Memorandum

From: Denis Lawrence **Date:** 14 July 2016

To: Anthony Bell and Andrew Ley, AER

CC:

Subject: Review of submissions on Powerlink's base year opex

Economic Insights has been asked to review the opex component of the AER Consumer Challenge Panel (CCP4 2016) submission on Powerlink's revenue proposal for the 2018–22 regulatory period and the Huegin (2016) report on opex benchmarking which formed an attachment to Powerlink's proposal.

The CCP4 submission argues that there is evidence that Powerlink's opex has been 'materially inefficient' and questions why the AER has not applied benchmarking in its recent TNSP determinations. The Huegin report, on the other hand, argues that there is no evidence that Powerlink's historic opex is inefficient and its opex is similar to its peers when selected operating environment factors (OEFs) are considered.

By way of background, Powerlink's revenue proposal proposes a reduction of $22.2 million or 10.5 per cent in its 2015 total opex of $211.3 million. However, around $12.1 million of this reduction is the removal of non–recurrent expenditure in 2015 which is also removed in Powerlink's Efficiency Benefit Sharing Scheme (EBSS) calculation. Consequently, Powerlink is not penalised for the temporary increase in non–recurrent opex as it is simply moved between revenue requirement building block components and only around 45 per cent of the overall proposed reduction comprises efficiency improvements. It should also be noted that the proposed changes take Powerlink's controllable opex back to roughly what it was in 2014. Powerlink has also proposed the inclusion of an opex productivity growth rate of 1.2 per cent in applying the rate of change formula.

CCP4 submission

The CCP4 submission argues that the AER has access to the requisite information to undertake comprehensive opex benchmarking. CCP4 (2016, p.63) quotes the Economic Insights (2014, p.3) comment that the AER's RIN data is 'the most consistent and thoroughly examined dataset of the transmission networks yet assembled in Australia' in support of this proposition. It also quotes several other TNSP benchmarking initiatives such as the International Transmission Operations and Maintenance Study (ITOMS) as demonstrating that the AER could access additional information given its information gathering powers. And CCP4 (2016, p.67) goes on to state that the AER has indicated its key reason for not relying on benchmarking in recent TNSP determinations is the small number of Australian TNSPs. CCP4 states it 'does not find this convincing'.

While the TNSP RIN dataset represents a sound basis for future TNSP benchmarking studies, this does not mean that economic benchmarking of TNSPs is itself yet sufficiently mature to base regulatory decisions on. Economic Insights (2014, p.2) noted:

> 'While economic benchmarking of distribution network service providers (DNSPs) is relatively mature and has a long history, there have been very few economic benchmarking studies undertaken of TNSPs. Economic benchmarking of transmission activities is in its relative infancy compared to distribution. As a result, in this report we do not apply the above techniques to assess the base year efficiency of TNSPs. We present an illustrative set of MTFP results using an output specification analogous to our preferred specification for DNSPs but caution against drawing strong inferences about TNSP efficiency levels from these results. However, output growth rates and opex input quantity growth rates can be calculated with a higher degree of confidence and used to forecast opex partial productivity growth for the next regulatory period which is a key component of the rate of change formula in equation (1.2) above.
>
> 'Economic benchmarking of TNSPs is also constrained by a much smaller number of observations generally being available compared to DNSP studies. As a result we use extrapolation of partial factor productivity (PFP) indexes in this report to forecast TNSP opex productivity growth as there are insufficient observations available to be able to reliably use econometric or DEA methods.'

Thus, the primary reason for not applying benchmarking to assess base year opex efficiency to date is the relative immaturity of economic benchmarking of TNSPs where very few comprehensive measurement studies have been undertaken (see WIK–Consult 2011). This contrasts markedly with the situation for DNSPs where there is a long history of economic benchmarking and impacts three key areas for TNSP economic benchmarking in particular: the specification of TNSP outputs, data maturity and the specification of OEFs.

The scarcity of previous economic benchmarking studies of TNSPs means there is limited scope to draw on a consensus specification of outputs for use in a comprehensive TNSP opex efficiency measure. The TNSP output specification used in Economic Insights (2014) was formed to be as consistent as possible with the much more mature DNSP specification. However, some of the outputs included, such as the entry/exit point voltage output, likely require more development. The current specification of this variable sums the product of the voltage level and the number of connection points at that voltage. While this is a workable approximation to reflect the 'size' of the TNSP's connection points, there is considerable scope for it to be further refined based on engineering considerations linking voltage levels and power supply capacity. Associated with this, it has taken time for TNSPs to provide consistent counts of connection points using a common definition so the value of this output has been revised for some TNSPs as better data have become available.

