Energy Probe Research Foundation Interrogatories

M-Energy Probe-1

Reference: Exhibit M, Pages 8-9 Transmission Productivity Study

Preamble: PEG indicates it based its US sample on the Sample it used for the Hydro Quebec Transmission MRI.

Interrogatories:

a) Confirm PEG's study sample was substantially based on an update for 2017-19 data to the recent sample for Hydro One Sault St Marie, which was in turn, based on the Power Systems Engineering (PSE) sample of 48 utilities in that case.

b) Please provide a tabular side by side comparison of the Clearspring and PEG samples in this case. Highlight utilities included/excluded and indicate the bases for these changes.

c) Please indicate, apart from PEG using a longer sample period (1996-2019) than Clearspring EA, what were the "other problems" with the Clearspring Transmission Productivity Study. Please be specific.

d) Please provide a chart that shows the US TX Industry Total Factor Productivity Growth over the two sample periods and indicate the impact of the Sample periods on the Clearspring and PEG TX Productivity study results. (-0.68% and -1.66%).

e) Apart from the sample period impacts, what are the other differences affecting the two TFP results. Please be specific, such as to which FERC accounts are at issue.

Responses:

The following response was provided by PEG.

a) The statement is confirmed. Expanding the sample was not a priority in PEG's Québec project.

b) Please see the table below. It is based on the table presented in the Clearspring

Transmission Sample Comparison

Companies in Clearspring Study

Company	Reason
Alabama Power Company	
ALLETE (Minnesota Power)*	CS Exclusion
Appalachian Power Company	
Arizona Public Service Company	
Atlantic City Electric Company*	CS Exclusion
Avista Corporation	
Baltimore Gas and Electric Company*	CS Exclusion
Black Hills Power, Inc.	
Central Hudson Gas & Electric Corporation	
Central Maine Power Company	
Cleco Power LLC	
Commonwealth Edison Company	O&M Data
Consolidated Edison Company of New York	
Duke Energy Carolinas, LLC	
Duke Energy Florida, LLC	
Duke Energy Indiana, LLC	
Duke Energy Progress, LLC	
Duquesne Light Company	
El Paso Electric Company	
Empire District Electric Company	
Entergy Arkansas, Inc.	
Entergy Mississippi, Inc.*	CS Exclusion
Entergy New Orleans, Inc.*	CS Exclusion
Florida Power & Light Company	
Gulf Power Company	
Hydro One Networks*	CS Exclusion
Idaho Power Co.*	CS Exclusion
Indianapolis Power & Light Company	
Jersey Central Power & Light Company*	CS Exclusion
Kansas City Power & Light Company	

Company	Reason
Kansas Gas and Electric Company	O&M Data
Kentucky Utilities Company	
Louisville Gas and Electric Company	
MDU Resources Group, Inc.	
Mississippi Power Company	
Monongahela Power Company	
Nevada Power Company	
New York State Electric & Gas Corporation	
Niagara Mohawk Power Corporation	
Northern States Power Company - MN	
Oklahoma Gas and Electric Company	O&M Data
Orange and Rockland Utilities, Inc.	
PacifiCorp	
PECO Energy Company	O&M Data
Potomac Electric Power Company	
PPL Electric Utilities Corporation	
Public Service Company of Colorado	
Public Service Company of New Hampshire	
Public Service Company of Oklahoma	
Public Service Electric and Gas Company	
Rochester Gas and Electric Corporation	
San Diego Gas & Electric Co.	O&M Data
South Carolina Electric & Gas Co.*	CS Exclusion
Southern California Edison Company	O&M Data
Southern Indiana Gas and Electric Company	
Southwestern Public Service Company*	CS Exclusion
Tampa Electric Company	
Tucson Electric Power Company	
Union Electric Company	
West Penn Power Company	

Companies in PEG HQT Work not in CS Study

Connecticut Light and Power
Delmarva Power and Light
Duke Energy Ohio

CS Exclusion means that Clearspring did not include them in their productivity work and PEG did not undertake the additional work to possibly include these companies.

