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By email: [redacted]

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Dear Claire

Feedback on the Draft 2022 Annual Benchmarking Report

Jemena Electricity Networks (Vic) Ltd (**JEN**) welcomes the opportunity to provide feedback on the Australian Energy Regulator's (**AER**) draft 2022 Annual Benchmarking Report (**draft report**) for Distribution Network Service Providers (**DNSPs**). We also welcome the AER's review of the Translog models used for benchmarking assessment.

In our previous submission to the AER we raised concerns with AER's approach to exclude Translog models based on monotonicity test.[1] In this submission, we share further analysis on Translog models that illustrates that the process of excluding models (when there is monotonicity violation) materially underestimates the actual problem with these models. We provide our analysis in more detail in the **Annexure**. In light of this analysis, we recommend that the Translog models are not used for benchmarking assessment and regulatory decision making.

We request the AER to consider the feedback provided in the Annexure in its review of Translog models and welcome any further queries. Please contact Jerrie Li on [redacted] or [redacted] if you would like to discuss this feedback.

Yours sincerely

Sandeep Kumar

Sandeep Kumar
Group Manager Regulatory Analysis and Strategy

[1] JEN, *Response to 2021 preliminary benchmarking results - 17 September 2021*

Annexure

Introduction

Two of the four econometric benchmarking models used by the AER, based on the Translog function form, have been beset with the issue of monotonicity. Monotonicity issue/violation occurs when opex is decreasing with increase in one or more cost driver which violates general principles on the relationship between cost and its driving factors.[2]

> *This property requires that an increase in output can only be achieved with an increase in cost, holding other things constant.*

The AER's practice has been to only exclude Translog models from its benchmarking assessment where a DNSP's cost drivers place it on a point of the cost function where there is a negative relationship between cost and cost drivers.

JEN has previously highlighted the problems arising from inclusion and exclusion of Translog models based on the monotonicity test.[3] We have now conducted further analysis and found that even when monotonicity conditions are satisfied for some DNSPs in some years, the Translog models still do not produce reasonable results.

Current monotonicity test

In the 2020 benchmarking exercise, the AER dropped Translog models for two of the thirteen DNSPs based on the 2006 to 2019 data and seven of the thirteen DNSPs based on the 2012 to 2019 data.[4]

In the 2021 benchmarking exercise, the AER dropped Translog models for three of the thirteen DNSPs based on the 2006 to 2020 data and all thirteen DNSPs based on the 2012 to 2020 data.[5]

In the most recent 2022 benchmark exercise, the AER dropped all estimates for SFA TL and five of the thirteen DNSPs for LSE TL based on the 2012 to 2020 data.[6]

Even though the AER has dropped estimated efficiency results that face monotonicity violations, the approach adopted by the AER fails to address the impact of monotonicity on a wider range of estimates under the same model.

We explain below why satisfying the monotonicity condition does not mean that the relevant observations are unaffected by the monotonicity violations along the Translog curve. That is, the current procedure materially underestimates the range of circumstances in which monotonicity creates potential bias in the estimation results.

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[2] Quantonomics, *Economic Benchmarking Results for the Australian Energy Regulator's 2022 DNSP Annual Benchmarking Report - 3 October 2022*, Pg. 32

[3] JEN, *Feedback on the draft 2021 Annual Benchmarking Report*, 27 October 2021

[4] Economic Insights, *Economic Benchmarking Results for the Australian Energy Regulator's 2020 DNSP Annual Benchmarking Report, 13 October 2020*, Section 3.2

[5] Economic Insights, *Economic Benchmarking Results for the Australian Energy Regulator's 2021 DNSP Annual Benchmarking Report*, 11 October 2022, Section 3.2

[6] Quantonomics, *Economic Benchmarking Results for the Australian Energy Regulator's 2022 DNSP Annual Benchmarking Report*, 3 October 2022, Section 3.2.1

The current test focuses solely on the curvature of the cost function at the point at which the DNSP sits. However, failure of monotonicity near (or even far) from that point can still make the estimate for a DNSP unreliable. This is because the entire shape (curvature) of a cost curve is affected by monotonicity violations.

