Electricity distribution network service providers

Annual benchmarking report

November 2014

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Shortened forms

Shortened term	Full title
ACT	ActewAGL
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGD	Ausgrid
AND	AusNet Services (distribution)
capex	Capital expenditure
CIT	CitiPower
END	Endeavour Energy
ENX	Energex
ERG	Ergon Energy
ESS	Essential Energy
JEN	Jemena Electricity Networks
MTFP	Multilateral total factor productivity
NEL	National Electricity Law
NEM	National Electricity Market
NER	National Electricity Rules
opex	Operating expenditure
PCR	Powercor
PPI	Partial performance indicator
RAB	Regulatory asset base
SAP	SA Power Networks
TND	TasNetworks (distribution)
UED	United Energy Distribution

Contents

Overview

In this report we (the AER) set out to describe the relative efficiency of distribution network service providers (distributors).[1] In doing this we consider the characteristics of each distributor, and how their productivity compares at the aggregate level and for the outputs they deliver to consumers. The report outlines the framework for our efficiency assessment, and presents the results of two benchmarking techniques, multilateral total factor productivity (MTFP), and partial performance indicators (PPIs).

We are obliged to publish the annual benchmarking report as a result of the recent amendments to the National Electricity Rules (NER) following the Australian Energy Market Commission (AEMC) review of network regulation in 2012. The AEMC intended that the annual benchmarking reports would be a useful tool for stakeholders (including consumers) to engage in the regulatory process and to have better information about the relative performance of regulated networks.[2]

In this report we examine the efficiency of distributors overall, unlike our determinations where we examine the efficiency of the distributors' forecast opex and capex. We must have regard to the benchmarking analysis presented in this report, as part of our revenue determinations.[3] However, when making our revenue determinations, we are likely to also undertake additional detailed modelling and benchmarking analysis that focuses on the opex and capex of distributors.

The AER has consulted broadly on the benchmarking of the distributors. This consultation was initiated by a joint ACCC/AER report on benchmarking the capex and opex of energy networks published in 2012.[4] Subsequent to this, in 2013 as part of the Better Regulation program that followed amendments to the NER, we developed a new benchmarking and information framework.

As part of this work, we considered the data requirements for benchmarking and the application of benchmarking in our regulatory determinations. In doing this we hosted numerous workshops seeking feedback from stakeholders on the data requirements for the benchmarking of electricity networks.

We developed the benchmarking report using the data that we consulted on and collected using regulatory information notices (RINs) after the release of the guidelines. This data has been compiled in accordance with our consistent information requirements and five years of data has been audited by the distributors. We have published this data on our website.[5] While no dataset will likely ever be perfect, this data is the most consistent and thoroughly examined dataset of the distributors yet assembled in Australia.[6]

As required under the NER we circulated a draft of this report to distributors and other stakeholders in August 2014. In light of comments made by stakeholders we have made some changes to the report.[7]

This report presents the results of our overall benchmarking measures including MTFP and PPIs. Figure 1 shows the results of our MTFP analysis.

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1 Under clause 6.27(a) of the National Electricity Rules we are required to publish an annual benchmarking report. The purpose of this report is to describe, in reasonably plain language, the relative efficiency of each Distribution Network Service Provider in providing direct control services over a 12 month period.

2 AEMC, *Rule determination*, 29 November 2012, p. 108.

3 NER clause 6.5.6(e)(4), 6.5.7(e)(4)

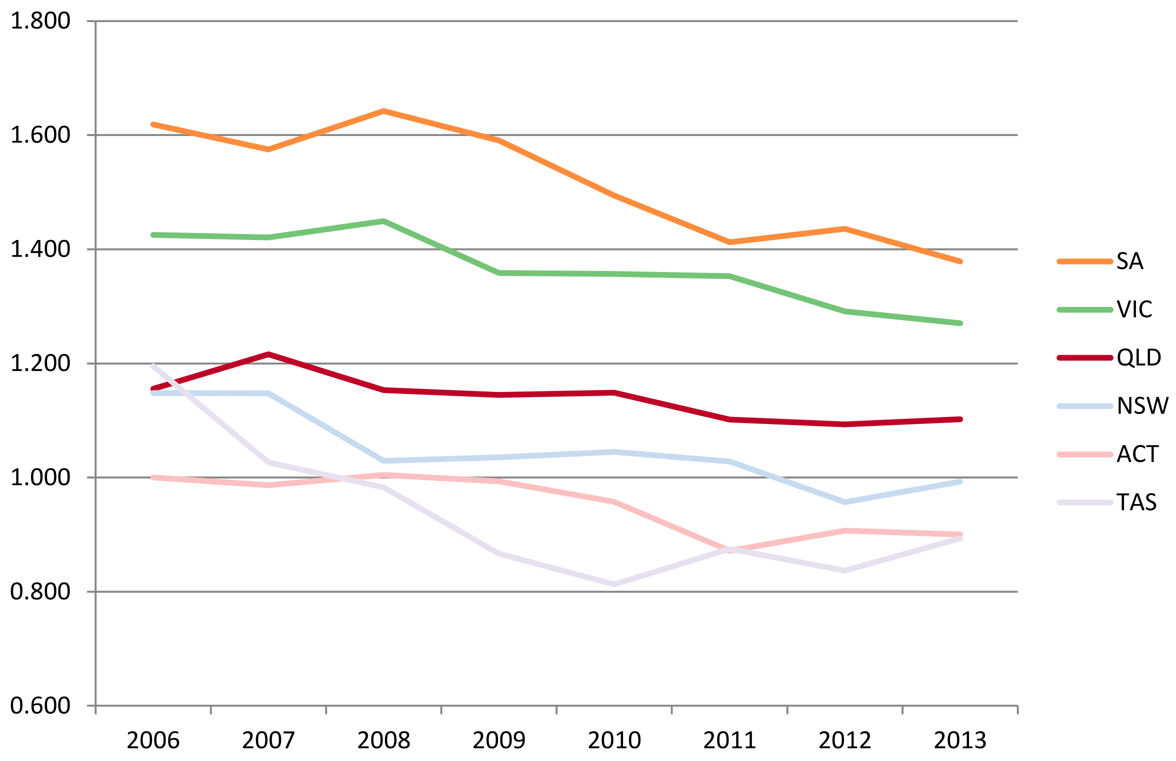
4 ACCC/AER Working Paper Series, *Benchmarking Opex and Capex in Energy Networks*, Working Paper no.6, May 2012.

5 This data is available at: https://www.aer.gov.au/node/483

6 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, p. 3.

7 We have adjusted the MTFP input specification to account for subtransmission assets. This follows feedback from ActewAGL and Huegin consulting, as we note in Appendix B.

Figure 1 **State wide multilateral total factor productivity**



The results of our MTFP analysis show that:

- The state wide average indicates that the Victorian and South Australian distributors appear to be the most productive. That said, one Queensland distributor Energex outperforms a Victorian distributor AusNet Services on average over the observed period.
- The ACT, NSW and Tasmanian distributors appear to be the least productive.
- Productivity across the whole sector is declining. This has been caused by large increases in the expenditure of distributors at a time when demand for their services has been relatively stable or declining. We recognise however, that some of the decrease in productivity may be attributable to changes in the operating environment, which are unaccounted for in the modelling, for example changes to bushfire related regulatory requirements.

Taken together, the PPIs also show that the Victorian and South Australian distributors generally appear the most productive. They also highlight the impact customer density has on a distributors' expenditure.

We are required under the NER to provide a specific analysis focusing on a 12 month period.[8] However, because this is the first time we have presented expenditure benchmarking results, this report focuses on the 2006-13 period, and the most recent historical year. With results presented over a longer period, stakeholders will gain insight into the distributors' current expenditure and productivity trends.

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8 NER clause 6.27(a)

Charges for distribution network services are only part of the electricity prices paid by consumers. As such, the relative performance of each of the distributors shown in this report does not necessarily mean that consumers on less productive networks pay more overall. Other components of the electricity market, including the wholesale generation of electricity and the retail component, may lead to price differences. We consider the performance of electricity retailers in a separate report.[9]

9 AER, *Annual report on the performance of the retail energy market 2012–13*, February 2014.

1 Network characteristics

This benchmarking report considers the efficiency of the 13 distributors in the National Electricity Market (NEM). The NEM connects electricity generators and customers from Queensland through to New South Wales, the Australian Capital Territory, Victoria, South Australia and Tasmania.

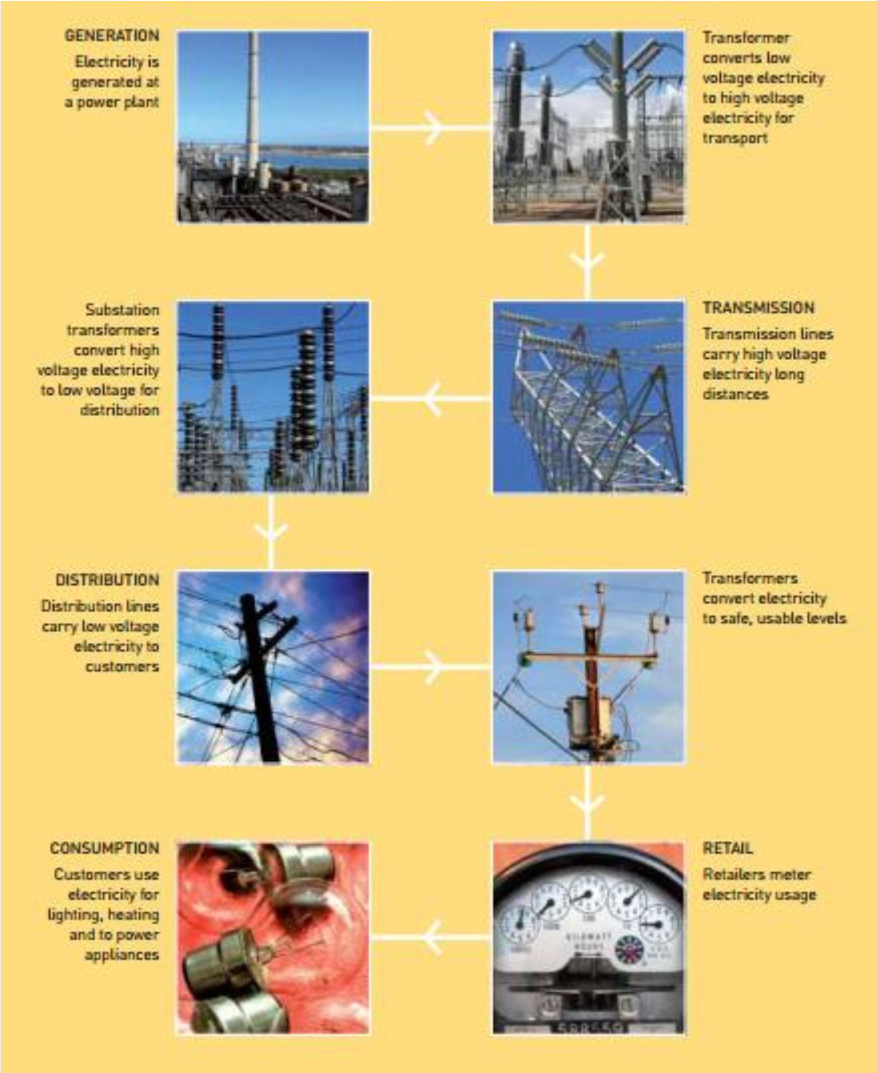
Figure 2 Electricity distribution networks within the National Electricity Market

Note: the colour coding of the distributors in this chart has been adopted for other charts in this document to allow for the easy identification of individual distributors.

Figure 2 illustrates the network areas for which the distributors are responsible. The distributors also differ in respect to scale of the services that they provide (outputs) and the mix of inputs that they use to provide those services.

The distributors are responsible for transporting electricity between the high voltage transmission networks, embedded generators and electricity customers. They are not responsible for the generation or sale of electricity. These functions are the responsibility of generators and retailors, respectively. Figure 3 outlines the structure of the national electricity market.

Figure 3 Structure of the national electricity market



Benchmarking analysis considers the efficiency of a business in using inputs to deliver outputs given the operating environment within which they function. The inputs and outputs of the distributors are considered in the following sections.

1.1 Framework for efficiency measurement

Our approach to benchmarking measures the efficiency of a business in using its inputs to produce outputs by comparing its current performance to its own past performance and to the performance of other NSPs. All the distributors use a range of inputs to produce the outputs they supply. If the distributors are not using their inputs as efficiently as possible then there is scope to lower network service costs and, hence, the prices charged to energy consumers, through efficiency improvements.

Many benchmarking techniques compare the quantity of outputs produced to the quantity of inputs used and costs incurred over time and/or across distributors.[10] The relationship between outputs, inputs and efficiency measurement is considered in box 1.

Box 1 Efficiency measurement

Economic efficiency is achieved when inputs are optimally selected and used in order to deliver outputs that align with customer preferences. Three components of economic efficiency were set out by Hilmer – 'productive efficiency', 'allocative efficiency' and 'dynamic efficiency'.[11]

Productive efficiency

Productive efficiency is achieved when distributors produce their goods and services at least possible cost. To achieve this, distributors must be technically efficient (produce the most output possible from the combination of inputs used) while also selecting the lowest cost combination of inputs given prevailing input prices.

Allocative efficiency

Allocative efficiency is achieved where resources used to produce a set of goods or services are allocated to their highest valued uses (i.e., those that provide the greatest benefit relative to costs). To achieve this, prices of the goods and services of distributors must reflect the productively efficient costs of providing those goods and services.

Dynamic efficiency

Dynamic efficiency reflects the need for industries to make timely changes to technology and products in response to changes in consumer tastes and in productive opportunities. Dynamic efficiency is achieved when distributors are productively and allocatively efficient over time.

We consider that the benchmarking techniques in this report primarily assist us in forming a view on the productive efficiency of distributors. However measuring productive efficiency will assist us in assessing whether distributors are allocatively and dynamically efficient. Measuring productive efficiency will assist us in determining the efficient prices/revenues for services promoting allocative efficiency. Measuring productive efficiency over time provides an insight into the dynamic efficiency of distributors.

The benchmarking metrics used in this report measure relative productivity.[12] The measurement of productive efficiency requires determining a firm's position relative to its industry's technological

[10] Economic Insights, *Economic Benchmarking of Electricity Network Service Providers Report prepared for Australian Energy Regulator*, 25 June 2013, p. ii.

[11] Independent Inquiry into National Competition Policy (F Hilmer, Chair), *National Competition Policy*, Australian Government Publishing Service, Canberra, 1993.

frontier. A firm's position relative to its industry's technological frontier can be inferred through observation of the relative productivity of firms (usually by assuming the most efficient firms in the sample lie on the efficient frontier).

There has been discussion about the correct approach to measuring the inputs and outputs of electricity distribution networks. This includes whether outputs should be measured on a "billed" or "functional" basis, whether maximum demand or network capacity should be used as an output measure and how capital should be incorporated into benchmarking analyses. We considered this as part of our consultation on the measurement of the inputs and outputs of distributors in 2013.[13] We have collected and published data that facilitates the measurement of inputs and outputs in accordance with the different approaches. This will allow stakeholders to conduct their own benchmarking analysis, testing different output specifications.[14] We encourage both networks and other stakeholders to do so. Using a common data set for analysing network performance will greatly assist transparency and constructive discussions between the networks and their customers.

1.1.1 Network outputs

In efficiency analysis outputs are generally considered to be all of the total goods and services produced by a business. There are many different facets to the outputs provided by distributors. Broadly distributors provide access to electricity via their networks. In doing this they transport electricity between transmission nodes and distribution customers. They will also meet the demand of their customers both over the course of a year and when this demand is greatest. Distributors will also seek to minimise interruptions to electricity supply in the most cost-effective way and in accordance with reliability standards.

Some distributors provide other services such as metering and public lighting. There are other less material aspects to the quality and reliability of distribution services such safety, aesthetics and quality. In this report we have chosen to focus on the primary outputs of the distributors that relate to the provision of their core 'poles and wires' distribution service.

Customer numbers

An important output of distribution networks is granting their customers access to electricity through their networks. There are a number of tasks the distributor has to undertake to facilitate the delivery of electricity, regardless of how much electricity the consumer uses. Economic Insights has modelled the costs of distributors and determined that customer numbers is the most significant output measure.[15] The number of customers on their network reflects this fixed output that the network has to provide. We measure the number of customers as the number of active connections on a network.

Figure 4 below sets out the average customer numbers of the distributors over a five year period.

