Draft decision

ActewAGL distribution determination

2014–19

Attachment 7: Operating expenditure

November 2014

AUSTRALIAN ENERGY REGULATOR

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Note

This attachment forms part of the AER's draft decision on ActewAGL's 2015–19 distribution determination. It should be read with other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – Annual revenue requirement

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Value of imputation credits

Attachment 5 – Regulatory depreciation

Attachment 6 – Capital expenditure

Attachment 7 – Operating expenditure

Attachment 8 – Corporate income tax

Attachment 9 – Efficiency benefit sharing scheme

Attachment 10 – Capital expenditure sharing scheme

Attachment 11 – Service target performance incentive scheme

Attachment 12 – Demand management incentive scheme

Attachment 13 – Classification of services

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Attachment 16 – Alternative control services

Attachment 17 – Negotiated services framework and criteria

Attachment 18 – Connection methodology

Attachment 19 – Pricing methodology

Contents

Shortened forms

Shortened form	Extended form
AARR	aggregate annual revenue requirement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASRR	aggregate service revenue requirement
augex	augmentation expenditure
capex	capital expenditure
CCP	Consumer Challenge Panel
CESS	capital expenditure sharing scheme
CPI	consumer price index
CPI-X	consumer price index minus X
DRP	debt risk premium
DMIA	demand management innovation allowance
DMIS	demand management incentive scheme
distributor	distribution network service provider
DUoS	distribution use of system
EBSS	efficiency benefit sharing scheme
ERP	equity risk premium
expenditure assessment guideline	expenditure forecast assessment guideline for electricity distribution
F&A	framework and approach
MRP	market risk premium

Shortened form	Extended form
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NSP	network service provider
opex	operating expenditure
PPI	partial performance indicators
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
repex	replacement expenditure
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue pricing principles
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SLCAPM	Sharpe-Lintner capital asset pricing model
STPIS	service target performance incentive scheme
WACC	weighted average cost of capital

7 Operating expenditure

Operating expenditure (opex) refers to the operating, maintenance and other non-capital expenses, incurred in the provision of network services. Forecast opex for standard control services is one of the building blocks we use to determine a service provider's total revenue requirement.

This attachment provides an overview of our assessment of opex. Detailed analysis of our assessment of opex are in the following appendices:

- Appendix A - Base opex
- Appendix B - Rate of change
- Appendix C - Step changes
- Appendix D - Forecasting methodology.

7.1 Draft decision

We are not satisfied ActewAGL's forecast opex reasonably reflects the opex criteria.[1] We therefore do not accept the forecast opex ActewAGL included in its building block proposal.[2] Our alternative estimate of ActewAGL's opex for the 2014–19 period, which we consider reasonably reflects the opex criteria, is outlined in Table 7.1.[3]

Table 7.1 Our draft decision on total opex ($ million, 2013–14)

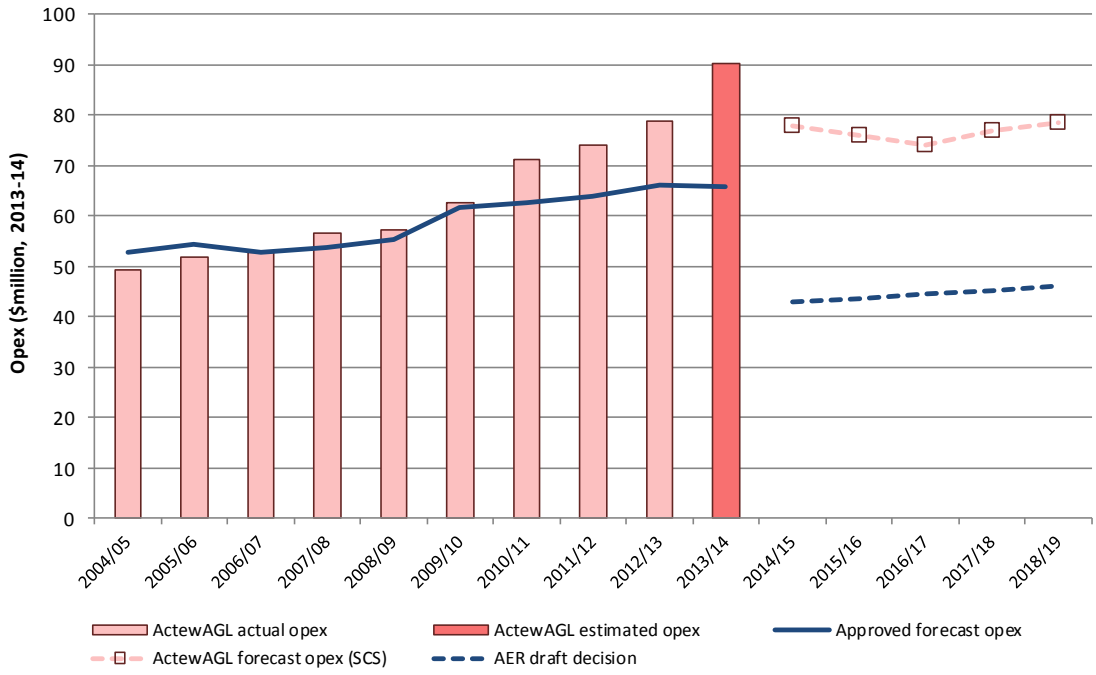
	2014–15	2015–16	2016–17	2017–18	2018–19	Total
ActewAGL's proposal	76.7	74.9	73.0	75.6	77.1	377.3
AER draft decision	42.5	43.2	44.1	44.8	45.6	220.3
Difference	-34.2	-31.7	-28.9	-30.7	-31.5	-157.0

Source: AER analysis.
Note: Excludes debt raising costs.

Figure 7.1 shows our draft decision compared to ActewAGL's proposal, its past allowances and past actual expenditure.

1 NER, clause 6.5.6(c).
2 NER, clause 6.5.6(d).
3 NER, clause 6.12.1(4)(ii).

Figure 7.1 AER draft decision compared to ActewAGL's past and proposed opex ($ million, 2013–14)

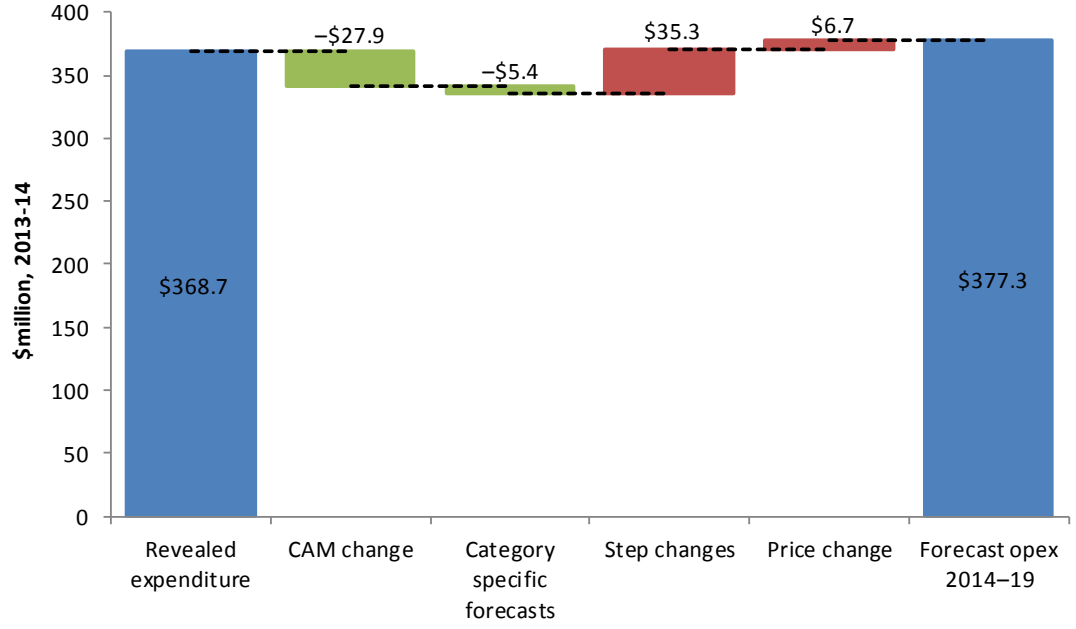


Source: ActewAGL, Regulatory accounts 2004–05; ActewAGL, Economic benchmarking - Regulatory Information Notice response 2005–06 to 2012–13; ActewAGL, *Regulatory proposal for the 2014–19 period* - Regulatory Information Notice.

7.2 ActewAGL's proposal

ActewAGL proposed total forecast standard control service opex of $377.3 million ($2013–14) for the 2014–19 period (excluding debt raising costs). In Figure 7.2 we have separated ActewAGL's opex forecast into its different elements.

Figure 7.2 ActewAGL's opex forecast ($ million, 2013–14)



Source: AER analysis.

Each of these elements are described below:

- ActewAGL used the actual opex it incurred in 2012–13 as the base for forecasting its opex for the 2014–19 period. It forecast this would lead to base opex of $368.7 million ($2013–14) over the 2014–19 period.
- ActewAGL proposed a reduction in standard control services opex as a result of a change in its cost allocation methodology. This reduced its opex by $27.9 million ($2013–14).
- ActewAGL proposed category specific forecasts for network maintenance and vegetation management. When compared to an opex forecast based on ActewAGL's actual opex in 2012–13 this reduced ActewAGL's opex by $5.4 million ($2013–14).
- ActewAGL accounted for forecast changes in input prices. These forecast price changes increased ActewAGL's opex forecast by $6.7 million ($2013–14).
- ActewAGL adjusted its opex forecast for step changes as a result of changes in costs associated with regulatory obligations or requirements, changes in its policies or strategies or a combination of these drivers. In total, step changes increased ActewAGL's opex by $35.3 million ($2013–14).

7.3 Assessment approach

We decide whether or not to accept the service provider's total forecast opex. We accept the service provider's forecast if we are satisfied that it reasonably reflects the opex criteria.[4] If we are not satisfied, we replace it with a total forecast of opex that we are satisfied does reasonably reflect the opex criteria.[5]

It is important to note that we make our assessment about the total forecast opex and not about particular categories or projects in the opex forecast. The Australian Energy Market Commission (AEMC) has expressed our role in these terms:[6]

> It should be noted here that what the AER approves in this context is expenditure allowances, not projects.

The service provider's forecast is intended to cover the expenditure that will be needed to achieve the operating expenditure objectives. These objectives are:[7]

1. meeting or managing the expected demand for standard control services over the regulatory control period
2. complying with all applicable regulatory obligations or requirements associated with providing standard control services
3. where there is no regulatory obligation or requirement, maintaining the quality, reliability and security of supply of standard control services and maintaining the reliability and security of the distribution system
4. maintaining the safety of the distribution system through the supply of standard control services.

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4 NER, clause 6.5.6(c).
5 NER, clause 6.5.6(d).
6 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. vii.
7 NER, clause 6.5.6(a).

We assess the proposed total forecast opex against the opex criteria set out in the NER. The opex criteria provide that the total forecast must reasonably reflect:[8]

1. the efficient costs of achieving the operating expenditure objectives
2. the costs that a prudent operator would require to achieve the operating expenditure objectives
3. a realistic expectation of the demand forecast and cost inputs required to achieve the operating expenditure objectives.

The AEMC noted that '[t]hese criteria broadly reflect the NEO [National Electricity Objective]'.[9]

In deciding whether or not we are satisfied the service provider's forecast reasonably reflects the opex criteria we have regard to the opex factors.[10] We attach different weight to different factors when making our decision to best achieve the National Electricity Objective. This approach has been summarised by the AEMC as follows:[11]

> As mandatory considerations, the AER has an obligation to take the capex and opex factors into account, but this does not mean that every factor will be relevant to every aspect of every regulatory determination the AER makes. The AER may decide that certain factors are not relevant in certain cases once it has considered them.

The opex factors we have regard to are:

- the most recent annual benchmarking report that has been published under clause 6.27 and the benchmark operating expenditure that would be incurred by an efficient distribution network service provider over the relevant regulatory control period
- the actual and expected operating expenditure of the distribution network service provider during any preceding regulatory control periods
- the extent to which the operating expenditure forecast includes expenditure to address the concerns of electricity consumers as identified by the distribution network service provider in the course of its engagement with electricity consumers
- the relative prices of operating and capital inputs
- the substitution possibilities between operating and capital expenditure
- whether the operating expenditure forecast is consistent with any incentive scheme or schemes that apply to the distribution network service provider under clauses 6.5.8 or 6.6.2 to 6.6.4
- the extent the operating expenditure forecast is referable to arrangements with a person other than the distribution network service provider that, in our opinion, do not reflect arm's length terms
- whether the operating expenditure forecast includes an amount relating to a project that should more appropriately be included as a contingent project under clause 6.6A.1(b)

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8 NER, clause 6.5.6(c).
9 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 113.
10 NER, clause 6.5.6(e).
11 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 115.

- the extent to which the distribution network service provider has considered and made provision for efficient and prudent non-network alternatives
- any relevant final project assessment conclusions report published under 5.17.4(o),(p) or (s)
- any other factor we consider relevant and which we have notified the distribution network service provider in writing, prior to the submission of its revised regulatory proposal under clause 6.10.3, is an operating expenditure factor.

For this determination, there are two additional operating expenditure factors that we will take into account under the last opex factor above:

- our benchmarking data sets including, but not necessarily limited to:

  (a) data contained in any economic benchmarking RIN, category analysis RIN, reset RIN or annual reporting RIN

  (b) any relevant data from international sources

  (c) data sets that support econometric modelling and other assessment techniques consistent with the approach set out in our Guideline

  as updated from time to time.

- economic benchmarking techniques for assessing benchmark efficient expenditure including stochastic frontier analysis and regressions utilising functional forms such as Cobb Douglas and Translog.[12]

For transparency and ease of reference, we have included a summary of how we have had regard to each of the opex factors in our assessment at the end of this attachment.

More broadly, we also note in exercising our discretion, we take into account the revenue and pricing principles which are set out in the National Electricity Law.[13]

The Expenditure Forecast Assessment Guideline

After conducting an extensive consultation process with service providers, users, consumers and other interested stakeholders we issued an Expenditure forecast assessment guideline (our Guideline) in November 2013 together with an explanatory statement.[14] Our Guideline sets out our intended approach to assessing operating expenditure in accordance with the NER.[15]

We may depart from the approach set out in our Guideline but if we do so we give reasons for doing so. In this determination we have not departed from the approach set out in our Guideline. In our Framework and Approach paper for each service provider, we set out our intention to apply our guideline approach in making this determination.

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12 This is consistent with the approach we outlined in the explanatory statement to our Expenditure Forecast Assessment Guideline. See, for example, p. 131.
13 NEL, s. 16(2); s. 7A.
14 AER, *Expenditure forecasting assessment guideline - explanatory statement*, November 2013.
15 NER, clause 6.5.6.

Our approach is to compare the service provider's total forecast opex with an alternative estimate that we develop ourselves.[16] By doing this we form a view on whether we are satisfied that the service provider's proposed total forecast opex reasonably reflects the criteria. If we conclude the proposal does not reasonably reflect the opex criteria, we use our estimate as a substitute forecast. This approach was expressly endorsed by the AEMC in its decision on the major rule changes that were introduced in November 2012. The AEMC stated:[17]

> While the AER must form a view as to whether a NSP's proposal is reasonable, this is not a separate exercise from determining an appropriate substitute in the event the AER decides the proposal is not reasonable. For example, benchmarking the NSP against others will provide an indication of both whether the proposal is reasonable and what a substitute should be. Both the consideration of "reasonable" and the determination of the substitute must be in respect of the total for capex and opex.

Our estimate is unlikely to exactly match the service provider's forecast because the service provider may not adopt the same forecasting method. However, if the service provider's inputs and assumptions are reasonable, its method should produce a forecast consistent with our estimate.

If a service provider's total forecast opex is materially different to our estimate and there is no satisfactory explanation for this difference, we may form the view that the service provider's forecast does not reasonably reflect the opex criteria. Conversely, if our estimate demonstrates that the service provider's forecast reasonably reflects the expenditure criteria, we will accept the forecast.[18] Whether or not we accept a service provider's forecast, we will provide the reasons for our decision.[19]

Building an alternative estimate of total forecast opex

Our approach to forming an alternative estimate of opex involves five key steps:

1. We typically use the service provider's actual opex in a single year as the starting point for our assessment. While categories of opex can vary from year to year, total opex is relatively recurrent.

2. We assess whether opex in that base year reasonably reflects the opex criteria. We now have a number of different techniques including economic benchmarking, by which can test the efficiency of opex in the base year. If necessary, we make an adjustment to the base year expenditure to ensure that it reflects the opex criteria. We can utilise the same techniques available to assess the efficiency of base year opex to make an adjustment to base year opex.

3. As the opex of an efficient service provider tends to change over time due to price changes, output and productivity, we trend the adjusted base year expenditure forward over the regulatory control period to take account of those changes. We refer to this as the rate of change.

4. We then adjust the base year expenditure to account for any other forecast cost changes over the regulatory control period that would meet the opex criteria. This may be due to new regulatory obligations and efficient capex/opex trade-offs. We call these step changes.

5. Finally we add any additional opex components which have not been forecast using this approach. For instance, we forecast debt raising costs based on the costs incurred by a benchmark efficient service provider. If we removed a category of opex from the selected base

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16 AER, *Expenditure forecast assessment guideline*, November 2013, p. 7.
17 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 112.
18 NER, clause 6.5.6(c).
19 NER, clause 6.12.1(3)(ii).

year, we will need to consider what additional opex is needed for this category of opex in forecasting total opex.

Underlying our approach are two general assumptions:

1. the efficiency criterion and the prudence criterion in the NER are complementary

2. actual expenditure was sufficient to achieve the expenditure objectives in the past.

We have used this general approach in our past decisions. It is a well-regarded top-down forecasting model that has been employed by a number of Australian regulators over the last fifteen years. We refer to it as a 'revealed cost method' in our Guideline (and we have sometimes referred to it as the base-step-trend method in our past regulatory decisions).

While these general steps are consistent with our past determinations, we have adopted a significant change in how we give effect to this approach, following the major changes to the NER made in November 2012. Those changes placed significant new emphasis on the use of benchmarking in our expenditure analysis. We will now issue benchmarking reports annually and have regard to those reports. These benchmarking reports provide us with one of a number of inputs for determining the benchmark efficient costs of providing opex.

We have set out more detail about each of the steps we follow in constructing our forecast below.

Step 1 – Starting point - base year expenditure

We prefer to use a recent year for which audited figures are available as the starting point for our analysis. We call this the base year. This is for a number of reasons:

- As total opex tends to be relatively recurrent, total opex in a recent year typically best reflects a service provider's current circumstances.

- During the past regulatory control period, we have incentives in place to reward the service provider for making efficiency improvements by allowing it to retain a portion of the efficiency savings it makes. Similarly, we penalise the service provider when it is relatively less efficient. This gives us confidence that the service provider did not spend more in the proposed base year to try to inflate its opex forecast for the next regulatory control period.

- Service providers also face many regulatory obligations in delivering services to consumers. These regulatory obligations ensure that the financial incentives a service provider faces to reduce its costs are balanced by obligations to deliver services safely and reliably. In general, this gives us confidence that recent historical opex will be at least enough to achieve the opex objectives.

In choosing a base year, we need to make a decision as to whether any categories of opex incurred in the base year should be removed. For instance:

- If a material cost was incurred in the base year that is unrepresentative of a service provider's future opex we remove it from the base year in undertaking our assessment.

- Rather than use all opex in the base year, service providers also often forecast specific categories of opex using different methods. We must also assess these methods in deciding what the starting point should be. If we agree that these categories of opex should be assessed differently, we will also remove them from the base year.

As part of this step we also need to consider any interactions with the incentive scheme for opex, the Efficiency Benefit Sharing Scheme (EBSS). The EBSS is designed to achieve a fair sharing of efficiency gains and losses between a service provider and its consumers. Under the EBSS, service providers receive a financial reward for reducing their costs in the regulatory control period and a financial penalty for increasing their costs. The benefits of a reduction in opex flow through to consumers as long as base year opex is no higher than the opex incurred in that year. Similarly, the costs of an increase in opex flow through to consumers if base year opex is no lower than the opex incurred in that year. If the starting point is not consistent with the EBSS, service providers could be excessively rewarded for efficiency gains or excessively penalised for efficiency losses in the prior regulatory control period.

Step 2 - Assessing base year expenditure

Regardless of the base year we choose, the service provider's actual expenditure may not reflect the opex criteria. For example, it may not be efficient or management may not have acted prudently in its governance and decision-making processes. We must test whether actual expenditure in that year should be used to forecast efficient opex in the next regulatory control period.

As we set out in our Guideline, to assess the efficiency of a service provider's actual expenditure, we use a number of different techniques.[20]

For instance, we may undertake a detailed review of a service provider's actual opex. For this draft decision, we have reviewed ActewAGL's labour and workforce and vegetation management practices.

Benchmarking is particularly important in comparing the relative efficiency of different service providers. The AEMC highlighted the importance of benchmarking in its changes to the NER in November 2012:[21]

> The Commission views benchmarking as an important exercise in assessing the efficiency of a NSP and informing the determination of the appropriate capex or opex allowance.

By benchmarking a service provider's expenditure we can compare its productivity over time, and to other service providers. For this decision we have used Multilateral Total Factor Productivity, Partial Factor Productivity and several opex cost function models to assess ActewAGL's efficiency.[22]

We also have regard to trends in total opex and category specific data to construct category benchmarks. We have used this information to inform our assessment of the efficiency of base year expenditure. In particular, we can use this category analysis data to diagnose potential sources of inefficiency. It may also lend support to, or identify potential inconsistencies with, our broader benchmark modelling.

If we determine that a service provider's base year expenditure does not reasonably reflect the opex criteria, we will not use it as our starting point for our estimate of total forecast opex. Rather, we will adjust it so it reflects an efficient, recurrent level of opex that does reflect the opex criteria. To arrive at an adjustment, we use the same techniques we used to assess the service provider's efficiency.

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20 AER, *Expenditure forecast assessment guideline*, November 2013, p. 22.

21 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 97.

22 The benchmarking models are discussed in detail in appendix A, which details our assessment of base opex.

Step 3 - Rate of change

Once we have chosen an efficient starting point, we apply an annual escalator to take account of the likely ongoing changes to efficient opex over the forecast regulatory control period. Efficient opex in the forecast regulatory control period could reasonably differ from the efficient starting point due to changes in:

- prices
- outputs
- productivity.

We estimate the change by adding expected changes in prices (such as the price of labour and materials) and outputs (such as changes in customer numbers and demand for electricity). We then incorporate reasonable estimates of changes in productivity.

Step 4 - Step changes

Next we consider if there is other opex needed to achieve the opex objectives in the forecast period. We refer to these as 'step changes'. Step changes may be for cost drivers such as new, changed or removed regulatory obligations, or efficient capex/opex trade-offs. As our Guideline explains, we will typically compensate a service provider for step changes only if efficient base year opex and the rate of change in opex of an efficient service provider do not already compensate for the proposed costs.[23]

Step 5 - Other costs that are not included in the base year

In our final step, we make any further adjustments we need for our opex forecast to achieve the opex objectives. For instance, our approach is to forecast debt raising costs based on a benchmarking approach rather than a service provider's actual costs. This is to be consistent with the forecast of the cost of debt in the rate of return building block.

After applying these five steps, we arrive at our total opex forecast.

Comparing the service provider's proposal with our estimate

Having established our estimate of total forecast opex we can test the service provider's proposed total forecast opex. This includes comparing our alternative total with the service provider's total forecast opex. However, we also assess whether the service provider's forecasting method, assumptions, inputs and models are reasonable, and assess the service provider's explanation of how that method results in a prudent and efficient forecast.

The service provider may be able to adequately explain any apparent differences between its forecast and our estimate. We can only determine this on a case by case basis using our judgment.

This approach is supported by the AEMC's decision when implementing the changes to the NER in November 2012. The Commission stated:[24]

> the AER could be expected to approach the assessment of a NSP's expenditure (capex or opex) forecast by determining its own forecast of expenditure based on the material before it. Presumably this will never match exactly the amount proposed by the NSP. However there will be a certain margin of difference

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[23] AER, *Expenditure forecast assessment guideline*, November 2013, p. 24.

[24] AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 112.

between the AER's forecast and that of the NSP within which the AER could say that the NSP's forecast is reasonable. What the margin is in a particular case, and therefore what the AER will accept as reasonable, is a matter for the AER exercising its regulatory judgment.

If we are not satisfied there is an adequate explanation for the difference between our opex forecast and the service provider's opex forecast, we will use our opex forecast in determining a service provider's total revenue requirement.