Illustration of the actual monotonicity issue

Figure 1 below shows the relationship between the modelled efficient opex and customer numbers for JEN under LSE TL (2006-21). The orange dot represent JEN's position on this curve.[7] Based on the monotonicity test, the LSE TL model will be included for JEN when the dot sits within the green area where opex increases with customer numbers, but excluded when the dot sits in the red area when opex decreases with customer numbers.

However, when the dot is very close to the top of this curve, like JEN this year, the model estimates that an increase in customer numbers leads to minimal increase in opex. This result is as unreasonable as a monotonicity violation. It significantly underestimates the incremental opex required to serve additional customers. However, as this point still satisfies the monotonicity criteria, LSE TL is still included in the AER's benchmarking assessment for JEN. It effectively punishes JEN for being close to the monotonicity violation range but not yet hitting the tipping point.

Figure 1: JEN's efficient opex and customer number relationship under LSE TL (2006-21)

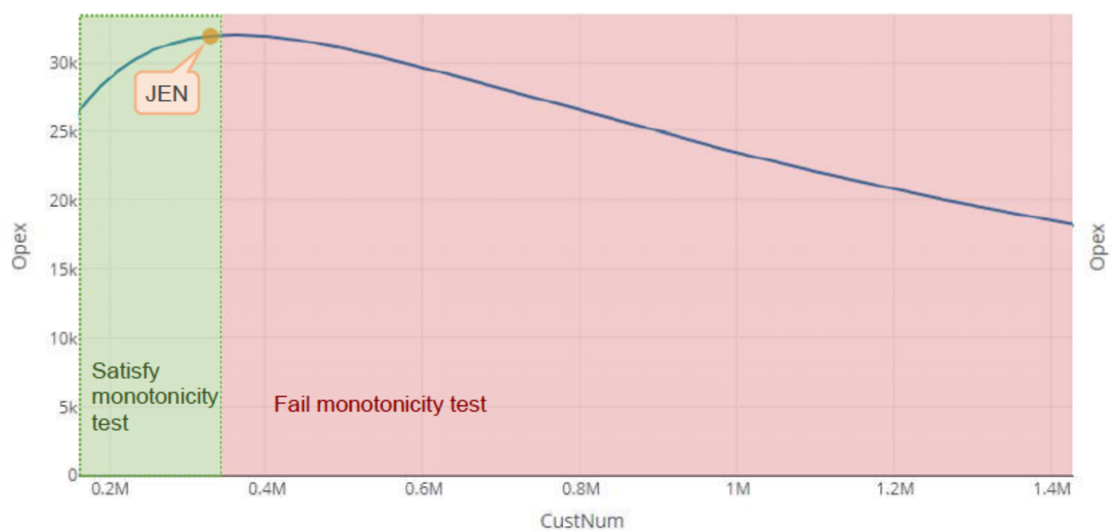


Chart note: The blue line in this chart shows the estimated relationship under LSE TL (2006-2021) between modelled efficient opex (at 100% efficiency score) and customer numbers, holding the circuit length and ratcheted maximum demand constant at JEN's average level over 2006-21. The orange dot shows JEN's position with the average customer numbers, circuit length and ratcheted maximum demand over 2006-21.

In the LSE TL over the short sample period (2012-21), JEN's position (orange dot below) has just passed the top of the curve and failed the monotonicity test, as shown in Figure 2 below. In this case, LSE TL is excluded for JEN.

[7] JEN's position means a point on the curve with JEN's average customer numbers, circuit length and ratcheted maximum demand over 2006-21

Figure 2: JEN's efficient opex and customer number relationship under LSE TL (2012-21)

