Memorandum

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To: Toby Holder, AER

CC: Anthony Bell, AER
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Subject: Review of AusNet Transmission arguments on the opex rate of change

Economic Insights has been asked by the Australian Energy Regulator (AER) to review arguments relating to the opex rate of change advanced by AusNet Transmission Group Pty Ltd (ANT) in its Revised Revenue Proposal for 2017–2022 dated 21 September 2016. Specifically, we have been asked to review arguments put forward relating to the opex input price weights used to forecast the opex price growth component and arguments relating to the forecast productivity component of the rate of change.

Background – the rate of change formula

As noted in Economic Insights (2014a), the base–step–trend method for forecasting future opex requirements can be summarised as follows:

$$Opex_t = \prod_{i=1}^{t}(1 + rate\ of\ change_i) \times (A_f^* - efficiency\ adjustment) \pm step\ changes_t \qquad (1)$$

where:

- *rate of change*$_i$ is the annual percentage rate of change in year *i*
- A_f^* is the estimated actual opex in the final year of the preceding regulatory control period
- *efficiency adjustment* is an adjustment for the difference between efficient and estimated actual opex in the final year, and
- *step changes*$_t$ is the determined step change in year *t*.

Under this forecasting approach the product of the annual rates of change accounts for changes in real opex input prices (changes in opex input prices relative to changes in the consumer price index), output growth and opex partial productivity in the forecast regulatory control period. The rate of change can be summarised as:

$$Rate\ of\ change_t = output\ growth_t + real\ price\ growth_t - productivity\ growth_t \qquad (2)$$

To put this another way, the rate of change rolls forward efficient opex (in real terms) according to changes in: distribution network service provider (DNSP) output – an increase in output will typically require additional opex; real opex price growth – an increase in opex prices relative to the CPI will require additional opex in real terms, all else equal; and, changes in opex partial productivity – an increase in opex partial productivity will reduce the amount of opex the DNSP requires to produce a given level of output.

To maintain logical consistency, the same specification of output needs to be used in the calculation of efficiency adjustments and the output growth and productivity growth components of the rate of change in the base–step–trend method. Similarly, the same specification of opex input prices needs to be used in the calculation of efficiency adjustments and the real price growth and productivity growth components of the rate of change in the base–step–trend method. It should be noted that the opex productivity growth component is usually calculated based on either extrapolation of past productivity trends or forecasts of future output and operating environment factors using relationships observed in the recent past – unless there is reason to believe circumstances will be different going forward to those observed in the recent past in which case simple extrapolation or use of past relationships will be inappropriate.

Implementation of the base–step–trend method requires us to divide nominal opex into its price and quantity components as accurately and consistently as possible. The efficiency adjustment and opex productivity growth components rely on estimates of the quantity of opex while the real opex price growth component relies on a measure of the opex price that is consistent with the quantity measure used in the efficiency adjustment and opex productivity growth components.

Opex input price weights

ANT (2016) argues that the use of 'benchmark weights' of 62 per cent for the labour and 38 per cent for the non–labour components of opex used in forming the opex input price forecast in AER (2016) was incorrect. Rather, ANT argues the AER should have used corresponding weights of 78 per cent and 22 per cent that ANT used in its revenue proposal. The AER's weights of 62 per cent and 38 per cent are the same as those used in Economic Insights (2014a,b) which are in turn derived from a study of Victorian network service providers (NSPs) by Pacific Economics Group (PEG 2004).

ANT (2016, pp.92–93) claims that the use of 'benchmark weights' contravenes the AER's approach to accepting revealed costs for NSPs judged to be efficient. However, ANT's arguments misinterpret the AER's approach to accepting revealed costs. If efficiency analysis indicates that the level of an NSP's actual total opex in the base year appears to be efficient then the AER's revealed costs approach involves accepting that level of total opex – or 'revealed cost' – as the base year opex which is then rolled forward through the next regulatory period using the rate of change method. The acceptance of base year total revealed cost as being efficient has no implications for the parameters that should be used in the roll forward process, other than that logic and internal consistency require the same output component and opex input component shares be used across the three parts of the rate of change formula – that is, the opex input price forecast, the output forecast and the partial productivity forecast. These should, in turn, be the same as those used in the efficiency analysis that assesses whether base year opex was efficient.