As outlined in our Guideline, if the prudent and efficient opex allowance to achieve the opex objectives is lower than a service provider's current opex, we would expect a prudent operator would take the necessary action to improve its efficiency. We would expect a service provider (including its shareholders) to wear the cost of any inefficiency. To do otherwise, would mean electricity network consumers would fund some costs of a service provider's inefficiency. Accordingly, if our opex forecast is lower than a service provider's current opex we would generally not consider it appropriate to provide a transition path to the efficient allowance. This approach appears to be reflected in the NER, which provides that we must be satisfied that the opex forecast reasonably reflects the efficient costs of a prudent operator given reasonable expectations of demand and cost inputs to achieve the expenditure objectives.[25]

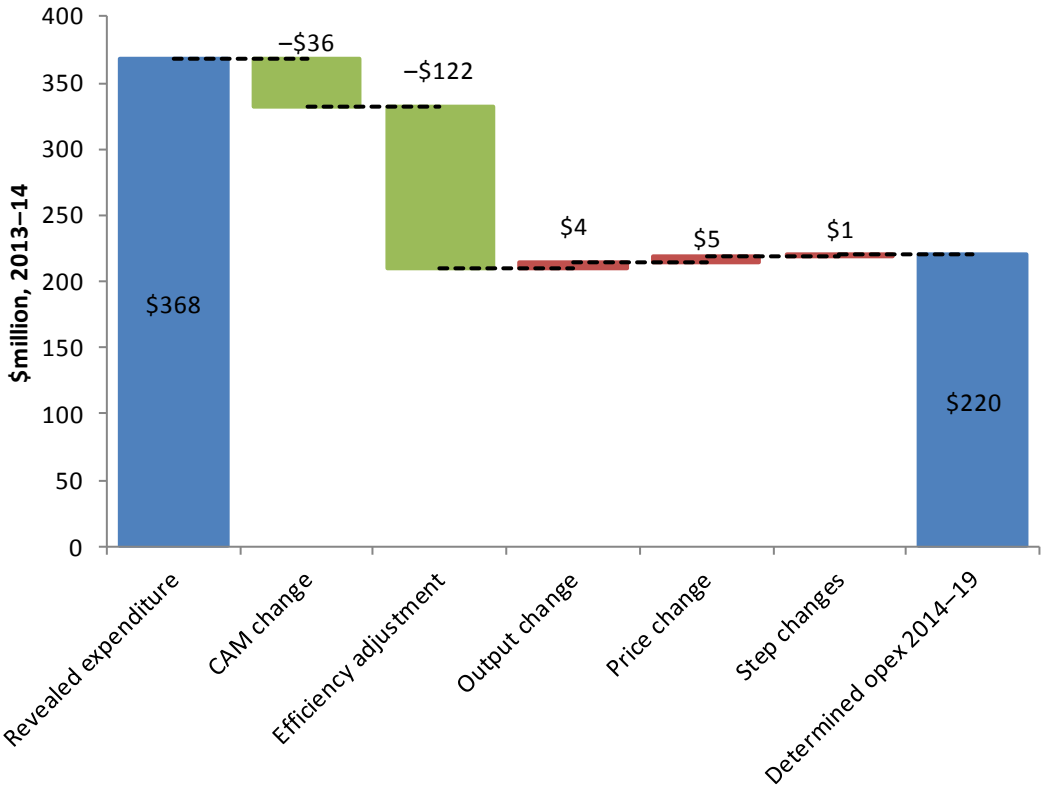
7.4 Reasons for draft decision

We are not satisfied ActewAGL's total forecast opex reasonably reflects the opex criteria. We compared ActewAGL's opex forecast to an opex forecast we constructed using the method outlined above. Our estimate is of the efficient opex a prudent operator would require to achieve the opex objectives. ActewAGL's proposal is higher than ours and we are satisfied that it does not reasonably reflect the opex criteria. For this reason, we have substituted ActewAGL's total opex forecast with our total opex forecast.

Figure 7.3 illustrates how our forecast has been constructed. The starting point on the left is what ActewAGL's opex would have been for the 2014–19 period if it was set based on ActewAGL's reported opex in 2012–13.

[25] AER, *Expenditure forecast assessment guideline - Explanatory statement*, November 2013, p. 23.

Figure 7.3 Our draft decision opex forecast



Source: AER analysis.

Table 7.2 summarises the quantum of the difference between ActewAGL's proposed total opex and our draft decision estimate.

Table 7.2 Proposed vs draft decision total forecast opex ($ million, 2013–14)

	2014–15	2015–16	2016–17	2017–18	2018–19	Total
ActewAGL's proposal	76.7	74.9	73.0	75.6	77.1	377.3
AER draft decision	42.5	43.2	44.1	44.8	45.6	220.3
Difference	-34.2	-31.7	-28.9	-30.7	-31.5	-157.0

Source: AER analysis.
Note: Excludes debt raising costs.

The key areas of difference between our estimate of opex and ActewAGL's estimate are outlined below.[26]

Base opex

We tested the efficiency of ActewAGL's base opex in 2012–13 using a number of different techniques. We are not satisfied it represents opex incurred by an efficient and prudent service provider. Our

[26] For each of these areas, our analysis is supported by an appendix. In addition appendix D assesses ActewAGL's forecasting methodology. We do not consider ActewAGL's forecasting methodology to be a significant driver between our opex forecast and ActewAGL's opex forecast.

alternative estimate of base opex is based on what we consider would be an efficient starting point to forecast total opex that reasonably reflects the opex criteria.

The techniques we used to test the efficiency of ActewAGL's opex are outlined in Table 7.3. All evidence suggests ActewAGL's actual opex is materially inefficient.

Table 7.3 Assessment of the efficiency of ActewAGL's opex

Technique	Description of technique	Findings
Regulatory proposal review	We examined ActewAGL's regulatory proposal and accompanying supporting information.	ActewAGL's regulatory proposal does not forecast efficiency improvements. ActewAGL's proposal suggests labour could be a driver of high expenditure in the base year due to wage negotiations. ActewAGL also undertook a restructure following a 'major organisation review' by Marchment Hill Consulting (MHC) that took place in 2011.[27]
Economic benchmarking	Economic benchmarking measures the efficiency of a service provider in the use of its inputs to produce outputs. The economic benchmarking techniques we used to test ActewAGL's efficiency included Multilateral Total Factor Productivity, Multilateral Partial Factor Productivity and opex cost function modelling. We compared ActewAGL's efficiency to other service providers in the NEM.	Despite differences in the techniques we used, all benchmarking techniques show ActewAGL performs about half as efficiently as the most efficient service providers in the NEM (CitiPower and Powercor). We do not consider that differences in operating environment faced by ActewAGL adequately explain the different benchmarking results between ActewAGL and other service providers.
Partial Performance Indicator (PPI) benchmarking	PPIs are used to compare the performance of businesses in delivering one type of output.	PPIs corroborate our economic benchmarking evidence. When compared to other service providers, ActewAGL appears to have higher costs than most other service providers on total network cost per customer and total opex per customer.
Category analysis benchmarking	Category analysis compares the costs of different service providers on discrete categories of opex. We have examined labour, overheads, maintenance, emergency response and vegetation management expenditure.	In general, ActewAGL appeared to have very high or comparable costs relative to most of its peers on the majority of the categories we examined.
Review of labour and workforce practices	Labour costs represent a large proportion of ActewAGL's opex. Category analysis showed ActewAGL had high labour costs relative to most of its peers so we decided to conduct a detailed review of its labour and workforce practices.	We found evidence to suggest inefficiencies in ActewAGL's labour and workforce practices. ActewAGL's workforce has grown significantly over the 2009–14 period in terms of size and cost. We also found evidence of structural and cultural issues, restrictions on outsourcing, and potentially restrictive redundancy provisions.
Review of vegetation management	ActewAGL's vegetation management costs have increased significantly over the 2009–14 period. Category analysis showed ActewAGL has very high costs compared to most of its peers. We decided to review ActewAGL's costs in detail.	Through our review of ActewAGL's vegetation management practices, we discovered inefficiencies arising from its contractor management and largely reactive approach to vegetation clearance.

[27] ActewAGL, *Regulatory proposal*, pp. 214–217.

Review of operating environment factors	While our economic benchmarking techniques take into account certain key differences in operating environments of service providers, they cannot account for all differences. We reviewed over 35 different operating environment factors to determine whether it is necessary to provide an allowance when deciding on the ultimate adjustment to base year opex.	We found some operating environment differences that we consider affect ActewAGL's opex performance on the economic benchmarking techniques. Overall, we consider a 30 per cent allowance for operating environment differences is necessary.
Direct comparison benchmarking	Direct comparison is a simple form of benchmarking which compares the outputs and costs of service providers directly.	Direct comparison shows that ActewAGL incurred similar total opex to Jemena Electricity Networks (JEN) over the past eight years, despite the fact that ActewAGL served only half of the customers and experienced 67 per cent of the maximum demand for electricity.

Source: AER analysis.

Following detailed examination of the quantitative and qualitative evidence, we consider it is appropriate to adjust ActewAGL's base year opex. On the advice of Economic Insights, we have used the results from its preferred benchmarking model (Cobb Douglas stochastic frontier analysis (SFA)) as the starting point.[28] However, we consider the following adjustments are necessary:

1. We have provided a further 30 per cent allowance for those operating environment differences not completely captured by our preferred benchmarking model.
2. We have compared ActewAGL's efficiency to a weighted average of all networks with efficiency scores above 0.75 (CitiPower, Powercor, United Energy, SA Power Networks and AusNet) rather than the most efficient service provider (CitiPower) in our preferred model.

In combination, these allowances reduce the benchmark level of efficiency to approximately 30.5 per cent less than the most efficient service provider predicted by the Cobb Douglas SFA model alone.

We estimate an efficient service provider would need less base opex than a forecast based on ActewAGL's actual opex in 2012–13. Table 7.4 illustrates how our efficient base level of opex compares with ActewAGL's actual opex in 2012–13. We are satisfied our substitute base opex forms the appropriate starting point for total forecast opex that reasonably reflects the opex criteria.

Table 7.4 Comparison of our estimate of base opex with ActewAGL's actual opex in 2012–13

	ActewAGL
Proposed base opex (adjusted)[a]	66.8
Substitute base opex	**42.2**
Difference	24.6
Percentage opex reduction	**36.8%**

Note: (a) we have adjusted ActewAGL's actual opex in 2012–13 for its new CAM and jurisdictional schemes.
Source: AER analysis.

Our detailed assessment of ActewAGL's base level of opex is outlined in appendix A.

[28] Economic Insights, 2014, p. iv.

Rate of change

Our forecast rate of change in opex captures the forecast year on year change in efficient base opex. Specifically, it accounts for forecast changes in output levels, prices and productivity (such as economies of scale). These three opex drivers should account for the main reasons why the efficient base level of opex changes over time. The output and productivity change variables capture the forecast change in the inputs required. The price change variable captures the forecast change in the real prices of those inputs.

In percentage terms our forecast rate of change is higher than ActewAGL's. This mainly reflects our higher forecast of output change. Our forecast of output change takes into account the efficient opex we consider is needed given forecast increases in ActewAGL's customers and its network.

In dollar terms, forecast opex attributed to the rate of change in our opex forecast is similar to ActewAGL's proposed opex forecast because our estimate of the rate of change is applied to a lower base level of opex.

Table 7.5 Rate of change in opex - Difference between ActewAGL and our approach (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
ActewAGL	0.44	0.92	1.09	1.12	1.18
AER	0.49	1.69	1.98	2.04	1.84
Difference	0.04	0.78	0.90	0.92	0.67

Source: AER analysis.

Step changes

We have included a step change of $1.4 million above an efficient base opex for increased costs associated with new regulatory obligations.

We typically allow step changes to base opex for changes to ongoing costs associated with new regulatory obligations. We are satisfied ActewAGL is subject to the following new regulatory obligations:

- regulatory reporting
- compliance with new obligations related to NECF connection charges
- changes to the NER for network pricing arrangements and the connection of embedded generation.

We are not satisfied that other cost changes ActewAGL identified require a change to an efficient base level of opex. All proposed cost changes we assessed as step changes are outlined in Table 7.6.

Table 7.6 Summary of our assessment of step changes ($ million, 2013–14)

	ActewAGL	AER	Reasons
Environment, health safety and quality (EHSQ)	2.8	0.0	The cost of meeting regulatory obligations are reflected in the base year and the regulatory requirements in 2015-20 are not more onerous than in 2009–14.
Regulatory compliance and strategy	8.6	1.4	Some new regulatory obligations.
Technical standards	1.5	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex.
Safe work practices	3.5	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex
Contractor management	3.1	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex.
Network operations and call centre	2.1	0.0	Base opex already accounts for efficient opex needed to provide standard control distribution services.
Network OT support	4.8	0.0	Base opex already accounts for efficient opex needed to provide standard control distribution services.
Corporate services	10.1	0.0	Not a new regulatory obligation.
Capitalisation corporate services	-1.2	0.0	Not specifically considered as a step change. Taken into account in setting an efficient base level of opex.
Total	**35.3**	1.4	

Source: AER analysis; ActewAGL, *Regulatory proposal*, June 2014, p. 227.

Our detailed assessment of step changes is outlined in appendix C.

7.4.1 Debt raising costs

Debt raising costs are transaction costs incurred each time debt is raised or refinanced. We forecast them using our standard forecasting approach for this category which sets the forecast equal to the costs incurred by a benchmark firm. Our assessment approach and the reasons for those forecasts are set out in appendix H to the rate of return attachment.

7.4.2 Interrelationships

In assessing ActewAGL's total forecast opex we took into account other components of its regulatory proposal, including:

- the impact of cost drivers that affect both forecast opex and forecast capex. For instance forecast maximum demand affects forecast augmentation capex and forecast output growth used in estimating the rate of change in opex.

- the approach to the assessing rate of return, to ensure there is consistency between our determination of debt raising costs and the rate of return building block.
- changes to the classification of services from standard control services to alternative control services.
- consistency with the application of incentive schemes - in particular our draft decision not to subject any expenditure to the EBSS during the 2015–19 regulatory control period.
- concerns of electricity consumers identified in the course of its engagement with consumers.

7.4.3 Assessment of opex factors

In deciding whether or not we are satisfied the service provider's forecast reasonably reflects the opex criteria we have regard to the opex factors.[29] Table 7.7 summarises how we have taken the opex factors into account in making our draft decision.

Table 7.7 Our consideration of opex factors

Opex factor	Consideration
The most recent annual benchmarking report that has been published under rule 6.27 and the benchmark operating expenditure that would be incurred by an efficient Distribution Network Service Provider over the relevant regulatory control period.	There are two elements to this factor. First, we must have regard to the most recent annual benchmarking report. Second, we must have regard to the benchmark operating expenditure that would be incurred by an efficient distribution network service provider over the period. The annual benchmarking report is intended to provide an annual snapshot of the relative efficiency of each service provider. The second element, that is, the benchmark operating expenditure that would be incurred an efficient provider during the forecast period, necessarily provides a different focus. This is because this second element requires us to construct the benchmark opex that would be incurred by a hypothetically efficient provider for that particular network over the relevant period. We have used several assessment techniques that enable us to estimate the benchmark opex that an efficient service provider would require over the forecast period. These techniques include economic benchmarking, opex cost function modelling, category analysis and a detailed review of ActewAGL's labour and workforce practices and vegetation management. We have used our judgment based on the results from all of these techniques to holistically form a view on the efficiency of ActewAGL's proposed total forecast opex compared to the benchmark efficient opex that would be incurred over the relevant regulatory control period.
The actual and expected operating expenditure of the distribution network service provider during any proceeding regulatory control periods.	Our forecasting approach uses the service provider's actual opex as the starting point. We have compared several years of ActewAGL's actual past opex with that of other service providers to form a view about whether or not its revealed expenditure is sufficiently efficient to rely on it as the basis for forecasting required opex in the forthcoming period.
The extent to which the operating expenditure forecast includes expenditure to address the concerns of electricity	We understand the intention of this particular factor is to require us to have regard to the extent to which service

[29] NER, clause 6.5.6(e).

consumers as identified by the distribution network service provider in the course of its engagement with electricity consumers.	providers have engaged with consumers in preparing their regulatory proposals, such that they factor in the needs of consumers.[30] We have considered the concerns of electricity consumers as identified by ActewAGL in assessing its proposal.
The relative prices of capital and operating inputs	We have had regard to multilateral total factor productivity benchmarking when deciding whether or not forecast opex reflects the opex criteria. Our multilateral total factor productivity analysis considers the overall efficiency of networks with in the use of both capital and operating inputs with respect to the prices of capital and operating inputs.
The substitution possibilities between operating and capital expenditure.	Some of our assessment techniques examine opex in isolation – either at the total level or by category. Other techniques consider service providers' overall efficiency, including their capital efficiency. We have relied on several metrics when assessing efficiency to ensure we appropriately capture capex and opex substitutability. In developing our benchmarking models we have had regard to the relationship between capital, opex and outputs. We also had regard to multilateral total factor productivity benchmarking when deciding whether or not forecast opex reflects the opex criteria. Our multilateral total factor productivity analysis considers the overall efficiency of networks with in the use of both capital and operating inputs. Further, we considered the different capitalisation policies of the service providers' and how this may affect opex performance under benchmarking.
Whether the operating expenditure forecast is consistent with any incentive scheme or schemes that apply to the distribution network service provider under clauses 6.5.8 or 6.6.2 to 6.6.4.	The incentive scheme that applied to ActewAGL's opex in the 2009–14 regulatory control period, the EBSS, was intended to work in conjunction with a revealed cost forecasting approach. In this instance, we have forecast efficient opex based on benchmark efficient service provider. We have considered this in deciding how the EBSS should apply to ActewAGL in the 2009–14 regulatory control period and the 2014–19 period.
The extent the operating expenditure forecast is referable to arrangements with a person other than the distribution network service provider that, in our opinion, do not reflect arm's length terms.	Some of our techniques assess the total expenditure efficiency of service providers and some assess the total opex efficiency. Given this, we are not necessarily concerned whether arrangements do or do not reflect arm's length terms. A service provider which uses related party providers could be efficient or it could be inefficient. Likewise, for a service provider who does not use related party providers. If a service provider is inefficient, we adjust their total forecast opex proposal, regardless of their arrangements with related providers.
Whether the operating expenditure forecast includes an amount relating to a project that should more appropriately be included as a contingent project under clause 6.6A.1(b).	This factor is only relevant in the context of assessing proposed step changes (which may be explicit projects or programs). We did not identify any contingent projects in reaching our draft decision.
The extent the distribution network service provider has considered, and made provision for, efficient and prudent non-network alternatives.	We have not found this factor to be significant in reaching our draft decision.

[30] AEMC, *Rule Determination*, 29 November 2012, pp. 101, 115.

The NER require that we notify the service provider in writing of any other factor we identify as relevant to our assessment, prior to the service provider submitting its revised regulatory proposal.[31] Table 7.8 identifies these factors.

Table 7.8 Other factors we have had regard to

Opex factor	Consideration
Our benchmarking data sets, including, but not necessarily limited to: 1. data contained in any economic benchmarking RIN, category analysis RIN, reset RIN or annual reporting RIN 2. any relevant data from international sources 3. data sets that support econometric modelling and other assessment techniques consistent with the approach set out in our Guideline as updated from time to time.	This information may potentially fall within opex factor (4). However, for absolute clarity, we are using data we gather from NEM service providers, and data from service providers in other countries to provide insight into the benchmark operating expenditure that would be incurred by an efficient and prudent distribution network service provider over the relevant regulatory period.
Economic benchmarking techniques for assessing benchmark efficient expenditure including stochastic frontier analysis and regressions utilising functional forms such as Cobb Douglas and Translog.	This information may potentially fall within opex factor (4). For clarity, and consistent with our approach to assessment set out in our Guideline, we are have regard to a range of assessment techniques to provide insight into the benchmark operating expenditure that an efficient and prudent service provider would incur over the relevant regulatory control period.

Source: AER analysis.

[31] NER, clause 6.5.6(e)(12).

A Base year opex

In this appendix, we present our detailed analysis of ActewAGL's base year opex. Base year opex is the starting point for our approach to developing an estimate of the total forecast opex we consider meets the requirements of the NER.[32] We use this approach to assess ActewAGL's total forecast opex proposal. If we are not satisfied ActewAGL's opex proposal reasonably reflects the opex criteria, our estimate forms the basis for any adjustment we will make.[33]

To ensure our estimate of total forecast opex reasonably reflects the opex criteria, we must be satisfied the starting point is efficient. If we use revealed expenditure that includes inherent inefficiencies as the basis for a forecast, the forecast will also contain these inefficiencies. Therefore, if we find that the base year expenditure is inefficient or in some other way unrepresentative of the expenditure needed to achieve the opex objectives in the forecast period, we adjust it. The structure of this appendix is:

- section A.1 sets out our findings and base year adjustment
- section A.2 explains our approach to assessing the efficiency of base year opex in more detail
- section A.3 presents the results of our benchmarking analysis, a key component of our approach to assessing efficiency
- section A.4 outlines potential sources of inefficiency that we have identified in base year opex
- section A.5 shows our consideration of the effects of operating environment factors that might affect ActewAGL relative to the benchmark
- section A.6 explains our conclusions on base year opex, including the adjustment.

A.1 AER findings and estimates of efficient base year opex

In this section we provide a summary of our findings and our view of the efficient base year opex for ActewAGL.

In contrast to the NSW service providers, ActewAGL has provided little evidence in its regulatory proposal or subsequent submissions that it considers it needs to improve its efficiency. ActewAGL's regulatory proposal implies that the AER's allowance in the 2009–14 period was not sufficient to appropriately compensate it for increased costs of labour arising from Enterprise Bargaining Agreement (EBA) negotiations.[34]

We expect all service providers to comply with their legal obligations, whether those obligations arise in legislation, contract or some other legal duty. They must comply with, for example, the *Fair Work Act 2009* and other relevant laws in providing their services. However, we find that the presence of a legal obligation, by itself, is insufficient to justify us providing opex for a particular item. Service providers undertake many significant activities by agreeing to enter into legally binding arrangements. EBAs are one example of this.

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32 As we explain in the opex attachment, this is the total forecast opex we consider the prudent and efficient expenditure a service provider would require to achieve the opex objectives in the forthcoming period.

33 NER, clauses 6.5.6(c), (d) and 6.12.1(4).

34 ActewAGL, *Regulatory Proposal*, 2014, pp. 214–215, 226.

If a contractual or legal obligation was sufficient to justify the provision of opex, it would curtail the scope for us to undertake efficiency assessments. Put differently, the costs of contract that incorporated inefficient expenditures would be passed through to consumers if we were unable to assess efficiency. Such an approach is more in keeping with a cost of service model rather than the efficiency based regulatory regime under which we operate.

Also, we determine a service provider's opex allowance at the total level. We do not seek to interfere in the decisions a service provider will make about how and when to spend this total opex allowance to run its network, including the particular legal obligations it enters into to do so. The service provider is free to choose how to manage its allowance.

Therefore, if a service provider ultimately spends inefficiently or imprudently, it will bear those additional costs and, conversely, if it achieves efficiencies it may make additional profits. This is a core feature of incentive based regulation and is intended to reflect the conditions that would be faced by businesses operating in a competitive environment.

Our findings are consistent with the view that material inefficiency does exist in ActewAGL's historical opex. Accordingly, we do not accept its proposed base year opex amount as the starting point for estimating required total forecast opex in the forthcoming period. Table A.1 contains our draft determination estimate of base year opex.

Table A.1 Draft determination estimate of efficient base year opex ($ million, 2013–14)

	ActewAGL
Proposed base opex (adjusted)[a]	66.7
Substitute base opex	**42.2**
Difference	24.5
Percentage opex reduction[b]	**36.8%**

Note: (a) we have adjusted ActewAGL's proposed opex for its new CAM and jurisdictional schemes.
(b) implied opex reduction is relative to proposed opex and rolled forward to 2012–13[35]
Source: AER analysis.

The percentage reduction to proposed base opex for ActewAGL may seem large. However, it is much less than the implied reduction based on raw benchmarked efficiency scores developed by our consultant Economic Insights. Table A.2 sets out the quantitative raw efficiency scores of each service provider compared to the efficiency frontier. The percentages expressed in Table A.2 represent how efficient ActewAGL is on average as a proportion of the frontier business.[36] A score of 40, for example, means ActewAGL is 40 per cent as efficient as the frontier service provider (or, put differently, 60 per cent less efficient than the frontier business).

[35] This differs to the percentage reduction to base year opex recommended in Economic Insights' report. This is because Economic Insights' report is relative to the amount of Network services opex in the base year rather than the base year opex proposed by the service provider. See Economic Insights, *Economic Benchmarking Assessment of Operating Expenditure for NSW and ACT Electricity DNSPs*, October 2014, Denis Lawrence, Tim Coelli and John Kain (Economic Insights, 2014). p. 55.

[36] For our preferred benchmarking technique, the frontier business is CitiPower, which has a score of 0.95.

