse on these credit benchmarks, they may be deemed investment grade through a superior business risk assessment.

Figure 16. Description of key credit metrics

Credit metric	Description
Debt/EBITDA	▪ Evaluates a company's ability to pay its debts ▪ A higher value suggests a longer time may be needed to pay debt, and thus is correlated with lower credit rating
FFO/Debt	▪ Assesses extent to which company is leveraged ▪ A lower value suggests higher leverage levels, and is correlated with lower credit rating
FFO/Interest	▪ Assesses the ability of a company to service its interest expenses ▪ A higher value suggests sufficient cashflows to service interest payments, and may support higher credit rating
CFO/Debt	▪ Assesses the leverage but evaluates the extent to which the company's operating cashflows can repay its debt obligations ▪ Like FFO/Debt, a lower value is correlated with a lower credit rating
EBIT/Interest	▪ Measures a company's earnings over its interest payments. ▪ A higher value suggests better financial health of the firm, and correlates to a higher credit rating

[89] OEB. *Decision and Order EB-2016-0152 Application for payment amounts for the period from January 1, 2017 to December 31, 2021.* December 28, 2017. Page 107.

[90] S&P Global Ratings. *Corporate Methodology: Ratios And Adjustments.* November 19, 2013.

[91] DBRS Morningstar. *Methodology. Rating Companies in the Regulated Electric, Natural Gas and Water Utilities Industry.* September 2019

	Debt/ EBITDA (x)	FFO/ Debt (%)	FFO/ Interest (x)	CFO/ Debt (%)
Minimal	Less than 2	Over 35	Over 8	Over 30
Modest	2-3	23-35	5-8	20-30
Intermediate	3-4	13-23	3-5	12-20
Significant	4-5	9-13	2-3	8-12
Aggressive	5-6	6-9	1.5-2	5-8
Highly Leveraged	Greater than 6	Less than 6	Less than 1.5	Less than 5

	EBIT/ Interest (x)
AA	Over 2.8x
A	1.8-2.8x
BBB	1.5x – 1.8x
BB/B	1.0x -1.5x

Notes: Key terms defined as follows:

"Debt" defined as total debt, including long-term and short-term borrowing.

Earnings before Interest, Taxes, Depreciation and Amortization ("EBITDA") defined as revenues minus operating expenses (excluding depreciation, amortization, and non-current asset impairment and impairment reversals).

Funds from operations ("FFO") represents a company's ability to generate recurring cash flows from operations (S&P Ratings defines it as EBITDA minus cash interest paid minus cash taxes paid).

"Interest" defined as total interest expense.

Cash from operations ("CFO") is also referred to as operating cash flow. This measure takes reported cash flows from operating activities (as opposed to investing and financing activities), and includes all cash interest received and paid, dividends received, and cash tax paid in the period.

S&P benchmarks used for this analysis are aligned with the 'low volatility' criteria, consistent with the categorization of regulated utilities.

Sources: DBRS Morningstar. *Methodology. Rating Companies in the Regulated Electric, Natural Gas and Water Utilities Industry.* September 2019; S&P Global Ratings. *Key Credit Factors for The Regulated Utilities Industry.* November 2013; S&P Global Ratings. *Corporate Methodology.* November 2013.

Utilizing forward-looking financial data on the record for regulated facilities,[92] LEI has estimated the impact of equity thickness between 45% and 50% on the five key credit metrics. In general, the metrics would support an investment grade rating throughout the application period. As discussed earlier, the investment grade rating is reflective of a combination of the evaluation of both business and financial risks, and LEI views OPG's business risk profile associated with the regulated assets to be at least strong.

This is consistent with the 2020 S&P Ratings report, which notes the following: "*We revised the business risk profile upwards to strong from satisfactory. Our revised business risk profile reflects our expectations for more stable and predictable cash flows. The business risk profile is supported by the company's regulated operation that constitutes about 70% of consolidated EBITDA and is regulated by the Ontario Energy Board (OEB). The company benefits from the generally supportive regulatory environment*

[92] Data taken from financial statements for OPG's regulated facilities filed in the proceeding record (Source: OPG. *EB-2020-0290. Exhibit A2-01-01.* December 31, 2020) and OPG's filings in Exhibit C of the proceeding record (Source: OPG. *EB-2020-0290. Exhibit C1.* December 31, 2020). LEI has assumed higher debt levels relative to planned net debt issuances in the 2020-2026 period to maintain total debt consistent with assumed equity thickness levels in the capital structure. Where forward-looking data was not available, projections have been made based on reasonable assumptions. LEI's methodology and data sources are described in Appendix A.

that includes using an incentive ratemaking methodology for hydroelectric and a custom incentive regulation framework for nuclear. In addition, the company uses various regulatory mechanisms, which smooth cash flow and we view as supportive of credit quality."[93]

Note that S&P Ratings reviews OPG on a consolidated basis, and views OPG's business risk profile to be strong despite the increase in risk profile associated with the unregulated assets, as indicated by the following: "*The business risk profile is hurt by the company's growing contracted unregulated power exposure, which will contribute about 30% of consolidated EBITDA.*"[94]

LEI's analysis is focused on regulated assets only, and is summarized in Figure 17 and Figure 18.

Figure 17. Forward-looking credit metric summary

Credit metric	Summary
Debt/EBITDA	▪ At 47% equity thickness, the ratio is ~5.4x in 2022, increasing to ~5.8x in 2026 ▪ On average across all years, an increase in equity ratio of 1% reduces this ratio by ~2.7% ▪ Comparing to the S&P benchmark, the metric indicates 'highly leveraged' in some years at lower levels of equity thickness, and improves at higher levels
FFO/Interest	▪ At 47% equity thickness, the ratio is ~5.3x in 2022, declining to ~3.4x in 2026 ▪ On average across all years, an increase in equity ratio of 1% increases this ratio by ~3.3% ▪ Comparing to the S&P benchmark, the metric is between 'modest' and 'intermediate' across scenarios
FFO/Debt	▪ At 47% equity thickness, the ratio is ~13.4% in 2022, declining to ~11.4% in 2026 ▪ On average across all years, an increase in equity ratio of 1% increases this ratio by ~3.3%* ▪ Comparing to the S&P benchmark, the metric is between 'intermediate' and 'significant' across scenarios
CFO/Debt	▪ At 47% equity thickness, the ratio is ~18.3% in 2022, declining to ~17.1% in 2026 ▪ On average across all years, an increase in equity ratio of 1% increases this ratio by ~2.8%* ▪ Comparing to the S&P benchmark, the metric is 'intermediate' across scenarios
EBIT/ Interest	▪ At 47% equity thickness, the ratio is ~2.5x in 2022, staying relatively steady at ~2.4x by 2026 ▪ On average across all years, an increase in equity ratio of 1% increases this ratio by ~4.1%* ▪ Comparing to the DBRS benchmark, the metric supports at least an 'A' rating across all scenarios

* Note: Percentage change is not additive. For example, an increase of ~3.3% means 3.3% of ~13.4%, equal to ~13.8%

Sources: LEI analysis; supporting data detailed in Appendix A.

[93] S&P Global Ratings. *Ontario Power Generation Inc. Outlook Revised To Stable From Negative; 'BBB+' Rating Affirmed.* July 17, 2020. (Also filed by OPG as Ex. A2-03-01 Attachment 11.)

[94] Ibid.

Figure 18. Forward-looking credit metric analysis

Credit Metric	Year	Equity thickness					
		45%	46%	47%	48%	49%	50%
Debt/ EBITDA	2022			Aggressive			Significant
	2023	Highly Leveraged		Aggressive			
	2024			Aggressive			
	2025	Highly Leveraged		Aggressive			
	2026	Highly Leveraged		Aggressive			
FFO/ Interest	2022	Intermediate		Modest			
	2023			Intermediate			
	2024			Intermediate			
	2025			Intermediate			
	2026			Intermediate			
FFO/ Debt	2022	Significant		Intermediate			
	2023			Significant			Intermediate
	2024			Significant		Intermediate	
	2025			Significant			
	2026			Significant			
CFO/ Debt	2022			Intermediate			
	2023			Intermediate			
	2024			Intermediate			
	2025			Intermediate			
	2026			Intermediate			
EBIT/ Interest	2022			A			AA
	2023			A			
	2024			A			AA
	2025			A			AA
	2026			A			

Notes: Orange shaded metrics can drive a negative ratings action if combined with a weak business risk profile. Note that LEI does not view OPG's business risk profile to be weak; instead, it is at least strong. Green shaded metrics would support an investment grade rating, unless business risk profile is weak or vulnerable. For S&P ratings, "Minimal" represents the lowest financial risk, followed by "Modest", "Intermediate", "Significant", "Aggressive" and "Highly leveraged". For DBRS, the Financial Risk Assessment ("FRA") ratings are from highest to lowest: AA, A, BBB, and BB/B.

Sources: LEI analysis; supporting data and calculations detailed in Appendix A.

Based on this sensitivity analysis, LEI recommends an equity thickness of 47%. Relative to lower levels, an equity thickness at 47% facilitates maintaining an investment grade rating due to reduced risk levels associated with: (i) Debt/EBITDA in 2023, 2025, 2026; (ii) FFO/Interest in 2022; and (iii) FFO/Debt in 2022.

While most key metrics appear acceptable at lower equity levels, an equity thickness of 47% allows for additional support for an investment-grade rating,[95] recognizing OPG's holistic risk profile, including the risks identified in the business risk assessment, as well as financial risks identified in subsequent sections. The OEB should carefully consider the implications of approving equity thickness levels below 47%, as illustrative analysis shows higher risk associated with debt service at lower equity thickness levels. To compensate for such higher risk, rating agencies would need to continue to perceive OPG's business risk profile between strong and excellent over the application period.

Concentrics's evidence contends that OPG faces an increase in risk "*as illustrated by the pressure on, and potential decline below current credit rating thresholds of, key credit metrics in the earlier years of the period.*"[96] This view is not supported by quantitative evidence from either OPG or Concentric. An IR response[97] indicates that neither OPG nor Concentric have undertaken such quantitative analysis.

However, OPG's credit metrics when calculated based solely on its regulated facilities remain largely supportive of investment grade rating, suggesting that this segment will remain steady throughout the application period. This is consistent with S&P's expectation of improved financial outlook: "*…for 2019 the company's financial measures exceeded our expectations, reflecting operational improvements and effective cost management. We expect these improvements will be sustained and lead to consistently improved financial performance.*"[98] LEI understands that ratings agencies have utilized consolidated financials to prepare their credit metrics analysis,[99] which differs from LEI's analysis that focuses solely on potentially less volatile regulated facilities.

LEI empahsizes that if OPG's unregulated activities were to negatively impact credit metrics, ratepayers should not be responsible for providing further support. OEB may want to consider imposing ring-fencing requirements to insulate ratepayers from any such negative impacts.

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[95] LEI notes that the objective is to maintain an investment grade rating, not necessarily OPG's current rating.

[96] Concentric Energy Advisors. Ontario Power Generation Common Equity Ratio Study. December 31, 2020. Filed as Ex. C1-01-01 Attachment 1. Page 31.

[97] OPG. *EB-2020-0290. Exhibit L. C1-01-Staff-072.* Page 1. April 19, 2021.

[98] S&P Global Ratings. *Ontario Power Generation Inc. Outlook Revised To Stable From Negative; 'BBB+' Rating Affirmed.* July 17, 2020. Page 1).

[99] See, for example, the most recent S&P ratings report, which assesses business risks related to OPG's unregulated businesses contribution to "consolidated EBITDA". (Source: Ibid. Page 2).

Summary of impact of equity thickness on credit metrics

- Most recent rating agency reports of OPG have a consensus view of a stable outlook for the utility. Supporting this view are the perceived support of the Province, a dominant market position, a "reasonable" regulatory framework and stable generation cashflows.
- LEI has used OPG's regulated facilities' reported financial information to estimate the key credit metrics ratios for the application period (i.e., 2022-2026). LEI's analysis suggests that, going forward, key credit metrics, in combination with evaluation of OPG's business risk profile, are anticipated to support investment grade ratings through 2026.
- Concentric states that it believes OPG's financial risk will increase "*as illustrated by the pressure on, and potential decline below current credit rating thresholds of, key credit metrics in the earlier years of the period*." It does not provide any quantitative support for this view.

3.2.2 Role of inflation

Inflation poses a financial risk for OPG given its request for a fixed ROE in this application, and rising levels of inflation may be perceived as an increase in its riskiness. This risk is not unique to OPG. Inflationary pressure will also be felt across the economy.

As of April 2021, projected inflation by the Bank of Canada for 2021 is 2.2%, before falling to 2% in 2022.[100] Between 2021 and 2023, drivers of upward inflationary pressure in Canada include dynamics in the energy market, in particular increased gasoline costs for customers due to rising prices relative to lows observed in 2020, while downward pressure will be driven by economic slack.[101] In its December 2020 issue, Consensus Economics, which provides a summary of analysis from multiple economic forecasters in Canada, presented an average of long-term inflation of 2% per year through 2030.[102]

In the US, during the Federal Open Markets Committee of the US Federal Reserve Bank (in March 2021), it was observed that: "*Inflation continued to run below 2 percent*".[103] However, we note that in the first few months of 2021, actual inflation measures have been higher than expected. The US Labor Department's Consumer Price Index ("CPI") recently reported an increase in its all-items index to 4.2% in the 12 months to April 2021, up from 2.6% in March.[104] This is the largest 12-month increase since September 2008. Supply chain constraints have been cited as driving the

[100] Bank of Canada. "*Monetary Policy Report: April 2021*". April 2021.

[101] Economic slack refers to the number of resources in an economy that cannot be used, for example, machines left idle in a factory or people who cannot find a job.

[102] Consensus Economics. *Surveys of International Economic Forecasts – G-7 and Western Europe*. December 7, 2020.

[103] Minutes of Federal Open Market Committee March 16-17, 2021. *Federal Reserve*. April 7, 2021.

[104] In Canada, the CPI rose to 2.2% in March 2021 (the most recent available data with Statistics Canada). Statistics Canada. *Consumer Price Index, March 2021.* Released April 21, 2021.

increase – for example, the price of used vehicles rose 10%, accounting for a third of the increase.[105]

The Federal Reserve expects inflation of 2% or higher from 2021-2023. This is due to supply chain disruptions coupled with potentially strong demand in the near term between 2021 and 2023.[106] Figure 19 outlines the inflation forecasts for both Canada and the US.

Figure 19. CPI forecast (2021-2023)

Description	2021	2022	2023
Canada:			
Private CPI Forecast	2.0%	2.0%	2.0%
Bank of Canada CPI Forecast	1.6%	1.7%	2.1%
US:			
Private PCE Forecast	2.1%	2.0%	2.0%
FED PCE Forecast	2.4%	2.0%	2.1%

* The Fed uses the Personal Consumption Expenditures ("PCE") Price Index as a primary inflation measure when making monetary policy decisions.[107] PCE tracks "the change in prices of goods and services purchased by consumers throughout the economy".[108]

Source: Bloomberg Professional. Data from 2021 updated through March 31, 2021.

It is notable that the exogenous factors driving inflation occur in the context of monetary policies that have been enacted in response to COVID-19. For example, large asset purchase programs by Bank of Canada, a policy known as quantitative easing ("QE"), has resulted in over $4 billion added to the central bank's balance sheet on a weekly basis, for a total of $280 billion.[109]

There continues to be debate about whether inflation risk is a temporary phenomenon, or a permanent reset of expectations, with the latter being more concerning. While the above-mentioned programs may have led to an increasing risk of inflation, the central banks' view seems to be that the risk is controllable. For example, the Bank of Canada states that a major misconception is that QE risks sparking high inflation and that the Bank of Canada "has the tools [it] needs to keep [inflation] in check".[110] Separately, the most recent meeting of the Federal Open Markets Committee of the US Federal Reserve Bank (in March 2021) observed that "*after the*

[105] US Bureau of Labor Statistics. *Consumer Price Index Summary – April 2021. Economic News Release.* May 12, 2021.

[106] Minutes of Federal Open Market Committee March 16-17, 2021. *Federal Reserve.* April 7, 2021.

[107] Matteo Luciani and Riccardo Trezzi. "Comparing Two Measures of Core Inflation: PCE Excluding Food & Energy vs. the Trimmed Mean PCE Index". *The Board of Governors of the Federal Reserve System*. August 2, 2019.

[108] Federal Reserve Bank of San Francisco. *PCE Inflation Dispersion*.

[109] Bank of Canada website. *COVID-19: Actions to Support the Economy and Financial System*.

[110] Bank of Canada. *How quantitative easing works*. December 10, 2020.

transitory effects of these [inflationary] factors fade, however, participants generally anticipated that annual inflation readings would edge down next year."[111]

Other factors that may drive inflation in the short term include strong economic growth as well as supply chain disruptions that could increase prices of materials and logistics delays. In an example of the impact of the former, the Bank of Canada recently signaled that it would pare back its QE program as the Canadian economy makes a stronger-than-expected recovery.[112]

OEB currently addresses inflation through the variable inputs of their ROE and long-term cost of debt calculations. The inputs include the long-term utility bond yield and the government bond yield, and indirectly reflect the movements of inflation. This increase in yields will ultimately result in a higher cost of equity and debt. Therefore, inflation risk is mitigated due to the annual adjustment of the inflation reflective inputs.

Setting a fixed multi-year ROE presents the risk that inflation rates push bond yields higher, thus understating a fair ROE, as currently calculated using the OEB ROE framework. In addition, unexpected inflation poses risks associated with: (i) timing of recovery for DRP costs, and (ii) rate freeze for hydro payments. The possibility of increasing inflation is a reality in the current economic environment.

Summary of inflationary financial risk

- Though the central banks have expressed confidence in their ability to control inflation, the degree of liquidity from monetary policy/stimulus programs is unprecedented. In addition, the potential for supply chain backlogs to impact timing and prices, as well as stronger-than-expected growth could lead to rising inflation.
- Inflationary pressures could pose a risk to coverage ratios.
- Concentric determined that inflationary pressures pose an incremental financial risk due to OPG's fixed hydroelectric payment amount set under the price-cap incentive model. LEI agrees.

3.2.3 Betas and perceived market volatility

Since OEB's previous decision (EB-2016-0152) on OPG's payment amounts, both capital market performance and volatility have evolved. Between 2017 and early 2020, markets rose steadily, continuing the 'bull market' that began in March 2009. In the later part of February 2020, the impacts of the COVID-19 pandemic began to be observed in the financial markets as worries about a possible recession were realized. As a result, between late February 2020 and March 2020, major market indices declined substantially: the S&P 500 fell 2,237 points against its February 19, 2020 high (a 34% decline), while the S&P/TSX Composite Index fell 6,697 points against its

[111] Minutes of Federal Open Market Committee March 16-17, 2021. *Federal Reserve*. April 7, 2021

[112] Hertzberg, E. *Bank of Canada Set to Dial Back Bond Buying: Decision-Day Guide*. Bloomberg News. April 20, 2021.

February 19, 2020 high (a 37% decline).[113] In response, central banks cut interest rates to near-zero levels as a monetary policy tool against recessionary effects, and these cuts substantially decreased the yields on corporate and government bonds.

Since late March 2020, equity markets have recovered, and market indices remain strong. In the United States, the Federal Reserve has indicated its intent to keep interest rates near-zero until 2023, despite rising treasury yields.[114] In Canada, the Bank of Canada also projected no change in interest rates until 2023, though rising inflation concerns may bring this timeline forward.[115] Figure 20 below summarizes the key capital market trends seen during the period of 2015 to March 2021.

Figure 20. Summary of Capital market trends

Description	2015	2016	2017	2018	2019	2020	2021 (as of March 31, 2021)
S&P 500 Index	2,061	2,095	2,449	2,746	2,913	3,218	3,973
TSX Index	14,331	14,046	15,544	15,745	16,318	16,017	18,701
30-Year Bond Yield (Canada)	2.19%	1.93%	2.28%	2.36%	1.80%	1.22%	1.98%
30-Year Bond Yield (U.S.)	2.84%	2.60%	2.89%	3.11%	2.58%	1.56%	2.41%
10-Year Bond Yield (Canada)	1.53%	1.26%	1.79%	2.28%	1.59%	0.76%	1.56%
10-Year Bond Yield (U.S.)	2.13%	1.84%	2.33%	2.91%	2.14%	0.89%	1.74%
30-Year Utility Bond Yield (Canada)	3.82%	3.68%	3.65%	3.74%	3.30%	2.78%	3.29%
30-Year Utility Bond Yield (U.S.)	4.14%	3.96%	4.01%	4.25%	3.78%	2.99%	3.45%
Bank of Canada Overnight Rate	0.50%	0.50%	1.00%	1.75%	1.75%	0.25%	0.25%
Federal Funds Target Rate	0.50%	0.75%	1.50%	2.50%	1.75%	0.25%	0.25%
Real GDP Growth (Canada)	0.67%	1.00%	3.04%	2.43%	1.86%	-5.39%	
Real GDP Growth (U.S.)	3.08%	1.71%	2.33%	3.00%	2.16%	-3.49%	

Source: Bloomberg Professional. Data from 2021 updated through March 31, 2021.; Statistics Canada. *Table 36-10-0104-01 Gross domestic product, expenditure-based, Canada, quarterly (x 1,000,000)*; US Bureau of Economic Analysis. *Table 1.1.6 Real Gross Domestic Product*.

