Memorandum

From: Denis Lawrence, Tim Coelli and John Kain **Date:** 8 November 2016

To: Su Wu, Andrew Ley, Joanne Ingham

CC: AER Opex Team

Subject: **TNSP MTFP Results for AER Benchmarking Report**

Economic Insights has been asked to update the electricity transmission network service provider (TNSP) multilateral total factor productivity (MTFP) and multilateral partial factor productivity (MPFP) results presented in the Australian Energy Regulator's 2015 TNSP Benchmarking Report (AER 2015b). The update involves including data for the 2014–15 financial year reported by the TNSPs in their latest Economic Benchmarking Regulatory Information Notice (EBRIN) returns. It also includes a small number of revisions to TNSP data, mainly relating to the entry and exit points output and the MVA rating of lines.

Specification used

The TNSP MTFP measure has five outputs included:

- Energy throughput (with 21.4 per cent share of gross revenue)
- Ratcheted maximum demand (with 22.1 per cent share of gross revenue)
- 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 TNSP MTFP measure includes four inputs:

- Opex (total opex deflated by a composite labour, materials and services price index)
- Overhead lines (quantity proxied by overhead MVAkms)
- Underground cables (quantity proxied by underground MVAkms), and
- Transformers and other capital (quantity proxied by transformer MVA).

In all cases, the annual user cost of capital is taken to be the return on capital, the return of capital and the tax component, all calculated in a broadly similar way to that used in forming the building blocks revenue requirement.

Data revisions

There have been a small number of data revisions included in the updated TNSP analysis. Most of these relate to calculation of the voltage–weighted entry and exit points output variable and the MVA rating of lines. TransGrid has revised its numbers of entry and exit points for the whole period. AusNet, ElectraNet and TransGrid have made minor refinements to the MVA rating of particular line categories in some years. And ElectraNet has corrected

an error in its reported maximum demand data for 2014. In addition, the latest WACC data are used and a change has been made to the method used to index the value of consumer reliability (VCR).

Issues raised in TNSP submissions on the Draft Benchmarking Report

AusNet Services Transmission (ANT) submitted that it would be timely to conduct a review of the TNSP economic benchmarking models, particularly the specification of outputs used in the models, before the AER's 2017 Benchmarking Report. We concur with this and recommend the AER undertake consultation on ways in which its EBRIN data collection and economic benchmarking modelling can be further refined.

ANT submitted that the current MTFP model specification places too high a weight on reliability outcomes and these can 'swamp' the other outputs contained in the model. ANT quoted the current measured impact of the 500kV transformer failure at the South Morang Terminal Station in 2009 which resulted in ANT's MTFP score falling by around 50 per cent and TNSP industry TFP falling by 13 per cent in that year. Similarly, in 2015 ANT's measured MTFP score fell by 12 per cent in 2015 following transmission outage involving a major 500kV customer.

ANT compared MTFP results from the current model with one that excluded the reliability output. ANT noted that the model without reliability included smoothed each TNSP's MTFP time–series 'without changing the trajectory of each TNSP's productivity'. ANT noted one solution to the problem might be to include a cap on the weight given to reliability in any one year or, alternatively, a cap on the included amount of energy not supplied. ANT argued this would align the productivity measure with the latest version of the transmission STPIS which includes a cap on included unplanned outages.

Economic Insights would be reluctant to exclude the transmission reliability output as reliability is an important requirement for TNSPs. We support alternative weighting and/or capping methods for the reliability output being considered as part of future consultation on ways to further refine TNSP economic benchmarking data and modelling.

ANT's submission questioned the appropriateness of the voltage–weighted connection points output currently included in the TNSP MTFP model. ANT argued that the variable is overly influenced by the historic split between transmission and distribution across the states. It noted that States with DNSPs taking current at 132kV will be advantaged on the measure compared to ANT where downstream DNSPs in Victoria take current at mainly 66kV (as the variable is currently measured according to the downstream DNSP voltage at the connection point). It noted this did not happen with other TNSP output measures such as throughput and ratcheted maximum demand. ANT also noted that the capacity of a connection to a DNSP system is most accurately represented by the capacity of the relevant transformer but this is already included in the MTFP model in the transformer input measure.

To illustrate its point, ANT noted that Powerlink currently has around twice the value of the connection point output as ANT despite serving 25 per cent fewer end customers than ANT. This mainly resulted from Powerlink's connected DNSPs taking power at 132kV compared to the 66kV used in Victoria.