Table A.2 Quantitative raw efficiency scores compared to the frontier (average for 2005–06 to 2012–13) (per cent)

Assessment technique	Frontier business	ActewAGL
Cobb Douglas stochastic frontier analysis (SFA CD)	CitiPower	40
Translog estimated least squares regression (LSE TLG)	Powercor	32
Cobb Douglas estimated least squares regression (LSE CD)	Powercor	36
Opex multilateral partial factor productivity (opex MPFP)	CitiPower	44
Multilateral total factor productivity (MTFP)	CitiPower	55

Source: Economic Insights.

If we did not make further adjustments to the raw efficiency scores, the reduction in ActewAGL's base year opex (based on the Cobb Douglas SFA model) would be 61 per cent.[37]

Instead, in arriving at our substitute base opex we analysed various benchmarking techniques, examined possible sources of high expenditure that might be driving the perceived gap between ActewAGL and its more efficient peers, and investigated the operating environment factors that differentiate the service providers. We holistically developed an estimate of base opex, starting with Economic Insights' Cobb Douglas Stochastic Frontier Analysis (SFA) model. However, rather than mechanistically applying the efficiency adjustment the model predicts, we have, on the basis of the quantitative and qualitative evidence before us, made three adjustments to the 'raw' benchmarking results in favour of ActewAGL.

Rather than using the National Energy Market (NEM) frontier service provider, CitiPower, as the benchmark for efficiency comparisons, the first adjustment is to set a lower benchmark based on an average of the efficiency scores of the most efficient service providers in the NEM. This reduces the benchmark efficiency target by 9 percentage points to 0.86 from 0.95.

The second adjustment is to modify the benchmark efficiency target to account for operating environment factors specific to the ACT. We are satisfied that a 30 per cent operating environment adjustment is appropriate for ActewAGL. This effectively reduces the benchmark efficiency target by 20 percentage points to 0.66.

Additionally we have made a third adjustment because the Cobb Douglas SFA model efficiency scores represent ActewAGL's average efficiency for the benchmarking period. We have applied a trend to move the substitute base opex from a forecast of the average amount for the 2006 to 2013 period to a forecast for 2012–13, the base year. In trending the average amount forward, we have used essentially the same rate of change method we use to determine the trend component of our base step trend methodology. For this reason, the percentage reduction differs to the average efficiency score. We explain this further in section A.3.4.

Table A.3 shows the effect of these adjustments.

[37] The implied opex reduction here is relative to proposed base opex whereas the CD SFA efficiency score is relative to average opex performance over 2006 to 2013.

Table A.3 Derivation of estimate of efficient base year opex ($ million, 2013–14)

Stage of estimate	Contribution to estimate
Starting point: 'Raw' CD SFA forecast with frontier service provider as benchmark	26.0
Adjustment 1: Change benchmark to weighted average of top quartile efficiency score range	+ 2.7
Adjustment 2: Adjust benchmark to account for operating environment factors	+ 8.6
Adjustment 3: Adjust benchmark to move from average results to 2013 results	+ 4.9
Substitute base opex	**42.2**

Source: AER Analysis.

The following sections summarise our reasoning for selecting the starting point for, and making adjustments to, our substitute base opex.

Benchmarking results

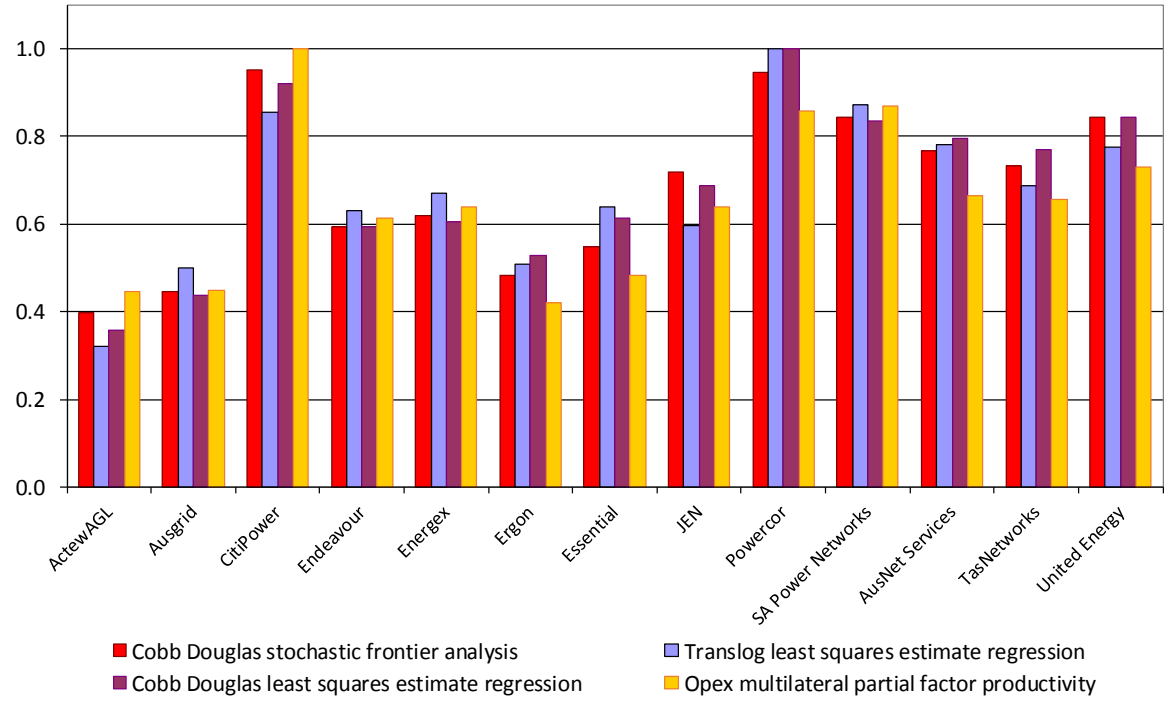
In assessing a service provider's forecast opex, the NER requires us to have regard to the benchmark opex that would be incurred by an efficient service provider over the relevant regulatory control period.[38] To that end, we engaged Economic Insights, experts in economic benchmarking, to develop several techniques for assessing the relative efficiency of service providers compared to their peers. Economic Insights developed five techniques to assess the relative efficiency of service providers. Three techniques use econometric modelling and two are index-based. Four of the five techniques measure opex performance. Economic Insights found:[39]

> The efficiency scores across the three econometric models are relatively close to each other for each DNSP and they are, in turn, relatively close to the corresponding MPFP score. This similarity in results despite the differing methods used and datasets used reinforces our confidence in the results.

Figure A.1 presents the results of each opex model for each distribution network service provider in the NEM. A score of 1 is the best score.

[38] NER, clause 6.5.6(e)(4).
[39] Economic Insights, 2014, pp. 46–47.

Figure A.1 Econometric modelling and opex MPFP results

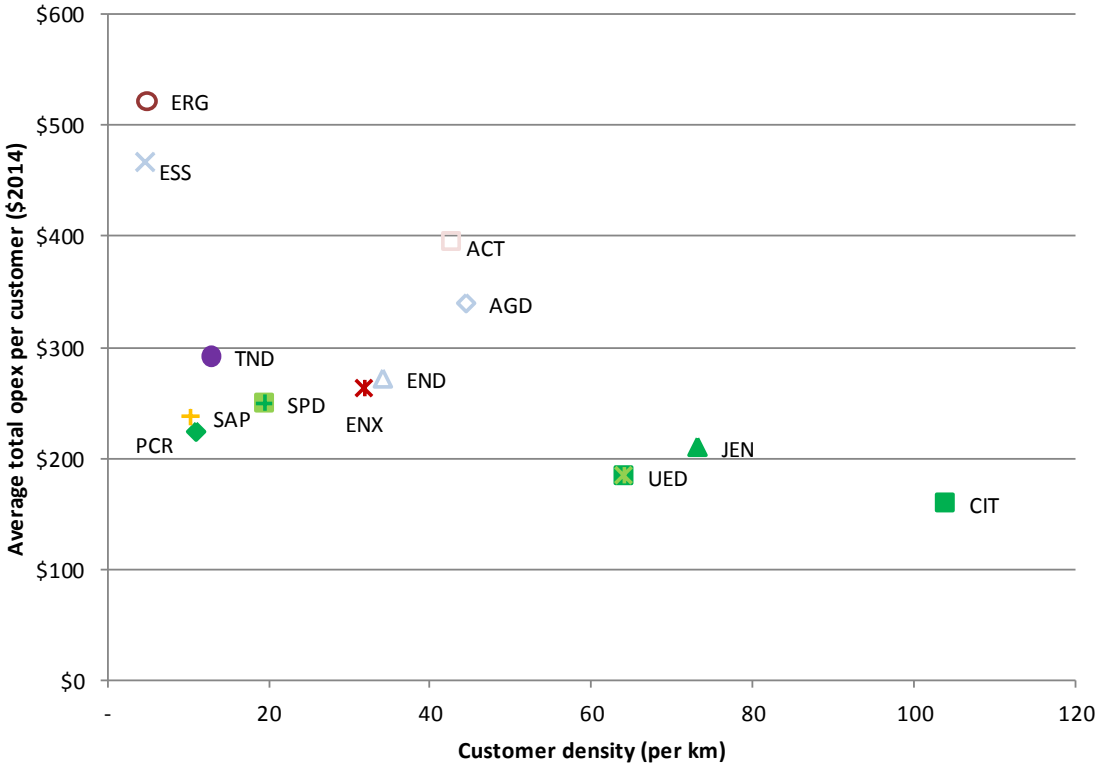


Source: Economic Insights.

Each model may differ in terms of estimation method or model specification and accounts for operating environment factors (factors that may differentiate service providers) to differing degrees so the results will never be identical. Regardless of which technique is used, Figure A.1 demonstrates that ActewAGL's base year expenditure is materially inefficient. We consider our economic benchmarking techniques in detail in section A.3.1 and section 0

We also examine partial performance indicators (PPIs) – a different method of benchmarking. Although they are more simplistic measures, the PPI results provide further evidence to support the results of our other benchmarking techniques. Figure A.2 compares, for example, average annual opex per customer for each service provider.

Figure A.2 Average annual opex per customer for 2009 to 2013 against customer density ($2013–14)



Source: Economic benchmarking RIN data

Figure A.2 demonstrates a clear demarcation between ActewAGL and the vast majority of its peers (all service providers except for Essential Energy and Ergon Energy). This is consistent with the economic benchmarking results which show ActewAGL as the worst performer on most measures.

Per customer PPI metrics tend to (on balance) favour urban service providers over rural providers as, typically, rural service providers will have more assets per customer because their customers are more spread out. We must bear this in mind when we consider the results in Figure A.2. ActewAGL is approximately in the mid range in terms of customer density so depending on the comparator, it may appear to perform better or worse on PPIs than it does on the economic benchmarking models. For example, of the two frontier performers for the economic benchmarking models, ActewAGL should compare more favourably to Powercor due to Powercor's significantly lower customer density, but less favourably to CitiPower because CitiPower is very dense.

This is simply a limitation of PPIs because they do not explicitly account for operating environment differences. If we consider the results of a number of PPIs, with these limitations in mind, we can nevertheless see that the results strongly support the economic benchmarking results set out above. We consider PPIs in detail in section A.3.3.

Sources of inefficiency or high expenditure

The Cobb Douglas SFA model (our preferred benchmarking technique) takes into account key operating environment factors such as economies of scale, network density and the relationship between opex and the multiple outputs service providers deliver. However, it does not account for all differences. We have used other assessment techniques, including category analysis and detailed

reviews of expenditure categories, to investigate potential sources of inefficiency or other explanations for high expenditure demonstrated by the benchmarking results.

Category analysis

Category analysis is a form of simple benchmarking. Category analysis metrics are PPIs that focus on particular categories of opex in isolation. They are, therefore, the next level of detail below the total cost and total opex PPIs we presented earlier. We would not necessarily expect every metric to produce the same results because service providers may allocate opex across the categories differently. Therefore, some service providers may perform relatively well on some category metrics despite having high expenditure overall.

Broadly, however, our analysis suggests that on the majority of the category analysis measures ActewAGL appears to have high costs relative to most other service providers. Table A.4 summarises the results of each metric. ActewAGL's expenditure is recorded as 'high' when its costs appear above its peers and 'comparable' where the gap is less distinct. 'Very high' indicates a substantial gap between other service providers. We consider these results are consistent with and support the findings of our economic benchmarking techniques.

Table A.4 Summary of category analysis metrics – ActewAGL's relative costs (average for 2008–09 to 2012–13)

	ActewAGL
Labour	Very High
Total overheads	High
Total corporate overheads	Comparable
Total network overheads	Comparable
Maintenance	Very High
Emergency response	Comparable
Vegetation management	Very High

Source: AER analysis.

Given ActewAGL generally has high expenditure on category analysis for most significant categories of expenditure, we consider this supports the view that it is likely systemic issues exist within ActewAGL. The results of the labour and total overhead metrics (which are broader measures) tend to support this view as well.

Detailed review

Category analysis suggested labour and vegetation management appeared to be two significant drivers of costs. Accordingly, we have conducted more detailed analysis of these categories of expenditure.

Labour

Labour costs are the largest component of opex and account for approximately 80 per cent of ActewAGL's opex.[40] We have reviewed ActewAGL's labour and workforce management practices, comparing and contrasting them to those of other service providers where relevant. ActewAGL has a larger and more costly workforce than other service providers, when considered on a comparable basis. We uncovered labour and workforce inefficiencies arising from:

- significantly lower proportions of outsourcing than more efficient peers
- workplace structure, culture and performance issues that have been identified by its own consultant.
- large increases in the number and cost of permanent employees leading up to and during the 2009–14 period
- restructuring that has led to an outlay of costs but little evidence of corresponding quantifiable benefit
- An enterprise agreement that contains, in some instances, more restrictive provisions on labour engagement and management than the enterprise agreements of ActewAGL's peers.

These issues are all consistent with our other evidence. We discuss our labour review findings in detail in section A.4.3.

Vegetation management

ActewAGL's actual direct vegetation management expenditure has more than doubled from $2.6 million ($2013–14) in 2008-09 to $5.4 million ($2013–14) in 2012–13.[41] Its outage performance has also declined over this time. Our view is that one of the sources of ActewAGL's material inefficiency in its historical opex is likely due to vegetation management practices. Our analysis suggests two primary reasons inefficiency may exist in the base year:

1. primarily engaging contractors on an hourly rate basis rather than a work volume basis and, in contrast to Essential Energy, ActewAGL has not proposed to change its practices
2. a lack of prudent operational risk management, resulting in a largely reactive approach to maintaining vegetation.

ActewAGL cites backyard reticulation as a material factor that contributes to its costs. While we accept backyard reticulation presents a unique challenge not seen in other networks, we consider it only partially explains the gap in ActewAGL's performance compared to its peers. We do, however, consider the incremental costs associated with backyard reticulation demonstrated by ActewAGL warrant an operating environment factor allowance because it may adversely affect ActewAGL's benchmarking results. We discuss our vegetation management review findings in detail in section A.4.3.

Operating environment factors

While Economic Insights' benchmarking models account for key differences – customer density, network line length and degree of network undergrounding, for example – they do not account for all

[40] See, for example, ActewAGL's response to the annual RIN for 2012-13.
[41] Category Analysis RIN.

differences. Accordingly, we have estimated the impact of five significant operating environment factors for which we are satisfied we should make an adjustment. The combined impact of these adjustments on ActewAGL is a 27.7 per cent margin on input use relative to the comparison service providers. The adjustments relate to:

- capitalisation policy
- standard control services connections
- backyard reticulation
- taxes and levies
- occupational health and safety regulations.

In addition, there are several other factors that we consider have little impact individually but, collectively, could potentially be more material. For the less significant operating environment factors, we are satisfied it is appropriate to consider their impact on opex holistically. Some may be difficult to quantify, particularly given certain factors may provide ActewAGL with a comparative advantage and some may be a disadvantage. Examples of these factors include topography and planning regulations.

Therefore, we are satisfied it is reasonable to incorporate a 30 per cent margin on input use into our adjustment for ActewAGL. This is larger than the allowance we provided for the NSW service providers because the evidence suggests some significant differences with ActewAGL's operating environment relative to other service providers. We discuss operating environment factors in detail in section 0.

Our conclusions on base opex

We have demonstrated in the preceding sections that all the evidence (quantitative and qualitative) points towards the need for an adjustment to ActewAGL's base year opex. Our expert consultant has provided advice that the economic benchmarking results are robust and reinforce each other.[42] In turn, the category analysis and detailed review findings corroborate the benchmarking results.

We explain above that if we were to make an adjustment based on the benchmarking results alone, we would use the Cobb Douglas SFA model as our preferred method. However, we consider it is necessary to determine an adjustment holistically, balancing the evidence from our qualitative analysis and the quantitative results.

To this end we have incorporated allowances to ensure that the amount we approve, when considered in the context of our overall decision, will best contribute to the achievement of the NEO, be sufficient to maintain the safety of the system and allow ActewAGL an opportunity to recover at least its efficient costs.

The detailed labour review provides evidence of inefficiencies within ActewAGL. ActewAGL does not seem to have excess labour problems like the NSW service providers. In contrast, ActewAGL has provided evidence that it has difficulties attracting and retaining staff. However, we consider certain provisions in ActewAGL's enterprise agreement are more restrictive than the equivalent provisions in other providers' enterprise agreements including the NSW service providers' enterprise agreements.

[42] Economic Insights, 2014, p. 37.

ActewAGL appears to have increasing volumes and costs of labour, structural problems and cultural issues. Further, the evidence suggests ActewAGL's vegetation management practices are inefficient or imprudent.

However, our operating environment factor review confirms significantly more operating environment differences than the NSW service providers (for which we have provided a 10 per cent margin on input use). We consider this explains a large part of the gap shown by the benchmarking results. Therefore, following the advice of Economic Insights,[43] detailed examination of operating environment factors and sources of inefficiency, we consider it is appropriate to adjust ActewAGL's base year opex, but:

1. provide a further 30 per cent allowance for those operating environment differences not completely captured by our preferred benchmarking model
2. compare ActewAGL's efficiency to a weighted average of all networks with efficiency scores above 0.75 rather than the minimum cost frontier service provider (that is, an average of the efficiency scores of CitiPower, Powercor, United Energy, SA Power Networks and AusNet).

In combination, these allowances reduce the benchmark level of efficiency to approximately 30.5 per cent less than the efficient opex predicted by the Cobb Douglas SFA model alone.

While economic theory suggests that the appropriate benchmark reference point for efficient opex is an efficient service provider, we have taken a cautious approach to making adjustments. This allows a margin for the potential effect of any modelling uncertainty and data error. Table A.5 presents our comparison of ActewAGL's proposed base year against our estimated efficient base year opex, taking into account the above considerations.

Table A.5 Comparison of estimated efficient base opex against proposed base opex ($ million, 2013–14)

	ActewAGL
Proposed base opex (adjusted)[a]	66.7
Substitute base opex	**42.2**
Difference	24.5
Percentage opex reduction[b]	**36.8%**

Note: (a) we have adjusted ActewAGL's proposed opex for its new CAM and jurisdictional schemes.
(b) implied opex reduction is relative to proposed opex and rolled forward to 2012–13.
Source: AER analysis.

Putting the adjustments into perspective

Figure A.3 shows a very simplistic direct comparison to put ActewAGL's historical opex spending into perspective. We have compared ActewAGL to JEN to show that for a similar level of opex it is possible to produce a greater amount of outputs.

[43] Economic Insights, 2014, p. iv.

Figure A.3 Direct comparisons between ActewAGL and JEN (averages for 2006 to 2013 period)

Source: AER analysis.

Figure A.3 shows that over the 2006-13 period, ActewAGL spent (on average) a similar amount of opex on core network services[44] as JEN. However, ActewAGL has substantially fewer customers to service, considerably lower maximum demand to meet and shorter circuit length to operate.

While this simplistic comparison does not account for differences between the service providers, it supports the findings of our more sophisticated benchmarking techniques and our detailed analysis.

[44] Standard control services opex less opex associated with connections, street lighting, metering and ancillary services.

A.2 Assessment approach

In our Expenditure Forecast Assessment Guideline (our Guideline), we explain that although we examine revealed expenditure in the first instance, we will use our various assessment techniques to test its suitability for the purpose of developing a forecast.[45] If a service provider performs well compared to its peers we can be satisfied that it is appropriate to rely on its revealed expenditure. Conversely, if our techniques show the service provider has high expenditure relative to its peers, it may be inappropriate to rely on revealed expenditure as the efficient starting point for total forecast opex.

While we use several assessment techniques to assess efficiency, benchmarking in particular is an essential part of our approach. The NER provide us with discretion as to how and when we use benchmarking in decision-making and support us in using it as the basis for adjusting a service provider's total forecast opex.[46] For this determination, our approach is to use various benchmarking techniques. This includes economic benchmarking, partial performance indicators and category-based techniques. If benchmarking shows a service provider's base year opex is materially inefficient, our approach is to complement our benchmarking findings with other analysis such as PPIs, category-based techniques and detailed review to investigate the drivers of, or potential explanations for, the apparently high expenditure.

ActewAGL agrees with some parts or our approach but disagree with others. Therefore, while we are to some extent reiterating the approach we outlined in our Guideline, we consider it appropriate to discuss the economic theory behind our approach. Building on this, we then explain our approach to identifying and adjusting for inefficiencies and why we find this approach to be more appropriate than the approach ActewAGL has taken. First, however, we explain how we choose the base year.

A.2.1 The starting point

Our Guideline explains that when we examine revealed expenditure, we assume that if the service provider has been meeting its objectives during the previous period then the past expenditure it incurred was sufficient for it to achieve those opex objectives. That is, the service provider has demonstrated it was capable of operating its network in a manner that achieved the opex objectives with the expenditure it actually incurred at the time.[47]

We have used 2012–13 as the base year for our forecasts of opex, subject to our consideration of efficiency adjustments. We used this to test ActewAGL's opex forecast against the opex criteria. Our choice of base year is consistent with ActewAGL's choice of base year. It proposed the use of 2012–13 as the base year because:[48]

- it was the latest available actual opex at the time they prepared their total opex forecasts
- total opex for that year had been audited and provided to the AER
- it claims to have responded to the incentive framework in place to reveal its efficient costs in 2012–13.

The first step in our forecasting approach is to estimate actual opex in the final year of the regulatory control period. Our Guideline outlines that we will estimate this as:

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45 AER, *Expenditure Forecast Assessment Guideline*, November 2013, pp. 7–8.
46 AEMC, *Final Rule Determination*, 29 November 2012, pp. 112–113.
47 AER, *Expenditure forecast assessment guideline*, November 2013, p. 9.
48 ActewAGL, *Regulatory proposal*, 2014, p. 223.

$$A_f^* = F_f - (F_b - A_b) + \ non - recurrent\ efficiency\ gain_b$$

Where:

- F_f is the determined opex allowance for the final year of the preceding regulatory control period
- F_b is the determined opex allowance for the base year
- A_b is the amount of actual opex in the base year
- $non - recurrent\ efficiency\ gain_b$ is the non − recurrent efficiency gain in the base year.

For this decision we have not added back (subtracted) any non-recurrent efficiency gains (losses) from the base year. This is because the transition EBSS that applied to ActewAGL in the 2009–14 regulatory control period does not allow for this adjustment. Making this adjustment only to base opex would result in the service provider being excessively rewarded (or penalised) for non-recurrent efficiency gains (losses) made in the base year.

Given this, we have considered the impact of non-recurrent efficiency gains (losses) in our selection of the base year. In fact this is one of the key considerations in choosing the base year, where we try to choose a year reflective of recurrent expenditure. If we find revealed expenditure to be efficient, and we do not need to make an efficiency adjustment, the choice of base year has little impact on revenue. This is because any increase (decrease) in opex is counteracted by a decrease (increase) in the EBSS carryover. These two effects cancel each other out. However, if we make an efficiency adjustment to revealed expenditure then the choice of base year could influence revenues. We consider this when we choose the base year to use.

Typically, we use the revealed expenditure of the second or third last year of the preceding regulatory control period. The second last year is usually the most recent available audited expenditure at the time of our final determination. [49] To the extent expenditure drivers change over time the second last year is likely to best reflect expenditure in the forecast period. We then use expenditure in the base year to estimate expenditure in the final year by adding the difference in the regulatory opex allowances for the base year and the final year.

However, the selection of a base year that appears representative of recurrent expenditure does not necessarily mean that the service provider's expenditure was actually efficient and prudent. If we consider the service provider's revealed costs in the base year are materially inefficient, we make an adjustment to account for this. The next section explains material inefficiency and why we must adjust for it.

A.2.2 What is material inefficiency?