These swings in the capital markets in 2020, combined with public health concerns and uncertainties surrounding the pandemic, has left market volatility above historical levels.[116]

[113] Jean-Sebastien Fontaine et al. "Canadian stock market since COVID-19: Why a V-shaped price recovery". *Bank of Canada*. October 2020.

[114] Summary of Economic Projections. *Federal Reserve*. March 17, 2021.

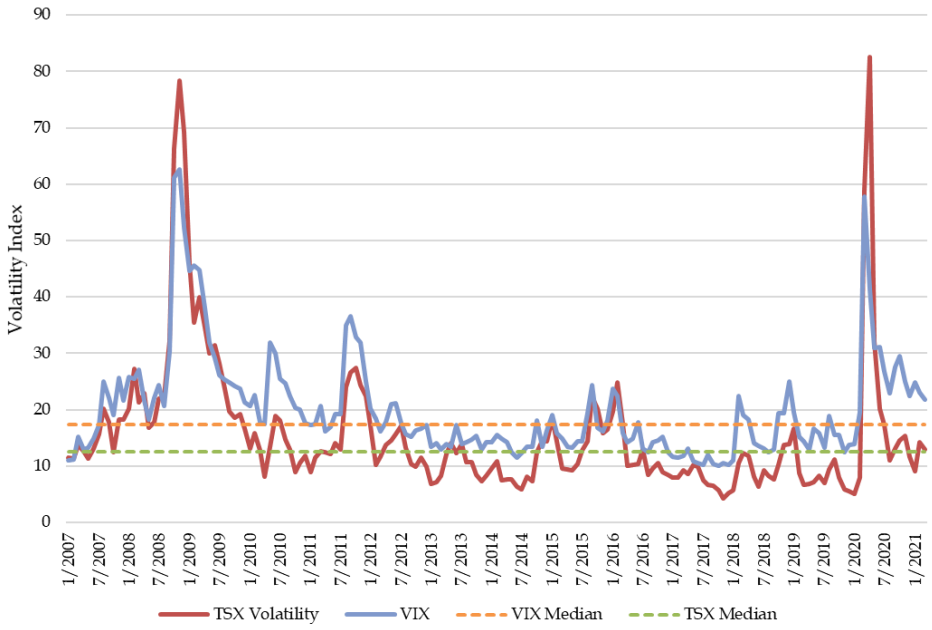
[115] "Bank of Canada will hold current level of policy rate until inflation objective is sustainably achieved, continues quantitative easing". *Bank of Canada*. March 10, 2021.

[116] "Monetary Policy Report: February 2021". *Federal Reserve*. February 2021.

Furthermore, volatility over the shorter-term has been driven higher by rapidly rising treasury bond yields.[117]

Figure 21 exhibits the historical market volatility for the TSX and the S&P 500, measured by the Volatility Index ("VIX"). VIX is a measure of the anticipated movements of the S&P 500, derived from currently traded prices of S&P 500 options. VIX is known on Wall Street as the "fear gauge".[118] According to the Chicago Board Options Exchange ("CBOE"), VIX tends to be mean reverting.[119]

Figure 21. Historical market volatility



Source: Bloomberg Professional. Data from 2021 updated through March 31, 2021.

A company's beta acts as a measure of systematic risk, or volatility, compared to the broader market.[120] Equities in regulated utilities have traditionally been deemed "defensive" stocks due to business characteristics such as predictable recurring cash flows and the perceived "essential" nature of their operations.[121] Therefore, regulated utilities typically see lower betas. Perceived risk

[117] Minutes of Federal Open Market Committee March 16-17, 2021. *Federal Reserve*. April 7, 2021.

[118] Edwards, Tim. "Reading VIX: Does VIX Predict Future Volatility". *S&P Dow Jones Indices*. November 2017.

[119] "VIX Index Characteristics: Why Volatility Products May Provide Unique Hedging and Income Strategies". *Cboe Exchange Inc.* November 23, 2020.

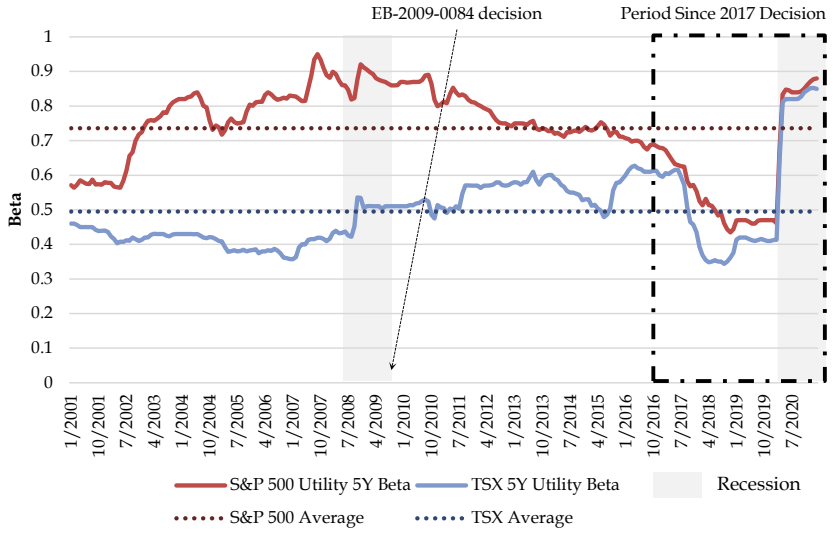
[120] Harrington, Diana. "Stock Prices, Beta, and Strategic Planning". *Harvard Business Review*. May 1983.

[121] "Have Defensive Sectors Stood the Test of Time in Global Markets?" *S&P Market Intelligence*. June 24, 2020.

in the market observed in the volatility of major indices has also been seen in utility betas that have been above historical levels since March 2020.

Since the previous OEB decision in 2017, utility betas have evolved considerably, consistent with market trends. From the later part of 2017 to early 2020, Canadian utility betas decreased to their lowest levels since the 2008 Financial Crisis and US utility betas decreased to their lowest levels in the past 20 years. However, beginning in March 2020, both US and Canadian utility betas increased substantially to historic highs. Figure 22 portrays the historical trend of S&P/TSX Composite Index utilities' Beta and the S&P 500 Utilities Index over the past 20 years.

Figure 22. Historical 5Y S&P/TSX Composite Index utilities beta



Source: Bloomberg Professional. Data from 2021 updated through March 31, 2021.

In the Concentric report, there is emphasis placed on the short-term upswing of utility betas at the onset of the COVID-19 pandemic in both Canada and the United States. Concentric's analysis of betas does not distinguish between US and Canadian utilities in its beta analysis, however this distinction may be warranted.

Though both Canadian and US utilities have followed similar patterns between the period of 2017 to the present, this is not consistent with the preceding periods. Between 2001 and 2010, betas deviated substantially with US utilities seeing a significantly higher beta, whereas Canadian utilities remained mainly below 0.5. Since 2016, the spread between the US and Canadian utility betas has declined. Therefore, although perceived risk as measured via betas over the short-term appears to be high, a longer dataset shows that for US utilities, market risk is consistent with the financial crisis of 2008. For Canadian utilities, the increase in beta is substantial, but consistent with current unprecedented market conditions.

The increase in betas since the start of the pandemic puts them near the level at the time of OEB's previous decision. However, strong economic recoveries are projected for 2021 and 2022 as immunization programs ramp up and economic activities return to pre-pandemic levels.[122,123] Should utility betas return to pre-pandemic trends, a long-term trend analysis suggest that lower betas should also be expected, particularly for Canadian utilities. Following the 2007-2008 global financial crisis at which S&P 500 utility betas peaked at 0.93 in August 2007, the S&P 500 utility betas trended downward reaching 0.74 in August 2013 and 0.49 in August 2018.

Further, LEI notes that the ROE formula employed in the current cost of capital methodology set in EB-2009-0084 is a formula-based ROE with a base ROE which has remained constant since the decision.[124] The recent increase in US utility betas simply brings them back to the levels where they were at around the time EB-2009-0084 was promulgated.

Moreover, utility betas, beyond being a metric for perceived market risk, may be less relevant to equity thickness assessment than to the cost of equity. The determination ofequity thickness should be more focused on the utility's ability to meet appropriate credit coverage ratios for debt.

Summary of beta and perceived market volatility financial risk

- Market volatility is currently above historical levels, driven by uncertainty in the short term. Current betas are above historical levels, but are likely to revert to historical levels as vaccinations increase, and the economy reopens.
- LEI considered a longer-term historical analysis of utility betas relative to Concentric's analysis, and differentiated between Canadian and US utility betas. By doing this, LEI was able identify both short-, and long-term trends and the deviations between Canadian and US utility betas.
- Although financial risk perception will likely be higher than average in the short term due to unease in the financial markets, it is likely to revert to normal levels over the near to medium term (i.e., potentially following significant vaccination levels).
- Finally, LEI notes that utility betas may be more meaningful for discussions related to cost of equity. The equity thickness is more relevant for meeting debt coverage ratios.

3.2.4 Role of OEB's regulatory framework

Ratings agencies consider the regulatory framework when evaluating OPG's risks, and thus OEB's regulatory framework may have a substantial effect on the financial stability of OPG. Under section 78.1 of the *Ontario Energy Board Act, 1998*, OEB is authorized to set payment amounts for the output of OPG's nuclear generating stations and certain hydroelectric generation

[122] "Monetary Policy Report: January 2021". *Bank of Canada*. January 2021.

[123] Summary of Economic Projections. *Federal Reserve*. March 17, 2021.

[124] OEB. *EB-2009-0084. Report of the Board on the Cost of Capital for Ontario's Regulated Utilities.* December 11, 2009.

facilities. Ontario Regulation 53/05 ("O. Reg. 53/05") determines the rules to be followed by OEB when determining payment amounts for the regulated generating facilities. Under this regulation, both the incentive rate-setting framework used by OPG as well as Z-factor claims for recovery of costs lend to the strong financial stability of OPG and its favorable low risk. In addition, OPG has proposed to continue over twenty existing authorized deferral and variance accounts as part of its application.[125]

The OEB provides for three forms of performance-based regulation ("PBR") for rate setting to provide a fair cost of service for both gas and electric utilities. Two of the forms of rate-setting are used by OPG and are summarized in Figure 23.

Figure 23. Incentive rate-setting framework for OPG

Methodology	Facilities	Key Features
Price Cap Incentive Rate-Setting	46 Hydroelectric Facilities	• Cost of Service process is used for the first year. • Following four years are indexed by the fourth-generation price cap index formula. • Allows for incremental rate recovery of additional capital spending above capital spending approved in the setting of the base rate through Incremental Capital Module (ICM). • As of November 2020, overridden by a rate freeze for the 2022-2026 period.
Custom Incentive Rate-Setting	2 Nuclear Facilities	• Sets base rates over a five yar span using forecasts based on OPG's nuclear facility costs and sales volume. • Allows for OPG to earn on its rate base within period without waiting for next COS application. • Beneficial as nuclear facilities have large multi-year capital spending commitments.

Source: Mayur Deval et al. "Why We See Ontario's Electricity and Gas Regulatory Framework As Strong". *S&P Global Rating*. January 13, 2021

The regulatory framework surrounding rate-setting is perceived by ratings agencies as allowing for strong and predictable revenue. In addition, uncertainties such as forecast risk are mitigated through the multiple variance accounts such as the Hydroelectric Water Conditions Variance Account, and Ancillary Services Net Revenue Variance Account.[126] DBRS Morningstar's most recent report (filed with OPG's application) states that the utility "benefits from a reasonable regulated environment" and cites the approval of balances in its past two deferral and variance accounts as part of the examples in support of this view.[127]

[125] OPG. *EB-2020-0290. Ex, H1-01-01.* December 31, 2020. Page 3.

[126] OPG. *EB-2020-0290. Ex, H1-01-01.* December 31, 2020. Page 9.

[127] DBRS Morningstar. *Ontario Power Generation Inc.* April 16, 2020. Page 8. (Also filed as Ex. A2-03-01. Attachment 4)

With respect to the Z-factor, this regulatory tool allows for utilities to mitigate the financial impact of unforeseen events that are outside its control. Within the OEB's regulatory framework, under the Custom IR plan, OPG can recover costs associated with unforeseen events through what the OEB defines as Z-factor claims.[128] While Z-factors claims must fulfill three criteria determined by the OEB[129] (see Figure 24), LEI has not seen evidence suggesting OEB denies prudent Z-factor claims.[130]

Figure 24. Z-Factor Amount Eligibility Criteria

Criteria	Description
Causation	The amounts should be directly related to the Z-factor event. The amount must be clearly outside of the base upon which rates were derived.
Materiality	The amounts must exceed the Board-defined materiality threshold and have a significant influence on the operation of the distributor; otherwise, they should be expensed in the normal course and addressed through organizational productivity improvements.
Prudence	The amount must have been prudently incurred. This means that the distributor's decision to incur the amount must represent the most cost-effective option (not necessarily least initial cost) for ratepayers.

Source: OEB. *Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors*. July 14, 2008

Provided OPG meets the criteria identified by the OEB, including a materiality threshold of $10 million, consistent with the OEB decision in EB-2016-0152,[131] the Z-factor is a tool to mitigate financial risk associated with unforeseen events. Furthermore, this aspect of the OEB's regulatory framework contributes to the stability and predictability of revenues and ROE as any large costs associated with unforeseen events can be recovered should it meet all three criteria listed above.

Recently, S&P provided analysis of Ontario's electricity and gas regulatory framework. S&P determined that Ontario had a strong credit supportive assessment, which was attributed to

[128] OEB. *Filing Requirements For Electricity Distribution Rate Applications: 2018 Edition for 2019 Rate Applications*. July 12, 2018.

[129] OEB. *Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors*. July 14, 2008

[130] For instance, following an ice storm in December 2013, Milton Hydro experienced extensive damage to its distribution lines and almost 50% of its customers were without power. In February 2014, the utility filed a Z-factor claim for recovery of ~$950,000 of operations maintenance and administration ("OM&A") costs. The Board was satisfied that the claim met the eligibility criteria of materiality, prudence and causation. (Source: OEB. Decision and Order. EB-2014-0162. October 16, 2014)

[131] OEB. EB-2016-0152. *Decision and Order*. December 28, 2017. Page 134.

Ontario's predictable and stable regulatory framework.[132] Four key aspects were discussed: (i) regulatory stability, (ii) tariff-setting procedures and design, (iii) financial stability, and (iv) regulatory independence and insulation. Figure 25 summarizes the findings from the S&P report.

Figure 25. S&P Global Ratings' key factors of the Ontario regulatory framework

Factor	Key Takeaways
Regulatory Stability	• Regulation came into effect in 1997 • Have been using performance-based ratemaking since 2001 for electric utilities • Framework is predictable and transparent with well-defined parameters
Tariff-Setting Procedures and Design	• Structure of tariffs is stable and targets fair returns for operators • Renumeration for operators allows for investment recovery, financial renumeration, and continuous operational expense recovery
Financial Stability	• Operators can recover most of their costs
Regulatory Independence and Insulation	• OEB is independent from the government and shows no indication of material political interference

Source: Mayur Deval et al. "Why We See Ontario's Electricity and Gas Regulatory Framework As Strong". *S&P Global Rating*. January 13, 2021

Having noted the above, S&P listed the following as potential factors that could increase the risk associated with Ontario's regulatory environment:[133] (i) *ineffectiveness of approach for calculating ROE* on approved capital structure under the current low-interest environment coupled with the OEB failing to adjust the approach; (ii) *loss of regulatory independence* or *political interference* with the framework; (iii) *changes in regulation* that could decrease transparency, consistency, and timely recovery of costs; and (iv) *increase in provincial or sovereign risk factors* that could cause a negative effect on the operator's financial compensation.

LEI agrees with the presence of provincial/sovereign risk; if the quality of the province's finances declines, rating agencies may be less likely to give credit for its implicit support of OPG. Further, LEI believes there is greater risk of political interference relative to US peer regulators, but one which poses only moderate risks to OPG's debtholders. S&P cites the OEB's prompt response to deal with credit pressures during the COVID-19 pandemic as an example of how OEB can effectively handle risks.[134]

[132] Mayur Deval et al. "Why We See Ontario's Electricity And Gas Regulatory Framework As Strong". *S&P Global Rating*. January 13, 2021.

[133] Ibid.

[134] Ibid.

Summary of the OEB's regulatory framework financial risk

- OPG is operating within a strong regulatory framework that provides cost recovery, and ensures revenues remain stable and predictable. Furthermore, the potential use of Z-factors within the ratemaking structure contribute to a strong regulatory framework.
- LEI determines that the current regulatory framework within which OPG operates mitigates for financial risk, and although there is a risk of political interference, it poses only moderate risks to OPG's debtholders, and is unlikely to deteriorate during the application term.

3.2.5 Implications of access to green financing/green bond program

OPG issued its first Green Bond in June 2018 under its existing Medium Term Note Program - the initial $450 million 30-year bonds had a coupon rate of 3.84%. Since the initial Green Bond offering, three other offerings have been made for a total of an additional $1.7 billion. The proceeds from these bonds are used to finance "Eligible Projects" that are defined by OPG as a group of selected projects that offer "*tangible environmental benefits*" and include renewable energy generation, energy efficiency and management.[135] Figure 26 outlines the bond offerings.

Figure 26. OPG green bond issuances

Metric	First Green Bond Offering	Second Green Bond Offering	Third Green Bond Offering	Fourth Green Bond Offering
Size of Issue	CAD$450 million	CAD$500 million	CAD$400 million	CAD$800 million
Coupon rate	3.838%	4.248%	2.893%	3.215%
S&P Global rating	BBB+	BBB+	BBB+	BBB+
DBRS rating	A(low)	A(low)	A(low)	A(low)
Term	30 years	30 years	5 years	10 years

Source: OPG; S&P Global; DBRS

The successful issuance of these bonds suggests there is substantial availability for debt financing that is accessible to OPG, indicating there is less need for equity thickness to increase.

The environmental characteristics of the assets underlying the issuances also makes them attractive to an increasing number of ethical investors. This shift is currently seen as some of

[135] OPG. "Ontario Power Generation Green Bond Framework". May 2018.

Canada's largest pension funds are pressing companies to address social issues, particularly climate change.[136]

Summary of green bond/green financing financial risk

- OPG's successful issuance of large amounts of debt through its Green Bond program suggests that there are significant sources of debt financing available for the utility. In particular, investors eager for investments that meet environmental, social and governance ("ESG") criteria may be a source of this funding.
- OPG has demonstrated its ability to raise debt financing from the markets consistently through this program suggesting markets perceive little need to increase equity thickness.

[136] Duarte, Esteban. "Bond Market Edge Seen Expanding for Sustainable Credit Bets". *Bloomberg Green*. January 27, 2021.

4 Jurisdictional scan and peer review analysis

4.1 How does OPG's risk compare to similar utilities in North America?

For its peer review analysis, Concentric compiled a group of 20 North American utilities that it deemed to be comparable to OPG, and presented recent capital structure data for each of these utilities to form the basis of its equity thickness recommendation. Based on this data, Concentric determined the average range of equity ratios to be between 45.7% and 55.9%, but "conservatively" recommended "an equity ratio of no less than 50%" to account for what it perceived to be OPG's elevated sources of risk compared to the proxy group, including concentrated nuclear generation and its status as a generation-only utility, among other factors.[137]

While LEI finds Concentric's screening criteria for the peer review analysis to be generally reasonable, it is LEI's view that the definition of what constitutes a suitable comparator for the purposes of a peer analysis is too narrow. LEI believes that the peer analysis component of the proceeding has become somewhat circular, with experts basing their cost of capital recommendations on data from a similar set of comparables and using similar screening criteria. In turn, the cost of capital recommendations for each of these comparables has been developed by looking at other comparables in the list, essentially creating a feedback loop that is not market based. This merits broadening the definition of what constitutes a suitable comparator, and introduction of additional data to inform cost of capital and capital structure recommendations. For this reason, LEI presents data for: (i) contracted zero-emitting assets (discussed in Section 4.1.3), and (ii) assets outside of North America (discussed in Section 4.2). LEI believes a suitable equity thickness for OPG of 47% is further supported based on this extended analysis.