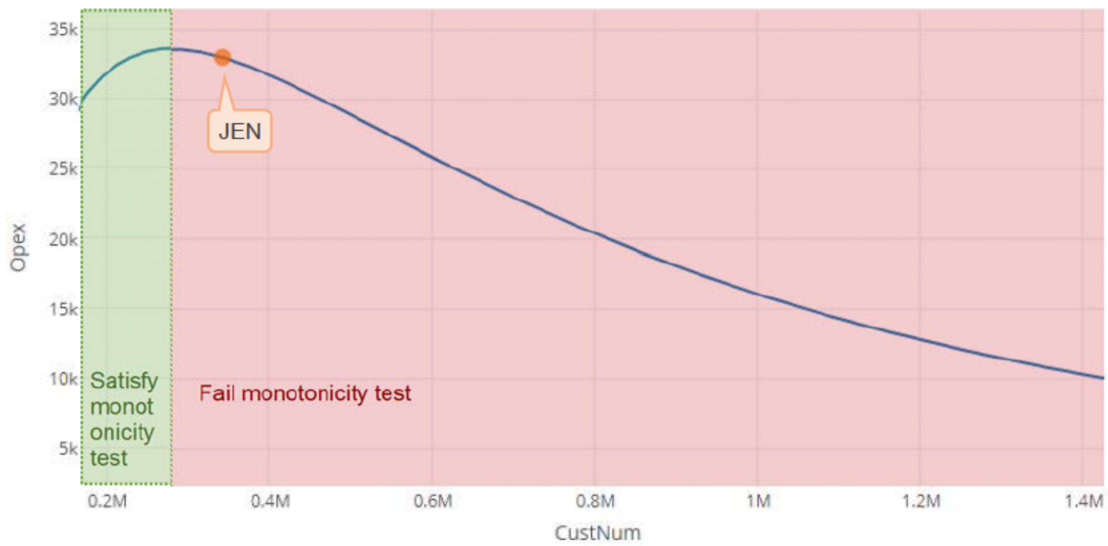


Chart note: The blue line in this chart shows the estimated relationship under LSE TL (2012-2021) between modelled efficient opex (at 100% efficiency score) and customer numbers, holding the circuit length and ratcheted maximum demand constant at JEN's average level over 2012-21. The orange dot shows JEN's position with the average customer numbers, circuit length and ratcheted maximum demand over 2012-21.

In our view, both short sample (2006-21) and long sample (2012-21) LSE TL models produce unreasonable results for JEN and therefore should be excluded from the AER's benchmarking assessment. Although the data points left to the curve and close to the top satisfy the monotonicity condition, it assumes that opex is nearly constant with increase in customer numbers, which is not reasonable. The range where the Translog models produce unreasonable results therefore extends beyond the monotonicity violation part of the curve.

Both figures 1 and 2 above show that the LSE TL relationship between opex and its cost drivers is unreliable in general. Opex is only increasing with customer numbers for a very small proportion of data. For the majority of the customer numbers, the estimated model predicts that opex is decreasing with customers.

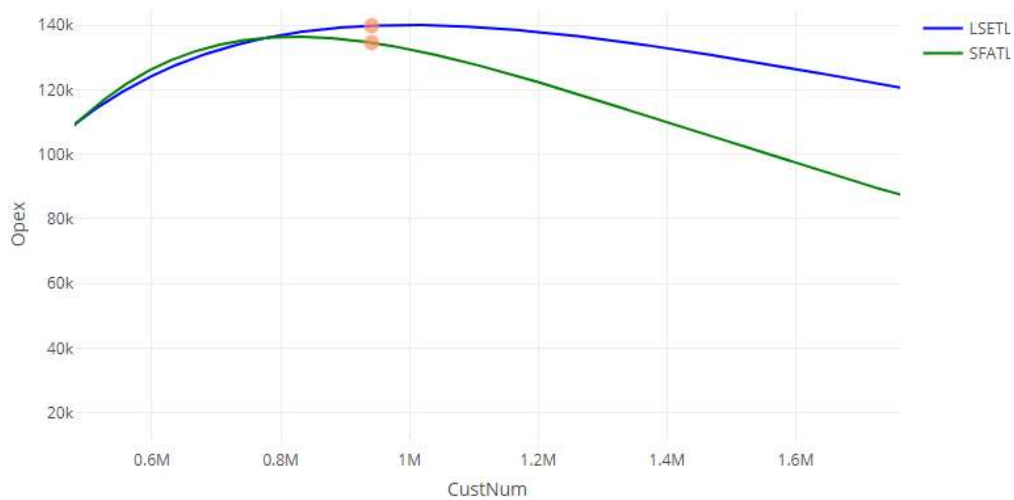
This issue with Translog models also holds true for other DNSPs.