O&M Data means that PEG excluded these companies because of suspect O&M data related to ISO, dispatch, or miscellaneous O&M as described in its report and responses to data requests.

*In CS Benchmark Sample but not TFP Sample report. The highlighted companies show the how the productivity samples differed from the full set of companies Clearspring used in their benchmarking work. Clearspring excluded a number of companies present in their benchmarking work from their productivity work and PEG did not seek to do the extra work required attempt to include any companies not already part of its HQT sample. Please see the response to M-Hydro One-17 (Exhibit N/Tab 1/Schedule 17) for additional information.

c) The most notable of PEG's other objections to Clearspring's transmission productivity study are the following.

- Clearspring included data for several OM&A cost categories where there were egregious reporting inconsistencies.
- Clearspring used a rolling average of peak demand instead of the ratcheted peak demand that they used in their prior studies for Hydro One. PEG believes that transmission cost is a function of expected peak demand in a year of unusually high demand. Ratcheted peak demand is a better proxy for this than a rolling average of peak demand.

d) Please see the table below. The more recent trends are similar between the two studies.

Total Factor Productivity Trends

	1996-2019	2001-2019
PEG	-0.62%	-1.42%
Clearspring	na	-1.66%

Please note that PEG uses the convention of reporting trends based on the first growth rate of a period as opposed to the earliest data used. For example, the PEG 1996-2019 trend is the average of the growth rates starting with the 1995-1996 growth rate. Clearspring uses the other convention that would label the same trend as 1995-2019 based on the period data required to calculate the trend. The trend that Clearspring presents in their report as a 2000-2019 trend is labeled here as 2001-2019 to match the PEG convention.

e) The two most notable differences in the methods were as follows.

- Clearspring included OM&A cost categories where there were egregious reporting inconsistencies, whereas PEG did not.
- Clearspring used a rolling average of peak demand instead of the ratcheted peak demand that they used in their prior studies for Hydro One. PEG used ratcheted peak demand.

In addition, the weights on the output variables differ modestly because they are based on different econometric total cost studies.

M-Energy Probe-2

Reference: Exhibit M, Page 10 and Page 35 Table 5 & Figure 1 Transmission Benchmarking Study

Preamble; PEG states: On average during the three most recent years for which the requisite historical data were available (2017-2019). Hydro One's forecasted/proposed total costs were about 14% above our model's predictions on average during the five years of the proposed new IR plan (2023-2027). The decline in the Company's total cost efficiency would average 1.12% annually between 2023 and 2027.

Interrogatories:

a) The PEG and Clearspring EA Benchmark Studies of Hydro One Transmission Total Costs vary materially. Please provide a Chart similar to Figure 1, that shows the two results for the historic and MRI Periods.

b) What are the main differences in the data sets and input assumptions such as the Substation counts. How do these affect the Clearspring EA results.

c) Please connect the PEG and Clearspring EA Benchmark scores to the respective recommended Stretch factors for Hydro One Transmission.

d) Provide an opinion if the X-factor and S-factors are to be determined and considered independently, or if there is an implicit relationship between the two.

e) What is the basis of the PEG recommended 0.75% S-factor? is it purely score/performance based or are there other factors/considerations? Please discuss.