Material inefficiency is a concept we introduce in our Guideline.[50] We consider a service provider is materially inefficient when it is not at (or close to) its peers on the efficient frontier. This stems from the NEO, which, as we explain in the explanatory statement for the Guideline, is fundamentally an efficiency objective.[51] The second reading speech introducing the NEL states, for example:[52]

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[49] Sometimes we use the third last year, being the most recent year available when the service provider submits its regulatory proposal.
[50] AER, *Expenditure Forecast Assessment Guideline*, November 2013, p. 22.
[51] AER, *Expenditure Forecast Assessment Guideline – Explanatory Statement*, November 2013, pp. 17–20.

> The market objective is an economic concept and should be interpreted as such. For example, investment in and use of electricity services will be efficient when services are supplied in the long run at least cost, resources including infrastructure are used to deliver the greatest possible benefit and there is innovation and investment in response to changes in consumer needs and productive opportunities.
>
> The long term interest of consumers of electricity requires the economic welfare of consumers, over the long term, to be maximised. If the National Electricity Market is efficient in an economic sense the long term economic interests of consumers in respect of price, quality, reliability, safety and security of electricity services will be maximised.

In essence, this explains that service providers are economically efficient when they deliver electricity services to a level in the long run interests of consumers at the lowest sustainable cost having regard to all the factors in the NEO.

A service provider in a competitive market has a continuous incentive to improve its economic efficiency. It will enjoy greater market share if it can continue to provide the best service at the lowest cost to the consumer. Conversely, an economically inefficient service provider will not survive because its long run marginal cost of production will be above that of the other firms and it will lose its market share to those who are more efficient.

A natural monopoly service provider, on the other hand, does not operate in a competitive market. Absent regulation, a natural monopoly can use its monopoly position to charge higher prices (and decrease service quality) and derive monopoly profits at the expense of consumers and economic efficiency.

Service providers may be historically inefficient or may not respond to efficiency incentives. Therefore, as noted in our *Guideline*, it is necessary for us to review the relative efficiency of service providers' historical expenditure when we assess their forecast expenditure.[53]

In the explanatory statement to our Guideline, we explain Hilmer's three components of efficiency (productive efficiency, allocative efficiency and dynamic efficiency).[54] We consider productive efficiency is most relevant for assessing cost forecasts.[55] Accordingly, when we assess total forecast opex in accordance with the first opex criterion – the efficient costs of achieving the opex objectives – we are principally focused on the service provider's productive efficiency.

Measuring productive efficiency

A service provider is productively efficient when it provides its services at minimum cost. To test whether service providers are inefficient we estimate the minimum cost at which they could provide their services with reference to the actual performance of other distributors. In doing this we estimate a benchmark minimum cost frontier (the frontier). If a service provider's costs are materially higher than as predicted by the frontier and there are not mitigating circumstances we conclude that the service provider is materially inefficient. The degree to which a service provider is inefficient is the degree to which their costs are higher than the frontier.

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52 Second reading speech, National Electricity (South Australia) (New National Electricity Law) Amendment Bill 2005, Parliament of South Australia, Hansard of the House of Assembly, 9 February 2005, p. 1452.

53 AER, *Expenditure forecast assessment guideline*, November 2013, p. 8.

54 AER, *Explanatory statement, expenditure forecast assessment guideline*, November 2013, pp. 125–129.

55 Productive efficiency is most relevant to assessing cost forecasts because using benchmarking to measure and report relative productive efficiency will also promote dynamic efficiency and allocative efficiency due to it incentivising service providers to innovate and adopt best practice. Measuring productive efficiency will also assist us in determining the efficient prices/revenues for services promoting allocative efficiency. See Independent Inquiry into National Competition Policy (F Hilmer, Chair), *National Competition Policy*, Australian Government Publishing Service, Canberra, 1993.

The various benchmarking techniques we use in our analysis enable us to assess efficiency and productivity performance in terms of historical expenditure. This is critical for determining the suitability of revealed expenditure for base year efficient expenditure, or whether we must adjust it.

When comparing the efficiency of service providers on a like-for-like basis,[56] economic theory indicates we should do so relative to the frontier rather than an overall industry average. If using benchmarking as the only means of assessing efficiency, the frontier represents the minimum cost to achieve the opex objectives for a comparable network service provider(s). In contrast, an industry average business may still be materially inefficient as it will be further from the frontier than the industry frontier performer(s). An industry average performer has the ability to further reduce its costs, and it should bear the responsibility for this rather than visiting inefficient costs on its consumers.

However, as we explain throughout this appendix, we have – on the advice of our consultant, Economic Insights – taken a cautious approach in this draft determination in assessing base opex. We are estimating the appropriate benchmark comparison point as the average of the most efficient Australian networks (those service providers who have an efficiency score greater than 0.75 on our preferred technique).

While the minimum cost frontier is the appropriate comparison point for determining relative efficiency, there is merit in making the adjustment less dependent on the performance of a single service provider. We consider this mitigates the risk of data imperfection or potential error in estimating the frontier performer.

Such an approach appropriately considers the revenue and pricing principles.[57] We need to balance, for example, incentives to promote economic efficiency with the economic costs and risks of the potential for under and over investment by the service provider in its distribution system.[58] We are satisfied that the benchmark comparison point will result in a total forecast opex estimate that reasonably reflects the opex criteria, subject to accounting for any exogenous factors not captured by benchmarking.

As a result, we may not apply a downward adjustment to base year expenditure for our alternative opex forecast if the service provider is operating close to, but below, the frontier. However, if our benchmarking shows the service provider's base year opex is materially inefficient, we will make an adjustment. That adjustment is necessary for us to be satisfied that our total forecast opex reasonably reflects the opex criteria. An estimate of total forecast opex based on an inefficient starting point cannot be efficient, so it would not satisfy the first opex criterion. To ensure we are performing our economic functions in a manner that will or is likely to contribute to the achievement of the NEO, we therefore adjust the base opex to account for material inefficiency.

A.2.3 Identifying material inefficiency

We have several assessment techniques we can use to identify material inefficiency. Benchmarking is central to our approach. For this review, the key techniques we used to identify inefficiencies are:

- multilateral total factor productivity (MTFP) and multilateral partial factor productivity (MPFP)
- econometric modelling of the opex cost function

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56 This includes properly controlling for factors that may affect the cost but are exogenous to the network service providers.
57 NEL, section 16(2)(i).
58 NEL, sections 7A(3) and 7A(6).

- partial performance indicators (PPIs)
- direct comparison.

Additionally, to identify potential sources of inefficiency within opex we have used category analysis and detailed review of certain expenditure categories. This approach is consistent with the approach we set out in our Guideline.

The use of diverse techniques involving both quantitative and qualitative approaches allows us to cross-check our findings, identifying potential irregularities in our approach. This approach also provides us with confidence in our results when the analyses in the various techniques yield consistent results.

A.2.4 The use of benchmarking

ActewAGL's proposal has, in our view, taken a flawed approach to developing its opex forecast because its approach does not incorporate top down benchmarking. It is necessary to consider the efficiency of providing services overall rather than the efficiency of specific activities. ActewAGL's approach focuses on certain aspects of performance in isolation, which ignores the trade-offs of delivering different output combinations. Under this approach, ActewAGL could offset savings it identifies for one output by increasing costs for another.

We consider top down benchmarking approaches are more appropriate because they demonstrate how efficient a service provider is overall, in comparison to its peers. Because top-down benchmarking measures can be applied more objectively and approached holistically, they do not focus on single aspects of service providers' costs at the detriment of others. Also because top-down benchmarking compares service providers, they reveal which service providers have relatively high base expenditure.

In contrast, ActewAGL's approach does not compare its performance with its peers on a like-for-like basis. Therefore, ActewAGL's approach does not provide any guidance on the efficiency of its proposal relative to its peers.

Many other stakeholders support the use of benchmarking. These include:

- The ACT Civil and Administrative Tribunal[59]
- AGL[60]
- The AER Consumer Challenge Panel[61]
- Energy Australia[62]
- The National Generators Forum[63]

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59 ACAT, *ACAT Submission - Issues paper: ActewAGL electricity distribution regulatory proposal 214-15 to 2018-19*, 22 August 2014, p. 2.

60 AGL, *NSW Electricity Distribution Networks Regulatory Proposals: 2014-19 - AGL submission to the Australian Energy Regulator*, 8 August 2014, p. 14.

61 Consumer Challenge Panel, *CCP1 submission to AER regarding ActewAGL regulatory proposal 2014-19*, p. 21.

62 Energy Australia, *Submission to Australian Energy Regulator - NSW electricity distribution revenue determinations, 8 August 2014,* p. 3.

63 NGF, *NGF Submission to the Revenue Determinations 92014-2019) of the NSW Distribution Network Service Providers*, 8 August 2014, p. 3.

- The Public Interest Advocacy Centre.[64]

ActewAGL considers benchmarking is of limited value due to what it describes as shortcomings and, as a consequence, proposes that we should not use it to reject a proposal or as a basis for substitution.[65] Broadly, we can classify service providers' submissions on benchmarking into three categories:

- benchmarking is unreliable
- the data are not robust
- it is not possible to compare service providers because they are different.

While we address these issues below, these views are inconsistent with the NER changes introduced in November 2012. These changes reinforce the importance of benchmarking in assessing expenditure;[66] a topic we discussed at length in the explanatory statement to our Guideline. The service providers also use certain forms of benchmarking to support their own proposals. We address these issues in more detail below.

The NER require us to undertake benchmarking

Benchmarking is central to our task of assessing expenditure forecasts. We must form a view about whether a service provider's opex forecast reasonably reflects the opex criteria. In doing so, we must have regard to the opex factors. The first factor requires us to produce annual benchmarking reports that compare service providers' expenditure.[67] When reviewing a service provider's total forecast opex, we must have regard to those reports as well as the benchmark opex that would be incurred by an efficient service provider.[68]

Benchmarking techniques enable us to objectively examine the prudency and efficiency of total forecast opex as required by clause 6.5.6 of the NER. In doing this, these benchmarking techniques measure how efficient service providers were at providing (and are forecasting to provide) their network services in accordance with the opex objectives, taking into account demand and the requisite regulatory and safety obligations.

Benchmarking is reliable

Some service providers have made comments to us on when benchmarking should be used and the reliability of benchmarking. A number of submissions referenced the Productivity Commission's Inquiry Report citing the conditions in which benchmarking should be used in regulatory determinations.[69][70] Other comments stated that benchmarking should be used as an informative tool rather than a determinative tool.[71] At heart, these submissions comment on the reliability of benchmarking for determining the efficient expenditure requirements of distributors.

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64 PIAC, *Moving to a New Paradigm: Submission to the Australian Energy Regulator's NSW electricity distribution network price determination*, 8 August 2014, p. 17.
65 ActewAGL, *Regulatory Proposal*, 2014, p. 223.
66 See, for example, AEMC, Rule Determination, 29 November 2012, pp. vii–viii.
67 NER, clause 6.27.
68 NER, clause 6.5.6(e)(4).
69 Productivity Commission, *Electricity Network Regulatory Frameworks – Inquiry Report*, Volume 1, 9 April 2013.
70 Ausgrid, *Regulatory Proposal*, 2014, p. 47; Endeavour Energy, *Regulatory Proposal*, 2014, p. 71; Essential Energy, *Regulatory Proposal*, 2014 pp. 86–87.
71 ActewAGL, *Regulatory Proposal*, 2014, Endeavour Energy, *Regulatory Proposal*, 2014, p. 71, Essential Energy, *Regulatory Proposal*, 2014, pp. 86–87; CitiPower Powercor SA Power Networks, *Draft Benchmarking Report Submission*, p. 2.

We are in a position to comment upon its reliability for assessing base opex now that we have several benchmarking techniques available to us. We consider that they are reliable. We have multiple techniques and their results support each other.

If we found that we could not draw conclusions on the relative efficiency of network service providers using benchmarking we would not have relied upon it. For example, we recognise in our annual transmission benchmarking report that work on whole-of-business benchmarking of transmission networks remains in its infancy. We consider there remain a number of analytical challenges that need to be overcome before firm conclusions can be drawn on the relative efficiency of transmission networks from benchmarking.[72] This is not the case in relation to distribution networks.

Further, we consider that benchmarking is preferable to ActewAGL's forecasting technique because it is transparent and impartial. Service providers have an incentive to overstate their expenditure requirements in order to increase their future revenues and as such their forecasts may be upwardly biased. Benchmarking is less susceptible to bias. Our benchmarking uses actual data setting out the revealed historical performance of the service providers. Our economic benchmarking data and Economic Insights' modelling and analysis are all in the public domain so it is also transparent.

In contrast to our forecast of base opex, ActewAGL has forecast the opex in its regulatory proposal using methods that are not always transparent, verifiable or repeatable. Examples of this are ActewAGL's approach to forecasting its IT planning and operations, maintenance and vegetation management costs. 73 For its maintenance assessment ActewAGL adopted a zero base year approach.[74] The zero-based method assumes a nil budget as the start point, adding the projects or activities required that year in a bottom-up construction of the cost. ActewAGL has not provided the costs that are the components of these forecasts nor their justification. This contrasts the approach applied by other service providers that used a base year approach to forecasting components of maintenance.[75]

This selection of forecasting techniques leads to different results. These differing results may bias forecasts in accordance with the preference of the relevant service provider. The results of our analysis are consistent and robust. We have used many different benchmarking (and other) assessment techniques. These include benchmarking at the whole of business level, at the total opex level and at the opex category level. These techniques take into account the different outputs of distributors. These also consider the main drivers of network costs. These benchmarking results support each other and align with the findings of our other analysis. The important point for our consideration of the analysis is that the benchmarking results are corroborated both by each of the different techniques we have applied and by the other findings of our other analysis.

Our top down benchmarking analysis of base year opex is less complex than alternative techniques available to us. The top down benchmarking has allowed us to avoid a detailed, line-by-line efficiency assessment of base year opex. Given the volume of different expenditures in base opex a line-by-line assessment is not practical. Also, such assessments rely heavily on the information of the service provider which is not commonly available to other stakeholders, may not be audited or otherwise verified and may be inaccurate.

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72 AER, *Transmission Annual Benchmarking Report*, September 2014, p. 5.
73 ActewAGL, *Regulatory Proposal*, Attachment B19, 2014, pp.16–18
74 ActewAGL, *Regulatory proposal*, 2014, p. 221.
75 Endeavour Energy, *Regulatory proposal*, 2014, p. 81; Ausgrid, *Regulatory proposal*, 2014, p. 52.

We have tested and validated our benchmarking techniques to ensure they are robust. However, all forecasting techniques are, by nature, subject to some degree of error. Economic Insights accounts for potential error in its economic benchmarking techniques. Where we have relied upon benchmarking, we have interpreted the findings as appropriate for the particular technique. For example, in determining efficient base year opex, we have not directly benchmarked ActewAGL against the most efficient service provider (as economic theory suggests we should). Rather, on the advice of our expert consultant, to allow for potential modelling and data error, we have benchmarked ActewAGL against the weighted average efficiency of service providers with a score of 0.75 or higher. We have also considered the effect of operating environment factors in detail.

Modelling issues

We have taken into account a number of modelling issues that we consider important to address when implementing benchmarking. We address these modelling issues in the following sections.

Model specification issues

Model specification is an issue our expert benchmarking consultant Economic Insights has been very mindful of in developing its top down benchmarking models. The NSW service providers, for example, noted that model specification will affect benchmarking results in their proposals.[76] We agree with this point, and Economic Insights has undertaken a careful approach to ensure that its model specifications are appropriate. We consider that Economic Insights' model specifications are the best currently available. Economic Insights' approach to selecting the model specification is objective. It tested its models rigorously to ensure that the results:

- capture all material inputs and outputs
- do not unduly preference one type of distributor over another
- provide a realistic spread of results
- are not sensitive to estimation method, small changes in model specification or data points.

Economic Insights' model specifications do not appear to advantage or disadvantage any particular type of service provider. For example, they do not show a bias towards urban or rural service providers. The results capture all the material outputs.

Submissions by the service providers noted that benchmarking does not account for all the variables that might affect network costs.[77] As such, the residual in the models might capture the effect of these variables and not necessarily inefficiency. Like all modelling techniques, benchmarking is limited in the number of variables that it can accommodate. However, we consider that we have captured all of the material variables to the extent that the economic benchmarking data and modelling permit. However, given they cannot account for every difference, we have also considered other operating environment factors that could potentially affect benchmarking comparisons in section A.5. Our analysis indicates that only a few of these factors appear to have a material effect on total opex and we have accounted for them appropriately in our draft decision.

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[76] Ausgrid, *Regulatory proposal: Attachment 5.33*, 2014, p. 6, Endeavour Energy, *Regulatory Proposal: Attachment 0.12*, 2014, pp. 7–8, Essential Energy, *Regulatory Proposal: Attachment 5.4*, 2014, p. 6.

[77] Ausgrid, *Regulatory Proposal: Attachment 5.33*, 2014, p. 3, Endeavour Energy, *Regulatory Proposal: Attachment 0.12*, 2014, p. 3, Essential Energy, *Regulatory proposal: Attachment 5.4*, 2014, p. 5.

Huegin, which has conducted benchmarking analysis for several service providers, has submitted that due to the small number of Australian service providers, finding a model specification that fits all service providers will require a relatively simple, high level model. This will mean that more costs will be pushed to the residual.[78]

We acknowledge that the size of the available data set will influence the confidence in a benchmarking modelling. The specific issue is that the accuracy of parameter coefficients will depend on the number of data points available. We have multiple top-down and category analysis benchmarks to provide cross checks of our benchmarking analysis. Further, to calibrate parameter estimates for econometric and SFA techniques, Economic Insights used an international data set capturing distributors in New Zealand and Ontario. The New Zealand and Ontario dataset has allowed Economic Insights to develop more precise parameter coefficients. Together, these two approaches have enabled us to develop more complex models and cross check our benchmarking results. Despite the differing approaches, Economic Insights' benchmarking techniques have produced consistent results. This indicates that the benchmarking findings are robust.

Potential bias[79]

We consider that Economic Insights' benchmarking models are comparatively free from bias (as they are objective) relative to the forecasts of stakeholders with their own interests. The results of different benchmarking techniques show no bias towards certain types of service providers. For example, the two most efficient service providers cover both urban and rural networks. The two least efficient service providers are the smallest and largest (in terms of customer numbers).

Economic Insights has taken an objective approach to developing its benchmarking models. It developed 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, Economic Insights went through an extensive testing process to ensure the benchmarking data is robust.

Residuals and potential inefficiency[80]

As noted by the Productivity Commission, the key question for a regulator engaged in benchmarking is not whether there is inefficiency, but whether there is enough to matter for regulatory purposes.[81] We consider that the benchmarking analysis presented here indicates that the current expenditure of ActewAGL is substantially inefficient. Our preferred model, as recommended by Economic Insights is the Cobb Douglas SFA model. The Cobb Douglas SFA model has a separate error term that allows us to differentiate between statistical noise and systematic inefficiency.

Benchmarking performance may be affected by cost allocation and capitalisation approach

Submissions have noted that cost allocation or capitalisation approaches may affect performance.[82] We consider that cost allocation may affect benchmarking but not significantly in most cases. We

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78 Huegin, *Distribution Benchmarking Study 2014: Ausgrid*, p. 10.
79 Huegin, *Distribution Benchmarking Study 2014: Ausgrid*, p. 10.
80 Huegin, *Distribution Benchmarking Study 2014: Ausgrid*, p. 10.
81 Productivity Commission, *Electricity Network Regulatory Frameworks – Inquiry Report*, Volume 1, 9 April 2013, p. 155.
82 ActewAGL, *Operating and capital expenditure 'site visit' clarifications*, 3 October 2014, pp. 7 – 11, Ausgrid, *Regulatory Proposal: Attachment 5.33*, 2014, p. 19, Huegin, *Distribution Benchmarking Study 2014: Ausgrid*, p. 32, Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 5.

have also considered the potential effect of differences in cost allocation approaches in determining the margin for operating environment factors.

An examination of the distributors across the NEM indicates that different corporate structures and ownership arrangements are in place. Flexibility in corporate structures and ownership arrangements allow distributors to organise themselves in order to provide services efficiently.[83] These differences necessitate the application of differing cost allocation and cost capitalisation approaches. This is why we allowed differences in cost allocation methods under our cost allocation guidelines.[84]

As such, cost allocation approaches and capitalisation policies will reflect the service provider's selected corporate structure. Differences in the capitalisation of costs will reflect the investment decisions of service providers undertaken under the same regulatory framework.

There is leeway in whether distributors capitalise or expense some costs. This may manifest itself in different capitalisation approaches across networks. However, statutory accounts are the basis of regulatory accounts so these policies accord with consistent statutory reporting requirements. Also, these approaches must also align with our nationally consistent cost allocation guidelines.

Further, benchmarking is common in industries without regulations governing cost allocation approaches. For example, many product retailers[85] and firms in technology development[86] benchmark their costs against their competitors. Also, differences in cost allocation approaches have not stopped network businesses in undertaking their own benchmarking to support their regulatory proposals. As we note below, other distribution service providers, transmission service providers and gas distributors have provided us with benchmarking analysis to support their proposals.

We have found that the networks that are close to the frontier appear to have varying capitalisation policies. This is important because, all other things being equal, a higher opex to capex ratio should make a service provider appear worse on opex benchmarking. However, SA Power Networks, United Energy and Powercor all have high ratios of opex to capex, but they are three of the top five performers under our benchmarking analysis. This would indicate that the capitalisation of costs does not significantly influence benchmarking performance. In particular, capitalisation does not appear to be a factor that adversely influences the NSW distributors. The opex to capex ratios for the NSW distributors are considerably lower than four of the five service providers that perform best on the SFA Cobb Douglas model. We discuss capitalisation policies in further detail in section A.5.3.

TFP, high level assessments and identifying potential areas of inefficiency

Some service providers have submitted that TFP benchmarking is too high level to identify potential areas of inefficiency.[87] We take the view that top down forecasting approaches are the most appropriate tools for a regulator to assess base opex. The NER requires us to consider the efficiency and prudency of total forecast opex. Top down benchmarking of opex enables us to do this.

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83 Restrictions of ownership arrangements or corporate structures may limit the ability of distributors to innovate or seek efficiencies in the way that they provide their services.

84 With the restriction that costs be directly allocated to services where possible and that shared costs be allocated using an appropriate causal allocator.

85 Deloitte, *SGA book of metrics for retail: Executive Summary*, February 2010.

86 Deloitte, *Measuring product development performance in high tech companies*, April 2010.

87 Ausgrid, *Regulatory Proposal: Attachment 5.33*, 2014, p. 5, Endeavour Energy, *Regulatory Proposal: Attachment 0.12*, 2014, p. 7, Essential Energy, *Regulatory Proposal, Attachment 5.4*, 2014, p. 9.

It is difficult to discern inefficiency of total opex through detailed cost assessments. A service provider may be inefficient for a number of reasons. As noted by the Productivity Commission inefficiency can manifest itself in many ways:

- Businesses may invest prematurely in what would ultimately be productive investment (the likely outcome of insufficient demand management or excessive reliability standards).
- Businesses may use existing capital inefficiently (lower capital productivity). For example, poor maintenance arrangements may require more redundancy than necessary.
- Businesses may make investments that are not required at all to produce output (the conventional definition of 'goldplating').
- Investment costs may be excessive due to poor project management.
- Labour may be in excess of what is required or poorly used (resulting in lower labour productivity).
- Physical investments and labour inputs may be at efficient levels, but may be priced excessively. This could arise if the weighted average cost of capital is too high or if unions are able to negotiate higher wages (which appears to be true — figure 2.14 — especially for the state-owned corporations).[88]

Inefficiency can be specific to certain activities of a service provider or may be systematic across a range of activities. Networks might be relatively efficient in providing some services but might be inefficient overall by using different inputs. It is difficult to account for all these factors when assessing the contribution of individual costs that comprise total opex. Indeed, in detailed cost assessments it can be difficult to see the 'forest for the trees' as the focus in such assessments tends to the reasons for differences in individual expenditures. This does not mean detailed cost assessments do not have a role. We use them to assess step changes, for example. However, we consider detailed cost assessments alone are inappropriate for determining an efficient overall opex forecast.

Further, our task under the NER does not require us to determine the source of inefficiency. We must determine whether we are satisfied the total forecast opex reasonably reflects the opex criteria. That is, efficient costs a prudent operator would require to achieve the opex objectives.

Data are robust

In their regulatory proposals some service providers commented that the data for benchmarking may not be accurate.[89] We have dedicated significant effort to ensuring that our economic benchmarking data are accurate.

We developed our benchmarking information requirements through a year-long consultation process. We initiated our consultation in November 2012 with the publication of the issues paper to our Guideline. As part of this consultation we held numerous workshops open to interested stakeholders from regulated businesses and consumer representatives. 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 (incorporating stakeholder submissions) in November 2013. Subsequent to

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88 Productivity Commission, *Inquiry report, Electricity Network Regulatory Frameworks*, 9 April 2013.

