Date Filed: October 09, 2026

Witness: Julia Frayer
Request from: Public Utilities Regulatory Authority

Question:

(OM&A PFP AND S-FACTOR) Exhibit CLP-PBR-3. LEI's econometric benchmarking model uses customer count as the principal measure of utility output.

a. Identify any alternative or additional output or scale measures LEI considered, including delivered energy and peak demand, or a combination of all three (i.e., delivered energy, peak demand, and customer count), and provide the results of any such specifications that were estimated.
b. If LEI did not evaluate alternative output or scale measures, re-estimate the preferred OM&A benchmarking model using reasonable alternative or additional measure of utility output or scale and provide the resulting Company benchmarking results.

Response:

a. In developing the econometric benchmarking models, LEI considered and tested several alternative measures of utility scale, including customer count, delivered energy sales, and specifications that included both customer count and delivered energy sales. The data was readily available for these variables across time and all EDCs and reliable. As described in LEI's response to OCC-444[i], LEI selected customer count as the preferred specification based on statistical performance, economic reasonableness, and parsimony.

   The OM&A cost model includes the natural logarithm of customer count, which has a coefficient of approximately 0.870 and is statistically significant. This result is consistent with the economic relationship that utilities serving more customers generally incur greater operating, maintenance, and administrative costs.

   Results for preliminary tests using delivered energy sales, either in place of or in addition to customer count, were not retained, as stated in response to OCC-444. Accordingly, LEI does not have additional regressions results to provide at this time.

   LEI did not estimate a specification using peak demand because such data is not available to LEI's knowledge, for all 88 utilities over time in FERC Form 1 or EIA data sets.

b. Not applicable. As discussed in response to subpart (a), LEI evaluated alternative scale measures, including delivered energy sales and specifications incorporating both customer

count and delivered energy sales. Accordingly, the condition in subpart (b)—"if LEI did not evaluate alternative output or scale measures"—does not apply.

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[i] OCC-444 Question:

Exhibit CLP-PBR-1 PBR Testimony Please provide the complete econometric specification and diagnostic testing underlying each preferred benchmarking model, including:

a. Whether the model is pooled OLS, fixed-effects, random-effects, or another panel-data specification;
b. The basis for the selected panel-data specification and the results of any specification tests performed;
c. How the models account for utility-specific unobserved heterogeneity;
d. How standard errors account for repeated observations for the same utility over time, including whether standard errors are clustered at the utility level;
e. Results of tests for serial correlation, heteroskedasticity, multicollinearity, influential observations, and model specification error; and

All alternative model specifications tested and the resulting the Company benchmarking results under each specification.

OCC-444 Response:

a. The statistical cost models developed for the econometric benchmarking analysis use a pooled ordinary least squares ("OLS") specification, as shown in Exhibit CLP-PBR-3B.

b. LEI selected a pooled OLS specification because of its cross-sectional properties. Panel treatment allows for development of explanatory relationships on cost functions based on both variation across utilities and time. LEI used a sample of 88 utilities over a 10-year period resulting in a balanced panel dataset with 880 total observations. Econometric analysis benefits from having a sufficiently large number of observations, as this improves the precision and reliability of the statistical estimates.

c. LEI's benchmarking model controls for various observable utility-specific cost drivers through selected, economically intuitive, independent variables that represent business drivers/operating characteristics. Subsequently, any remaining differences in cost performance that are not explained by those observable characteristics, i.e. "utility-specific unobserved heterogeneity," are reflected in the model's residual values. For benchmarking purposes, this residual is used as the measure of relative cost performance, representing the extent to which a utility's actual costs differ from the costs predicted by the model given the utility's own circumstances related to its scale, input prices and network characteristics, and the impact that those business drivers are expected to have on cost (based on fitted values developed from analysis across the industry).

d. In developing the econometric equation with fitted values for each cost function, LEI used heteroskedasticity-robust standard errors (vce (robust)), rather than standard errors clustered by utility.

e. The table below summarizes the various tests that LEI performed on the regressions for the three cost models. LEI did not separately test for influential observations, which assess whether individual observations disproportionately affect the regression estimates, or for model specification error, which assesses whether the assumed model form may be mis-specified.

	OM&A model	Total Cost model	Capital Cost model
Serial correlation	Wooldridge F = 2.671; p = 0.1058	Wooldridge F = 3.523; p = 0.0639	Wooldridge F = 319.424; p = 0.0000
Heteroskedasticity	Breusch-Pagan χ^2 = 7.47; p = 0.0063	χ^2 = 0.01; p = 0.9054	χ^2 = 37.55; p = 0.0000
Multicollinearity	Mean Variance Inflation Factor ("VIF") = 1.61; max = 2.22	Mean VIF = 156.98; Ln_Customers_sq = 540.14; Ln_Customers = 539.91	Mean VIF = 156.98; Ln_Customers_sq = 540.14; Ln_Customers = 539.91
Model Selection Criteria	AIC = 477.00; BIC = 500.90	AIC = -179.14; BIC = -140.90	AIC = 170.44; BIC = 208.68

f. During the initial phases of constructing an econometric model, LEI considered and tested a range of alternative explanatory variables for each const function, which were selected based on economic intuition and their potential relevance to utility cost performance. Various combinations of these variables were also assessed as part of the specification process. LEI generally found that other variables initially considered were not statistically significant for the chosen time period and sample of utilities and were therefore not retained in the final model specifications. LEI did not retain workpapers for these initial tests as these other candidate variables were ultimately not reflected in the final model specification.