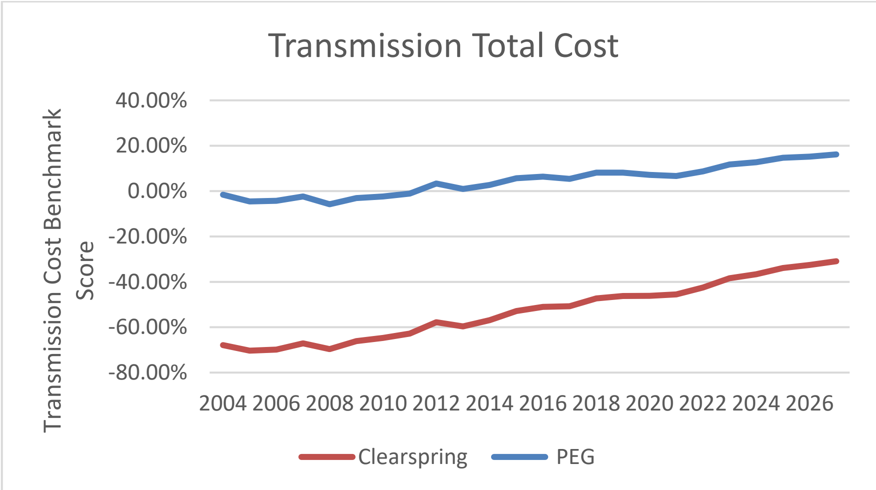
f) Please confirm PEGs position on inclusion of a Growth Factor for Transmission

Responses:

The following response was provided by PEG.

a) The requested chart appears below.

Figure 1:



b) The similarities and differences in the two transmission total cost benchmarking models are as follows.

Sample:

1. PEG's sample exclusions are as follows:
    a. For implausible miscellaneous expenses:
        i. Oklahoma Gas & Electric
        ii. Kansas Gas & Electric
        iii. San Diego Gas & Electric
    b. For implausible increases in dispatch-related expenses and miscellaneous expenses:
        i. Commonwealth Edison
        ii. Southern California Edison
        iii. PECO Energy
    c. For missing substation and transmission peak data:
        i. Appalachian Power
        ii. Public Service Company of Oklahoma
2. PEG's econometric research sample begins in 2004, the first year that transmission-specific peak data became available on the FERC Form 1. Clearspring's econometric research sample begins in the year 2000. This is possible since they use the alternative monthly peak demand data.

Identical business condition variables:

1. Transmission line miles
2. Average transmission line voltage
3. Percentage Overhead Transmission Lines

Different business condition variables:

1. PEAK:
    a. PEG uses the transmission peak for the U.S. sample, while Clearspring uses the monthly system peak. Both measures are sourced from the FERC Form 1. The transmission peak data are the correct data to use in this application since they more closely aligns with Hydro One’s measure of peak demand for transmission. Clearspring acknowledges in Undertaking JT-4.04 that the use of the monthly peak has a major favorable impact on Hydro One’s score.
    b. Clearspring uses a 10-year rolling measure while PEG’s ratchets the peak data, meaning it can never decrease in the sample period. The ratcheted value captures the cost effect of the necessity of building infrastructure to meet peak demand plus a reserve margin, and the unlikelihood of dismantling infrastructure due to a few years of a lower peak. PEG found that using a ratcheted peak measure has materially stronger statistical support than Clearspring’s rolling average approach.
2. ECONOMIES OF SCOPE:
    a. PEG and Clearspring both use a scope economy variable intended to control for differences in utilities’ ability to share expenses across distribution and generation functions. Clearspring’s variable is the share of transmission in the total gross value of electric plant in service.
    b. PEG’s variable is a modified version of this which excludes general plant from the denominator.
3. SUBSTATIONS:
    a. While Clearspring uses a simple count of the number of substations each utility has, PEG uses two types of substation variables intended to measure density and intensity of the substations: MVa per substation

and substations per km of transmission line. PEG believes these measures more accurately capture the total cost impact of transmission substation infrastructure.

b. Clearspring's substation data are mismeasured, as discussed at length in Appendix B.2 of PEG's report. Because the FERC Form 1 substation data are extremely time-intensive to process correctly, PEG's substation and MVa variables are measured in 2004, 2009, and 2019, and the interim years are interpolated. Since mismeasurement bias is a serious concern in econometric modeling, PEG determined that a smaller number of well-measured data points is strongly preferable to a full time-series of poorly-measured data. When Clearspring's substation and MVa data are used in PEG's Total Cost Transmission model, the parameter estimates for their variables are less statistically significant, which we would expect since the cost relationship is obscured by the errors.

