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Mr Matthew Thomas
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By email: [redacted]

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Dear Matthew

Ausgrid submission on the review of TFP and MTFP non-reliability output weights

Ausgrid welcomes the AER commissioning CEPA to conduct an independent review of the process used to estimate the non-reliability output weights used to construct the Productivity Index Number (**PIN**) models reported in the Annual Benchmarking Reports.

Whilst these models do not drive DNSPs' operating expenditure (opex) allowances directly, DNSPs pay close attention to movements in the Multilateral Partial Factor Productivity (**MPFP**) and Multilateral Total Factor Productivity (**MTFP**) indices. These indices provide valuable information about the productivity of DNSPs over time, and also the efficiency of DNSPs relative to peers at any given point in time. For this reason, senior management and Boards of DNSPs use these indices to track DNSP performance and to inform their decisions about resource allocation and future expenditure.

Because they influence decision-making within DNSPs, it is critical that the MPFP and MTFP indices provide the most accurate picture possible of efficiency over time and relative to other DNSPs. If these indices provide an inaccurate picture of efficiency, that could lead to poor decision-making about future expenditure, which may be to the detriment of consumers.

Our analysis indicates that the MPFP and MTFP indices can be highly sensitive to the output weights employed when constructing those indices. Hence, we support the AER commissioning an independent study to investigate whether the method used to estimate the non-reliability output weights used to compile these indices is sound.

Please refer to the Attachment for our comments on CEPA's key review findings and recommendations. If you would like to discuss any aspect of our submission, please do not hesitate to contact me.

Regards,

[redacted]

Fiona McAnally
Head of Regulation

Attachment: Comments on CEPA's key findings and recommendations

Accuracy of existing output weight estimates

CEPA confirms that it is able to more or less replicate independently the AER's existing estimates of non-reliability output weights, derived using data between 2006-2018. CEPA obtains these findings using a different numerical routine to the one used originally by Economic Insights to derive the existing (corrected) output weight estimates in 2020. We consider that this provides a high degree of confidence that the existing output weight estimates are free of any obvious calculation errors.

Need to update output weights over time

The existing output weights are derived using data up to 2018. However, five additional years of data are now available, which could be used to update the existing estimates. Given the data used to estimate the existing output weights is now dated, we consider it appropriate for the AER to update the non-reliability output weights using all of the data currently available. This issue was not explored by CEPA.

When updating output weights for new information, the AER should recast the PINs over the historical period so that the indices reflect a common set of output weights over the whole period. This would aid comparison of these indices over time.

The AER indicated in last year's benchmarking report that it prefers to update the non-reliability output weights periodically every five years. Ausgrid considers that more frequent updating would be appropriate, in order to reflect the latest information available, provided that the PINs are recast historically using the updated weights. Allowing the output weights to reflect outdated information could result in distorted MPFP and MTFP indices, and result in DNSPs making ill-informed expenditure decisions.

Linearisation of time trend

CEPA recognises that estimation of the Leontief cost function can be complicated by the non-linear nature of the model, which requires the use of numerical routines to identify solutions to an optimisation problem. One of the practical challenges that CEPA identifies is that these numerical approaches can inadvertently identify 'local' rather than 'global' optima, resulting in the coefficients of the Leontief model being mis-estimated. This, in turn, would result in mis-estimated output weights.

To solve this problem, CEPA recommends that the AER linearise the time trend component of the model, as this would make the model easier to estimate, and mitigate the risk of erroneously identifying a local, rather than global, optimum.

Whilst possible in principle, Ausgrid has seen no evidence that the issue that CEPA seeks to address by linearising the specification of the Leontief model arises in practice. Nor has CEPA presented any such evidence.

In the absence of such evidence, we consider the AER should avoid making unnecessary changes to the specification of the cost function used to estimate the output weights.

Moreover, the linearised model that CEPA proposes could no longer be interpreted as a Leontief cost function. The generalised Leontief cost function implies that a firm's inputs (i.e., costs) increase in fixed proportion to its outputs. This theoretical underpinning would no longer hold under CEPA's proposed modification of a linearised time trend.

Ausgrid does not support the adoption of CEPA's proposed linearised model, unless there is clear evidence that there is a material risk of misestimation of the model due to identification of a local rather than global optimum.

Minimisation of Mean Absolute Deviations

CEPA also notes that it is theoretically possible to find multiple solutions in terms of the parameters of the Leontief cost function, for a given optimum value for the estimated objective function.

Consequently, CEPA states that this problem could be addressed by changing the minimisation criteria from least squares to a sum of absolute deviations. This approach is sometimes referred to as the Least Absolute Deviations (**LAD**).[1] The LAD approach is usually employed if the dataset includes large outliers. In the absence of such outliers, or practical evidence that the Leontief cost function suffers from non-unique parameter estimates, our view is that there is no strong case to adopt CEPA's recommendation to adopt a LAD approach.

Direct cost benchmarking

Although not within the scope of the review sought by the AER, CEPA recommends that the AER consider a 'direct cost benchmarking' approach.

