RÉPONSES À LA DEMANDE DE RENSEIGNEMENTS N^{O} 2 DE HQDT À AQCIE-CIFQ RELATIVE À LA DEMANDE D'ÉTABLISSEMENT D'UN MÉCANISME DE RÉGLEMENTATION INCITATIVE ASSURANT LA RÉALISATION DE GAINS D'EFFICIENCE PAR LE DISTRIBUTEUR D'ÉLECTRICITÉ ET LE TRANSPORTEUR D'ÉLECTRICITÉ

1. Préambule :
i) C-AQCIE-CIFQ-0107 Mémoire p. 1-155

PEG has submitted a 155-page document in its "Revised HQ Draft 24 February 2017".

1.1 Please provide all the changes from the original 131-page PEG report dated October 26, 2015.

1.1 Réponse de l'AQCIE/CIFQ :

Please see **Attachment HQDT2-AQCIE-1.1** for a version of PEG's report showing changes between the October 26, 2015 report (corrected as per feb 2nd 2016 version, C-AQCIE-CIFQ-0046) and the February 24, 2017 report.

2. Préambule :
i) C-AQCIE-CIFQ-0107 Mémoire p. 122-123

"The size and complexity of HQT's transmission system is enormous. However, these features do not make its capex (or any other cost) more variable. If anything, the opposite is the case.

Challenging climatic conditions and remote generating sites affect HQT's cost *level* more than its cost *growth.*
….
Québec's grid lies at the "end of the line," and there is no need for major new projects to send power flows across it."

2.1 Please provide the analytical support for each of these statements.

2.1 Réponse de l'AQCIE/CIFQ :

Dr. Lowry believes these statements to be self-evident but provides the following supplemental commentary.

"The size and complexity of HQT's transmission system is enormous. However, these features do not make its capex (or any other cost) more variable. If anything, the opposite is the case."

The larger and more complex a transmission (or distribution) system, the less likely it is that capex will be unusually high relative to the depreciation and revenue cap index growth that is available to finance it. Consider, for example, that transmission substations must occasionally be replaced. In a small transmission system with only one substation, cost would rise markedly if the substation were replaced (and would tend to grow relatively slowly between replacements). A large transmission system with 60 substations would, in contrast, be highly unlikely to replace *all* substations in the same year. Furthermore, there is a greater chance that at least one substation would need replacement in a given five year period.

Challenging climatic conditions and remote generating sites affect HQT's cost *level* more than its cost *growth.*

Productivity growth is typically affected more by *changes* in business conditions that drive cost growth than it is by stable business conditions that drive cost levels. The classic mathematical decomposition of sources of productivity growth by Denny, Fuss, and Waverman makes this point clearly.[1] Thus, for example, a transmission system in a forested region is likely to have higher cost but this has little effect on the productivity *trend* because the extent of forestation changes only gradually. Similarly, cost is probably higher in a zone of severe winter weather. Unless the severity of winter weather increases materially, however, this does not affect productivity *growth* in a five year period

Québec's grid lies at the "end of the line," and there is no need for major new projects to send power flows across it."

Hydro-Quebec's transmission system is chiefly designed to carry power from hydroelectric power generation facilities in Quebec and Labrador to markets in Quebec and the United States. Some deliveries are also made to Ontario. Relatively little power is wheeled *across* the system between Ontario and Labrador or the States. In contrast, a number of U.S. transmission utilities have been compelled in the last decade to make large investments in facilities to wheel power so as to improve the functioning of bulk power markets or bring renewable resources to load centers.

3. Préambule :
i) C-AQCIE-CIFQ-0107 Mémoire
p. 123, ligne 23

"Indexed ARMs have already been studied by transmission owners in Ontario."

3.1 Please provide copies or links to any available studies by transmission owners in Ontario referenced in this statement.

3.2 Please indicate if Dr. Lowry is aware if an ARM has been implemented by any North American company for whom regulated transmission is its sole business? If so, please indicate the company name and date of the program.

3.1 Réponse de l'AQCIE/CIFQ :

In a 1997 White Paper on electric industry restructuring, Ontario's government stated its preference for a "performance-based approach to regulation in the wires sector in order to economically encourage efficiencies and keep prices competitive". The Ontario Energy Board soon after commenced incentive regulation for jurisdictional power distributors (as well as a natural gas distributor, Union Gas). These plans featured price cap indexes based on industry productivity research.

Ontario Hydro was restructured in the late 1990s under the terms of the Energy Competition Act. Its transmission and distribution services were placed in a company initially called Ontario Hydro Services Company ("OHSC") and later renamed Hydro One. This company provides most transmission services in Ontario --- a vast region that includes many communities and hydroelectric generating stations on the Canadian Shield.

[1] Denny, Michael, Melvyn A. Fuss and Leonard Waverman, 1981. "The Measurement and Interpretation of Total Factor Productivity in Regulated Industries, with an Application to Canadian Telecommunications," in Thomas Cowing and Rodney Stevenson, eds., *Productivity Measurement in Regulated Industries*, (Academic Press, New York) pages 172-218.