The third area where lack of maturity in TNSP economic benchmarking affects currently available TNSP economic benchmarking information relates to allowance for the most important OEFs. Economic Insights (2013, p.25b) listed nine potentially important OEFs (in addition to networks densities) that should be considered. These included three weather factors (extreme heat days, extreme cold days and extreme wind days), three terrain factors (bushfire risk, the proportion of lines in rural areas and vegetation encroachment) and three network characteristics (line length, variability of dispatch and concentrated load distance). While we listed preliminary specifications for these OEF variables, they remain very much at the developmental stage and data collection to support these variables is incomplete.

The combination of these considerations means that it would still be premature to use economic benchmarking to assess TNSP opex base year efficiency. It does, however, highlight the ongoing nature of refinement involved in developing robust economic benchmarking measures and the need to devote more resources to developing TNSP measures to achieve a similar level of maturity to that now applying to DNSP measures.

The other TNSP–initiated benchmarking studies referred to by CCP4 all focus on partial indicators. While partial indicators provide some useful information, they do not provide a comprehensive basis for assessing the overall efficiency of a TNSP's opex spend.

The limitations of partial indicators are illustrated in the measures CCP4 quotes in support of its contention that Powerlink is 'materially inefficient'. Firstly, CCP4 (2016, p.65) quotes figures on asset cost per entry/exit point voltage and claims that opex 'forms a part' of asset cost. However, the AER's measure of asset cost does not include opex. Consequently, little, if anything, can be deduced from this indicator regarding opex efficiency. Furthermore, as noted above, the output measure of total entry/exit point voltage is still in the developmental stage.. It would thus be premature to make base year efficiency decisions using an indicator which uses this output for normalisation (which includes CCP4's third partial indicator of opex per total entry/exit point voltage). Secondly, the partial indicator CCP4 presents of opex per MVA of downstream transmission capacity uses an output which is at a similarly preliminary stage of development. Further refinement may be required to ensure as consistent a treatment as possible of interconnector capacity and transmission/distribution boundary points.

While the two opex partial indicators quoted by CCP4 show Powerlink to have the highest unit costs of the Australian TNSPs in 2013, the AER (2014) benchmarking report also included another two opex partial indicators. For both these Powerlink ranked third of the five TNSPs. For opex per circuit kilometre, Powerlink was close to the lowest unit opex cost and, for opex per MW of maximum, demand Powerlink was just above the middle of the observed range. CCP4 (2016) does not mention these results. However, the mixed findings from the four opex partial indicators highlight the problems that can arise from relying on one or two partial indicators and why a comprehensive indicator which appropriately weights all key outputs is required. Furthermore, as noted above, significant revisions were made to the entry/exit point indicators for some TNSPs between the AER (2014) and AER (2015) benchmarking reports, highlighting the lack of maturity of these measures and the inadvisability of placing too much weight on the AER (2014) results.

CCP4 (2016, pp72–3) also mounts an argument that because Powerlink's directly–connected customers are all capital–intensive and have 'delivered much more significant productivity growth during the past decade', then Powerlink should have as well. However, demand and supply characteristics across industries are affected by much more than levels of capital–intensity. Just because some capital–intensive industries have achieved good productivity growth does not necessarily mean that similar productivity growth can be achieved by TNSPs. In particular, declining throughput and peak demand levels in recent years limit the extent of relative productivity growth likely to be achievable in transmission networks as output growth will be contributing less to growth in productivity measures than will be the case for industries subject to ongoing growth in demand for their outputs.

CCP4 (2016) also mounts two arguments regarding labour price changes and the rate of change that appear to understate the underlying complexities. Firstly, CCP4 (2016, p.70) argues that ‘industries in contraction do not face real labour price increasing drivers’. However, wage rates are determined by many factors including competition from other industries that use similar types of labour. If an industry is facing strong competition for labour from other industries then it may face increasing real labour prices at the same time demand for its output is reducing.

Secondly, CCP4 (2016, p.73) argues that ‘in general, employers only allow labour costs to rise above CPI if they are accompanied by offsetting productivity improvements’. It goes on to argue that Powerlink’s proposed opex productivity growth rate for the rate of change of 1.2 per cent should thus be higher. However, the relationship between the CPI, productivity growth and input prices is for all inputs and not just labour, for total factor productivity and not necessarily opex partial productivity, and holds for the economy as a whole and not necessarily each industry. Industry results need to take account of differentials between industry productivity growth rates and those for the economy as a whole and industry price growth rates and those for the economy as a whole (see Economic Insights 2012, pp.4–7). The CCP4 argument also fails to recognise that the rate of change productivity growth rate in the Powerlink proposal is higher than the 0.8 per cent used in the Transgrid determination and the 0.2 per cent used in the AusNet determination.