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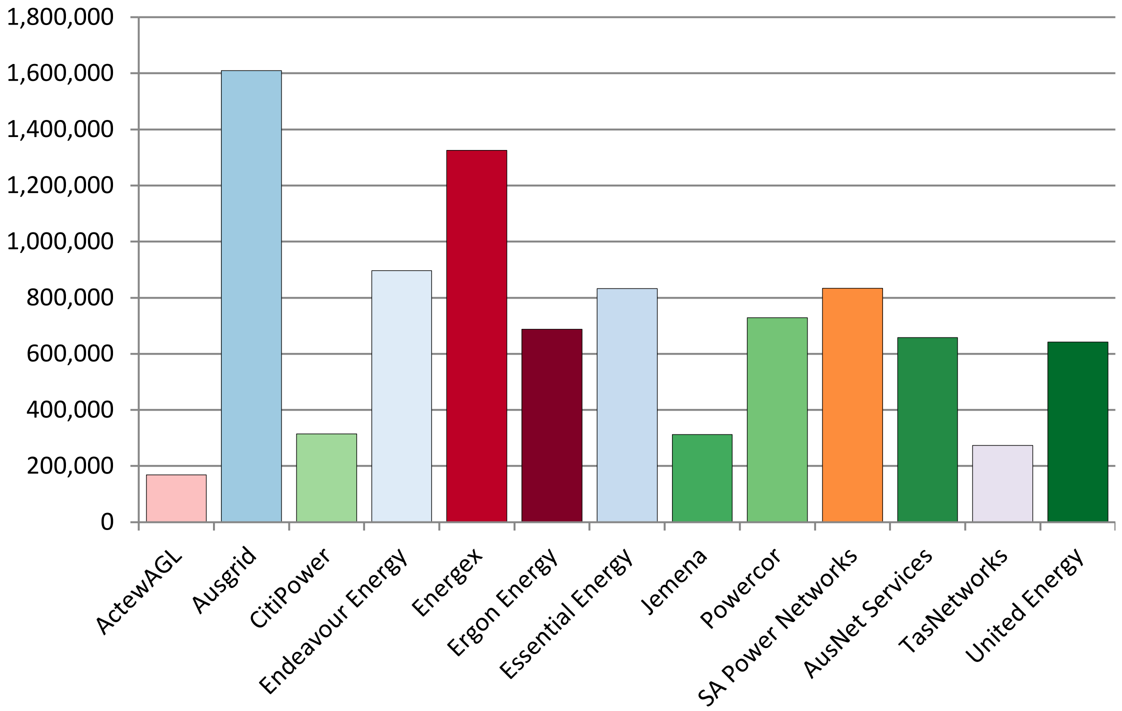
12 Productivity can be defined as the ratio of aggregate output quantity to aggregate input quantity. Where a firm has one output and one input productivity can be measured by a simple ratio of the output to the input. However, where a firm has multiple outputs and multiple inputs, weights are required to construct an output index and an input index. This allows the calculation of total factor productivity which is the ratio of an index of total output quantity to an index of total input quantity. The output and input quantities are normally weighted by the prices of outputs and inputs in forming the relevant index, where these prices are can be observed and reflect the unit costs of outputs and inputs. (See Coelli, A Estache, S Perelman, and L Trujillo, *A primer on efficiency measurement for utilities and transport regulators*, World Bank Publications, 2003, pp. 10-11).

13 For a comprehensive outline of the discussions on input and output measurement see: Economic Insights, *Economic Benchmarking of Electricity Network Service Providers Report prepared for Australian Energy Regulator*, 25 June 2013, pp. 6–71.

14 This data has been published on our website and is available here: https://www.aer.gov.au/node/483

15 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, pp. 11–12.

Figure 4 **Distributor's five year average customer numbers (2009–2013)**

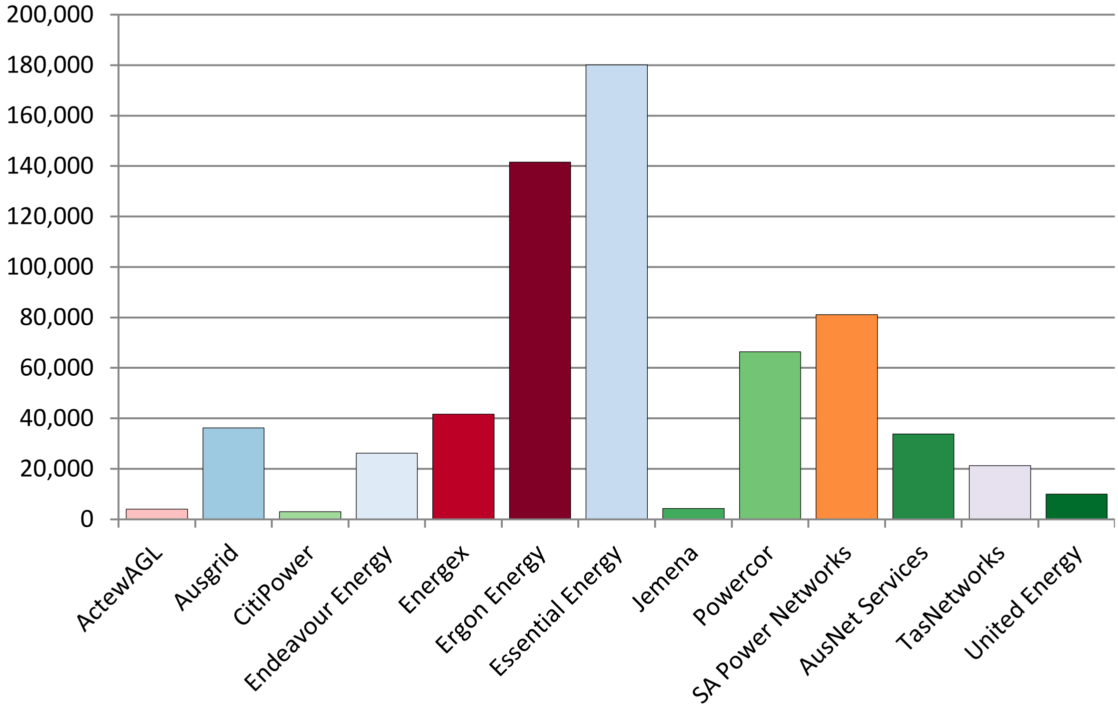


Route line length

Route line length reflects the distances over which distributors deliver electricity to their customers. To provide their customers with access to electricity, distributors have to transport electricity from the transmission network to its customers' premises. Distributors will typically operate networks that transport electricity over thousands of kilometres.

In this report line length is predominantly measured in terms of 'route line length'. This is the aggregate length in kilometres of each pole and tower line and underground line.

Figure 5 **Distributor's five year average route line length (2009–2013, kilometres)**



Maximum demand, capacity and energy delivered

Distributors are required to meet and manage the demand of their customers. This means that they must build and operate their networks to have sufficient capacity to meet the expected demand for electricity when it is at its peak. Maximum demand is a measure of the overall peak in customer demand experienced by the network.[16]

An alternative approach to measuring a distributor's service in meeting the demand of its customers at times of peak demand is to measure network capacity. In this report we measure capacity as distribution transformer capacity which is the capacity of transformers that convert electricity from high voltages to the standard customer connection voltage.[17]

Energy delivered is a measure of the amount of electricity that distributors deliver to their customers. This reflects the overall throughput on the network.[18] Energy delivered is not a driver of costs as distribution networks are typically engineered to manage maximum demand. However the energy delivered is an output for which customers are billed.

Table 1 presents the average capacity, maximum demand and energy delivered for each of the distributors for the 2009-2013 years.

16 Our maximum demand measure is non-coincident summated raw system annual maximum demand, at the transmission connection point.

17 High voltage and subtransmission customers are not included in this measure.

18 There has been some consideration as to whether maximum demand, network capacity and energy delivered should be used as measures of a distributor's output. For further discussion of this matter please see: Economic Insights, *Economic Benchmarking of Electricity Network Service Providers, Report prepared for Australian Energy Regulator*, 25 June 2013, pp. 6–15.

Table 1 Capacity, maximum demand and energy delivered of the distributors

	Network capacity (MVa)	maximum demand (MW)	energy delivered (MWh)
ActewAGL (ACT)	1,980	650.65	2,894,863
Ausgrid (AGD)	16,272	6,239.19	29,498,623
AusNet Services (AND)	5,938	1,868.20	7,676,880
CitiPower (CIT)	4,099	1,415.44	6,095,544
Endeavour Energy (END)	8,849	3,859.44	16,968,906
Energex (ENX)	15,045	4,938.72	21,581,200
Ergon Energy (ERG)	8,848	3,139.67	13,760,202
Essential Energy (ESS)	10,315	2,549.34	12,062,538
Jemena (JEN)	2,484	979.92	4,372,000
Powercor (PCR)	6,659	2,405.46	10,587,837
SA Power Networks (SAP)	8,738	3,011.17	11,211,160
TasNetworks (TND)	3,456	1,078.20	4,428,350
United Energy (UED)	4,547	2,000.53	8,035,225

Reliability

Another dimension of the outputs of network businesses is their reliability. The reliability of distributors is commonly measured as the average number of minutes off supply per customer (per annum) or the average number of interruptions per customer. Figure 6 presents the average number of minutes off supply per customer. Figure 7 presents the average number of interruptions to supply per customer. There are other measurements of reliability; however the frequency and duration of interruptions to supply per customer are the standard measures for distributors.[19]

[19] The Institute of Electrical and Electronics Engineers (IEEE), Inc. *IEEE Guide for Electric Power Distribution Reliability Indices,* 1366TM, Published by 3 Park Avenue, New York, NY 10016-5997, USA, 14 May 2004, p. 3.

Figure 6 Average number of minutes off supply per customer (2009–2013)[20]

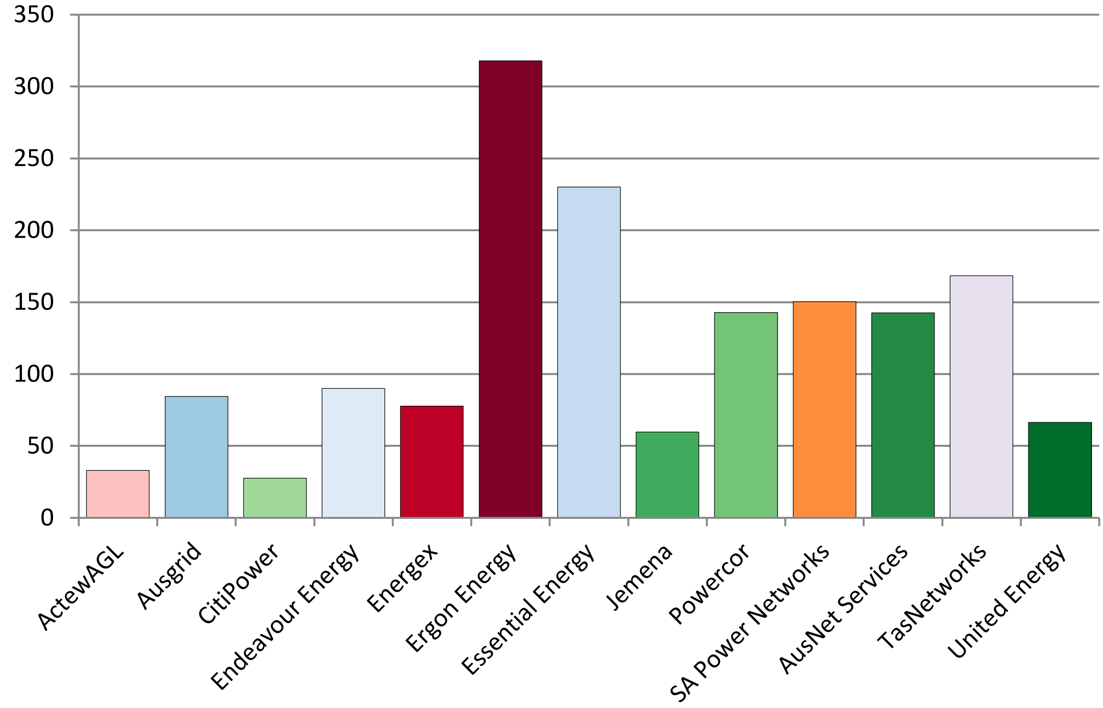
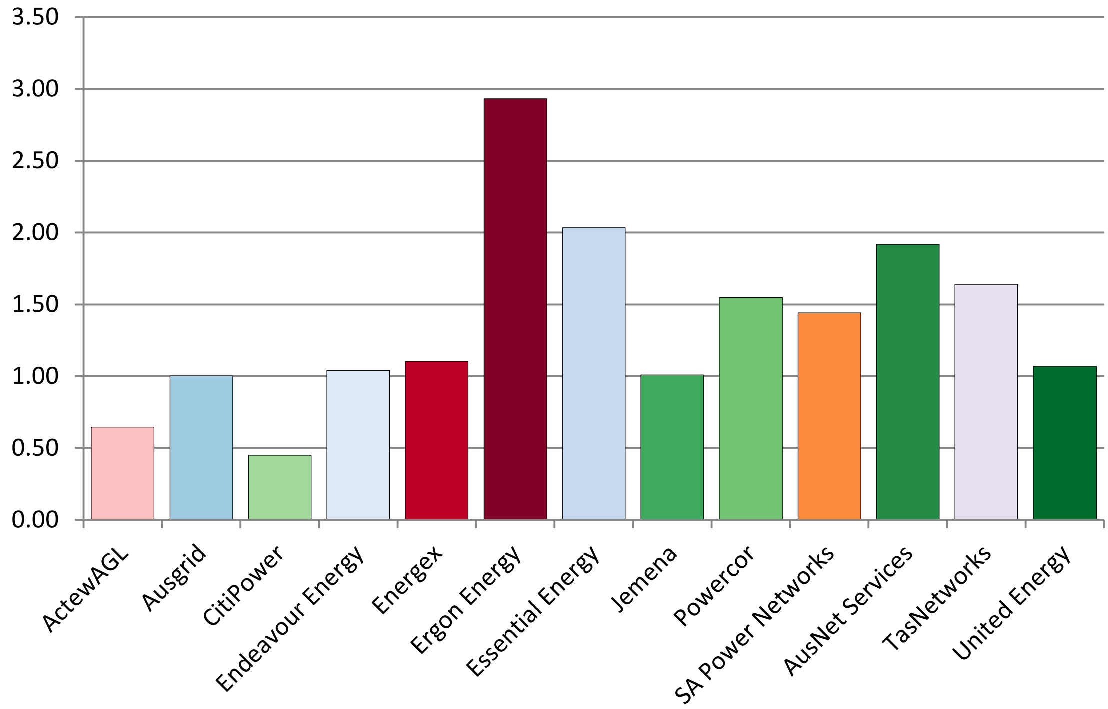


Figure 7 Average number of interruptions per customer[21]



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20 The effects of major events, planned outages and transmission outages have been excluded from the minutes off supply reported in this figure.

21 The effects of major events, planned outages and transmission outages have been excluded from the minutes off supply reported in this figure.

1.1.2 Network inputs

Network inputs are the resources that distributors use to deliver services (outputs) to their customers. The inputs used to provide distribution services can be separated into those that are consumed in the year that they are purchased and those that may be used over several years or, in the case of energy networks, over several decades. The former is normally referred to as operating expenditure (opex) and the latter as assets or capital stock.

Assets will provide useful service over a number of years. However benchmarking studies will typically focus on a shorter period of time, such as a year. As such, the incorporation of assets into benchmarking requires careful consideration.[22] A number of measures have been used to proxy the cost of asset input in benchmarking studies, including; capital expenditure (capex) and the constant price value of the asset base (the regulatory asset base or RAB). These measures have various strengths and weaknesses.[23] In Section 2.1 we consider these input measures further.

For the purpose of this benchmarking analysis we are using the 'asset cost' of distribution networks. The asset cost is the summation of annual depreciation and return on investment. This measure has the advantage of reflecting the total annual costs of assets for which customers are billed. Asset costs are described in more detail below.

Table 2 presents various measures of the cost of network inputs for all the distributors in the NEM. We have presented the average annual network costs over five years in this table to moderate the effect of any once-off fluctuations in expenditure.

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22 For further consideration of this issue see: Economic Insights, *Economic Benchmarking of Electricity Network Service Providers Report prepared for Australian Energy Regulator*, 25 June 2013, pp. 47–71.

23 This is considered in greater detail in: AER, *Better regulation, expenditure forecast assessment guidelines for electricity distribution and transmission issues paper*, December 2012, pp. 62–71.