OHSC proposed an incentive regulation mechanism in a 1998 filing which we provide as **Attachment HQDT2-AQCIE-3.1**. The company proposed to escalate rates established in a rate case for one year using a "performance-based regulation (PBR)" framework. The framework featured a revenue cap index with a formula

$$R_t = R_{t-1}(1 + I - X + GAF) +/- Z$$

where

I = Inflation Factor

X = Productivity Factor

GAF = Growth Adjustment Factor

Z = Z Factor

The proposed inflation index was the Ontario consumer price index. The Company proposed that the X factor reflect the insufficiency of I and the GAF to fund its forecasted revenue requirement but acknowledged that in future plans X might be based on productivity research. The proposed GAF was the annual weather-corrected growth in the forecasted system peak demand for power in the province.

Appendix J of the OHSC proposal contains a general discussion of PBR for the Company's transmission business. It includes the following statement about the benefits of the revenue cap approach to PBR.

- provides operational efficiency incentives to minimize costs and improve productivity
- shares the benefits of efficiency gains between customers and shareholders
- does not encourage "goldplating" or over investment in capital
- provides incentives to take risks and be innovative
- not as complex, costly and time consuming as Cost of Service regulation
- provides better revenue and financial stability than a Price Cap
- more compatible with energy efficiency objectives than a Price Cap
- provides more pricing flexibility[2]

This Appendix also provides a discussion of precedents for power transmission PBR.

> Jurisdictions where competition has been introduced in the electricity industry and PBR has been selected to regulate vertically unbundled electrical transmission companies include England and Wales, Scotland, and Australia. It has also been used in Norway, and California to regulate electrical transmission and distribution which is bundled together. The form and components of the PBR in these jurisdictions are summarized in the table J-1 below.
>
> The preferred form in all jurisdictions where transmission has been unbundled is a Revenue Cap.[3]

[2] Ontario Hydro Services Company, *Preparing for Open Access*, Transmission Rate Order Application to the Ontario Energy Board, 1999-2000, p. 107. Provided as Attachment HQDT2-AQCIE-3.1.
[3] *Ibid*, pp. 108-109.

Table J-1 PBR for Transmission in Other Jurisdictions

Country & Company	PBR Type	Scope	Duration	X-Factor Offset	Inflation	Z Factor	Service Quality Safeguards
UK National Grid Co	Revenue Cap $R_t = R_{t-1}$ (1+RPI-X), where R=Revenue (additional incentive scheme for losses) (Growth accounted for in calculation of X)	Transmission (new Tx connection excluded)	4 years 1998-2001	4%	RPI (retail price index)	not explicit	planning & operating standards; report on system security, availability, and quality of service
Scotland Scottish Power	Revenue Cap $P_t = P_{t-1}$ (1+RPI-X), where P=average Price/kWh, kWh = predetermined energy delivered, not actual	Transmission (new Tx connection excluded)	5years 1994-1998	1%	RPI		planning & operating standards; report on system security, availability, and quality of service
Australia Victoria PowerNet	Revenue Cap $P_t = P_{t-1}$ (1+CPI-X), where P=avg. Price/kw, kW = predetermined peak demand, not actual	Transmission (new Tx excluded)	5years 1995-2000	1.79%	CPI	tax changes	operating & design standards
Australia (New South Wales) Transgrid	Revenue Cap R={fixed charge*(CPI -X)}+ (energy charge*projected kwh)*(CPI-X)}+ (demand charge*Projected kw)*(CPI-X)}	Transmission	3years 1997-1999	3%	CPI		operating & design standards
Norway Statnett SF	Revenue Cap $R_t = R_{t-1}(1+RPI)(1-X)(1+\Delta kwh/2)$ where R=Revenue, Δkwh = predetermined % growth in energy, true up for actual Δkwh after 5 years	Transmission and Distribution (incl. losses)	5 years 1997-2001	2%	CPI		None but considering: technical standards, reporting failures, penalties for undelivered energy, & contracts specifying quality
USA Southern California Edison	Rate Cap $Rate_t = Rate_{t-1}$ (1+CPI-X) ±Z	Transmission &Distribution (non-generation)	5 years 1997-2001	1.2% 97 1.4% 98 1.6% (99-to 2001)	CPI	Nine criteria for Z factors	financial rewards & penalties for: reliability (duration & frequency), customer satisfaction, and health & safety

HON continued research and deliberations on PBR for power transmission for several years. From 2000 to 2003, Pacific Economics Group was their advisor and did extensive work to calculate transmission productivity trends and develop plan design options. Our work included several reports, but these are not to our knowledge in the public domain. A draft PBR proposal was nearly finalized which featured a price cap index. We recollect that the plan was never formally proposed due to changed circumstances.