Responses to PEG's New Analyses and Studies

(in reply to PEG's May 6, 2024 report)

Toronto Hydro's Rate Application

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1 PEG's New Benchmarking Analyses and Studies

PEG delivered its *Statistical Cost Research* report dated May 6, 2024 ("PEG Report"), and provided its accompanying answers to interrogatories on May 23, 2024, in which PEG describes new benchmarking analyses and studies it performed and raises certain other new issues. Clearspring was not able to consider or respond to PEG's new analyses/studies or issues in our original report dated October 31, 2023 since they were disclosed for the first time in the subsequent PEG Report. In the sections below we respond to PEG's new analyses/studies and the issues it has raised.

PEG's Changing Distribution Cost Benchmarking Methodologies

In the PEG Report, PEG has now departed in a significant way from the agreed upon and established methodologies in our and PEG's Joint Report in the prior Hydro One application. This is problematic from the perspective of ensuring consistent and fair results across the total cost benchmarking research that is being employed for Ontario Custom IR applicants.[1] If PEG had been consistent in following the Joint Report methodologies, Toronto Hydro's benchmark score would be improved by about 30% relative to PEG's reported result in the PEG Report.[2] PEG's Joint Report model would result in a 0.3% stretch factor recommendation.

PEG cited no significant concerns with Clearspring's distribution total cost methodologies (other than the Hydro One service territory issue which is a non-issue in the current study) in the Joint Report and PEG's methodologies essentially mirrored those of Clearspring's. Clearspring supported PEG's model specification in the Joint Report (which showed poor cost performance for Hydro One Dx) because it was a proper approach and was consistent with the continuous improvements made in CIR benchmarking.

The following table displays PEG's reported total cost benchmark scores for the most recent CIR applications along with PEG's treatment of the three most consequential changes it made relative to the Joint Report. Those changes are: 1) not interacting the area variables, 2) discarding the percent congested urban variable, and 3) no longer using GDPPI as the Materials and Service input price for the U.S. sample.

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[1] In contrast, Clearspring retained all the agreed upon methodologies and specifications of the Joint Report and only investigated the inclusion of substation variables (which PEG was already supportive of in the transmission cost benchmarking models) and made a refinement to the agreed upon percent congested urban variable.

[2] PEG declined to provide this result in M3-TH-003 part c. Clearspring was able to replicate PEG's Joint Report model specification and its methodology and estimated a CIR average result of approximately +7.8%.

Applicant (Year of CIR Start Year)	PEG Total Cost Benchmarking Result	Did PEG Fully Interact the Area or Line Length Variable?	Did PEG Include the Percent Congested Urban Variable?	Used GDPPI Only for M&S Input Price for U.S. Sample?
Toronto Hydro 2020	+15.6% (2020 – 2024)	No	Yes	Yes
Hydro One Tx 2020	+9.0% (2020 – 2022)	Yes	Not Applicable	Yes
Hydro Ottawa 2021	+5.0% (2021 – 2025)	Yes	Yes	Yes
Hydro One Dx 2023	+37.2% (2023 – 2027)	Yes	Yes	Yes
Hydro One Tx 2023	+14.1% (2023 – 2027)	Yes	Not Applicable	Yes
Toronto Hydro 2025	+36.4% (2025 – 2029)	No	No	No

PEG has now made numerous changes to its Joint Report distribution total cost methodologies. The changes with which we have concerns include:

1. not interacting the area variable,
2. discarding the % congested urban variable,
3. increasing the input price assumptions for the U.S. sample,
4. not including the percent overhead interaction with forestation,
5. using a different dataset start year, and
6. breaking out area into two components.

We specifically address below the three changes that are the most consequential to Toronto Hydro's benchmark score.

In evaluating the PEG Report and its working papers, we also discovered an error in PEG's code with respect to how total cost was defined.[3] In presenting the impacts below, we corrected this error.

