AUSTRALIAN ENERGY REGULATOR

GPO Box 3131
Canberra ACT 2601
Telephone: (02) 6243 1233
Facsimile: (02) 6243 1205
www.aer.gov.au

Consumer Challenge Panel

CCP Sub-Panel No. 9

24/05/2017

AER Board
Mr Evan Lutton, Assistant Director, Networks
Mr Adam Petersen, Co-ord Director
Mr Andrew Ley, Co-ord Director
Australian Energy Regulator
By email: adam.petersen@aer.gov.au Cc: ccp@aer.gov.au

Dear Paula,

Re: Issues Paper – Transmission Benchmarking Review

Please find attached our submission in relation to the above project.

Kind Regards,

Eric Groom

Consumer
Challenge
Panel

Submission to the Australian Energy Regulator (AER)

Consumer Challenge Panel Sub-Panel 9

Response to Issues Paper – Transmission Benchmarking Review

Sub-Panel 9

Eric Groom

Bev Hughson

Andrew Nance

24/05/2017

Executive Summary

CCP9 has been invited to make a submission to the AER in response to an Issues Paper prepared by Economic Insights.[1]

The objective of the CCP is to:

- advise the AER on whether the network businesses' proposals are in the long term interests of consumers; and,
- advise the AER on the effectiveness of network businesses' engagement activities with their customers and how this is reflected in the development of their proposals.

CCP 9 has reflected on its reviews of recent regulatory proposals from Transgrid and ElectraNet in preparing this submission.

In this section of our advice to the AER we summarise the issues of interest to CCP 9 and our recommendations. The Summary and subsequent Advice is split into two sections to reflect the two CCP objectives: consumer engagement and the long term interests of consumers.

A. CONSUMER ENGAGEMENT

This section of our submission discusses the characteristics of economic benchmarking and the role and use of economic benchmarking in regulation from a consumer perspective. Subheadings are:

- Benefits of a top-down benchmarking approach
- Focus on outputs that are provided to and valued by customers
- Role and use of economic benchmarking
- Relative efficiency or sector-wide productivity trends
- Observations from TransGrid's 2018-23 Regulatory Proposal
- Observations from ElectraNet's 2018-23 Regulatory Proposal
- Implications for Economic Regulation of TNSPs

We support the use of economic benchmarking amongst the techniques employed in a regulatory determination. It is particularly useful in the context of the propose-respond regulatory model. However, at a practical level, the scope and nature of the use of the economic benchmarking approach should reflect the uncertainty inherent in the results.

In summary:

- Effective *economic* benchmarking can inform the assessment of productive efficiency. Assessment of the allocative and dynamic efficiencies of TNSP performance may be best informed by both quantitative and qualitative benchmarking.
- We support the consideration of multiple economic models as well as the preferred model specification. Considering multiple output specifications would increase confidence in observed trends and reduce the incentive for TNSPs to defer to alternate specifications when it is their interest to do so.
- We support the conduct of regular reviews of the arrangements.

[1] Economic Insights, Review of Economic Benchmarking of Transmission Network Service Providers – Issues Paper, 18 April 2017.

- Data sets, benchmarking models, and the understanding of those models will improve over time, allowing the AER to place greater weight on the benchmarking results over time. However, this should not prevent the AER from using the current benchmarking results judiciously - having regard to the sensitivity of the results to data and model specifications/assumptions.
- AER needs to carefully consider how it uses the information from alternative model specifications and data sets. One approach is to have a preferred model but test the results for the sensitivity to other specifications and data sets in interpreting the results. Another approach would combine the information from different model specifications and data sets to create a range and midpoint estimate (weighted or unweighted) incorporating the results of a number of model specifications and data sets
- The ability to make economic and qualitative peer-to-peer comparisons on REPEX should be investigated further as it is an issue of increasing relevance to consumers.

B. LONG TERM INTEREST OF CONSUMERS

This section of our submission considers the questions raised in the Issues Paper in relation to the long-term interests of consumers. Our approach to considering the long-term interests of consumers is based in the National Electricity Objective (NEO). The NEO is an economic efficiency objective that is often described in terms of three dimensions: productive, allocative and dynamic efficiency.

- The continued application and refinement of economic benchmarking techniques can be expected to contribute to the pursuit of productive efficiencies and, hence, achievement of the long-term interests of consumers.
- The current Issues Paper would benefit from a consistent framework for assessing the questions posed. This should be based on the NEO and be consistent with the overall approach to regulatory determinations.
- A literature review of broader work on NSP benchmarking would have also been a useful inclusion.
- We do not support the use of an end-use customer number output variable. All other factors being held equal, there is no sound argument for TNSP costs to vary as a function of the final number of end use customers.
- In relation to the construction of the connection point output variable, the use (or not) of connection voltages as a weight should be informed by worked examples.
- In relation to the weighting of the reliability output, the issues seem to stem from the results attributed to a specific incident for AusNet Services in 2009. In our view this output measure would be improved by reflecting underlying trends rather than be overly reactive to individual incidents. Consideration of alternatives should be informed by worked examples.
- In relation to the weights applied to the non-reliability outputs, we do not have a view, a priori, that the current weights are not reasonable. Further, stability in the weights assigned to the outputs is desirable. Overall, we would like to see the sensitivity of results to a range of weights. Given the potential issues in estimating the weights of the outputs from the regression of costs and outputs, it may be useful to cross-check this econometric result against cost allocations that reflect engineering/accounting understanding of the cost drivers.

More detailed consideration of these issues is set out in CCP 9 advice below.

BACKGROUND

- CCP 9 was established in September 2016.
- This advice was prepared in accordance with the Schedule of Work agreed upon between sub-panel CCP 9 working on the Murraylink, TransGrid and ElectraNet resets and Adam Petersen and Andrew Ley, Co-ordination Directors for the resets.
- CCP 9 will participate in the public forum being convened by the AER on 31 May 2017

Role of the CCP

The objective of the Consumer Challenge Panel (CCP) is to:

- advise the AER on whether the network businesses' proposals are in the long term interests of consumers; and,
- advise the AER on the effectiveness of network businesses' engagement activities with their customers and how this is reflected in the development of their proposals.

