Locked Bag 14051
Melbourne City Mail Centre
Victoria 8001 Australia
T: 1300 360 795
www.ausnetservices.com.au

24 May 2017

Evan Lutton
Assistant Director, Networks Branch
Australian Energy Regulator
GPO Box 520
Melbourne, VIC 3001

Via email: Evan.Lutton@AER.gov.au

Dear Evan,

Re: Review of transmission benchmarking model – Issues Paper

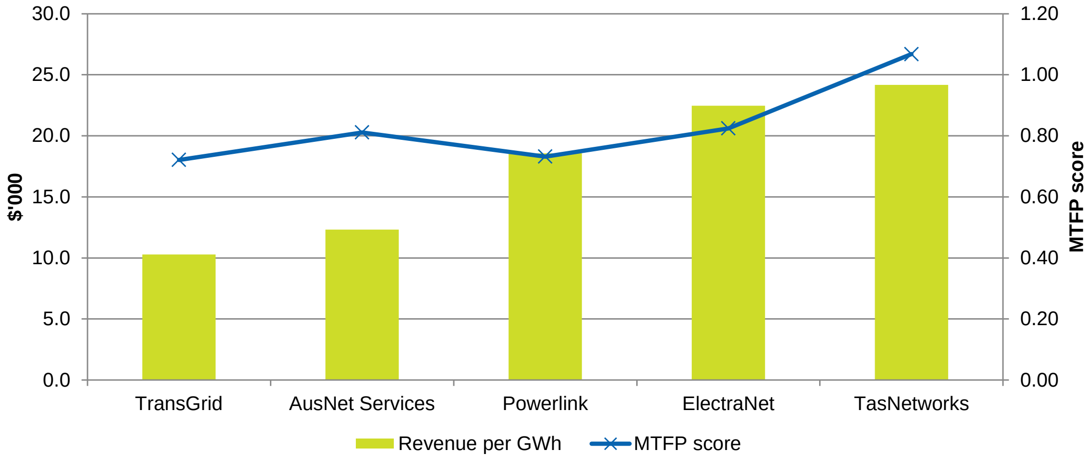
AusNet Services welcomes the AER's review of the transmission MTFP benchmarking model.

AusNet Services supports benchmarking as a useful efficiency indicator. However, results are highly sensitive to model specification and operating environment factors. Accordingly, productivity benchmarking is not a precise tool and is better suited to identifying trends and high-level observations than it is to being used deterministically, particularly in transmission. It is also important to consider the results of alternative approaches in interpreting benchmarked performance.

A number of significant model specification issues exist in the transmission MTFP model, principally in relation to the connection and reliability outputs measured by the model. These issues undermine the usefulness of the current benchmarking model. These output-related issues have been recognised in the issues paper produced by Economic Insights (the Issues Paper). While there may be merit in a wider ranging review of the transmission benchmarking model, addressing these output-related issues is the clear priority.

This review is timely, because the current MTFP model produces results that are inconsistent with the relative prices of the benchmarked TNSPs. All else equal, under the current regulatory framework, the most efficient and productive networks should also have the lowest prices. That is, one would expect a negative correlation between price and productivity (higher productivity drives lower prices). However, as the figure below shows, the current specification drives *positive* correlation between price (using revenue per GWh of energy delivered as a proxy for price) and the productivity scores produced by the model.

Figure 1: Revenue per GWh vs MTFP score, 2016



Source: 2016 RIN data; AusNet Services analysis

While we are cognisant of the challenges involved in benchmarking transmission networks, the results shown above are counter-intuitive, and suggest specification issues with the current MTFP model. These issues need to be remedied if benchmarking is to be a meaningful assessment technique for use in regulatory decision making. Addressing the issues outlined in the Issues Paper, and discussed in this submission, would mark an important step toward achieving this.

Attachment 1 to this submission provides responses to the discussion questions posited in the Issues Paper. We would welcome the opportunity to discuss our response to these questions further with the AER.

We look forward to attending the AER's upcoming workshop on this important topic on 31 May 2017. In the meantime, if you have further questions regarding this submission, please contact Rob Ball, Senior Economist, on 03 9695 6281.

Sincerely,

Tom Hallam
General Manager, Regulation and Network Strategy
AusNet Services

Attachment 1: Responses to Issues Paper discussion questions

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?

Yes, end-users are a better measure of transmission output than the current voltage weighted connections output variable. There are a number of concerns with the voltage weighted connections output, including:[1]