In summary, based on this review of CCP4 (2016) we do not concur with CCP4’s (2016, p.65) view that ‘the AER’s benchmarking results identify material inefficiencies in Powerlink’s opex’.

Huegin report

Huegin (2016) reviews the economic benchmarking methods used by the AER and examines Powerlink’s historic opex productivity performance. It argues that there is no evidence that Powerlink’s historic opex is inefficient and its opex is similar to its peers when selected operating environment factors (OEFs) are considered. The report proceeds to use three different methods for estimating an appropriate base year opex for 2015 based on the historic data. These estimates are close to but slightly higher than the 2015 base year opex contained in Powerlink’s revenue proposal.

Huegin (2016, p.7) fails to recognise that the multilateral index number productivity specification used in AER (2014, 2015b) and Economic Insights (2014) includes allowance for key network density OEFs through the output specification used. Thus, key elements of load density (peak demand per kilometre) and energy density (throughput per kilometre) discussed in Huegin (2016, pp.9–10) are already incorporated in the output specification via the ratcheted maximum demand, throughput and network length output components.

We do, however, agree with Huegin (2016, p.11) that capitalisation differences across TNSPs need to be allowed for as an OEF. As noted above, this and ideally the nine other non–density OEFs discussed in Economic Insights (2013b, p.25) and listed in the section above, including concentrated load distance, need to be considered before robust conclusions can be drawn regarding base year efficiency levels.

Huegin (2016, p.7) exhibits confusion over the economic benchmarking methods used by the AER. It lists 'Malmqvist (sic) index' and 'Fisher index' as the two main types of 'MTFP analysis'. However, it does not mention the Caves, Christensen and Diewert (1982) Multilateral Total Factor Productivity and Multilateral Partial Factor Productivity index number method actually used by Economic Insights and the AER to compare productivity levels (which is what MTFP analysis does). Rather, the Fisher index is used for time–series TFP analysis (as noted by Huegin) but it cannot be used to compare productivity levels across firms. The Malmquist index is a distance function method but it is not used in the AER's analysis.

Huegin (2016, p.16) incorrectly argues that the outputs included in the AER's MTFP analysis are 'not actually production … outputs, rather they are proxies for cost'. This line of argument – and associated comments regarding 'historical multicollinearity' between variables[1] – is misguided because it fails to recognise that the outputs included in the economic benchmarking analysis are functional outputs designed to capture the key dimensions of TNSP output valued by customers. In the case of building blocks regulation, the functional outputs should reflect the key output dimensions the regulator uses in setting (or assessing) the revenue requirement. As noted in Economic Insights (2013a, p.5):

> 'The regulator typically sets the revenue requirement based on the TNSP being expected to meet a range of performance standards (including reliability performance) and other deliverables (or functional outputs) required to meet the expenditure objectives set out in clauses 6A.6.6(a) and 6A.6.7(a) of the National Electricity Rules (NER).'

We thus disagree with Huegin (2016, p.20) that there are 'limitations in what conclusions can be drawn about cost or efficiency performance where changes in performance are driven by changes in more volatile outputs or those not directly related to the activities that incur costs (such as unserved energy)'. There is likely to be a direct (although complex) link between opex (and other costs) and reliability performance and this forms an important dimension of TNSP performance which cannot simply be ignored as Huegin appears to imply it should be. And the analysis in Huegin (2016, p.19) regarding whether productivity changes are attributable predominantly to output changes or input changes suffers from a similar deficiency. This is further illustrated by the Huegin (2016, p.21) argument that throughput and peak demand are 'not suitable proxies for cost' which again confuses the engineering concept of 'cost drivers' with the functional outputs included in economic benchmarking studies. As discussed above, it simply means that productivity growth in the transmission sector is unlikely to match that of industries with continually growing outputs because of the different demand conditions transmission currently faces.

Huegin (2016, pp.23–31) presents analysis based on the AER's Category Analysis data. We note that the Category Analysis data is, like the TNSP economic benchmarking, still being developed. As a result, while some useful information can be gleaned from it, it is not at a stage of development where it could be relied on as the basis for major regulatory decisions.

[1] Note that statistical concepts such as multicollinearity are not relevant in index number analysis.

Finally, Huegin (2016, p.34) presents three methods for forming an estimate of base year opex for 2015. The first estimates the average growth rate for Powerlink's total output and opex productivity over the period 2006 to 2014 and then moves Powerlink's 2014 constant price opex forward to 2015 using these growth rates and the rate of change formula. This is a reasonable method although it is, of course, dependent on 2014 opex being both efficient and not subject to abnormal influences. Huegin's second method involves 'matching current productivity' but insufficient information is provided on its implementation for us to be able to assess this method. And the third method is a simple extrapolation of nominal opex over the period 2006 to 2014 – this is unlikely to be a preferred method.