CCP 9 is focussed on promoting the consumer interest during the development of revenues and prices for the 2018-23 Transgrid, ElectraNet and Murraylink Regulatory Control Periods. Further information on the Panel is available at www.aer.gov.au/about-us/consumer-challenge-panel

ADVICE

A. Consumer Engagement

The role of economic benchmarking in regulation

Our approach to considering the long-term interests of consumers is based in the National Electricity Objective (NEO). The NEO is an economic efficiency objective that is often described in terms of three dimensions: *productive*, *allocative* and *dynamic* efficiency. The continued application and refinement of economic benchmarking techniques can be expected to contribute to the pursuit of *productive* efficiencies and, hence, achievement of the long-term interests of consumers.

The Issues Paper raises a number of technical questions in regard to the output specification of economic benchmarking models used by the AER. However, before responding to these specific questions it is important to be clear on the nature and limitations of economic benchmarking and the role and use of economic benchmarking in regulation from a consumer perspective.

Benefits of a Top-down benchmarking approach

Economic benchmarking measures, such as the AER's preferred multilateral total factor productivity (MTFP) measure, represent a class of a top-down assessment techniques that attempt to measure a business's overall relative *productive* efficiency[2], taking into account trade-offs between components that make up the total[3]. Measures such as the MTFP are largely indifferent to whether (for instance) the output is achieved via operating or capital costs. It is this combination of resources used to deliver the outputs for the least possible cost that defines relative 'productive efficiency'. Being able to measure productive efficiency is, in turn, an important benefit compared to relying on various partial performance indicators (PPIs) and bottom-up measures.

The AER also uses multilateral partial factor productivity measures (MPFP) as part of considering the productive efficiency of operating cost (opex) and separately, the efficiency of capital expenditure (capex). These measures are not concerned with how different businesses may classify different components of operating or capital expenditures but rather whether the business has combined its opex (or capex) resources in a relatively efficient way.

From a consumer perspective, the benefit of the MTFP (and the MPFP) measure is that it provides a perspective on the overall efficiency of a TNSP without the necessity of addressing detailed issues of cost allocation and business processes that arise when considering and comparing PPI measures. However, as discussed later in this submission, there are several challenges in determining how MTFP should be measured and what it should be used for in the regulatory process. Other measures such as MPFP and some PPIs can complement the interpretation of the MTFP and the confidence with which it can be used as part of the AER's regulatory revenue determinations.

Focus on outputs that are provided to and valued by customers

The AER's consultant, Economic Insights (EI) explains the unique characteristics of economic benchmarking versus other benchmarking techniques based on the focus of economic

[2] Relative efficiency as the efficiency frontier is not an absolute construct, but is defined by and limited to the set of businesses in the analysis.

[3] See for instance, AER, Final TNSP annual benchmarking report 2016.

benchmarking being on outputs that are provided to and valued by customers. While EI's comments (quoted below) are in response to the concerns raised by DNSPs and their consultants in the NSW/ACT determinations, the distinction equally applies to benchmarking for TNSPs. EI states[4]:

> *It is important to note that economic benchmarking focuses on* ***output provided to and valued by customer*** *whereas engineering benchmarking focuses more on 'cost drivers' such as the quantity of assets that the DNSP have in place. With the latter there is a risk of delinking the efficiency of DNSP's from* ***the provision of output actually valued and demanded by customers****.*

From the perspective of the long-term interests of consumers, the focus on the efficiency of delivering the services provided to and valued by customers is more relevant than technical engineering benchmarking focussing on cost drivers.

It is, therefore, useful to keep this distinction in mind when responding to the questions set out in the current Issues Paper.

Role and use of economic benchmarking

We support the use of economic benchmarking amongst the techniques employed in a regulatory determination. It is particularly useful in the context of the propose-respond regulatory model where the AER's principal task under the rules is to satisfy itself that, overall, the proposed operating and capital expenditure forecasts of a TSNP meet the opex and capex objectives and, if it is not satisfied, to replace the proposed expenditures with its own forecast of efficient expenditure to meet the opex and capex objectives[5]. The focus is, therefore, on satisfying the overall opex and capex objectives, not on the efficiency of the discrete components of these expenditures, although it may be a useful adjunct to the AER to examine some of these components. Because the Rules are concerned with overall expenditures, it is more consistent for the AER to consider efficiency by reference to benchmarks based on these total expenditures such as the MTFP and the opex and capex MPFPs.

However, at a practical level, the scope and nature of the use of the economic benchmarking approach should reflect the uncertainty inherent in the results. Its use also needs be considered in the context of:

- the relative strength and weaknesses of other information available on the efficiency of the NSPs
- the overall design of the incentive mechanisms and the response of the firms to the incentives.

Hence, while economic benchmarking can be an important source of information on efficiency and productivity trends it should not be used mechanistically to set regulatory allowances without reference to other data sources and an objective assessment of factors that may not be adequately captured in the MFTP specifications.

According to the AER TNSP Annual Benchmarking Report 2016 (p13):

[4] Economic Insights, Response to Consultant Reports on Economic Benchmarking of Electricity DNSPs, 22 April 2015, p. 2. It is for this reason that EI prefers to use a consumer demand variable such as ratcheted peak demand rather than an engineering variable such as installed capacity measure.
[5] See for instance, NER, 6A.6.6(c), 6A.6.6(d)(e), 6A.6.7(c), 6A.6.7(d)(e).

"We have not drawn conclusions on the relative efficiency of the transmission networks because the relative rankings observed are currently sensitive to the model specification. MTFP analysis is in its early stage of development in application to transmission networks. Further, there are only a few electricity transmission networks within Australia which makes efficiency comparisons at the aggregate expenditure level difficult."

Benchmarking provides a quantitative basis for the regulator and stakeholders to challenge the expenditure forecasts of the utility to which a rigorous, quantitative response can be provided. As the AEMC noted[6]:

"Whilst benchmarking is a critical tool for the regulator, it can also be of assistance to consumers, providing them with relative information about network performance on NSPs. Benchmarking information would be useful to consumers when participating in the regulatory determination process and merits reviews, and also in their informal interactions with NSPs."

