

## DEMANDE DE RENSEIGNEMENTS N° 2 D'OPTION CONSOMMATEURS (OC) À HQT (BRATTLE)

DEMANDE DU TRANSPORTEUR DE MODIFICATION DES TARIFS ET CONDITIONS DES SERVICES  
DE TRANSPORT POUR L'ANNÉE 2022-2025

R-4167-2021

## CARACTÉRISTIQUES DU MÉCANISME DE RÉGLEMENTATION INCITATIVE (MRI)

## BRATTLE PRODUCTIVITY REPLY EVIDENCE

1. References :
- i) B-0012, HQT-5, Document 2, Brattle Report
  - ii) B-0094, Brattle Reply Evidence
  - iii) C- AQCIE-CIFQ-0050 ,PEG Commentary on Brattle Study
  - vi) OEB EB-2021-0110 Exhibit A, Tab 4, Schedule 1, Attachment 1, Clearspring EA Productivity Study for Hydro One Transmission

Preamble : OC notes Brattle has provided reply evidence rebutting Commentary by Pacific Economics Group on the Brattle Econometric Productivity Study. OC has prepared a table showing the primary points of difference:

PEG Critical Points	Brattle Reply
Productivity Study of US TX Industry 1995-2019	Productivity Study of US TX Industry 1995-2019
<ul style="list-style-type: none"> <li>• Brattle excludes certain OM&amp;A costs</li> <li>• In particular, accounting for "Transmission by Others".</li> <li>• Accounting for Structural Change- ISO Complications &amp; Costs</li> </ul>	<ul style="list-style-type: none"> <li>• We include accounts 561, 565, and 566 in our productivity study, there may be some misreporting but this does <u>not</u> bias the Studies' results.</li> <li>• FERC O&amp;M accounts specifically capture expenses re ISOs and RTOs. Accounts 575 and 576 are <i>Regional Market Expenses</i> accounts.</li> </ul>
<ul style="list-style-type: none"> <li>• Exclusion of General Costs-Admin and General costs</li> </ul>	<ul style="list-style-type: none"> <li>• Including Common costs does not change result. Other Transmission costs are &gt; 50% of O&amp;M. Exclusion results in upward CNE bias.</li> </ul>
<ul style="list-style-type: none"> <li>• Sampled Companies -data issues (6/71)</li> </ul>	<ul style="list-style-type: none"> <li>• PEG excluded several Companies: PG&amp;E, Georgia Power, Central Maine Power etc. Sample bias results in lower TFP and CNE growth</li> </ul>
<ul style="list-style-type: none"> <li>• ROE same for all companies</li> </ul>	<ul style="list-style-type: none"> <li>• Specific ROE used for each company</li> </ul>
<ul style="list-style-type: none"> <li>• Benchmark Year -Capital Stock 1964</li> </ul>	<ul style="list-style-type: none"> <li>• 1988 - readily available data. Weighted average</li> </ul>

<ul style="list-style-type: none"> <li>Labour Price</li> </ul>	<ul style="list-style-type: none"> <li>Revised with same Index. &lt;5% change</li> </ul>
<ul style="list-style-type: none"> <li>One hoss shay for capital -service life sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>?</li> </ul>
<ul style="list-style-type: none"> <li>Output Variable-Ratcheted (monthly) peak demand</li> </ul>	<ul style="list-style-type: none"> <li>Using ratcheted peak demand artificially constrains the output growth to be no lower than zero</li> </ul>
<p>Cost Benchmarking of HQT 2017-2019</p>	<p>Cost Benchmarking of HQT 2017-2019</p>
<ul style="list-style-type: none"> <li>Brattle includes certain OM&amp;A costs</li> </ul>	<ul style="list-style-type: none"> <li>PEG’s econometric cost-benchmarking study includes account 561 and account 566 but left ‘transmission of electricity by others’ out.</li> </ul>
<ul style="list-style-type: none"> <li>Sampled Companies- data issues (6/71)</li> </ul>	<p>See above</p>
<ul style="list-style-type: none"> <li>Benchmarking Sample Period</li> </ul>	<p>See above</p>
<ul style="list-style-type: none"> <li>Econometric Model Estimation Procedure- Fixed Effects (“FE”) and Random Effects (“RE”) estimators rather than OLS estimators</li> </ul>	<ul style="list-style-type: none"> <li>PEG assumes HQT efficiency is <i>endogenous</i>.</li> <li>The FE estimator controls for HQT’s unique factors. Statistical tests performed on our data confirm that a FE model is required and that pooled OLS would result in unreliable cost benchmarking.</li> </ul>
<ul style="list-style-type: none"> <li>Similar concerns to TFP Study. Input price; OHS -service life; output demand</li> </ul>	<p>?</p>
<ul style="list-style-type: none"> <li>No secondary variables; forestation, construction cost index (per ClearSpring EA for Hydro One)</li> </ul>	<ul style="list-style-type: none"> <li>Unlikely that the score’s for HQT and Hydro One are the same, thus further biasing the cost benchmarking analysis.</li> </ul>