89 Ausgrid, *Regulatory Proposal Attachment 5.33*, 2014, p. 5, Endeavour Energy, *Regulatory Proposal: Attachment 0.12*, 2014, p. 7, Essential Energy, *Regulatory Proposal: Attachment 5.4*, 2014, p. 6.

the release of the benchmarking data requirements we required the network businesses to submit unaudited information responses for review in March 2014. In reviewing these templates we identified and resolved data issues.

We required the service providers to seek independent audit of their final benchmarking data, which was due on 30 April 2014. We also required the CEO of the service providers 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 (where service providers could comment on each other's' data) on the economic benchmarking data. No significant data issues were identified in the cross submissions.

On 5 August 2014 we circulated our draft annual benchmarking report and associated modelling and data to service providers. In responding to this report service providers were afforded yet another opportunity to identify data issues. In this process service providers provided guidance on how the modelling could be improved.[90] We have incorporated this feedback into our benchmarking analysis.

Because of this process, we consider that the data that we have received for benchmarking is robust. This perspective has been supported by Economic Insights. We are particularly encouraged by our consultant's statement that:[91]

> While no dataset will likely ever be perfect, the AER's economic benchmarking RIN data provides the most consistent and thoroughly examined DNSP dataset yet assembled in Australia.

Service providers are comparable

Several submissions have stated that service providers are not comparable, citing differences in the operating environments of service providers that models are unable to account for.[92] The Consumer Challenge Panel noted that: [93]

> It is to be expected that every business will seek to distinguish themselves and thereby diminish the importance of benchmarking by the AER. Our view is that every business will be advantaged on some measures by virtue of their operating environment, and disadvantaged on others. On balance, benchmarking is appropriate and will work.

There are some differences in the scope of services and operating environments of distributors. However, we have accounted for these in our analysis. We are only examining the standard control services for ActewAGL in the 2014–19 period. To do this we exclude the costs of other services from our opex data for benchmarking. The benchmark models account for major operating factors. We have considered the effects of additional operating environment factors in detail in section A.5.

Benchmarking has been used to support regulatory proposals

We note that ActewAGL utilises benchmarking in different circumstances to support its regulatory proposal. In its regulatory proposal it references a benchmarking report it commissioned from KPMG.[94] It also submitted a response by Huegin in response to AER information requests. Though this report critiqued benchmarking, it also provided benchmarking analysis showing that under some

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90 Energex noted that we had not excluded the effect of its feed in tariffs from its opex in our PPI modelling. Citipower, Powercor and SA Power Networks noted that our reliability PPI metrics included major event days.

91 Economic Insights, 2014, p. 3.

92 Ausgrid, *Regulatory Proposal: Attachment 5.33*, 2014, p. 3, Endeavour Energy, *Regulatory Proposal: Attachment 0.12*, 214, p. 3, Essential Energy, *Regulatory Proposal: Attachment 5.4*, 2014, p. 3.

93 Consumer Challenge Panel, *Submission 1 to AER regarding NSW DNSP regulatory proposals 2014-19*, p. 41.

94 ActewAGL, *Regulatory Proposal*, 2014, p. 198.

metrics ActewAGL appears efficient.[95] In reaching our decision, we have had appropriate regard to this benchmarking information.

Benchmarking has been a consistent feature of electricity and gas regulatory proposals that the AER has received for distribution networks, transmission networks and gas distribution networks in recent years.

We also support and encourage stakeholders investigating the efficiency of service providers. However we disagree with the approach that Huegin has adopted to conduct its benchmarking and we consider that its benchmarking analysis is deficient.

Huegin utilises uses partial performance indicators (PPIs) to benchmark the performance of ActewAGL against other service providers. Huegin benchmarks residential revenue per customer and reliability across the networks. We also use PPIs and consider that they provide an insight into the efficiency of the networks. However we consider that PPIs do not, on their own, adequately measure relative efficiency.[96] In order to measure relative efficiency it is necessary to consider the multiple inputs and outputs of networks, their scale and the environment within which they operate. As stated in the ACCC/AER working paper series on benchmarking opex and capex in electricity networks:[97]

> While PPIs provide some insights, they can give misleading information regarding the overall economic performance of energy utilities producing multiple outputs and multiple inputs. For example, when considered in isolation, a labour productivity measure would tend to overstate the growth of overall productivity in a utility experiencing a substantial degree of capital deepening (i.e., capital substituting for labour in the production). Similarly, inadequately accounting for the multiple outputs produced by a utility would also make performance comparison over time or across utilities less useful for the regulator.
>
> PPIs assume a linear relationship between the input and output measures and also assume that any change in the input measure can be described by a change in the output measure. However, in most circumstances the change in an input usage will be dependent on a number of inputs, outputs and other factors that may not be described in the model. In particular, PPIs used in isolation cannot easily take into account differences in the market or operating environment that impact upon a business but are beyond the control of management. For example, a utility may have a relatively high or low unit cost simply because it faces input prices or serves customers that are different from those for utilities operating in other regions. Because of this, they may present problems in providing a meaningful comparison of businesses in different operating environments.

Huegin's analysis is further deficient as it selectively chooses measures that favour ActewAGL. For instance, Huegin benchmarks ActewAGL using residential revenue per customer. Under this measure, ActewAGL appears to be one of the most efficient service providers. However, this measure is flawed as it does not take into account the allocation of revenue between residential and non-residential customers. A more appropriate measure would be total revenue per customer. Under this measure ActewAGL fairs much worse with the fourth highest total revenue per customer (only faring better than much less dense networks). As such, it is challenging for stakeholders to consider economies of scale and other factors which may affect the comparisons. Further, benchmarking revenue per customer is not as relevant to the consideration of the efficiency of base year opex as our opex benchmarking.

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95 Huegin, *ActewAGL Productivity Performance Analysis: An analysis of the suitability of current productivity assessment techniques of the AER to ActewAGL's costs*, September 2014, pp. 4–5.

96 In some instances, particularly capex assessment, PPIs are appropriate because we do not have more sophisticated techniques. However, for this decision, we have several techniques that can measure relative efficiency, particularly for opex.

97 ACCC/AER working paper series, Benchmarking Opex and Capex in Energy Networks, Working Paper no.6, May 2012, p. 17.

A.2.5 Implementing efficiency improvements

Some stakeholders have previously submitted that if we significantly reduce a service provider's allowance, it may not be realistic for the service provider to make the necessary efficiency savings immediately; rather, a period to transition to the efficient level would be appropriate.[98] It is not clear from the information before us that transitioning to an efficient level of opex is consistent with the incentive framework provided by the NEL and the NER.

In particular, during our consultations with ActewAGL, it raised a point for our consideration concerning its EBA.

Under the NER, the total forecast opex should be sufficient to achieve certain objectives. One of these objectives is the applicable 'regulatory obligations or requirements' that the service provider must meet that are associated with the provision of standard control services.

ActewAGL's regulatory proposal implies it must meet its EBA obligations and should be funded by consumers to do so. It seems ActewAGL considers its EBA constitutes a regulatory obligation or requirement and, in determining total forecast opex, we should take account of the specific circumstances it may face under the EBA it has negotiated in relation to its ongoing labour costs.[99]

The term 'regulatory obligation or requirement' has a specific definition in the NEL.[100] The definition limits what constitutes a regulatory obligation or requirement to:

- distribution system safety duties
- distribution reliability standards
- distribution service standards
- obligations under the NEL, NER, NERL and NERR
- tax obligations on service providers
- use of land
- protection of the environment
- an act of a participating jurisdiction that materially affects the provision of electricity network services.

An EBA is an agreement made under the *Fair Work Act 2009*. That Act is a piece of Commonwealth legislation. The definition of 'participating jurisdiction' only includes the Commonwealth in limited circumstances and those circumstances do not apply here.[101] Accordingly, in our view, the terms of an EBA do not constitute a 'regulatory obligation or requirement'.

However, we think it is important to also highlight a more general point about the opex allowance that we determine.

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98 For example, Grid Australia, *Grid Australia submission on AER draft expenditure forecast assessment guidelines,* 20 September 2013, pp. 16–17.
99 ActewAGL, *Regulatory Proposal*, 2014, pp. 214-215, 226.
100 NER ch 10 definition of 'regulatory obligation or requirement' and NEL, s2D.
101 NEL, s.5.

Employers and employees have significant discretion to agree on terms and conditions that are incorporated into an EBA. This includes the period during which that agreement will run.

When we determine total forecast opex, we are setting a total forecast for an objectively efficient and prudent service provider to achieve certain objectives in the provision of standard control services for a particular network area.

We do not seek to interfere in the decisions a service provider will make about how and when to spend this total opex allowance to run its network, including the particular legal obligations it enters into to do so. The service provider is free to choose how to manage its allowance.

We do not approve a particular EBA or any other plan of expenditure when we set a total opex allowance. When a service provider enters into an agreement of any kind, it does so in a context where it knows that a particular allowance will apply for five years, but there is no guarantee that the same or a similar allowance will be approved for the following five year period.

If a service provider ultimately spends inefficiently or imprudently, it will bear those additional costs and, conversely, if it achieves efficiencies it may make additional profits. This is a core feature of incentive based regulation and is intended to reflect the conditions that would be faced by businesses operating in a competitive environment.

We must be satisfied that the opex forecast reasonably reflects the efficient costs of a prudent operator (not the service provider in question), given reasonable expectations of demand and cost inputs, to achieve the opex objectives.

It is important to note the effect of a change to the NER in November 2012 on this point. Previously, the NER provided that the total forecast opex should reasonably reflect the costs that a prudent operator *in the circumstances of the service provider* would require to achieve the objectives. The reference to "in the circumstances of the service provider" was deleted from this rule to ensure that the opex forecast would reasonably reflect the costs of an objectively prudent provider, rather than a provider in the particular circumstances of the service provider concerned. One of the stated objectives of this change was to ensure that benchmarking could be applied to assess the efficient and prudent expenditure requirements of an objective operator.[102]

The broader circumstances of a service provider are still relevant to our assessment, as we are assessing a forecast to achieve certain opex objectives. Thus, the forecast must reasonably reflect the costs necessary to meet or manage the expected demand for services, and to comply with the regulatory requirements for the network in question, and to maintain the safety of the system, as these are opex objectives.

However, our assessment is necessarily focussed on forecasting what an objective efficient and prudent service provider would require to achieve those opex objectives, rather than what a service provider in all the same circumstances as the relevant service provider would require. If the forecast was made by reference to a provider in all the same circumstances as the service provider the AER would potentially need to make a decision that incorporated matters as specific as the service provider's staffing levels or car leasing arrangements, and other matters that are completely within the discretionary control of management. That would run counter to the notion of having a national market

[102] AEMC, *Rule Determination*, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012 and National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012, p. 107.

in which an independent regulator sets an efficient level of opex (and other building blocks) for a prudent provider to deliver services.

It follows from this that, in our view, a forecast which allowed a service provider to transition over time to an efficient opex would provide for the recovery of inefficient costs during the transition period. It would place the burden of funding inefficiencies on consumers, rather than on the service providers.

If our determined prudent and efficient allowance to achieve the opex objectives is lower than actual past expenditure, our view is that a prudent operator would take the necessary action to improve its efficiency. This view seems to be supported by AGL, who submitted that in competitive markets, prudent and efficient firms incur short term costs to increase efficiency because the benefits of those costs will accrue to the owners in the long-term.[103] On the information before us, our view is, mirroring what would be expected under competitive market conditions, it would be appropriate for service providers (including their shareholders) to bear the cost of any inefficiency rather than consumers.

[103] AGL, *NSW Electricity Distribution Networks Regulatory Proposals: 2014-19 - AGL submission to the Australian Energy Regulator*, 8 August 2014, p. 15.

A.3 Benchmarking results in detail

In this section we set out our analysis of the benchmarking techniques we have used to test to see whether ActewAGL's base year opex is efficient in greater detail. The techniques, developed for us by our consultant Economic Insights, measure either the overall efficiency of service providers or how efficiently they use opex in particular. They are:[104]

- multilateral total factor productivity (MTFP) – is an index that measures the ratio of inputs used for output delivered
- econometric modelling techniques:
  - Cobb Douglas stochastic frontier analysis (SFA) – this estimates the efficient level of opex required for a service provider by constructing an efficient frontier and compares this to the actual opex used by the service provider
  - Cobb Douglas least squares estimate – is similar to the above in modelling opex cost function but uses least squares estimation method to estimate an industry-average technology, which is then shifted to envelope the most efficient service provider sampled
  - Translog least squares estimate – this is similar to the Cobb Douglas least squares estimate technique but uses different functional form assumption regarding the relationship between opex and outputs.

Additionally, we used opex multilateral partial factor productivity (MPFP), which is an index-based technique that measures the ratio of output quantity index to opex input quantity index.[105] Each benchmarking technique compares the relative efficiency of service providers to its peers. They each may differ in terms of estimation method or model specification and account for operating environment factors (factors that may differentiate service providers) to differing degrees. Despite this, Economic Insights found:[106]

> The efficiency scores across the three econometric models are relatively close to each other for each DNSP and they are, in turn, relatively close to the corresponding MPFP score. This similarity in results despite the differing methods used and datasets used reinforces our confidence in the results.

We also examine some PPIs, which are a simpler form of benchmarking. Finally, we present the implied adjustments to base opex based on benchmarking alone (that is, prior to considering operating environment differences other than those included in the models).

A.3.1 Findings from multilateral total factor productivity and multilateral partial factor productivity

Economic Insights' MTFP and MPFP modelling indicates that, prior to considerations of the effect of operating environment factors, ActewAGL is inefficient overall and the opex MPFP results indicate that ActewAGL is also inefficient in its use of its opex. Inefficiency at the whole of business level and at the opex level indicates that ActewAGL's opex inefficiency is not offset by efficiency in the use of capital.

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104 AER, *Expenditure forecast assessment guideline*, November 2013, p. 13.

105 At the time of developing the Expenditure forecast assessment guideline, we had not received data from service providers so we considered data envelopment analysis (DEA) may be another technique we could apply. However, given the data quality and the availability of international data, we have been able to apply stochastic frontier analysis. This is a superior technique to DEA. Economic Insights, 2014, p. 7.

106 Economic Insights,2014, pp. 46–47.

Table A.6 presents the raw results of the MTFP and MPFP analysis. An efficiency score of 55 per cent means ActewAGL is 55 per cent as efficient as the frontier business (or, put another way, 45 per cent less efficient).

Table A.6 Relative performance of ActewAGL using MTFP and MPFP

Distributor	MTFP Efficiency Score	MTFP Implied inefficiency	Opex MPFP	Opex MPFP implied inefficiency
ActewAGL	55	45%	44	56%

Source: Economic Insights.[107]

Methodology

Multilateral total factor productivity allows for the comparison of productivity levels between service providers and productivity across time. Productivity is a measure of the quantity of output produced from the use of a given quantity of inputs. When there is scope to improve productivity, this implies there is productive inefficiency.

In this section we consider partial factor productivity (PFP) and total factor productivity (TFP). TFP measures total output relative to an index of all inputs used. PFP measures total output relative to one particular input (eg opex partial productivity is the ratio of total output quantity index to an index of opex quantity input).

For further detail on MTFP and index number benchmarking approaches we direct readers to our previous publications.[108]

Inputs and outputs

Economic Insights' preferred output specification for the MTFP and MPFP includes:

- customer numbers
- ratcheted maximum demand
- circuit line length
- energy throughput
- reliability (measured as total customer minutes off supply).

Economic Insights sets out its reasons for the selection of these outputs in its report.[109] In developing this output specification Economic Insights considered a number of different specifications.[110] Other specifications tested, unlike this specification, appeared to disadvantage either urban or rural service providers. 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

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107 Economic Insights, 214, pp. 17–20.
108 These include:
AER, *Better Regulation, Explanatory Statement Expenditure Forecast Assessment Guideline*, November 2013
ACCC/AER, *Benchmarking Opex and Capex in Energy Networks, Working Paper no.6*, May 2012.
109 Economic Insights, 2014, pp. 9–14.
110 Economic Insights, 2014, pp. 9–14.

for differences in energy density and demand density by including energy delivered and a measure of maximum demand as outputs. Further this specification includes reliability as an output. 111

The MTFP analysis uses opex and capital as inputs. In this analysis capital is split into five distinct components – subtransmission overhead lines, distribution overhead lines, subtransmission underground cables, distribution underground cables and transformers and other. Each input is measured in terms of its physical quantity.[112] This measure of inputs aligns with Economic Insights' preferred input specification which is justified in our explanatory statement to the Guideline.[113]

Several submissions on our draft benchmarking report said that we did not allocate an appropriate weight to line length.[114] We consider that the weighting for overhead lines is appropriate. The weighting for line length has been developed through a Leontief estimation of the cost function.[115]

Some submissions also noted that our lines and cables input index for MTFP analysis might be multiplicative in nature placing a greater weighting on high voltage lines than is warranted.[116] Economic Insights addressed this concern by creating separate input indexes for subtransmission and distribution lines. The weighting given to high voltage lines will not influence our alternative assessment techniques that examine the productivity of opex. These techniques, unlike MTFP, are not sensitive to the weighting given to individual capital inputs.

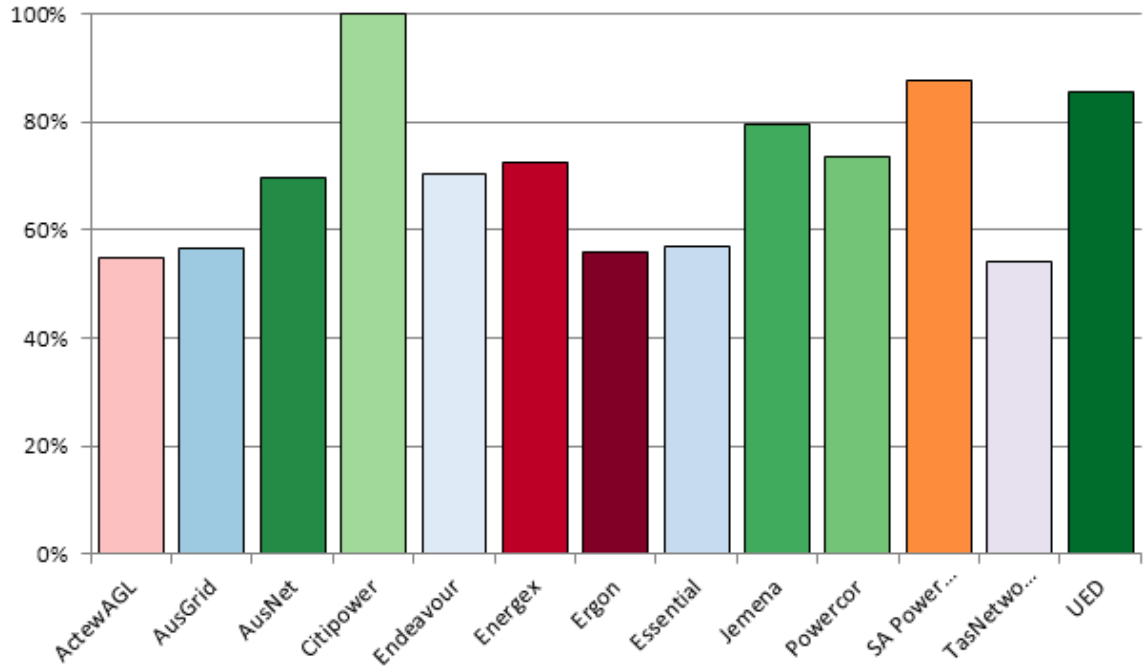
Results

Figure A.4 presents the relative efficiency of the service providers. A score of 100 per cent indicates that the service provider is 100 per cent efficient (they are producing the highest ratio of outputs to inputs). A score of 50 per cent indicates that a service provider is half as efficient as the frontier networks and can reach the frontier by halving its inputs.

The MTFP results indicate that, on average, CitiPower, SA Power Networks, United Energy and JEN are the most productive. Ausgrid, ActewAGL, Ergon Energy, Essential Energy and TasNetworks appear to be amongst the least efficient.

111 Economic Insights, 2014, p. 11.
112 Economic Insights, 2014, pp. 12–14.
113 AER, *Better Regulation, Explanatory statement, Expenditure Forecast Assessment Guidelines for electricity transmission and distribution*, November 2013, pp 154–156.
114 CitiPower, Powercor Australia and SA Power Networks, Joint submission to AER on draft annual benchmarking report for electricity distribution network service providers, 22 August 2014, pp. 2–3.
115 Economic Insights, 2014, p. 57.
116 AusNet services draft TNSP benchmarking report submission, pp. 6–7; Huegin, ActewAGL Productivity Performance Analysis, September 2014, p. 9.

Figure A.4 MTFP Performance (average 2006–2013)



Source: AER analysis.

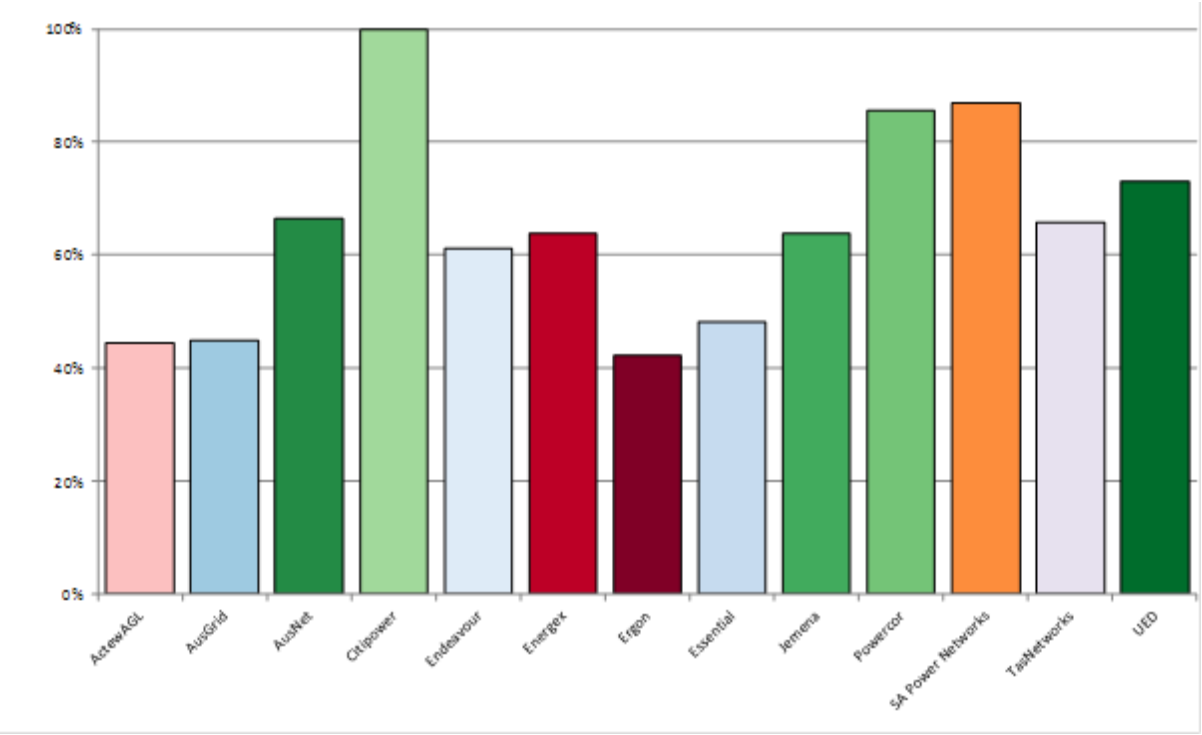
The results also indicate that the NSW service providers can achieve efficiency improvements going forward because there are significant efficiency gaps between their performance and the frontier service providers. This finding aligns with the findings of benchmarking undertaken by the EUAA.[117]

Figure A.5 presents the opex multilateral partial factor productivity (MPFP) results. As would be expected, the performance of the service providers changes somewhat under these results, reflecting the different combination of opex and capital used by the service providers to deliver network services. However the results are broadly consistent with the MTFP results, excepting TasNetworks, who performs much better on MPFP.[118] Under both measures ActewAGL appears less productive than almost all of its peers.

[117] Mountain, B.R., May 2011. *Australia's rising electricity prices and declining productivity: the contribution of its electricity distributors*. Energy Users Association of Australia, Melbourne. p. 31.

[118] TasNetworks has recently reduced its opex significantly and is currently spending close to its 2009 levels of opex (in real terms).

Figure A.5 Opex MPFP performance (average 2006–13)



Source: AER analysis.

The MTFP and MPFP modelling 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, which factor in the differences in costs between overhead and underground lines when weighting the inputs. Economic Insights also excluded the first-stage of transformation at the zone station level where there are two stages and split the line inputs into subtransmission and distribution voltages. Thus the model specification makes some allowances for differences in system structure and complexity across distributors, such as the delineation between transmission and distribution networks in different states.[119]

In addition to accounting for these factors in the model specification, Economic Insights tested the effect of the following operating environment factors on the MPFP scores in a second-stage regression analysis:

- customer numbers (to check whether additional scale effects are significant)
- customer, energy and demand network densities
- the share of underground cable length in total circuit kilometres
- the share of single stage transformation capacity in single stage plus the second stage of two stage transformation capacity at the zone substation level

[119] Economic Insights, 2014, pp. 18–19.

