Date Filed: October 20, 2026

Witness: Julia Frayer
Request from: Public Utilities Regulatory Authority

Question:

(TFP Study) Exhibit CLP-PBR-2; Interrog. Resp. OCC-560. London Economics International (LEI) states that it did not evaluate the possibility of a structural break in the total factor productivity (TFP) series associated with the COVID-19 pandemic and its economic disruptions. Explain the basis for assuming that TFP followed a stable multiplicative growth process throughout 2005-2024, despite the large, non-cyclical shock observed during the pandemic years.

Response:

LEI did not assume that the TFP followed a stable or constant growth process throughout the 2005–2024 study period. As explained in Exhibit CLP-PBR-2, LEI used a chained Fisher Ideal index to measure annual changes in industry inputs, outputs, and productivity. Under this methodology, the index is constructed by linking successive annual changes calculated using observed data from adjacent years. Accordingly, the methodology does not impose a constant annual rate of productivity growth but instead captures the year-to-year variations reflected in the underlying data. This approach is consistent with established index-number methodology, as described by the U.S. Bureau of Economic Analysis.[1] The 20-year average represents the historical average of these annual growth rates rather than evidence that productivity growth was constant or statistically stable throughout the study period.

LEI recognizes that certain business operations and patterns of consumer behavior changed during the COVID-19 pandemic. However, as previously stated in response to OCC-560[i], LEI did not perform a formal structural-break analysis to determine whether these disruptions resulted in a permanent change in the underlying productivity trend. Such an analysis was not necessary to implement LEI's index-based methodology, which measures observed annual productivity changes, including those occurring during the pandemic, rather than assuming a constant rate of productivity growth. The objective of the Industry TFP Study was to estimate the long-term historical industry productivity trend over a consistently defined period, rather than establish whether productivity growth remained statistically stable throughout that period.

[1] U.S. Bureau of Economic Analysis (BEA), *NIPA Handbook: Concepts and Methods, Chapter 4* (December 2023). < https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/chapter-04.pdf>

The inclusion of the pandemic years is also consistent with practices followed by other productivity experts and statistical agencies.[2] Furthermore, the U.S. Bureau of Labor Statistics ("BLS"), the BEA, and Statistics Canada have retained the pandemic years in their published TFP or multifactor productivity ("MFP") series, notwithstanding the economic disruptions associated with COVID-19.[3]

Consistent with LEI's responses to OCC-445[ii], OCC-446[iii], and OCC-538[iv](d), the 2005–2024 study period was selected to measure long-term industry productivity trends while reducing the influence of unusual individual years and short-term fluctuations. Pandemic-period observations were therefore treated consistently with all other observations in the study period, allowing both positive and negative annual productivity changes to contribute to the calculation of the historical industry average.

Prior Referenced Responses:

[i] OCC-560 Question:

(Total factor productivity) In Exhibit CLP-PBR-1, Page 32, LEI states that *"On the other hand, a longer term (e.g., more than 20 years) would also not capture significant changes in the industry such as widespread AMI deployment, distributed energy resources ("DERs"), increased cybersecurity requirements, resilience and climate adaptation investments, and modern vegetation management practices."*.

a. Please identify each formal statistical test for structural breaks or parameter instability performed by LEI across the 2005–2024 study period to evaluate the timing and statistical significance of the alleged structural breaks. If no such tests were conducted, please explain the empirical basis for LEI's assertion.

b. Please provide any empirical or quantitative analysis performed by LEI or the Company evaluating the specific impact of AMI deployment, automation, and DER integration on OM&A efficiency and labor productivity.

c. Given that large-scale AMI deployment, advanced DER integration, and heightened cybersecurity requirements emerged primarily within the last 5 to 10 years, please explain why a 20-year historical average (2005–2024)—which incorporates a decade of pre-AMI/pre-DER data—is more representative of forward-looking operating conditions than a 5- or 10-year period.

[2] For example, TFP studies prepared by NERA Economic Consulting, Christensen Associates, and PEG for the Alberta Utilities Commission's 2024–2028 performance-based regulation proceeding included data through 2021. [Sources: Pacific Economics Group Research LLC, *Statistical Cost Research for THESL's New CIR Plan*, May 6, 2024, Section 6, Table 11a, p. 69, Ontario Energy Board Proceeding EB-2023-0195. PEG study. See also Alberta Utilities Commission, *Decision 27388-D01-2023*, October 4, 2023, Table 5, p. 35. AUC decision.

[3] U.S. Bureau of Labor Statistics, *Total Factor Productivity—2024*, March 21, 2025. BLS publication; BEA, Integrated *BEA-BLS Industry-Level Production Account*, 1997–2023, April 25, 2025. BEA publication; Statistics Canada, *Multifactor Productivity Growth Estimates and Industry Productivity Database*, 2022, April 16, 2024. Statistics Canada publication.

OCC-550 Response:

a. LEI did not perform a formal statistical test for structural breaks or parameter instability in selecting the 2005–2024 study period, as previously stated in the Company's response to information request OCC-538i, in subpart d. The Industry TFP Study uses index-number techniques to measure changes in aggregate industry inputs and outputs over time; it does not estimate statistical relationships or coefficients whose stability would need to be tested.

   The statement in Exhibit CLP-PBR-1, was not intended to assert that a discrete statistical structural break occurred in 2005, or in any other particular year. Rather, the cited developments-such as AMI deployment, DER integration, cybersecurity requirements, resilience and climate-adaptation investments, and modern vegetation-management practices-were examples of material changes in industry operating conditions that have occurred over time.