- a) Please review/amend the above table.
- b) Provide where appropriate, references to both the February 2021 Brattle Report (Ref i)) and November 2021 Reply Evidence (Ref ii)).
- c) Please provide specific additional explanatory notes on the issues of sample composition, exclusion/inclusion of certain FERC accounts, structural change and treatment of capital.
- d) Compare your sample and exclusion/inclusion of certain FERC accounts and treatment of Capital to the Clearspring EA Productivity Study for Hydro One Transmission (Ref iv)).

- 2. References**
- i) B-0012,HQT-5, Document 2
  - ii) C-AQCIE-CIFQ-0050, PEG’s Comments on Brattle Study
  - iii) B-0095, Brattle Reply Evidence Table 5
  - iv) B-0095,Brattle Reply Evidence Table 8
  - v) OEB EB-2021-0110 Exhibit A, Tab 4, Schedule 1, Attach.1, Clearspring EA Productivity Study for Hydro One Transmission

ii) PEG has summarized the results of the Brattle and PEG Partial (CNE and Capital) and Multi/Total Factor productivity studies for the North American transmission industry:

	Multifactor Productivity			CNE		Capital	
	Brattle (OHS)	Brattle (GD)	PEG (GD)	Brattle	PEG	Brattle (OHS)	PEG (GD)
Full sample period	-1.04%	-1.82%	-0.62%	-3.38%	-0.68%	-0.05%	-0.46%
Last 15 years	-1.69%	-2.91%	-2.26%	-3.09	-1.74%	-0.97%	-2.16%

iii) Brattle has provided the effect of using the Brattle Sample on PEG’s Results:

Brattle Table 5 TFP Results–PEG Methodology on Brattle and PEGs Samples

Model	TFP Growth (1995 – 2019)	Growth of PFP O&M (1995 - 2019)	Growth of PFP Capital (1995-2019)
PEG Base Case with Brattle Companies (74)	1.22%	-0.94%	-0.72%
Difference due to PEG sample selection bias	0.35%	0.98%	0.02%

Source: Brattle TFP Model; Note: The “PEG Base Case” referenced in the table uses the Brattle TFP model with the sample of 47 companies that are common to the Brattle and PEG sample. It also includes the assumptions used by PEG to model productivity for the US sample-geometric decay for capital, output weights, exclusion of transmission accounts 561, 565, and 566, inclusion of share of A&G and general plant, ratcheted peak demand and asset service life.

iv) Brattle shows the upward bias in PEG’s productivity study by removing certain FERC accounts

Brattle TABLE 8: Upward Bias in Measured Productivity from removal of (certain) O&M Accounts		
Model	TFP Growth (1995 - 2019)	Growth of PFP O&M (1995 - 2019)
Brattle Base Model	-1.04%	-3.38%
Removing Load Dispatching (Act: 561)	-0.90%	-2.98%
Removing Transmission by Others (Act: 565)	-0.64%	-2.32%
Removing Miscellaneous Transmission Expense (Act: 566)	-0.86%	-3.00%
Removing All Three Accounts	-0.34%	-1.20%

- a) Does Brattle believe the PEG results should be adjusted based on the different samples? If so, what would be the adjusted full period productivity values for TFP, CNE(O&M) and Capital?
- b) Does Brattle believe the PEG results should be adjusted based on exclusion of certain FERC accounts? If so, please confirm the specific accounts.
- c) Does Brattle believe the PEG results should be adjusted to include certain FERC accounts? If so, what would be the adjusted full period PEG Productivity values for TFP, CNE(O&M) and Capital?
- d) Which FERC accounts does ClearSpring EA exclude from its costs for the Hydro One Transmission Productivity Study? Please list and compare to PEG and Brattle studies.
- e) Please provide a comparison table with the Brattle-adjusted PEG values, the Brattle Results and ClearSpring EA results for the full period and for ClearSpring EA 2000-2019.