- Weighting each connection point using voltage is arbitrary because it does not reflect the productive capacity and input costs required at each connection point and, therefore, does not result in a meaningful productive output quantity. In contrast, weighting each connection point using capacity measured in MVA or end-users supplied more accurately reflects the productive output, the scale of assets and, importantly, matches the basis on which the cost inputs required to manage the assets at each connection point are being incorporated in the model. These points, and the deficiencies of the current voltage-weighted approach, are discussed below in our response to question 5.
- Exit points are not a meaningful output of a TNSP. Instead, meeting customer demand at the connection point whilst ensuring the security and reliability of electricity supply to customers is the output service. A simple example demonstrates this; if AusNet Services supplied Melbourne's population with power from 20 connections points, we are not 20 times more productive that if we supplied them from one. The current specification produces a nonsensical outcome.
- It reflects differences in respect of the exit voltage of each transmission network. These differences, which reflect the arbitrary historic network design of each transmission network, can be material but do not reflect the true productive output of the TNSP at the connection point.
- Given the above, it is not surprising that recent analysis by Frontier Economics demonstrated that, when updated for recent data, the voltage weighted connections output has limited explanatory power in respect of TNSP cost inputs. Specifically, when the original 2006-13 dataset was updated to either reflect data revisions made in 2015 and 2016, or to include 2014 data, the connections output was shown to have a **negative** coefficient (i.e. all else equal, an increase in the connections output would result in a decrease in a TNSP costs). Frontier Economics stated that "this result is economically not plausible, which indicates that the model has been mis-specified or represents a spurious relationship between total costs and the cost drivers included in the model.[2]
- It is arguable that the actual output at each connection point is already accounted for by the model's specification of demand and energy throughput as outputs.

Because the current specification does not measure a meaningful output, it is not surprising that the current voltage weighted connections output quantity appears to be out of step with the relative magnitudes of the other outputs measured for each TNSP. For instance:

- Powerlink's energy throughput is 11% higher than AusNet Services', yet its voltage weighted connections output is 87% higher.[3]

[1] AusNet Services, *Submission on the 2016 distribution and transmission benchmarking reports*, October 2016

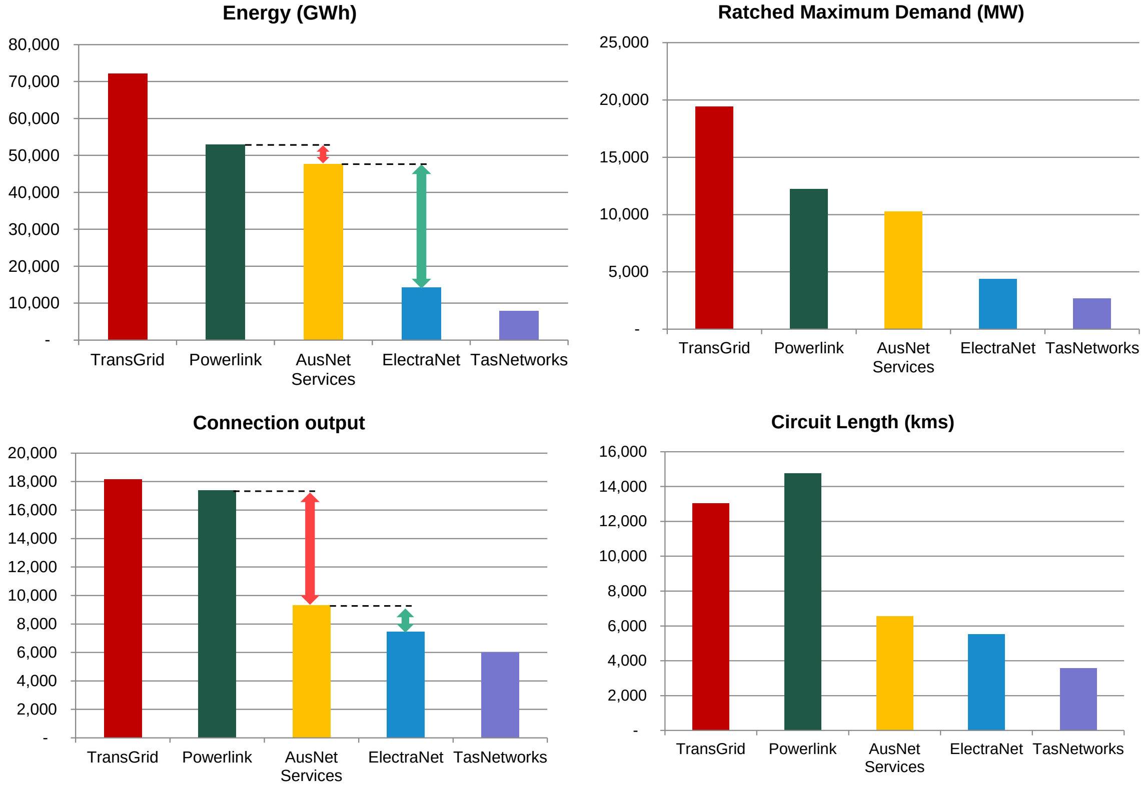
[2] Frontier Economics, *Review of the MTFP and MPFP analysis in the AER's 2016 Annual Benchmarking Report,* January 2017, p.11

[3] While Powerlink's circuit length is also far higher, this logically reflects the rural geography covered by Powerlink's network, which is a valid and reasonable cost driver. The inclusion of circuit length as an output is also intended to normalise for the efficiency impacts of operating a rural network.

- AusNet Services' energy throughput is 235% higher than ElectraNet's, yet its voltage weighted connections output is just 25% higher than ElectraNet's.

These differences are highlighted in the figures below.