Endeavour

Figure 3 below shows how the estimated efficient opex varies as customer numbers is varied holding circuit length and ratcheted maximum demand constant. The orange dot in Figure 3 represents estimated efficient opex for a firm that had the same customer number, circuit length and ratcheted maximum demand as the average for Endeavour over the estimation period.

The shape of curve under both models are very similar in that opex is decreasing on customer numbers when customer numbers are large enough. However, because the downward sloping component of LSE TL occurs slightly later than SFA TL, SFA TL fails the monotonicity test whereas LSE TL passes the test. Although LSE TL satisfies the monotonicity condition, it is in the area where the curve flattens in order to start its downward path. This LSE TL result cannot be considered reasonable for benchmarking assessment.

Figure 3: Endeavour's efficient opex and customer number relationship under both LSE TL (2012-21) and SFA TL (2012-21)

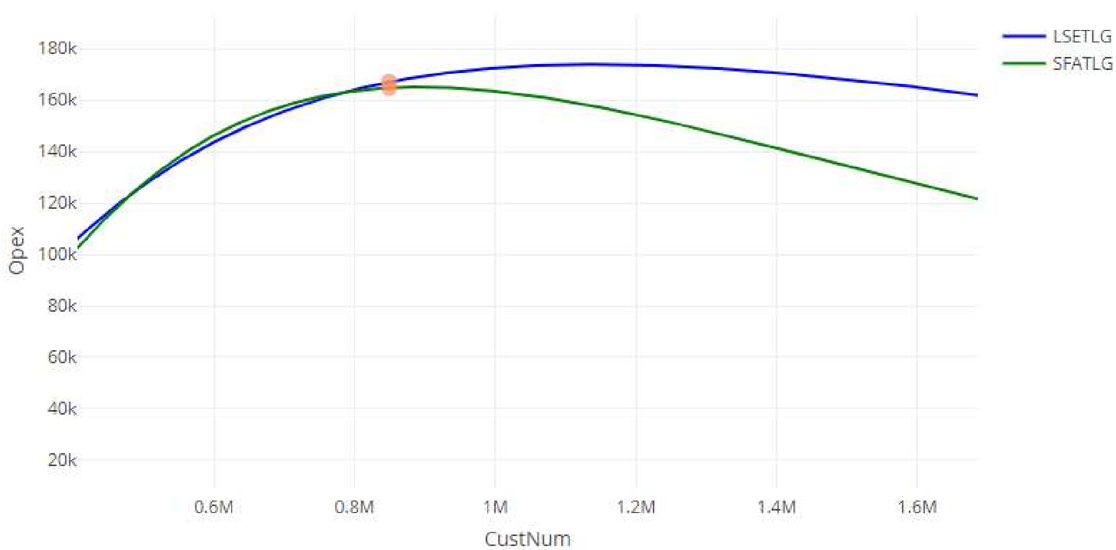


SA Power Networks (SAPN)

For SAPN, the orange dots under both LSE TL and SFA TL models satisfy the monotonicity conditions, as shown in Figure 4 below. They are both very close to the top of the curve and sits on the upward sloping part of the curve. The AER's monotonicity test will therefore not find a problem when examining a firm with SAPN's average customer number, circuit length and ratcheted maximum demand.

However, this is where the curve is about to enter into the downward slope. As a result, even though SAPN's results do not violate monotonicity condition, it is affected by the downward trajectory as customer numbers increase further.