- 3. References**
- i) **C-AQCIE-CIFQ-0050, PEG Commentary, Table 10**
  - ii) **B-0095, Brattle Reply Evidence, Table 5 & Table 8**

**Preamble : PEG Table 10 shows the effect of cost exclusions and other adjustments :**

**PEG Table 10**  
**Productivity Results with All Three CNE Exclusions,**  
**Improved Benchmark Year, Capital Quantity, and Ratcheted Peak Demand**  
**(growth rates)**

Sample Period	Multi-Factor	CNE	Capital
<b>1995-2019 (full sample period)</b>	<b>0.09%</b>	<b>-1.00%</b>	<b>0.34%</b>
<b>2000-2019 (last 20 years)</b>	-0.40%	-1.53%	-0.13%
<b>2005-2019 (last 15 years)</b>	-0.72%	-2.16%	-0.39%
<b>2010-2019 (last 10 years)</b>	-1.19%	-1.77%	-0.90%

- a) PEG has indicated that with all three FERC accounts added, using a 1964 Benchmark Year and using GD rather than OHS, the Brattle productivity results would be closer to those of PEG, i.e. counter to Brattle’s adjustment to PEG results (in the opposite direction). Please comment in detail which assumptions Brattle believes intervenors should accept- PEG or Brattle adjustments to the other expert’s study?
- b) Please provide a tabular comparison of the experts productivity ranges for Multi-Factor, CNE (O&M) and Capital assuming:
  - i) Brattle adjustments
  - ii) PEG adjustments
  - iii) ClearSpring EA Study productivity values for a similar period.

**BRATTLE BENCHMARKING STUDY- REPLY EVIDENCE**

- 4. References**
- i) C-AQCIE-CIFQ- 0050, PEG Commentary, Table 11
  - ii) B-0094, Brattle Reply Evidence, Pages 22 and 33
  - iii) B-0094, Brattle Reply Evidence, Table 11
  - iv) B-0088, HQT-10, Doc 1.2, Table 5

Preamble : Brattle states the following: “PEG’s econometric models have a *fundamental methodological flaw* because they fail to control for those *unobservable* economic and business condition factors that are specific to each firm, and especially HQT, which has unique cost characteristics. By not controlling for HQT’s unobservable factors, PEG’s predictions significantly under estimate HQT’s costs that are outside management’s control. These factors include characteristics such as the type of organization (e.g., HQT being a government-owned crown corporation), unique technology, and challenging logistical conditions to name a few, see more below. PEG did not have independent variables that controlled for these and other factors described below. When PEG uses its econometric model to predict and to benchmark HQT’s costs it assumes that if the economic and business factors that cannot be included in the econometric model increase costs more for HQT than for US companies, then HQT is relatively less efficient.<sup>33</sup> This assumption, which is wrong and makes PEG’s cost benchmarking unreliable, is the main explanation for the differences between Brattle and PEG’s cost-benchmarking results.”

**Preamble: PEG has adjusted the Brattle cost benchmarking results by removing 6 companies’ data:**

**PEG Table 11 Summary of Alternative Benchmarking Results Total Cost**

Sample Period	Remove 6 Companies with Bad Miscellaneous Transmission Expenses							
	Brattle		Upgraded Benchmark Year Adjustment (A)			(A)+RemoveTransmission by Others		
Years	FE*	RE*	FE*	RE*	OLS**	FE*	RE*	OLS**
<b>2001 - 2019</b>	-1.7%	0.6%	-1.2%	0.7%	109.3%	-0.7%	0.9%	89.0%
<b>2005 - 2019</b>	-2.7%	-0.3%	-2.1%	-0.1%	109.3%	-0.4%	1.3%	90.2%
<b>2010 - 2019</b>	-5.8%	-3.3%	-4.8%	-2.7%	106.2%	-2.1%	-0.3%	88.6%
<b>2017 - 2019</b>	-3.8%	-0.5%	-3.2%	-0.4%	107.5%	1.4%	4.2%	93.2%

\* FE –Fixed Effects Panel Data

RE-Random Effects Panel Data

\*\*OLS-Ordinary Least Squares for variables

- a) Confirm that Commonwealth Edison, Kansas Gas & Electric, Oklahoma Gas & Electric, PECO Energy, San Diego Gas & Electric and Southern California Edison were removed by PEG.
- b) Comment on the PEG claim of questionable data.
- c) Brattle Table 11 shows the effect of the change to be minor. Please comment.