4.1.1 Evaluating the filed peer group

As discussed briefly in Section 1.5, Concentric conducted a review of capital structure data for several North American electric utilities that it deemed to be similar to OPG. Concentric conducted this comparative analysis for two sets of proxy groups:

1. **Moody's Peer Group**, which consisted of three companies identified as OPG's peers by Moody's; and
2. **Concentric's Proxy Group**, which consisted of a broader group of 20 companies.

To form Concentric's Proxy Group, Concentric relied on the following screening criteria to include only companies that:[138]

- own regulated generation assets that are included in rate base;

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[137] Concentric Energy Advisors. *EB-2020-0290. Exhibit C1-1-1/ Ontario Power Generation Common Equity Ratio Study.* December 31, 2020. P. 7 of Attachment 1.

[138] Ibid. P. 63-65 of Attachment 1.

- own regulated nuclear and/or hydro generation;
- have regulated revenue and regulated net income that make up greater than 60% of total revenue and total income for the consolidated company;
- have regulated electricity revenue and net income that make up greater than 80% of revenue and income for the consolidated company's regulated operations; and
- have an investment credit rating similar to that of OPG (specifically an S&P credit rating of BBB- or above, or a Moody's credit rating of Baa3 and above).

Notably, all Canadian utilities failed to pass at least one of these screening criteria, and hence were initially excluded from the analysis. However, to ensure that "at least a minimal number of Canadian utilities" were included in the comparative analysis, Concentric incorporated the capital structure data for Algonquin Power & Utilities Corp, Emera Inc., and Fortis Inc.[139] As such, the final iteration of Concentric's Proxy Group consisted of 20 utilities (17 US, three Canadian), while the Moody's Peer Group included three US utilities. LEI discusses the differences between US and Canadian utilities in greater detail later in Section 4.1.2.

Figure 27. Concentric's comparative analysis results of peer groups

Figure 2: Summary of Comparative Analysis Results (Concentric Proxy Group)

Analytical Approach	Mean Equity Ratio	Median Equity Ratio
Holding Company Equity Ratios: 5-Year Avg.	45.7%	47.4%
Operating Company Equity Ratios: 5-Year Avg.	52.8%	53.0%
Operating Company Equity Ratios: Authorized	49.5%	49.6%

Figure 3: Summary of Comparative Analysis Results (Moody's Peer Group)

Analytical Approach	Mean Equity Ratio	Median Equity Ratio
Holding Company Equity Ratios: 5-Year Avg.	50.6%	49.1%
Operating Company Equity Ratios: 5-Year Avg.	55.9%	53.6%
Operating Company Equity Ratios: Authorized	50.7%	50.1%

Source: Concentric Energy Advisors. *EB-2020-0290. Exhibit C1-1-1/Ontario Power Generation Common Equity Ratio Study.* December 31, 2020. P. 6 (or page 9 of 131 of Attachment 1).

The results of Concentric's comparative analysis are summarized in Figure 27, with an observed range of equity ratios between 45.7% and 55.9%. However, Concentric argues that a reasonable range of equity thickness for OPG should focus on the results of the regulated operating companies only, which would place the range at the upper end between 49.5% and 55.9%. In this regard, "Concentric places less weight on the equity ratios at utility holding companies (versus those at regulated operating companies) because those companies reflect a different risk profile than the regulated operations of OPG."

[139] Ibid. P. 66 of Attachment 1.

LEI disagrees with this argument and is of the view that a focus on the equity ratios at the holding company level is reasonable. This is because holding company ratios are market determined. Considering the fact that unregulated businesses in the holding company face a higher amount of risk, but the equity thickness is less, this suggests that the market will tolerate more debt in the capital structure. In this sense, a focus on the authorized equity ratios at regulated *operating* companies would be too generous. Focusing instead on equity ratios at the holding company level places the range at the lower end between 45.7% and 50.6%. Notably, LEI's recommended equity thickness of 47% lies close to the midpoint of this range. A prior decision from the regulator in Connecticut supports this view: Public Utilities Regulatory Authority ("PURA") in a 2016 rate case for Avangrid subsidiary United Illuminating Co., the regulator stated that when establishing a ratemaking capital structure, it is "*the holding company level that matters*."[140] More recently, witness testimony by the PURA's Office of Education, Outreach, and Enforcement ("EOE") recommended a reduction in Connecticut Light & Power's equity thickness to 40.5% citing this decision.[141]

Summary of filed peer group analysis

- Concentric consolidated a proxy group of 20 comparable utilities based on generally reasonable criteria, screening for: the presence of regulated generation assets, specifically some nuclear and/or hydro generation; notable revenue and net income derived from regulated electricity operations; and an investment credit rating similar to OPG.
- While Concentric argued that a focus on the equity ratios at the operating company level was appropriate (imputing a reasonable equity thickness range between 49.5% and 55.9%), it is LEI's view that a focus on the equity ratios at the holding company level is reasonable (resulting in an equity thickness range between 45.7% and 50.6%).

4.1.2 Has the OEB previously opined on OPG's risk compared to US utilities?

As the OEB stated in its Decision and Order in the 2016 proceeding, referring to Concentric (on behalf of OPG) and Brattle (on behalf of OEB Staff), "[w]hile the experts used different comparator groups, both relied heavily on US companies, as there are very few companies in Canada similar to OPG."[142] Based on 2015 data, the OEB further found that "the allowed ROE in the US and Canada have converged, but this is not true for common equity ratios."[143] As such, the OEB opined that a risk differential adjustment should be applied to the equity ratios imputed

[140] Connecticut Public Utilities Regulatory Authority. *Docket No. 16-06-04. Application of The United Illuminating Company To Increase Its Rates And Charges. Decision.* December 14, 2016. Page 62.

[141] Connecticut Public Utilities Regulatory Authority. *Docket No. 17-12-03RE11. Direct Testimony of Aaron L. Rothschild – Cost of Capital.* April 26, 2021. Page 18 and 19.

[142] Ontario Energy Board. *Decision and Order (EB-2016-0152): Ontario Power Generation Inc.* December 28, 2017. P. 107.

[143] Ibid. P. 108.

from the comparative analyses, to account for the observed difference between US and Canadian utilities.

LEI conducted a review of authorized ROEs and equity ratios for Canadian and US utilities in 2020 and found that this trend of converging ROEs but divergent equity ratios still persists. As illustrated in Figure 28, authorized ROEs in Canada averaged 8.92% in 2020, versus 9.28% in the US. In contrast, authorized equity ratios in Canada averaged 38.38%, versus 50.56% in the US.

Figure 28. Authorized ROEs and common equity ratios for Canadian and US utilities (2020)

ROE (%)	Canada range	Canada average	US average
Gas	8.30 - 11.00	9.23	9.46
Electricity distributors	8.20 - 9.35	8.61	9.10
Average		**8.92**	**9.28**

Common equity ratio (%)	Canada range	Canada average	US average
Gas	30.00 - 46.50	40.25	51.89
Electricity distributors	25.00 - 45.00	36.50	49.22
Average		**38.38**	**50.56**

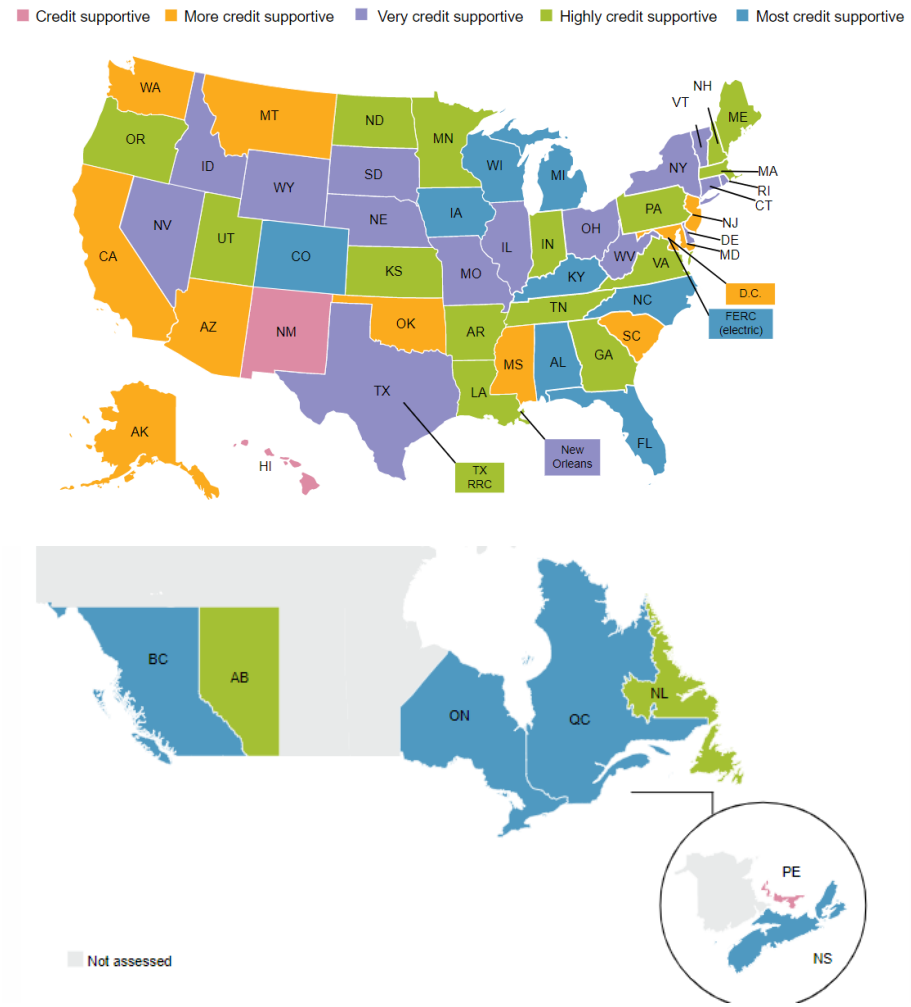
Note: See Appendix B (Section 7) for a complete list of utilities included and their sources.

In its evidence, Concentric provides summaries of interviews with equity and credit analysts to support its view that an adjustment for risk between Canadian and US utilities is "not necessary at this time." LEI disagrees with this view; the data presented in Figure 28 suggests that an adjustment when setting OPG's regulatory capital structure may still be appropriate in the current proceeding.

Further, analysts continue to view Canadian jurisdictions as more credit supportive in the utilities sector relative to the US. For instance, S&P publishes an update on its assessments of regulatory risk of jurisdictions in North America. Its most recent update in November 2020 illustrates nearly all Canadian jurisdictions ranked as "most credit supportive" relative to US jurisdictions (see Figure 29).[144]

[144] S&P Global Ratings. *U.S. And Canadian Utility Regulatory Updates And Insights: November 2020.* November 9, 2020.

Figure 29. Regulatory assessments by state and province (2020)



Source: S&P Global Ratings (November 2020)

In its updated rating methodology, Moody's states that in Canada, "*the framework has historically been viewed as predictable and stable, which has helped offset somewhat lower levels of equity in the capital structure*", although the agency notes that returns have continued to fall during the review period.[145]

[145] Moody's Investor Service. *Regulated Electric and Gas Utilities.* June 23, 2017. Page 40.

Summary of LEI's view on the issue of US versus Canadian utilities

- LEI reviewed the authorized ROEs and equity ratios for utilities in Canada and the US in 2020.
- LEI observes that while the gap between authorized ROEs in Canada and the US is narrow (8.92% on average in Canada versus 9.28% in the US), authorized equity ratios vary widely between the countries (38.38% on average in Canada versus 50.56% in the US).

4.1.3 Is the amount of leverage attained by contracted zero-emitting IPPs relevant?

As discussed in a prior section, peer analysis in rate cases has become somewhat circular, relying on the same sample of comparator utilities for multiple proceedings and using this data as a basis for informing an equity thickness recommendation for OPG. LEI is of the view that the sample of comparator entities should be expanded to include market-based data from contracted zero-emitting independent power producers ("IPPs").

Figure 30. Key statistics for zero-emitting IPPs included in analysis

Company	Ticker	% of 2020 revenues from renewable assets	% of 2020 revenues from North American operations	% of assets or revenues under contract (FY 2020) **
Boralex Inc.	BLX	96%	46%	98%
Brookfield Renewable Partners L.P.	BEP.UN	54%*	40%	84%
Innergex Renewable Energy Inc.	INE	100%	84%	>95%
Northland Power Inc.	NPI	68%	32%	76%
TransAlta Renewables Inc.	RNW	62%	100%	~100%

* BEP's remaining 46% of 2020 revenues related to (1) unallocated contributions from equity-accounted investments and (2) unallocated revenues attributable to non-controlling interests.

** **BLX:** 98% of assets (by net installed capacity) were under long-term indexed, fixed-price energy sales contracts. Includes BLX's entire portfolio, which includes assets in Canada, the US, France, and Scotland. (Boralex Inc. *2020 Annual Report.*)

BEP.UN: "As of December 31, 2020, approximately 84% of [Brookfield's] generation (on a proportionate basis) was contracted over the following five years under long-term, fixed price contracts with creditworthy counterparties." Includes assets in North America, Asia, and Europe. (Brookfield Renewable Partners L.P. *2020 Annual Report.* February 4, 2021. p. 48)

INE: "Over 95% of [Innergex's] revenues are contracted with government-owned or -backed utilities with high credit ratings and large investment grade related corporations. Less than 5% of [Innergex's] revenues are subject to merchant price." (Innergex Renewable Energy Inc. *Innergex Provides an Update Regarding COVID-19.* March 27, 2020. p. 1)

NPE: "In 2020, approximately 76% (2019 – 91.3%) of Northland's consolidated revenue was derived indirectly from the sale of electricity to government-related entities." (Northland Power Inc. *2020 Annual Report.* February 22, 2021. p. 89)

RNW: TransAlta Renewables reports that "substantially all" of its "wind, hydroelectric, solar, and gas facilities have contracts in place for the sale of electricity they produce." According to the plant summary included in its 2020 annual report (p. 125), all assets were under a PPA. (TransAlta Renewables Inc. *2020 Annual Report.* p. 45)

Sources: S&P Capital IQ; annual reports.

While LEI does not suggest that these entities face all of the same risks or operating conditions as OPG, there are notable similarities which warrant their inclusion in a peer analysis. LEI focuses on entities with: (i) zero-emitting generation portfolios, (ii) North American operations, and (iii)

substantial contract cover (i.e., whose assets are mostly under contract and thus not exposed to price risk from selling output at market prices). Figure 31 summarizes the list of publicly traded entities included in LEI's analysis screening for this criteria.

Based on data for the past five years, LEI finds that these entities have been able to achieve equity thicknesses of 26.2% on average (see Figure 31).

Figure 31. Historical equity thickness ratios for zero-emitting IPPs, FY 2016 – FY 2020

	Total common equity (% of total capital)					
Company	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Average**
Boralex Inc.	21.9%	19.2%	20.1%	20.6%	20.4%	**20.4%**
Brookfield Renewable Partners L.P.	27.1%	22.1%	21.8%	20.9%	22.4%	**22.9%**
Innergex Renewable Energy Inc.	10.7%	8.3%	8.8%	8.7%	14.5%	**10.2%**
Northland Power Inc.	8.4%	7.4%	8.6%	8.6%	12.8%	**9.2%**
TransAlta Renewables Inc.	65.3%	66.7%	70.8%	69.3%	70.6%	**68.5%**
						26.2%

Source: S&P Capital IQ.

Contracted zero-emitting IPPs, particularly with a strong investment-grade offtaker, bear many similarities to regulated utilities. These similarities, including stable earnings and cashflows, suggest that their leverage levels and outcomes can be compared to OPG in a meaningful way.[146]

While these IPPs do not have nuclear generation, and the regulatory term for OPG's payments amounts is shorter, the IPPs do not benefit from deferral and variance accounts available to OPG, and have greater levels of hydrology risk (which OPG can mitigate).

For the Canadian IPPs reviewed, an average equity thickness of 26% observed suggests that high levels of indebtedness may still support continued capital raising. Ratings agencies have taken similar views for OPG's contracted assets, with DBRS noting that it "*considers assets under regulatory-styled contracts…to have similar credit risks as regulated operations because those contracts mimic the current regulatory construct under the OEB*."[147]

[146] The weighted average remaining contractual term for these IPPs is as follows: (i) BLX: 13 years; (ii) BEP.UN: 14 years across portfolio (16 years in North America); (iii) INE: 14.2 years; (iv) NPI: not specified; and (v) RNW: 11 years. Source: 2020 company annual reports.

[147] DBRS Morningstar. *Ontario Power Generation Inc.* April 16, 2020. Page 4 (Filed as Ex. A2-03-01. Attachment 4)

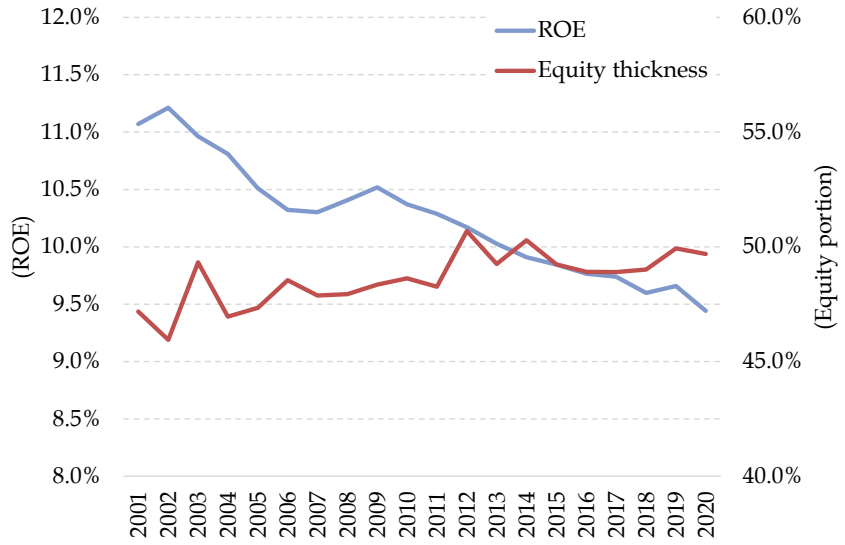
Summary of LEI's view on the suitability of zero-emitting IPPs as comparators

- LEI reviewed the equity thickness ratios reported for various zero-emitting IPPs, focusing mostly on publicly traded, Canadian renewable entities. On average, these entities have been able to achieve common equity proportions of 26.2% over the past five years.
- Contracted zero-emitting IPPs with strong off-takers are analogous to regulated generators, and their outcomes comparable to OPG. This view is shared by DBRS in its assessment of OPG's contracted assets.

4.2 What is the historical trend for equity portions in capital structures in North America and around the world?

In the US, allowed ROEs in electric rate cases have gradually declined since 2001 through to 2020, from an average of 11.1% to 9.4% (see Figure 32). At the same time, equity portions have remained steady, averaging 49% over the same period.

Figure 32. Allowed ROE and equity portion trends in the US



Source: S&P Global Market Intelligence

The experience of international regulators with incentive-based ratemaking offers useful comparators to augment the peer review analysis. In the UK, transmission, and distribution utilities, referred to as network utilities, are regulated by the Office for Gas and Electricity Markets ("Ofgem"). Ofgem employs an incentive ratemaking framework known as the RIIO model, which is an acronym for Revenues = Incentives + Innovations + Outputs. Under this price control framework, utility returns are based on "total expenditures" or "totex" approach,

meaning the returns consider both capital and operating expenses.[148] There is an emphasis on the utility outputs, and for transmission networks, the regulatory period was established for 8 years in the first iteration (RIIO-T1 was established from 2013-2021).

Outcomes for networks under this model have been positive, and Ofgem reports that for example, the transmission owners have all "*met or exceeded the annual targets or are on schedule to deliver equivalent outputs to those agreed at the outset of RIIO-T1.*"[149] This strong performance has driven Ofgem to move to reduce allowed returns over the past decade in each subsequent determination (see Figure 33). Most recently, for its transmission networks, Ofgem moved to lower allowed returns to below 5% (in real terms) for the RIIO-2 period. In its determination for the RIIO-2 price controls, Ofgem established a "*cost of equity reduced from approximately 7.8% RIIO-1 (CPIH) to 4.55% in RIIO-2 (at 60% gearing).*"[150]

In Australia, the allowed returns for network utilities are set by the Australian Energy Regulator ("AER"). The AER approaches this using the "Rate of Return Instrument" which is established every four years, using a CAPM approach. The return establishes parameters for a benchmark efficient utility – the most recent instrument was set in 2018 and set a real return on equity of 6.36%, down from 7.25% in 2013. Both these were established with a gearing of 0.6, i.e., an equity thickness of 40%.[151] In the AER's most recent update, which is published for informational purposes only, the updated parameters yield a much lower real return on equity of 4.60% and 4.57% in 2019 and 2020, respectively.[152] Although these updates are not implemented during the rate term, the AER notes that the updates may inform the next Rate of Return Instrument, which will be set in 2022.[153]

Although the returns described in the two jurisdictions are real returns, LEI notes that Canadian institutional investors remain active owners of network utilities and do not appear to have reduced their holdings. For example, Caisse de Depot et Placement du Quebec ("CDPQ"), a major institutional investor for pension funds in the province of Quebec, is among the largest shareholders of National Grid plc and SSE plc, the ultimate parent of two major transmission networks in the UK.[154] CDPQ has a smaller holding in AusNet Services Ltd, the parent of a transmission network in Australia. TransGrid, another Australian transmission company, has

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[148] Ofgem. *RIIO-ET1 Performance Summary 2019-20.* March 2021

[149] Ibid. Page 2.