Table 2 Average annual total cost for network inputs for 2009–2013[24]

$2013 thousands	Opex	Capex	RAB[a]	Depreciation	Asset cost
ActewAGL (ACT)	66,325	67,369	721,955	36,789	80,768
Ausgrid (AGD)	541,381	1,443,712	10,847,069	371,729	1,032,505
AusNet Services (AND)	162,594	301,536	2,327,552	115,509	257,297
CitiPower (CIT)	49,711	109,820	1,149,809	59,578	129,621
Endeavour Energy (END)	241,332	566,196	4,508,391	233,696	508,335
Energex (ENX)	345,186	825,515	6,900,276	299,924	720,272
Ergon Energy (ERG)	355,504	636,740	6,387,623	286,578	675,695
Essential Energy (ESS)	384,875	749,426	5,430,219	278,806	609,601
Jemena (JEN)	65,118	101,912	740,762	43,281	88,406
Powercor (PCR)	161,582	215,784	2,044,972	105,873	230,446
SA Power Networks (SAP)	195,737	249,715	3,107,236	188,741	378,025
TasNetworks (TND)	79,180	123,202	1,280,602	63,915	141,926
United Energy (UED)	116,999	163,413	1,496,858	84,530	175,714

Source: Economic benchmarking RIN responses. Note that the data for the Victorian distributors is for calendar years whereas the data for the other distributors is for financial years.

a: Average of opening and closing RAB

1.1.3 Operating environment factors

To measure the efficiency of distributors it is necessary to consider the environment within which they operate. While it may not be possible to account for every operating environment factor directly in our modelling, we can estimate the impact of the operating environment in other ways.

We have accounted for a number of operating environment differences in our benchmarking analysis. There are other differences between the operating environments of distributors in Australia. The impact of these operating environment factors is a matter of contention. In consultation on the economic benchmarking regulatory information notice the distributors noted a number of operating environment differences that may affect the ability to convert inputs into outputs. These include:

- Differences in the scope of distribution services;
- Differences in the size and density of networks;
- Differences in network terrain;
- Differences in climate; and
- Differences in jurisdiction specific requirements.

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24 This has been converted into constant dollar terms using the ABS Weighted Average of Eight Capital Cities CPI. We have used this index to convert all reported nominal financial amounts into real $2013 in this report.

To account for differences in the scope of distribution services we have chosen to benchmark only the core 'poles and wires' component of distribution services. We have excluded the costs and assets associated with other services that distributors provide including metering and public lighting.

The way that we account for operating environment differences depends on the benchmarking technique that we apply. The multilateral total factor productivity analysis presented below accounts for more operating environment factors than the partial performance analysis. This is because the multilateral total factor productivity can accommodate more variables.

That being said, we have not accounted for every potential operating environment factor that may affect relative efficiency of distributors. As such, there may remain some unquantified operating environment factors. The presence of unquantified differences in the operating environment does not preclude us or other parties from forming a quantified view about the relative efficiency of distributors. It may be that the net impact of some operating environment factors will be immaterial to the consideration of efficiency. Further, the gap in relative efficiency may prove to be so great that operating environment factors alone could not account for the difference in relative efficiency.

Density

Network density will affect the benchmark performance depending on the benchmark applied. Low density networks such as predominantly rural distributors will have low costs per km of line length and high costs per customer. This is because the customers of a rural distributor are more dispersed than those of an urban distributor.

The customer density (measured as the number of customers per km of line length) is presented in Figure 8. Density measures are likely to be the most important operating environment factors affecting efficiency comparisons.[25]

[25] Economic Insights, *Economic Benchmarking of Electricity Network Service Providers Report prepared for Australian Energy Regulator*, 25 June 2013, p. 73.

Figure 8 Customer density (customers / km of route line length, average 2009–2013)

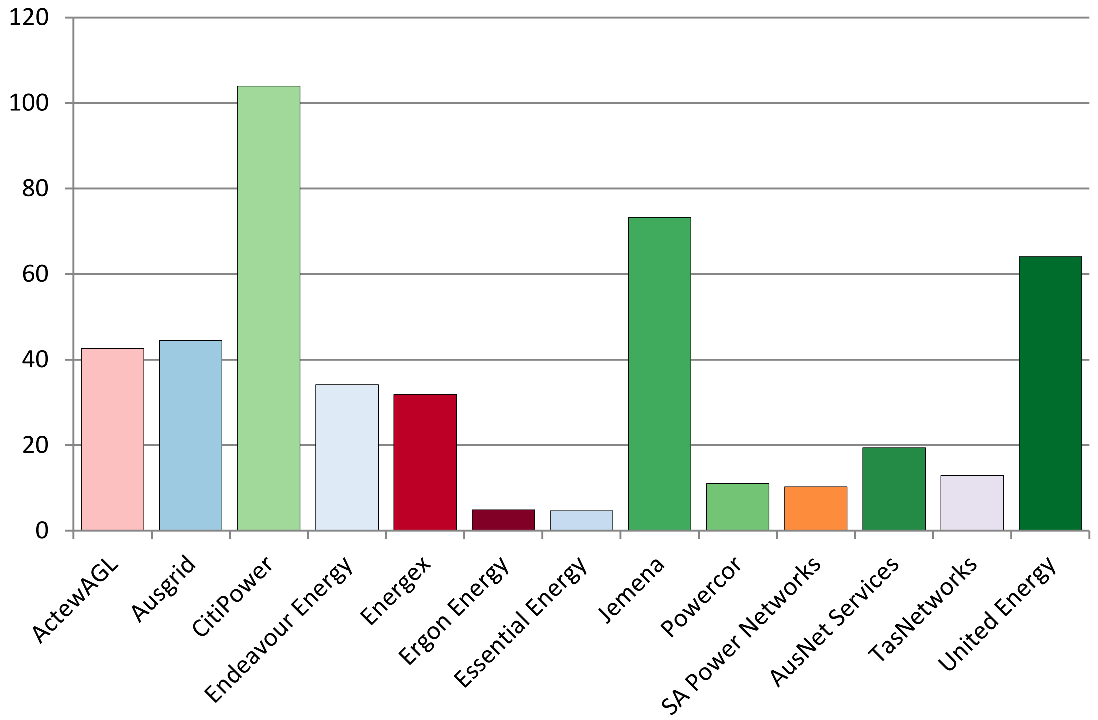


Figure 8 shows that the customer density of distributors in Australia varies from less than 5 customers per km (in the case of Ergon and Essential Energy) to more than 100 customers per km (in the case of CitiPower). The positive relationship between customer density and cost per km of line length is illustrated in Figure 29 in Appendix A. Energy density and maximum demand density may also be used as density measures for the distributors. However, we find that energy density and maximum demand density are correlated to customer density so we have chosen to use customer density in this report.

Energy delivered per customer and maximum demand per customer might also be operating environment factors. Figure 9 and Figure 10 show the maximum demand per customer and the energy delivered per customer for the distributors. We compare these measures to cost per MW of maximum demand and MWh of energy delivered in Appendix A. There does not appear to be a relationship between costs and these measures of density.

Figure 9 **Maximum demand per customer (KW maximum demand / per customer, average 2009-–2013)**

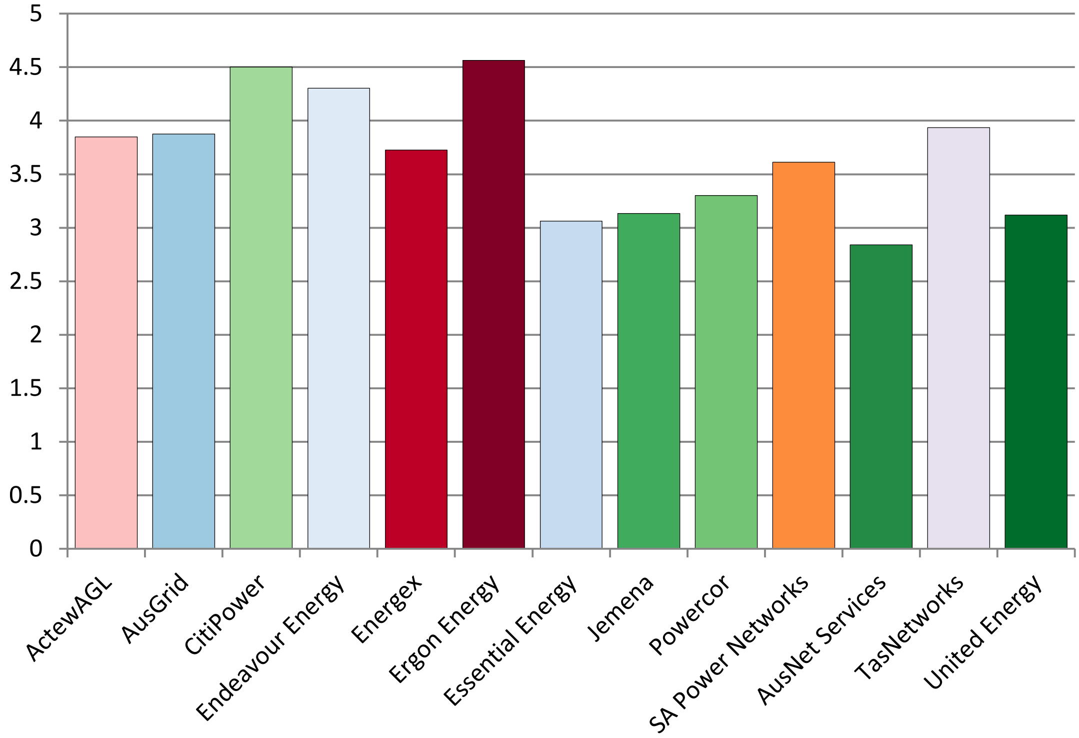
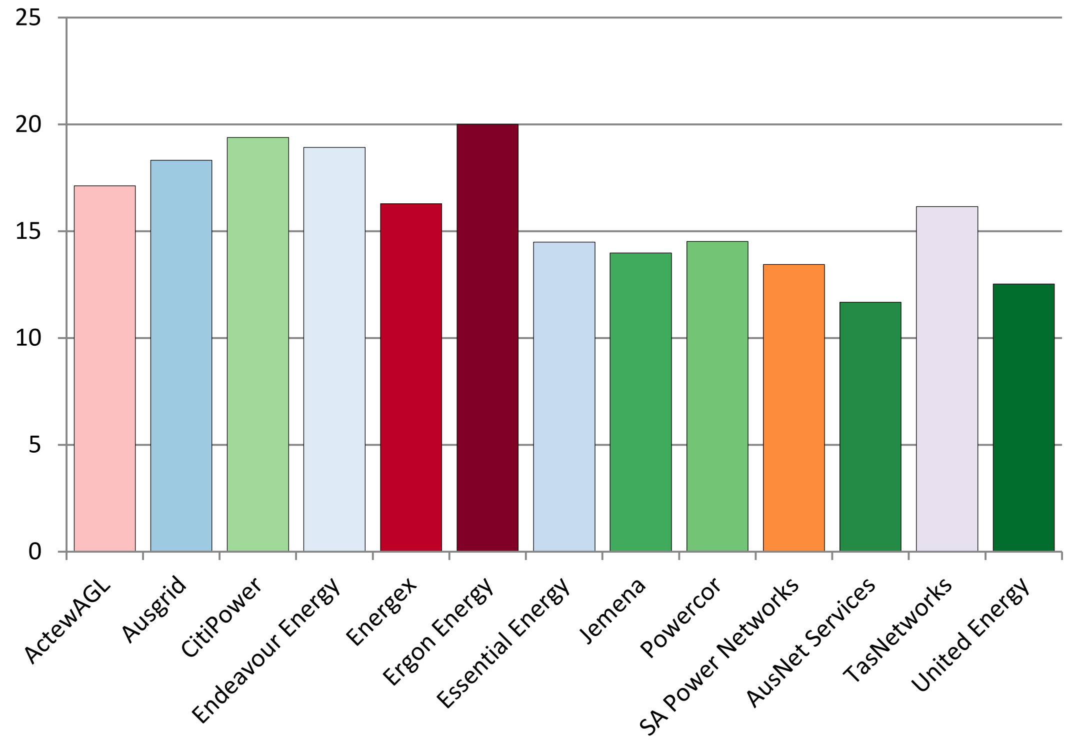


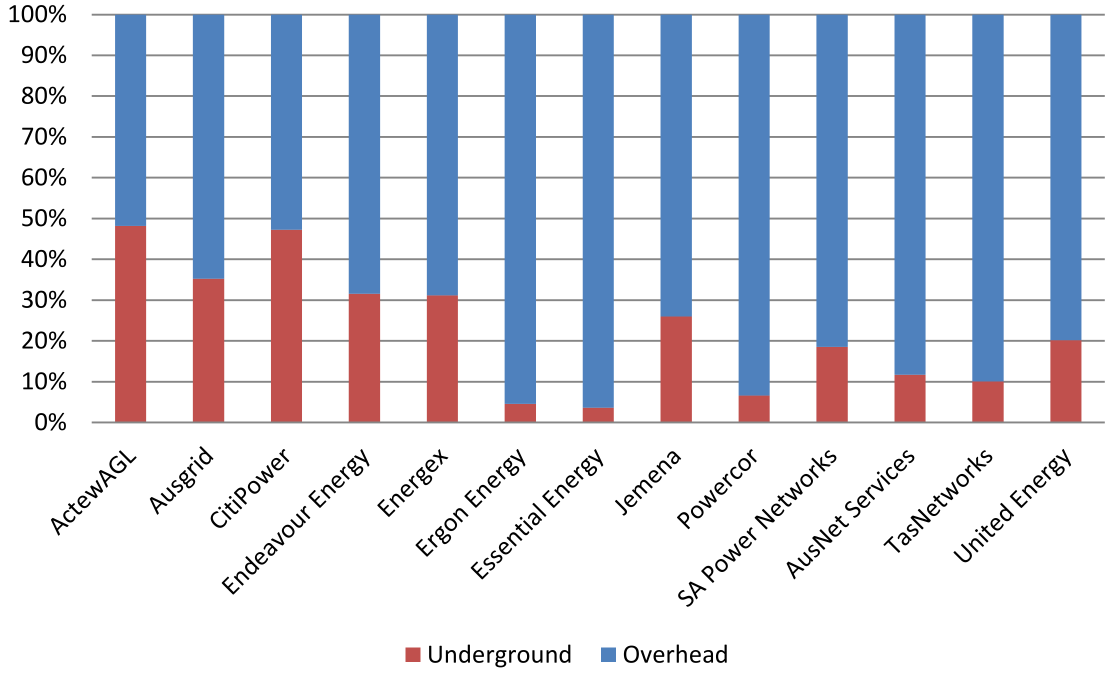
Figure 10 **Energy delivered per customer (energy delivered MWh / customer, average 2009–2013)**



Undergrounding

Another environmental factor that increases the costs of networks is the extent to which their circuits run underground. Underground circuits are considerably more expensive to install than overhead circuits but are then usually less expensive to maintain.[26]

Figure 11 Proportion of underground and overhead circuits



1.1.4 Unaccounted for operating environment factors

Service providers do not operate under exactly the same operating environment conditions. Operating environment conditions may have a significant impact on measured efficiency through their impact on a service provider's expenditure. It is desirable to adjust for material operating environment differences to ensure that when comparisons are made across service providers, we are comparing like with like to the greatest extent possible. We received submissions on our draft report noting that there are environmental factors that are considered material but haven't been taken into account in our models.[27] Stakeholders specifically raised subtransmission assets, geography/terrain, regulatory obligations, capitalisation policies, cost allocation methods, network design, ownership structures, reliability licence conditions and security of supply as operating environment factors that had been unaccounted for in the draft report.[28]

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[26] Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, pp. 6–7.

[27] TasNetworks, Submission to the draft benchmarking report, August 2014, p. 2; ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 5–9; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, p. 7; Ergon Energy, *Submission on the draft electricity distribution network service providers – 2014 annual benchmarking report*, August 2014, p. 6; NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 11.

[28] ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 5–9; CP/PC/SAPN, Submission to draft benchmarking report, August 2014, p. 2; Energex, *Energex response to AER's draft annual benchmarking report*, August 2014, p. 2; NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, pp. 10–11.

There are a number of operating environment factors that have not been considered in this analysis; however we do not consider that these account for the whole gap in relative productivity between the frontier networks and other networks. Quantifying these effects is of importance in our decision making process. We have not formed a view on the operating environment factors that need to be considered as this requires examination of the operating environment for all distributors against all their counterparts. We will consider the impact of operating environment factors in greater detail in future regulatory determinations.

That said we have considered the impact of operating environment factors on the NSW distributors and ActewAGL in the NSW/ActewAGL 2014–19 revenue proposal draft decisions.[29] Where environment factors have not been directly accounted for in our modelling we have considered their effect qualitatively. We consider that the presence of unquantified operating environment differences should not preclude us from presenting our benchmarking results.