Figure 2: TNSP outputs, 2016



Source: TNSP RINs

For transmission networks that serve entire jurisdictions containing both metropolitan and rural regions with comparable customer bases, one would expect broadly similar relativities across the output quantities (with the exception of circuit length which logically reflects the physical infrastructure of each network and hence is a valid and reasonable driver of cost). However, the relative output quantities shown above suggest the connection output is not reflective of the scale of connection services provided by each network and, therefore, is distorting the productivity scores produced by the model. This is particularly an issue given the relatively high weighting (27.8%) assigned to the connection output.

AusNet Services considers end-users represent a better measure of TNSP output than connection points, and is one that is not affected by many of the issues identified above in respect of the connection output.

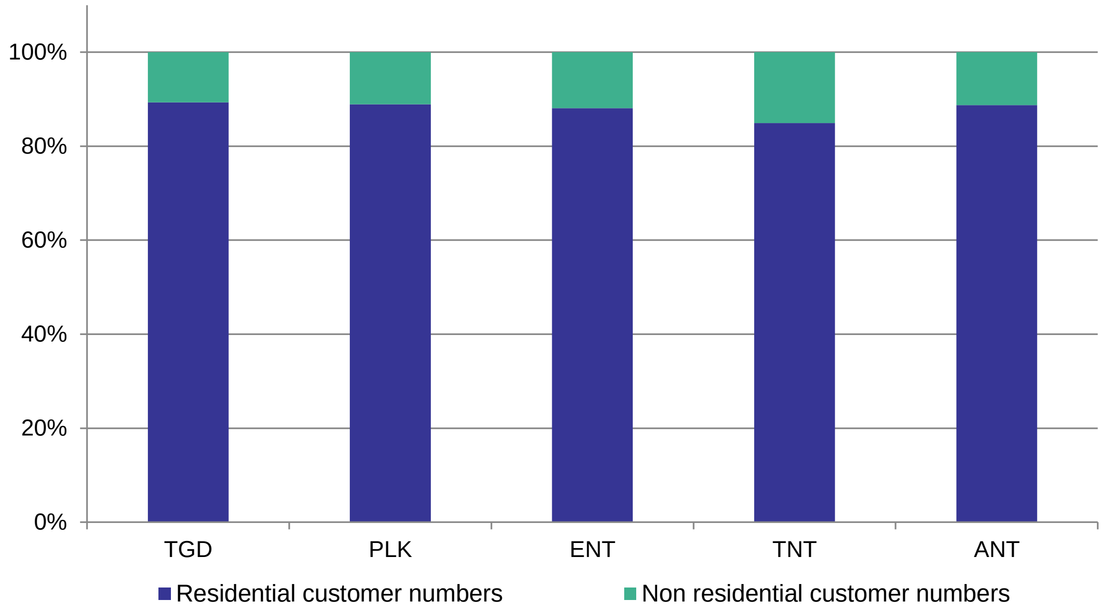
Firstly, end-users are able to be measured on a consistent basis using reliable data that is already reported to the AER through the existing RIN process (i.e. DNSP customer numbers).

Secondly, end-users are unaffected by historic decisions in respect of transmission to distribution network boundaries which, to the extent possible, are factors that should not materially impact productivity scores.

Thirdly, end-users inherently reflect 'size', and unlike the voltage weight connection output, end-users do not require weighting by a measure of 'size'. This avoids the need to select an appropriate basis for weighting, which if not done correctly, can potentially introduce large bias into the model. The current voltage-weighted connection output unequivocally introduces bias into the model by failing to account for material differences in productive output at terminal stations of the same voltage. As demonstrated below in response to question 5, AusNet Services' Thomastown Terminal Station (located in metropolitan Melbourne) provides significantly greater productive capacity and requires higher cost inputs compared to the relatively small Terang Terminal Station (located in rural Victoria). However, because both stations supply at 66kV, the current benchmarking model assumes both of these stations produce the same level of output, while at the same time capturing the differences in the cost inputs required to operate and manage the assets at these stations and, therefore, resulting in an internal inconsistency and material bias.

Fourthly, the composition of end-users is comparable across TNSPs, as demonstrated by the figure below, which shows that residential customers account for between 84% (TasNetworks) and 89% of customers (Powerlink) for all TNSPs. This means no material biases will be introduced into the model due to differences in end-user composition, which could potentially drive different demand and consumption patterns. We note that even if the composition of end-users **did** differ materially, no adjustment would be required to reflect different size end users because end-users of different size (e.g. a smelter compared to a household) are already accounted for in the energy and demand outputs.