[150] Ofgem. *RIIO-2 Final Determinations - Core Document*. December 8, 2020. Page 6.

[151] Australian Energy Regulator. *Rate of return instrument. Explanatory Statement.* December 2018. Page 13.

[152] Australian Energy Regulator. *Rate of Return Annual Update*. 2nd December 2020.

[153] Ibid. Page 4.

[154] Based on data retrieved from Capital IQ as of April 24, 2021.

received investment from OMERS Infrastructure Management, an Ontario-based institutional investor.[155]

Figure 33. Allowed ROE and equity portion trends in Great Britain and Australia

Jurisdiction	Utility	Period	ROE (real)	Equity thickness
Great Britain	Distribution utilities	2011-2015	6.7%	35.0%
		2015-2023	6.1%	35.0%
	Transmission utilities	2013-2020	7.0%	41.2%
		2021-2026	4.0%	45.0%
Australia	Network utilities	2013-2017	7.25%	40.0%
		2018-2021	6.36%	40.0%

Note: Equity thickness calculated as 1 – "notional gearing", which refers to the debt ratio.
Sources: Ofgem; AER

Against the backdrop of these trends for network utilities, while there is a perception among analysts that generation is riskier than wires, with nuclear potentially more risky than other generation sources, there is little discussion of the actual magnitude of the differences in the risk levels.

Comparative risk analysis should be based on relative differences between unhedgeable revenue volatility. Long term volatility of revenues should be a key consideration, and companies facing similar regulatory regimes are likely to have fewer differences in revenue predictability regardless of the underlying nature of the activity. The focus needs to be on actual regulatory mechanisms, instead of underlying technology. On this basis, LEI is of the view that OPG's regulated generation risk is similar to other regulated entities, and the extent of differences in revenue predictability between regulated generation and wires is exaggerated.

LEI notes that the regulated nature of the generation in question addresses some of those risks, and in the case of OPG, forecasted generation and deferral and variance accounts mitigate the outage risk relative to generators operating in competitive markets. Even controlling for the fact that generation is riskier than wires, one should not exclude the UK and Australian experience.

[155] Ibid. Based on Capital IQ data

Adjusting for greater risk would likely still result in equity thickness of consistent with the 47% recommended here.

Summary of LEI's view on the issue of trends in international jurisdictions

- An important trend among regulators that employ incentive ratemaking outside North America, such as in Australia and the UK, is lower returns for utilities.
- Allowed returns in Australia and the UK have generally fallen over the past 10 years with notable declines in the most recently proposed real ROEs of below 5% in the UK, and below 6.5% in Australia. In both the UK and Australia, the concept of "notional gearing" is used to set the allowed return, which translates to an equity thickness of below 45% in all cases. For distribution utilities in the UK, the most recent RIIO decision established an equity thickness below 40%.
- Assuming ~2% inflation, the nominal ROEs in UK (7%) and Australia (8.5%) are lower or comparable to Ontario (8.34%), while the approved equity thickness levels remain lower than Ontario.
- Despite the falling returns and low equity thickness, several institutional investors in Canada have maintained their holdings of these utilities, e.g., CDPQ holdings of National Grid and SSE, as well as OMERS holdings of AusNet.
- Acknowledging that generation is more risky than wires, adjusting UK and Australian experience for greater risk would still result in equity thickness consistent with 47%.

4.3 How does the organizational transition impact OPG's comparison to peer utilities in North America?

The end of Pickering commercial operations during the regulatory period in question is unlikely to prove unmanageably disruptive to OPG, due to OPG's prior experience with a business transformation initiative within the last decade, OPG's pursuit of Small Modular Reactors ("SMRs"), and the availability of a deferral account for costs associated with workforce transition.

The end of commercial operations at Pickering will affect roughly 3,000 OPG employees.[156] However, OPG has recent experience with workforce transformations of this magnitude. Between 2011 and 2015, OPG reduced its workforce by around 2,700 employees.[157] In contrast to the transformation which began a decade ago, OPG currently has an emerging new business venture that may accommodate at least some of the displaced employees.

[156] Concentric Energy Advisors. *Ontario Power Generation Common Equity Ratio Study.* Exhibit C1-1-1, Attachment 1. p. 49.

[157] Ontario Power Generation. *2015 Annual Report*. 2016. p. 25.

In November 2020, OPG announced that it would resume planning to host an SMR at the Darlington Nuclear Station, and that it had applied to the Canadian Nuclear Safety Commission to renew its license for site preparation activities, first granted in 2012.[158] OPG is collaborating with Bruce Power and SaskPower to select a design for an on-grid SMR (with 300 MW capacity) to be deployed at Darlington, targeting first power in 2028.[159] While the final investment decision has yet to be made, and OPG is currently only requesting payments to maintain the option to build an SMR at Darlington, a target on-line date of 2028 indicates that specialized labor could be required during the application period.[160] This suggests that OPG's existing business may find itself with a need for technical staff who may be redeployed at the SMR site – OPG estimates 700 jobs during project development and 1,600 during manufacturing and construction.[161]

Furthermore, labor contracts usually specify the process for recission; while these processes may be "untested",[162] they are nonetheless normally addressed in the agreements. At the same time, OPG will also be able to establish a deferral account to record costs related to employee termination, layoff, reassignment or retraining pursuant to Pickering closure activities; OPG will be able to recover these costs, subject to an OEB prudency review.[163] This account would help minimize the financial impact of workforce transition to OEB.

Finally, looking to the future, OPG may benefit from having a wide pool of workers ready to be redeployed. According to Electricity Human Resources Canada ("EHRC"), by 2022 the electricity sector workforce will require 20,500 new employees (compared to 2019) nationally, the vast majority (~86%) of which are needed to replace retiring employees. EHRC reported that power station operators were among the occupations facing skills shortages, and predicted to be among the most difficult to hire in 2022.[164] Thus, having a wide group of workers experienced with power station operations that can be redeployed throughout the organization may prove to be an asset for OPG, as it faces the effects of demographic pressures in the industry.

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[158] Ontario Power Generation. *OPG resumes planning activities for Darlington New Nuclear*. November 13, 2020.

[159] SaskPower, Énergie NB Power, Bruce Power and Ontario Power Generation. *Feasibility of Small Modular Reactor Development and Deployment in Canada.* March 2021. p. 21.

[160] OPG. *EB-2020-0290. Ex. F2-08-01. New Nuclear at Darlington.* December 31, 2020. Page 2.

[161] Ontario Power Generation. *OPG resumes planning activities for Darlington New Nuclear*. November 13, 2020.

[162] OPG. *OPG's Amended 2020-2026 Business Plan (Redacted).* October 19, 2020. Page 29 (Filed as Ex. A2-02-01, Attachment 1)

[163] LEI notes that this is an amendment to O. Reg. 53/05 (Source: "O. Reg. 622/20: Payments under Section 78.1 of the Act." Filed November 6, 2020.)

[164] Electricity Human Resources Canada. *Electricity Human Resources Canada (EHRC) Releases Labour Market (LMI) Report.* April 11, 2019.

Summary of LEI's view on the issue of OPG's organizational transition

- While Concentric contends that OPG faces additional risk due to the workforce transformation and redeployment following the Pickering closure, this risk may be mitigated due to the following reasons:
  - OPG has prior experience with a business transformation initiative carried out between 2011 and 2015;
  - Possibility of technical staff redeployment, should OPG receive additional approvals and proceed with investment decision to pursue a Small Modular Reactor ("SMR") at Darlington of ~300 MW; and
  - Costs associated with the workforce transition for Pickering staff are allocated to a dedicated deferral account.
- Given demographic pressures in the electricity sector workforce (specifically a need for new employees due to retirements), OPG may in fact benefit from having a wide pool of workers ready to redeploy.

5 Conclusions

OPG is seeking approval of a cost of capital using a structure of 50% equity and 50% debt, an increase from the current equity thickness of 45%, contending that this reflects an increase in business and financial risk since the previous application.

LEI's analysis suggests that an equity thickness of 47% is more appropriate, having considered the need to maintain investment-grade rating, and following a quantitative and qualitative review of OPG's risks. LEI's analysis shows that although a few of the business and financial risk factors have evolved, key credit metrics (for regulated assets) considered by ratings agencies should support investment-grade ratings over the application period.

Business risks considered are summarized as follows:

- ***Political intervention***: Recent interventions at Hydro One and rates action during the COVID-19 pandemic have increased the perception of political risk in Ontario. Although additional intervention is unlikely, rating agencies may remain wary of future government intentions;

- ***Evolution of the OEB***: OEB has recently undergone a strategic review following recommendations by the Modernization Review Panel. Although the impact is likely to be minimal, it remains to be seen how this transition is implemented;

- ***DER growth in Ontario***: OEB's DER impact study estimates that by 2030, around 1.5 GW of solar PV and 1 GW of battery storage may be installed in Ontario. An accelerated uptake may be a business risk for OPG, but is unlikely to materialize during the current application period;

- ***Role of COVID-19 pandemic***: COVID-19 has had a meaningful impact on operational risk for all industries. However, earlier-than-anticipated rollout of vaccines, coupled with OPG's adaptation to new business operations suggests a return to pre-pandemic operations is forthcoming;

- ***Role of the DRP***: successful completion of the refurbishment of Unit 2, generally on time and nearly on budget, as well as legislative protections afforded by O. Reg. 53/05 mitigate the risks of this project;

- ***Changes to OPG's generation portfolio***: generation mix transition may change the composition of ratebase, but would have limited impact on perceived riskiness. In addition, the relative stability of revenue share between nuclear and hydro mitigates risk of the transition;

- ***Implications of climate change***: climate change risks in Ontario are in line with, or even lower than the national average; any impacts would apply across all industries and

sectors, through different manifestations; and risks have not increased considerably from the previous regulatory period. Any meaningful impacts would likely be passed through via regulatory mechanisms.

Financial risks were also considered:

- ***Sensitivity analysis of credit metrics***: rating agency reports of OPG have a consensus view of a stable outlook for the utility. In addition, illustrative estimates of OPG's credit metrics associated with regulated facilities suggest they are anticipated to support investment-grade ratings through 2026. LEI notes that Concentric's view of pressure on credit metrics to potentially decline below current credit rating thresholds is not supported by any quantitative evidence submitted by either Concentric or OPG.

- ***Role of inflation***: unprecedented size and scope of monetary policy and stimulus programs may put inflationary pressure in 2021. Although central banks are confident of controlling inflation, a fixed ROE for OPG may cause increased risk. Further, risk of unexpected inflation may compress margins due to: (i) timing of recovery for DRP costs, and (ii) partial caps on rates.

- ***Utility betas and perceived market volatility***: economic conditions and uncertainty have driven higher utility betas above historical levels for the short-term. Strong projections for an economic recovery suggest a return to long-run historical levels is likely. Moreover, analysis of betas is more relevant for cost of equity, and less critical for equity thickness.

- ***Ontario's political and regulatory framework***: although the potential for political interference may be perceived as higher than in some US jurisdictions, rating agencies consistently view Ontario's regulatory framework as credit supportive. These factors are unlikely to deteriorate in the application period.

- ***Access to green financing and OPG's green bond program***: availability of green bonds shows that significant new sources of debt financing are available, suggesting that there is less need for equity thickness to increase.

Additional support for the recommended equity thickness can be derived from a further review of filed proxy groups. Specifically, even with the proxy group presented by Concentric, a focus on the equity ratios at the holding company level (which is a better proxy for market-determined debt levels) shows that an equity thickness of 47% is reasonable. Further, LEI concurs with the OEB view that an adjustment for US and Canadian ratios is warranted. This view continues to be valid as analysts see Canadian jurisdictions as more credit supportive compared to US jurisdictions.

Broadening the analysis to include overseas utilities and contracted IPPs, it is observed that much lower equity thickness levels have been achieved, without any apparent decrease in financeability.

6 Appendix A: Relevant information associated with credit metrics analysis

Figure 34. Relevant financial information

Label	Item	Formula/Source	Units	2021	2022	2023	2024	2025	2026
[a]	Rate Base (financed by capital structure)	Ex C1-01-01 Schedule 1 (Tables 1-8)	$ Millions	$16,202.9	$16,482.0	$16,826.8	$19,443.0	$20,980.9	$22,189.6
[b]	Return on Equity	2021: Approved ROE 2022 onwards: Assumed to be same as 2021 ROE	%	8.34%	8.34%	8.34%	8.34%	8.34%	8.34%
[c]	Equity portion	2021: Approved equity thickness 2022 onwards: Input (toggle)	%	45%	**47.0%**	47.0%	47.0%	47.0%	47.0%
[d]	Net income	[a]*[b]*[c]	$ Millions	$608.1	$646.1	$659.6	$762.1	$822.4	$869.8
[e]	Net income, net of earnings from nuclear fixed asset removal and nuclear waste management funds	[d]-[n]	$ Millions	$99.2	$121.0	$117.8	$203.1	$245.6	$274.7
[f]	Interest expense	[p]*[v]	$ Millions	$199.2	$221.9	$242.1	$295.2	$345.6	$396.3
[g]	Tax liability	[o]*([d]/(1-[o]))	$ Millions	$202.7	$215.4	$219.9	$254.0	$274.1	$289.9
[h]	Depreciation	2019: Exhibit A2-01-01 Attachment 2 (Page 4 of 69) 2020 onwards: Nuclear depreciation data from Exhibit F4-01-01 Table 2; Additional depreciation, (i.e., total depreciation minus nuclear depreciation) assumed to be the same as 2019, assuming the straight line method	$ Millions	$1,041.2	$1,049.0	$967.5	$1,074.7	$1,017.6	$1,064.6
[i]	EBITDA	[e]+[f]+[g]+[h]	$ Millions	$1,542.3	$1,607.2	$1,547.3	$1,827.1	$1,882.9	$2,025.5
[j]	Funds from Operations	[i]-[f]-[g]	$ Millions	$1,140.4	$1,170.0	$1,085.3	$1,277.8	$1,263.2	$1,339.3
[k]	Cashflow from Operations	[e]+[f]+[g]+[h]+[l]	$ Millions	$1,532.3	$1,597.2	$1,537.3	$1,817.1	$1,872.9	$2,015.5
[l]	Deferred income taxes	2019: Exhibit A2-01-01 Attachment 2 (Page 6 of 69) 2020 onwards: Assumed to be same as 2019	$ Millions	-$10.0	-$10.0	-$10.0	-$10.0	-$10.0	-$10.0
[m]	Earnings on nuclear fixed asset removal and nuclear waste management funds	Historical (until 2019) from OPG Prescribed Assets Financial Statements (Ex. A2-01-01 Attachment 2); assumed an increasing trend going forward	$ Millions	$508.9	$525.1	$541.8	$559.0	$576.8	$595.1
[n]	EBIT	[e]+[f]+[g]	$ Millions	$501.1	$558.2	$579.8	$752.4	$865.3	$960.9
[o]	Income Tax Rate	Technical Conference - Transcript (May-7-2021)	%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
[p]	Interest rate	10-year Government of Canada bond yield plus Credit Spread (Ex. C1-01-02)	%	2.24%	2.54%	2.72%	2.87%	3.11%	3.37%
[q]	Planned/Historical New Debt Issue (net of debt issues maturing)	2021-2026: Exhibit C1, Tab 1, Schedule 2, Chart 3 for EB-2020-0290	$ Millions	$15.0	$375.0	$35.0	-$400.0	$0.0	-$50.0
[r]	Planned Long-term Debt (net of debt issues maturing)	2019: Ex. A2-02-01 Attachment 2 (Page 8 of 69) 2020 onwards: [a] + prior year long-term debt	$ Millions	$6,125.0	$6,500.0	$6,535.0	$6,135.0	$6,135.0	$6,085.0
[s]	Short-term Debt	Exhibit C1-01-03 Table 2	$ Millions	$97.4	$97.4	$97.4	$97.4	$97.4	$97.4
[t]	Operating Lease Obligations	Exhibit A2-01-01, Attachment 3, Page 63	$ Millions	$6.0	$5.0	$3.0	$0.0	$0.0	$0.0
[u]	Additional debt required (to be consistent with capital structure)	[v] - ([r]+[s]+[t])	$ Millions	$2,683.2	$2,133.1	$2,282.8	$4,072.4	$4,887.5	$5,578.1
[v]	Total Debt	[Ratebase x (1 - equity thickness)], i.e., [a]*(1-[c])	$ Millions	$8,911.6	$8,735.5	$8,918.2	$10,304.8	$11,119.9	$11,760.5

Note: LEI illustrative analysis does not consider delays, if any, in timing of projected cash flows.

7 Appendix B: Average ROEs and equity ratios for Canadian gas and electric utilities (2020)

Canadian gas distributors	ROE	Equity ratio
AltaGas Utilities Inc [1]	8.5	39
ATCO Gas [1]	8.5	37
Centra Gas Manitoba Inc. [2]	8.3	30
Enbridge Gas Inc. [3]	8.52	36
Liberty Utilities (Gas New Brunswick) [4]	10.9	45
FortisBC Energy Inc. [5]	8.75	38.5
Gaz Métro Limited Partnership [6]	8.9	38.5
Gazifère Inc [7]	9.1	40
Heritage Gas Limited [8]	11	45
Pacific Northern Gas Ltd. [9]	9.5	46.5
Pacific Northern Gas (N.E.) Ltd. (Fort St. John/Dawson Creek) [9]	9.25	41
Pacific Northern Gas (N.E.) Ltd. (Tumbler Ridge) [9]	9.5	46.5
SaskEnergy Inc. [10]	-	37-42

Canadian electric distributors	ROE	Equity ratio
ATCO Electric Ltd. [1]	8.5	37
ENMAX Power Corporation [1]	8.5	37
EPCOR Distribution Inc [1]	8.5	37
FortisAlberta Inc. [1]	8.5	37
FortisBC Inc. [11]	9.15	40
Hydro-Québec Distribution [12]	8.2	35
Manitoba Hydro [13]	-	25
Maritime Electric Company Limited [14]	9.35	40
Newfoundland and Labrador Hydro [15]	8.5	25
Newfoundland Power Inc [16]	8.5	45
Nova Scotia Power Inc. [17]	8.75-9.25	40
Ontario's Electric Distributors [18]	8.52	40
Saskatchewan Power Corporation [19]	8.5	25-40

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[2] Manitoba Public Utilities Board. *Centra Gas Manitoba Inc. ("Centra") 2019/20 General Rate Application – Compliance Filing Pursuant to Order 152/19*. October 25, 2019; Manitoba Public Utilities Board. *Centra Gas Manitoba Inc. ("Centra") 2019/20 General Rate Application*. August 23, 2019.

[3] Enbridge Gas Inc. *EB-2019-0194 Enbridge Gas Inc. ("Enbridge Gas") 2020 Rates – Application and Evidence*. October 8, 2019.

[4] New Brunswick Energy and Utilities Board. *Matter No. 478*. January 13, 2021.

[5] FortisBC Energy Inc. *Annual Review for 2020 and 2021 Delivery Rates*. August 12, 2020.

[6] Énergir Inc. *Annual Information Form Fiscal year ended on September 30, 2020*. December 17, 2020.

[7] la Régie de l'énergie. *D-2020-104, R-4122-2020 Phase 1A*. August 7, 2020.

[8] Nova Scotia Utility and Review Board. *Decision NSUARB-NG-HG-R-11. 2011 NSUARB 183*. November 24, 2011.

[9] Pacific Northern Gas Ltd. *Amended Application to the British Columbia Utilities Commission for Approval of 2020 and 2021 Revenue Requirements*. February 28, 2020.

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[18] OEB. *2020 Cost of Capital Parameters*. October 31, 2019; OEB. *Cost of Capital Parameter Updates*. November 9, 2020.

[19] SaskPower. *SaskPower Annual Report (2019-20).* 2020.

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9 Appendix D: Curriculum vitae for AJ Goulding

KEY QUALIFICATIONS:

In his role as president of London Economics International LLC, A.J. Goulding manages a growing international consulting firm focused on finance, economic, and strategic consulting to the energy and infrastructure industries. In addition to serving as a sector expert in electricity and gas markets, his responsibilities include project management, marketing, budget, and financial control, and recruiting. A.J. also serves as an Adjunct Associate Professor at Columbia University, where he teaches a course on electricity market design and regulatory economics while also supervising graduate workshops.