ANT noted that the voltage–weighted connection output measure is currently included as the equivalent of the customer numbers output for DNSPs. ANT suggested that an alternative measure for TNSPs which might better capture their function would be the total number of

end customers in the TNSP's service area (ie across all its connected DNSPs). ANT observed that 'despite not being a direct output of transmission networks', such a measure would be 'a more appropriate measure of a product provided by transmission networks'.

We recognise that the voltage–weighted connection output is the least developed of the output measures included in the TNSP MTFP model. And we have previously recognised that TNSP economic benchmarking is still in its relative infancy compared to DNSP economic benchmarking which, by contrast, has quite a long history (Economic Insights 2014, p.2). We support further consideration being given to the connections output as part of the AER's future consultation on ways to further refine TNSP economic benchmarking data and modelling. The alternative measure proposed by ANT should be assessed at that time.

ANT's submission raised a further issue with the current specification of the connections output relating to the way connections to multiple DNSPs at the one terminal station are treated. Currently, only one DNSP connection is counted where multiple DNSPs are connected to the station. This approach was adopted in an attempt to provide consistency with jurisdictions that have fewer DNSPs. However, ANT claimed that it had to provide extra infrastructure and administration to accommodate its multiple DNSPs so it used extra inputs compared to states with few DNSPs but it received no credit for this on the output side. It quoted the example of Templestowe Terminal Station that currently has complex connections to four DNSPs but these are currently only counted as one connection in measuring the connections output. ANT requested that all its DNSP connections be counted to ensure parity of treatment. We support further consideration being given to this issue as part of the AER's future consultation process.

ElectraNet submitted that different approaches to asset refurbishment and replacement across TNSPs can affect the outcomes of opex benchmarking. It also noted that network support costs (the funding of alternative solutions to network augmentation) can 'distort' opex benchmarking. ElectraNet requested the AER to adjust TNSP opex for network support and operational refurbishment costs in its opex benchmarking. Further consideration should be given to this issue as part of the AER's future consultation process.

ElectraNet also argued that the voltage–weighted connection output should use the upstream or transmission–side voltage of the connection point rather than the downstream or DNSO–side voltage currently used. The AER currently uses a measure consistent with AEMO's Marginal Loss Factor (MLF) reports which use the downstream voltage. ElectraNet argued the upstream voltage more accurately reflected the connection assets owned and maintained by the TNSP. More generally, ElectraNet argued the current voltage–weighted connection output was 'misleading'. As noted above, this output is the least developed of the included TNSP output measures and we recommend it be further refined as part of the AER's future consultation process.

Powerlink submitted that further work is required to achieve greater consistency of TNSP input data. It noted differences in data used in the AER's draft benchmarking report compared to the EBRIN data published for ANT and TransGrid. The difference for ANT concerned total revenue and reflects the inclusion of some AEMO activities in the benchmarking analysis to make Victorian TNSP coverage comparable to the other States. The AEMO data used is included in the accompanying modelling files. The difference for TransGrid related to energy throughput and was due to the latest version of TransGrid's EBRIN not having been uploaded onto the AER's website. This has now been rectified.

More generally, Powerlink noted that it had been working with other TNSPs to improve alignment of EBRIN data relating to energy delivered to other connected TNSPs, disaggregated RAB values and installed transformer capacity. We welcome this development and believe it will assist with ongoing refinement of the TNSP EBRIN data.

Powerlink noted that its low load and energy density and the long distances it has to traverse are likely to impact its benchmarking performance. It also noted that differences in capitalisation policy across TNSPs could impact opex efficiency comparisons. The output specification currently used for TNSP economic benchmarking is designed to capture key network density differences across TNSPs. However, given the less mature stage of development of TNSP economic benchmarking, we have recommended against drawing strong inferences about TNSP efficiency levels from the current results. The AER has not used economic benchmarking for efficiency comparison purposes in its TNSP determinations. Consequently, further development of relevant operating environment factors, including assessment of differences in capitalisation policies across TNSPs has yet to be undertaken. Rather, the use of economic benchmarking in determinations has been limited to informing the forecast rate of opex productivity growth to be used in the opex rate of change forecasting method. We recommend the AER include the issues raised by Powerlink in future consultation on refining the TNSP EBRIN data and modelling.

