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Request from: Public Utilities Regulatory Authority

Question:

(WACC and X-FACTOR) Exhibit CLP-PBR-2, p. 38. LEI states that it used an average weighted-average cost of capital (WACC) of 6.05% in the implicit rental price formula for estimating the capital input price. Explain how LEI determined that 6.05% was the appropriate forward-looking WACC assumption, including all data sources and methodological steps. Explain how using a different WACC would change the implicit rental price formula and the resulting capital share used in the TFP analysis, including how these changes would affect the OM&A productivity (PFP) results. Include both the direction and magnitude of the changes.

Response:

LEI adopted a WACC of 6.05% based on the average of the annual WACC estimates calculated over the 2005–2024 study period. This approach provides a representative cost of capital based on the financing conditions observed over the period under examination in LEI's Industry TFP study. The underlying data sources are identified on page 38 of the TFP Study. For each year, WACC was calculated using the following formula:

$$WACC = (ROE \times Equity-to-Capital\ Ratio) + (Cost\ of\ Debt \times Debt-to-Capital\ Ratio \times (1 - Tax\ Rate))$$

Where:

ROE = Average allowed return on equity observed across a subset of electric distribution utilities for which data was available

Equity-to-Capital Ratio = Average allowed equity to capital ratio observed across a subset of electric distribution utilities for which data was available

Cost of Debt = Average of the 12 monthly observations of Moody's seasoned AAA corporate bond yield (not seasonally adjusted)

Debt-to-Capital Ratio = 1 minus the equity-to-capital ratio
Tax Rate = Average corporate tax rate across states

The resulting formula gave us a WACC for each of the 20 years. An average WACC of the 20 years was calculated to be 6.05%.

LEI applied a common WACC of 6.05% to all utilities and across all years in the Industry TFP Study covering 2005-2024. The 6.05% represents a historical industry-based estimate, rather than a utility-specific or annual WACC. The use of a common WACC across utilities and a constant WACC over the historical study period is an established approach in utility industry TFP studies,[1] as it promotes consistency and comparability in the measurement of capital input prices. This approach reduces fluctuations associated with differences in utility financing arrangements and year-to-year changes in financing conditions, allowing the Industry TFP Study to better identify underlying long-term productivity trends.

As stated in Exhibit CLP-PBR-2 (page 38), the average cost of debt is based on the average Moody's seasoned AAA bond yield (published by the Federal Reserve Bank of St. Louis).[2] Moody's AAA corporate bond yield over the historical period (2005-2024) averaged 4.33% and averaged 5.35% in 2025 and 5.59% in 2026 (Jan-Sep).[3] For comparison, the yield on 20-year-constant-maturity US Treasury securities, which serves as a benchmark for long-term risk-free interest rates, averaged 3.38%, 4.78%, and 4.99% over the same respective periods.[4] AAA corporate bond yields generally exceed comparable Treasury yields because they reflect additional credit and other risks associated with corporate debt. Both series were higher in 2025 and January-September 2026 than their respective historical averages, illustrating the difference between the long-term financing conditions reflected in LEI's Industry TFP Study and more recent market interest rates.

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[1] Examples of TFP Studies that have done this include: Christensen Associates' NSTAR Electric TFP Study (2022) (Source: Christensen Associates, Joint Direct Testimony of Mark E. Meitzen and Nicholas A. Crowley, NSTAR Electric, D.P.U. 22-22, Exhibit ES-PBR/TFP-1, January 14, 2022, Exhibit ES-PBR/TFP-1) and CEPA – New Zealand Electricity Distribution Productivity Study (2024) (Source: CEPA, EDB Productivity Study, June 24, 2024, EDB Productivity Study);

[2] The use of historical Moody's AAA bond yields in estimating a financing-return assumption also has precedent. In its 2022 TFP study for NSTAR Electric, Christensen Associates used the average Moody's seasoned AAA bond yield and average inflation over 2006–2020 to implement a constant forward-looking real-return assumption in its implicit rental-price calculation.

[3] Moody's, "Moody's Seasoned AAA Corporate Bond Yield [AAA]," *FRED*, Federal Reserve Bank of St. Louis, accessed October 20, 2026, https://fred.stlouisfed.org/series/AAA.

[4] Board of Governors of the Federal Reserve System (US), "Market Yield on U.S. Treasury Securities at 20-Year Constant Maturity, Quoted on an Investment Basis [GS20]," FRED, Federal Reserve Bank of St. Louis, accessed October 20, 2026, https://fred.stlouisfed.org/series/GS20.

The average regulatory-approved return on equity ("ROE") of US electric utilities was used as a proxy for the cost of equity.[5] The average ROE is based on 53 electric utilities from S&P Global's Regulatory Research ROE rate case dataset (historical). The financing-data sample was smaller than the 88-EDC productivity sample due to differences in data availability.

The average equity-to-total-capital ratio was calculated using historical authorized capital-structure[6] data for the same sample of 53 U.S. electric utilities from S&P Global's Regulatory Research Associates ("RRA") dataset. The corresponding debt-to-total-capital ratio was calculated as one minus the equity-to-total-capital ratio, assuming that total capital consists of debt and common equity. The average corporate tax rate is the average of all states corporate tax rates in a given year.

A higher WACC would, all else equal, increase the implicit rental price of capital and its relative expenditure share in the aggregate TFP calculation, while a lower WACC would have the opposite effect. The resulting impact on TFP growth would depend on the relative growth rates of capital and OM&A inputs, and its magnitude would require recalculation under alternative WACC assumptions. However, the OM&A PFP results would remain unchanged, as the OM&A PFP calculation considers only OM&A inputs and the relevant output measure, and does not incorporate the cost of capital.

[5] Using regulatory-authorized ROEs to inform the cost-of-capital assumption also has precedent in utility TFP studies. For example, Ankura's 2024 TFP study for Public Service Company of New Hampshire used authorized ROEs obtained from S&P's RRA together with company-specific debt costs. (Source: Agustin J. Ros/Ankura, Total Factor Productivity and the X-Factor for Use in PSNH PBR Plan, Docket DE 24-070, Attachment ES-AR-1, June 11, 2024)

[6] The use of a representative, regulatory-informed capital structure has precedent in utility industry TFP studies. For example, Pacific Economics Group's 2013 Ontario electricity distribution TFP study applied a standardized capital structure based on the Ontario Energy Board's deemed capital structure, although the methodology used to derive the capital-structure assumption differs from LEI's approach. [Source: Pacific Economics Group Research, LLC, Productivity and Benchmarking Research in Support of Incentive Rate Setting in Ontario: Final Report to the Ontario Energy Board (Madison, WI: Pacific Economics Group Research, LLC, November 2013)]