With over twenty-five years of experience in evolving electricity and natural gas markets, A.J.'s diverse background enables him to work effectively in both emerging markets and OECD countries. In North America, A.J. has been articulate in describing market relationships between wholesale power marketers, merchant plants, aggregators, and the existing investor-owned utilities. In emerging markets, A.J. has considerable experience dealing with the challenges of mixed private and public ownership, difficulties in creating credit-worthy distribution and retail entities, and the realities of line losses, unreliable fuel deliveries, and politicized labor relations.

A.J. began his career performing natural gas market analysis for the ICF Resources subsidiary of ICF Kaiser International. Later, he lived for two years in New Delhi, India, where he advised the United States Agency for International Development (USAID) on electric power sector restructuring in India. He continued his work on India while pursuing his MA at Columbia University, leading to the publication of an article on Indian privatization. Simultaneously, he researched the process of power sector reform in Pakistan, contrasting it with the Indian experience. Upon completion of his MA, A.J. served as business development associate for Citizens Power LLC, a top ten US wholesale power marketer. He then moved to London Economics, where he has held roles of progressively increasing responsibility.

EDUCATION:

Earlham College, Richmond, Indiana, B.A. in Economics, 1991. College honors, scholar-athlete, public service graduate fellowship.

Columbia University, New York, New York, M.A. in International Business, 1997. Foreign Language and Area Studies fellowship, Cordier prize.

EMPLOYMENT RECORD:

From: 1996 **To:** present
Employer: *London Economics International LLC, United States*
President (July 1999 to present), Senior Consultant (January 1998 to July 1999), Summer Associate (June 1996 to August 1996)

From: September 2003 **To**: present

Employer:	*Columbia University* Adjunct Associate Professor (2014 to present), Adjunct Assistant Professor (2003-2014)
From: 1997	**To**: 1997
Employer:	*Citizens Power LLC; Boston, MA* Associate
From: 1994	**To**: 1995
Employer:	*USAID; New Delhi, India* Energy Consultant
From: 1991	**To**: 1993
Employer:	*ICF Resources, Inc.; Fairfax, VA* Analyst

SAMPLE PROJECT EXPERIENCE:

The projects briefly described below are typical of the work A.J. has performed throughout his career at London Economics, Citizens Power, USAID/India, and ICF Resources. A.J. also serves as an adjunct professor at Columbia University, where he teaches a course in electricity market design.

Electricity and Natural Gas Asset Valuation and Transaction Advisory Work

- ***member of OEB's Advisory Committee on Innovation:*** AJ, as LEI's President, was selected to serve on the Ontario Energy Board ("OEB")'s Advisory Committee on Innovation, to assist the OEB in sharpening its focus on enhancing efficiency, cost effectiveness, innovation and value for electricity customers. The Committee, reporting directly to the Chair of the OEB, focused on identifying actions that a regulator can take that will support and enable cost effective innovation, grid modernization, and consumer choice to help inform regulatory policy development. The Committee's overarching goal was to support the OEB's embarkment on a process that would evaluate whether and how best to adapt regulation in order to keep pace with an evolving sector.
- ***led Alberta performance review:*** LEI was engaged to perform an assessment of the Alberta Energy Framework, which encompasses the wholesale generation market, retail market, agencies, transmission planning, access, and distribution, as well as the operations of the Alberta Interconnected Electricity System. The analysis included both qualitative and quantitative components.
- ***conducted overview of hydro-dominated market:*** LEI was hired to provide an understanding of the dynamics underpinning hydro-dominated power markets as opposed to thermal systems. As part of this project, LEI reviewed in details the dynamics and key drivers of energy markets in a sample of Latin America countries including Colombia, Panama, Brazil, and Chile. Colombia was the point of focus of the report, in this respect LEI compared and

contrast several aspects of the Colombian markets to other jurisdictions and created a scoring card to evaluate Colombia against similar jurisdictions.

- ***evaluated peaker units in New England:*** London Economics International LLC ("LEI") was retained to evaluate the economics of constructing peaking units in two possible existing New England hydro facilities. Specifically, LEI conducted an analysis on existing peaker technologies, the permits required, and determined how much investment would be justified to make the project economic.
- ***evaluated cost economics of installing energy storage technologies at existing hydro power plants in Massachusetts and New York:*** The analysis was conducted in three phases – phase 1 consisted of literature reviews and primary information collection (from manufacturers and service providers) on the available types of energy storage technologies and associated fixed and variable costs. Phase 2 consisted of an economic cost-benefit analysis of the least cost storage technologies to understand the viability of the investment. Phase 3 consisted of developing comprehensive criteria for selecting the energy storage manufacturer/service provider and presenting implementation recommendations.
- ***conducted PJM price forecasting:*** London Economics International LLC ("LEI") was retained to provide forecasted energy and capacity prices as well as supply curves for a plant located in PJM's SWMAAC region
- ***led Ontario gas LDC performance-based ratemaking project:*** LEI was engaged by a large Ontario gas utility to review their proposed 2014 to 2018 incentive ratemaking ("IR") plan as presented to stakeholders on April 29th, 2013 and to examine case studies of approaches to IR applied to other North American gas distribution utilities. In the case study analysis, the utility particularly requested that LEI examine approaches to a set list of ratemaking parameters: productivity and X-factor trends, alternative approaches to designing an I-X framework, approaches to establishing inflation factors, approaches in other jurisdictions to applying an Earnings Sharing Mechanism ("ESM"), use of capital trackers for unknown costs, appropriateness of deferral accounts for unaccounted-for gas ("UFG"), and service quality indicators ("SQIs") and how they are measured. LEI was subsequently requested by the utility to provide comments on the utility's draft Settlement Agreement.
- ***submission to Ontario LTEP consultations regarding value of capacity imports:*** On behalf of a large Canadian hydropower generator, LEI analyzed the potential economic benefits of the export of capacity and energy from Quebec to Ontario. The engagement included a review of the treatment of imports in capacity markets in the Northeast, an examination of the impact on capacity prices of imports, and a discussion of the reliability benefits that long term contracts for capacity imports provide. In addition, LEI discussed how Ontario can create a level playing field for clean energy imports relative to other potential future sources of supply in Ontario.
- ***market briefing on renewables in El Salvador:*** LEI was engaged by a private equity firm focused on small-scale renewable energy projects considering expanding into South America to develop a market briefing on El Salvador, focused on the challenges and opportunities in developing small hydro projects in the country.

- ***cost benefits analysis of US transmission line:*** for a utility in the northeastern US, LEI prepared a cost-benefit analysis of a proposed transmission line with the potential to change existing market arrangements. In the analysis, LEI developed a base case and multiple project cases based on different configurations of the transmission project. Using its proprietary modeling tool, POOLMod, LEI simulated energy and capacity prices in each configuration over a 15-year timeframe and compared the price differences against various cost allocation scenarios for the transmission line's construction. LEI also tested the statistical significance of the project case results against the base case results and conducted further analysis on the economic effects of additional renewable generation projects that construction of the transmission line would make possible.
- ***review of RRO in Alberta:*** London Economics International LLC ("LEI") was asked by ENMAX Energy Corporation ("EEC") to review EEC's request for continuation of the practice of earning a fixed margin associated with expenses incurred as a result of operation of the Regulated Rate Option ("RRO"). For the client, LEI reviewed the settled practice in Alberta, investigated the risk of operating the RRO, and calculated an indicative range of margin for EEC.
- ***review of risk management practices:*** LEI was engaged by the client to review its risk management practices and provide meaningful insights with regards to the risk management related issues. Analysis included quantification of the magnitude and probability of risks being faced, as well as research into the best practices of other similar organizations.
- ***conducted Independent Evaluation review:*** LEI provided advisory services to assist the OPA in evaluations of applications made to the Aboriginal Renewable Energy Fund ("AREF") and the Aboriginal Transmission Fund ("ATF"). LEI provided advice and analysis related to the technical, financial, and regulatory viability of each proposed project.
- ***conducted a report on net metering programs in New Hampshire and New York:*** for a private equity power sector investor, LEI conducted a report on net metering programs to determine if the client's facilities would qualify. Project work included determining load at the sites, examination of net metering in the applicable regions, assessment of potential solar installation, exploration of installation options to determine which would be most suitable and analyzing potential returns.
- ***assessment of small hydro properties:*** as part of a retainer agreement with a growing private equity firm focused on the roll-up of small hydro properties, LEI performed a variety of supporting activities, including examination of forward markets, review of PPAs, assessment of renewable energy policies, and strategic analysis.
- ***review of North American hydro assets:*** LEI was engaged by a large Canadian hydro generator to evaluate the potential renewable premium associated with its hydro assets in North America. LEI developed an economic model to project legacy Renewable Energy Certificate ("REC") prices in New York and New England. LEI also provided alternative methodologies such as projecting the premium based on forecasted carbon allowance prices and analyzing potential sales to large corporations on a voluntary basis.

- ***analyzed current and future dynamics in the British Columbia power markets for of British Columbia power producers:*** topics analyzed included costs of independent power producers ("IPPs") relative to BC Hydro, uncertainty around future demand levels in BC, implications of moving away from use of Critical Water Year analysis in planning, risks and uncertainties regarding import availability, and the overall macroeconomic contributions of IPPs. LEI also analyzed the provincial government's Review of BC Hydro and provided an assessment.
- ***valuation of distribution company in Bolivia:*** LEI provided inputs into the valuation of a Bolivian distribution company, including developing the cost of capital; assessing demand, cost, and tariff forecasts; and reviewing the overall cash flow model. LEI also reviewed the company's historical performance relative to efficiency and performance targets.
- ***wrote paper on investments by electric and natural gas utilities:*** LEI authored a paper on the successes and failures associated with international investment by electric and natural gas utilities for a major Japanese utility. The paper focused on the activities of over forty companies, both within North America and internationally
- ***European power market analysis:*** LEI worked with one of North America's largest independent operator of power generation facilities to develop a comprehensive analysis of central European power markets including price forecasts and renewable energy policies. As part of its client's efforts to acquire a portfolio of hydroelectric power generating facilities, LEI's team developed a medium-term price forecast, stress tested critical assumptions, and provided detailed insight into federal and state renewable energy policies.
- ***developed several forecasts of the long-term Alberta electricity power pool prices (2010 to 2030) based on different market parameters and build decisions:*** the forecast also made special note of the effect on the market, if any, of the following conditions: (i) greenhouse gas legislation; (ii) increase in unconventional (shale) natural gas production; (iii) effect of the enactment of Bill 50; and (iv) effect on the market by external jurisdictions
- ***market analysis for a client interested in purchasing a portfolio of global generation assets:*** in this project, the LEI team, led by AJ, provided a market analysis of California, Mexico, and the Philippines. This market analysis included the following aspects: description of portfolio assets in the jurisdiction, supply/demand balance in the jurisdiction, regulatory framework, contract description and impact of competition on specific portfolio assets in the jurisdiction, indicative position of target asset on supply curve presently and in the future, impact of climate change and other environmental regulations, observations from material in dataroom, review of pool price projections, and remarks about the jurisdiction. In addition, LEI performed a 20-year price forecast for these markets, which was delivered in a spreadsheet form and incorporated into the management presentation.
- ***review of business plans for hydrokinetics technology company:*** for startup hydrokinetics technology company, LEI reviewed business plans and applicability of technology worldwide. Tasks included commenting on strategic plan, advising board members on the evolution of renewable energy markets worldwide, and assessing US Federal Energy Regulatory Commission polices towards hydrokinetic projects.

- ***due diligence and valuation of engineering consulting firm:*** for a Middle Eastern investment fund, A.J. led the evaluation of the acquisition of an engineering consulting firm with offices in the US, Europe, and the Middle East focused on the power sector; the project included creation of a pro forma for the business, evaluation of business prospects and strategy, and an examination of the relevant economic conditions and their impact on value.
- ***assessment of plant pro formas and underlying market environment in six Asian countries:*** for leveraged buyout of major global IPP developer, assessed plant financial models, state of reform efforts, and potential for unbundling in Bangladesh, China, India, Philippines, Thailand, and Turkey
- ***valuation of Singapore generating asset:*** on behalf of a large Asian generating company, provided revenue forecasts from spot, retail, and vesting contracts for successful acquisition of Singapore generator Analysis included review of repowering options, assessment of regulatory evolution, assessing the relevant cost of capital, and potential for strategic behavior; A.J. later performed a similar exercise for a second Asian generating company also seeking to purchase a similar set of assets in Singapore, as well as subsequently assisting in analysis associated with refinancing of the acquisition performed by initial client
- ***modeling future Japanese electricity market dynamics:*** for a leading Japanese financial institution, led workshop and directed the creation of an interactive model of the Japanese electric power sector. Issues addressed included quantification of plant asset values under various market scenarios, an assessment of the potential for stranded costs, review of debt coverage ratios, and exploration of the evolution of transmission assets.
- ***due diligence support associated with the evaluation of the possible acquisition of a minority stake in a major Ontario transmission and distribution company:*** LEI prepared reports and analysis which contributed to the analytic framework for this proposed transaction, including analysis of the regulatory framework, review of impact of PBR on revenues, strategic issues, and the potential for revenue growth.
- ***advised Japanese company on potential US power sector acquisitions:*** reviewed project economics for multiple acquisition targets of Japanese investor. Tasks included providing long term revenue forecasts, reviewing motivations of sellers, providing insights on the associated market, and examining the role of hedge funds and private equity.
- ***examination of markets and generation asset values in Mexico, Philippines, and California:*** assisted Asian IPP in assessing generating assets in Mexico and Philippines, as well as export potential from Mexican plants to the US; mandate included developing long run marginal cost forecasts for Philippines and Mexico and providing detailed dispatch modeling of the California market.
- ***valuation of generation and distribution assets in Philippines and the Caribbean:*** provided detailed analysis of regulatory trends in the Philippines and in selected Caribbean countries. Used regulatory filings, PPAs, and public information to develop a value for generation and distribution assets in these markets. Advised potential buyer on relative risk in each country examined, including country risk, regulatory risk, and fuel supply and load growth issues.

- ***power price forecast for Balkans:*** to support potential bid to acquire nuclear station in Bulgaria, led team forecasting revenues from future spot power market sales. Issues included treatment of carbon emission credits, extent of regional integration, and availability of existing transmission capacity.
- ***revenue forecast and financing advisory for renewables acquisition:*** for newly established private equity firm, managed acquisition process for small hydro and biomass site. Process included revenue forecasting, negotiating term sheets with banks, obtaining quotes for power purchase agreements, reviewing operating agreements, and overseeing all aspects of transaction process.
- ***prices for merchant generators and IPPs:*** provided expert opinion on the extent to which value of a generating station could change over a 12 to 18-month period, based on historical analysis of price changes for individual generation assets as well as for generation asset portfolios.
- ***biomass investment evaluation:*** on behalf of growing private equity investor, performed extensive analysis of economics of restart of several biomass plants in California and elsewhere. Tasks included PPA review, examination of permits, assisting in arranging financing, and examination of California market dynamics.
- ***advised on purchase of small hydro station:*** for a newly established hydro-focused private equity investor, valued and performed regulatory review associated with successful purchase of a small hydro facility in Maine. Tasks including creating pro forma, reviewing material contracts, negotiating purchase and sale agreement, hiring operator, and monitoring ongoing performance.
- ***bid for New York City gas and oil-fired stations:*** for a major financial institution, A.J. led a team of analysts in examining potential future revenues for a portfolio of peaking plants in New York City. Assignment included using proprietary models to forecast future capacity and energy revenues, and the application of real option techniques to determine value of plant flexibility.
- ***bid for PJM coal-fired power station:*** worked closely with private equity fund in creating deal team, preparing first round bid, and valuation of facility, including coal supply, environmental compliance, site options, and forecast of future revenues; helped to develop second round bid, including assisting in arranging financing and risk management.
- ***collateralized debt obligations ("CDOs"):*** led projects associated with detailed statistical analysis of the underlying economics of CDOs associated with distressed debt in the power sector, and with examining whether such a CDO could have been launched in the wake of the Enron collapse.
- ***valuation of New England based generation portfolio:*** worked with potential acquirer of New England's largest generation portfolio to determine the costs of ongoing obligations associated with the portfolio, provide an understanding of long-term market dynamics, and assess value of overall portfolio, including revenue forecasts and review of market rules.

- ***valuation of integrated IOUs:*** coordinated evaluation effort for acquisition of Southeastern US utility and of Ontario municipal electric utility; tasks included assessment of impact of PBR, calculation of difference in profits from generation portfolio under ratebase versus in open market, and analysis of ratebase settlement.
- ***valuation and regulation of LNG facilities:*** assessed potential for combination of strategically situated LNG facility with US wholesale power marketer; for separate client, advised on third party access requirements for LNG facilities in the US and relevance to potential regulatory changes in Japan.
- ***valuation of Ontario generating plants, including assessment of regional electricity markets:*** organized and implemented major modeling effort to determine potential value of generation stations in Ontario. Assessed impact of transmission constraints and restructuring efforts in neighboring markets on future wholesale market prices.
- ***assessment of value of coal station contracts circa year 2000:*** developed analysis of value of contracts to bear costs and benefits associated with output from coal fired power stations in Alberta. Engagement involved considering only information known as of 2000, for inclusion in tax litigation case. Created pro forma valuation of the contracts as of 2000, including forecast costs and revenues, as well as opining on the appropriate cost of capital to be used.
- ***price forecasts in key Canadian markets and associated export zones:*** provided long term electricity price forecasts in multiple engagements for key Canadian markets, including Alberta, British Columbia, and Ontario, as well as related export markets such as New York, Midwest ISO, and PJM. Results used by clients for obtaining financing and assessing contract pricing.
- ***revenues to wind generators in Alberta:*** A.J. led the examination of merchant revenues to a portfolio of existing and under construction wind generators in the province of Alberta. Tasks included review of market design issues, 20-year scenario analysis for merchant revenues, review of contract terms and conditions, and an examination of the potential for additional revenues from the sale of emissions reduction credits and renewable energy certificates. Deliverables included market study supporting issuance of income trust units.
- ***revenues to hydro portfolio in Ontario:*** for a large North American industrial company, A.J. led the creation of a market study and report underlying the issuance of income trust securities. Tasks included multiple scenario analysis of merchant revenues, review of ancillary services revenues, and an examination of the Ontario hybrid market structure.
- ***assessment of role of peaking plant in Ontario power sector:*** for Ontario government body, performed extensive scenario analysis to determine extent to which peaking plant should be a part of future procurement plans in the province; this analysis included assessment of revenues from ancillary services and of optionality.
- ***developed price trends, in conjunction with the valuation of several Colombian power plants:*** LEI also provided an evaluation of the Colombian market, an overview of modeling methodologies and assumptions, and modeling results. The modeling results included

forecast spot market prices, plant dispatch and revenues (energy and capacity), under a variety of scenarios.

- ***conducted tariff review for Ente Nacional Regulador de la Electricidad ("ENRE"):*** The Argentine regulatory authority for the electricity sector (ENRE) awarded a contract for a tariff review of Edenor, a large utility serving the northern portion of Buenos Aires to a consortium led by LEI. The engagement entailed evaluating the performance of Edenor in the 1992-2002 tariff period; advising ENRE on international best-practice design of distribution tariffs; proposing a tariff setting methodology for the 2002-2007 tariff period; providing technical assistance in the analysis of information presented to ENRE by Edenor; proposing tariffs for the 2002-2007 tariff period; and assisting ENRE during public hearings on the proposed tariffs. The consortium proposed that tariffs be set via an RPI-X approach employing Data Envelopment Analysis (DEA) for establishment of the X-factor.
- ***advised on bid strategy for Mexican IPP:*** LEI assisted a large foreign utility in its bid strategy for acquisition of generating assets in international jurisdictions (across North America, Europe, and Asia). The LEI team led the market analysis for assets located in Mexico; more specifically, LEI analyzed a series of macroeconomic risks (including political, economic, and regulatory risks) likely to impact operations of the assets in the long run, performed a full due diligence review of the targeted assets, and developed forecast of the Mexican wholesale spot energy prices in order to determine future profitability of the assets.