[29] AER, *Draft decision ActewAGL distribution determination 2014–19 Attachment 7: Operating expenditure*, November 2014, pp. 86–117. Our consideration of the impact of the operating environment for the three NSW DNSPs can be found in any of the respective NSW DNSP revenue proposal draft decisions, for example: AER, *Draft decision Endeavour Energy distribution determination 2014–19 Attachment 7: Operating expenditure*, November 2014, pp. 98–128.

2 Benchmarking

There are many possible approaches to benchmarking the efficiency of distributors. These have been detailed in the ACCC/AER's working paper on benchmarking opex and capex in electricity networks and the AER's explanatory statement to the expenditure forecast assessment guideline.[30] These benchmarking approaches differ in complexity and have their advantages and disadvantages.

The benchmarking approaches that we have chosen to apply in this first report are PPIs and MTFP.

The PPIs presented in this report compare the performance of businesses in delivering one type of output. PPIs provide a useful means of focussing on a certain aspect of the operation; for example, it may provide an indication of where certain expenditure may be above efficient levels.

Using MTFP we measure the productivity of distributors across time and relative to each other. MTFP measures total outputs relative to all input quantities and takes into account the multiple types of inputs and outputs of distributors. This differs to PPIs which only examine the ratio of input cost to a single output.

2.1 Partial performance indicators

In this section we present the partial performance of operating expenditures, asset costs and the sum of opex and asset costs. We compare the cost of these inputs against the outputs of customer numbers, line length, and maximum demand. The relative network densities of distributors are environmental factors that may affect their costs. To allow for a comparison that takes this into account we plot the PPIs of businesses against their network densities.

We consider that the most significant output of distributors is customer numbers. The number of customers on a distributor's network will drive the demand on that network. Also, the comparison of inputs per customer is an intuitive measure that reflects the relative efficiency of distributors. As such, we present the partial performance of the distributors in this section of the report using customer numbers as the output. Appendix A presents graphs of the partial performance of distributors with respect to their other outputs.

By examining the ratios of inputs to outputs we account for the relative size of networks. We consider the impacts of density by plotting the ratios of inputs to outputs against customer density.[31]

Our analysis also accounts for anomalous or once-off fluctuations in costs due to exogenous factors. We do this by presenting average input and output measures over a five year period.

2.1.1 Operating expenditure

Total annual opex differs across each of the distributors, with Ausgrid spending the most, approximately $484 million in 2013 and CitiPower spending the least, approximately $55 million in the same year. Because there are large differences in the operating expenditure for the networks it is necessary to consider the size of their networks.

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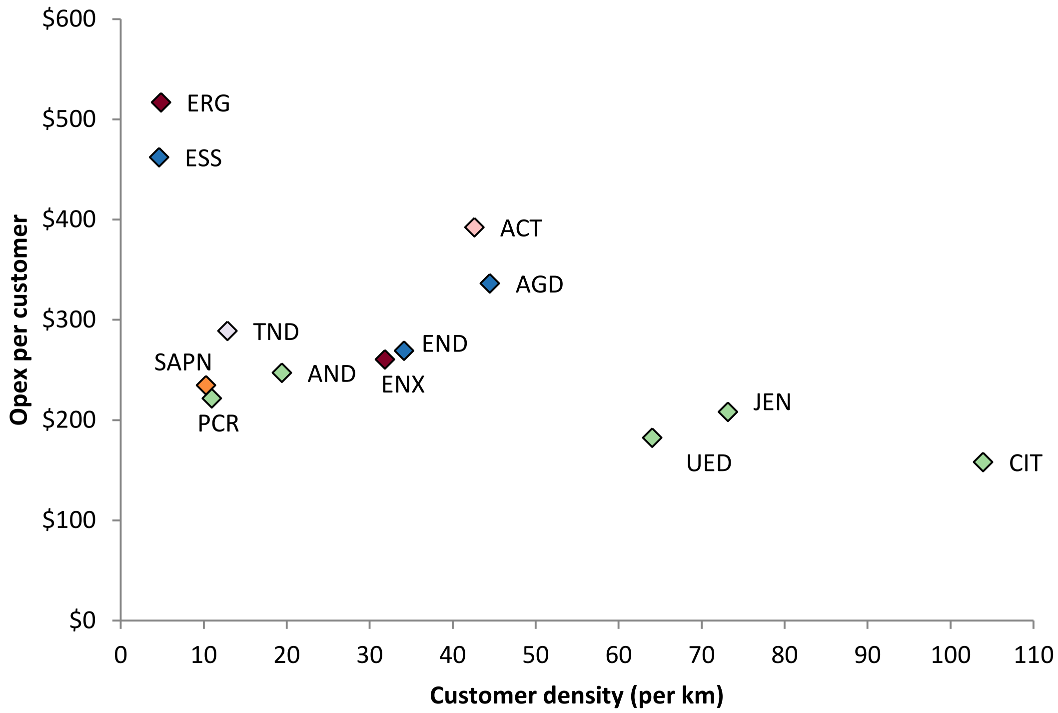
[30] ACCC/AER Working Paper Series, *Benchmarking Opex and Capex in Energy Networks*, Working Paper no.6, May 2012; AER, *Better Regulation Expenditure forecast assessment guidelines for electricity distribution and transmission, Issues paper,* December 2012, pp. 46–87.

[31] Customer density is measured as the number of customers per km of route line length.

Figure 12 illustrates the PPI ratio of five year average operating expenditure per customer. Under this measure the Victorian and South Australian distributors appear the most productive in their use of opex. They have the lowest ratio of opex to customers regardless of their customer density. This is because they spend the lowest amount of opex per customer at about $200 per customer each. Ergon has the highest opex spend per customer, being approximately double that of the Victorian networks and South Australian networks.

We note that there may be operating environment factors (see Section 1.1.4) that are outside the control of the service provider and unaccounted for in our MTFP results; the presence of operating environment factors should be considered when examining the results in this section.

Figure 12 Operating expenditure per customer compared to customer density (average 2009–2013)



There is some variability in the partial performance of opex depending on the output selected (as evidenced by the figures in Appendix A). However, under most of the measures the Victorian and South Australian distributors appear more productive in their use of opex because they generally have the lowest ratio of opex per unit of output.

It is important to note that opex is only one of the two broad inputs that distributors can use to deliver their services. The assets that distributors use in providing their services are also a significant input into the provision of distribution services. This is considered in the next section.

2.1.2 Asset cost

As opex is consumed in the period that it is purchased it is relatively simple to compare it to outputs delivered in that period. The comparison of the input of assets across distributors is more complex because assets will provide services over a number of years and, indeed, a number of decades. This means that comparing expenditure on assets (capital expenditure or capex) in a period to output in that period is unlikely to be a useful comparison as capex may fluctuate from period to period. Capex also reflects new assets installed in the period which may have only provided services for part of the period. Further, such a comparison would not consider the quantity of assets in place being used to provide the bulk of services.

To measure the cost of assets used to provide services we have chosen to use a measure of asset cost to consumers (asset cost). This represents the amount that consumers are charged for the asset inputs of the distributors on annual basis. The asset cost is made up of depreciation (return of capital) and the return on investment (return on capital) of the distributors.

To calculate the asset costs we have applied the average return on capital over the period.[32] Applying the average return on capital over the period accounts for variations in the return on capital across distributors and over time. We have adopted a consistent return on capital over time and across distributors to avoid differences in the return on capital being a source of difference in our benchmarking measures.

In the calculation of total cost we use straight line depreciation as reported by the businesses in their response to our economic benchmarking RIN. The RIN required that straight line depreciation be reported in accordance with the approach applied in calculating the regulatory asset base.[33]

Our measure of asset costs tracks closely to the RABs of the distributors. This is expected as the asset costs are driven by the size of the RAB. Depreciation and the return on investment are proportionate to the size of the RAB, Figure 22 and Figure 23 in Appendix A show this relationship.

When asset cost per customer is compared to customer density the benchmarking results appear similar to those for opex.

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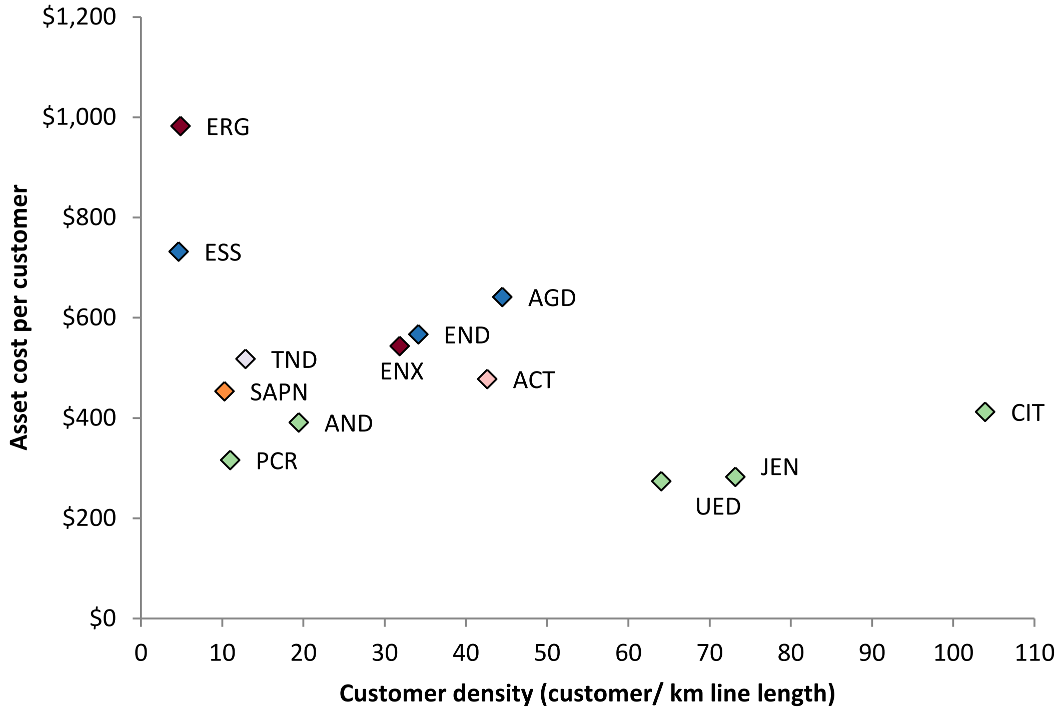
32 We have applied a real vanilla weighted average cost of capital of 6.09. In calculating this average return on capital, we applied the parameters in the AER's rate of return guideline where possible, used a market risk premium of 6.5 per cent based our most recent transmission determination, a risk free rate based on the yield 10 year CGS 365 day averaging period, and a debt risk premium based on an extrapolation of the Bloomberg BBB fair yield curve.

33 Straight line depreciation entails a constant rate of depreciation over the expected life of an asset. Under this measure asset age should not affect the rate of depreciation unless fully depreciated assets are still utilised. However, asset age will influence the return on investment. The return on investment is calculated as a percentage of the total value of the RAB. This means that as an asset base gets older the return that distributors earn on it will decrease with time.

Figure 13 Asset cost per customer compared to customer density (average 2009–2013)

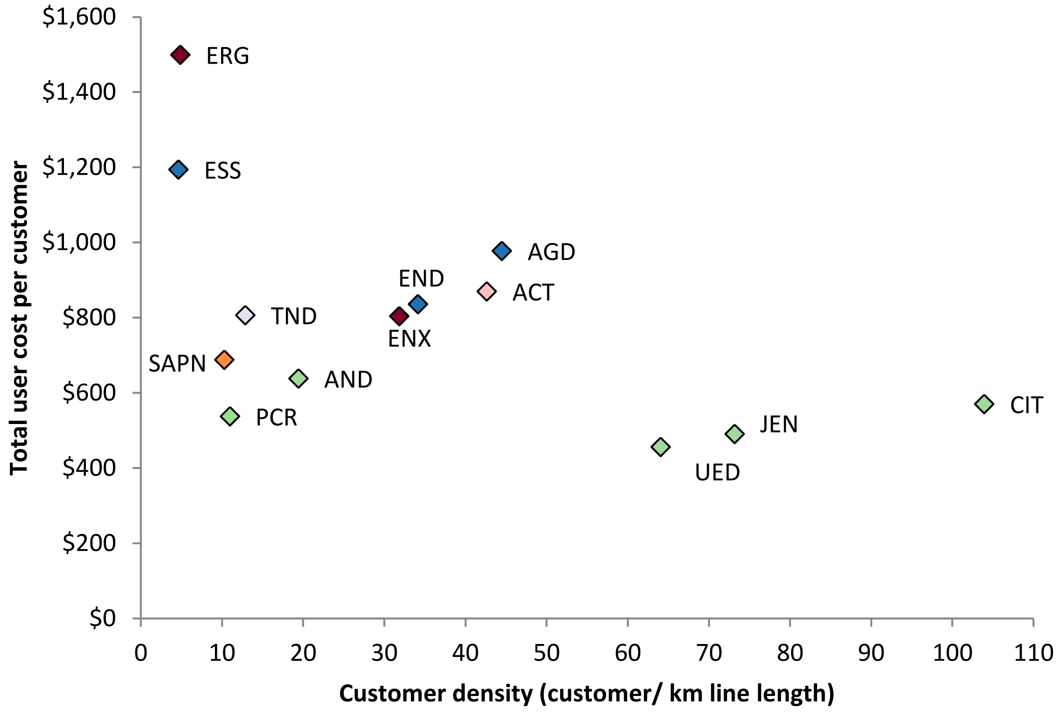


Similar to the partial performance indicators for opex there is variability in the performance of the distributors on asset cost depending on the output measure used (see Figure 13 and Appendix A). The Victorian distributors appear the most efficient in the use of assets because they have the lowest asset cost per customer regardless of customer density.

2.1.3 Total costs

To consider the total input for each output we have added opex and asset costs. The PPI results for this benchmarking is similar to that of the benchmarking of opex costs and asset cost. Figure 14 shows when total cost per customer is compared to customer density the Victorian distributors appear the most efficient regardless of customer density.

Figure 14 Total cost per customer compared to customer density (average 2009–2013)



2.2 Multilateral total factor productivity

In the figures in Section 2.1 and Appendix A the Victorian and South Australian distributors generally appear more productive than their counterparts. However, the performance of the distributors differs depending on the PPI selected. This makes it difficult to quantify about the efficiency of distributors from observing the PPI benchmarks alone. The PPIs only consider the delivery of individual outputs. To quantify on the overall productivity of distributors it is necessary to weight all outputs relative to all inputs. MTFP measures the productivity of distributors in their use of inputs to produce outputs.

We have engaged Economic Insights to develop and undertake MTFP analysis of the distributors. The key findings of their analysis are presented in this section of the report. Economic Insights has prepared a report on the development and rationale for the MTFP model for the distributors.[34]

Productivity is measured by constructing a ratio of output produced over inputs used. Total factor productivity (TFP) is one type of productivity measure, measuring total output relative to an index of all inputs used. Total factor productivity indexes are formed by aggregating output quantities into a measure of total output quantity and aggregating input quantities into a measure of total input quantity.[35]

This MTFP analysis compares the outputs (energy delivered, customer numbers, ratcheted maximum demand, reliability and circuit line length) against the inputs (opex and capital). In this analysis capital input is split into five distinct components – overhead distribution lines, overhead subtransmission lines, underground distribution cables, underground subtransmission cables, and transformers and other.

In developing this input/output specification Economic Insights considered a number of different specifications. The input/output specification presented here is Economic Insight's preferred specification. We also consider that this is the best specification. Other specifications tested, unlike this specification, appeared to disadvantage either urban or rural distributors. Also, this specification takes into account the operating environment variable of customer density by including both customers and line length as outputs. It similarly includes some allowance for differences in energy density and demand density by including energy delivered and a measure of maximum demand as outputs. Further this specification includes the reliability dimension of outputs. It also makes some allowances for differences in system structure and complexity across distributors, such as the delineation between transmission and distribution networks in NSW and QLD.

To weight the inputs and outputs a cost share or price is required for each output and each input. Economic Insights has derived unit cost shares for the inputs by dividing their costs by their quantities. Economic Insights has weighted outputs in accordance with econometric modelling of their unit costs.[36]

As noted above, this specification takes into account a number of important operating environment factors. Customer density is implicitly included in the model because both customer numbers and line length are included as outputs. Further, the modelling has separate input indexes for overhead and underground lines. As MTFP is measured over a long time period the effect of once-off variations in

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34 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014.