Figure 3: Composition of TNSP end-users



Source: DNSP 2015 RINs; excludes unmetered customers and 'other' customers

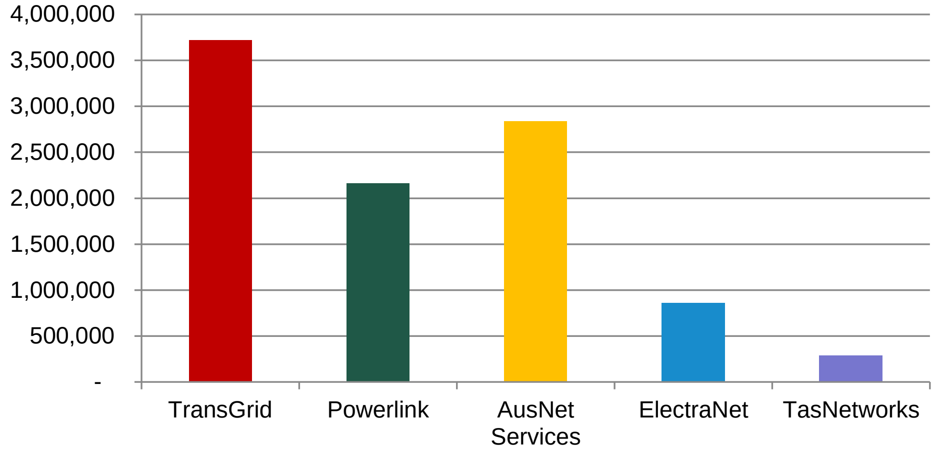
Finally, end-users are ultimately the users of the transmission network and their usage trends drive investment in transmission networks and, therefore, TNSP costs. Given that end-users largely create the demand served by transmission networks, and end-user preferences in respect of price and reliability drive investment decisions, it is fitting that the number of end-users served by each network are included as an output. Indeed, the AER's 2017-22 transmission revenue determination for AusNet Services – and the equivalent determination for other transmission networks - sets out the impact on the typical **residential** electricity bill as a key outcome of the determination.[4] This highlights that when making assessments of efficient expenditures and capital programs for transmission networks, the impact on end-user customers is an important consideration.

The figure below shows relative magnitudes of end-users, as measured by total distribution customers reported by the DNSPs within each TNSPs jurisdiction. This figure demonstrates that TransGrid, AusNet Services and Powerlink all have significantly higher numbers of end-

[4] AER, *AusNet Services transmission determination 2017-22 – overview*, April 2017, p.13

users than ElectraNet and TasNetworks, consistent with the relative sizes of these TNSPs as measured by the volume of energy and maximum demand they serve.

Figure 4: End-user numbers, 2016



Source: DNSP RINs; nd-users are measured as the total number of distribution customers in each TNSP's service area

In respect of our suggestion to adopt end-users, Economic Insights states:[5]

> *"We consider this suggestion has merit. It directly reflects the services provided to end–users and focuses on a significant output while also linking closely to the NEL/NER.* ***It can be based on relatively uniform and unambiguous data and avoids many of the issues with construction of the current variable discussed in the following section.*** *Disadvantages though are that it only focuses on downstream users and does not capture the entry side of the transmission network and does not differentiate the size of end–users (eg a smelter versus a household)* [emphasis added]*."*

We agree with Economic Insights that adopting end-users has merit for these reasons. In particular, we agree that it avoids many of the issues with the construction of the current connections output. Therefore, we strongly encourage the AER to adopt this measure.

The disadvantages of end-users identified by Economic Insights, which are relatively minor and should not preclude the use of end-users in the benchmarking model, are discussed below.

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?

Introducing explicit allowances for "special circumstances" (e.g. the Snowy Mountains Scheme) is not warranted because these differences are not expected to be material to the benchmarking results, and would also be accounted for in the other output measures. Introducing unnecessary and potentially complex adjustments to the model would also run counter to the simplicity benefits offered by using end-users to measure output.

Furthermore, should the AER elect to make an explicit adjustment to account for the impact of interconnectors on outputs, it is the energy throughput output that should be adjusted, rather than end-users.

[5] Economic Insights, *Review of Economic Benchmarking of Transmission Network Service Providers – Issues Paper*, April 2017, p.5

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

A TNSP's connection output is not exit point voltages, it is the demand or number of customers supplied with reliable and secure power. This is demonstrated definitively with the Thomastown and Terang terminal station example discussed below in response to question 5.

End-user customer numbers are, therefore, a robust measure of output. While an end-user output would exclude entry points, there is no simple way of capturing entry points while retaining the simplicity and consistency benefits of adopting end-users, apart from defining the end-user output as the sum of distribution customers and upstream customers. This approach would ensure that entry points are accounted for without introducing undue complexity in the model, and would treat entry and exit point transmission customers on a consistent basis.

We note that the DNSP benchmarking model captures only end-user customer numbers in its outputs (i.e. it excludes the entry points to each distribution network from the relevant transmission network). This feature not been identified as being problematic for that model.

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

No, the simple addition of number of entry and exit points would not be a viable output because this approach would not address the issues identified above in respect of connection points in any material way.

Principally, the output quantities would continue to be significantly out of step with the relative size of each TNSP's outputs. For example, the dataset underlying the 2016 transmission benchmarking report shows a total of 71 entry and exit points for AusNet Services, and 82 entry and exit points for TasNetworks. Accordingly, using the simple addition of entry and exit points would result in a larger output quantity for TasNetworks than AusNet Services, despite the fact the Victorian transmission system serves around ten times the number of end-users as the Tasmanian system.

Accordingly, using the simple addition of entry and exit points would fail to remove a significant misspecification from the model, which would continue to remain a material issue given there is little evidence to suggest that connection points are the most robust proxy for transmission output.