However, while we agree with the AEMC on the potential value of benchmarking to consumers, it is important that consumers are advised of the strengths and weaknesses of the MFTP and MPTP assessments for the particular industry. As a case in point, the limited sample size of Australian transmission businesses[7] provides a challenge to the application of this approach in the regulatory setting, as these methodologies require a substantial and validated set of input and output related data to be of maximum determinative value.

Relative efficiency or sector-wide productivity trends

Two key questions are how should benchmarking be used in regulatory decisions and whether it should be used in determining relative efficiency (*peer to peer*) and/or individual business & sector-wide productivity trends (*time series*).

The regulator can use benchmarking to assess the relative efficiency of the utility or the trend rate of productivity growth achievable. Under the AER's approach to assessing expenditure, the former equates to the assessment of the efficiency of the base level of expenditure and results in utility specific adjustments. In contrast the trend rate of productivity growth can inform the assumption on the trend in sector-wide efficient costs – i.e. it is a common sector-wide factor.

In our view, it is important to be clear that some methods and data are more suitable for *time series* analysis of the productivity of an individual business than they are at comparing *peer-to-peer* performance. This is very important in the context of TNSPs where the small number in the sample (n=5) and different Operating Environment Factors (OEF) will limit the ability to make *peer-to-peer* comparisons. While OEFs will be an important factor in the peer-to-peer comparisons it does not follow that they are as important in analysing sector productivity trends. The OEFs are likely to be relatively constant over time and to argue that they distort

[6] AEMC, RULE DETERMINATION National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012 National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012, pviii

[7] Namely 5 businesses with 10 data points (years) for each business limit the variance in the data, the ability to include multiple explanatory variables and to provide precise point estimates of a TNSP's efficiency relative to the frontier. This does not mean, however, that the output has no value – it provides a reasonable indication of trends in performance for instance over time, which is valuable information for consumers. Over time, both the quality and volume of data can expand to improve the ability of the model to provide reasonable point estimates.

industry-wide productivity trends it is necessary to show that the OEFs do not just affect relative costs between utilities but also the scope to make productivity gains.

We would note that the economic benchmarking of transmission is more difficult than distribution. There are fewer TNSPs to use as comparators in any jurisdiction or comparable jurisdictions. Furthermore. there are fewer prior studies to learn from and compare model constructions and results – for example the ACCC paper reviewing practice in benchmarking electricity and gas networks in seven other countries did not identify economic benchmarking models for electricity transmission[8]. While we would encourage the AER to continue developing models for peer benchmarking and the assessment of sector wide productivity trends over time, at this point in time we consider economic benchmarking will be of most assistance in assessing *time-series* productivity trends. Hence, in our responses below to the questions posed in the Issues Paper we have focused on the implications for the use of benchmarking for this purpose.

TransGrid 2018-23

In summary, our submission on TransGrid's revenue proposal stated:

> Benchmarking TNSPs is more difficult than benchmarking DNSPs due to the limited data set. However, TransGrid generally performs well the measure of opex partial productivity and some of the opex KPI's used by AER. TransGrid also cites several other industry studies of operating cost performance to provide further evidence that TransGrid is efficient.
>
> CCP 9 recognises that benchmarking is difficult, especially for TNSPs where there are fewer comparators. In assessing the information value of benchmarking studies we consider that the transparency of the data and models and replicability of the analysis are important. In the absence of this, it is difficult to assess the strengths and weakness of the benchmarking and the value of the results. We encourage the AER to continue benchmarking TNSPs, and further developing its multi-factor productivity and partial productivity measures. All benchmarking has its flaws in terms of data quality, limited peer comparators, and incomplete models. The advantage of the AER's benchmarking is its transparency and replicability. The AERs benchmarking has been subject to rigorous review and critiques by stakeholders and legal review. Inevitably this has identified some weaknesses but this does not mean it does not have value when used in conjunction with other information. Furthermore, such public review help AER continue to improve its benchmarking.

ElectraNet 2018-23

ElectraNet's regulatory proposal makes a number of references to economic benchmarking[9]. The MTFP results from the AER's 2016 Benchmarking Report are reproduced to illustrate the relatively good performance of ElectraNet (Overview, Figure 9, p21). However, when discussing Opex efficiency, the chart from the AER 2016 Benchmarking Report is reproduced

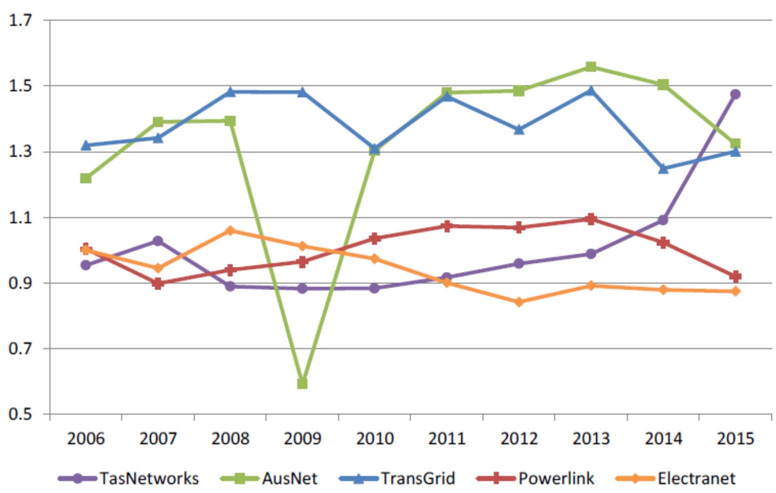
[8] See ACCC, Regulatory Practices in Other Countries: Benchmarking opex and capex in energy networks May 2012, The countries examined were UK, Ireland, Netherlands, Canada, USA, Japan, and NZ.