ANT (2016, p.92) criticises the use of the PEG (2004) opex labour and non–labour shares as being 'outdated'. However, we believe these estimates are still the best available. Subsequent analysis has also supported these shares as being reasonable estimates.

The majority of NSP opex costs comprise labour costs (both direct and contracted). Remaining NSP opex costs cover a wide range of intermediate inputs spanning operational consumables, office activities and professional services. Productivity studies have generally divided opex inputs into labour, materials and services components with separate price indexes for each used to deflate nominal values into quantities (or constant price series).

As we have noted on a number of occasions previously, it has become increasingly difficult to ascertain what the exact split between the labour component and the materials and services component of NSP opex is with the move to greater (and varying) use of contracting out of field (and other) services by NSPs. Similarly, NSPs themselves are generally not able to identify the price and quantity components of their increasingly contracted out activities as they are only interested in the overall cost and it is up to the contractor how many resources they use, provided they meet the agreed service standards. However, to allow efficiency assessment and estimation of past opex productivity growth it is then necessary to estimate the split of opex into its price and quantity components.

The most detailed attempt to identify a representative price index for NSP opex in Australia remains that undertaken by PEG (2004) using regulatory accounts data for Victorian DNSPs. Since the PEG study was undertaken the degree of contracting out of DNSP opex activities has generally increased making it harder to accurately identify the price component of opex. PEG (2004, pp.13–14) described the process they adopted as follows:

> 'The process for developing an input price index for O&M was more complex [than that for capital inputs]. We began by considering the major sources of DBs' [Distribution Businesses'] operating and maintenance costs, as reported in the Regulatory Accounts. We then assigned what we believed was the most appropriate available price index from the ABS to the relevant O&M cost category. The mapping of price indexes to O&M cost categories is given below:

'O&M Cost Category	ABS Price Index
Meter data services	Producer price index (PPI) computer services
Billing and revenue collection	PPI computer services
Advertising/marketing	PPI advertising services
Customer service	PPI secretarial services
Regulatory	PPI legal services
Other operating	PPI business services
SCADA maintenance	PPI computer services
Network operating costs	Labor cost index
All other maintenance costs	Labor cost index

> 'We then constructed an overall O&M input price index as a weighted average of inflation in these subindexes. Weights were equal to the share of the O&M cost component in DBs' overall O&M cost components.'

Aggregating weights for each price index and allowing for changes in ABS price indexes associated with the introduction of the new National Accounts industrial classification in 2008, this produces the following composition of the opex price index:

- EGWWS WPI – 62.0 per cent

- Intermediate inputs – domestic PPI – 19.5 per cent
- Data processing, web hosting and electronic information storage PPI – 8.2 per cent
- Other administrative services PPI – 6.3 per cent
- Legal and accounting PPI – 3.0 per cent, and
- Market research and statistical services PPI – 1.0 per cent.

This is the opex input price specification used in the Economic Insights (2014a,b) assessments of NSP efficiency. Translating this to the conventional productivity study disaggregation of opex into labour and materials and services produces a labour share of 62 per cent and a materials and services share of 38 per cent. It should be noted that the EGWWS WPI covers the gamut of occupations observed in the EGWWS and so covers both field and office staff.

Subsequent to the PEG study, Economic Insights staff sought to verify the above labour share of opex. In work for the three Victorian gas distribution businesses information was requested on their estimated direct and indirect labour shares in opex (Economic Insights 2009b, p.13). It is significant that only one of the three businesses was able to supply this information. The resulting labour share estimate was consistent with the 62 per cent figure used by PEG (2004). The nature of gas distribution operations is broadly similar to that of electricity NSPs. Both are highly capital intensive with long–lived fixed structure assets transporting energy. Safety issues are critical to both and both involve connecting transmission systems with a small number of large users and reticulating to a large number of small users. Customer service, maintenance and response functions are broadly similar across gas distribution and DNSP operations. This result, therefore, provides corroborating evidence for the above NSP labour share of opex.