35 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs, November 2014*, pp. 4–5.

36 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs, November 2014*, p. 12.

inputs and outputs can be identified. Economic insights also excluded HV transformer assets, as these are used by some distributors but not others, from this specification.

MTFP results

The MTFP results indicate that distributors including CitiPower, United Energy, Jemena, and SA Power Networks are the most productive; and ActewAGL, Ausgrid, Ergon Energy, Essential Energy and TasNetworks appear to be the least productive distributors. However productivity across the whole sector has declined over the 2006–13 period as seen in Figure 15. The reason that overall productivity has been declining across the sector over the last eight years is that some outputs have remained relatively steady or declined while all or most distributors have increased input use significantly. We recognise however, that some of the decrease in productivity may be attributable to changes in obligations on the distributors.

Figure 16 shows the MTFP results over the 2006–13 period for each distributor. The decline in productivity over the period can be observed for all distributors except Ergon Energy. Figure 16 also shows the relative performance of the distributors noted above.

Figure 17 shows the MTFP scores for the distributors grouped by state, highlighting the difference in productivity observed across states, again with South Australia and Victoria performing the most favourably.

We also present multilateral partial factor productivity results for capital and opex below (Figure 18 and Figure 19 respectively). These differ from the MTFP results presented below in that they only examine the productivity of opex and capital. However the capital partial factor productivity considers the productivity of transformers, overhead lines and underground cables together. As would be expected, the rankings of the distributors change somewhat under these results. This reflects the differing input combinations of the networks. However the results are broadly consistent with the MTFP results. Under both measures Victorian and South Australian distributors appear the most productive.

We note that there may be operating environment factors (see Section 1.1.4) that are outside the control of the service provider and unaccounted for in our MTFP results; the presence of operating environment factors should be considered when examining the results in this section.

Figure 15 MTFP output index as compared to MTFP input index for all distributors

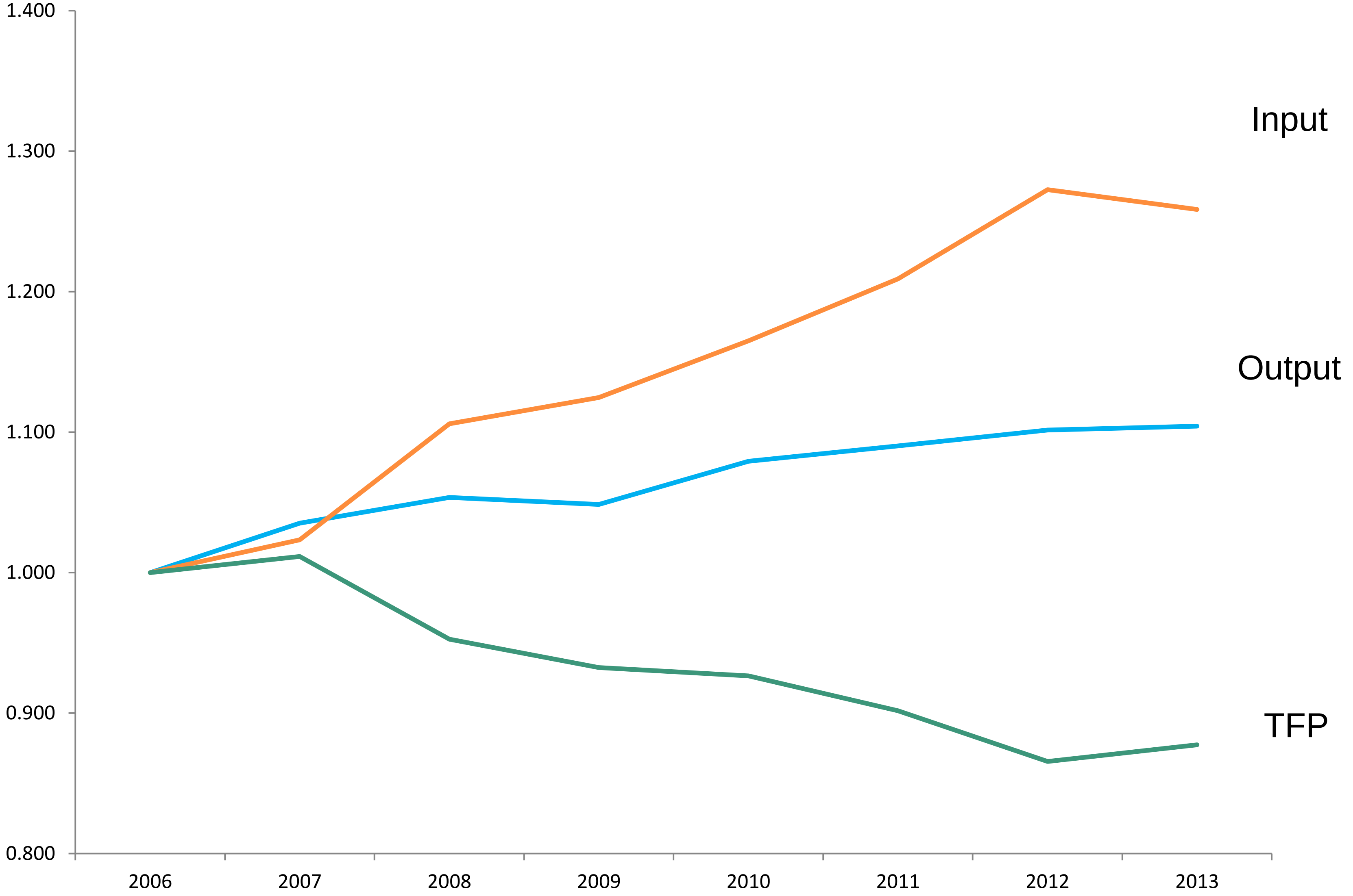


Figure 16 Multilateral total factor productivity for each distributor

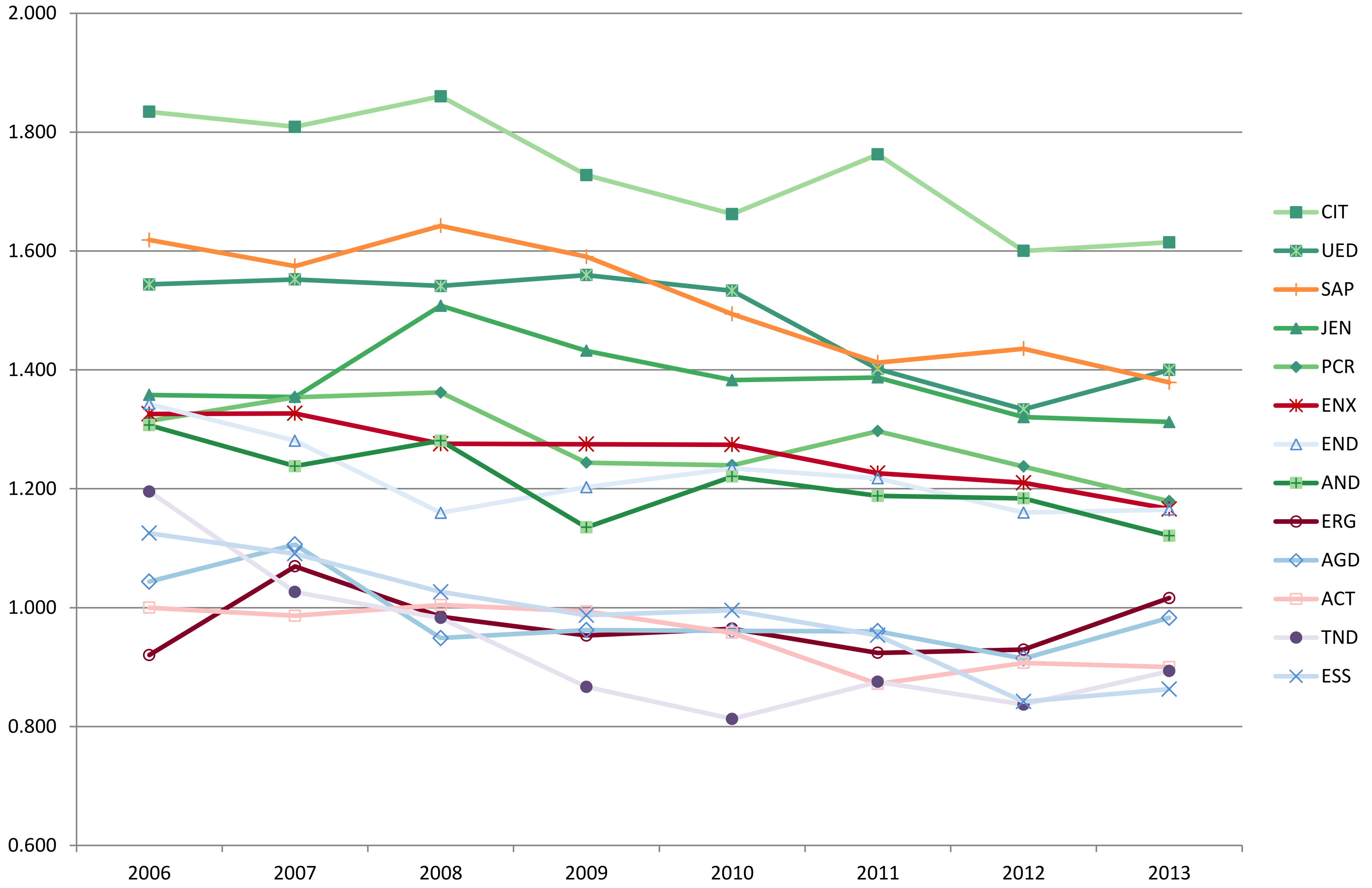


Figure 17 State wide multilateral total factor productivity

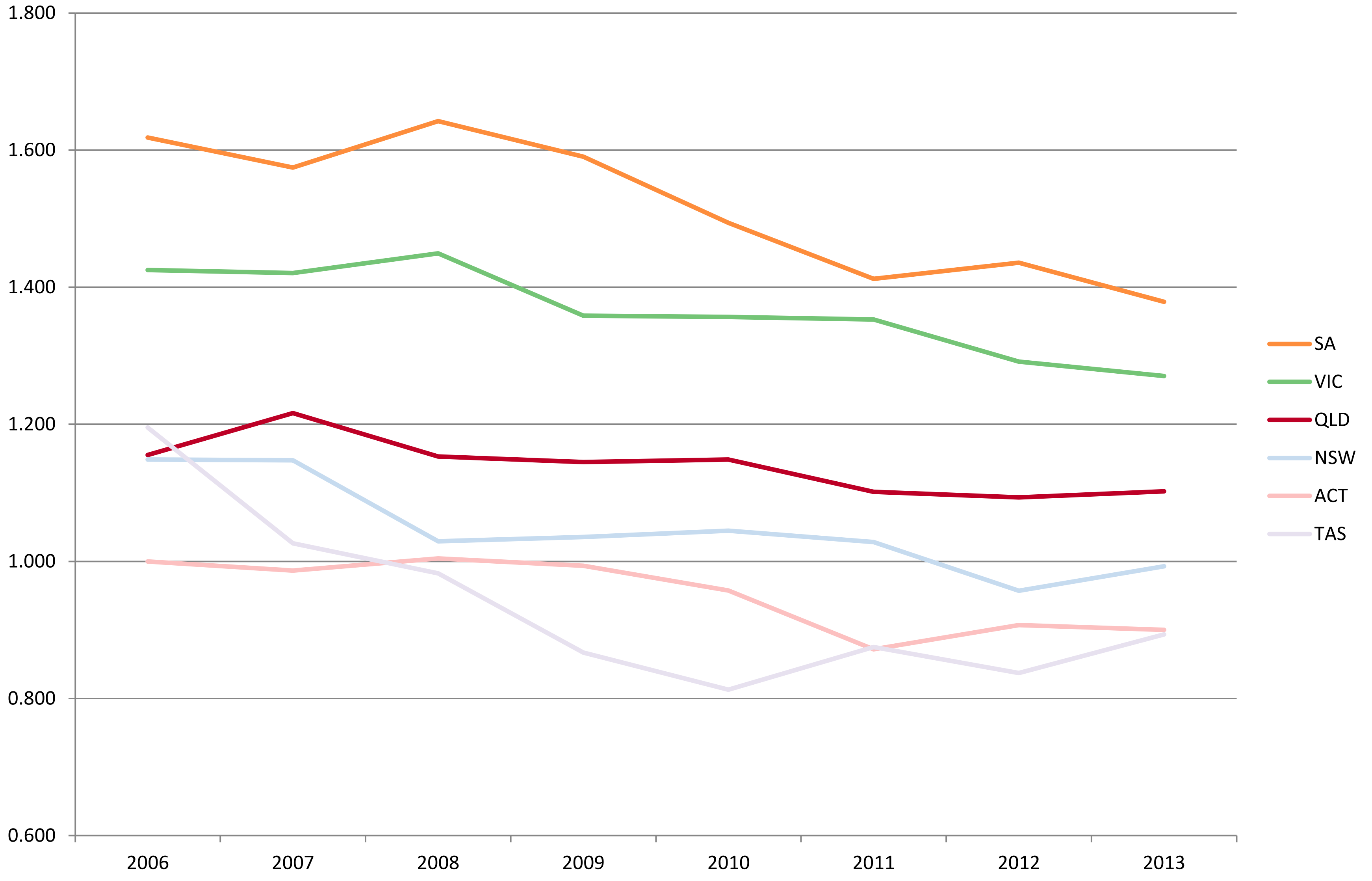


Figure 18 Partial factor productivity of capital (transformers, overhead and underground lines)