Issues with the 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?

As discussed above in response to question 1, weighting each connection point using voltage is arbitrary because voltage does not reflect the productive capacity and cost inputs required at each connection point , and, therefore, does not result in a meaningful output quantity. Instead, the voltage weighted approach reflects <u>solely</u> the voltage of the connection point.

Importantly, the relationship between the voltage of each terminal station and the inputs required is not clear. For a given level of demand, high voltage stations typically require fewer assets that are relatively costly to maintain individually, whereas low voltage stations typically have more assets that are less costly to maintain individually, but collectively may be similarly costly. While high voltage electricity systems are generally the most efficient way to meet demand, it cannot be argued that voltage is a good proxy for the productive output nor the costs required at each terminal station. This, presumably, is why MVA capacity, and not voltage, is used to standardise input quantities for each TNSP.

To illustrate these points, the following table contrasts two of AusNet Services' terminal stations that **both** supply at 66kV (on the customer-side) – Thomastown (TTS) and Terang (TGTS) terminal stations. TTS is a relatively large terminal station that supplies significant numbers of metropolitan Melbourne through connections to multiple distributors, while TGTS is a relatively small terminal station that serves relatively few customers in rural Victoria. A specification that suggests the same productive output from these two stations is clearly nonsensical.

Table 1: Comparison of Thomastown and Terang terminal stations

Characteristic	Thomastown (metro)	Terang (rural)
Number of end customers served	159,338	78,406
Aggregate capacity of customer contracted exits	750 MVA (5 x 150)	275 MVA (125 + 50)
Maximum demand on station	510 MVA	213 MVA
Exit point voltage	66kV	66kV
Connection output measure under current model	= 1 station x voltage weighting = 66kV	= 1 station x voltage weighting = 66kV

Source: AusNet Services analysis

The current benchmarking model assumes both of the stations shown above produce the same level of output and, therefore, implicitly assumes that the same cost inputs are required to operate and manage the assets at these stations. However, as the table shows, this is a highly flawed assumption as there are significant differences between these stations in respect of:

- **Productive capacity.** The maximum demand served at TTS is around twice that at TGTS, and its MVA capacity is around three times as high. Furthermore, over twice as many end-users are served by TTS. These differences unequivocally demonstrate that the output produced at TTS, on a number of different measures, is significantly higher than that produced at TGTS, despite both stations supplying at 66kV (and having a primary voltage of 220kV).
- **Scale of assets.** As shown by the single line diagrams provided at Attachment 2, TTS contains five transformers and in excess of 20 switchbays, compared with just two transformers and around 10 switchbays at TGTS. Accordingly, a substantially greater scale of assets is required to meet the higher demand at TTS.
- **Cost inputs required.** The greater scale of assets at TTS drives higher O&M input costs, as higher volumes of monitoring, physical inspection and routine maintenance activities are required, as well as higher capital costs when the assets are renewed or replaced at end of life. The current benchmarking model, by assuming the same outputs, implicitly assumes the cost to maintain all 66kV stations is the same – this is quite clearly not the case, with the model capturing these higher costs on the input side.

By simply inferring an output quantity of 66kV for both stations, the current connections output fails to account for the substantial differences in the cost inputs required, and outputs provided, at each station.

On the other hand, measuring output as MVA capacity would result in a materially higher output quantity for TTS, in line with its greater productive capacity, scale of assets and cost inputs required. For these reasons, MVA capacity is a more robust basis to use to weight each connection point.

Accordingly, should the connection point output variable be retained, each connection point should be weighted by MVA capacity. This data is readily available for each terminal station (as demonstrated above for TTS and TGTS) and can be added to the existing benchmarking RIN process.

However, while an MVA-weighted approach would be an improvement to the current approach, it would continue to be affected by the issues outlined above in respect of the underlying number of connection points measured for each TNSP. For this reason, the connection point output should be replaced with end-users which are a simpler, transparent and unbiased measure of output, as discussed above in our response to question 1.

Alternatively, the connection output should be removed from the model altogether if the issues inherent in it are not addressed through refinement to the model. As noted above, it is arguable that the actual output at each connection point is already accounted for by the model's inclusion of the demand and energy throughput outputs.

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?

One of the major problems with voltage weighting is that it will reflect the characteristics of the customer (e.g. DNSP or generator) rather than the TNSP's network. Referencing the transmission system operating voltages, rather than stepped down voltage at connection points, addresses this issue. However, connection points remain an inappropriate indicator of service to customers, as discussed in the responses above.

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

The main benefit of using downstream voltage appears to be the readily available dataset underlying the Marginal Loss Factor (MLF) reports. However, this should not preclude the use of TNSP-side voltage data because it is a more robust measure and requisite data could be obtained and reported by each TNSP.

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?

Notwithstanding the shortcomings of using voltage weighted connection points, where multiple DNSPs connect to a single terminal station, each connection should be counted separately in the calculation.