<u>The Three Most Consequential Changes from the Joint Report Methodologies</u>

The three most consequential changes PEG has made compared to its Joint Report methodologies are:

1. **Not Interacting the Area Variables in the Model (Impact of approximately 20% on the results).[4]** Interacting the area variables is a flexible approach that in our view -- and consistent with PEG's view in prior CIR reports including the Joint Report -- more accurately estimates the cost impact differences at varying levels of size and congested urban characteristics. By now making this variable inflexible, PEG's new approach only estimates the impact at the mean of the data. This is

[3] PEG defined total cost as capital cost instead of capital cost plus OM&A expenses. This results in PEG's reported total cost results being capital cost results. PEG acknowledged this error in its response to M3-TH-025 part a.

[4] PEG was asked to provide the model if it had interacted the area variables in M3-TH-003, part f but did not provide this information.

unreasonable because cost impacts of area will not be fixed for different sized utilities and the cost impacts of area also may be influenced by the other output variables**.** Including the interaction variables enables the model to estimate the "curvature" of the cost impacts rather than an unchanging value. These missing variables in PEG's model are strongly statistically significant in Clearspring's total cost model. Not including them creates an omitted variable bias that skews the benchmark results by approximately 20% to Toronto Hydro's detriment.

2. **Discarding the Percent Congested Urban Variable and Breaking Total Area into Congested Urban and Other (Impact of approximately 19% on the results).** Representing a significant change compared to the previously agreed upon methodology in this regard, PEG has now discarded the percent congested urban variable and replaced it with a different "Area Congested Urban" variable. In making this change, PEG's model does not account for the fact that the percentage of utility costs driven by their congested urban challenges varies dramatically from utility to utility. Toronto Hydro is a very small utility in terms of total area (second smallest in the sample) and in terms of other outputs where they are below the mean. Despite this, the company serves a large congested urban area. Therefore, Toronto Hydro's total costs are driven, on a percentage basis, far more by its congested urban challenges than every other utility in the sample.

   Due to PEG's irregular model specification, the estimated marginal costs of adding one km of congested urban area vary drastically from utility to utility. To help illustrate the problem with PEG's approach, contrast Toronto Hydro's situation with three other utilities with similar congested urban areas (Commonwealth Edison, Pacific Gas & Electric, and Consolidated Edison) but not similar size or total cost levels (the other three utilities have far higher total costs due to their much larger size in terms of area and other outputs).[5] PEG's irregular calculation on the congested urban variable gives other utilities up to 6 times more "credit" for the same amount of area congested urban than a smaller utility like Toronto Hydro. The following table illustrates how much PEG's model adds to the benchmark costs of each utility in 2017 to 2021 when one km of congested area is added.[6]

	PEG Model Marginal Costs of Adding 1 km of Area Congested Urban			
Year	Toronto Hydro	Commonwealth Edison (Illinois serving Chicago)	Pacific Gas & Electric (California serving San Francisco and San Jose)	Consolidated Edison (New York City)
2017	$ 6,430,394	$ 26,160,569	$ 36,200,018	$ 13,530,788
2018	$ 6,716,648	$ 27,623,478	N/A	$ 14,909,312
2019	$ 6,870,089	$ 28,429,186	N/A	$ 15,149,190
2020	$ 6,648,555	$ 27,286,371	N/A	$ 14,677,980
2021	$ 6,654,656	$ 27,286,371	N/A	$ 14,767,650

[5] These are the top 4 utilities in the dataset in terms of congested urban service area.

[6] We start in 2017 because this is the last year that PG&E is included in the dataset.

The marginal costs of serving an added km of congested area should be relatively consistent from utility to utility in order for the model to produce accurate and reasonable results. However, the table above illustrates how PEG's model specification estimates far different marginal costs per km of congested urban served for utilities of different sizes. The model credits PG&E nearly six times the benchmark costs of serving 1 km of congested area relative to Toronto Hydro. The model provides the Commonwealth Edison serving Chicago approximately four times the benchmark costs per km of congested area. Consolidated Edison serving New York City receives double the benchmark costs. These inconsistent results invalidate the accuracy of the congested urban variable that PEG used in the PEG Report. Relying on this flawed construction of the congested urban variable skews the benchmark results by approximately 19% to Toronto Hydro's detriment.