Based on our understanding of CEPA's proposal, direct cost benchmarking would involve the AER estimating a specified cost function for each DNSP, and then using that fitted model directly to estimate an efficient level of opex for the DNSP in a given year (e.g., the base year).

This would remove the need to use the estimated parameters from the cost function to derive the output weights that are used to construct the PINs. In other words, under this approach, the MPFP and MTFP indices would become superfluous, since the estimated cost function could be used directly to set a DNSP's opex allowance.

As explained above, DNSPs use results from the MPFP and MTFP models to track their efficiency performance over time, and relative to their peers, and use this information as an input to planning decisions about resource allocation and future expenditure.

These models (in particular the opex MPFP model) play an important role as a cross-check on the outcomes from the AER's opex benchmarking models, which are used to set DNSPs' opex allowances.

We therefore do not support an approach that would result in abandonment of the PINs in favour of direct cost benchmarking.

Other issues not raised by CEPA

CEPA's report did not consider two important issues that have a material impact on reliable estimation of non-reliability output weights:

- **Multicollinearity.** A number of output variables specified as explanatory variables in the Leontief cost function are highly correlated with one another.[2] This gives rise to a statistical problem known as multicollinearity, whereby the coefficients on highly correlated explanatory variables cannot be estimated reliably. This is because the statistical model cannot reliably separate the effect exerted by individual colinear output variables on the input variable. When this occurs, the resulting estimates of the output weights will also be unreliable. This, in turn, will distort the performance of individual DNSPs in the PINs, because some output will be either overweighted or underweighted.

[1] The AER has previously used the LAD approach to derive beta estimates, to inform its overall estimate of the allowed rate of return for network service providers.
[2] Whilst the degree of correlation, and the variables that exhibit high degrees of pairwise correlation, vary between DNSPs, the data used by each of the individual DNSP Leontief functions estimated by the AER exhibit strong collinearity between explanatory variables.

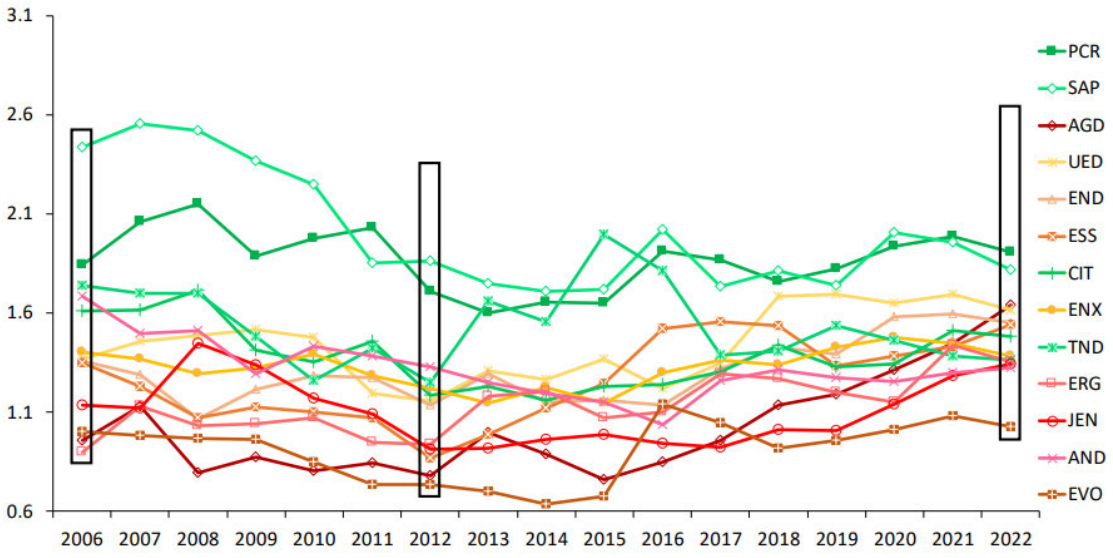
Whilst there is no straightforward solution to this multicollinearity problem, it is important that this be recognised as a serious limitation of the PINs, so that stakeholders can interpret the outcomes implied by those indices with appropriate caution.

- **No recognition of non-linear changes in opex over time.** CEPA makes a very strong assumption that DNSPs' opex changes linearly over time, all else remaining equal. In fact, the historical data show that some DNSPs have reduced their opex very materially in response to the AER's regulatory framework. This is evident, for example, from the opex MPFP indices presented in the 2023 Distribution Annual Benchmarking Report (reproduced below). Most of the movement in these indices reflect (very non-linear) changes in opex.

  The AER's existing Leontief model is not sufficiently flexible or well-specified to account for these non-linearities. Nor would CEPA's modified (linearised) model be capable of modelling the non-linear movement in opex over time. This mis-specification problem (which also affects the AER's econometric benchmarking models used to assess the efficiency of base year opex) will result in incorrect output weight estimates.

  To obtain reliable output weight estimates, we consider the AER should address the strong non-linearity in DNSP opex over time.

Figure 13 DNSP opex MPFP indexes under the preferred approach to addressing capitalisation differences, 2006–2022



Source: Quantonomics; AER analysis. Note: These results do not reflect the impact of a range of material OEFs (see Section 7).