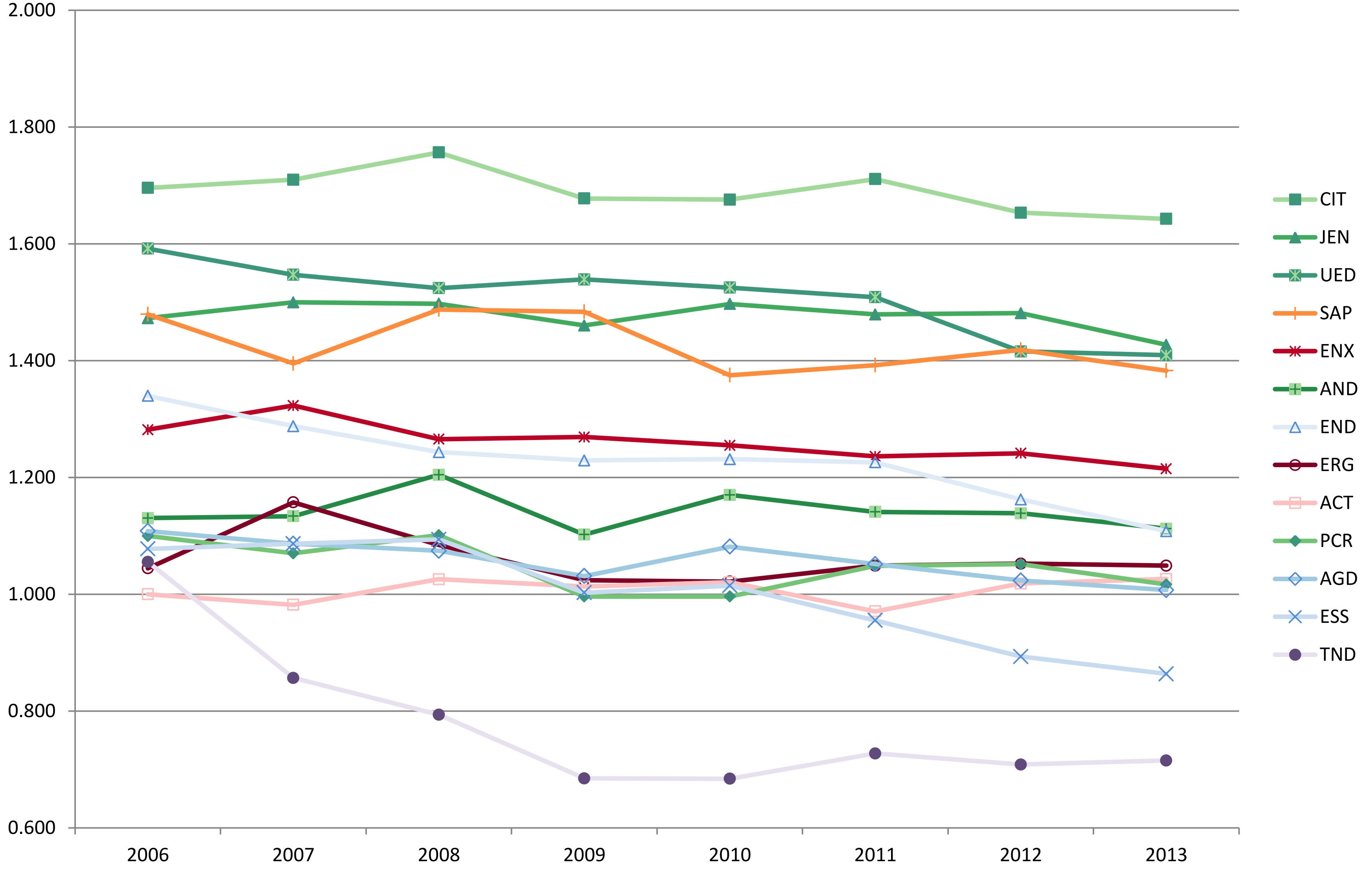
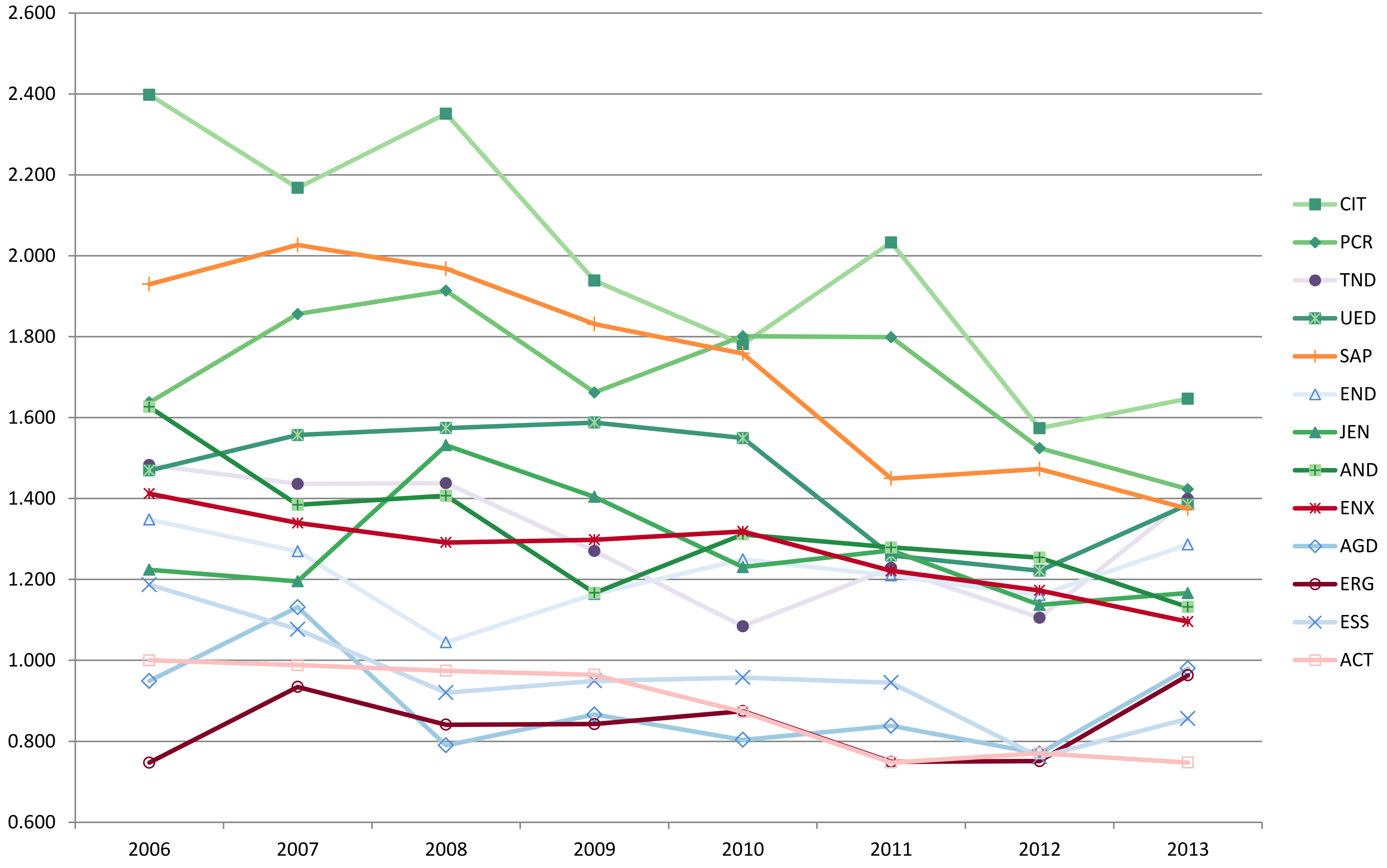


Figure 19 Partial factor productivity of opex



Appendix A

In this appendix we present partial productivity measures for opex and asset costs. These measures provide some insight into the relative partial performance of the distribution networks with respect to their use of opex and assets respectively.

There may be operating environment factors (see Section 1.1.4) that are outside the control of the service provider and unaccounted for in our MTFP results; the presence of operating environment factors should be considered when examining the results in this section.

Overall expenditures

Figure 20 Opex by distributor ($millions, 2013)[37]

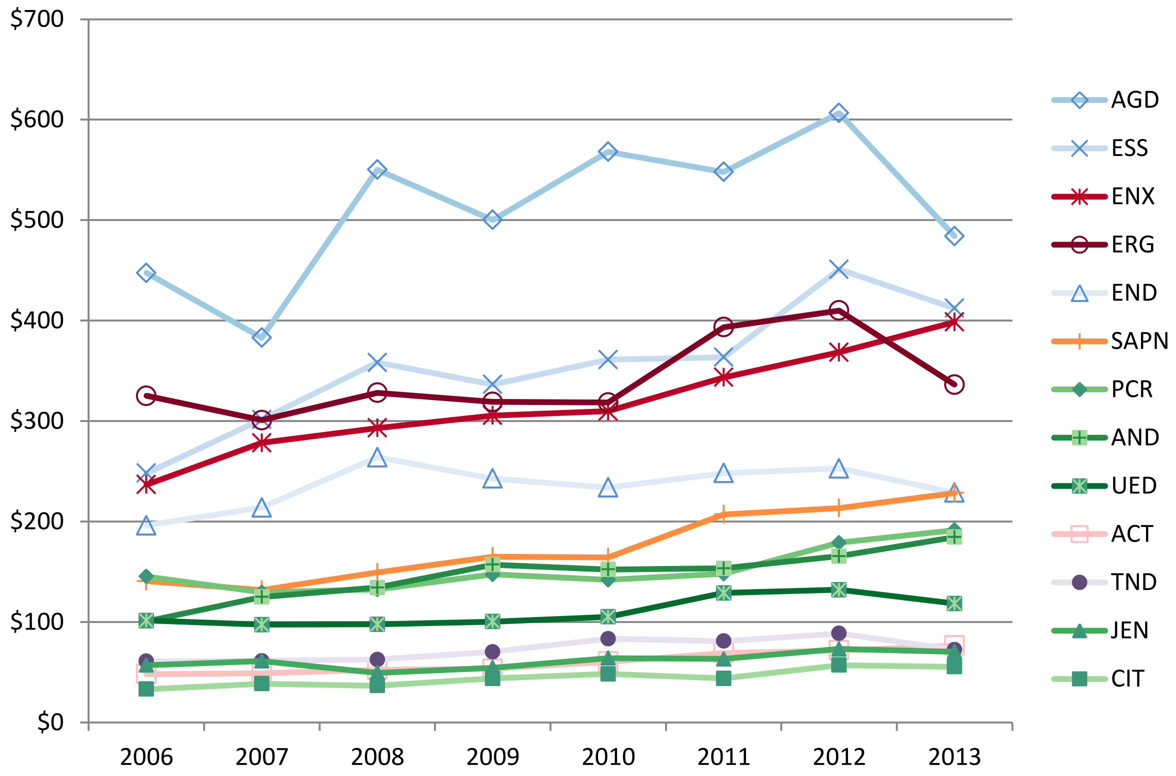


Figure 20 presents total opex over the 2006–13 period. It illustrates that there is considerable difference in opex for each of the distributors with Ausgrid spending the most, approximately $484 million in 2013 and CitiPower spending the least, approximately $55 million in the same year. It is also clear that most distributors have increased their annual opex over the observed period.

[37] This has been converted into constant dollar terms using the ABS Weighted Average of Eight Capital Cities CPI. We have applied this approach consistently across all figures in this report.

Figure 21 Capex ($millions 2013)

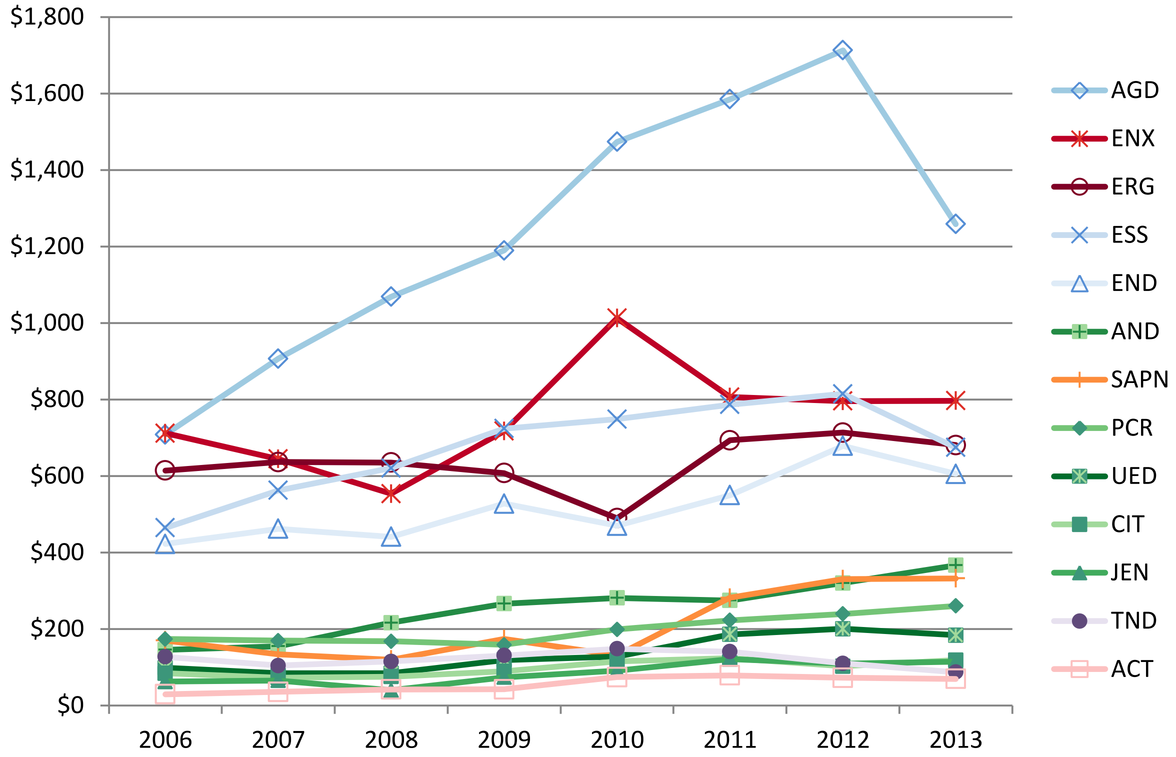


Figure 21 presents total capex over the 2006–13 period. It is apparent that the NSW distributors have increased their annual capex over the period but increases in capex can be observed for most distributors. Comparisons of capex for the purpose of this report are complex because assets will provide services over a number of years or decades, as noted in Section 2.1.2.

Figure 22 Asset cost ($millions 2013)

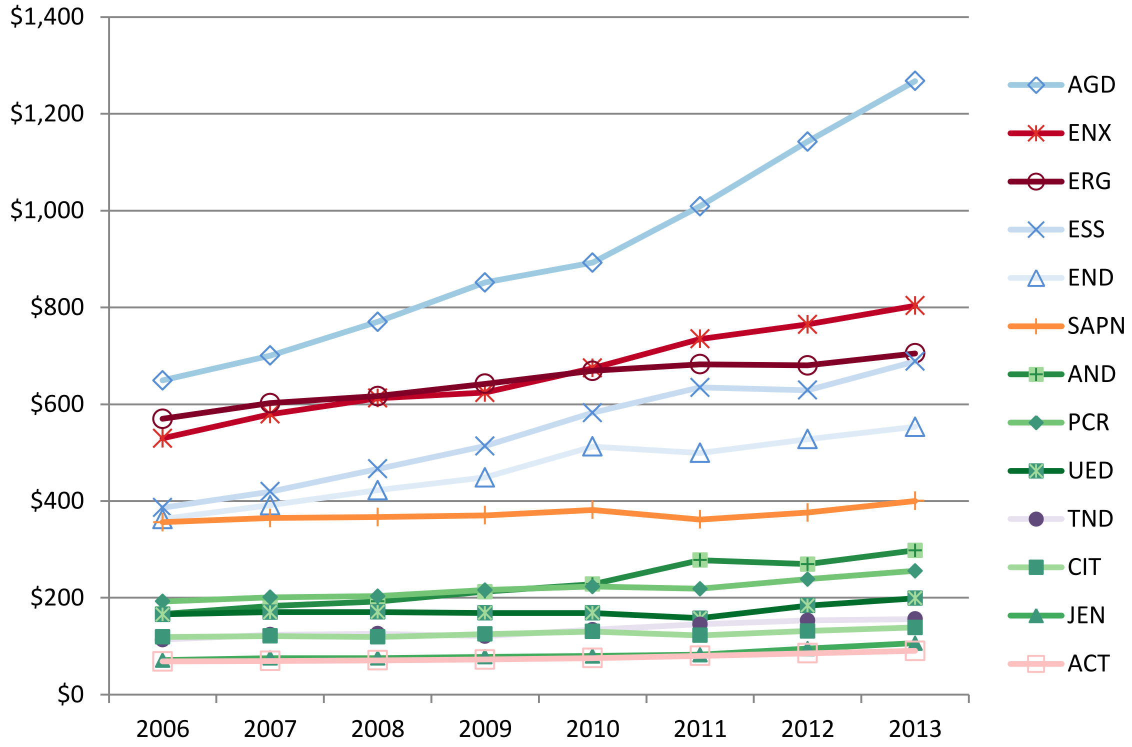


Figure 22 presents asset cost over the 2006–13 period. Asset cost is made up of depreciation (return of capital) and the return on investment (return on capital) of the distributors. This represents the amount that consumers are charged for the asset inputs of the distributors on an annual basis. It closely tracks the RAB of the distributors as observed in Figure 23. This is expected as asset costs are driven by the size of the RAB.

Figure 23 Regulatory asset base ($millions 2013)

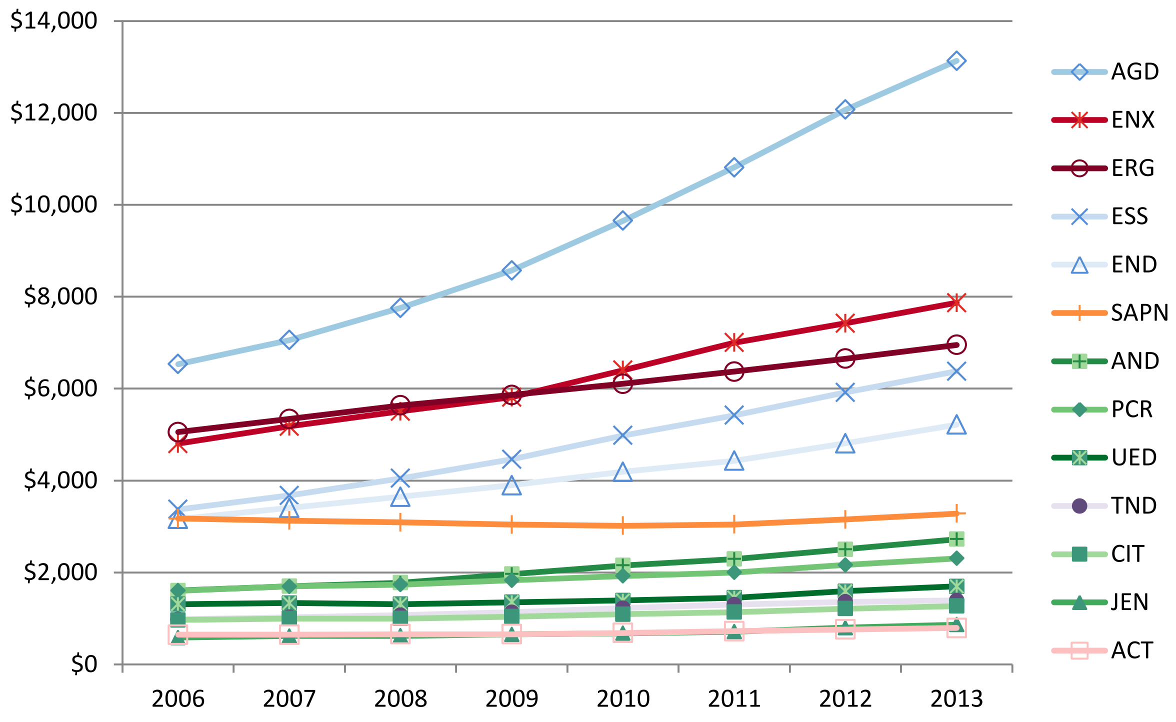


Figure 23 shows the change in the RAB for distributor over the 2006–13 period. Increases in the RAB are attributable to increases in capex, as observed in Figure 21.