An important issue is how contracts should be allocated between a labour component and a materials and services component – noting that NSPs generally claim to not have access to this information themselves. This could be addressed in a number of ways. Firstly, all contracts (both field–related and non–field–related) could be allocated to labour. This would generally produce an estimated labour share of opex which is considerably higher than the 62 per cent currently used by the AER. Alternatively, all contracts could be allocated to material and services which would produce an estimated labour share of opex generally considerably lower than the 62 per cent currently used by the AER. Clearly, neither of these extreme assumptions is likely to be accurate.

It is also important to recognise that NSPs have an incentive to argue that contracts should all be allocated to labour as the WPI (and other measures of labour prices) have generally increased faster than the CPI. In the current situation this would simply maximise the size of the future opex requirement the NSP is allowed and not reflect an accurate disaggregation of future opex into its true price and quantity components. It would also not be consistent with the basis on which NSP efficiency has been assessed.

ANT (2016, pp.92, 95–96) also claim that 'the outdated PEG analysis was … for a different purpose to that which Economic Insights, and the AER, now use it'. This is incorrect. The PEG (2004) analysis was for the purpose of constructing NSP productivity estimates which is what Economic Insights also uses the labour and non–labour opex input shares for. As noted above, logic and internal consistency requires that the same opex and output shares be used in the opex input price forecast, output price forecast and partial productivity forecast components of the rate of change as are used in the assessment of base year opex efficiency. ANT appears to accept this in the case of outputs but argues for different opex shares to be used for opex input price forecast component and the partial productivity forecast component. Apart from being logically inconsistent, this would open up considerable scope for cherry picking of results in favour of the NSP. It should be noted that, had a higher labour share of opex been used in the historical productivity analysis, a higher partial productivity growth rate would have been obtained which would in turn increase the forecast productivity growth component in the rate of change formula.

ANT (2016, pp.93–94) argues that, while it accepts that a forecast of CPI increase is a reasonable approximation for the non–labour component of opex (what we term 'materials' above), it does not accept that the CPI forecast is reasonable for 'non–field services contracts' (what we term 'services' above). ANT (2016, p.94) states:

> 'The AER has attempted to demonstrate that non–field services costs will increase in line with CPI by comparing historical growth across a range of productivity price indices (PPIs) it has presumed are reflective of AusNet Services' non–field services costs. However, no evidence has been presented that the composition of AusNet Services' non–field services labour reflects these weights.'

However, Economic Insights (2014b, p.14) demonstrated that, using the 'benchmark' opex weights for materials and services components, using the CPI compared to the five disaggregated PPIs produced no material difference in DNSP efficiency assessment results. This is because aggregating the five PPIs using the relative weights listed above and the Fisher index method produces a materials and services price index which tracks the CPI closely. It should be noted that some PPI components increase faster than the CPI while some increase slower than the CPI – but the weighted average tracks the CPI closely. This indicates the CPI is likely to be a good proxy for the overall materials and services price component for forecasting purposes. ANT's comments fail to recognise that the CPI movement closely tracks the overall weighted average of the five separate PPIs which cover all of materials and services (and not just materials as implied by ANT). The 'benchmark' weights used for overall materials and services components are based on the analyses presented in PEG (2004) and Economic Insights (2009b). ANT has not provided any evidence that its actual weights differ from the 'benchmark' weights and, as discussed further below, there are potential adverse incentive effects in using DNSP–specific weights in any case.

Furthermore, just as the composition of the opex price index used in the real price component of the rate of change formula should be the same as that used in the efficiency assessment component of the base–step–trend method, then ideally the forecast of the opex price index should contain the same components as the index used for historic analysis. While forecasts of the EGWWS WPI are currently produced by a number of forecasters, forecasts of the disaggregated PPIs are not currently available and would be unlikely to be sufficiently robust as they would require forecasts to be made at a much finer level of disaggregation than current macroeconomic models were designed for. Consequently, the AER has used the CPI to escalate materials and services opex costs instead of disaggregated PPIs in recent determinations. Forecasts of the CPI are readily available from a number of forecasters.