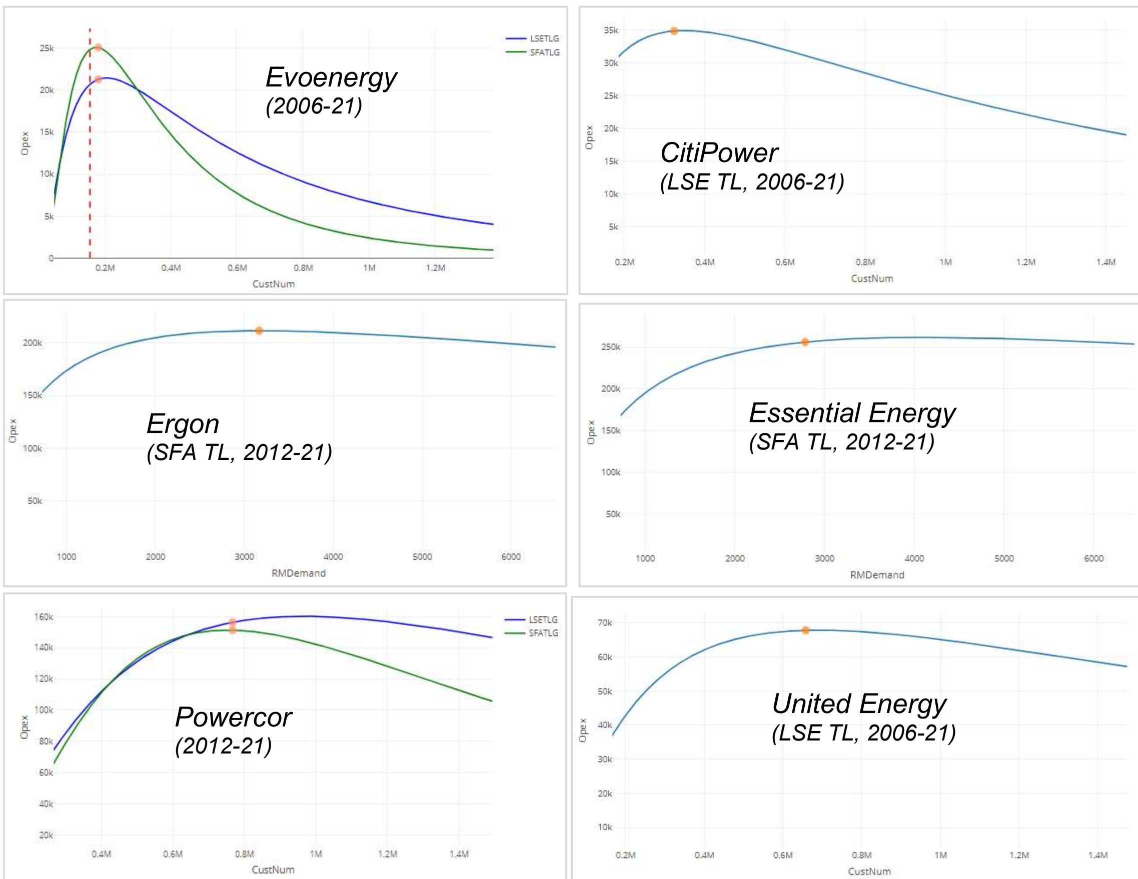
Figure 4: SAPN's efficient opex and customer number relationship under both LSE TL (2012-21) and SFA TL (2012-21)



Other impacted DNSPs

Similar issues where the opex remains almost unchanged with increase in cost drivers are also present for Evoenergy, CitiPower, Ergon, Essential Energy, Powercor and United Energy across LSE TL and SFA TL models, as shown in Figure 5 below.

Figure 5: DNSPs' efficient opex and cost driver relationships under LSE TL and SFA TL



This illustration highlights the problem that applying the current monotonicity test cannot identify a much bigger problem in the Translog curve in relation to the extended range beyond the section violating the monotonicity condition. It is unreasonable to assume that the issue only occurs as soon as the slope turns negative.

Furthermore, in the Quantonomics memo accompanying this year's draft benchmarking report, it found that the Translog models do not improve the goodness-of-fit of Cobb-Douglas models.[8] This highlights the fact that the Translog models add little value to the benchmarking assessment compared to using only Cobb Douglas models.

Recommendation

We therefore recommend the AER exclude Translog models and rely only on Cobb Douglas models for its benchmarking assessment and regulatory decision making.

[8] Quantonomics, *Memorandum on Opex Cost Function Development – 7 October 2022*, Pg. 3