Powerlink's proposed 2015 base year controllable opex is somewhat lower than the three estimates of 2015 opex produced by Huegin (2016). Powerlink identifies a number of efficiency improvements which can be made and non–recurrent items that can be removed. Around $12.1 million of the proposed $22.2 million reduction is the removal of non–recurrent expenditure in 2015 which is also removed in Powerlink's Efficiency Benefit Sharing Scheme (EBSS) calculation. Consequently, Powerlink is not penalised for the temporary increase in non–recurrent opex as it is simply moved between revenue requirement building block components and only around 45 per cent of the overall proposed reduction comprises efficiency improvements. To put this in perspective, it has the effect of bringing Powerlink's 2015 base year controllable opex back to around its 2014 actual controllable opex.

As noted by Huegin (2016, p.33), in its final determination for TransGrid, the AER (2015a, p.7–33) found:

> 'We have no evidence to suggest that TransGrid's revealed base year expenditure is materially inefficient. In arriving at this conclusion we had regard to the results of various benchmarking analysis. On the whole, our benchmarking analysis for TransGrid is inconclusive.'

Based on our review of the information and analysis contained in CCP4 (2016) and Huegin (2016), we agree with Huegin that there is currently a similar lack of evidence concerning material inefficiency regarding Powerlink's proposed base year opex. We also note that Powerlink's proposed incorporation of a 1.2 per cent opex productivity growth rate in the rate of change formula allows for higher opex productivity growth going forward than the industry average opex productivity growth rates of 0.86 per cent and 0.2 per cent used in the recent TransGrid and AusNet determinations, respectively.

Conclusion

In summary, while Huegin (2016) contains some technical and interpretational errors, we agree with its finding that there is a lack of evidence that Powerlink's proposed base year opex is materially inefficient. The proposal includes an efficiency improvement of around 5.1 per cent relative to Powerlink's 2015 total opex excluding non–recurrent expenditure. It also allows for higher opex productivity growth going forward than the industry average opex productivity growth rates used in recent TNSP determinations.

We note the finding regarding base year opex efficiency is subject to the proviso of 'given the current stage of development of TNSP economic benchmarking'. This highlights the need to further advance understanding and refinement of the appropriate specification of TNSP outputs used in economic benchmarking studies and incorporation of additional key OEFs into the analysis.

References

AER Consumer Challenge Panel (CCP4), *Submission to the AER: Powerlink Queensland 2018–22 Revenue Proposal*, Submission prepared by Hugh Grant and David Headberry, June.

Australian Energy Regulator (AER) (2014), *Electricity Transmission Network Service Providers Annual Benchmarking Report*, Melbourne, November.

Australian Energy Regulator (AER) (2015a), *Final Decision: TransGrid transmission determination 2015−16 to 2017−18, Attachment 7 – Operating expenditure*, Melbourne, April.

Australian Energy Regulator (AER) (2015b), *Electricity Transmission Network Service Providers Annual Benchmarking Report*, Melbourne, November.

Caves, D.W., L.R. Christensen and W.E. Diewert (1982), "Multilateral Comparisons of Output, Input, and Productivity Using Superlative Index Numbers", *The Economic Journal* 92, 73–86.

Economic Insights (2012), *The Total Factor Productivity Performance of Victoria's Gas Distribution Industry*, Report prepared by Denis Lawrence and John Kain for Envestra Victoria, Multinet and SP AusNet, Canberra, 26 March.

Economic Insights (2013a), *Outputs and Operating Environment Factors to be Used in the Economic Benchmarking of Electricity Transmission Network Service Providers*, Report by Denis Lawrence and John Kain prepared for Australian Energy Regulator, Eden NSW, 21 February.

Economic Insights (2013b), *Measurement of Outputs and Operating Environment Factors for Economic Benchmarking of Electricity Transmission Network Service Providers*, Report by Denis Lawrence and John Kain prepared for Australian Energy Regulator, Eden NSW, 16 April.

Economic Insights (2014), *Economic Benchmarking Assessment of Operating Expenditure for NSW and Tasmanian Electricity TNSPs*, Report prepared by Denis Lawrence, Tim Coelli and John Kain for the Australian Energy Regulator, Eden, 10 November.

Huegin (2016), *Powerlink Operating Expenditure Benchmarking Review*, Report prepared for Powerlink, 8 January.

Powerlink Queensland (2016), *2018–22 Powerlink Queensland Revenue Proposal*, Brisbane, January.

WIK–Consult (2011), *Cost Benchmarking in Energy Regulation in European Countries*, Report prepared for the Australian Energy Regulator, Bad Honnef, December.