ANT (2016, p.95) goes on to make the following claims:

> ‘The labour weights applied in the productivity model are used solely to form a price index for the purposes of inflating nominal opex inputs into real terms…
>
> ‘Accordingly, the productivity model does not “define” opex inputs as labour or non–labour, as asserted by the AER. Instead, it relies on total opex, adjusted for inflation, as the sole input. The opex productivity model is, therefore, neither sensitive nor sophisticated enough to attribute productivity improvements to different labour or non–labour inputs.’

These statements fail to recognise that the opex productivity analysis is based on deriving the quantity of opex used by each TNSP. This is formed by dividing the value of opex by its price (since price times quantity equals value for each output and each input). The more disaggregated the level at which this calculation is undertaken, the more accurate the resulting overall opex quantity measure will be. In this case, opex is disaggregated into a labour component and a materials and services component and separate price indexes are used for each – in the case of materials and services, five separate price indexes are in fact used. The model is, therefore, based on separate labour and materials and services opex components which are aggregated up to form a more accurate measure of the quantity of opex used. The claim that the model is ‘neither sensitive nor sophisticated enough’ to attribute productivity improvements to different opex components is, therefore, incorrect.

Finally, ANT (2016, pp.96–97) claims that the AER’s concerns about the potential adverse incentive effects of using reported rather than ‘benchmark’ opex shares are ‘unfounded’. ANT argues that not accepting reported opex shares as necessarily being efficient contradicts the finding that its total revealed opex in the base year is efficient. However, this argument ignores the fact that the efficiency assessment is predicated on the specified opex price index which has a 62 per cent weight applied to the EGWWS WPI. It is technically possible that an NSP could in fact be using (or reporting) a much higher share of an opex input whose price has increased less rapidly than, say, the WPI. If these weights were used in the efficiency assessment then the NSP’s estimated opex quantity would increase relative to the current assessment and the NSP could then be found to be inefficient. This is because the same dollar value of opex is then being deflated by a price index which has increased less rapidly and hence the quantity of opex has increased more rapidly than is the case in the current efficiency assessment. This would make the NSP a less efficient opex performer – and perhaps an inefficient performer relative to other NSPs – than is currently the case. While this scenario is unlikely to occur in practice, it is possible technically. What it does highlight is the need to use a consistent price index in the efficiency assessment and the opex real price growth component of the rate of change when applying the base–step–trend method.

ANT (2016, p.96) further argues that the AER’s position implies that the Efficiency Benefit Sharing Scheme (EBSS) ‘provides an incentive for TNSPs to achieve an efficient level of total opex, but not to achieve an efficient mix of labour and non–labour inputs’. Again, this argument fails to recognise the distinction between the dollar value of opex and its composition. In fact, if NSPs are able to influence the reporting of their base year opex’s composition and skew it towards components with faster increasing price indexes this could lead to them being given a higher opex allowance going forward against which they could achieve higher savings going forward and hence achieve higher EBSS rewards. Again, these potential distortions can be avoided by using the best estimate of the labour share of opex available and applying this share to all NSPs when calculating the opex real price growth component of the rate of change.

Opex productivity change

ANT (2016, pp.98–102) raises two objections to the 0.2 per cent forecast opex productivity growth rate used in AER (2016). The first relates to the method used to calculate the historic opex partial productivity growth rate (which is extrapolated to form the forecast for the next regulatory period) while the second relates to claimed double counting of economies of scale effects.

With regard to the method used to calculate the historic productivity growth rate, ANT objected to the change from an average annual growth rate method used in immediately preceding TNSP determinations to a regression–based trend method in AER (2016).