Powerlink also noted that in recent years it had curtailed, and in some cases ceased, earlier planned capex projects in response to falling energy throughput and demand. It noted its opex partial productivity performance had declined in 2015, partly as a result of redundancies associated with restructuring and the write–off of expenditure on early capital project development works no longer required due to reduced demand. We recommend the AER undertake further consultation on the reporting and modelling treatment of 'abnormal' costs such as voluntary redundancy payments.

TransGrid requested in its submission that the AER reiterate previous qualifications on TNSP economic benchmarking results given the relative immaturity of TNSP performance assessment compared to the quite long history of DNSP economic benchmarking. TransGrid also noted it had engaged a consulting firm to help it better understand data and model specification issues. As noted above, we recommend the AER undertake consultation on ways in which its EBRIN data collection and economic benchmarking modelling can be further refined. Constructive suggestions from TNSPs and engagement by them will be welcome.

MTFP and MPFP results

TNSP MTFP and MPFP results are presented in figures 1 to 3.

Figure 1 **TNSP multilateral total factor productivity indexes, 2006–2015**

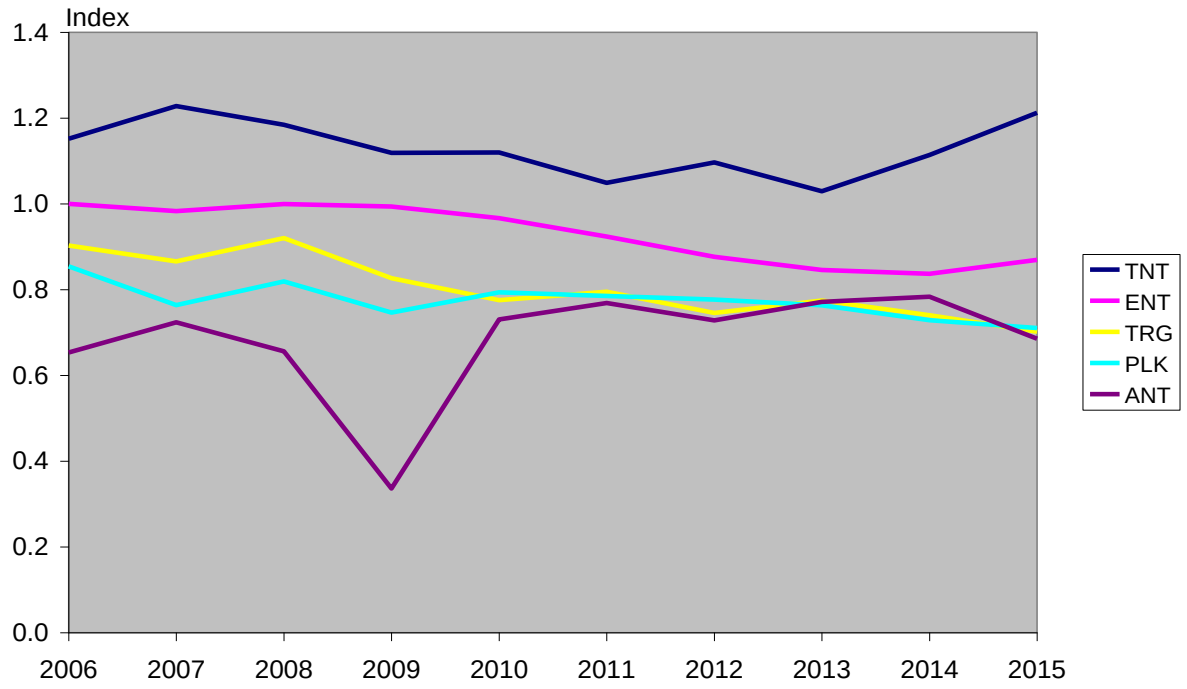


Figure 2 **TNSP multilateral opex partial factor productivity indexes, 2006–2015**