   As explained in the responses to OCC-534ii and OCC-538 and in Section 2.4 of Exhibit CLP-PBR-2, LEI selected the 2005-2024 period to balance the benefits of a sufficiently long period for measuring long-run industry productivity trends with the relevance of the historical period to current and prospective industry conditions. LEI also evaluated 10-, 15, and 20-year productivity trends as sensitivity periods.

b. LEI did not perform a causal or econometric analysis that separately quantified the effect of AMI deployment, distribution automation, or DER integration on OM&A efficiency or labor productivity. Based on information LEI has available, it would not be possible to pinpoint in time when these specific events and changes occurred for every individual EDC and therefore make it intractable to perform such a study. The Industry TFP Study was designed to measure the aggregate historical productivity trend of the electric distribution industry, rather than to attribute that trend to individual technologies or operational initiatives.

   OM&A includes both labor and non-labor costs, and the available FERC Form 1 data do not separately identify the labor and non-labor costs attributable to AMI, distribution automation, or DER integration. As a result, LEI could not isolate the effects of those individual initiatives on labor productivity.

c. LEI does not contend that every year from 2005 through 2024 is equally representative of each technology or operating practice expected during the PBMRP term. Rather, the purpose of the selected period is to estimate a representative long-run industry productivity trend. As explained in response to part (a) and in the Company's responses to OCC-534 and OCC-538, LEI selected the 20-year period to balance relevance to current industry conditions with the need to reduce sensitivity to short-term volatility and one-off events. For the overall TFP analysis, a longer period also reduces the influence of uneven capital-investment timing, while for OM&A productivity it reduces sensitivity to unusual expense years or unusual operating circumstances. The selected period remains recent enough to reflect evolving industry conditions while providing a broader basis for estimating the long-run productivity trend.

   A five-year period would contain only four annual year-over-year productivity observations, and a ten-year period would contain nine data points, making those estimates more sensitive to individual years and short-term conditions. In contrast, the selected 2005–2024 period contains 19 annual growth observations. LEI nevertheless presented shorter-period results as sensitivities rather than selecting among time periods after observing their results.

[ii] OCC-445 Question:

Exhibit CLP-PBR-1 PBR Testimony Please provide a sensitivity analysis showing the US industry OM&A PFP over the 2005–2024 study period excluding the 2019–2020 observation. Please provide the resulting average annual OM&A PFP and corresponding X Factor.

OCC-445 Response:

LEI does not consider excluding the 2019–2020 observation to be an appropriate sensitivity for purposes of estimating the industry OM&A PFP trend. The purpose of the TFP/PFP study is to measure industry productivity performance over time. As explained in Exhibit CLP-PBR-2, productivity trends are inherently long term and the use of 20 years of data is intended specifically to reduce the influence of unusual individual years, numerical outliers and one-time events.

Selectively excluding particular years, as suggested by this request, would undermine the objective of this analysis and could introduce selection bias. Industry productivity is affected over time by a variety of unusual conditions such as economic cycles and there is no objective basis for excluding one particular period while retaining other years that may also reflect unusual circumstances. A consistently defined study period allows both favorable and unfavorable annual observations to contribute to the measured long-run trend.

As discussed in Exhibit CLP-PBR-2, the 20-year period was selected to reduce the effects of year-to-year variability while remaining sufficiently recent to reflect industry conditions relevant to the prospective PBR period.

[iii] OCC-446 Question:

Exhibit CLP-PBR-1 PBR Testimony Please explain the extent to which the 2019–2020 observation affected the magnitude and direction of the 2005–2024 average OM&A PFP. Did LEI evaluate whether productivity changes during the COVID-19 pandemic period is representative of the productivity trends that may reasonably be expected during the proposed PBMRP term? If yes,

a. Please provide all underlying data and calculations in an unlocked Excel workbook with formulas intact.

OCC-446 Response:

Please refer to response OCC-445i, which explains why LEI does not consider the selective exclusion of the 2019–2020 observation as an appropriate or relevant analysis.
LEI did not evaluate any adjustments to the cost or customer count data during the COVID-19 pandemic period.

In LEI's professional opinion, and consistent with the theoretical foundation of TFP analysis, the annual productivity changes observed in 2019–2020, viewed in isolation, is not representative of productivity that could be expected during the proposed PBMRP term. However, it is equally invalid to remove those years from the sample as discussed in response to OCC-445.

[iv] OCC-538 Question:

Performance Based Ratemaking Panel Exhibit CLP-PBR-1
Please provide a sensitivity analysis showing the effect of unusually volatile pandemic-period observations on LEI's reported 2005–2024 average OM&A PFP growth rate of -0.03%. At a minimum, please provide:

a. The average OM&A PFP growth rate excluding the 2019–2020 observation;
b. The average OM&A PFP growth rate excluding both the 2019–2020 and 2020–2021 observations;
c. The median annual OM&A PFP growth rate over the 2005–2024 study period; and
d. An explanation of whether LEI performed any outlier, structural-break, or other sensitivity analysis to determine whether the long-run OM&A PFP result is representative of expected productivity during the Company's proposed PBMRP term.

OCC-538 Response:

a. Please refer to OCC-445i. As mentioned, "LEI does not consider excluding the 2019–2020 observation to be an appropriate sensitivity for purposes of estimating the industry OM&A PFP trend. The purpose of the TFP/PFP study is to measure industry productivity performance over time".

b. Please refer to the response to subpart (a).

c. The median annual OM&A PFP observation over the time horizon of 2005 to 2024 is approximately 0.02%. Please refer to Exhibit CLP-PBR-2A, TFP_Calc tab, cells BN16:BN34.

d. LEI did not perform a formal structural-break or outlier test for the TFP study. As explained in OCC-445 and OCC-446ii, LEI does not consider selective exclusion of individual observations as an appropriate basis for estimating the long-run industry productivity trend.