- system average interruption duration index (SAIDI).[120]

Economic Insights found, using these tests, that none of these variables are statistically significant in their effect on the MPFP scores.[121] This indicates that the MPFP results have appropriately captured the effects of these variables.

Given that the model incorporates the significant outputs of the distributors and accommodates a number of operating environment factors, we consider that the results are robust. Despite this, index number analysis has some limitations. Specifically, index numbers do not replicate the underlying production function of the firms in question and instead assume constant returns to scale.[122] As such, it is prudent to compare index number analysis with econometric modelling.

A.3.2 Findings from econometric modelling of the opex cost function

Economic Insights has chosen to model the opex cost function of the service providers using three models.[123] These models are Cobb Douglas SFA, Cobb Douglas least squared estimate (CD LSE) and Translog least squared estimate (TLG LSE). The findings from these models support each other. Like the opex MPFP analysis, prior to the consideration of the effects of operating environment conditions, these models indicate that the NSW service providers are inefficient. Table A.7 presents the results of this analysis. Though the models differ in their estimation method or specification, they are broadly consistent with the opex MPFP results and support each other. The efficiency scores are the efficiency of the service provider relative to the frontier service provider.

Table A.7 ActewAGL Efficiency scores (average 2006-13)[124]

Method	Score
Cobb Douglas stochastic frontier analysis	40
Cobb Douglas least squares estimate	36
Translog least squares estimate	32

Source: Economic Insights.[125]

Methodology

The TLG LSE and CD LSE models are regressions of Translog and Cobb Douglas opex cost functions, respectively.[126] In order to estimate efficiency, these models include dummy variables for each of the service providers. The dummy variables pick up differences in opex levels after the effects of all the included variables are accounted for. The service provider with the lowest valued dummy variable coefficient is the most efficient in this case (as it has the lowest underlying cost). It is necessary then to transform the dummy variable coefficients to form efficiency scores such that the

120 Customer minutes off supply are not included as a negative output in the opex MPFP indexes used in the second stage regression.
121 Economic Insights, 2014, p. 24.
122 This is because the MTFP analysis measures productivity as a ratio of inputs and outputs. Econometric analysis allows for more flexible relationships between inputs and outputs and can accommodate increasing and decreasing returns to scales. This is because econometric models estimate the effect of each individual output variable on inputs and allow for different relationships between inputs and outputs (such as a Cobb Douglas production function).
123 Economic Insights, 2014, p. iii.
124 An efficiency score of 60 per cent indicates that a service provider is 60 per cent as efficient in the use of its opex as the frontier service provider.
125 Economic Insights, 2014, p. 36.
126 The Translog model differs from the Cobb Douglas model in that it has a more flexible functional form. This means that the Translog model allows for the elasticity of opex to outputs to change depending on the relative quantities of outputs.

most efficient service provider has an efficiency score of one, to which the relative opex efficiency of other service providers are measured.

These models are more sophisticated than the MTFP and MPFP approaches. They are parametric techniques which mean that they model the underlying production function of the service providers as specified. Further, these models allow for the direct incorporation of operating environment factors into the analysis.

The Cobb Douglas SFA method is the most sophisticated model because it directly estimates the efficient frontier and efficiency scores for the networks. It also retains the benefits of the LSE models. In the Cobb Douglas SFA method, the stochastic disturbance term is decomposed into a white noise term and a cross-sectional (firm-specific) strictly positive random term, which is interpreted as a measure of inefficiency. For these reasons the Cobb Douglas SFA method is Economic Insights' preferred model. We agree and have adopted Economic Insights' recommendations. Economic Insights' report provides a detailed explanation of these modelling approaches.[127]

International data

In developing the econometric models Economic Insights initially used only Australian data. However, the Australian data proved not to have enough cross sectional variance to allow for the development of a robust model for the opex cost function.[128] Consequently, Economic Insights augmented the data set with international data to allow for the development of more accurate models. Economic Insights drew on the established benchmarking data sets for New Zealand and Ontario distributors for this purpose.

Economic Insights used the international data to calibrate parameter estimates within the econometric models. Through the incorporation of international data Economic Insights was able to develop robust econometric models of the opex cost function. The significant t-ratio for each of the parameters demonstrates the accuracy of the parameter estimates.[129]

The models themselves do not benchmark the Australian service providers against their international peers. Economic insights used the international data to estimate the opex cost function of service providers to a high degree of accuracy. The models derive efficiency scores for the service providers by comparing their actual opex to opex predicted by the models. We only compare efficiency scores for the Australian networks. That is, we ascertain the relative efficiency of the Australian networks among themselves.

We consider that there is potential to benchmark Australian service providers against their international peers. However, time has not permitted us to undertake this benchmarking in this instance.

We also engaged Pacific Economics Group Research (PEGR) to examine the scope to supplement its benchmarking data with data from the US Federal Energy Regulatory Commission (FERC). PEGR noted significant data inconsistencies between Australian and FERC dataset. Standardized reliability data are available for some US utilities from state regulators. However, the overlap between this group of utilities and the group that reports total distribution route miles is not large.[130] They found that

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127 Economic Insights, 2014, pp. 25–28.
128 Economic Insights, 2014, pp. 28–29.
129 Economic Insights, 2014, p. 33.
130 PEGR, *Database for Distribution Network Services in the US and Australia*, 21 August 2014, p. 5.

consistent data were unavailable, for several variables in the AER data set. These included variables pertaining to reliability, line length, system age, and distribution transformer capacity.[131]

PEGR was only able to assemble data for 15 US service providers that had the basic data required for two or more years. A further complication with the US data is that many network businesses are vertically integrated. This creates challenges in making like-for-like comparisons of network services opex. All the service providers in the data set also provided transmission services. Further, these service providers often also operated electricity generators.[132]

PEGR developed an illustrative benchmarking model that benchmarked the Australian service providers against their US counterparts. PEGR found that while US companies generally fared better in the benchmarking than their Australian counterparts, statistical tests would be unable to reject the hypothesis that most Australian utilities are average cost performers. Given, additionally, the small sample size, they could not confidently conclude from the research that service providers in the United States tend to be more efficient in their management of network services opex than those in Australia.[133]

PEGR also developed an example benchmarking model using only Australian data. However, due to the limited number of observations, we consider that this benchmarking is not robust enough to rely on. PEGR noted that the current size of the Australian dataset did not permit particularly accurate estimation of the parameters for their Translog model.[134]

We agree with PEGR's concerns regarding international benchmarking. Having reviewed PEGR's illustrative modelling we found that the US data are not generally comparable in terms of variable coverage and definitions to our dataset for the Australian service providers. As a result, the example model specification presented in PEG (2014) does not incorporate or appropriately measure key output dimensions of network services such as peak demand or capacity in explaining opex differences across networks. Furthermore, with an unbalanced panel of 170 observations for the 15 US utilities over the period 1995 to 2013, the US data cannot provide sufficient additional cross-sectional variations in order to model reliably the opex of Australian service providers. We also identified a number of observations violating monotonicity properties of the opex cost function in the model.[135] Further, we note that even with a better dataset, Economic Insights chose not to directly benchmark Australian service providers against their international peers.

Model specification

The opex cost functions incorporate the significant output variables of customer numbers, circuit length, and ratcheted maximum demand.[136] Unlike the MTFP model the opex cost function models do not include energy delivered and reliability. Economic Insights excluded energy delivered because it was highly correlated with ratcheted maximum demand. The estimated coefficients of either energy delivered or ratcheted maximum demand were generally insignificant in these models. Economic Insights found that the correlation coefficient between these two variables was larger than 0.99 and the behaviour of their coefficients was almost certainly a consequence of multicollinearity problems.

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131 PEGR, *Database for Distribution Network Services in the US and Australia*, 21 August 2014, p. 5.
132 PEGR, *Database for Distribution Network Services in the US and Australia*, 21 August 2014, p. 5.
133 PEGR, *Database for Distribution Network Services in the US and Australia*, 21 August 2014, p. 3.
134 PEGR, *Database for Distribution Network Services in the US and Australia*, 21 August 2014, p. 25.
135 A monotonicity violation occurs when the cost elasticity with respect to an output is negative.
136 The ratcheted maximum demand is the highest maximum demand of the businesses in the observation year or prior years.

Hence Economic Insights excluded energy delivered.[137] As energy delivered is highly correlated with ratcheted maximum demand the model will pick up the effect of energy delivered.

Reliability was not included because consistent reliability data is not available for the international distributors.[138] We are comfortable with Economic Insights not including reliability in the econometric models. A primary driver of reliability performance is capital expenditure. Expenditure on maintenance may prevent outages. However, individual network outages lead to opex associated with rectifying the outages.

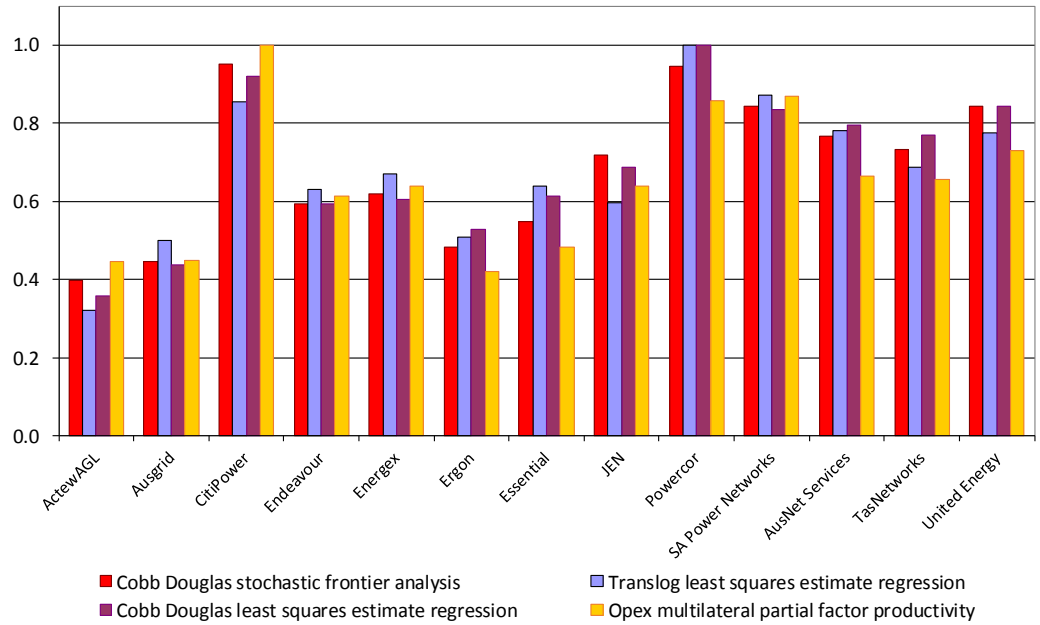
The opex cost function models also include the proportion of underground circuits as an operating environment factor. This is consistent with the MTFP analysis which has separate input indexes for overhead and underground lines. As expected the coefficient of this variable is negative. Underground cables will require less ongoing maintenance than overhead cables. Further, underground cables do not incur vegetation management costs.

Economic Insights did not include a capital input variable as equivalent data was not available in Ontario. However Economic Insights found that the aggregate capital quantity variable formed by aggregating physical measures of lines, cables and transformers and using annual user costs as weights has a very high correlation of 0.95 with the energy delivered output and of 0.94 with the ratcheted maximum demand output. Similarly, the constant price capital stock variable was highly correlated with both the customer number and ratcheted maximum demand output variables. This suggests that the omission of a capital input variable is unlikely to have a significant bearing on the results.[139]

Figure A.6 presents the benchmarking results for each of the econometric cost functions. This figure also presents the opex MPFP results. Figure A.6 shows that the models, despite employing different efficiency measurement techniques, produce consistent results. Further these models are consistent with the opex MPFP results. This gives us confidence that the models provide an accurate indication of the efficiency of base year opex.

[137] Economic Insights, 2014, p. 32.
[138] Economic Insights, 2014, p. 32.
[139] Economic Insights, 2014, p. 32.

Figure A.6 Econometric modelling and opex MPFP results



Source: Economic Insights, 2014.

All the models indicate that, prior to accounting for the effect of operating environment conditions not already factored into the modelling, there are significant efficiency differences between the frontier businesses (CitiPower and Powercor) and ActewAGL.

Economic Insights has not accounted for all operating environment factors that may affect the benchmarking performance explicitly in the opex cost functions. However, the econometric modelling captures the important operating environment factors such as scale and density. The Cobb Douglas and Translog cost functions explicitly measure the scale effect. The inclusion of international distributors in the analysis ensures that the modelling will appropriately capture economies of scale. For example, the dataset used in the opex cost function analysis contains 88 small service providers (less than 100,000 customers). As both line length and customer numbers are included as outputs the model specification captures the customer density effect.

We consider that it is important to consider a broad range of benchmarking techniques. As such, we have also conducted partial performance indicator benchmarking. We outline the results of our partial performance indicator benchmarking in the following section.

A.3.3 Partial performance indicators

PPIs are complementary to economic benchmarking. We can compare the results from each method to crosscheck their validity. High costs on a single PPI do not necessarily indicate an inefficient level of base opex because each PPI examines only one driver of costs. However, if a service provider has high costs on several PPIs, it is likely that service provider's base level of opex is inefficient. In this respect, it is useful to compare PPI results with the economic benchmarking results.

For the purpose of PPI comparisons, we have chosen two 'per customer' metrics and used them to compare ActewAGL to Powercor. This provides an indication of the magnitude of ActewAGL's costs – using an alternative benchmarking technique – relative to one of the top performers for economic benchmarking.

We have presented the metrics against customer density, which is the number of customers per km of route line length. We have done this because less dense (that is, rural) service providers have more assets per customer so they appear to have high higher costs on 'per customer' metrics than urban service providers. Presenting metrics against customer density provides a visualisation of the service providers' relative densities and makes it easier to distinguish between urban providers, rural providers and those in between. This then enables more meaningful comparisons.

Powercor's customer density makes it a better point of comparison to ActewAGL than CitiPower (the other top performer) because CitiPower is significantly denser than all other service providers. Powercor, on the other hand, has a lower customer density than ActewAGL. This means, in theory that Powercor should be at a cost disadvantage relative to ActewAGL (due to its higher customer density).

Importantly, this is a limitation of PPIs only; it does not apply to our economic benchmarking techniques because they explicitly take customer density into account.

Operating environment considerations

PPIs do not explicitly account for operating environment factors, so we must bear this in mind when interpreting the results. However, we have taken measures to minimise the effects of operating environment factors on PPIs. To account for scale, we normalised our PPIs by customer numbers. Customer numbers is an easily understandable output measure that reflects the relative scale of service providers. Economic benchmarking also suggests customer numbers is the most significant driver of costs.

Total customer cost

Total customer cost for network services is a partial performance measure of the costs incurred by service providers that they pass on to customers. It includes opex, return on capital,[140] and depreciation costs.[141] This indicator only includes costs incurred in providing the core 'poles and wires' component of distribution services. We have excluded costs associated with other services such as connections, metering and public lighting. This is to prevent classification of services from influencing results on this indicator. As a total cost measure, it also takes into account differences in allocation between capex and opex.

Total customer cost for network services is a good measure of asset costs and operating costs. We chose to use return on capital and depreciation costs to represent asset costs instead of capex because together, they are a better indication of asset costs than capex. Capex, which only reflects new assets in a given year, has the potential to overstate or understate asset costs.

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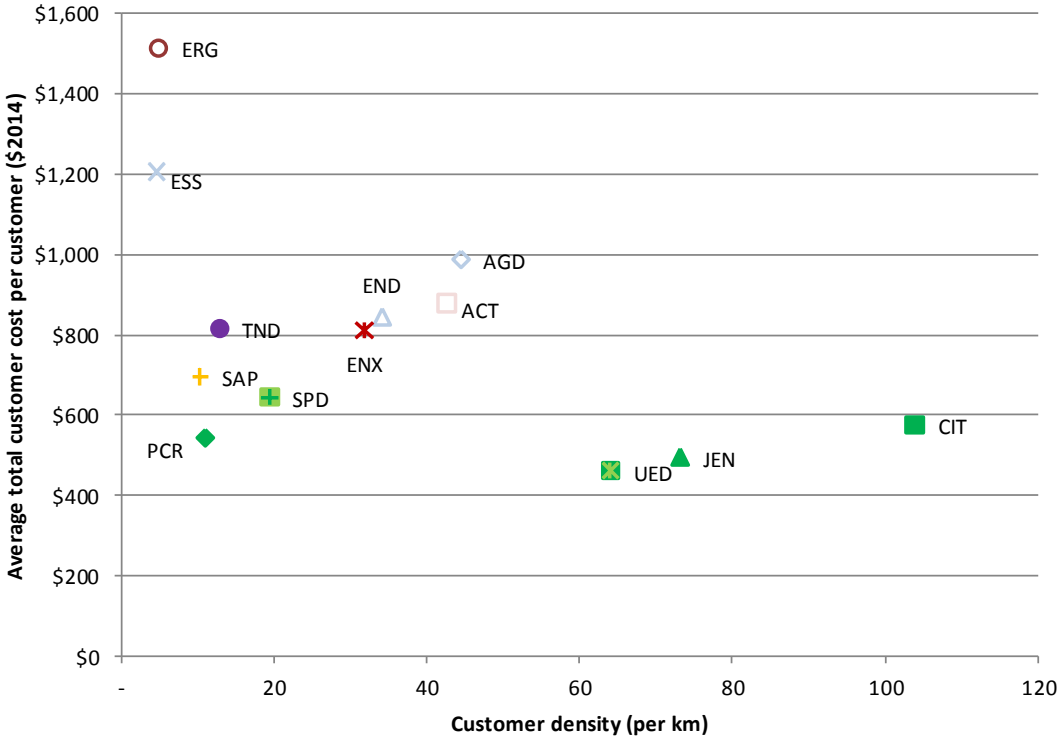
[140] We have applied a real vanilla weighted average cost of capital of 6.09. In calculating this average return on capital, we applied the parameters in the AER's rate of return guideline where possible, used a market risk premium of 6.5 per cent based our most recent transmission determination, a 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.

[141] We have measured depreciation costs using straight line depreciation. 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 A.7 Average annual total customer cost for 2009 to 2013 against customer density ($2013–14)



Source: Economic Benchmarking RIN data and AER analysis.

Figure A.7 shows that ActewAGL has higher costs than Powercor but lower costs than Ausgrid.

On total customer cost per customer ActewAGL appears to have high costs relative to Powercor. These results are consistent with our economic benchmarking, which account for factors such as scale and customer density. As a result, these operating environment factors only explain a part of the cost differential between ActewAGL and Powercor. Table A.8 below compares ActewAGL's total customer cost per customer to Powercor's.

Table A.8 Comparison of ActewAGL's average total customer cost per customer to Powercor's for 2009 to 2013 ($2013)

Service Provider	Cost	Difference in total customer cost per customer to Powercor	Implied efficiency score[142]
ActewAGL	$870	$332	62%

Source: Economic Benchmarking RIN and AER Analysis.

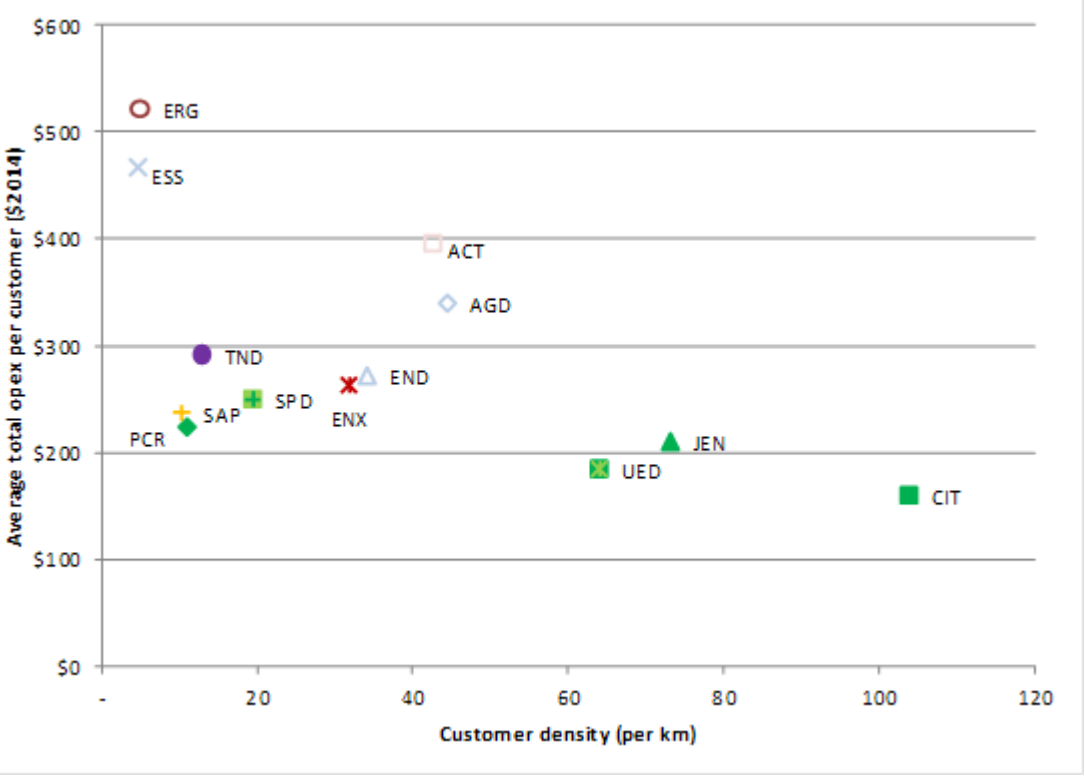
Total opex

This metric measures the opex cost per customer of providing core 'network services'. As with the total customer cost metric, have excluded the costs associated with other services such as connections, metering and public lighting to prevent classification of services from influencing results. This measure does not include a capital component because it measures opex only. However, we

[142] We calculated the efficiency score as Powercor's cost per customer divided by that of ActewAGL.

can compare the results to Figure A.8 to ensure capitalisation approaches are not materially influencing the results.

Figure A.8 Average annual opex for 2009 to 2013 against customer density ($2013–14)



Source: Economic benchmarking RIN data.

Consistent with total user cost per customer, ActewAGL appears to have high costs relative to Powercor (and most other less dense service providers). These results are consistent with our economic benchmarking and the total cost PPI.

When we consider capitalisation, comparison between Figure A.7 and Figure A.8 shows ActewAGL appears is relatively higher on the opex PPI than the total customer cost PPI. This suggests ActewAGL may allocate more of its costs to opex than capex. Table A.9 compares ActewAGL's opex per customer to Powercor.

Table A.9 Comparison of ActewAGL's average opex per customer to Powercor's for 2009 to 2013 ($2013)

Service Provider	Opex	Difference in opex per customer to Powercor	Implied efficiency score[143]
ActewAGL	$392	$171	57%

Source: Economic Benchmarking RIN.

A.3.4 Using benchmarking to estimate efficient base year opex

We have applied a number of different benchmarking techniques. We have taken the results of each of these techniques into account when measuring relative efficiency because they complement each other and provide useful cross checks. However, on the recommendation of Economic Insights, we

[143] We calculated the efficiency scores as Powercor's cost per customer divided by ActewAGL's.

consider that the Cobb Douglas SFA econometric model is the most appropriate for estimating efficient base opex. We consider the characteristics and outline how we have used each of the techniques in turn below.

MPFP and our three econometric models all provide an indicator of opex efficiency between service providers. The raw efficiency score shows the relative position of the service provider under consideration to the frontier in terms of the use of opex. Conceptually, the raw efficiency score using any of these four techniques measures the extent of inefficiency prior to adjustments for modelling error and certain operating environment factors (factors that may differentiate service providers).

Each of these measures is slightly different in terms of functional form, inputs, outputs or operating environment factor coverage. The efficiency scores are, therefore, also measures of the scope of the raw adjustment required to base year opex in order to develop an estimate of the total forecast opex that we would be satisfied reasonably reflects the opex criteria. Therefore, comparatively, they are slightly different measures relative to each other but provide useful cross-checks.

MTFP plays an important role as the overarching indicator of total productive efficiency and, consequently, operates as a check on the techniques that examine opex efficiency (such as opex partial MPFP and category analysis). This is necessary because a service provider could, for example, appear to be inefficient in the use of opex alone, but be efficient overall. In such a circumstance the apparent opex inefficiency may be a result of an efficient combination of opex and other inputs. As such, MTFP provides an important cross check for opex specific benchmarking approaches.