4. ISO:
   a. Clearspring includes a binary variable for ISO membership and assigns Hydro One a value of 1. PEG does not believe this variable is appropriately vetted for these data; utilities are not randomly assigned to join ISOs, so some research must be provided to show that the ISOs are causing higher transmission costs rather than the possibility that utilities that happen to have higher transmission costs are more likely to join ISOs. If the latter is true, the econometric model gives utilities "credit" for the average higher cost and it helps their benchmark score.
5. FORESTATION:
   a. PEG includes Clearspring's service territory forestation variable in the transmission model. The Clearspring model excludes such a variable.
6. CONSTRUCTION STANDARDS INDEX:
   a. PEG includes Mr. Fenrick's variable used in the previous Hydro One proceeding, which "measures the minimum requirements for strength of transmission structures, which vary by geographic region." Clearspring's model excludes such a variable.

c) Clearspring and PEG's proposed stretch factors apply the benchmarking score for the Custom IR term to the stretch factors approved by the Board for power distributors in its 4GIRM decision. Table 3 of the Report of the Board in EB-2010-0379 assigned total cost benchmarking performances to specific stretch factors for Ontario power distributors and is included below.

Table 3: Demarcation Points and Stretch Factor Values

Group	Demarcation Points for Relative Cost Performance	Stretch Factor
I	Actual costs are 25% or more below predicted costs	0.00%
II	Actual costs are 10% to 25% below predicted costs	0.15%
III	Actual costs are within +/-10% of predicted costs	0.30%
IV	Actual costs are 10% to 25% above predicted costs	0.45%
V	Actual costs are 25% or more above predicted costs	0.60%

Based on the Board's precedent from 4GIRM, PEG's finding that the total transmission cost of Hydro One would be about 14% above predicted cost for the 2023-27 results period in a proposed stretch factor of 0.45%. Clearspring's finding that Hydro One transmission was 34.5% below predicted cost for the 2023-27 period led Clearspring to recommend a stretch factor of 0%.

d) The base MFP growth trend and the stretch factor would be calculated separately. The stretch factor would include a supplemental stretch factor that adjusts for the unusually weak performance incentives of sampled U.S. transmitters. The X factor would be the sum of the base MFP growth trend and the stretch factor.

e) Please see our response to M-Hydro One-5 (Exhibit N/Tab 1/Schedule 5)

f) PEG believes that a growth factor isn't needed for Hydro One transmission because growth in its operating scale is slow.

M-Energy Probe-3

Reference: Exhibit M, Page10 Distribution Productivity Study

Preamble; PEG States "Clearspring developed an econometric model of total power distributor cost using operating data from 81 U.S. electric distribution utilities over the 2000-2019 period.

This model was used to benchmark the total cost of base rate inputs which Hydro One Distribution incurred over the historical 2003-2019 period, as well as the Company's forecasted/proposed cost over the 2020-2027 period".

Interrogatories:

a) Provide the genesis of the PEG US Distributor Sample for Hydro One Distribution, for example did PEG adopt the Clearspring EA US Distribution sample?

b) Please provide the list of Companies that form the basis of the sample for the PEG Total and Partial Productivity Analyses and indicate any differences to the Clearspring EA Sample.

c) Confirm the proposed X factor is fixed during the plan as the sum of a base productivity growth factor and a stretch factor. 0% base productivity growth factors are proposed, which is consistent with the OEB 4th Generation IRM decision.

Responses:

The following response was provided by PEG.

a) The econometric work done for this project is based on variations of the work done by Clearspring. The sample was reduced in specific cases for the reasons stated in response to M-EP-4b (Exhibit N/Tab 4/Schedule 4 part b). PEG did not seek to obtain the requisite data not already in the Clearspring study. PEG has found that adding additional plausible data to an econometric study does not tend to significantly alter the results. However, PEG has found that the removal of companies with implausible data can improve the accuracy of the models.

b) PEG did not offer a distribution productivity study in this proceeding.

c) This statement is confirmed. PEG believes that a 0% MFP growth target is reasonable for Ontario power distributors based on currently available information. However, this issue will hopefully be examined more carefully in a future OEB generic proceeding or consultation on incentive rate-making for Ontario utilities.