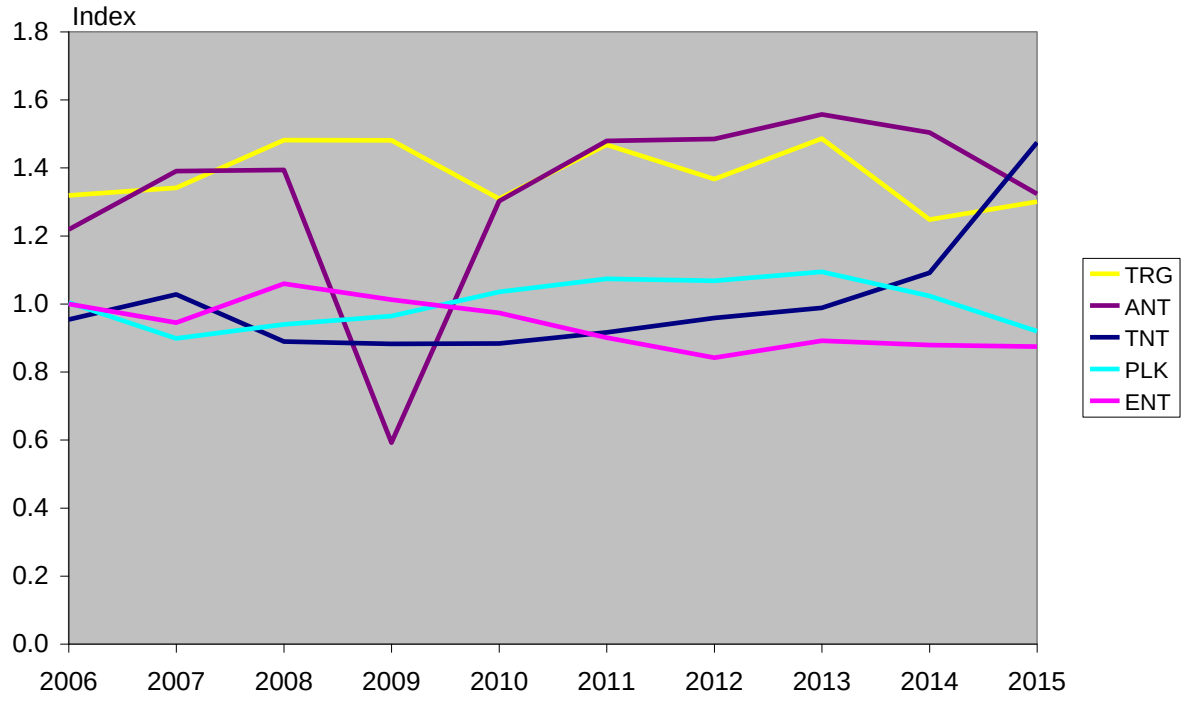
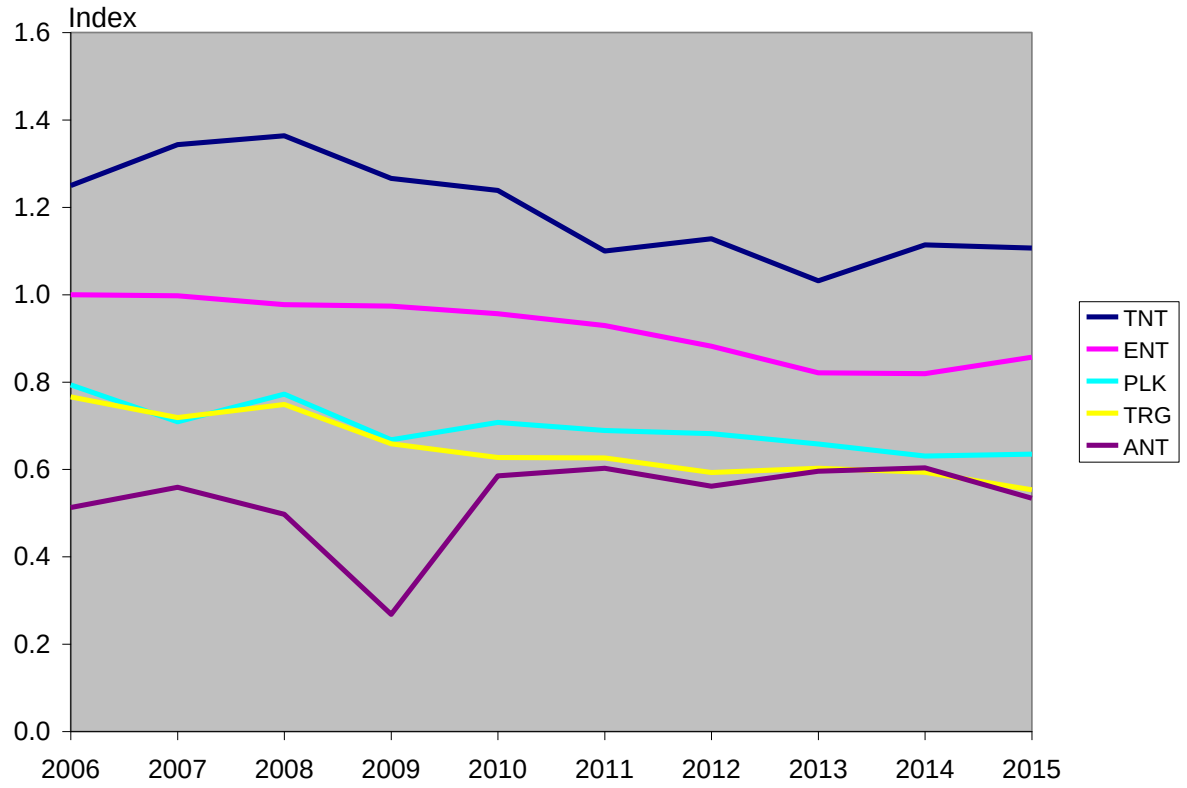