As discussed in AusNet Services' previous submissions, the current approach to counting a single connection point where multiple DNSP connections exist:[6]

- Inconsistently treats inputs and outputs at terminal stations (the capacity of the transformers and capital cost of these assets is counted as an input, but the services to four connections have not been counted as outputs).
- Inconsistently treats TNSPs by including all DNSP connections for some, but not for others.
- Penalises AusNet Services for the historic decision to separate the Victorian distribution network into five distributors.

To remedy these inconsistencies, each connection should be counted separately when calculating connection output if the connection output is retained.

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

[6] AusNet Services, *Submission on the 2016 distribution and transmission benchmarking reports*, October 2016, p.8

The design of the Victorian electricity grid is such that a number of AusNet Services' terminal stations connect multiple DNSPs. For example, four DNSPs, including AusNet Services' electricity distribution business, are connected to the Templestowe Terminal Station (TSTS).

Accordingly, counting the connections separately would result in a minor increase to AusNet Services' connection output. However, counting multiple connections separately would not address the more material issues identified above in respect of connection points and, therefore, is not a solution to the issues affecting the current benchmarking model's outputs.

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?

Yes, we consider the weight placed on the reliability output should be reduced. While we agree with Economic Insights that reliability is an important requirement for TNSPs, we consider the current specification of the MTFP model places a disproportionately high weight on reliability.

Transmission networks are inherently reliable. The events that result in customer outages are often not reflective of TNSP practices, since multiple coincident outages are usually required for this eventuality. These events may be caused by weather related events, such as storm, extreme heat or fire, which are outside of the control of the TNSP. Hence, events that result in customer minutes off supply are rare and volatile and should not lead to significant change in results.

As stated in our previous submissions, the current approach to measuring reliability results in single events 'swamping' annual productivity at the individual TNSP level and, in some cases, at the industry level. Therefore, moderating the effects of reliability would result in productivity scores that are more reflective of the underlying productivity achieved in any given year and, therefore, better achieves the intended purpose of benchmarking.[7]

We consider that applying a cap on either the weight of the reliability output or on the volume of unserved energy are both sensible way of addressing this issue. While the value for a cap should ideally reflect a statistical based approach, it may also require a degree of judgement. Both approaches may also yield similar outcomes.

A number of alternative approaches to mitigate the impact of reliability may also have merit, including:

- **Excluding unserved energy to direct connect customers.** Reliability for major direct connect customers (e.g. smelters) may in some cases dealt with through contractual arrangements that stipulate certain reliability levels. Consequently, it could be argued that also penalising TNSPs for outages to direct connect customers through deterioration in benchmarking performance is not justified and, therefore, such outages should be excluded from the reliability output.

- **Measuring the impact of outages on productivity as a percentage of total annual system minutes.** Under this approach, the reliability output would be expressed by the

[7] AusNet Services, *Submission on the 2016 distribution and transmission benchmarking reports*, October 2016, p.6

annual system minutes off supply as a proportion of total annual system minutes. This approach recognises that, because transmission networks provide very high levels of reliability all year round and outages are rare, the impact of outages on benchmarking performance should be commensurately minor.

There are a range of potential options that could be used to moderate the impact of reliability, some of which differ materially in the extent to which they moderate this impact. We consider these options warrant further analysis and consideration by Economic Insights to ensure reliability is measured appropriately in the model. The approach taken should ensure reliability is captured as an important transmission output, without undermining the value provided by other transmission outputs.

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?

The transmission STPIS' unplanned outage event limit applies a cap on the performance impact of unplanned outages that is equal to 17% of the performance target set for the relevant regulatory period.

Our submission highlighted that applying a cap to the reliability variable in benchmarking would be consistent with the *principles* underpinning the STPIS' unplanned outage cap – to mitigate the impacts of these outages on performance and ensure TNSPs remain incentivised following a major unplanned outage. However, consistency between the benchmarking model and the STPIS in respect of the design of a cap is neither practical nor desirable given they both serve very different purposes.

Accordingly, if a cap is applied to the reliability output in the benchmarking model, we do not consider there is a need for consistency with the method used to set the STPIS unplanned outage event limit.

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

Adopting a rolling average measure of reliability would reduce the annual volatility in productivity caused by major asset failures under the current approach. However, by simply spreading the impact of reliability across multiple years, the rolling average approach addresses the symptoms of the issue, rather than the underlying cause – reliability having a disproportionately high weight in the model. This approach would also spread the impact of a reliability event such that a TNSP's performance is impacted for multiple years in the event of a major transmission outage (such as AusNet Services' 2009 outage or the South Australia system black event in September 2016), which may mask productivity changes in subsequent years that are due to other factors.

Consequently, alternative approaches to measuring or capping reliability, as discussed above, are preferable to a rolling average.

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?

Notwithstanding the issues raised in this submission in respect of the output specification of the model, the current weights appear broadly reasonable. However, the rationale for a relatively lower weight being assigned to maximum demand is unclear. While we understand these weights have been derived through econometric modelling of a cost function, maximum demand is the key driver of network investment and cost. On this basis, it could be argued the weights for this output should be at least equivalent to the remaining outputs.

We also note that should any changes be made to the output specification, as this submission suggests are desirable, this would necessarily require recalculation of the output weights. This recalculation should be carried out using a robust statistical-based approach that considers a range of modelling approaches, and should also be "sense-checked" to ensure the results are consistent with an engineering and business view of the predominant cost drivers for transmission networks.