Figure 24 Average decomposition of total costs 2009–13 ($million 2013)

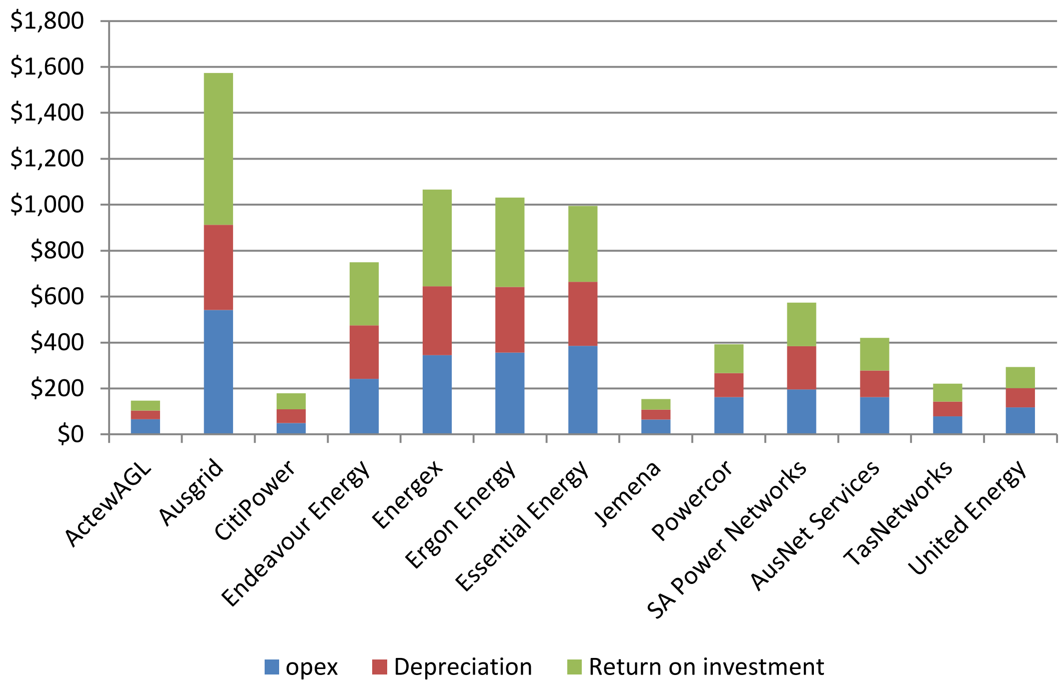
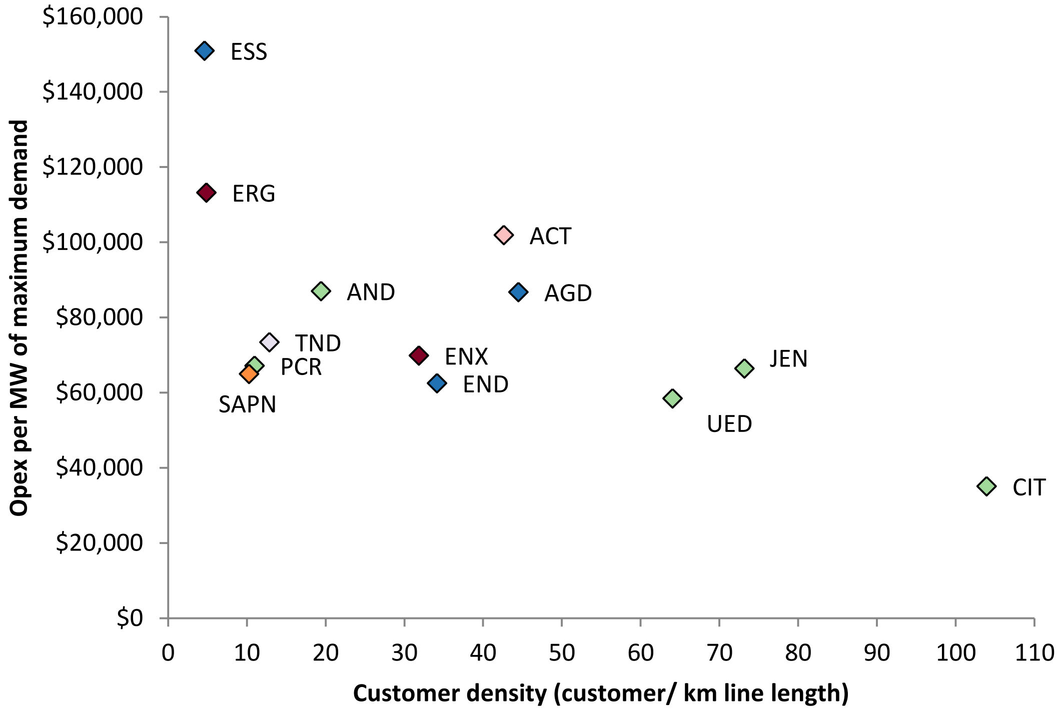


Figure 24 shows the average decomposition of total cost over a five year period. It illustrates the impact opex and the two components of asset cost have on the total annual cost consumers are charged.

Opex PPIs

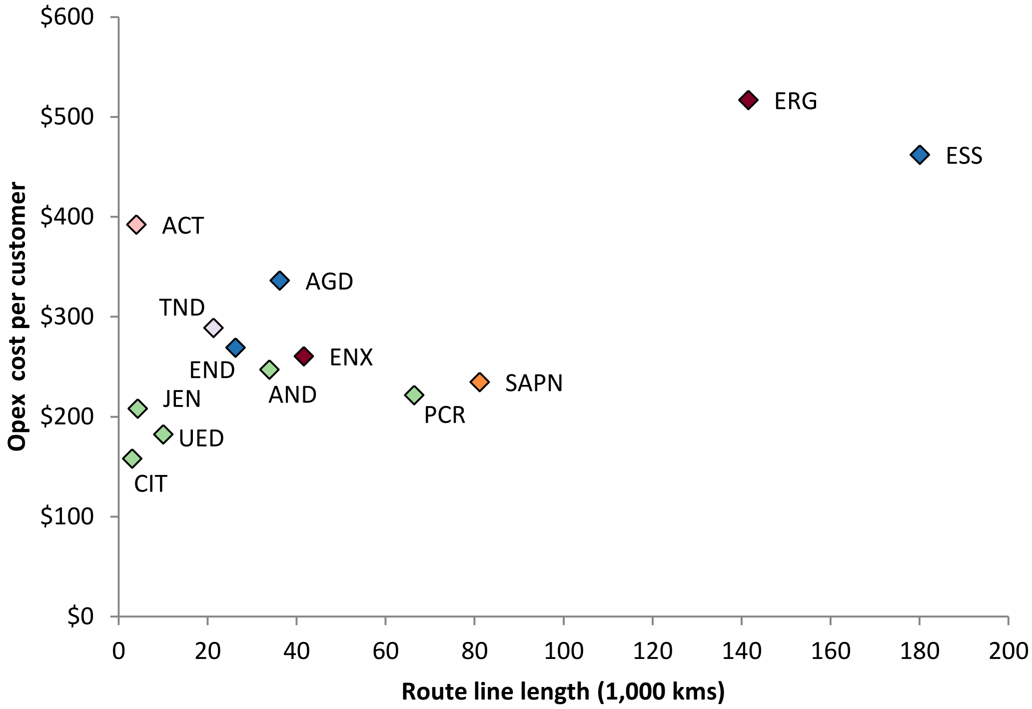
Figure 25 Opex per MW of maximum demand compared to customer density (average 2009–2013)



Maximum demand is an indirect driver of opex as demand increases drive increased capex, and additional capital requires additional expenditure to maintain. Figure 25 shows there is clear variability in opex per maximum demand, with Endeavour and Energex performing well on this metric alongside most of the Victorian distributors and SAPN.

We would expect the results to favour those distributors with higher customer density, because higher density networks have fewer assets per customer that must be maintained, irrespective of the maximum demand of the network.

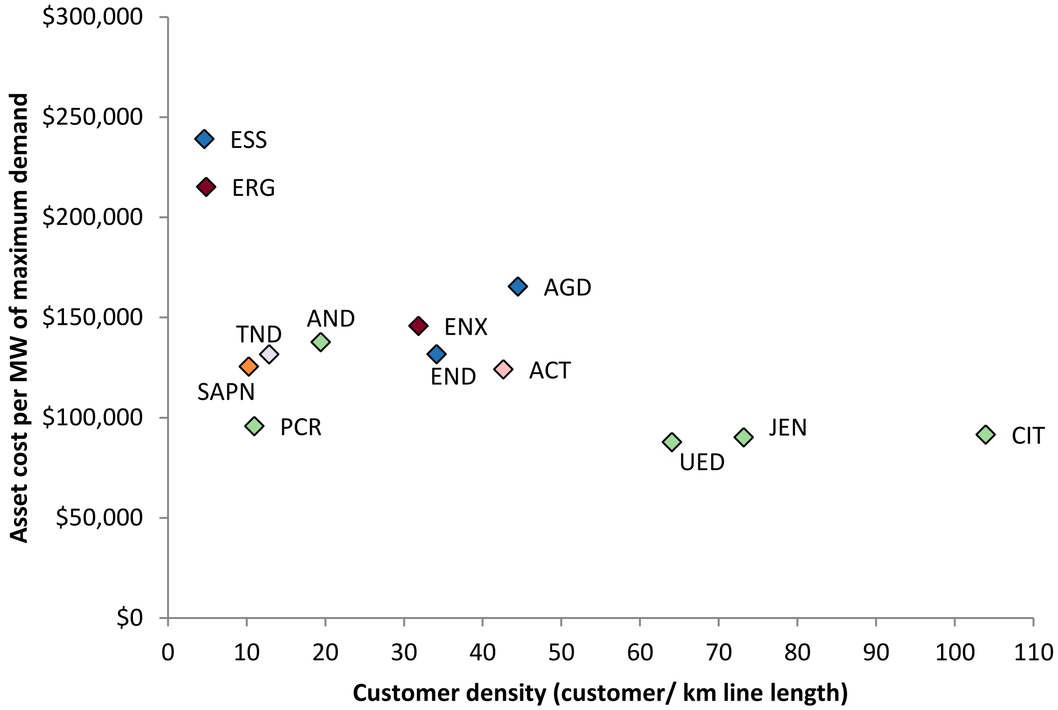
Figure 26 **Opex per customer compared to line length (average 2009–2013)**



We would expect the results of Figure 26 to show higher opex per customer for those distributors with greater route line length, as they have a greater length of lines to maintain. However it is difficult to draw this conclusion from Figure 26, as there is great variability in performance, particularly for distributors with lower route line lengths.

Asset cost PPIs

Figure 27 Asset cost per MW of maximum demand compared to customer density (average 2009–2013)



Maximum demand is a driver of capex. We consider capex as asset cost, which indicates the amount that consumers are charged annually for the asset inputs of the distributors. Most of the Victorian distributors appear to perform favourably in Figure 27.

We would expect the results to favour those distributors with higher customer density, because higher density networks have fewer assets per customer, irrespective of the maximum demand of the network.

Total cost PPIs

Figure 28 Total cost per MW of maximum demand compared to customer denisty (average 2009–2013)

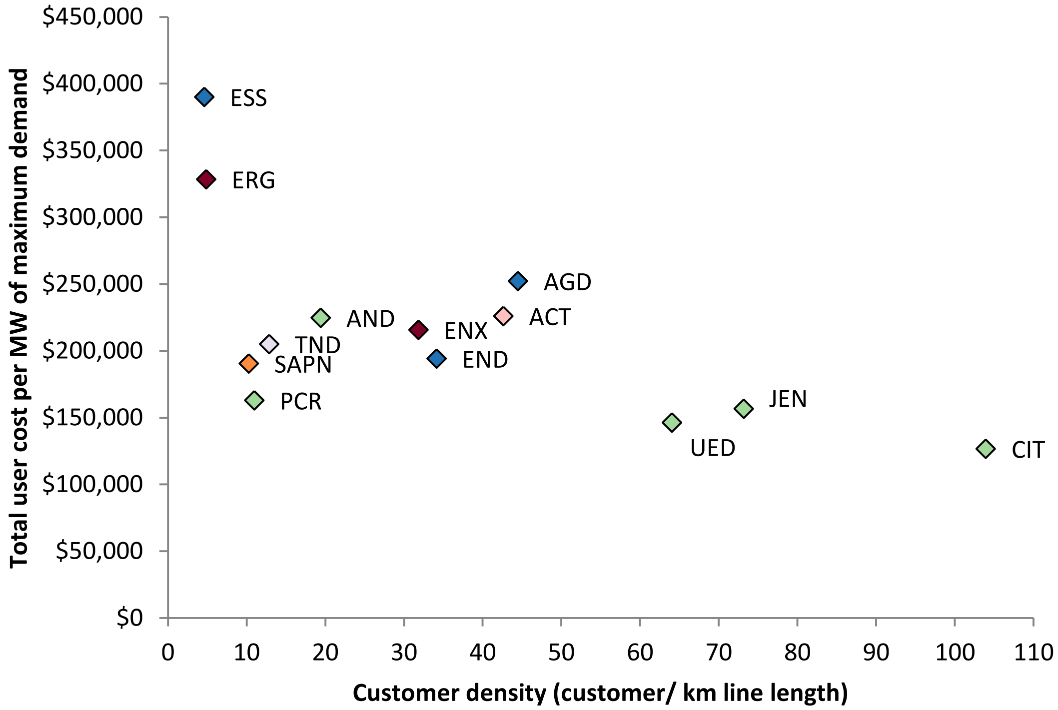


Figure 28 shows our PPI results for total cost per MW of maximum demand. Total cost is the sum of opex and asset costs for each distributor; therefore comments above also apply here. Again most of the Victorian distributors appear to perform favourably on this metric.