Economic Insights (2016, p.5) noted that two different approaches have been used to calculate the productivity growth rate used in regulatory settings. Economic Insights (2014b) used the average annual growth rate between the first and last observations calculated using the logarithm of the ratio of the index values divided by the number of annual changes between the first and last years. Lawrence (2003, 2007) and Economic Insights (2009a), on the other hand, have used a regression–based trend method which regresses the logarithm of the relevant variable against a constant and a linear time trend. The time trend regression coefficient is then the logarithm of (one plus) the relevant growth rate.

Both methods have a number of advantages and disadvantages. The average growth rate method has the advantage of tracking movement in the index exactly between the two endpoints of the series. However, this method is more influenced by outlier observations, particularly those lying near either the start or the end of the time period. If changes in opex driving these outlier observations are one–off rather than recurrent then these observations may then produce an average growth rate that is not reflective of the underlying trend change over the time period – see Economic Insights (2009b, pp.24–25) for an illustration of this effect. The risk of this happening for an industry growth rate will, of course, also be higher where there are few NSPs making up the industry and thus volatile movements in individual NSP results will have a much more pronounced effect on the industry growth rate than if there are many NSPs in the industry.

The trend growth rate method, on the other hand, has the advantage of more closely reflecting the underlying trend rate of growth over the period but it will not track the series from endpoint to endpoint exactly. If an ‘outlier’ observation near the end of the series turns out to reflect an ongoing change in recurrent opex rather than a one–off change then the trend method will move more smoothly to reflect that over time. That is, the trend method has the advantage of moderating the impact of sudden changes in opex levels but it will be responsive to the effects of ongoing changes over time.

In recent years reported TNSP opex levels have been relatively volatile. For instance, Economic Insights (2016, p.5) noted that a fall of 16 per cent in TransGrid's opex productivity in 2014 was the principal reason for a fall of nearly 7 per cent in TNSP industry opex productivity in that year. TransGrid's opex productivity then grew by a healthy 4.4 per cent in 2015. Similarly, 2015 also saw large movements in individual TNSP opex partial productivity with falls of 10 per cent in Powerlink's opex productivity and 11.6 per cent in AusNet's opex productivity but an increase of 35 per cent in TasNetwork's opex productivity.

Given the now relative volatility of movements in TNSP opex and the small number of TNSPs in Australia, we are of the view that it is more appropriate to measure TNSP opex productivity growth using the trend growth rate method as this will more closely approximate the underlying trend movement in TNSP opex productivity over the historic period and, hence, provide a better forecast for opex partial productivity likely to be achieved over the next regulatory period. It moderates the impact of large changes in opex reported for an individual TNSP which can have a potentially disproportionate impact on measured TNSP industry productivity growth given that there are only five TNSPs covered. This will make the trend figure the most appropriate one to use in application of the opex rate of change for TNSP assessment purposes.

It should be noted that the difference between the two growth rate methods is relatively small in this case with the trend growth rate of opex partial productivity from 2006 to 2015 being 0.20 per cent per annum and the average annual growth rate being –0.17 per cent per annum.

ANT (2016, p.100) also includes a third growth rate measure which it describes as 'simple average'. This is the average of all the year–on–year changes in the time period. We consider this to be an inferior growth measure as it does not allow for compounding growth over time. ANT (2016, p.101) goes on to argue for taking an average across the three growth measures and claims this would be analogous to the current practice of taking the average of the growth rate forecasts for the EGWWS WPI from different forecasting models. However, averages are currently taken across models with different output and input specifications and internal structures but using a common growth rate methodology. We do not support extending this to averaging different growth rate methodologies. Averaging the results from models with different specifications is a useful way of including a wider range of information but averaging different growth rate methodologies applied to the same model is not likely to add additional useful information and would likely only cause confusion.

ANT's second objection regarding claimed double counting of economies of scale effects relates to the unique structure of transmission activities and associated regulatory arrangements in Victoria compared to the other Australian States. In Victoria the Australian Energy Market Operator (AEMO) undertakes the role of system planner and ANT is paid for the maintenance of new assets until they are rolled into ANT's asset base at the start of the next regulatory period. Consequently, the regulated opex allowance does not provide opex for the maintenance of these new assets until they are rolled into the RAB, at which point the relevant opex changes from being unregulated to regulated for ANT.