M-Energy Probe-4

Reference: Exhibit M, Page10 and Page 55 Table 13 & Figure 4 Distribution Benchmarking Study

Preamble; PEG states: “On average, projected/proposed Hydro One Distribution Total Cost during the new plan will exceed the benchmarks by about 37% during the 2023-2027 term of the CIR plan. From 2023 to 2027, cost efficiency will average a 1.38% annual decline”.

Interrogatories:

a) The PEG and Clearspring EA Benchmark Studies of Hydro One Distribution Total Costs vary materially. Please provide a Chart similar to Figure 4, that shows the two results for the historic and MRI Periods.

b) Apart from the sample period, what are the differences in other input assumptions affecting the two Benchmarking Studies. Please be specific.

c) What is PEG’s view of the effect of amending the Density parameter and 50kV threshold on the Results?

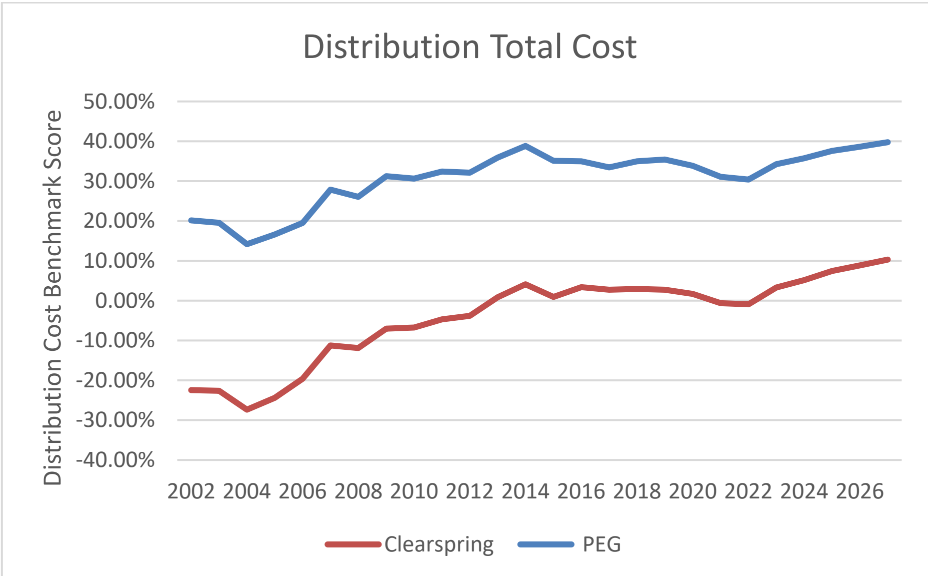
d) Please confirm the basis of the recommended Stretch Factor. Is it purely score based or are other factors included. Please discuss.

e) Confirm PEGs view regarding inclusion of an explicit growth factor for Hydro One Distribution.

Responses:

The following response was provided by PEG.

a) The requested figure is provided below.



b) The similarities and differences in the two distribution total cost benchmarking models are as follows:

Sample:

1. PEG's excludes several companies from their sample for the following reasons.
    a. For bad or missing peak data and for missing distribution plant data:
        i. PacifiCorp
        ii. Northern States Power - WI
    b. For lacking transmission line mile data:
        i. Wisconsin Power & Light
        ii. Madison Gas & Electric
        iii. Ohio Edison
        iv. Pennsylvania Power
        v. Cleveland Electric Illuminating
        vi. Metropolitan Edison
        vii. Pennsylvania Electric
        viii. Toledo Edison
        ix. Consumers Energy
        x. DTE Electric
        xi. Wisconsin Electric Power
        xii. Wisconsin Public Service

Identical business condition variables:

1. Number of retail customers
2. Share of electric customers in the sum of gas and electric customers
3. Share of distribution plant overhead times share of service territory forested
4. Share of service territory congested urban
5. Share of customers with automated metering infrastructure.
6. Trend variable

Differences in business condition variables:

1. PEAK LOAD:
    a. PEG used ratcheted peak demand whereas Clearspring took a 10-year rolling average (no ratcheting).
2. CUSTOMER DISPERSION:
    a. Clearspring used a total service territory area variable that PEG believes overstates the territory that Hydro One's actually serves and this variable has an enormously favorable effect on the Company's cost benchmark score.
    b. PEG used transmission line length, which is highly correlated with distribution service territory, to avoid this problem.
3. ECONOMIES OF SCOPE:
    a. PEG used the share of distribution in the value of transmission and distribution plant. Clearspring did not include this kind of scope variable in its model even though it included a scope variable in their transmission model.

       Clearspring used a variable which measures the percent of lines classified as transmission which are above Hydro One's 50 kV transmission classification cutoff. PEG found that this variable was not statistically significant in its model.
4. ELEVATION:
    a. Clearspring included a variable for the standard deviation of elevation in the utility service territory. PEG did not out of concern that it produced surprising results in their OM&A and capital cost models. See our response to M-Hydro One-22a (Exhibit N/Tab 1/Schedule 22 part a).

c) The handling of customer dispersion is a complex issue that is discussed at some length in our responses to Exhibit N/Tab 1/Schedule 21. PEG's view of the 50kV threshold variable is discussed in our responses to M-HYDRO ONE-19.

d) The proposed stretch factor is based solely on the results of PEG's econometric benchmarking study on Hydro One's total distribution cost.

e) PEG believes that a customer growth term is warranted for the power distribution revenue cap index.

M-Energy Probe-5

Reference: Exhibit M, Page 68 Capital Stretch Factor- Scap

Preamble: "After considering the pros and cons of these options, we recommend that the OEB at a minimum add a supplemental stretch factor to Hydro One's C factor calculation. This factor should be no less than the comparable markdown on plant additions that is produced by the ICM".

Interrogatories:

a) Confirm the recommended Capital Stretch Factor(s) for Transmission and Distribution.

b) What is the basis for these? Is there a mathematical derivation related to historic and planned CAPEX? Please discuss and illustrate.

c) Does the recommendation for Hydro One to keep 5% (rather than 2%) of CIVSA negative balances apply to both Tx and DX and apply annually or over the entire IRM period?

Responses:

The following response was provided by PEG.

a) In prior Ontario CIR proceedings, PEG criticized the ratemaking treatment of capital and argued in favor of a custom capital stretch factor that imposed a markdown on the cost of new plant additions that was at least as high as that in the incremental capital module. The equivalent custom capital stretch factor varies with the cost proposal and is difficult to calculate accurately.

   A table comparing PEG's proposals with the OEB's decisions in recent proceedings is presented below. Reviewing the table, it can be seen that the OEB tends to approve Capital Stretch Factors of 0.15%.

S Factor Proposals and Decisions

	PEG Proposal	OEB Decision	Case No.
Hydro One Dx	N/A	0.15%	EB-2017-0049
Toronto Hydro	0.64%	0.30%	EB-2018-0165
Hydro Ottawa	0.18%	0.15%	EB-2019-0261
Hydro One Tx	0.31%	0.15%	EB-2019-0082

PEG did not compute Capital Stretch Factors in this proceeding which produce markdowns that are equivalent to those produced by the incremental capital module. PEG believes that the 0.15% Capital Stretch Factors proposed by Hydro One are the minimum that should be considered. 0.30% Capital Stretch Factors would be more commensurate with a 10% ICM markdown.

b) Please see the response to part a of this question

c) PEG recommends that Hydro One be able to keep 5% of capital cost savings from both distribution and transmission operations. This should apply to the accumulated savings as calculated at the end of each plan.