[9] In particular, refer to Overview Section 3.3 "We perform well, despite the unique challenges of our network" (p18-)

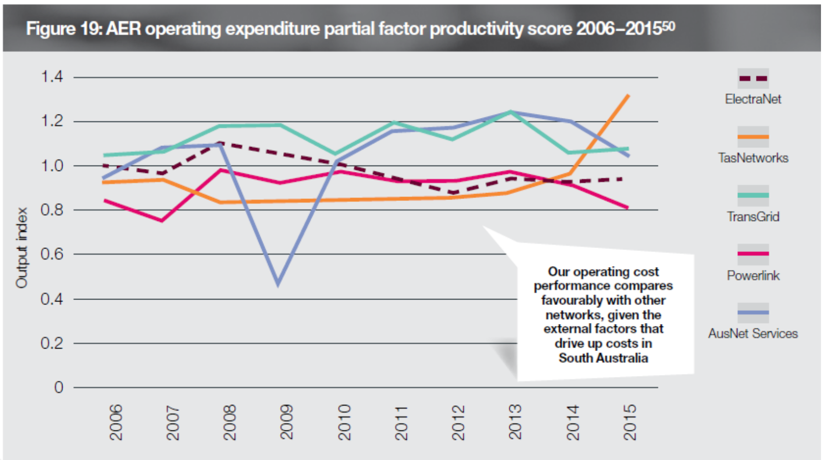
with an adjustment to remove energy throughput as a factor and adjusting for network support payments (Overview, Figure 19, p58)[10].

The referenced chart from the 2016 Benchmarking Report:

Figure 6 Opex partial factor productivity index, 2006 to 2015



The ElectraNet version:



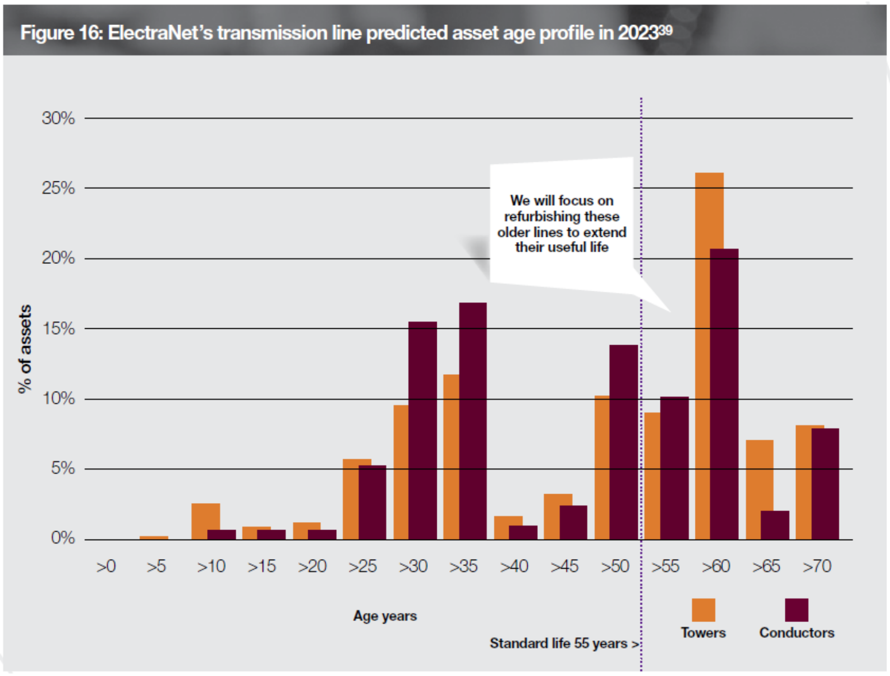
We are yet to finalise a view on ElectraNet's proposal but this does highlight the potential for selective use of benchmarking results. This potential will hopefully reduce as techniques mature.

One area where benchmarking would prove very useful is in the review of TransGrid and ElectraNet's REPEX program. We understand the importance of an efficient refurbishment and replacement program and appreciate the adoption of risk-based asset management by ElectraNet, TransGrid, PowerLink and others. The ability to make economic and qualitative peer-to-peer comparisons on REPEX should be investigated further as it is an issue of increasing relevance to consumers. The ability to benchmark, such as via a Partial Performance Indicator (PPI) based on asset age, may be of significant value to consumers.

[10] Note that ElectraNet state "This chart has been adjusted to remove energy throughput as an input measure (which has no bearing on operating expenditure) and network support payments (which is a non-standard cost incurred by ElectraNet as an alternative to network augmentation)." However, energy throughput is part of the output specification, not the input specification. Clarification will be sought from ElectraNet.

For example, ElectraNet state (Overview p48-49):

> *"South Australia has among the oldest assets of transmission networks in the NEM… Between 30% and 45% of major line assets on the transmission network will have exceeded their standard economic lives by the end of the next regulatory period (see Figure 16)."*



Noting that ElectraNet do not replace assets based on age but on condition and risk, asset age may not be a precise comparator and further analysis is obviously required to generate an indicator. However, the ability to benchmark asset age or asset health would provide a useful benchmark given the focus on expenditure in this capex category. Existing Regulatory Information Notice (RIN) data may be able to form a basis for this[11].

Implications for Economic Regulation of TNSPs

In summary:

1. Effective *economic* benchmarking can inform the assessment of productive efficiency. Assessment of the allocative and dynamic efficiencies of TNSP performance may be best informed by both quantitative and qualitative benchmarking.
2. We support the consideration of multiple economic models as well as the preferred model specification. Considering multiple output specifications would increase confidence in observed trends and reduce the incentive for TNSPs to defer to alternate specifications when it is their interest to do so.
3. We support the conduct of regular reviews of the arrangements.
4. Data sets, benchmarking models, and the understanding of those models will improve over time, allowing the AER to place greater weight on the benchmarking results over time. However, this should not prevent the AER from using the current benchmarking results judiciously - having regard to the sensitivity of the results to data and model specifications/assumptions.
5. AER needs to carefully consider how it uses the information from alternative model specifications and data sets. One approach is to have a preferred model but test the

[11] For example, Economic Benchmarking RIN Tab 3.3 Assets, Section 3.3.4 Asset Lives

results for the sensitivity to other specifications and data sets in interpreting the results. Another approach would combine the information from different model specifications and data sets to create a range and midpoint estimate (weighted or unweighted) incorporating the results of a number of model specifications and data sets

6. The ability to make economic and qualitative peer-to-peer comparisons on REPEX should be investigated further as it is an issue of increasing relevance to consumers.