Further, PEG's treatment of the congested urban variable is inconsistent with its approach to the other variables in its model. PEG's other variables in the model demonstrate that using percentages for the non-output variables is the regular and standard approach. Besides PEG's two output variables (customers and peak demand, which are both interacted), the rest of PEG's variables are based on percentages that show the relative proportion of a cost challenge to a size variable. These are:

- % line plant that is overhead in total line plant,
- % electric customers in total gas and electric customers,
- % AMI in total customers,
- % distribution O&M in total G, T, and D O&M,
- % forested area in total service area, and
- % distribution lines over 50 kV in total lines.

The most helpful comparable is the percent forested area variable. Just like serving a congested urban area increases costs in that area, serving an area with more trees and forestation is also more costly. Both area types increase costs. PEG addresses the forestation challenge in its model by taking the total area forested and dividing it by the total service area of the utility.

$$PEG's\ \%\ Forestation\ Variable = \frac{Forested\ Area}{Total\ Area}$$

Challenging areas like forestation and congested urban should be treated and calculated in a consistent manner using percentages, just like the rest of the business condition variables.[7]

[7] PEG claims that area is a "network" variable but there is no difference in forested areas or congested areas other than the nature of the cost challenge. They should be treated consistently and formulated as percentages of total area.

3. **Increasing the Input Price Assumptions for the U.S. sample (Impact of approximately 8% on the results).** PEG has added an MFP growth adder to the M&S input price for the U.S. sample only. By contrast, in all the prior CIR applications PEG used U.S. GDPPI as the M&S input price inflation assumption and the Ontario utility being studied also used the Canadian GDP-IPI as the inflation assumption. This was a consistent approach. However, now PEG has increased the M&S input price escalation for the U.S. sample utilities only. Adequate attention to Toronto Hydro's input price inflation needs to be given prior to adjusting the input price assumptions for the U.S. sample that both consultants agreed to in the Joint Report and have also used in other CIR applications.

   In PEG's dataset using this new input price assumption only for the U.S. utilities, all U.S. utilities are assumed to have higher input price inflation rates than Toronto Hydro. In examining PEG's new input price named "wndx_peg" in its code, the U.S. sample's average annual total input price inflation from 2007 – 2021 is assumed to be 3.0%. Conversely, for Toronto Hydro in PEG's dataset the inflation rate is assumed to be 2.2%. Toronto Hydro receives the lowest input price inflation in the entire PEG sample and has 0.8% lower inflation annually than the average U.S. utility using PEG's new input price calculations.

   This difference of 0.8% is problematic for at least two reasons. First, Toronto operates in Ontario which has seen positive MFP growth of around 0.2% from 2007 to 2021. To be consistent with PEG's new approach, at a minimum, 0.2% inflation should be added to Toronto Hydro's M&S input price inflation rate. Second, Toronto input price inflation rates are likely higher than Canada at large, thus if input prices are to be re-examined and increased for the U.S. sample then the input prices for the studied utility should also be thoroughly examined – which PEG has not done.[8] [9]

2 PEG's New Distribution TFP Research and Implications

In the PEG Report, new U.S. distribution TFP trend research and results are provided. Based on the industry TFP trends, PEG recommends a new "cost efficiency growth factor" of 0.10%. This flows from PEG's finding that the most recent ten-year TFP trend (2013-2022) in the U.S. electric distribution industry equaled +0.10%. This TFP trend used a cost-weighting procedure that gives far more weight to large utilities and less weight to medium and small utilities in formulating the TFP trend.

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[8] We say "likely" here from a brief examination of price indexes in Toronto versus national or regional indexes such as how the non-residential building construction prices for Toronto grow much more rapidly than most other Canadian municipal cities. However, this is a new issue that Clearspring thought had already been settled on and we have not had adequate time to research and produce a recommendation on how to consistently adjust input prices in light of PEG's departure from precedent.

[9] PEG states in M3-TH-021, part g, "PEG has not considered how or why the inflation in THESL's input price index might differ from that of the U.S. utilities in our sample."