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

It is generally considered good practice to use the latest information when developing regulatory decision making tools such as benchmarking. However, frequent updating makes measuring changes in productivity more difficult and may create uncertainty for businesses. Accordingly, we would support infrequent (e.g. five yearly) updates of the weights.

When considering the merits of updating the weights (or any other change to the specification of the model), due consideration should be given to the historical measurement of productivity. While historical productivity could presumably be recast to reflect any model changes, this may raise questions in respect of the validity of regulatory determinations based on previous productivity analysis. However, only applying model changes to measurements of future productivity will make inference of long-term productivity trends problematic. We consider these issues warrant further exploration by Economic Insights, the AER and TNSPs.

'Additive' versus multiplicative capacity measures

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

Yes, we consider the current multiplicative capacity input biases against TNSPs with relatively high proportions of high-voltage lines and, therefore, fails to recognise the scale efficiency benefits of this network configuration. This is in direct contrast to the model's inclusion of circuit length as an output, which to an extent normalises for the efficiency impacts of operating a rural network.

As stated in our previous submissions:[8]

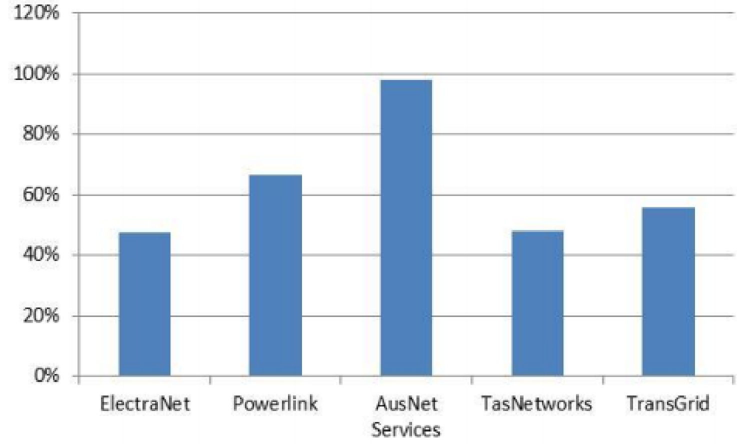
> *"The input specification selected by Economic Insights proxies the annual input quantity of overhead lines and underground cables using MVA-kms. This measure implies that 200km of a 100MVA line requires the equivalent capital input as 20km of a 1000MVA line. However, the relationship between capital cost and line capacity is not linear.*
>
> *AusNet Services submits that maintaining and operating a higher capacity line does not require a proportional increase in cost compared to maintaining and operating a lower capacity line. The application of the MVA-kms measure assumes that this is the case. Therefore this measure inherently ignores the scale efficiencies from operating higher capacity assets.*
>
> *AusNet Services' transmission network contains a much higher proportion of high capacity lines compared with its peers. This is demonstrated in the figures below. This means the quantity of AusNet Services' overhead lines capital input included in the MTFP model specification is particularly high compared with its peers, given the scale of its network under other common used measures captured in the output*

[8] AusNet Services, *Detailed Response to Draft Transmission Economic Benchmarking Report*, August 2014

specification, such as energy delivered, peak demand and circuit length. This increases the ratio of inputs to outputs for AusNet Services."

While the Issues Paper demonstrates the model does not bias larger TNSPs if it is assumed that all TNSPs have the same line configuration, this is not a realistic assumption given the actual line configuration of the five benchmarked TNSPs. As shown in the figure below, AusNet Services' transmission network contains a much higher proportion of high capacity lines compared with its peers.

Figure 5: Proportion of overhead circuits ≥ 220kV, 2013



Source: AusNet Services analysis

The installed capacity of AusNet Services' transmission lines is a consequence of previous investment decisions. However, this distinctive structural difference has not been appropriately normalised under the current model specification. In addition, while AusNet Services appears relatively less productive under this model specification, it does not follow that it is less efficient. The aforementioned scale economies associated with operating higher capacity lines could be seen as relatively *more* efficient than the contrary.

The Issues Paper also explains that this issue only impacts relative productivity scores between TNSPs (and not productivity trends over time) which to date have not been used *deterministically* by the AER. However, most issues identified with the current model impact relative productivity scores between TNSPs and not productivity trends over time, including those raised throughout this submission. It does not follow from this that these issues should not be addressed by making improvements to the model which, ultimately, would make its results more meaningful.

Furthermore, the AER does currently use relative productivity scores in its regulatory determinations as an indicator of the efficiency of base year operating expenditure. In AusNet Services' 2017-22 transmission determination, the AER stated:[9]

"We had regard to our transmission benchmarking results in deciding to use AusNet Services' actual opex as a starting point for our opex forecast. Our benchmarking indicates that AusNet Services is operating relatively efficiently when compared to other service providers in the NEM. That said, conclusions from our transmission benchmarking should be treated with caution. In contrast to electricity distribution networks, our benchmarking of transmission networks is relatively new and relies on a limited data set. It is limited by the small sample size of transmission businesses in the NEM—among other things. Notwithstanding these limitations, we consider our benchmarking models are the best available measure of the transmission businesses' overall efficiency levels."