MTFP and MPFP analysis also has the advantage of being able to incorporate a broader range of inputs and outputs than the econometric techniques. For instance, our preferred MPFP model contains five outputs (energy delivered, ratcheted maximum demand, customer numbers, circuit length and minutes off supply) and four inputs (opex, overhead lines, underground cables and transformer capacity). The transformer capacity input excludes the first stage of two stage transformation at the zone substation level. Further, MTFP and MPFP are not as data intensive as other benchmarking approaches.

However, while MTFP and MPFP analysis has the advantage of producing robust results with small datasets, they are deterministic methods that do not facilitate the calculation of confidence intervals and can only directly accommodate a small number of operating environment factors.

The econometric models, on the other hand, allow the estimation of confidence intervals and explicitly account for operating environment factors. The opex cost functions specify a smaller number of outputs (customer numbers, circuit length, and ratcheted peak demand) than MPFP but account for operating environment factors such as share of underground cables and economies of scale.

The Cobb Douglas SFA model is comparatively superior to Economic Insights' other econometric techniques because it directly estimates the efficient opex cost function. In doing so it takes into account economies of scale, network density and the relationship between opex and the multiple outputs service providers face. Therefore, Economic Insights recommends Cobb Douglas SFA as the preferred model for estimating efficient base year opex.[144]

However, the Cobb Douglas LSE and Translog LSE models provide useful cross checks of the Cobb Douglas SFA model. The Translog LSE model allows for a more flexible opex cost functional form

[144] Economic Insights, 2014, p. iv.

incorporating second order coefficients. Should the Translog LSE model produce inconsistent results it might indicate that the opex cost function being inappropriately captured by one of the models. The LSE and SFA Cobb Douglas models both estimate efficiency using slightly different techniques. By running both methods we can observe whether the efficiency measurement technique makes a material difference to relative efficiency performance.

The PPIs are simple, intuitive metrics that provide another perspective on the relative efficiency of networks. As the PPIs only focus on one aspect of a service provider's performance they do not provide an overall indication of efficient costs. They are, however, useful for cross checking the results from the opex models and MTFP.

Table A.10 presents the raw results of our benchmarking analysis. This table indicates that the results of our benchmarking analysis are consistent. There are some differences between the efficiency techniques – particularly the PPIs (which only examine one output). However, this is expected as the benchmarking approaches differ in their characteristics. The consistency between the modelling gives us comfort the Cobb Douglas model is not producing anomalous results and is an appropriate basis for our estimate of efficient opex.

Table A.10 Quantitative raw efficiency scores compared to the frontier (per cent)

Assessment technique	Frontier	Efficiency score
Cobb Douglas stochastic frontier analysis	CitiPower	40
Translog estimated least squares regression	Powercor	32
Cobb Douglas estimated least squares regression	Powercor	36
Opex multilateral partial factor productivity	CitiPower	44
Multilateral total factor productivity	CitiPower	55
Total customer cost per customer PPI	Powercor	62
Opex per customer PPI	Powercor	57

Source: AER analysis.

What the adjustment would be if we used the raw benchmarking results

Table A.11 presents our comparison of the proposed base year of ActewAGL against estimated efficient base year opex based solely on the benchmarking results. As we explain above, if we made an adjustment purely based on benchmarking alone, we would use the Cobb Douglas SFA model. Table A.11 presents the implied reduction in opex the Cobb Douglas SFA model predicts would be required to catch up to the efficient frontier service provider (CitiPower).

Table A.11 Implied reduction to proposed base year opex predicted by benchmarking before any adjustments ($ million, 2013–14)

	ActewAGL
Proposed base opex (adjusted)[a]	66.7
Benchmarking estimate of efficient base opex	26.0
Implied reduction	40.7
Implied percentage reduction to reach full efficiency[b]	61%

Note: (a) we have adjusted ActewAGL's proposed opex for its new CAM and jurisdictional schemes.
(b) implied opex reduction is relative to proposed base opex whereas the CD SFA efficiency score is relative to average opex performance over 2006 to 2013.
Source: AER analysis.

The results of the models presented here reflect the average distance from the frontier for the service providers over the benchmarking period.[145] Consequently this does not directly compare to the service providers' base year opex (which is 2012–13) because the average opex will reflect their average network characteristics over the eight year period.

Hence, to calculate our estimate of efficient base year opex we have, on the recommendation of Economic Insights, trended forward the average efficient opex by the change in outputs, input prices[146] and technical efficiency to properly reflect conditions in the base year. This is consistent with our approach to trending forward expenditure for the 2014–19 period using our rate of change approach but relies on less assumptions because we can use actual observed output growth (rather than a forecast). For this reason, the percentage reduction in Table A.11 is different to those implied by the raw Cobb Douglas SFA results in Table A.10.

As we mention above, the Cobb Douglas SFA model takes into account several operating environment factors, including economies of scale, network density and the relationship between opex and the multiple outputs service providers face. It does not, however, account for all operating environment differences. In addition, an adjustment based solely on the Cobb Douglas SFA model alone does not take into account:

- consideration of findings from detailed review or other qualitative analysis of the service providers' regulatory proposals and supporting information
- the potential for modelling or data issues.

Given this, we consider it would be inappropriate to make adjustments to base year opex on the basis of raw results alone. Rather, we prefer to holistically consider the results of our quantitative and qualitative analysis in forming a view on the appropriate adjustment. We present the ultimate adjustments in section A.6.

[145] Economic Insights, 2014, p. 46.
[146] Also referred to as real prices in the expenditure forecast assessment guideline.

A.4 Sources of inefficiency or high expenditure in the base year

We have used detailed review to investigate supporting evidence for the benchmarking results in the detail of the ActewAGL's historical expenditure. We have:

- examined ActewAGL's explanations of opex drivers in its regulatory proposal and supporting material
- conducted category analysis benchmarking for major categories of opex
- undertaken detailed reviews of two key expenditure categories:
  - labour costs
  - vegetation management.

The aim of this detailed review is not to identify all inefficiencies in the practices of ActewAGL or in its base year opex, or to explain all reasons for the gap in performance compared to its peers. As we state in section A.2, inefficiencies can manifest themselves in many ways and may not be easy to identify. This evidence, therefore, does not necessarily explain the entire performance gap quantified in the benchmarking.

Our findings reveal a diverse – but consistent – body of evidence that support the view that ActewAGL's proposed base year opex is not reflective of the base costs that would be appropriate for the purposes of forecasting expenditure over the 2014–19 period in accordance with the opex criteria. Therefore, we are satisfied the results of these investigations support the overall benchmarking results.

A.4.1 Findings from ActewAGL's proposal

In contrast to the proposals of the NSW service providers, ActewAGL does not openly acknowledge its past expenditure was inefficient. It also does not propose any efficiency improvements in its forecast. However, parts of ActewAGL's regulatory proposal suggest some labour inefficiency in the 2009–14 period. For example, ActewAGL notes:[147]

> The utilisation of internal and contracted labour resources will be improved.

ActewAGL also states it overspent its allowance on labour in the 2009–14 period due to a 'tighter labour market' resulting in higher costs than allowed by the AER:[148]

> …prevailing effective full-employment conditions in the ACT at that time saw negotiated wage increases set at 5 per cent per annum for all ActewAGL staff, and the introduction of a significant retention allowance for all qualified field staff.

ActewAGL also refers to a 'major organisation review' by Marchment Hill Consulting (MHC) that took place in 2011. The primary objectives of the review were to:[149]

> [I]dentify, validate and understand key performance issues and improvement opportunities within the division from the management and organisational structure through to the operating model, as well as further develop an organisational culture in which safety is deeply embedded.

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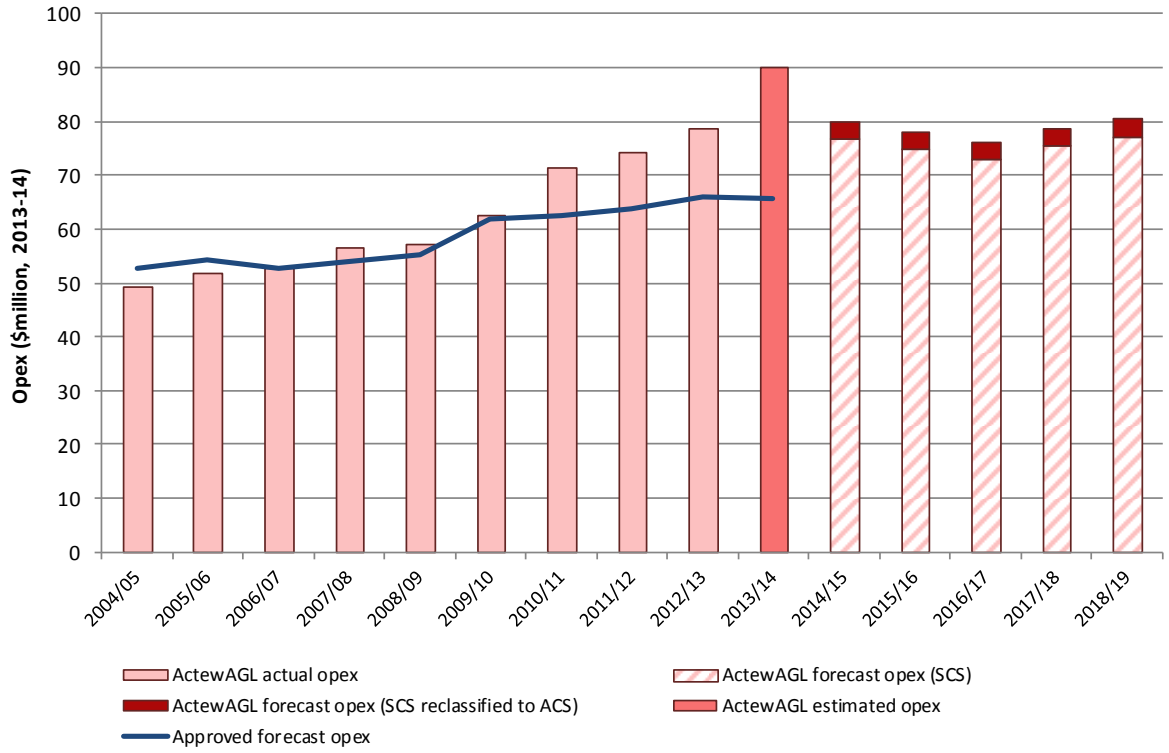
147 ActewAGL, *Regulatory Proposal*, 2014, p. 128.
148 ActewAGL, *Regulatory Proposal*, 2014, pp. 214–215.
149 ActewAGL, *Regulatory Proposal*, 2014, pp. 216–217.

MHC's core recommendation was for ActewAGL to restructure the Energy Networks Division, but it also recommended a number of critical business improvement initiatives, aimed at addressing process, competency, systems, data and capability issues within Energy Networks, as well as improving the interfaces between Network Asset Management, Network Services and other ActewAGL divisions.[150] This suggests some structural issues and efficiency problems may have existed during the 2009–14 period. However, such a review might have provided ActewAGL with the opportunity to address some of these problems such that it could forecast efficiency improvements in the next period.

However, despite this, Figure A.9 shows ActewAGL's proposal for the forecast period is, on average, at a similar level to its actual expenditure in 2012–13. Indeed, Figure A.9 shows that once we account for ActewAGL's proposed changes in service classification, forecast opex is similar to its actual spend in 2012–13, which was significantly higher than its regulatory allowance.

Figure A.9 ActewAGL's past and forecast total opex, including reclassified services ($ million, 2013–14)



Source: AER analysis.

Given ActewAGL's performance on the benchmarking and the overspends in the last period, the lack of acknowledgement of the existence of an efficiency problem in its regulatory proposal is somewhat surprising. However, the MHC review and suggestions of potential labour inefficiency provide a reason (additional to the benchmarking results) for conducting a detailed review of ActewAGL's labour practices. We outline our findings from this review in section A.4.3.

[150] ActewAGL, *Regulatory Proposal*, 2014, pp. 216–217.

A.4.2 Category analysis

Category analysis metrics are PPIs that focus on particular categories of opex in isolation. They are, therefore, the next level of detail below the total cost and total opex PPIs we presented in section A.3.3. We would not necessarily expect every metric to produce the same results because service providers may allocate opex across the categories differently. This is relevant to our analysis. For instance, a source of apparent inefficiency in the base year could be due to costs associated with a particular category of opex, for which there is a reasonable explanation for the high costs. Similarly, a service provider could appear to perform well on some category metrics but be inefficient overall. Category analysis is, however, useful for identifying areas of high cost and potential inefficiency.

Broadly, our analysis suggests that on the majority of the category analysis measures ActewAGL appears to have high costs relative to other service providers. Table A.12 shows a summary of the results. ActewAGL is marked as 'high' when it appears above most of its peers and 'comparable' where the gap is less distinct. 'Very high' indicates a substantial gap between most service providers. We consider the results are consistent with and support the findings of our economic benchmarking techniques.

Table A.12 Summary of category analysis metrics: ActewAGL's relative costs (average over 2008–09 to 2012–13)

	ActewAGL
Labour	Very High
Total overheads	High
Total corporate overheads	Comparable
Total network overheads	Comparable
Maintenance	Very High
Emergency response	Comparable
Vegetation management	Very High

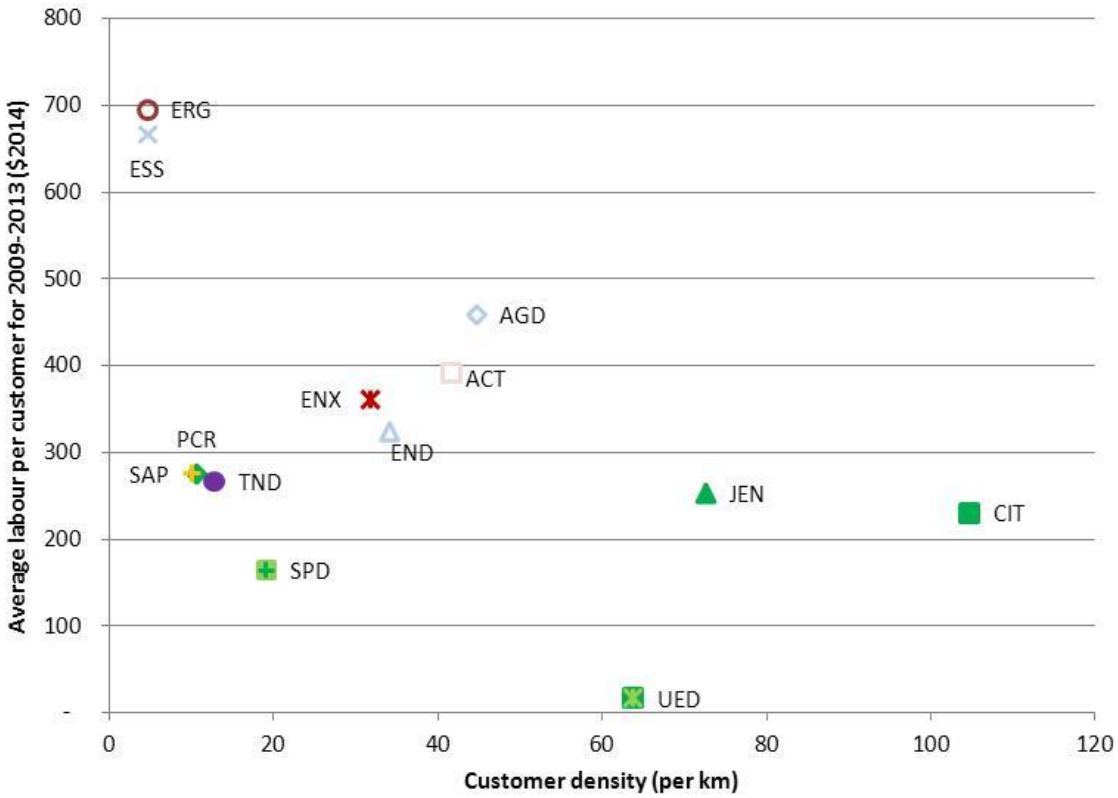
Source: AER analysis.

Given ActewAGL generally performs poorly on category analysis for most categories of expenditure, we consider this supports the view that it is likely systemic issues exist across ActewAGL. The results of the labour metric (which is a broader measure) tends to support this view as well. We discuss each metric below

Labour

Figure A.10 measures labour costs per customer, normalised by customer density. Labour expenditure, in this context, only applies to costs incurred for internal labour. It excludes the labour costs of external contractors. We have used labour expenditure rather than the number of staff. Labour expenditure is a better indicator of the costs faced by service providers than staff numbers. Staff numbers may provide an indirect indicator, but due to differences in wages, firms with similar staff numbers may have different labour expenditures

Figure A.10 Average annual labour expenditure per customer for 2009 to 2013 ($2013–14)



Source: Category analysis RIN data and economic benchmarking RIN data.

Figure A.10 shows that ActewAGL appears to have very high labour costs per customer relative to Energex, Endeavour Energy, AusNet, SA Power Networks, Powercor and TasNetworks. While ActewAGL also appears higher than JEN, UED and CitiPower, it is significantly less dense. Given 'per customer' metrics tend to favour higher density service providers, we must bear this in mind when comparing ActewAGL to these businesses.

Because this metric excludes contractor costs, contracting policies are likely to affect service providers' relative positions on this metric. This is likely why UED – who over the benchmarking period outsourced almost all of its opex – has such low labour costs per customer compared to everyone else.

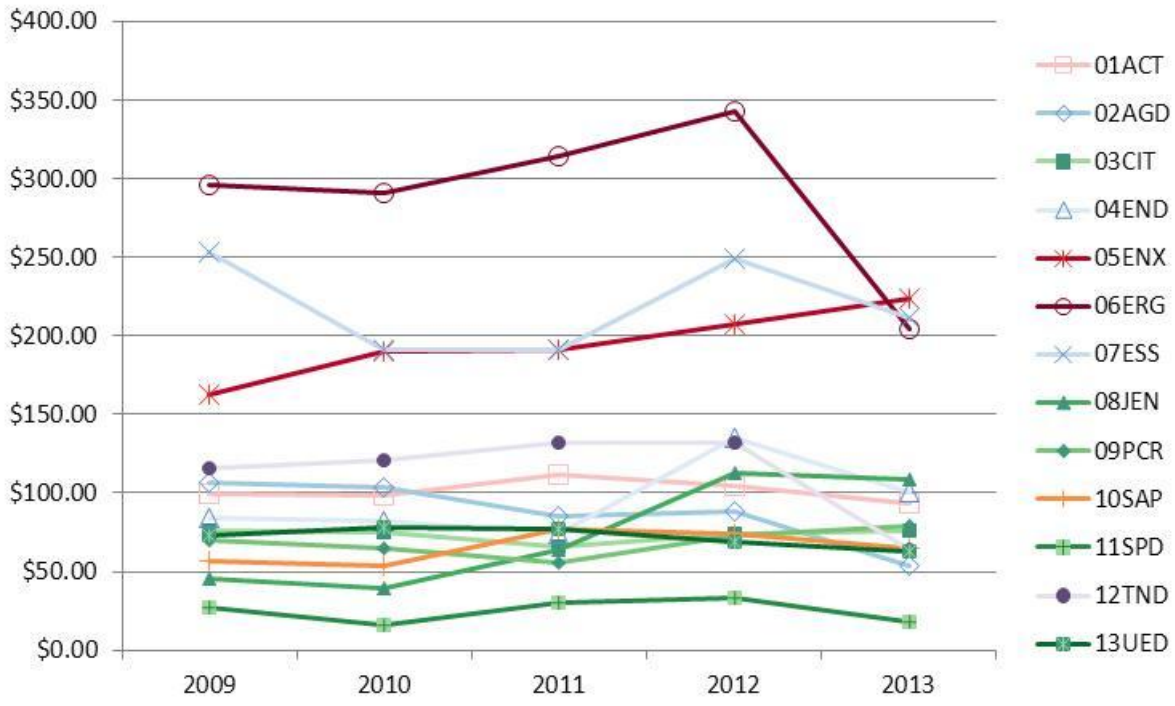
The results in Figure A.10 are consistent with the total customer cost PPI and the economic benchmarking results. This indicates that lower costs in other areas do not offset relatively high labour costs for these ActewAGL at the total level.

Corporate overheads

Corporate overheads, in this context, are all expensed and capitalised overhead costs allocated to standard control services that are not directly attributable to operating an electricity distribution system (that is, not network overheads). Among other things, these include costs incurred by legal, finance, and human resources functions. We have measured total corporate overheads rather than corporate opex overheads because opex overheads are affected by service providers' capitalisation policies.

We have not presented this metric against customer density. Customer density should not greatly affect the level of corporate overheads a service provider incurs because corporate overheads should be largely fixed costs.

Figure A.11 Corporate overheads per customer 2009 to 2013 ($2013–14)



Source: Category analysis RIN data and economic benchmarking RIN data.

Figure A.11 shows that ActewAGL appears to have average corporate overhead costs comparable to most service providers. However, ActewAGL appears to have high costs on the total customer cost PPI. This indicates that higher costs in other areas offset relatively low corporate overhead costs for ActewAGL at the total level.

Network overheads

Network overheads are all expensed and capitalised overhead costs allocated to standard control services that are directly attributable to operating an electricity distribution system. Among other things, these include costs incurred by network planning and asset management functions.

We chose total network overheads per customer because network overheads are likely to vary with changes in the amount of work done on the network. Customer numbers are a good proxy for this. We chose to normalise network overheads costs by circuit kilometre because asset volumes are more likely to drive network overhead costs than customer numbers. We have used circuit length as a proxy for assets. Circuit length is a more easily understandable and intuitive measure than capacity measures such as transformer capacity or circuit capacity.

When making comparisons on 'per kilometre' metrics against customer density, we need to bear in mind that service providers with low customer densities should appear more favourably than those with high customer densities. Lower density service providers are typically larger networks with many kilometres of line to serve sparsely located customers. While this generally means they tend to have high 'per customer' costs, they also have low 'per kilometre' costs.

'Per kilometre' metrics, therefore, typically favour rural service providers. For example, because ActewAGL has a lower customer density than JEN it should, in theory, also have lower costs per kilometre on this PPI.

Figure A.12 Average network overheads per circuit km for 2009 to 2013 against customer density ($2013–14)

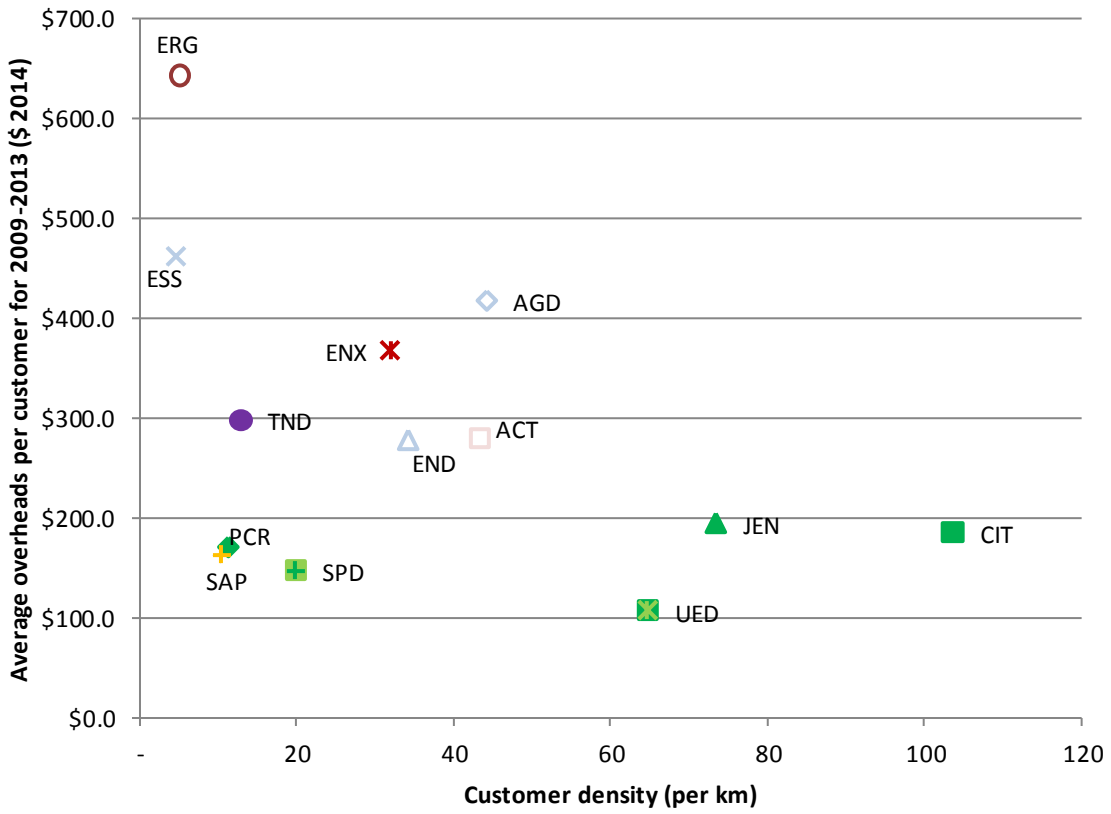
Source: Category analysis RIN data and economic benchmarking RIN data.