Clearspring was not expecting that TFP distribution industry trends and new productivity factors would be re-examined and put forth in this application, and as a practical matter we have not been able to put forth our own study regarding this issue.

We have a number of concerns regarding PEG's TFP trend research and productivity factor, including:

1. **Other Related aspects of the IR plan would need to be properly investigated if the TFP trend and productivity factors are being re-examined**. The TFP trend of the industry is only one component of a well-designed multi-year revenue plan. A key component, besides the productivity factor, is that the input price factor needs to be properly calibrated to reflect industry input price inflation and the research for that calibration should be consistent with the TFP trend calculations. PEG examined the TFP trend of the U.S. industry and did so after applying new industry input price inflation assumptions and calculations (discussed in the prior section) that had the impact of increasing the reported TFP trend. For proper calibration of the plan, those new industry input price inflation assumptions/calculations need to flow through and be applied to a possible reduction of the X Factor through an input price differential.

2. **PEG used the wrong weighting calculation and if they had used the proper one, the TFP trend from PEG's research would be negative.** PEG calculates the individual utility TFP trends and then weights those trends. PEG used a cost-weighting calculation that gives substantially more weight to the large utilities. A simpler approach would be to take the average of the TFP trends. This is more appropriate for medium-sized utilities because the TFP trends will be more applicable for that medium-sized utility if based on the average and not be unduly influenced by the TFP trends of a few of the largest utilities. PEG agrees in the PEG Report with Clearspring as it states on p. 52 of the PEG Report, *"Size-weighted averages are sometimes unduly sensitive to the results for a few large utilities.* ***Even-weighted averages are more pertinent in X factor studies for medium or smaller-sized utilities.*** *[*bold added*]"*

   Toronto Hydro is clearly a medium-sized utility in the U.S. dataset used by PEG to calculate the TFP trends. In PEG's response to interrogatory M3-TH-008, part d, PEG agrees that Toronto Hydro should be characterized as a "medium" utility in its dataset. In 2022, PEG's TFP sample average number of customers is 880,788. Toronto Hydro's 2022 customer count is 790,699. The sample average peak demand in 2022 is 4,594 MW. Toronto Hydro's peak demand in 2022 is 4,276 MW.

   PEG's results show that using average-weighted (referred also as even-weighted) results in a negative TFP trend. Rather than the ten-year TFP trend of 0.10%, using average-weights the TFP trend over that same period is -0.13%.

   PEG and Clearspring also agree that cost-weighting can make the results sensitive to a few large utilities. To illustrate this point, if only one utility, PacifiCorp, is excluded from PEG's TFP sample then PEG's TFP trend result moves from 0.10% to 0.00% (actually slightly negative at -0.002%).

3. **PEG used the wrong output definition and if it had used the proper one, the TFP trend would be negative.** In PEG's U.S. TFP trend calculations it only uses the growth rate in the number of customers in the output quantity index. The proper calculation method would be to include both outputs included in the total cost econometric modeling (customers and peak demand). PEG lays out the mathematical and cost theory basis of what the revenue cap index formula should include starting on page 47 of the PEG Report. PEG shows that mathematically the output quantity index in a revenue cap plan should be calculated using cost elasticity weights based on a total cost econometric model. In PEG's total cost econometric model, customers and the 10-year rolling average of peak demand are the outputs. In Equations [6], [7], [8b], [9], [10a], and [14] PEG displays the mathematical rationale for cost elasticity weights in the output quantity index. In Equation [17], PEG actually shows how a cost elasticity output quantity index should be calculated using the cost elasticity estimates of the two outputs from the econometric total cost model.

   PEG further claims in its response to M3-TH-022, part a, "Cost theory supports the use of a multidimensional scale index in a productivity study if the goal of the study is to measure cost efficiency." PEG is using this study to estimate an "efficiency growth factor".[10] PEG also used both outputs of customers and the 10-year rolling average of peak demand when calculating Toronto Hydro's productivity trends. This decision by PEG had the impact of raising the U.S. TFP trends and lowering Toronto Hydro's productivity trends.