Power, Gas, and Infrastructure Sector Business Development and Strategy

- ***conducted workshop on generation reliability standard review in Malaysia:*** LEI held a two-day workshop on Generation Reliability Standard Review Seminar for TNB in Kuala Lumpur, Malaysia. The topics included: Malaysia reliability standard policy overview, jurisdiction review on reliability indices and benchmarking Malaysia's reliability standard against other countries, inter-play between government agencies in formulating the reliability standard, lessons learned from other counties, incorporating renewable energy, interconnection and distributed generation in calculating reliability indices, input parameter to derive the value of reliability indices, and lesson learned from LOLE studies from other jurisdictions.
- ***performed a peer-group analysis of Independent Power Producers ("IPPs") in the US market:*** LEI presented insights on the key economic, financial, and strategic factors contributing to growth of mid-sized companies in the US merchant generation market. LEI identified nine categories of IPPs in the US merchant market and defined a subset of companies to be considered as the peer-group of the client. For the peer-group, LEI reviewed key success criteria of each company including business focus, leadership, growth strategy and financial performance. LEI presented three peer-group companies as case studies to highlight examples of successful players in the US IPP market. Overall, LEI highlighted the implications that current market trends and key success factors of the peer-group would have on the company's future growth strategy in the US market.
- ***conducted water pricing in California:*** London Economics International LLC ("LEI") was retained to conduct a 30-year price curve for Metropolitan Water District of Southern California ("MET Water") in relation to a potential acquisition of a proposed desalination

plant in California. The desalination plant's water rate specified in the draft Term Sheet of the Water Purchase Agreement is based on MET Water's prices plus avoidable charge, subsidy, and a premium. LEI reviewed the regulatory arrangements of MET Water, supply-demand dynamics in Southern California, and water pricing mechanisms used by MET Water. LEI also assessed the different key drivers for each component of the MET Water price. Lastly, LEI created a cost-of-service model and projected the MET Water prices for the next 30 years.

- ***transmission review in Canada:*** LEI was hired by a French consulting firm to provide commentary insights on the state of the transmission and distribution market in a number of Canadian provinces including Alberta, Ontario, British Columbia, Manitoba, Saskatchewan, and Quebec
- ***study on transmission and distribution:*** LEI collaborated with a French consultancy on the development of strategic recommendations for market penetration in the US transmission and distribution markets. As part of this work, LEI performed a detailed analysis of the US market structure, identifying key market players and recent development, as well as barriers of entry and market opportunities for a prospective European investor.
- ***analyzed cost implications of Ontario's Green Energy Act:*** on behalf of the Official Opposition in Ontario, analyzed the cost implications of the government proposed 2009 Green Energy Act. This included costing of the feed in tariff program, interconnection costs, conservation and demand management initiatives and the implementation of the smart grid. The company presented key results in a press conference.
- ***advisory services on the development of a 75 MW hydroelectric power plant in Cameroon:*** under a USTDA contract, AJ Goulding acted as a Senior Energy Market Specialist in the LEI portion of the work for a consortium to provide financial and technical advisory assistance to the Ministry of Energy and Water Resources of the Government of Cameroon with respect to the development of a 75 MW hydroelectric power plant at Bini à Warak. Specific tasks included review of Cameroon's existing regulatory system, regional market demand analysis and assessment of developmental impact of the project.
- ***business development opportunities in India:*** for UK electricity and mining conglomerate, provided detailed assessment of opportunities in construction of integrated mining and mine-mouth power stations and in distribution of electricity.
- ***assessment of US natural gas storage business:*** for a large Japanese gas utility, examined trends in regulation and investment in the US natural gas storage business. Engagement included comparison of natural gas storage business risks to that of IPP investment.
- ***European renewables investment strategy:*** on behalf of a global power and real estate investment company, reviewed policies towards renewable energy in Europe and individual European companies, as well as available assets, sites, and investment climate
- ***distressed asset acquisition strategy:*** advised a major Japanese utility on entry strategies to the US market, including performing a workshop on due diligence, US regional market analysis, and asset valuation; arranging for introductions to major asset sellers, potential

investment partners, and advisors; and creating a screening methodology and database of potential acquisition targets.

- ***unbundling of French state-owned vertically integrated monopoly:*** worked with leading French electricity generator and supplier to examine how to create independent profit and loss statement for its generation assets, benchmark performance against expectations, and separate revenues from plant operations from those gained through trading.
- ***renewables value chain investment analysis:*** for Dutch foundation based in Switzerland, examined macro trends associated with renewable energy in several major global economies, including the global supply chain from component manufacturers to installation to operation. Objective was to determine where on the renewables value chain the most profitable opportunities could be found.
- ***workshop on performance-based ratemaking strategy:*** for first stand-alone transmission company in North America, conducted day long workshop on issues associated with PBR, including the types of PBR and which one is most appropriate for what type of company, the sources of efficiency gains observed in other transmission companies worldwide, and the impact of performance standards on profitability and flexibility.
- ***global generation investment strategy:*** for a major Canadian generation company, used modern portfolio theory to identify combination of asset classes and geographic locations which would result in optimal risk-reward combination for generator given its core competencies. Deliverables included interactive model to be used by generator staff on an ongoing basis.
- ***development of regulatory and financing strategy for transco:*** for first stand-alone transmission company in North America, evaluated key transaction parameters, assessed allowed ROE, proposed strategy for attaining favorable incentive rates, and helped to identify potential cost savings.
- ***impact of Ontario market changes on industrial consumers:*** for association of large power consumers in Ontario, assessed market trends and future entry and exit scenarios to determine long term price dynamics in the face of changes in government deregulation policies.

Regulatory Economics

- ***ratemaking:*** LEI was selected by the Kansas Legislative Coordinating Council ("LCC") to perform a study of the retail rates of Kansas electric public utilities. The study, which involved two main sections, aimed to inform electric sector policies and result in competitive electric rates and reliable electric service in Kansas. Section 1 of the study evaluated the effectiveness of current Kansas ratemaking practices and their ability to attract required capital investments, and balance utility profits with public interest objectives and reliable service. Section 2 focused on exploring options available to the State Corporation Commission and the Kansas Legislature to affect Kansas retail electricity prices for a better regional competition, while providing the best practicable combination of price, quality and service.

- ***market report:*** LEI was retained to develop a technical report of the Ontario electricity market to support refinancing a portfolio of hydroelectric assets in Ontario. The report discussed the following items: an overview of the Ontario market; the dynamics of the provincial supply and demand; a range of potential re-contracting outcomes based on new-build referent assets (SCGT and solar + storage); forecasts of New York Zone A prices (Zone A has interties with Ontario), as well as an overview of market dynamics relevant to Zone A; and a review of the client's approach to netting back LEI's outlook.
- ***grid resiliency:*** AJ Goulding drafted comments opposing US Secretary of Energy Rick Perry's grid resiliency pricing rule, which instructs FERC to put in place cost-of-service mechanisms for power plants with 90 days of onsite storage, as part of an overall strategy aiming at addressing threats to US electrical grid resiliency.
- ***way forward regulation:*** LEI was retained by the Ontario Energy Board to assist in developing regulatory reforms with respect to utility remuneration, to support the evolution of the sector. As part of this engagement, the LEI team prepared a concept paper on approaches to utility remuneration and incentives, assisted in the final preparation of staff's paper, developed an empirical model for OEB staff to use in evaluating alternative approaches, and carried out empirical modeling to demonstrate the impact of the alternative approaches on utilities and ratepayers.
- ***review of cost of capital parameters in Ontario****:* LEI has been engaged by OEB staff (since Fall 2019) to provide updates on the macroeconomic conditions of the utility sector in Ontario, potentially impacting the regulated cost of capital parameters in Ontario. These updates are presented in quarterly reports to OEB staff.
- ***analysis of electricity transmission:*** LEI was retained by a state-owned utility responsible for transmission and distribution throughout Tasmania, Australia, to leverage its expertise on electricity transmission pricing to provide support on the adoption of a 'beneficiary pays' approach.
- ***electricity rate impact***: LEI was engaged by an industry association for an Industrial Electricity Rate Economic Impact Study in Ontario's manufacturing sector. The scope of work consisted of the review of current Ontario industrial electricity rates and rate designs; assessment of competitive electricity rate levels; development of options to change rates in a manner consistent with rate setting principles, which is beneficial to industrial consumers and the Province in overall; quantification of economic benefits from appropriate rate adjustments; and consultation with relevant industry stakeholders including government officials and various experts.
- ***supported Manitoba cost of service review:*** London Economics International LLC ("LEI") was retained by Christian Monnin Law Corporation, at the request of Manitoba Public Utilities Board, to represent the interests of small commercial customers in its review of Manitoba Hydro's cost of service review.
- ***supported setting of Nova Scotia Performance Standards:*** LEI was engaged by the Nova Scotia Regulatory Authority – the Nova Scotia Utility and Regulatory Board (NS UARB) to

assist in setting performance standards for NSPI in respect of reliability, response to adverse weather conditions, and customer service for Nova Scotia.

- ***conducted NYC entities capacity portfolio analysis:*** For a large Canadian hydropower generator, LEI performed a review and analysis of the capacity portfolio of several entities operating within New York City.
- ***served as Ukraine Electricity Tariff Expert:*** As part of a team hired by the Anti-Crisis Energy Group of the Cabinet of Ministers of Ukraine, LEI was tasked with identifying opportunities to streamline and enhance procedures used to set tariffs and prices for electricity produced. LEI performed an extensive literature review of the Ukrainian electricity market, assessed the current tariff-setting regulations and procedures, and carried out in-person interviews with stakeholders. LEI wrote a briefing memo on the Ukrainian market and a recommendations paper in line with its scope of work. The recommendations were incorporated into an Energy Resiliency Plan that would aid decision-making to the Cabinet of Ministers and the Verkhovna Rada.
- ***Conducted 2015 Review of Non-Energy Margin***: London Economics International LLC ("LEI") was asked by ENMAX Energy Corporation ("EEC") to review EEC's proposed non-energy return/risk margin associated with expenses incurred as a result of operation of the Regulated Rate Option ("RRO"). For the client, LEI reviewed the settled practice in Alberta, recent proposed changes providing for an all-inclusive return margin, and calculated an indicative range of margin for EEC.
- ***overview of Colombia market and revenue forecasts for target assets:*** LEI performed a comprehensive review of the Colombia energy market (including fuel and power market drivers), detailing the functioning of both wholesale power market and firm energy market (capacity market), and developing forecasts of spot prices in order to derive expected revenues for the portfolio. LEI summarized its research and modeling results in a final report that was presented to lenders and other interested parties.
- ***conducted analysis of Nova Scotia electricity systems:*** LEI was retained by Nova Scotia Department of Energy ("NS DOE") to perform analysis of the organization and governance of electricity systems both cross-jurisdictionally and within the province of Nova Scotia. The scope of work was divided into two main phases: (i) Review of international best practices and lessons learned; and (ii) Translation of best practices and lessons learned into best fit for NS.
- ***assessed consistency of proposed Clean Energy Standard with existing Alberta electricity market design characteristics:*** Paper included discussion of potential additional program attributes, indicative cost assessment, impact on investment and reliability, and assessment of further required research.
- ***Ontario electricity market paper:*** on behalf of a respected Canadian think tank, LEI provided an assessment of the ways in which the Ontario electricity sector could be improved to increase economic efficiency and reduce costs for consumers over the long run.

- ***assisted generator in hydro development strategy:*** assisted Alberta generator on strategy related to new large scale hydro development, including justification as inflation hedge for potential pension fund investors, integration into competitive market while maintaining ability to finance, and other strategic and regulatory support.
- ***conducted IBR workshop in Malaysia:*** LEI was retained by the largest electric utility company in Malaysia to conduct a workshop on incentive-based ratemaking ("IBR"). The topics for the workshop include theoretical conceptual overview of IBR regulatory framework, key elements of comprehensive IBR regimes, best practices of IBR in various jurisdictions, timing, and framework in other jurisdictions, how to convince regulators and stakeholders, identifying barriers to successful implementation of the IBR, and moving from first to second generation IBR, to name a few.
- ***developed a transmission cost causation study for the Alberta Electric System Operator ("AESO"):*** the study will be used for the determination of the AESO's Demand Transmission Service Rate DTS and is expected to be filed with AESO's 2014 tariff application to the Alberta Utilities Commission ("AUC"). The study is intended to cover four main topics: (i) Functionalization of Capital Costs; (ii) Functionalization of Operating & Maintenance ("O&M") costs; (iii) Classification of Bulk and Regional System Costs; and (iv) Implementation Considerations.
- ***conducted review of gas transmission sector in the US:*** for a European economic advisory firm, LEI reviewed the US gas transmission sector focusing on its regulatory structure. Tasks included researching the regulatory approach, legal framework, allowed capital costs and incentive mechanisms of the US gas industry.
- ***review of rate of permitted return in Hong Kong:*** for the Hong Kong Government, LEI reviewed the rate base and the rate of permitted return for the power companies in Hong Kong under the Scheme of Control Agreements. This required reviewing the alternatives to using Average Net Fixed Assets as the rate base, examining the assumptions used and methodology to calculate the WACC of power companies, updating the indicative range for the permitted rate of return, and recommending changes to existing rates of return by identifying new international best practices.
- ***provided a briefing for Alberta's Minister of Energy:*** briefings consisted of two 90-minute presentations – the first was a review of the Alberta Retail Market, and the second was a wholesale market review of ERCOT, Australia, Singapore, UK, and Ontario
- ***supported client's transmission FBR reopener application:*** in particular, the client wanted LEI to provide an independent opinion on their argument (i) to amend the G factor calculation to eliminate the G-factor lag effective January 1, 2011 and (ii) to reduce EPC's current X factor of 1.2% to 0.0%. LEI provided support throughout the whole litigation proceeding by responding to information requests which involved additional research and analysis, including synthesis of publications on recent technological advances in electricity transmission sector, and updating the Ontario LDCs TFP model to ten years.

- ***reviewed the US gas transmission sector focusing on its regulatory structure:*** on behalf of a European economic advisory firm, an LEI team, led by AJ, reviewed the US gas transmission sector. Tasks included researching the regulatory approach, legal framework, allowed capital costs, and incentive mechanisms of the US gas transmission industry. Analysis focused on US Federal Energy Regulatory Commission ("FERC") regulatory proceedings, as well as state commission findings, related to allowed returns, capital investment requirements, and treatment of capacity.
- ***developed financial, commercial, and regulatory framework, in addition to drafting an investment strategy and model for Saudi clean energy institution:*** deliverables included: (i) A master plan on how to develop renewable and atomic energies based on local value chains in Saudi Arabia; (ii) An economic framework to create a favorable environment in order to follow this master plan; (iii) An investment strategy to make use of KSA resources and available funds in an efficient way; (iv) A multitude of international case studies to avoid costly mistakes in the future and to know when to adopt; (v) A final report on 'National Policy for Investment in Alternative Energy Sources'; and (vi) Two 'sales pitch' documents for submittal to the King's Supreme Council and for the financial community
- ***advised Jordan regulator:*** advised the regulator on the weighted average cost of capital and optimal capital structure for Jordan's three distribution companies: EDCO, IDECO and JEPCO. The recommended optimal capital structure was consistent with targeted debt service and interest coverage ratios in line with the rating methodology for distribution companies from the global credit rating agencies. Work also included identifying salient risk factors for the distribution companies, identifying appropriate local and international metrics and benchmarks, developing a usable cost of capital model, and providing training workshops for local staff.
- ***drafting National Renewable Energy Plan for Saudi Arabia:*** on behalf of the regulator, developed proposal for renewable energy plan for Saudi Arabia, including assessment of procurement methods, new institutions required, and determination of resource eligibility.
- ***rate design for water and wastewater services in Saudi Arabia:*** on behalf of utility serving industrial areas in the Kingdom, examined appropriate regulatory structure and recommended approach to establishing new regulatory body, including composition of regulator, incentive structure, and tariff modeling.
- ***design of wheeling tariff and pilot program for Saudi Arabia:*** for Saudi regulator, developed proposed plan for wheeling of power in Saudi Arabia, including proposed pilot program, assessment of impact on incumbent, relative economics of wheeling versus the industrial tariff, and review of associated commercial and regulatory issues.
- ***tariff design for Kingdom of Saudi Arabia:*** led engagement with international team assessing tariff design, modeling, and electricity market evolution in Saudi Arabia; engagement resulted in a revised tariff system, including performance-based rates, tolling agreements for generation, and an open access tariff. Included holding workshops for regulator in explaining cost of capital, tariff design, and other regulatory issues.

- ***Electricity Industry Restructuring Plan for Saudi Arabia:*** A.J. developed the blueprint for industry restructuring in Saudi Arabia, including unbundling of the current monopoly vertically integrated utility, introduction of wholesale competition, and creation of a Single Buyer.
- ***developed regulatory incentives in Jordan:*** examined regulatory framework in Jordan, with particular focus on creating specific regulatory incentives for distribution companies to optimize their operational expenses. Proposals envision move away from cost-of-service regime to incentive-based structure benefiting customers and shareholders.
- ***global regulatory review:*** assisted private equity player in assessing electricity markets in Eastern Europe, Turkey, Asia, and Latin America to determine potential regulatory and market issues associated with proposed purchase of diverse portfolio of generation, distribution, natural gas pipeline, and retail fuels businesses.
- ***assessed retail margin review for generator in India:*** reviewed retail margins on electricity sales worldwide, in order to provide Indian generator insight with regards to appropriate retail margins that could be charged to selected customers in one Indian jurisdiction. Engagement involved review of case studies of electricity retail margins around the world, including the US, UK, and Australia. In addition, retail margins in other industries were reviewed, along with the progression of margins as an industry progresses from infancy to maturity.
- ***institutional development for IPP promotion:*** contributed to Indian private power promotion efforts through technical assistance program to state electricity boards, central government agencies, and private firms, with particular emphasis on role of PURPA in creating US IPP industry
- ***bagasse cogeneration:*** worked extensively with Indian sugar mills, equipment suppliers, government investment promotion agencies, and state electricity boards to develop cost-effective targeted loan and technical assistance program to promote bagasse cogeneration.
- ***barriers to introduction of new coal combustion technologies in emerging markets:*** served as liaison between India's National Thermal Power Corporation (NTPC) and US research institutions to assess ways to adapt US coal combustion technologies to Indian conditions.
- ***recommendations for next Scheme of Control in Hong Kong:*** worked with the Hong Kong government to develop a series of recommendations regarding appropriate allowed returns, calculation of asset base, prevention of over-investment, and rate stability.
- ***lessons from North American experience for Chinese regulators and grid companies:*** for a set of Chinese state-owned companies, including grid operators, the nuclear operating company, and provincial power companies, London Economics International LLC prepared a series of detailed briefings on developments in electricity market design worldwide, with a particular emphasis on lessons from the North American experience. This experience was then used to highlight the various alternatives for market design in China, and the potential outcomes.

- ***implications of restructuring the Japanese power sector:*** for a major Japanese development bank, we analyzed the impact of proposed reforms on a Japanese transmission and generation company, including the potential for stranded costs, opportunities for expansion of transmission, and future tariff setting regimes. The engagement included extensive training of the development bank's staff, as well as the creation of a working model of the Japanese power sector.
- ***preparing appropriate framework for private investment in Romanian distribution sector:*** on behalf of a private client, worked with Romanian regulators to develop a consensus on approaches to capital recovery, PBR application, performance standards, supply cost-pass through, and cost of capital. These elements served as preconditions for the private investor's participation in the privatization process.
- ***arguments for retaining vertical integration:*** for large French utility, reviewed cases worldwide in which during liberalization incumbents were allowed to remain active across the value chain, including retail. Our work included an assessment of the minimum competition enhancing measures regulators may require in order for the utility to continue operating in all or most of its traditional supply chain activities.
- ***implications of performance-based ratemaking (PBR) in the Caribbean:*** for a privately owned integrated electric company based on a well-developed Caribbean island, directed strategic analysis of implications of PBR, suggested approach to regulators, and provided indicative benchmarking analysis.
- ***review of stranded cost settlement and default supply pricing:*** prepared support for regulatory filing in Pennsylvania assessing benefits to customers from a proposal to extend recovery period for competitive transition charge while extending fixing price for default supply.
- ***assessment of changes in market power for a FERC Section 203 filing:*** in connection with a proposed combination of generation portfolios, developed testimony concerning the change in market concentration as a result of the transaction, including an assessment of changes in HHIs under various market definitions.
- ***review of durability of gas franchises in the face of competition:*** reviewed state regulator decisions and FERC rulings regarding sanctity of natural gas distribution franchises, assessed relevance in the face of deregulation of gas markets.
- ***market response to tax credit:*** performed in-depth analysis of impact of Section 29 tax credit for non-conventional fuels production on supply and price response in US southwestern gas markets.
- ***economic efficiency effects of retail market design:*** for major US electricity retailer, analyzed various forms of retail electricity competition and default service parameters and compared them to retail/wholesale structure in other industries to determine welfare effects.