B. Long Term Interests of Consumers

Whether the approach to Transmission Benchmarking is in the long term interests of consumers

Our approach to considering the long term interests of consumers is based in the National Electricity Objective (NEO). The NEO is an economic efficiency objective that is often described in terms of three dimensions: productive, allocative and dynamic efficiency. Economic benchmarking involves making choices as to:

- *Outputs* – key issues are the choice of outputs, the values/weights assigned to the outputs and the challenges of measuring service quality
- *Inputs* – key issues are level of disaggregation, measurement of quantities (physical/monetary), and derivation of relevant prices and WACC
- *Operating environment factors* – what factors not captured in inputs and outputs affect relative efficiency between peers and over time and how significant are these factors
- *Data sets* – should the analysis include local utilities only or some international utilities as well, is the data robust and comparable over time
- *Functional forms* of the production functions used
- *Measurement technique* – such as DEA, SFA, and MTFP

The Issues Paper prepared by Economic Insights focuses on issues raised by TNSPs in relation to the specification of outputs in the benchmarking models as it is considered that "*the main area where there is not yet a consensus position is the appropriate measurement of outputs for transmission networks*" (p.iii).

However, while not agreeing with or endorsing their comments, we would note that Frontier Economics advice to TransGrid critiques other aspects of the benchmarking including the construction of the input price index[12]. Furthermore, there can be interrelationships between the choice of outputs and choice of environmental variables or the specification of input measures. For example, the inclusion of a network density variable in the environmental variables can be an alternative to the inclusion of a network length alongside exit point or maximum demand.

The model currently specifies 5 outputs and a weighting formula:

- Energy throughput (with 21.4 per cent share of gross revenue)
- Ratcheted maximum demand (with 22.1 per cent share of gross revenue)

[12] TransGrid Revenue Proposal 2018-23 Appendix F: Frontier Economics January 2017 *"Review of the MTFP and MPFP analysis in the AER's 2016 Annual Benchmarking Report"* https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/transgrid-determination-2018-23/proposal

- Voltage–weighted entry and exit connections (with 27.8 per cent share of gross revenue)
- Circuit length (with 28.7 per cent share of gross revenue), and
- (minus) Energy not supplied (with the weight based on current AEMO VCRs).

The selection of the current output specification is described in Economic Insights memo to the AER dated 31 July 2014[13].

The current Issues Paper would benefit from a consistent framework for assessing the questions posed. This should be based on the NEO and be consistent with the overall approach to regulatory determinations. We note that EI appear to have done this across earlier publications but a consolidated version should appear in the issues paper.

A literature review of broader work on NSP benchmarking would have also been a useful inclusion. Past work by the Productivity Commission and the Australian Energy Markets Commission could have added to the context. While there are few similar transmission studies it is relevant to compare the output choices for the transmission model with other distribution cost models. For example, Jamasb and Pollitt[14] undertook a survey of benchmarking studies published prior to 2000. The survey looked at the benchmarking techniques and models used. Of most relevance, they found that:

- The most common output measures were energy sold (kWh) and customer numbers. Measures of network size (line length and/or transformer capacity) were included as outputs in a substantial number of studies.
- The most common input measures were physical measures of network size (line length and transformer capacity) and labour/wages.
- Other variables (usually included with inputs but they can also be modelled as outputs) included customer dispersion, sales to industrial users/total sales, residential customers/km of line, line length*total voltage, and load factor. Inclusion of customer dispersion and line length factors in other variables has the same functional effect as including network size measures in outputs.

Arguably such precedents provide support for the specifications used in the AER's benchmarking.

In our view, the EI Issues Paper presents a number of issues (such as the discussion on weights) from the perspective of economic/statistical relationships. Statistical analysis can inform choices and the absence of this in the Issues Paper makes it difficult in responding on the detailed options set out in the paper. Our comments are informed by our understanding of the fundamental cost drivers and other network studies, but not statistical analysis.

[13] www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/annual-benchmarking-report-2014/aer-position
[14] T Jamasb and M Pollitt, "Benchmarking and regulation: international electricity experience", Utilities Policy, 9(2001), pp107-130.

2.1 Connection points output variable versus end–user numbers

1. Would the use of downstream customer numbers be a better output measure than the current voltage weighted connections output variable?

2. Would the use of end–user customer numbers for the state the TNSP operates in be appropriate or would allowance need to be made for interconnectors and special situations such as the Snowy Mountains Scheme on end–user numbers?

3. Would there also be a need to include a measure of entry points or would the end–user customer numbers measure be adequate?

4. Would the simple addition of the number of entry and exit points be a viable output measure?

This set of questions relate to issues raised around the connection point output variable. This variable is based on both the number of connection points and their entry or exit voltage (as the case may be). Entry and exit connection voltage is assumed to be a reasonable proxy for the level of service provided by the TNSP to its upstream and downstream customers. The proposition of the Issues Paper is that the total number of downstream customers is a more appropriate indicator of the service provided.

The Issues Paper provides no comparative analysis and asks in Q1 if this alternate option is 'better' than the status quo. Criteria for assessing 'better' have not been established but in our view, the number of end-use customers is not a relevant indicator for TNSP performance. As EI notes, the disadvantage is that it only focuses on downstream users and does not capture the entry side of the transmission networks (which is generally also a source of expenditure and revenue to the TNSP). Nor does it differentiate the size of end-users – a very large direct connect customer would have the same weight as a single downstream residential customer yet they would impose very different costs at the connection point. Similarly, a smaller generator would impose different connection costs than a very large base load generator, and it is the former that are likely to increase in the future.

All other factors being held equal, there is no sound argument for TNSP costs to vary as a function of the final number of end use customers while the number of exit or entry points is held constant. In the value chain of electricity supply, the contribution of the Transmission Network is the bulk supply of electricity from generators to customers. Fundamental analysis suggests costs would increase if the number of exit/entry points increased even if the number of end-customers and demand was unchanged.