   If PEG had taken the correct approach, the TFP trends for the U.S. industry would be lower. PEG's reported cost-weighted TFP trend would change from 0.10% to -0.26%. The average-weighted (which is the more appropriate TFP trend for Toronto Hydro as discussed in the prior point) would change from -0.13% to -0.45%.

4. **PEG used a different rate of return than Toronto Hydro's; if it had used the right one the TFP trend would have been negative.** PEG assumed a different rate of return for the U.S. sample than what it used in its total cost econometric benchmarking research. PEG and Clearspring used the OEB approved rate of returns in the benchmarking studies. PEG also used the OEB rate of returns in Toronto Hydro's productivity study. However, PEG changed this assumption in the U.S. TFP trend work. This had the impact of raising the U.S. industry TFP trend and made its research less applicable to Toronto Hydro's situation as it operates under OEB rate of return regulations. The proper approach would be to use the OEB rates of return to better simulate the actual productivity situation of Toronto Hydro in terms of TFP trend expectations.

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[10] PEG defends its decision to only use the number of customers by alluding to a growth or scale index factor. This growth factor does not exist in Toronto Hydro's proposed escalation formulas. Mathematically, if PEG's TFP trends with the incomplete output quantity index are used, then the X-Factor should be reduced by the expected growth in customers which is around 0.35% to properly calibrate the formula.

To illustrate how different PEG's rate of return assumptions for its U.S. TFP study are, we can examine the capital cost shares in PEG's total cost and TFP studies. In PEG's U.S. TFP trend research, using the non-OEB rate of return assumption, PEG's 2022 sample average capital cost share is only 38%.[11] However, Toronto Hydro's capital cost share in 2022 is 77% using the OEB approved rate of returns. In PEG's total cost econometric benchmarking dataset, the average capital cost shares in 2021 (the last year of the dataset) are 72%. Therefore, PEG is putting far less weight on capital in its U.S. TFP trend research. Since capital productivity is substantially lower than OM&A productivity in the U.S. industry, PEG's rate of return assumptions are raising the U.S. TFP trends below what they should be when applied to Toronto Hydro.

In its U.S. TFP code, PEG did not insert an option to revert to the OEB rate of return assumptions. However, the difference in the productivity trends between capital and OM&A in PEG's work illustrates that the U.S. TFP trend would be substantially lower if PEG's study was consistent with its two other studies in its report and used the OEB rate of return. Clearspring's estimate is that the U.S. TFP trend would be reduced by at least 0.2%.[12] Using the average-weighted and cost-elasticity weighted U.S. TFP trend discussed in the points above, Clearspring estimates a U.S. TFP trend of around -0.65%.

5. **PEG did not examine Ontario TFP trends and the last research on those indicated they are highly negative.** In order to conduct a full investigation of the appropriate productivity factor for Toronto Hydro, the Ontario TFP trends should, at the very least, be examined. While Ontario distributors are unlike Toronto Hydro in terms of business conditions, their TFP trends would have at least some relevance. Clearspring agrees that the U.S. TFP trend also has relevance but, ideally, both should be examined. The latest TFP research in Ontario showed that the trends are negative.

The considerations highlighted above show that it is likely that the results will continue to show a negative productivity factor. Using PEG's own research and correcting the three errors of size weighting, using the two outputs of customers and peak demand, and using the appropriate rate of return yields a revised estimated TFP trend of -0.65%. This shows that PEG's analysis should not be relied upon in this proceeding, in our view.

Clearspring is also of the view that any re-opening and re-examination of the productivity factor should be done in a more comprehensive and thorough manner, with advance notice and sufficient opportunity for those affected by the results to conduct their own TFP trend research for consideration by stakeholders and the OEB, to support a specific recommendation.

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[11] Utilities are known as capital intensive industries and using an assumption that says capital is 38% of costs and OM&A is 62% does not align with this expectation.

[12] In its response to M3-TH-025, part j, PEG declined to provide to produce this estimate given available time and budget.

3 Other New Issues Raised by PEG Regarding Clearspring's Benchmarking Approach

In the PEG Report on pages 19 to 26, PEG raises issues it has regarding Clearspring's distribution total cost benchmarking research, to which we briefly reply as follows.