- d) PEG also suggests Brattle's econometric benchmarking study is flawed, primarily due to the use of Fixed Effects (FE) panel data. PEG Table 11 shows a huge difference in HQT scores using OLS residuals. Please comment in detail.
- e) Brattle levels a similar criticism related at use of Ordinary Least Squares residuals. What would be the HQT benchmark result, if the PEG sample used FE and RE panel estimators?
- f) How does this translate to a recommended S-Factor range? Please discuss.
- g) Confirm/calculate the impacts of the S-factor on the 2022 MRI revenue requirement (Ref iii):
  - i) S=0.1%
  - ii) S=0.3%
  - iii) S=0.6%
- h) Would the S-factor apply to both CNE and Capital if the latter was included in the RCI formula? Please discuss.

## 5. References

- i) C -AQCIE-CIFQ -0050, PEG Commentary, Table 11
- ii) B-0094, Brattle Reply Evidence, pages 30-32

**Preamble:** Brattle notes the following: "In its Report, PEG discussed unique features of HQT comparison with its U.S. counterparts. Among the unique HQT characteristics that PEG identified were:

- Being a crown corporation (p. 83) and having a unique corporate structure (p. 87);
- Transmission of large amounts of power over large distances has over the years encouraged HQT to use *unusual and innovative technologies* including 735 kV alternating current lines and high-voltage direct current line, new tower design, and remote monitoring systems (p. 85);
- Sizable lakes, rivers, cold winters throughout territory with postes sometimes housed in structures (p. 86);
- Special logistical challenges, many facilities are distant from good roads (p. 86);
- Extensive telecommunications network (p.85);
- HQT operating asynchronously from North America's Eastern Interconnection (p. 85);
- Sizable portion of HQT's access to transmission corridors achieved by easements (p. 85);
- Hard rock close to the surface, difficult to establish footing for structures (p. 86);
- Accounting idiosyncrasies (p. 88);
- A list of cost advantages including scale and scope economies, low borrowing rates, and no income taxes (pp. 86-87);

In its econometric cost-benchmarking model, analysis and its predictions for HQT, PEG does not control for the above-listed factors. In response to Brattle question 5.1, PEG conceded that although it believes it has a good model, it did not capture all relevant factors that affect total, CNE and capital transmission costs."

"Brattle utilizes a fixed-effects, (FE), model for our econometric cost-benchmarking analysis and for predicting HQT's costs. A FE estimator is very well suited to the econometric problem at hand because it controls for HQT's unique factors when benchmarking HQT's costs. Specifically, the FE model treats all of the companies' unique characteristics as another parameter to estimate and used in making predictions. In essence, each company's fixed effect parameter is another independent variable and ensures that the model does not penalize or reward a company for its unique characteristics when making predictions."

- a) Confirm that Brattle used both Fixed Effects (FE) and Random Effects (RE) panel estimators. Please discuss the relevance of each and why only FE is noted in the Reply Evidence.
- b) Please provide a list of electric utility benchmarking studies that used FE and RE panel estimators.
- c) Why does Brattle include HQT-the subject utility- in the sample but PEG does not? What is the normal practice for experts? Please discuss.
- d) Please discuss if the characteristics and business conditions of HQT are similar to other utilities in the Brattle sample or unique. List the similar companies using the above noted characteristics.
- e) Please discuss whether the characteristics and business conditions of HQT, Hydro One and Manitoba Hydro are/are not similar.
- f) Why have both experts in their Hydro One Transmission benchmarking studies used OLS, included business condition related variables and included second order terms, that Brattle has rejected? Please discuss rationale for the different model specifications in detail.

## 6. References

- i) **B-0012, HQT-5, Document 2, Brattle Report**
- ii) **C -AQCIÉ-CIFQ -0050, PEG Commentary, Pages 20/21**
- iii) **B-0094, Brattle Reply Evidence, Table 12 and Footnote 39**

**Preamble :** PEG states " Brattle's methodology would be more useful were the goal of the econometric research to predict HQT's cost. However, the goal of the exercise is instead to provide a benchmark that permits us to estimate the extent of the Company's cost efficiency. The benchmark should effectively be the cost that typical utility managers would incur if faced with Brattle's (sic) business conditions."

Brattle states "Specifically, in lay terms and for our purposes the null hypothesis of the Hausman test is that there is no correlation between the unique, company-specific factors and the independent variables. A rejection of the null hypothesis means that the unique, company-specific factors are important and failure to control for them would result in biased and inconsistent parameter estimates. Importantly for our purposes, failure to reject the null hypothesis means that PEG's pooled OLS methodology is econometrically in error and leads to biased and inconsistent parameter estimates and unreliable cost-benchmarking conclusions".