Figure 29 **Total cost per km of line length compared to customer density (average 2009–2013)**

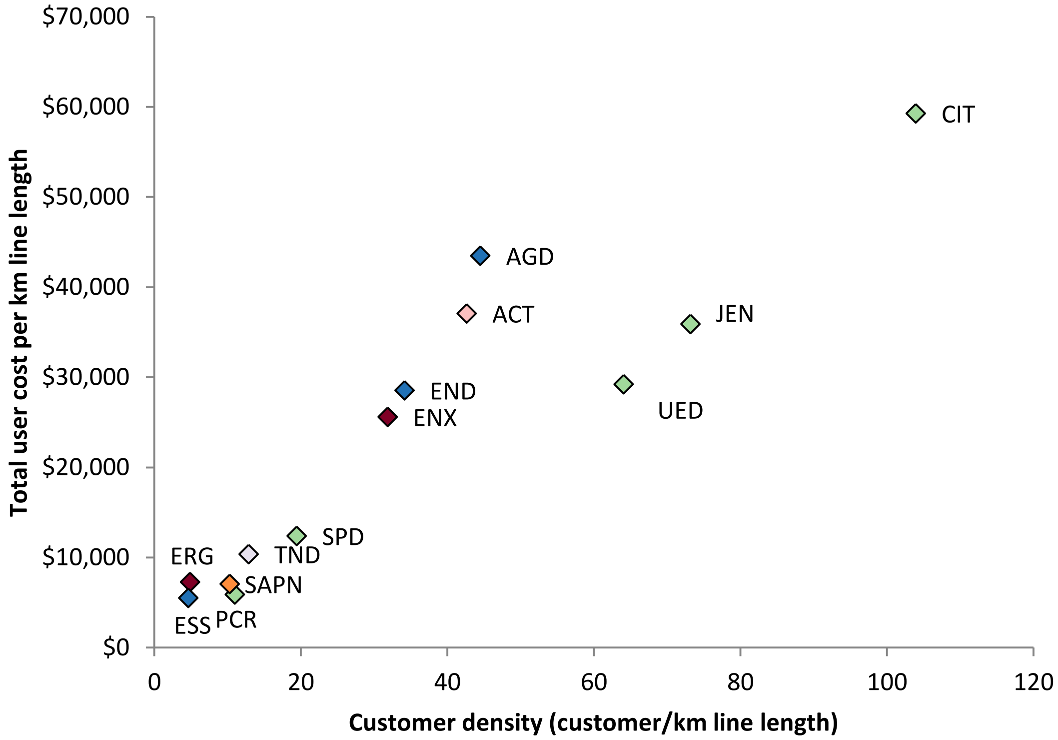
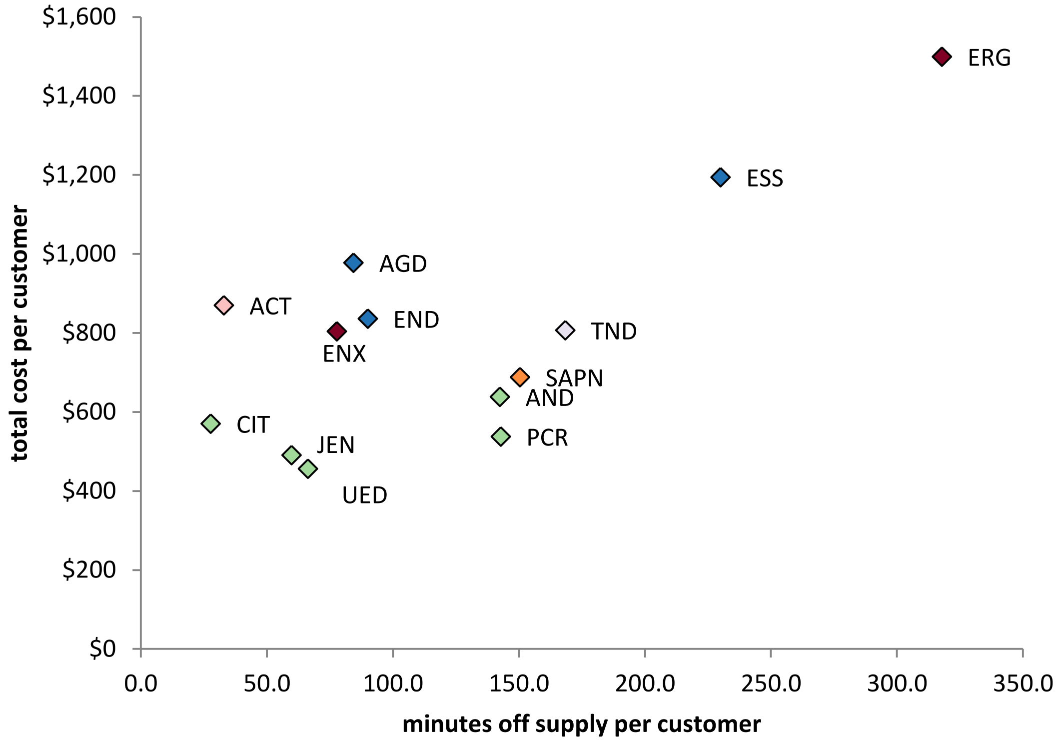


Figure 29 shows total cost per km of line length against customer density. We would expect a strong positive relationship between these two variables because both user cost per km and customer density are driven by line length, and indeed the results show this is the case. However Ausgrid and ActewAGL perform poorly on this metric because they spend more per km than Jemena and United Energy, which both have a higher customer density.

Reliability PPIs

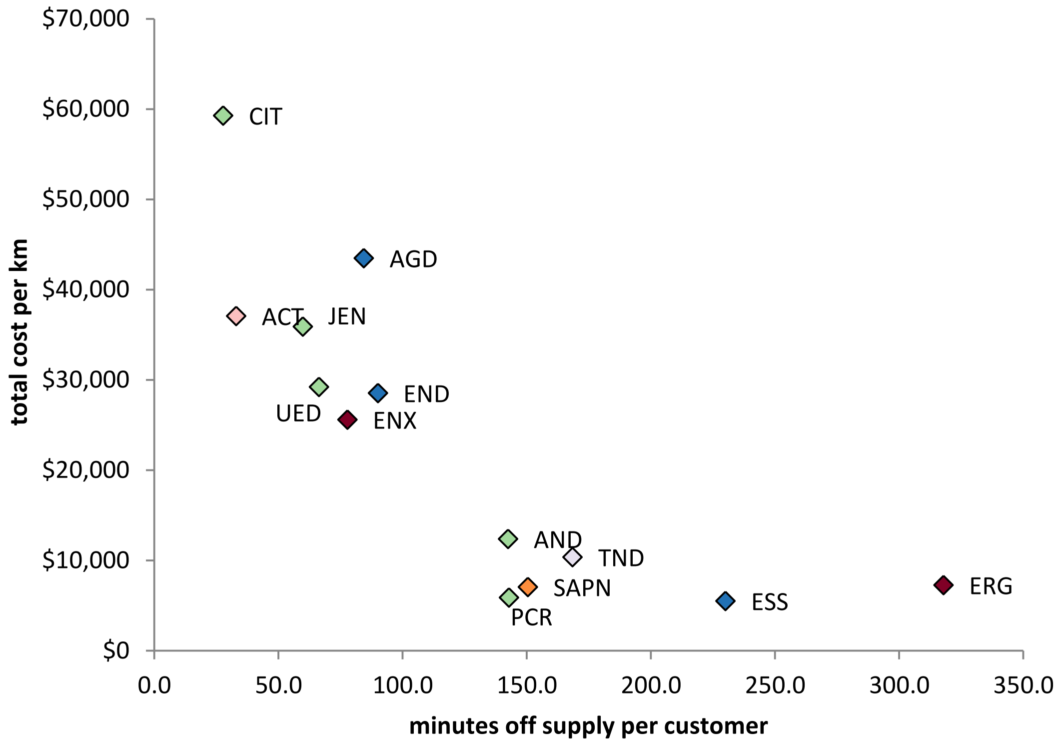
Figure 30 Total cost per customer and unplanned minutes off supply per customer (excluding MEDs, average 2009–2013)



The other important dimension of network performance is a network's ability to maintain reliable supply of electricity. In this report, when benchmarking reliability, we have excluded the effect of large, abnormal outage events. This is because these events can be unforeseeable, uncontrollable and may affect measured performance.

Figure 30 shows that when the cost per customer is compared to the minutes off supply per customer the Victorian and South Australian distributors appear the most productive. We would expect those distributors with greater route line lengths to incur higher minutes off supply per customer, as they may need to travel further distances when responding to outages.

Figure 31 **Total spend per km and unplanned minutes off supply per customer (excluding MEDs, average 2009–2013)**



Recognising that larger distributors by route line length would incur higher minutes off supply, we consider total cost per km in Figure 31. We would expect those distributors with greater line length to spend less per km and exhibit longer outage durations. The results are consistent with this expectation, with respective urban and rural distributors grouped together on this metric.

Appendix B

In this appendix we discuss the submissions we received from stakeholders in response to the draft report.

Submissions on benchmarking

One stakeholder submitted that this report should note that the data in the first benchmarking report has many limitations, with regard to the accuracy and reliability of estimated information.[38] We consider the economic benchmarking data is robust. We have dedicated significant effort to ensuring that the data that we are using for benchmarking is accurate.

We developed our benchmarking information requirements through a year-long consultation process. We initiated our consultation in November 2012 with the publication of our expenditure forecast assessment guideline issues paper. As part of this consultation we held numerous, open stakeholder workshops. These included nine workshops on our economic benchmarking information requirements (upon which we have based the bulk of our benchmarking analysis) from March to June in 2013. We also published numerous papers covering the data requirements for economic benchmarking. We met with each of the network businesses and circulated a number of drafts of the benchmarking data requirements.

We released our draft economic benchmarking information instruments in August 2013 and the final information instruments in November 2013. Subsequent to the release of the benchmarking data requirements we required the network businesses to submit unaudited information responses to review in March 2014. In reviewing these templates we identified and resolved data issues.

We required the distributors to audit their final benchmarking data which was due on 30 April 2014. We also required the CEO of the distributors to certify the accuracy of the information provided. Once we received the benchmarking data we published the data on our website. We called for cross submissions on the economic benchmarking data. No significant data issues were identified in the cross submissions.

On 5 August we circulated our draft annual benchmarking report for distribution network service providers and associated modelling and data. In responding to this report service providers were afforded yet another opportunity to identify data issues. As we note in response to other submissions in this section, service providers have identified some relatively minor modelling issues that we have subsequently addressed.

One submission stated that we should acknowledge limitations of benchmarking, including difficulties in identifying and measuring drivers, and noting the presence of unmeasured, uncontrollable operating environment factors.[39] We recognise that there may be operating environment factors (see Section 1.1.4) that are outside the control of the service provider and unaccounted for in our benchmarking; the presence of operating environment factors should be considered when examining the results in this report.

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38 Jemena Electricity Networks, Submission to the draft benchmarking report, August 2014, p. 1.

39 CP/PC/SAPN, *Joint submission to AER on draft annual benchmarking report for electricity distribution network service providers*, August 2014, pp. 1–2.

Stakeholders noted that we have previously considered using data envelopment analysis (DEA) as a cross check of MTFP results, therefore the DEA results should be made available.[40] Economic Insights explain why they have not included DEA results in Section 2.4 of their report.[41]

Stakeholders observed that we had included opex associated with solar feed-in-tariffs in our results in the draft benchmarking report, which is a specific jurisdictional requirement and outside the control of the service provider.[42] We have removed this expenditure from the figures in this report.

One stakeholder submitted that benchmarking may not fully consider where NSPs are in terms of their investment cycle.[43] We consider we address this through the use of asset cost in our modelling of total costs. We explain in Section 2.1.2 that if a distributor is undertaking significant capex on their network, their RAB will increase that in turn means the distributor incurs higher depreciation costs and have a higher return on investment, which is captured in asset costs. Conversely, if distributor has not invested significantly, we would expect opex to be higher due to increased maintenance on aging assets.

Submissions on PPIs

We received submissions from stakeholders that we should include trend lines in our PPI figures.[44] There are a number of functions that can be used to develop trend lines. These assume certain relationships between PPI inputs and outputs. We consider that including these could be misleading as any trend line will assume a certain relationship between inputs and outputs, which we have not verified. Further trend lines may not necessarily reflect the relationship between inputs and outputs, as they may be affected by outlying results and inefficient performers.

Submissions on MTFP modelling

We received submissions that there are differences between the businesses (not just customer density) that cannot be normalised with a single model specification.[45] We accept that there are differences between businesses that remain unaccounted for in the MTFP modelling, and consider these need be taken into account when considering our benchmarking results, as we note in Section 1.1.4.

We received submissions that the MTFP input specification had not accounted for subtransmission assets operated by some of the distributors.[46] Economic Insights have modified the input specification of the MTFP modelling in light of these submissions. Overhead and underground lines are now each split into separate inputs, reflecting both distribution and subtransmission assets.

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40 ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, p. 12; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, p. 2.

41 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, p. 7.

42 NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 12; Ergon Energy, *Submission on the draft electricity distribution network service providers – 2014 annual benchmarking report*, August 2014, p. 5; Energex, *Energex response to AER's draft annual benchmarking report*, August 2014, pp. 1–2.

43 TasNetworks, Submission to the draft benchmarking report, August 2014, p. 2.

44 Consumer Challenge Panel, Written comments on the draft distribution benchmarking report, August 2014; NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, pp. 6–7.

45 NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 8; Energex, *Energex response to AER's draft annual benchmarking report*, August 2014, p. 2.

46 ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 6–10; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, pp. 9–11.

A number of submissions commented on the lack of robustness of the model specification and the results.[47] We agree with the assertion of the networks that model specification may affect efficiency results. However, we consider that our approach to selecting the model specification is objective, and has thus led to us developing an appropriate model specification. The results of our benchmarking have shown an even spread of results across different types of distributors. The two most efficient businesses on average over the 2006–2013 period are urban and rural networks respectively. The two least efficient businesses on average over the 2006–2013 period are the smallest and largest (in terms of customer numbers).

Further, we have taken an objective approach to developing our benchmarking analysis. We developed our input and output specifications with regard to economic theory, expert engineering knowledge and cost driver analysis. Our preferred model specification reflects all material inputs and outputs. Further, as outlined below, we have gone through an extensive process to ensure that our benchmarking data is robust.

Stakeholders submitted that the MTFP model has not fully accounted for customer density across the service providers. Stakeholders identified two main issues:

- The output index of the MTFP model gives uneven weights to customer numbers and line length (45 and 23 percent respectively); meaning the service providers with higher customer density will be favoured.[48]

- The input variables include overhead and underground MVA-km, which also favours those service providers with higher customer density.[49]

The output weights used in the MTFP model are derived as a share of output cost and the weights are therefore reflective of the cost of operating and maintaining electricity networks. We consider the MTFP results do not reflect these concerns. There appears to be a fairly even spread of MTFP results regardless of customer density, with CitiPower (a high density network) and SA Power Networks (a relatively low density network) the most productive distributors on average over the 2006–2013 period.

Economic Insights has considered the input specification in detail. Economic Insights explain the process of forming the input specification in Section 3.2 of their economic benchmarking assessment report.[50] The weightings for the outputs were developed using a cost function, therefore the cost of delivering the outputs has been estimated and applied in developing the output weights.[51]

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47 Ergon Energy, *Submission on the draft electricity distribution network service providers – 2014 annual benchmarking report*, August 2014, pp. 7–9; NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, pp. 7–13; ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 11–13; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, p. 4; Energex, *Energex response to AER's draft annual benchmarking report*, August 2014, p. 2.

48 CP/PC/SAPN, *Joint submission to AER on draft annual benchmarking report for electricity distribution network service providers*, August 2014, p. 2; NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 11; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, p. 7.

49 CP/PC/SAPN, *Joint submission to AER on draft annual benchmarking report for electricity distribution network service providers*, August 2014, pp. 2–3; Huegin Consulting, *Benchmarking results for Networks NSW businesses: A review of the AER annual benchmarking report*, August 2014, p. 7; ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 6–9.

50 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, p. 12.

51 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, November 2014, p. 12–14.

One submission said that one flaw with the MTFP specification is it doesn't include an output measure to value security of supply investments, and consideration should be given to removing these investments from our analysis.[52] We consider that from a customer's perspective, security of supply is no different from reliability, which is accounted for in our modelling. We consider investment in security of supply is a reflection of the service provider's risk appetite. Part of the role of a corporation's management is to select the level of risk that they are willing to bear.[53]

In issuing the draft benchmarking report, we proposed to adjust the value of Value of Customer Reliability (VCR) in our modelling, and requested feedback from stakeholders. We received submissions that historical VCRs should be applied, and should be consistent with the VCR we use in other applications.[54] AEMO has since released its final report of its VCR review that includes updated state-level VCRs.[55] Residential VCR values have not substantially changed since the 2007–08 values, although the values for the commercial sector are notably lower.[56] We have adopted the values from the VCR review.

We received submissions that we should not infer declining productivity means declining efficiency.[57] We recognise there is a distinction between productivity and efficiency, and now note in the overview and in Section 2.2 that the decline in productivity can be attributed to changes in the operating environment.

We received a submission that at a minimum, we should include specific analysis focusing on a 12 month period as required by the Rules.[58] We consider that because this is the first benchmarking report, there is value in presenting the results over the 2006–13 period, and in the most recent historical year, as noted in the overview.

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[52] NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 11.

[53] Nocco, B. W. and Schultz, R. M. 2006, 'Enterprise Risk Management: Theory and Practice', *Journal of Applied Corporate Finance*, vol. 18, no. 4, p. 11.

[54] NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 11; Ergon Energy, *Submission on the draft electricity distribution network service providers – 2014 annual benchmarking report*, August 2014, p. 9; Energex, *Energex response to AER's draft annual benchmarking report*, August 2014, p. 2; TasNetworks, Submission to the draft benchmarking report, August 2014, p. 2.

[55] AEMO, *Value of customer reliability review: Final report*, September 2014.

[56] AEMO, *Value of customer reliability review: Final report*, September 2014, p. 1.

[57] CP/PC/SAPN, *Joint submission to AER on draft annual benchmarking report for electricity distribution network service providers*, August 2014, p. 4; ActewAGL, *Response to the AER's draft annual benchmarking report*, September 2014, pp. 2, 10–11.

[58] NSW DNSPs, *NSW DNSPs' comments on draft annual benchmarking report*, August 2014, p. 12.