PEG takes issue with Clearspring escalating our congested urban variable based on the growth in skyscrapers. Toronto is one of the fastest growing cities in North America and the congested urban challenges faced by the Company relative to the sample are rapidly growing every year. The time invariant percent congested urban variable was calculated in 2017 and used by both Clearspring and PEG in the last three CIR applications where PEG and Clearspring produced total cost benchmarking models. Since this time invariant variable does not change from year to year, the time invariant variable was unable to adjust for the differences in urban growth.

While PEG criticized this particular escalation approach, they did not dispute that there needs to be some sort of escalation. In fact, PEG used our method of escalation in its new (though inappropriate) area congested urban variable.[13] In using the same method, PEG seems to implicitly agree that the escalation method is reasonable.

PEG takes issue with Clearspring translogging the area variable and with the value used for Toronto Hydro. We discussed the merits of translogging the area variable in the first section of this Reply Report and showed how PEG regularly translogs this same variable. It is unfair to the CIR applicants to translog the variable in some cases and not others. A consistent treatment of this variable from application to application should be applied. Regarding the value used by Clearspring for Toronto Hydro's area variable, Toronto Hydro's benchmark scores would have slightly improved if we had used the variable value suggested by PEG.

PEG takes issue with Clearspring's development of substation data and variables. The substation data is a collection of over a million individual substation observations that requires substantial processing and data cleaning methods. In the most recent Hydro One application, Clearspring put forth substation data and variables for the transmission total cost model. PEG reviewed the data, suggested some potential ways to adjust and clean the data and included the variables in its responding transmission total cost models. PEG seemingly was of the view that including substation variables improved the transmission models. Clearspring then incorporated PEG's suggested changes and they were included in the Joint Report research.

It is Clearspring's view that the total cost models are improved by including substation information into the analysis and enabling the models to adjust for those business conditions. However, we recognize that the underlying data can contain unresolved issues. The substation variables do not

[13] PEG confirms this in its response to M3-TH-005, part b.

have a large impact on Toronto Hydro's benchmark score and would not change Clearspring's stretch factor recommendation of 0.15% if they were to be excluded from our model.

4 Concluding Remarks

PEG's new total cost benchmarking methodologies in this application are inconsistent in a number of significant ways with the established practices that both Clearspring and PEG supported and followed previously, including in the Joint Report. PEG's new approach undermines the progress made through the last few CIR applications, which created consistency and predictability in the total cost benchmarking models.

Based on the considerations discussed in this Reply Report, our view is that PEG's benchmarking results in the PEG Report are unreliable. PEG should instead be using its Joint Report model (which would result in a 0.3% stretch factor recommendation) as the starting point of evaluation. We say "starting point" because those results do have a recognized challenge for Toronto Hydro that is not being adjusted for, which is the Company's ever growing congested urban challenges. If the percent congested urban variable is allowed to increase annually using the method Clearspring developed and that PEG also used, then using PEG's Joint Report methodologies plus this one change would result in a 0.15% stretch factor. For these reasons, Clearspring continues to recommend a 0.15% stretch factor as being appropriate.

PEG has also put forth a new productivity or efficiency growth factor of 0.10% based on its U.S. TFP trend research, the deficiencies of which are discussed above. While Clearspring has not had the opportunity to put forth its own study on this issue, using PEG's own research it appears likely that a proper study would produce a negative TFP trend, and a more comprehensive re-examination of the revenue escalation formula parameters would likely suggest a negative X factor.

We are not recommending a re-opening of those parameters for purposes of this proceeding, as we do not consider this to be necessary. The well-established 0.0% productivity factor should be continued until a more comprehensive evaluation can be conducted in an appropriate forum. Further, adopting a positive efficiency growth factor or a higher than warranted stretch factor is not supported by the available empirical evidence. For these reasons, Clearspring continues to recommend a 0.0% productivity factor (efficiency growth factor), albeit with recognition that this value of 0.0% likely includes a sizeable implicit stretch factor.