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Networks Benchmarking Team
Australian Energy Regulator
Via email: AERInquiry@aer.gov.au

Dear Networks Benchmarking Team:

Technical issue with the AER's econometric opex cost function benchmarking models – Submission to Quantonomics' memorandum

AusNet welcomes the opportunity to provide this submission to the Australian Energy Regulator's (AER) memorandum on options to address an ongoing technical issue with some of the AER's econometric opex cost function benchmarking models.

We make the following submission in response to the questions Quantonomics sought input on in its memorandum regarding the development of opex cost function models:

(a) Whether jurisdictional time trend models such as tested in sections 2 and 3 are the most appropriate way of including flexible time trends or whether there are better alternatives. For example, DNSP-specific time trends models discussed in section 4.2, or other possible options and, if so, what those options might be.

AusNet supports the introduction of Jurisdictional Time Trend (JTT) models as an improvement over standard models, as they improve the previously observed monotonicity violation problem and omitted variable bias.

This is because:

- The incorporation of jurisdiction-specific trends better reflects differences in regulatory frameworks and technological advancements across jurisdictions, recognising that DNSPs in different regions experience different conditions.
- The estimation results in Section 2 confirm that jurisdictional time trends are an omitted variable in existing specification, as their inclusion improves model fit (higher pseudo-adjusted R-square) and reduces monotonicity violations, with the Wald test rejecting the assumption of uniform trends across jurisdictions.

We also consider the JTT model is theoretically superior to the ATT model as it allows for jurisdiction-specific trends compared to ATT which groups Canadian and New Zealand DNSPs under one single time trend. Empirically, JTT exhibits fewer monotonicity violations and achieves a better model fit.

We consider that incorporating DNSP-specific time trends could, in theory, further improve the model by capturing firm-level variations, yet there are potential challenges associated with a more flexible time trend specification.

These include:

- **Multicollinearity,** as highly correlated time trends across DNSPs within the same jurisdiction could inflate standard errors and reduce the reliability of parameter estimates.
- **Overfitting** may arise if the model assigns excessive flexibility to individual DNSPs, making efficiency scores more sensitive to short-term fluctuations rather than long-term trends.
- **Degrees of freedom constraints** could become an issue, particularly given the limited number of DNSPs in the dataset, potentially reducing the statistical power of the estimates.

A direct comparison with the JTT model, assessing relative model fit, stability, and monotonicity compliance, would be necessary to determine whether DNSP-specific time trends a further refinement in time trend specification.

We note that while jurisdictional time trends capture some changes in omitted OEFs over time, they do not account for all effects of omitted OEFs. Specifically, they do not address cross-sectional differences in omitted OEFs across DNSPs, meaning omitted variable bias remains due to unaccounted OEF variations. In particular, the current benchmarking models omit key variables related to terrain and severe storms, which can significantly impact DNSPs' operating costs. Steeper and more difficult to access terrain leads to higher operating and maintenance costs and longer restoration times, yet these factors are not adequately captured in the existing framework. Likewise, DNSPs in regions prone to frequent and severe storms face higher costs such as emergency response and preparedness costs, which are not reflected in the models. As highlighted in our benchmarking proposal, storm-related cost pass-through data could provide a more accurate measure of these impacts.

We also note that we previously submitted a benchmarking proposal as part of our EDPR regulatory proposal for the upcoming 2026-31 Regulatory Period, highlighting outstanding issues such as the treatment of GSLs, storm risk, and model specification concerns. These issues remain unresolved by the inclusion of Jurisdictional time trends.

(b) Whether the jurisdictional time trend models are a step forward but remain incomplete due to their lack of accounting for time varying inefficiency.

While we consider that the JTT models represent an improvement by better capturing regional trends, yet they remain incomplete due to their assumption of time-invariant inefficiency.

The JTT models as proposed conflate time-varying inefficiency with technical change, as the time trend is assumed to capture all systematic shifts in costs. However, empirical evidence suggests that inefficiency has varied over time, particularly in Australian DNSPs, as reflected in upward trends in Total Factor Productivity (TFP) since 2015, largely driven by opex efficiency improvements. Additionally, in practice, we know that a DNSP’s efficiency is dynamic, evolving over time due to factors such as:

- Regulatory incentives, including efficiency carryover mechanisms and incentive-based regulation.
- Network investment cycles and operational improvements, affecting opex efficiency.
- Technological advancements, such as automation and digital asset monitoring, leading to long-term cost reductions.

This implies that the inefficiency component of the JTT models should not be treated as static, and instead, should be separately identified from technical change. Failing to incorporate time-varying inefficiency introduces bias into efficiency scores and cost elasticity estimates. A more complete specification would distinguish between:

- **Frontier shift** (pure technical progress), reflecting industry-wide improvements in operational efficiency.
- **Efficiency "catch-up"** (time-varying inefficiency), capturing firm-specific improvements or deteriorations relative to the frontier.

We support the memorandum's recognition of this issue as a potential source of model misspecification and agree that further research is needed to distinguish technical change from inefficiency trends, particularly in Stochastic Frontier Analysis (SFA) models.

We agree that dynamic inefficiency models such as Battese & Coelli (1992) or Cuesta (2000) frameworks discussed in section 4.2.2 are possible future refinements that could be explored, which allow inefficiency to evolve over time rather than remain fixed. However, we note these approaches pose identification challenges, as technical change and efficiency shifts may be highly correlated, making it difficult to estimate both effects separately.

(c) The challenges of incorporating time varying inefficiency, and whether suitable approaches exist for addressing these.

While time-varying inefficiency models offer a more dynamic representation of efficiency evolution, they also introduce estimation complexities and identification challenges.

We agree with the key challenges acknowledged in the Memorandum, including:

- **Identification Issues** – Separating technical change (frontier shift) from efficiency improvements (catch-up) is difficult.
- **Multicollinearity** – Introducing an additional time-varying inefficiency term alongside a jurisdictional or DNSP-specific time trend increases the risk of multicollinearity, particularly in Translog models where interaction terms are already numerous.
- **Estimation Complexity** in SFA Models – Time-varying inefficiency models within SFA frameworks require additional parameters, making estimation computationally demanding and potentially unstable.
- **Data Limitations and Degrees of Freedom** – Benchmarking models rely on a limited number of DNSPs across jurisdictions. Increasing model complexity by allowing for time-varying inefficiency at the firm level could lead to overfitting and loss of statistical power.

We therefore note that any further refinements incorporating time-varying inefficiency should be closely examined and rigorously tested, ensuring they do not introduce estimation instability or identification issues. In particular, such models should be empirically compared with the JTT models to assess whether they provide meaningful improvements in efficiency estimation before being considered for adoption in regulatory benchmarking.

(d) Whether the potential issue with the measurement of Ontario circuit length has been adequately tested and whether stakeholders agree with the conclusion that there is no evidence of systematic differences in the effects of circuit length on Opex for Ontario DNSPs

AusNet agrees with the memorandum's conclusion that there is no systematic evidence of measurement bias in Ontario's circuit length data. The empirical tests undertaken, including interaction terms and robustness checks, indicate that circuit length does not exert a materially different effect on opex for Ontario DNSPs.

Given the importance of data integrity, we support continued validation in future benchmarking studies to ensure that circuit length remains a reliable variable in cost modelling.

Please do not hesitate to contact Frank Hu, Regulatory Economist [redacted] about this submission.

Sincerely,

[redacted]

Manager, Regulation (Electricity Distribution)
AusNet