[9] AER, *AusNet Services transmission determination 2017-22 – Attachment 7*, April 2017, p.24

The AER's use of benchmarking in future determinations may also expand and evolve, consistent with the NER requirement for it to have regard to benchmarking when assessing expenditure forecasts. Therefore, to ensure future regulatory determinations reflect robust benchmarking analysis, it is desirable to address biases in the benchmarking model now.

The Issues Paper states that adopting a multiplicative output measure is not the solution to this issue as it would distort productivity change over time. However, this does not suggest that other remedies should not be explored. While some solutions are flagged in the Issues Paper (as discussed in the responses below), these may not be practical due to data availability issues.

Accordingly, there is a need to explore alternative solutions to remove the inherent bias against TNSPs with greater proportions of higher capacity assets which may, in fact, be *more* efficient due to this characteristic of their networks. One approach could be to add a scale efficiency factor to the MVA * km multiplicative calculation that would reflect the fact that the relationship between input cost and line capacity is not linear. The scale efficiency factor could be determined through expert engineering analysis of the operating and capital costs that are required to operate lines of different capacity.

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)?

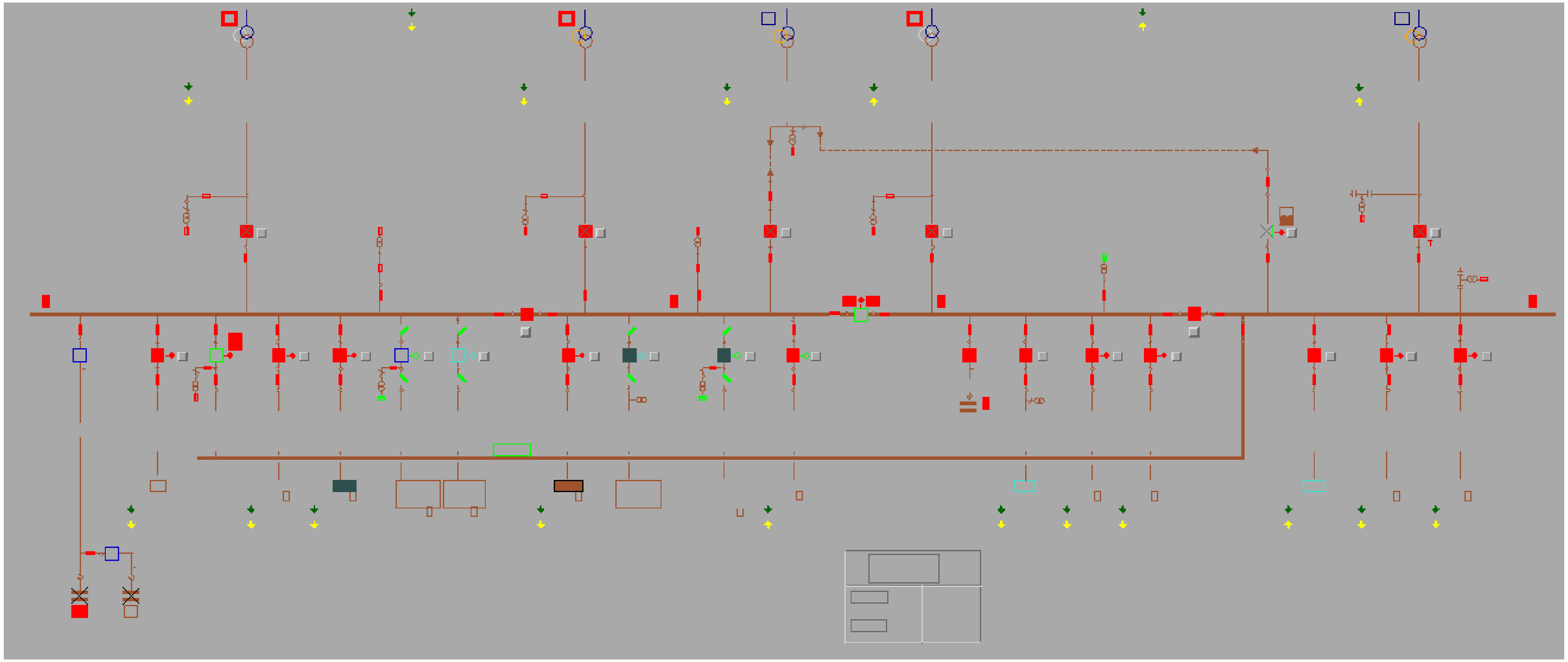
No, an objective basis does not exist. However, a point of demarcation between 'very high' and 'high' could potentially be determined, with a degree of judgement, through a statistical analysis of the population of lines across all the TNSPs.

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

No, the current regulatory accounting approach does not split the regulatory asset base into these categories. Accordingly, this approach is likely to require estimates and, therefore, could be subject to estimation errors or biases.

Attachment 2: Single line diagrams

Thomastown Terminal Station single line diagram



Terang Terminal Station single line diagram