- a) Does Brattle agree that the difference of opinion between the experts on the appropriate benchmarking model specifications is very marked? Please provide support from other similar benchmarking studies for Brattle's use of FE/RE estimators.
- b) Please provide the other accepted statistical tests for the Brattle and PEG benchmarking models ( $R^2$ , etc.).
- c) Discuss the test results and significance to the cost performance of HQT.

## 7. References

- i) B-0094, Brattle Reply Evidence, Tables 13 & 14
- ii) B-0094, Brattle Reply Evidence, Page 40
- iii) C-AQCIE-CIFQ-0068, PEG responses to OC IRs No 1

TABLE 13: COMPARISON OF PEG'S BENCHMARKING RESULTS: OLS VS. FIXED-EFFECTS

	OLS			Fixed Effects		
	Total Costs	Capital Costs	O&M Costs	Total Costs	Capital Costs	O&M Costs
2008 - 2019	74.1%	61.3%	124.5%	-0.5%	-0.5%	-2.1%
2017 - 2019	67.4%	54.8%	121.1%	-7.1%	-8.2%	-1.1%

Note: This analysis uses the same specifications as laid out by PEG in the February 2021 report and workpapers

TABLE 14: BRATTLE COST-BENCHMARKING RESULTS USING OLS

	OLS			Fixed Effects		
	Total Costs	Capital Costs	O&M Costs	Total Costs	Capital Costs	O&M Costs
2001 - 2019	114.3%	118.3%	68.1%	-1.7%	-1.1%	-8.5%
2005 - 2019	114.4%	122.2%	57.7%	-2.8%	1.9%	-20.8%
2010 - 2019	111.4%	123.1%	43.5%	-6.0%	2.5%	-35.2%

Note: This analysis uses the same data and specifications as laid out by Brattle in the July report.

**Preamble :** Brattle states- "As is the case with Brattle's replication of PEG's benchmarking analysis, the average differences in costs obtained from the incorrect OLS approach are dramatically different than the fixed effects estimator. The OLS results show that actual total costs for HQT are more than double those predicted by the model while the fixed effects estimator shows that cost differences are within the +/-10% range.

From the results presented in Table 13 and Table 14, it is evident that the **vast differences in conclusions by PEG and Brattle are driven primarily by the choice of estimators [emphasis added]**. The differences in conclusions are generally not driven by the underlying data, TFP assumptions, or methodologies".

- a) How do the intervenors and regulator decide which benchmarking model to rely on and which of the experts' estimates for S-Factors are appropriate? Please discuss.
- b) PEG has provided a review of previous X and stretch factor approvals in North America (Ref iii)). This suggests that stretch factors in the range of 0.3-1.00% have been approved by regulators. Does Brattle have any other examples to support its recommendation? If, so, please provide these.

## 8. References

- i) C-AQCIE-CIFQ-0068, Réponses de PEG à la DDR no 1d'OC
- ii) B-0094, Brattle Reply Evidence, p. 40



**Preamble:** PEG clarifies that the cited mention of a partial true up of capital revenue to actuals was intended as an alternative to a simple compte d'écarts et reports ("CER")<sup>1</sup>. The proper treatment of capital in a succeeding MRI for HQT is ideally addressed in a separate proceeding. However, *PEG did recommend a partial true up of capital revenue to actuals as a Custom IR provision in the last MRI proceeding of Hydro One Transmission.*<sup>2</sup>

PEG first notes that Hydro-Québec Distribution operates under a comprehensive revenue cap index and has limited opportunity to obtain supplemental capital revenue. It is PEG's understanding that the Company influenced the design of this MRI.

- a) Please provide/reiterate Brattle's views on a HQT comprehensive MRI, including capital and if this should be implemented in 2022 or later.
- b) Please provide an example of such an RCI MRI formula, including definitions of the terms.
- c) Should the MRI include an Earnings Sharing Mechanism (ESM) (*écarts de rendement*)? If so what form should this take?
- d) Please provide an appropriate I-factor, X-Factor and S-Factor(s) for such a hypothetical MRI formula, based on Brattles' studies.

---

<sup>1</sup> C-0050 PEG Commentary on Brattle Study page 46

<sup>2</sup> OEB EB-2028-0049 Hydro One Transmission