The introduction of this regulated opex component at the start of the next regulatory period occurs as an additional step after the rate of change has been applied to the efficient base year opex and step changes have been included (ANT 2015, p.112). However, past practice has been to apply scale factors to the different components of this additional opex in recognition of ANT's ability to take advantage of economies of scale in monitoring and maintaining the new assets. The scale factors ANT has proposed using are a continuation of the 'legacy' factors used at the start of the current regulatory period. These were 10 per cent for corporate support, 25 per cent for routine maintenance support, 95 per cent for routine maintenance and 100 per cent for taxes and insurance. The weighted average of these factors is reported to be 59.45 per cent. ANT has proposed rolling in the opex associated with these new assets based on the net increase in ratio of regulated to unregulated assets multiplied by the 59.45 per cent scale factor.

ANT (2016, pp.101–102) notes that the AER's preference is to account for all sources of opex productivity change in the forecast opex productivity growth component of the rate of change formula. However, it notes that the unique transmission arrangements in Victoria and continuation of the past method for rolling in opex associated with the new assets outside application of the rate of change to base year opex would lead to double counting of economy of scale effects associated with operating a larger network over time. This is because the effects are built into the forecast opex productivity growth component of the rate of change and also into the scale factor applied to the separate roll in of opex associated with new assets, thus potentially compromising ANT's ability to cover its prudent costs.

ANT (2016, p.102) argues that if the AER maintains its forecast opex productivity growth forecast of 0.2 per cent per annum in the rate of change formula then a corresponding adjustment would be required to the scale factor used in the roll in of opex associated with new assets.

We agree with ANT that the unique structural and regulatory arrangements in Victoria have led to some degree of double counting of scale effects in this instance. In our view the most transparent way of addressing this issue is to accept ANT's lower proposed forecast opex productivity growth factor of 0 per cent for use in the rate of change formula while retaining its proposed continuation of the current scale factors used in the separate roll in of opex associated with new assets.

References

AusNet Transmission Group Pty Ltd (ANT) (2015), *Transmission Revenue Review 2017–2022*, Melbourne, 30 October.

AusNet Transmission Group Pty Ltd (ANT) (2016), *Transmission Revenue Review 2017–2022 – Revised Revenue Proposal*, Melbourne, 21 September.

Australian Energy Regulator (AER) (2016), *Draft Decision: AusNet Services transmission determination 2017–18 to 2021–22 – Attachment 7: Operating Expenditure*, Melbourne, July.

Economic Insights (2009a), *Electricity Distribution Industry Productivity Analysis: 1996–2008*, Report by Denis Lawrence, Erwin Diewert, John Fallon and John Kain to the Commerce Commission, Canberra, 1 September.

Economic Insights (2009b), *Total Factor Productivity Index Specification Issues,* Report by Denis Lawrence, Erwin Diewert and John Fallon to the Australian Energy Market Commission, Canberra, 7 December.

Economic Insights (2014a), *Economic Benchmarking Assessment of Operating Expenditure for NSW and ACT Electricity DNSPs*, Report prepared by Denis Lawrence, Tim Coelli and John Kain for the Australian Energy Regulator, Eden, 17 November.

Economic Insights (2014b), *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.

Economic Insights (2016), *TNSP MTFP Results*, Memo prepared by Denis Lawrence, Tim Coelli and John Kain for the Australian Energy Regulator, Eden, 29 April.

Lawrence, Denis (2003), *Regulation of Electricity Lines Businesses, Analysis of Lines Business Performance – 1996–2003*, Report prepared by Meyrick and Associates for the New Zealand Commerce Commission, Canberra, 19 December.

Pacific Economics Group (PEG) (2004), *TFP Research for Victoria's Power Distribution Industry*, Report prepared for the Essential Services Commission, Madison.