- ***assessed potential cost of Ontario Green Energy Act:*** explored costs of Green Energy Act, including feed in tariff provisions, grid connection funding, institutional development, loss of local control, and stakeholder mandates.
- ***cost of capital for regulated generating assets:*** provided expert testimony on behalf of OEB staff regarding risk factors associated with Ontario Power Generating's prescribed assets, as well as creating a risk-return continuum on which power sector assets could be placed.
- ***incentive-based contract design:*** for Ontario Power Authority, advised on provisions of power purchase agreement associated with incentives for optimization of production in peak periods for hydro facility owned by a major generator.
- ***upstream capability to deliver conservation and demand management:*** for Ontario Power Authority, performed examination of capabilities of Ontario to provide necessary inputs to assure that Ontario meets is conservation and demand management targets; report incorporated into Integrated Power System Plan submission to OEB.
- ***design of incentive rate structure for Alberta utility:*** for a large metropolitan Alberta utility, A.J. advised on design of a proposed incentive based rate structure, including a multi-year term, operating cost incentive structure, and earnings sharing mechanism. Deliverables aided in development of regulatory filings and included testimony before the Alberta Utilities Board
- ***regulation of generation in Ontario:*** for Ontario Energy Board, A.J. authored paper described the ways in which legacy assets of Ontario Power Generation could be regulated, including incentive regulation and a set of regulatory contracts. Deliverables included providing technical advisory during public workshop.
- ***potential for regulation of retail market auctions:*** for Ontario Energy Board, A.J. led engagement to review practice of regulatory oversight of load auctions to serve default supply across North America.
- ***examination of contracting processes in Ontario:*** on behalf of the Ontario Power Authority, met with over 50 stakeholder groups to determine potential ways in which contracting process for new supply could be improved. Engagement included assessing practices in other jurisdictions and review of standard offer processes.
- ***critiquing and improving electricity market structure in Alberta:*** for market institutions and regulators in the Canadian province of Alberta, performed extensive analysis of current industry market structure, including role of Power Pool, Transmission Administrator, Market Surveillance Administrator, the Scheduling Coordinator, and the Balancing Pool. Directed detailed analysis of market power issues associated with divestiture of specific assets and advised on particular market rules to ameliorate strategic behavior.
- ***recommendations regarding market power mitigation and retail market design:*** in two separate engagements, advised the Government of Alberta on alternatives for rate designs for small customers and on measures to monitor, measure, and ameliorate market power; both

engagements included extensive modeling of Alberta wholesale market and of retail supply tariffs.

- ***evaluation of rates across Canada:*** reviewed rates charged to final consumers across Canada and identified distortions in rate design across provinces; performed modeling to adjust for distortions; developed appropriate calculations to appropriately compare rates across jurisdictions.
- ***resource adequacy mechanisms for Alberta:*** worked with generators association to assess alternative approaches to assuring resource adequacy. Reviewed mechanisms for capacity and default supply procurement worldwide, developed alternatives for Alberta, and engaged in intensive stakeholder consultation.
- ***strategic implications of US deregulation:*** performed in-depth study of the impact of unbundling in the US on the fundamental economics of the electric power industry at all points on the value chain; identified regional investment opportunities congruent with these dynamics.
- ***2nd generation PBR in Ontario:*** led Cdn. $1.5 million engagement focusing on design of second generation PBR in Ontario. Key components include estimating total factor productivity (TFP), determining appropriateness of yardstick competition, analyzing demand-side management programs in the context of PBR, and examining service quality indicators.
- ***market power concerns in Ontario:*** determined concentration ratios for existing configuration of generation plant, developed set of recommended portfolios to minimize market power across all timeslots in hourly market in preparation for divestiture or other market power mitigation mechanisms.
- ***Regulatory review of power markets for Chilean client:*** at the request of a major Chilean generating company, LEI performed a detailed review of the regulatory regimes of four restructured power markets (California, Colombia, Nord Pool, and Spain), as well as an analysis of the current Chilean regulatory regime and the changes to that regime that the regulator has proposed. The review addressed the positions of all stakeholders, with a particular focus on the implications of various types of market design on generators.

Written and oral expert testimony

Note: expert testimony was also a component of some projects listed above, particularly regulatory projects for Ontario Power Authority, Ontario Energy Board, and involving incentive rates in Alberta.

- ***review conclusions of the Financial Management and Oversight Board for Puerto Rico:*** LEI's expert services included performing economic analyses, preparing an opening expert testimony report, preparing a rebuttal testimony, sitting for a deposition, and testifying at the hearing on the motion.
- ***valuation of onsite gas peakers***: LEI's scope of work consisted of identifying prospective technology types that would suit the client's operational needs. LEI's work consisted of

reviewing historical and projected site load, developing a status quo estimation for the cost of delivering power, and finally creating an economic model that compared the use of on-site generation against the status quo.

- ***regulatory support with regards to a natural gas pipeline toll application:*** LEI was retained by Torys LLP to provide regulatory support for Black Swan Energy in its response to the application of NOVA Gas Transmission Limited ("NGTL") to the National Energy Board ("NEB"). LEI was asked to review the application and intervener evidence, as well as assist the client in preparing cross-examination of interveners, review of the argument, and replies. Upon request by the client, LEI prepared an expert report to form the basis of Black Swan's intervenor evidence and responded to information requests ("IRs"). AJ served as an expert witness and testified before the CER.
- ***oversight of wholesale market rules:*** LEI was retained by the Ontario Energy Board ("OEB") to provide regulatory expertise on an as-needed basis as the OEB evaluated the Independent Electricity System Operator's ("IESO") Market Rules and Market Rule Amendments ("MRAs").
- ***electricity regulation in Newfoundland & Labrador***: LEI was engaged by the Commission of Inquiry Respecting the Muskrat Falls Project to serve as an expert to the Inquiry. LEI's scope of work consisted of preparing a report addressing the following topics: a comparison of Newfoundland and Labrador's electricity regulation system relative to other jurisdictions; assessing the system's ability to deal with challenges stemming from interconnection, including energy marketing; exploring the province's energy policy; recommending changes to the province's electricity pricing model; and assessing the potential role for renewable energy generation expansion.
- ***review of valuation metrics used in conjunction with tax payment challenge for an Alberta generator:*** assessed the appropriateness of valuations utilized to determine depreciation deductions related to the acquisition of a coal-fired generating station. Engagement also required creating forecasts that would have been appropriate at the time the acquisition was made several years previously, as well as calculating asset values using multiple valuation approaches. Multiple forecasting tools were used. Engagement included developing critiques of work by opposing expert witnesses.
- ***examination of Swiss electricity market:*** for a US financial institution, A.J. reviewed the development of the Swiss electricity market and specifically the position of hydro stations within that market. Analysis included a discussion of the factors that influence the value of hydro stations, presence of foreign owners in the Swiss electricity market, and use of post-tax cash flow to evaluate potential investments.
- ***analysis of potential customer impacts due to holding company acquisition of merchant generator:*** discussed ways in which customer rates would be impacted by potential credit rating downgrades of regulated subsidiaries due to holding company parent's acquisition of merchant generator; engagement included examination of impact on default supply as well as reliability.

- ***assessment and valuation of quantum merit claims:*** for advisor and developer of biomass facilities, provided expert opinion on value of services provided based on industry knowledge, review of correspondence, and experience providing or commissioning similar services.
- ***conservation and demand management (C&DM) in Ontario*** wrote testimony related to the alternative ratemaking approaches available regarding C&DM; addressed innovative alternatives and compared and contrasted various schemes in the Ontario context.
- ***review of Dutch electricity market regulatory dynamics:*** in a case before the US Federal Court of Claims related to economic substance, provided understanding of how Dutch electricity market was structured in the mid-1990s, how it was expected to evolve, and how it did actually evolve. Issues addressed included market structure, regulation, role of non-utility investors, and role of private and international investors.
- ***valuation of PPAs associated with IPPs in Thailand:*** as an expert witness in an arbitration case, A.J. quantified the change in value resulting from modifications to several PPAs associated with a power project in Thailand. Engagement included review of PPAs, evaluation of Thai power sector restructuring process, extensive modeling of financial aspects of PPAs, and assessment of financing alternatives; client won on all claims.

PUBLICATIONS:

Goulding, AJ, Mugwe Kiragu and David Nour Berro. "Potential Implications of the COVID-19 Crisis on Long-Term Electricity Demand in the United States." Columbia University. SIPA – Center on Global Energy Policy. October 2020.

Goulding, AJ, and Jarome Leslie. "Dammed If You Do: How Sunk Costs Are Dragging Canadian Electricity Ratepayers Underwater." C.D. Howe Institute. January 2019.

Goulding, AJ, and Stella Jhang. "Secretary Perry's Grid Resiliency Pricing Rule: On Market Interventions and Minimizing the Damage." Columbia University. SIPA – Center on Global Energy Policy. October 2017.

Goulding, AJ. "Railroads, Utilities and Free Parking: What the Evolution of Transport Monopolies Tells Us About the Power Network of the Future." Columbia University. SIPA – Center on Global Energy Policy. November 2016.

Goulding, A.J. "A New Blueprint for Ontario's Electricity Market." C.D. Howe Institute. Commentary No. 389. September 2013.

Goulding, A.J. and Serkan Bahçeci. "Stand-by rate design: Current issues and possible innovations." *Electricity Journal*, June 2007, pp 87 – 96.

Goulding, A.J. and Bridgett Neely. "Picture of a Stalled Competitive Model" *Public Utilities Fortnightly*, February 2005, pp 35 - 42.

Goulding, A.J. and Bridgett Neely. "Acceding to Succeed" *Public Utilities Fortnightly*, July 2004.

Goulding, A.J. "Let's Get This Party Started: Why Ontario needs a competitive market" *Public Utilities Fortnightly*, May 2004, pp 16 - 20.

Goulding, A.J. and Nazli Z. Uludere. "Uncovering the *true value* in merchant generation" *Electricity Journal*, May 2004, pp 49-58.

Goulding, A.J. "On the Brink: Avoiding a Canadian California" *Public Utilities Fortnightly*, February 5, 2003.

Goulding, A.J., Julia Frayer, Jeffrey Waller. "X Marks the Spot: How UK Utilities Have Fared Under Performance-Based Ratemaking" *Public Utilities Fortnightly,* July 15, 2001.

Goulding, A.J., Julia Frayer, Nazli Z. Uludere. "Dancing with Goliath: Prospects After the Breakup of Ontario Hydro" Public *Utilities Fortnightly*, March 1, 2001.

Goulding, A.J., Carlos Rufin, and Greg Swinand. "Role of Vibrant Retail Electricity Markets in Assuring that Wholesale Power Markets Operate Effectively." *Electricity Journal*, December 1999.

Adamson, Seabron and A.J. Goulding. "The ABCs of Market Power Mitigation: Use of Auctioned Biddable Contracts to Enhance Competition in Generation Markets." *Electricity Journal*, March 1999.

Goulding, A.J. "Retreating from the Commanding Heights: Privatization in an Indian Context." Columbia University: *Journal of International Affairs*, Winter 1997, pp. 581-612.

Hass, Mark R., and A.J. Goulding. "Impact of Section 29 Tax Credits on Unconventional Gas Development and Gas Markets." Society of Petroleum Engineers: SPE 24889, presented at 67th Annual Technical Conference, Washington, DC, October 6, 1992.

SPEAKING ENGAGEMENTS:

"Is There a Future for Mega Energy Projects?" Panelist, Ivey's 4th Annual Workshop on the Economics of Electricity Policy and Markets. October 6, 2020.

"COVID-19 related demand destruction and its implications for utilities and IPPs." Speaker, Bank of America's 2020 Future of Power conference. September 23, 2020.

"Fortune-Telling and Fortune-Seeking: The Future of the Power Markets in New England." Panelist, Northeast Energy and Commerce Association ("NECA") Wholesale Panel discussion. Webinar. May 20, 2020.

"Examining Risk & Opportunities In Canada's Procurement Models." Panelist, Gowling WLG's live webinar. May 23, 2019.

"***System and tariffs impacts of increasing distributed generation."*** Speaker, CAMPUT. Calgary, Alberta, Canada. May 7th, 2019.

"Rate design and fixed cost recovery revisited." Panelist, Ivey Energy Policy and Management Centre ("EPMC"). Toronto, Ontario, Canada. October 22nd, 2019.

"Alternative Regulatory Approaches". Speaker, Electricity Distributors Association Energy Business Innovation Conference. Toronto, Ontario, Canada. October 22nd, 2019.

"Regulation" – Keeping up with the pace of change." Panelist, APPrO. Toronto, Ontario, Canada. November 12th, 2018.

"Blockchain and the Grid." Panelist, Wires Conference. Washington, DC, USA. October 25th, 2018.

"Considerations for policymakers regarding capacity mechanism design." Speaker, Independent Power Producers Society of Alberta ("IPPSA"). Calgary, Alberta, Canada. July 17th, 2017.

"Future Models for Utility Ownership and Regulation in Hawaii." Speaker, VERGE Hawaii: Asia Pacific Clean Energy Summit. Hilton Hawaiian Village, Honolulu, Hawaii, US. June 20th, 2017.

"Capacity Market Review: Workshop #2." Speaker, Independent Power Producers Society of Alberta ("IPPSA"). Calgary, Alberta, Canada. June 14th, 2017.

"Capacity Market Review: Workshop #1." Speaker, Independent Power Producers Society of Alberta ("IPPSA"). Calgary, Alberta, Canada. May 18th, 2017.

"Distributed Energy Resources: Regulatory Framework and Ratemaking Considerations." Speaker, CAMPUT Annual Conference 2017's CEA's Regulatory Innovation Task Group. Vancouver, British Columbia, Canada. May 10th, 2017.

"From Theory to Practice: Disruptive Technologies, Innovation and the Future of the Utility." Panelist, Northwind Professional Institute 13th Annual Electricity Invitational Forum, Langdon Hall, Cambridge, Ontario, Canada. January 27th, 2017.

"Ontario's Electricity Sector: Does the Current Institutional Framework Serve the Public Interest? Is it Times for Ontario to Consider a Fundamental Redesign?" Discussion Leader, Northwind Professional Institute 11th Annual Electricity Invitational Forum, Langdon Hall, Cambridge, Ontario, Canada. January 30th, 2015.

"What's Next for Ontario's Electricity Market?" Panelist, C.D. Howe Institute Roundtable, Toronto, Ontario, Canada. September 16th, 2014.

"Prices and Costs Why Rates Don't Tell the Whole Story" Speaker, Making Markets Work Symposium – Manning Centre, Calgary, Alberta, Canada. June 25th, 2014.

"Examining the Future Structure of Ontario's Electricity Market: Should Ontario Incorporate a Capacity Market or Alternative Structural Framework?" Panelist, Ontario Power Conference, Toronto, Ontario, Canada. April 15th, 2014.

"Electricity Prices – Economics, Public Policy, Technologies and Affordability" Panelist, CCRE Energy Leaders Roundtable, Hockley Valley Resort, Orangeville, Ontario, Canada. March 27th, 2014.

"Priorities for enhancing Ontario's electricity market: What direction forward?" Panelist, APPrO, Toronto, Ontario, Canada. November 20th, 2013.

"Evolving Regulation in Ontario: Best Practices from Other Jurisdictions" Panelist, Ontario Energy Association's ENERGYCONFERENCE13, Toronto, Ontario, Canada. September 11th, 2013.

"Points to consider when valuing hydro in the US" Speaker, HydroVision 2013, Denver, Colorado, US. July 26th, 2013.

"Pricing Power in Ontario: Perspectives and Competitive Analysis on the Future Direction of Ontario Electricity Rates" Panelist, Ontario Power, Toronto, Ontario, Canada. April 17th, 2013.

"Why Alberta* is *Still Standing" Panelist, Independent Power Producers Society of Alberta's 19th Annual Conference – Last Market Standing? Alberta, Canada. March 11th, 2013.

"Market Evolution in the context of the EMF and the post-election environment" Panel Moderator, Association of Power Producers of Ontario, Toronto, Ontario, Canada. November 16th, 2011.

"Green Energy Economics" Panelist, Electricity Distributors Association's ENERCOM, Toronto, Ontario, Canada. March 30th, 2011.

"Projected Supply-Demand Balance in Ontario: A Call to Inaction" Speaker, APPrO, Toronto, Ontario, Canada. November 18th, 2010.

"Changes in electricity policy: what will it cost?" Speaker, 2010 Ontario Energy Association Annual Conference, Niagara Falls, Ontario, Canada. September 21st, 2010.

"Energy Infrastructure Spending" Debate Panelist, Canadian Association of Members of Public Utility Tribunals (CAMPUT), Montreal, Ontario, Canada. May 5th, 2010.

"Strategic implications of the Ontario Green Energy Act" Presentation to Ontario Energy Association Green Energy and Conservation Joint Sector Committee, Toronto, Ontario, Canada. June 24th, 2009.

"Strategic implications of evolution of North American utilities sector in response to environmental initiatives" Presentation to Mitsui Canada Leadership Forum, Toronto, Ontario, Canada. June 17th, 2009.

"Making retail competition work in electricity" Speaker, Illinois Commerce Commission Retail Competition Workshop, Chicago, Illinois, US. October 2nd, 2006.

"Gods and monsters: the role of the Ontario Power Authority in Ontario's hybrid market" Speaker, Ontario Energy Association annual conference, Niagara Falls, Ontario, Canada. September 14th, 2005.

"Transmission investment in today's power markets: key considerations" Presentation to the Wyoming Infrastructure Authority, Casper, Wyoming, US. May 26th, 2005.

"The true cost of power: comparing rates for power across Canada" Speaker, Independent Power Producers Society of Alberta conference, Banff, Alberta, Canada. March 15th, 2005.

"Key considerations with regards to resource adequacy mechanisms in Alberta." Speaker, Independent Power Producers Society of Alberta luncheon, Calgary, Alberta, Canada. November 3rd, 2004.

"Finding the silver lining: investment opportunities in Canadian power markets" Speaker, 2004 Canada Power Conference, Toronto, Ontario, Canada. September 30th, 2004.

"Adding value for the shareholder: Managing small utilities in a period of regulatory change." Speaker, Ontario Electricity Distributors Association, London, Ontario, Canada. June 8th, 2004.

"Case studies in electricity market design: learning from experience." Guest lecturer, Columbia University Center for Energy and Marine Policy graduate program, International Energy Systems and Business Structures class, New York, New York, US. April 8th, 2003.

"'The grass is always greener' vs. 'All of your eggs in one basket': investment outlook for California and foreign markets." Speaker, Platt's Global Power Markets Conference, New Orleans, Louisiana, US. March 31st, 2003.

"Transmission congestion, valuation, and investment issues in the region surrounding Ontario." Speaker, Canadian Institute conference on Inter-jurisdictional Power Transactions, Toronto, Ontario, Canada. April 8th, 2002.

"Update on new generation development in Alberta." Speaker, Canadian Institute Conference on Managing Electricity Price Volatility in Alberta, Calgary, Alberta, Canada. February 27th, 2002.

'The Alberta market structure and implications of structural change." Speaker, Insight Conferences Alberta Power Summit, Calgary, Alberta, Canada. February 22nd, 2002.

"Implications for developers of key aspects of competing Midwest ISO designs." Speaker, INFOCAST conference on Maximizing the Value of QFs and IPPs, Orlando, Florida, US. February 1st, 2001.

"Risk and rewards from PBR for US utilities: lessons from overseas." Speaker, UTECH 2000 conference, St. Petersburg, Florida, US. November 30th, 2000.

"Dancing with Goliath: increasing competition in Ontario wholesale generation market." Speaker, Canadian Independent Power conference, Toronto, Ontario, Canada. November 27th, 2000.

"***Asset valuation in evolving global power markets.***" Speaker and case study facilitator, World Bank conference on Emerging Issues in the Power Sector, Washington, DC, US. April 19th-21st, 2000.

"***Overseas exposure: is it worth the risk?***" Speaker at Global Power Markets Conference, organized by Global Power Report and McGraw-Hill, New Orleans, Louisiana, US. April 16th -19th, 2000.

"***Profiting from retail: challenges for MEUs.***" Speaker at conference on buying and selling electric utilities in Canada, organized by IBC USA conferences, Toronto, Ontario, Canada. November 15th-17th, 1999.

"***Assessing the US electricity market and evaluating US targets***." Facilitator for workshop on US acquisition opportunities for European energy firms, organized by IIR Limited, London, England. February 9th-11th, 1999.

10 Appendix E: Curriculum vitae for Amit Pinjani

KEY QUALIFICATIONS:

Amit Pinjani has extensive experience advising North American and international clients on matters related to electricity regulation, market design, cost of capital, and transaction advisory services. Amit has been qualified as an expert economist by multiple regulatory authorities in North America (including the Nova Scotia Utility and Regulatory Board and the Alberta Utilities Commission), where he has submitted expert written and oral testimony. In addition to working on several economic and regulatory advisory projects, Amit has successfully managed energy litigation support and asset valuation projects with LEI.