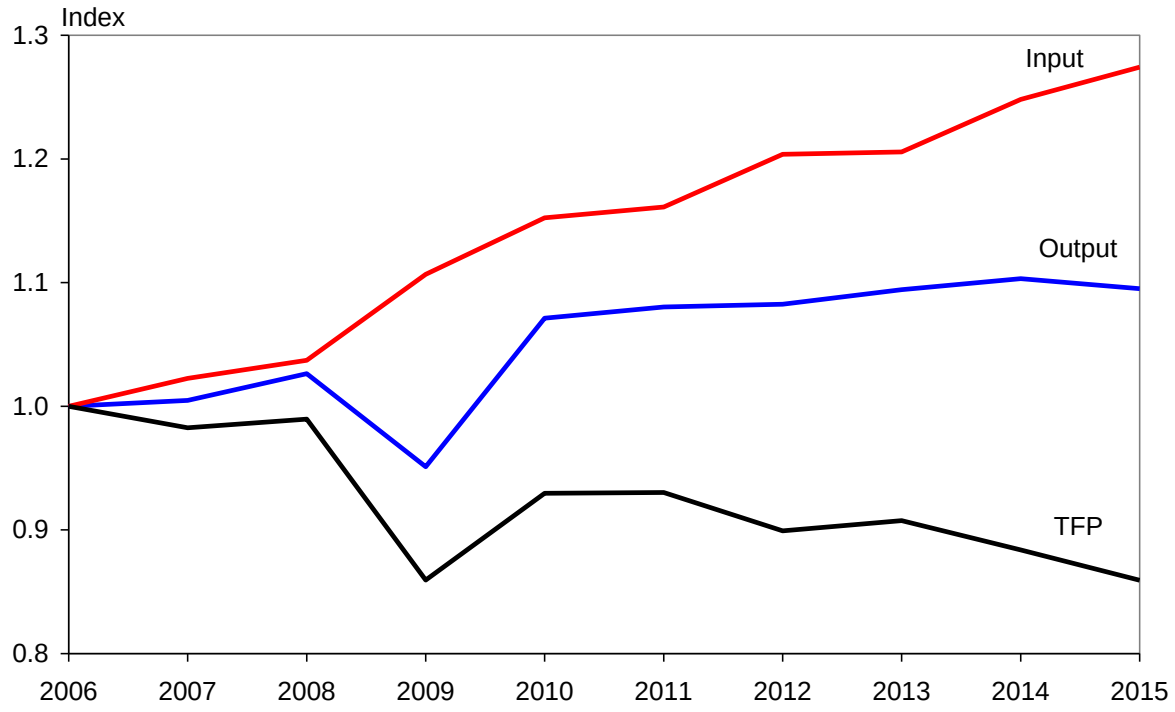