However, we also recognise that by using the actual voltage as a multiplier, there is risk that the output measure becomes disconnected from the services required and instead, reflects decisions made many years ago (given the long-life of the assets and the high average age). MTFP and MPFP (capex) adjustments will be necessarily slow given these long asset lives and limited volume growth. In our view, this is only relevant for peer-to-peer comparisons.

In response to Q2 and Q3, we note that if end-use customer numbers were used rather than connection*voltage, then it is likely that some form of capturing entry costs (generators, interconnectors and the like) will be required. It is difficult to anticipate how that would done, and a safer position is to retain the current approach (connection numbers weighted by voltage).

The Issues Paper states that the current specification takes the voltage of each entry/exit point into account based on an assumption that higher voltage connections require more or higher capacity assets. Question 4 asks whether the simple addition of the number of entry/exit points is a viable output measure. In our view the number of entry/exit points is a legitimate driver of costs and a common-sense inclusion as discussed above. The 'weighting' of these numbers by downstream voltage appears to only raise issues in relation to peer-to-peer comparisons. It would be useful to be able to compare numerical results and assess options in relation to time-series performance separately to performance in peer-to-peer comparisons.

We note too TasNetwork's comments that they do not consider there is a link between voltages and the quantity of assets required to serve a particular connection point (cited on p. 4 of the Issues Paper). TasNetwork appears to be indicating that connection point costs are more a function of complexity rather than voltage with the latter having limited impact on costs. We are not in a position to assess this claim and whether the observation is limited to TasNetwork's particular mix of downstream and upstream customers. AusNet expressed a similar view (Issues Paper p. 4). If it is the case more generally, then it may be more appropriate to use a simple addition of entry and exit point connection numbers.

However, what is also clear from the data available to CCP9 is that there is a very large variation in the number of entry and exit points and the associated voltages. This provides a significant challenge to using this variable for peer-to-peer comparisons. On the other hand, the numbers appear to be relatively stable for a TNSP over time, indicating there is some value in the variable where the benchmarking is used for time-series analysis and assessing sector-wide trends.

2.2 Construction of the connection points output variable

5. If we retain the voltage weighted connections variable, is there a better approximation to the 'size' of connections than the current multiplicative variable?

6. Should the voltage weighted connections output variable use the voltage at the customer side or the TNSP side or entry and exit point transformers? Which measure would better reflect the service provided by TNSPs to customers?

7. Is there a case for the treatment being consistent with AEMO's Marginal Loss Factor reports, which uses downstream voltage?

8. In accounting for terminal stations that connect to multiple DNSPS:

(a) Should connections to multiple DNSPs at the one terminal station be counted separately or as one connection?

(b) How would counting the connections separately or as one connection advantage or disadvantage particular TNSPs?

It is not clear if voltage (either upstream or downstream) reflects the service provided by a TNSP at all (see above discussion). Of the two, however, it seems logical that the upstream voltage is most relevant to a TNSP's costs as suggested by ElectraNet (p. 6) in providing the services to both generators and to distribution businesses. Some worked examples would have been a useful inclusion.

The 'weighting' of connection point numbers by downstream voltage appears to only raise issues in relation to peer-to-peer comparisons. It would be useful to assess options in relation to time-series performance separately to performance in peer-to-peer comparisons.

It is not clear that the treatment of connections for benchmarking should necessarily be the same as the treatment of connections for marginal loss factor reports. The questions to be considered in the context of benchmarking is whether connection at different levels of voltage provides a different level of service and/or entails significantly different levels of cost as noted above. The answers to these questions should guide the decision rather than harmonisation with the treatment for loss factors.

In relation to the issue of accounting for terminal stations that connect to multiple DNSPs, it would be useful to see a worked example in order to come to a view on the materiality of the issue. Conceptually, however, it makes sense that there would be higher costs at a terminal that must service multiple DNSPs with different voltage requirements and operational profiles. The question is whether such costs are 4 times the cost of a single DNSP connection (as per the case of the Templestowe Terminal Station with 4 DNSPs), and if not what functional relationship should or could be used within the MFTP model. Moreover, we would need to understand the materiality of this issue – e.g., how many of AusNet's terminal stations are affected by this?

2.3 Reliability output weighting

9. Should the weight placed on the TNSP reliability output be reduced to avoid volatile movements in MTFP?

10. If so, should a cap be placed on the weight itself or on the volume of unserved energy incorporated in the model?

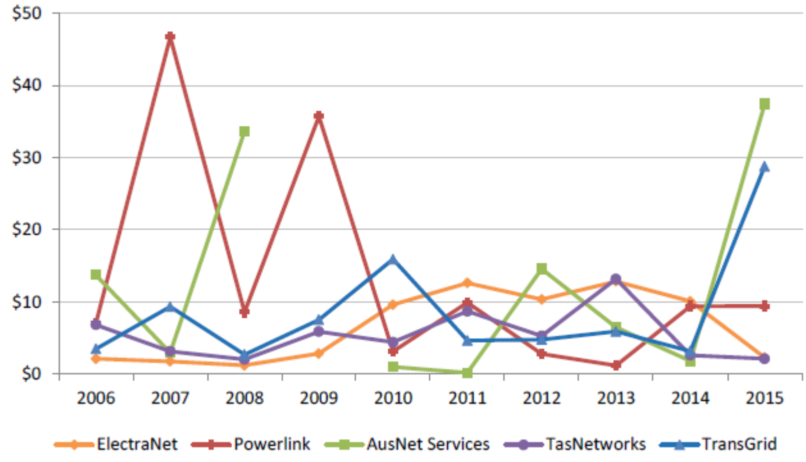
11. The value of the reliability output relative to total TNSP revenue exceeded 5% in only 7 of our current 50 observations. Of these all were less than 8.5% except AusNet in 2009 which equalled 29%. If we were to cap this weight, what should the size of the cap be?