Internationally, Amit has managed extensive engagements with government entities and private clients in the Middle East and Asia. Amit is a seasoned project manager who ensures client deliverables entail robust analysis and clear recommendations (where necessary), along with providing seamless client communication and management. Prior to LEI, he worked for the Investment Banking Division at Citibank, and assisted on capital market and mergers and acquisition (M&A) transactions.

EDUCATION:

York University Osgoode Hall Law School, Masters of Law – LLM (Candidate), Energy and Infrastructure Law, 2021 (expected)

Brandeis International Business School, Masters in Business Administration, 2008

Lahore University of Management Sciences, Pakistan, Masters of Science in Economics, 2004; Bachelors of Science (Economics major, Mathematics minor), 2003

EMPLOYMENT RECORD:

From: 2008	**To:** present
Employer:	*London Economics International LLC, Toronto, ON* Director (January 2020 to present) Managing Consultant (October 2013 to December 2019), Senior Consultant (December 2009 to September 2013), Consultant (December 2008 to November 2009)
From: February 2005	**To**: July 2006
Employer:	*Citibank, Karachi, Pakistan* Assistant Manager, Corporate Finance/Investment Banking Group
From: January 2004	**To**: February 2005
Employer:	*Eni Group, Karachi, Pakistan*

SAMPLE PROJECT EXPERIENCE:

Regulatory economics and tariff related

- ***Review of rate of permitted return in Hong Kong:*** for the Hong Kong Government, Amit led the LEI team in the review of the rate base and the rate of permitted return for the power companies in Hong Kong under the Scheme of Control Agreements ("SCAs"). This engagement required reviewing the alternatives to using Average Net Fixed Assets as the rate base, examining the assumptions used and methodology to calculate the WACC of power companies, updating the indicative range for the permitted rate of return, and recommending changes to existing rates of return by identifying new international best practices. Following this engagement, LEI was requested again to review the permitted rate of return for Hong Kong based power companies under the SCAs, beginning 2019.
- ***Abu Dhabi distribution company study:*** LEI provided peer review of methodology and deliverables for the project by Tetra Tech to review the regulatory treatment of connection charges and large-scale infrastructure investments.
- ***Development of bilateral contract arrangements***: Amit managed an engagement where LEI was retained by the energy regulator in Saudi Arabia to assist in development of bilateral contract arrangements. The project involved multiple stakeholder engagements including with the Ministry, major electricity generation, transmission and distribution company members, petrochemical industry. The project culminated with staff trainings and submission of a draft bilateral contracts' arrangement plan for the Kingdom.
- ***Restructuring of the power sector institutions:*** In 2017/2018, LEI provided strategic advice to the Ministry of Energy, Industry and Mineral Resources ("MEIM") on the options for the evolution of the Saudi power sector, including the role of the Saudi Electricity Company ("SEC"). Amit managed the engagement where the team considered a number of options available to SEC (e.g., retain its current form, improved, and encouraged to expand overseas, or fully unbundled, and a competitive power market created from its constituent parts). In all of these scenarios, depending on the governance structures deployed and the range of financing options available, LEI considered aspects of achieving KSA's Vision 2030.
- ***Capital structure and cost of capital review in Jordan:*** LEI advised the Jordanian regulator on the weighted average cost of capital and optimal capital structure for Jordan's three distribution companies: EDCO, IDECO and JEPCO. The recommended optimal capital structure was consistent with targeted debt service and interest coverage ratios in line with the rating methodology for distribution companies from the global credit rating agencies. Work also included identifying salient risk factors for the distribution companies, identifying appropriate local and international metrics and benchmarks, developing a usable cost of capital model, and providing training workshops for local staff.
- ***Tariff model and regulatory advice to a water and power utility in Saudi Arabia:*** LEI was retained for development of a regulatory framework for a power and water utility not regulated by the government, development of a charter for a new regulatory body, establishment of a recommended tariff structure and accompanying tariff model for its business activities, and filing of tariff petitions with the applicable regulatory authorities for

approval. The tariff model separated out business entities such as power, potable water, processed water, industrial wastewater etc. across two jurisdictions.

- ***Incentive-based ratemaking filing for Malaysian electric utility:*** LEI was retained by the largest electric utility company in Malaysia to provide project management services for the client's 2nd regulatory period ("RP2") performance-based regulation ("PBR") (2018-2020) submission. LEI's scope of work consisted of several tasks: propose the policy and governance framework for the PBR submission; provide detailed project plan; assess the PBR Regulatory Requirement Model; ensure accuracy and timely delivery of RP2 submission workshops and review of overall RP2 report.
- ***Ukraine electricity tariff expert:*** As part of a team hired by the Anti-Crisis Energy Group of the Cabinet of Ministers of Ukraine, LEI was tasked with identifying opportunities to streamline and enhance procedures used to set tariffs and prices for electricity produced. LEI performed an extensive literature review of the Ukrainian electricity market, assessed the current tariff-setting regulations and procedures and carried out in-person interviews with stakeholders. LEI wrote a briefing memo on the Ukrainian market and a recommendations paper in line with its scope of work. The recommendations were incorporated into an Energy Resiliency Plan that would aid decision-making to the Cabinet of Ministers and the Verkhovna Rada. Amit provided support to LEI President AJ Goulding in this engagement.
- ***Return on equity evolution in Ontario***: retained by a private client to perform analysis regarding the prospects for transmission return on equity ("ROE") evolution in Ontario. The report included a discussion on (i) the process for determining transmission related ROE in Ontario; (ii) potential changes in the ROE formula and/or base parameters; (iii) historical trends in transmission ROE in the United States and Canada; (iv) expectation of future interest rate trends across North America, particularly Ontario, and effect on transmission ROE; (v) the effect of public versus private ownership of transmission assets on cost of capital/ROE in Ontario; and (vi) potential factors limiting one-to-one magnitude changes in ROE (for example, regulatory lags and avoiding rate shocks).
- ***Electricity rate economic impact study:*** LEI was engaged by an industry association for an Industrial Electricity Rate Economic Impact Study in Ontario's manufacturing sector. The scope of work consisted of review of current Ontario industrial electricity rates and rate designs; assessment of competitive electricity rate levels; development of options to change rates in a manner consistent with rate setting principles that is beneficial to industrial consumers and the Province; quantification of economic benefits from appropriate rate adjustments; and consultation with relevant industry and government officials and experts throughout the project. As part of a panel of speakers, Amit presented LEI's findings at an Energy Forum in February 2020.
- ***Cost of capital parameter updates for OEB:*** LEI was retained by Ontario Energy Board staff to provide updates on the macroeconomic conditions of the utility sector in Ontario. These were presented in quarterly reports since September 2019.
- ***Development of reliability, storm response and customer service standards for the province of Nova Scotia:*** LEI was retained by the Nova Scotia Utility and Review Board ("UARB") to

act as an independent consultant to the Board assisting in the formulation of performance standards for Nova Scotia Power Inc. ("NSPI") in the areas of system reliability, storm response and customer service. Amit led the preparation and submission of a Consultation Paper followed by a technical workshop with stakeholders. He also led the LEI team in responding to various interrogatories and submission of a rebuttal report. Finally, as part of the LEI team, he testified as an independent expert along with LEI President AJ Goulding in Halifax at the oral hearing in late September 2016.

- ***Literature review and case studies related to the organization and governance of electricity systems***: LEI was retained by the Department of Energy to perform a review of the organization and governance of electricity systems both cross-jurisdictionally and within the province of Nova Scotia. The scope of work was divided into two main phases: (i) review of international best practices and lessons learned; and (ii) translation of best practices and lessons learned into best fit for Nova Scotia.
- ***Transmission cost causation study in Alberta***: LEI was retained by the Alberta Electric System Operator (AESO) to develop a transmission cost causation study. The study was used for the determination of the AESO's Demand Transmission Service Rate DTS, and was filed with AESO's 2014 tariff application to the Alberta Utilities Commission (AUC). The study covered four main topics: (i) Functionalization of Capital Costs; (ii) Functionalization of Operating & Maintenance (O&M) costs; (iii) Classification of Bulk and Regional System Costs; and (iv) Implementation Considerations. LEI also worked with the AESO to facilitate technical sessions and Negotiated Settlement Agreement (NSA) meetings, which involved in-depth discussions regarding methods used and results. Following these meetings, the AESO filed an application for approval of the NSA (along with the revised cost causation study), which was unanimously supported by all participants in the process.
- ***Analysis of procurement processes to meet standard offer service load:*** LEI was retained by the Delaware Public Services Commission ("PSC") to assist with review of the procurement process for the provision of Delmarva Power & Light Company ("Delmarva Power")'s standard offer services, and to provide information and analysis regarding alternative long-term electricity procurement options for Delmarva Power to meet its Standard Offer Service residential and small commercial retail load.
- ***Review of the Alberta Electricity Framework:*** LEI was retained by the AESO to perform an assessment of the Alberta Electricity Framework, which encompasses the wholesale generation market, retail market, agencies, transmission planning, access, and distribution, as well as the operations of the Alberta Interconnected Electricity System. The analysis included both qualitative and quantitative components.
- ***Assistance related to incentive ratemaking application***: LEI was retained to review a large Ontario gas utility's proposed 2014 to 2018 incentive ratemaking ("IR") plan and to examine case studies of approaches to IR applied to other North American gas distribution utilities. In the case study analysis, LEI examined approaches to a set list of ratemaking parameters: productivity and X-factor trends, alternative approaches to designing an I-X framework, approaches to establishing inflation factors, approaches in other jurisdictions to applying an

Earnings Sharing Mechanism ("ESM"), use of capital trackers for unknown costs, appropriateness of deferral accounts for unaccounted-for gas ("UFG"), and service quality indicators ("SQIs") and how they are measured. LEI was subsequently requested by the utility to provide comments on the utility's draft Settlement Agreement, which was accepted by the Ontario Energy Board ("OEB").

- ***Independent expert related to proposed auctioning for the Load Following Service ("LFS") product***: LEI provided an independent evaluation of the proposed auction, including evaluation of the both the product being auctioned and the auction mechanism and key parameters. The LFS product as proposed to be auctioned was meant to represent the "shape risk" in the Regulated Rate Option ("RRO") service. LEI's evaluation considered whether the product and auction mechanism would result in an efficient, competitive, and fair outcome for the Alberta market, RRO providers, potential suppliers of the auctioned product, and customers of the RRO service. LEI prepared a report titled "Independent assessment of proposed market-based determination of shape risk in RRO supply", which was filed with the Alberta Utilities Commission ("AUC").

Asset valuation and transaction advisory work

- ***Comprehensive review of multiple power purchase agreements – potential buy side due diligence***: LEI was engaged by a private client for professional services related to assistance with developing underwriting scenarios for a solar portfolio located across several US states. As part of the diligence, LEI reviewed the Seller's model assessing reasonability of re-contracting assumptions for the portfolio across all markets, provided high level commentary around outlook for renewables in key markets, highlighted any other red flags or key concerns that were captured as part of the review, and identified any potential options for performance improvement projects based on the key markets (e.g. repowering, addition of storage, selling to different markets etc.). Amit also led a comprehensive review of over 25 power purchase agreements as part of the due diligence.
- ***Hydroelectric asset acquisition in Maine:*** LEI was retained to provide assistance in relation to the potential acquisition of a set of hydroelectric assets in Maine. As part of this process, LEI performed (i) an operating performance and review of the assets in the portfolio; (ii) forecasts for energy, capacity, and Renewable Energy Credit prices over a 20-year timeframe, as well as the development of a revenue profile for the target portfolio; and (iii) an investment review, which included developing the ultimate valuation model and associated report. Amit provided due diligence questions to LEI staff on this engagement.
- ***Litigation support - valuation of a power purchase agreement***: LEI was engaged by counsel to provide an independent valuation of an asset in conjunction with a tax payment challenge for an Alberta generator. LEI assessed the appropriateness of valuations related to the acquisition of a coal-fired generating station. Engagement required developing power pool price forecasts that would have been appropriate as of the valuation date several years previously, as well as estimating a range of asset values using multiple valuation approaches.

The engagement also included developing critiques of work prepared by opposing expert witnesses.

- ***Investment advice related to district energy assets***: LEI was retained to analyze revenue/gross margin modules for various district energy assets being considered for acquisition. LEI reviewed information received from the client, including detailed documents in the data room, and presented analysis in a slide deck relating to contract revenues (prices and volumes) and fuel costs (electricity) along with revenue and cost drivers. LEI also presented sensitivity analysis for high/low sales volumes, new customers, expiry dates of existing contracts, and fuel costs.
- ***Bid advice in California***: LEI was retained by a private client to analyze alternative technology solutions in relation to preparation of a bid for a Southern California Edison Company ("SCE") Local Capacity Requirements ("LCR") Request for Offers ("RFO"). Work included: (i) a review of the RFP, PPA and related documents and creation of a working memo on relevant issues; (ii) PoolMod (hourly dispatch simulation model) Base Case and up to four sensitivities for the California market for a 20-year time frame, varying only the technology solutions for the project; (iii) development of an excel pro-forma financial model for comparison of up to four technology alternatives; and development of a brief PowerPoint slide deck.
- ***Advice related to transmission acquisition***: LEI was retained by a private client to evaluate the potential acquisition of incumbent transmission companies located in the Alberta power market. Specifically, the client was seeking assistance in understanding the regulatory regime in Alberta as it relates to transmission ratemaking, as well as potential drivers for transmission asset values in Alberta. LEI provided the client with a PowerPoint presentation focusing on historical background of each of the following subjects, discussing the current state of play related to the subject, and conceptually discussing how important it may be in the overall consideration of value. The subjects discussed were as follows: (i) overview of transmission ratemaking in Alberta; (ii) potential regulatory issues resulting from the transaction; and (iii) potential value drivers, including development of the deemed cost of capital for transmission, evolution of performance-based ratemaking ("PBR") and relevance to transmission, distinguishing between those future capex projects that will retain incumbent preference and those that will be placed into competitive processes, and overall implications of Alberta transmission policy for future interconnected load growth versus behind-the-meter growth.
- ***Valuation associated with coal station contracts***: Amit was extensively involved in the analysis as an external consultant retained by a law firm to provide an independent assessment of costs associated with coal-fired generation units in Alberta, consistent with their underlying power purchase arrangements. The range of cost estimates was developed using pro forma cash flow analysis performed for both owner and buyer under the PPA, by modeling flows of payments under the PPA (and post-PPA life) and using results of forward wholesale price forecasts of the Alberta Power Pool, along with research associated with related environmental regulations on plant refurbishments in the region. The analysis also relied on explicit modeling of revenues and costs and utilized a realistic specific discount rate for both the owner and buyer separately.

- ***Analysis of long-term PPA related to contractual dispute***: LEI served as lead analyst in an expert testimony engagement for a private equity investor in matter related to a contractual dispute regarding a long-term power purchase agreement between a municipal utility located in New England and a landfill gas generator. LEI analyzed the key contractual terms of the PPA and provided a review of how those terms compared to the industry norm when the contract was signed and became effective.
- ***Strategic advice related to entrance in the power sector:*** In late 2017, LEI was retained by a private Middle Eastern client in relation to developing a comprehensive study with a road map and implementation plan for the client's entrance in the power sector nationally and regionally. The key objective of this engagement was to determine where best the client would be positioned in the power generation ecosystem in the country and the region, to create capacity and value. The assessment evaluated opportunities along the power sector value chain and across the following energy types: conventional, renewables (including hydro, wind, solar, geothermal and biomass), and nuclear energy. Amit managed the project involving multiple stakeholder meetings and presentation to the Board.
- ***Investment analysis related to new potential capacity***: LEI was retained by a Canadian power utility to provide advice on long-term Alberta electricity power prices (2010-2030) to inform an investment decision on an 800MW gas-fired power station based on different market parameters and build decisions. The project included a detailed assessment of gas procurement costs and forecast gas price trends. The forecast also made special note of the effect on the market, if any, of the following conditions: (i) greenhouse gas legislation; (ii) increase in unconventional (shale) natural gas production; (iii) effect of the enactment of Bill 50; and (iv) effect on the market by external jurisdictions. LEI was asked to provide two subsequent updates for the company's board of directors on the status of the project.
- ***Privatization transaction***: Amit was part of the advisory team to the Government of Pakistan on potential privatization of one of the largest public sector enterprises. Amit's work involved strategic industry and financial analysis, due diligence, and stakeholder engagement.
- ***Capital syndication transaction for a cement company***: Amit worked as a lead team member in a capital syndication transaction involving eight corporate financial institutions for a takeover and long-term financing for a cement plant. Amit's work involved financial modeling and future long-term cash flow forecasts associated with the successful transaction.

Renewable energy analysis

- ***Impact of regulatory delays for renewable projects globally***: The IEA's Implementing Agreement for Renewable Energy Technology Deployment (IEA-RETD) retained LEI, in consortium with 3E (based in Belgium) to carry out a study on the impact of regulatory delays and uncertainty. The project developed a model to estimate the cost of regulatory delays to renewable energy industry and the broader economy and documented its validity through a number of case studies. Amit led the project from the LEI side.

- ***Potential for low carbon energy exports in North America***: LEI was retained by a private client to perform a high-level estimation and analysis of potential opportunity for developing low carbon energy exports from Canadian markets to target US power markets. Amit co-led the analysis with LEI staff, findings of which were presented at the ABB Energy and Automation Forum.
- ***Development of a comprehensive renewable energy procurement plan***: Amit managed an engagement where LEI was retained by a large Middle Eastern client involving development of the renewable energy competitive procurement process (CPP), customized feed in tariff (FIT) program, sustainable energy procurement company (SEPC), and a procurement leverage strategy (PLS). The client's objective of procuring significant amount of renewable energy by 2032 had to be carefully balanced with competing objectives related to macroeconomic development. The work conducted by the project team consisted of four interrelated "modules": (i) detailed design of a CPP and underlying documents; (ii) detailed design of a robust and flexible FIT building upon the design of the CPP and underlying documents; (iii) company framework documents for the formation of a creditworthy SEPC (covering the legal and regulatory framework, mandate, board structure and composition, business and human resources plans, and organizational structure); and (iv) algorithmic model and detailed strategy for a procurement leverage strategy infused throughout other modules, promoting the client's objectives in terms of job creation, local content, training, and research & development. Throughout the engagement, international best practices (building on case studies covering 18 jurisdictions) were taken into account and translated into best fit for the Saudi economic, legal, regulatory, and financial context. The engagement was structured so that implementation is essentially a matter of "pushing the button": templates, contract forms, online frameworks, promotional material, etc. were created.
- ***Development of a financial, commercial, and regulatory framework for renewable and atomic energy***: Amit was a key member of the project team involved in the development of a financial, commercial, and regulatory framework, as well as drafting an investment strategy and model for a large Middle Eastern private client. Deliverables included: (i) a master plan on how to develop renewable and atomic energies based on local value chains in the country; (ii) an economic framework to create a favorable environment in order to follow this master plan; (iii) an investment strategy to make use of in-country resources and available funds in an efficient way; (iv) a multitude of international case studies to avoid costly mistakes in the future and to know when to adopt; (v) a final report on 'National Policy for Investment in Alternative Energy Sources'; and (vi) two 'sales pitch' documents submitted to the Supreme Council and to the financial community.
- ***Renewable energy fund analysis for first nations***: LEI analyzed costs related to the development of renewable energy projects in aboriginal communities and assisted the client in the establishment of the Aboriginal Renewable Energy Fund. The Fund's aim was to provide grants based on a list of potential activities associated with the development of renewable energy projects.
- ***Municipal renewable energy fund analysis:*** LEI investigated the types of costs incurred by a municipality when hosting a renewable energy project. Amit and the team identified which

of these costs are paid for by the developer, and which are paid for by the municipality, in order to assist the client in the establishment of the Municipal Renewable Energy Fund. The Fund's target was to provide grants to municipalities for direct costs of hosting renewable projects, which are not covered by developers.

- ***Evaluation of feed in tariff applications***: LEI monitored the application review process under the FIT program administered via the Green Energy Act in Ontario. Work involved evaluating FIT applications independently and validating results obtained by the client.
- ***Advice related to wind farm investment***: Examined and modeled long term energy price forecast scenarios for the Electric Reliability Council of Texas ("ERCOT") power market, where client considering investment in a wind farm in one of the ERCOT zones.
- ***Development of a solar project in Vermont***: Amit assisted an LEI client in successful development of a greenfield solar project in Vermont. Key tasks involved assistance in permitting, coordinating with EPC suppliers on quotes, discussing financing and leasing alternatives with banks and other investors, and negotiating property tax matters with the town, among other matters.
- ***Asset management services for a small hydro portfolio***: On behalf of an LEI private client, Amit provides asset management services for an existing renewable (small hydro) portfolio of 11 assets. In his role, Amit performs detailed economic and financial analyses, assists with regulatory filings, oversees property tax and insurance related matters, and is involved in business development and product marketing activities (such as net metering).