Figure 3 **TNSP multilateral capital partial factor productivity indexes, 2006–2015**



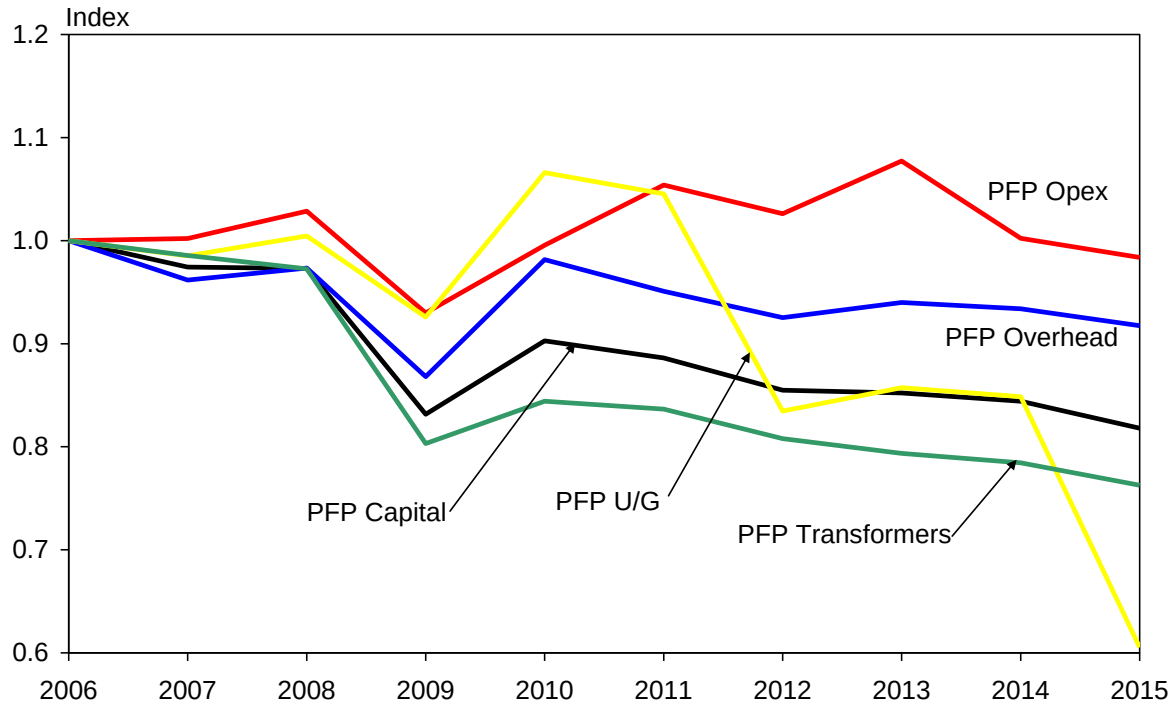
Transmission industry level output, input and TFP indexes are presented in figure 4.

Figure 4 **Industry–level transmission output, input and total factor productivity indexes, 2006–2015**



TNSP industry level opex and capital partial productivities are presented in figure 5.

Figure 5 **Industry–level transmission partial productivity indexes, 2006–2015**



Opex PFP levels can be seen to have fluctuated while overhead capital and transformer capital PFPs have exhibited a steadier pattern. Underground capital PFP levels have exhibited larger changes because underground lengths have grown from a very small base in 2006.

From figure 5 we can see that opex partial productivity trended up from 2006 to 2013 before falling in 2014 and again in 2015 although to a lesser extent in 2015. The 2014 fall of nearly 7 per cent in TNSP industry opex productivity was driven principally by a fall of 16 per cent in TransGrid's opex productivity. TransGrid's opex productivity then grew by 4.2 per cent in 2015. Similarly, the 2015 fall of nearly 2 per cent in TNSP opex productivity was driven principally by falls of 10 per cent in Powerlink's opex productivity and 12 per cent in AusNet's opex productivity.

In the case of Powerlink at least, there is evidence that the increase in reported opex at the end of the series is a one–off and not a reflection of recurrent opex. In its regulatory proposal Powerlink has reduced its reported opex in 2015 by 12.6 per cent to allow for non–recurrent factors as part of the process of forming its base year opex for forecasting purposes (Powerlink 2016, pp.5–6). Most of this reduction was attributed to a cancelled project.

Individual index values and growth rates[1] for the period 2006 to 2015 are presented in the accompanying spreadsheets 'Economic Insights AER TNSP MTFP Results 7Nov2016.xlsx' and 'Economic Insights AER TNSP Industry Prod Results 7Nov 2016.xlsx'.

[1] Note that two types of growth rates are presented – average growth rates and trend growth rates. In Economic Insights (2016) we discuss the advantages and disadvantages of the two types of growth rates for calculating the forecast opex partial productivity growth rate to be included in the opex rate of change formula.

References

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