12. Should a cap be made to be consistent with the current TNSP STPIS, which applies a cap on the impact of unplanned outages? If so, how would this be applied to the reliability output measures for benchmarking purposes?

13. Would using a rolling average of unserved energy be an alternative way of handling annual volatility in reliability?

The issues raised regarding the impact of the current reliability measure on the volatility and value of the MTFP appears to stem from the results attributed to a specific bushfire related incident for AusNet in 2009, although the 2016 Benchmark Report indicates a further impact of external events on the estimated cost of USE for both Ausnet and TransGrid which may have flowed through to the decline in the MTFP index. Figure 16 from the 2016 Benchmarking Report is replicated below to illustrates the volatility of the USE costs.

Figure 16 Estimated customer cost of energy unsupplied due to supply interruptions ($million, nominal)



Note: We excluded the cost of customer interruptions in AusNet Services' network for 2009 as these are anomalously large (about $400 million) and dwarf the other results.

In our view this output measure would be improved by reflecting underlying trends rather than be overly reactive to individual incidents. Averaging over time assists in reducing the volatility but given that the significant changes in reliability reflect very rare events the impact of 'chance' can still be significant. However, if the results are used to assess sector-wide productivity trends the impact of 'chance' is further reduced by averaging across the TNSPs.

The reliability output measure is a negative output that captures energy not supplied as a result of network outages (un-served energy, USE). The weight applied is based on AEMO's current estimates of the Value of Customer Reliability (VCR) for each state (noting there are slight differences in the average VCR for each state) [15]. The weighting of reliability differs from the weight given to the other outputs in that it is based on the value to customers rather than the costs of providing that output. However, this appears sensible and consistency with the VCR estimated by AEMO that is factored into planning standards and capex evaluations is warranted. If it is the appropriate measure for valuing the benefits of network investment it also appears appropriate to use it in valuing increases or reductions in reliability more generally. We support the consistent and transparent use of agreed VCR settings.

An issue that may arise, however, is the decision by state regulators to vary the effective planning VCR in specific sectors of the state. For instance, IPART has recently imposed a higher VCR for planning purposes in the Inner Sydney region, than is indicated by AEMO's figures. It is not clear whether this will impact significantly on the overall state measure used by AER/EI.

Imposing caps on either the weight attached to reliability or absolute movements in the in the reliability component appears to be arbitrary. Averaging over time and TNSPs will reduce the effect of rare events but the example of Ausnet shows that the results can be distorted by very rare events.

In relation to peer-to-peer comparisons, an alternative measure to actual unserved energy may be consideration of the USE targets used for network planning in each case. This is not

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[15] See AEMO, *Value of Customer Reliability Review, Final Report,* September 2014. Table 25 sets out the VCR excluding and including direct connects by state and by total NEM. Excluding direct customers the VCR ranges from 38.09 (SA) to 39.71 (Qld) with NEM average of 39.00. Including direct customers (which may be the appropriate VCR in this instance), the VCR ranges from 25.62 (Tas) to 34.91 (Qld), with a NEM average of 33.46.

sensitive to chance events and may better reflect the long term, underlying reliability level but it may be difficult to back-cast and to verify and monitor. Further consideration of consistency with the assessment of reliability performance in the Service Target Performance Incentive Scheme (STPIS) would be welcomed. For example, it may be desirable to also use a statistically-based approach, such as unserved energy levels more than 2 standard deviations from the average.

Another alternative is to define events that should be excluded from the measure, preferably in line with the exclusions of the STPIS measures, including force majeure, directions from AEMO to close supply and so on. What is important to the integrity of the measure is that any exclusion events (or the standard deviations criteria) are predefined and cannot be readily manipulated.

Ultimately, most USE 'events' (however defined) will have only a small impact on the annual performance measures and even less impact at all on the longer term average results that drive the forecast changes (see Q3 above). It is only the events such as the $400 million AusNet supply event in 2009 that has such a significant impact on overall MTFP (although we may also see the September 2016 events impact the next benchmarking reports) that will require 'special' treatment.

Finally, it is important that in excluding events, or capping the amounts we recognise that customers are currently funding expenditures to 'harden' the network and/or reduce risks that impact (inter alia) on USE. If customers are paying to improve the reliability of the network in the face of e.g. bushfires, then it may well not be appropriate to remove the costs of USE associated with a subsequent bushfire from the output analysis. The customers have paid for a service they have not necessarily received.[16]

2.4 Econometrically–derived weights for outputs other than reliability

14. Do the current output cost share weights of 21.4 per cent for energy, 22.1 per cent for ratcheted maximum demand, 27.8 per cent for weighted entry and exit connections and 28.7 per cent for circuit length seem reasonable?

15. Should the output cost shares be updated to take account of the latest information?

In summary, we do not have a view, a priori, that the current weights are not reasonable. Further, stability in the weights assigned to the outputs is desirable. While it is appropriate to review the weights periodically, the AER should be cautious in changing the weights on the basis of the latest data.

Moreover, we note EI's comments that while the weights would be significant in making cross sectional (peer-to-peer) comparisons and, more particularly, in setting an 'efficient' base opex cost as occurs with the DNSPs, they are of less importance when considering changes over time for a TNSP or the industry as a whole. What is more important in this instance, is that there is consistency of the measures and their weightings over time and that the total index is more stable then the components.

[16] We acknowledge the difficulty of making such a judgment in practice, but it is an important principle that should be considered as part of this assessment.

The AER has estimated the weights based on econometric estimation of costs as a function of these outputs. Frontier Economics have the following concerns in regard to this[17]:

- the coefficients (and hence weights) for the outputs vary substantially with changes in data definitions and estimation periods
- in some cases the coefficients for the outputs are the 'wrong sign' sign' (more outputs are associated with lower input costs)
- the outputs are highly correlated with each other

This led Frontier Economics to reject both the specification of the outputs and the weights proposed.

We consider a clearer distinction should be made between the decision on the specification of the outputs and the estimation of the weights than is made by Frontier Economics. In our view, the specification of the outputs should be informed by, but not driven by, statistical analysis. The outputs proposed can be supported by fundamental analysis of the cost drivers for TNSPs and the specification of the outputs is broadly consistent with common practice in similar studies for DNSPs. We note also that the AER/EI have consulted extensively with the networks on these inputs and output specifications.

However, we recognise that there remains an important element of judgement (and uncertainty) with respect to the TNSP inputs and outputs that suggests the results of multiple models should be considered in coming to a view on trend productivity growth. The results of the econometric models should inform these choices.

Frontier Economics highlight the problem of multicollinearity between the outputs. As they point out this makes it difficult to obtain robust estimates of the coefficients via statistical tests to determine preferred models. The conclusion we would draw, though, is that it is important that regard be had to more than one model and that the models should be developed through a structured approach considering fundamental analysis and common practice. We would note that the problem of multicollinearity is not unique to AER's TNSP model: the output specification is consistent with common practice and the correlation between these outputs is common. Because there is correlation between, say, connection numbers and ratcheted demand, this does not mean that they do not both drive the costs of the TNSPs. Fundamental analysis of TNSPs costs and cost drivers provide strong arguments that they do. However, it does affect the robustness of the coefficient estimates.

We agree with Frontier that the correlation between the outputs can create difficulties in estimating weights econometrically. The instability of the coefficients may well be a function of this. The question then is what should be done in response to this?

One response, as AER suggests is to be cautious in changing weights, especially as changes in weights may cloud productivity trends. But given it may be timely to review the weights, it may also be desirable to consider the accounting-based cost allocation models. There are well accepted conventions for allocating costs by identification of outputs and cost drivers, direct allocation of costs where possible, pooling of other costs and allocation of these to outputs or cost objectives based on cost drivers. These models have been widely used by utilities in setting prices. In the context of the difficulties estimating the weights econometrically, this is a relevant alternative approach that could be used to cross-check those weights.

[17] TransGrid Revenue Proposal 2018-23 Appendix F: Frontier Economics January 2017 *"Review of the MTFP and MPFP analysis in the AER's 2016 Annual Benchmarking Report"* https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/transgrid-determination-2018-23/proposal

Significant fundamental analysis has been done but has not been included in the Issues Paper. One way of approaching this is through a structured approach that considers in turn:

1. Fundamental analysis to identify typical costs of networks and what are the services provided to end users and how these drive costs from an engineering/service perspective;
2. Review of existing cost studies; and
3. Cost analysis of the TNSPs. That is, given the likely outputs from (1) and (2), what is the statistical relationship with costs and each other. This can help determine whether these outputs are important cost-drivers, what weight should be given to these outputs (if costs rather than value-to-user is used as the weight) and whether there are potential estimation problems form including the outputs.

Fundamental analysis would support inclusion of peak demand and entry or exit points. It can also be used to clarify the reasoning behind the inclusion of energy instead of or as well as peak demand and network capacity or asset measures. Are the latter proxies for maximum demand (as an output) or network density variables (as an environmental variable)?

The options proposed can also be tested by empirical analysis of the relationship between the costs and these outputs measures to test their statistical significance and estimate the weights. The weights for the outputs derived from this modelling are reported in the Economic Insights memo cited above, but not the results of the other testing.

While the statistical analysis can inform decisions on the output specification they should not be determinative. Fundamental analysis and the lessons from other similar studies are also important. For example, outputs such as exit/entry points and maximum demand may be closely correlated. This can result in instability in the parameter values and their significance, but does that necessarily mean that it is incorrect to include both in the outputs in constructing an index of outputs for the estimation of productivity changes. Fundamental analysis and precedent may support the inclusion of both outputs.

Overall, we would like to see the sensitivity of results to a range of weights. Given the potential issues in estimating the weights of the outputs from the regression of costs and outputs, it may be useful to cross-check this econometric result against cost allocations that reflect engineering/accounting understanding of the cost drivers.

‘Additive’ versus multiplicative capacity measures

16. Does the current separate inclusion of output capacity variables and the MVAkms based input specification introduce any biases?

17. Is there an objective basis on which to divide a category of very high voltage lines from other lower voltage transmission lines (noting that productivity indexes require non–zero quantities and values for all input categories for all TNSPs)?

18. Can TNSP asset values be reliably and accurately split and provided on a similar basis?

This section responds to criticisms in the Frontier Economics Report for TransGrid. The worked example at p11 is a good example of the sort of analysis that what would have been useful elsewhere in the Issues Paper. The example does demonstrate that while the multiplicative system capacity output would distort the results and favour larger TNSPs, this does not occur on the input side because of the constant value of the MVA rating.

In any case, the issue appears to be more relevant to peer-to-peer comparisons than time series. As noted, given the inherent limitations of peer-peer comparisons between five entities we have not considered these issues in any detail.

In terms of a split between very high voltage lines and lower voltage transmission lines, we agree that such a split would be arbitrary, whereas the split between the DNSPs' sub-transmission lines and cables and distribution lines and cables was able to be relatively clearly defined both conceptually and in the data. Moreover, with only 5 transmission businesses and of those, only one (AusNet), having 500 KV lines (if that was the split), the additional complexities may not add much to the outcome.

If the AER was considering using the benchmarking at some point for peer-to-peer comparison, then further analysis of this question may be warranted. While the practical use of the benchmarking is confined to trend analysis, such additional complexity does not seem warranted.

CONCLUSION

e support the use of economic benchmarking amongst the techniques employed in a regulatory determination. It is particularly useful in the context of the propose-respond regulatory model. However, at a practical level, the scope and nature of the use of the economic benchmarking approach should reflect the uncertainty inherent in the results.

We support the consideration of multiple economic models as well as the preferred model specification. Considering multiple output specifications would increase confidence in observed trends and reduce the incentive for TNSPs to defer to alternate specifications when it is their interest to do so.

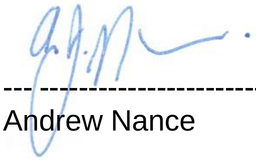
CCP 9 commends to the AER the issues raised in this advice and the recommendations made.

Signed

Eric Groom
Sub-panel Chairperson

B. Hughson

Bev Hughson



Andrew Nance