Figure A.12 shows that ActewAGL appears to have costs comparable to JEN but higher than UED, Energex and Endeavour Energy. It has much lower costs than Ausgrid, who has a similar customer density.

Total overheads

Total overheads are the sum of corporate and network overheads for both capex and opex allocated to standard control services. We have used total overheads allocated to both capex and opex to ensure that differences in capitalisation policies do not affect the analysis. It also mitigates the impact of service provider choices in allocating their overheads to corporate or network services.

Figure A.13 Average overheads per customer for 2009 to 2013 against customer density ($2013–14)



Source: Category analysis RIN data and economic benchmarking RIN data.

Figure A.13 shows that ActewAGL appears to have costs comparable to Endeavour Energy and TasNetworks, but high relative to SA Power Networks, Powercor and AusNet. Given that 'per customer' metrics tend to favour higher density service providers, ActewAGL should appear lower than these three rural providers as it should have less assets per customer.

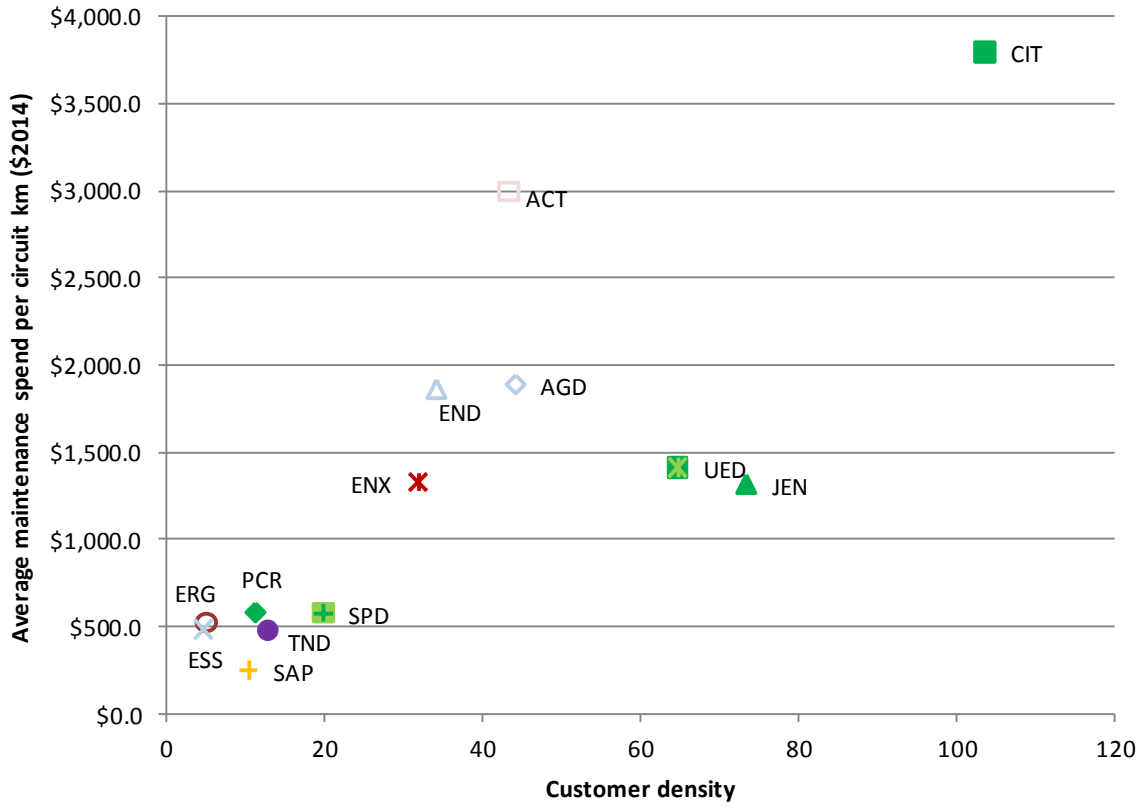
On this 'per customer' metric, ActewAGL will appear higher than UED, JEN and CitiPower due to its lower customer density. However, differences in customer density can only account for part of the cost difference between ActewAGL and these urban service providers. This is consistent with the economic benchmarking results, which do account for customer density and show ActewAGL has high costs relative to its peers.

Maintenance

Maintenance expenditure relates to the direct operating costs incurred in maintaining poles, cables, substations, and SCADA, but excludes vegetation management costs and costs incurred in responding to emergencies.

We chose maintenance per circuit kilometre because assets are more likely to drive maintenance costs than customer numbers. We used circuit length because it is a more easily understandable and intuitive measure of assets than transformer capacity or circuit capacity.

Figure A.14 Average maintenance per circuit km for 2009 to 2013 against customer density ($2013–14)



Source: Category analysis RIN data and economic benchmarking RIN data

Figure A.14 shows that ActewAGL appears to have very high costs compared to Ausgrid, Endeavour Energy. Energex, JEN and UED but lower costs than CitiPower.

Emergency response

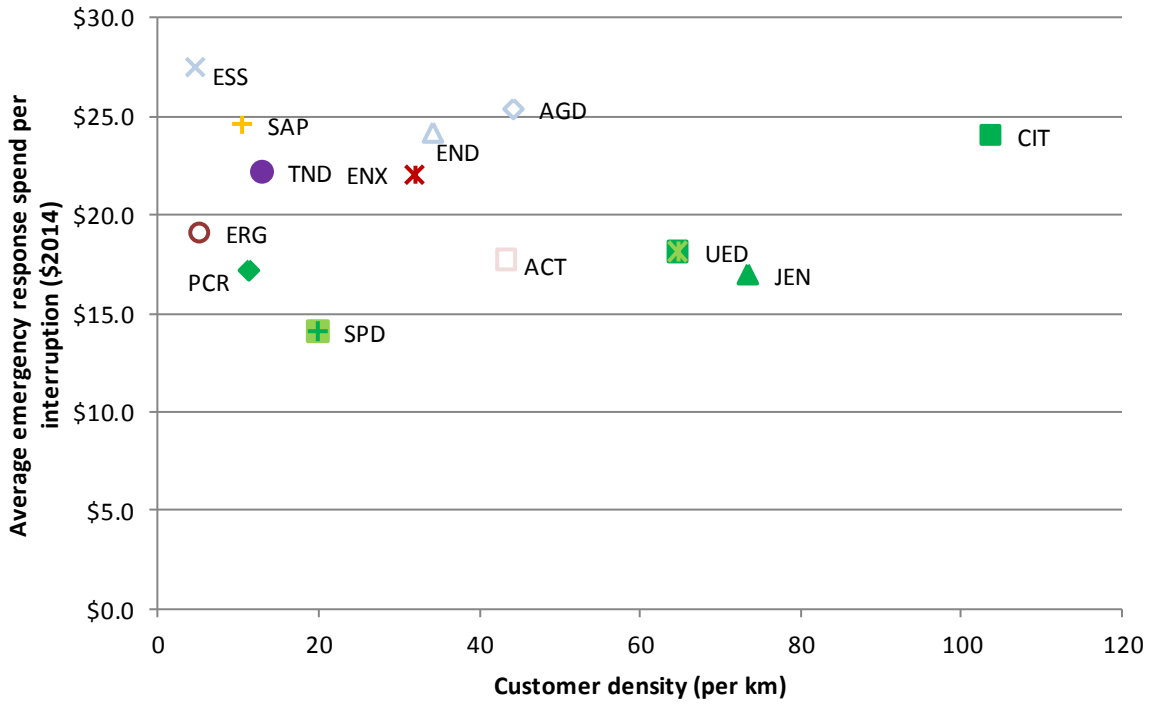
Emergency response expenditure is the direct operating cost incurred in responding to network emergencies, excluding costs associated with major event days. We excluded major event day emergency response costs and interruptions because major events are outside of the control of service providers.

We chose emergency response per interruption because the number of supply interruptions is more likely to drive emergency response costs than customer numbers. We used supply interruptions rather than interruption duration because the number of interruptions is more likely to drive emergency response costs than the duration of interruptions. Where there is an interruption, there must be expenditure to correct it. The duration of an interruption should not impose emergency response costs on the service provider. There may be other costs imposed on the service provider such as lost revenue or Guaranteed Service Level payments, but these are not emergency response costs.

It is possible to make comparisons between service providers of different densities on this metric because customer density should not affect the average emergency response spend per interruption. Although customer density does not appear to affect costs, we have measured emergency response costs against customer density because the average spends against customer density are easier to read than the time trend of expenditures.

Figure A.15 shows the range of service providers' emergency response expenditure per interruption is relatively narrow.

Figure A.15 Average emergency response expenditure per interruption for 2009 to 2013 against customer density ($2013–14)



Source: Category analysis RIN data and economic benchmarking RIN data.

ActewAGL appears to have comparable emergency response expenditure. However, ActewAGL also appears to have high costs on the total customer cost PPI. This indicates that at the total level, higher costs in other areas offset relatively low emergency response costs.

Vegetation management

Vegetation management expenditure includes tree trimming, hazard tree clearance, ground clearance, vegetation corridor clearance, inspection, audit, vegetation contractor liaison, and tree replacement costs.

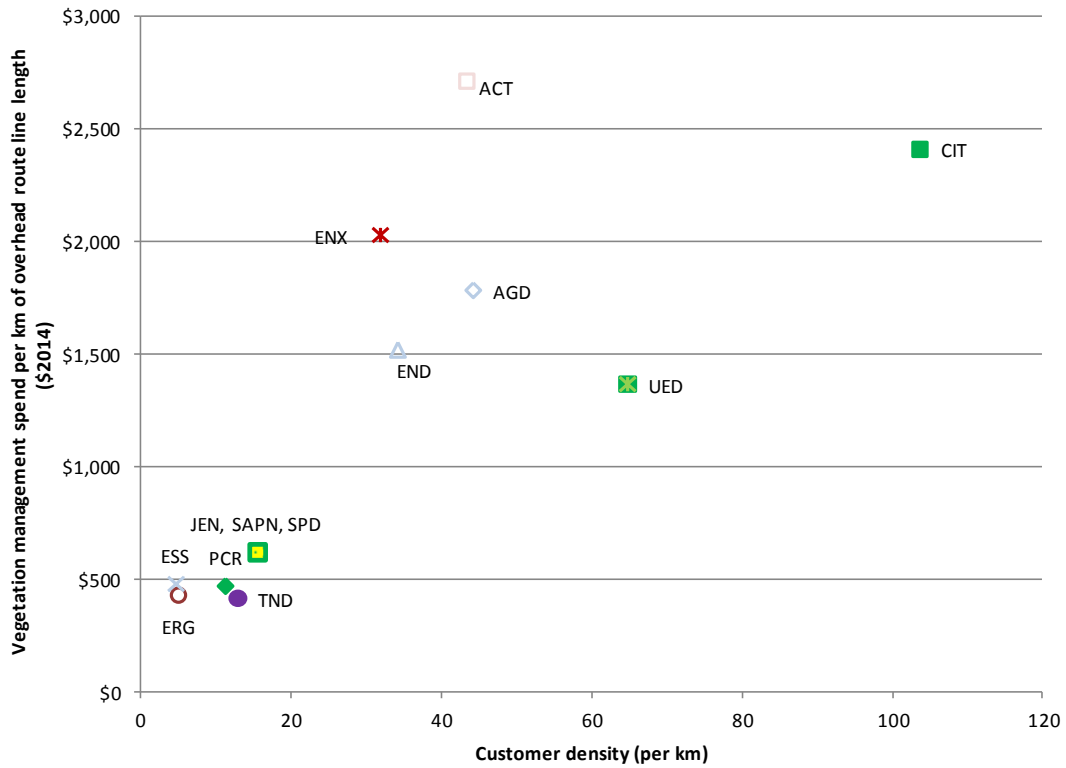
We chose vegetation management per kilometre of overhead route line length because the length of overhead lines is more likely to drive vegetation management costs than customer numbers. We used overhead route line length rather than maintenance span length or circuit length.

Ideally, we would use maintenance span length. Maintenance span length measures the length of service providers' lines that have undergone vegetation management in the preceding 12 months. However, service providers' estimation assumptions seem to influence the data on maintenance spans. For some service providers maintenance spans are only a small part of overhead route line length, while for others they makes up the vast majority of overhead route line length. Therefore, we consider overhead route line length is a better measure of the area of network that requires vegetation management.

We have not used circuit length because it could understate costs per kilometre when multiple circuits run through the same vegetation (if, for example, poles support more than one circuit). This is

because vegetation management for one circuit should equally affect the other. Our definition of route line length requires service providers to count the length of only one circuit where two circuits run in parallel.

Figure A.16 Average vegetation management costs per kilometre of overhead line length for 2009 to 2013 against customer density ($2013–14)



Source: Category analysis RIN and Economic benchmarking RIN.

Figure A.16 shows ActewAGL appears to have very high costs compared to all other urban service providers. These results are consistent with our economic benchmarking. ActewAGL also appears to have high costs on the total cost PPI. This indicates that lower costs in other areas do not offset relatively high vegetation management costs for ActewAGL at the total level.

We have undertaken a detailed review of ActewAGL's vegetation management program. We have investigated ActewAGL's vegetation management expenditure because its costs appear very high despite it not being primarily responsible for performing vegetation management on a large part of its network. We discuss this in detail in section A.4.3.

A.4.3 Detailed review

Our analysis in the above sections provides clear evidence of material inefficiency in ActewAGL's revealed opex. In particular, the category analysis metrics show that ActewAGL's labour and vegetation management costs are a likely source of material inefficiency. As a result, we conducted a detailed review of these topics.

Labour

Over the 2009–14 regulatory control period, ActewAGL's total labour costs increased by 39 per cent (in real terms), which appear to have been driven by an increase in the quantity of labour (that is, employees) and increases in the total cost per employee. Our view is that one of the sources of

ActewAGL's material inefficiency in its historical opex (identified with our benchmarking techniques) is likely due to inefficiencies and inflexibilities within its labour force. Due to the sensitive nature of much of the material, we discuss it in detail in a confidential appendix. We provide a summary here.

Marchment Hill Consulting review

ActewAGL's regulatory proposal refers to a 'major organisation review' by Marchment Hill Consulting (MHC) that took place in 2011. According to ActewAGL's regulatory proposal, the primary objectives of the review were to:[151]

> [I]dentify, validate and understand key performance issues and improvement opportunities within the division from the management and organisational structure through to the operating model, as well as further develop an organisational culture in which safety is deeply embedded.

ActewAGL states that MHC's core recommendation was for ActewAGL to restructure the Energy Networks Division, but that it also recommended a number of critical business improvement initiatives. ActewAGL considers it has successfully implemented the structural reforms.[152]

From our review of the MHC report, we consider it is unlikely the restructure of management could have addressed all of the identified problems by 2012–13. ActewAGL's business as usual forecast seems to support this.

Outsourcing

ActewAGL has outsourced less of its operational activities than its peers, so rising labour costs per employee would likely have a bigger impact on ActewAGL's total opex than for businesses who outsource more opex.

We found opex outsourcing in ActewAGL's electricity business is significantly lower than that undertaken by other service providers. Deloitte's analysis of the NSW service providers' practices highlighted that outsourcing delivers efficiencies and competitive pressure to the workforce, suggesting that a low level of outsourcing can indicate less than efficient work practices.[153] ActewAGL outsources significantly less than economic benchmarking frontier peers CitiPower and Powercor and less than its peers in NSW.[154]

ActewAGL's outsourcing provision in its EBA is more restrictive than even the NSW service providers. For example, the NSW service providers' EBAs allow outsourcing if they can demonstrate it is commercially viable, providing they follow proper consultation procedure.[155]

However, ActewAGL cannot do this. ActewAGL can outsource only in times of peak workload where specialist expertise does not exist in its workforce.[156] This is substantially more restrictive than the NSW equivalent clauses. In our view, this suggests material inefficiency.

We also note that ActewAGL's gas business (which, like the electricity business is a partnership between ACTEW and Jemena) is entirely outsourced. Yet ActewAGL's electricity business is predominantly operated in-house.

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151 ActewAGL, *Regulatory Proposal*, 2014, pp. 216–217.
152 ActewAGL, *Regulatory Proposal*, 2014, pp. 216–217.
153 See, for example, Deloitte, *NSW Distribution Network Service Providers Labour Analysis*, pp. 44–46.
154 See, for example, Deloitte, *NSW Distribution Network Service Providers Labour Analysis*, pp. 33–34, 46–47.
155 See, for example, *Endeavour Energy Enterprise Agreement 2012*, clause 27.2(c).
156 *ActewAGL and Combined Unions Enterprise Agreement 2011*, clause 20.

Redundancies

In contrast to the NSW service providers, ActewAGL's EBA explicitly allows involuntary redundancies. However, this seems to come at a cost to ActewAGL and may be a driver of inefficiency. ActewAGL's EBA sets the minimum redundancy payout at 31 weeks (if the employee is 44 or younger) and 57 weeks (if the employee is 45 or older). This is significantly higher than other service provider EBAs, whose minimum severance payments range from three weeks to six weeks.

One submission on ActewAGL's regulatory proposal suggests ActewAGL has spent 'millions of dollars in costly redundancies.'[157] We consider the existence of the redundancy conditions may limit options for workforce planning and management. Such limitations may impact on management's ability to efficiently and prudently manage its labour costs.

Conclusions

We consider the information we have viewed presents evidence of material inefficiency in ActewAGL's labour practices in the 2009–14 period (including the base year, 2012–13). We are satisfied that ActewAGL's high labour costs are likely a key driver of ActewAGL's benchmarking performance. This level of expenditure is unlikely to be representative of the efficient and prudent base opex in future years. Further detail of our labour review is in a confidential appendix.

Vegetation management

ActewAGL's performance in vegetation management expenditure has increased markedly in the 2009–14 period. Its related performance measures, however, have deteriorated. ActewAGL has provided material to explain the cost requirements of its vegetation management program[158] but we consider these do not provide a satisfactory explanation for cost increases over the period. Our analysis indicates that increasing contractor costs and a lack of risk management are the primary causes of inefficiency.

Our view is that one of the sources of ActewAGL's high expenditure in its base year opex (identified with our benchmarking techniques) is likely due to vegetation management practices. While we are satisfied that backyard reticulation presents some challenges unique to ActewAGL, on the evidence before us, our view is that backyard reticulation is likely only to be part of the reason for high vegetation management expenditure in the base year.

Analysis of expenditure and performance

ActewAGL's actual vegetation management expenditure has more than doubled from $2.6 million ($2013–14) in 2008-09 to $5.4 million ($2013–14) in 2012–13.[159] For the purposes of assessing base year opex, we are interested in historical actual expenditure rather than forecast expenditure, but it is useful to compare the expenditure trend over time. Figure A.17 shows that ActewAGL has forecast this to decline slightly to $3.9 million ($2013–14) on average in the 2014–19 period, which remains well above 2008–09 levels.

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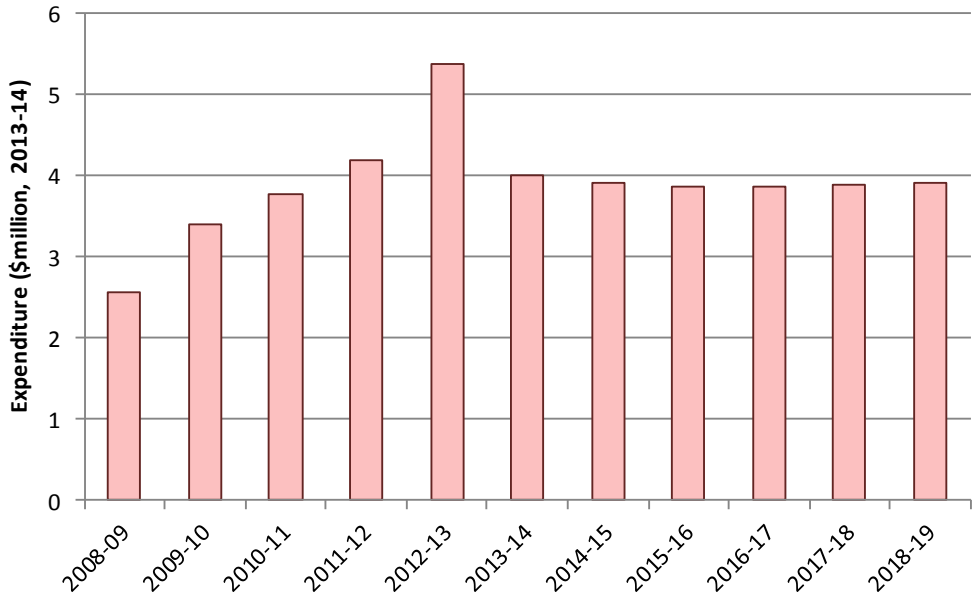
157 Name withheld, Submission to ActewAGL's regulatory proposal, p. 1.
158 ActewAGL, *Response to CCP submission on ActewAGL Distribution Regulatory Proposal 2014-19*, p. 4.
159 Category analysis RIN data.

Figure A.17 ActewAGL's historical and forecast vegetation management expenditure excluding overheads ($ million, 2013–14)



Source: Category analysis RIN, Table 2.1.2 and Table 2.16.2; AER analysis.

In addition, if we examine ActewAGL's performance data on sustained interruptions to supply due to vegetation, it shows that despite the increasing expenditure, performance has continued to deteriorate each year. Figure A.18 shows that the number of vegetation-related interruptions to supply increased significantly each year between 2009–10 and 2012–13.

This is not the result we would expect given that ActewAGL's regulatory proposal states it increased reliability and safety focused operating and maintenance expenditure in the 2009–14 period, particularly for vegetation management.[160]

Figure A.18 ActewAGL's historical network outages due to vegetation

Source: Category Analysis RIN, Table 6.3.1; AER analysis.

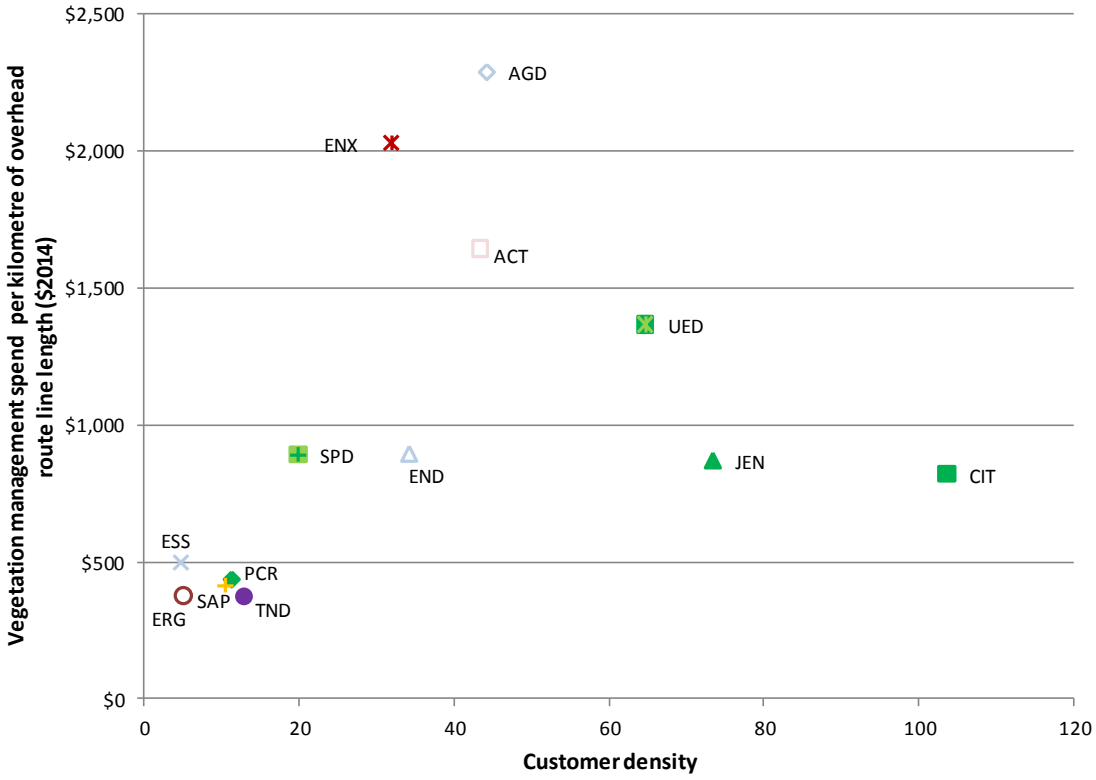
[160] ActewAGL, *Regulatory proposal*, 2014, pp. 161, 236.

However, in its regulatory proposal, ActewAGL also states that its expenditure increased during the 2009–14 period because the ACT experienced above average rainfall in 2010–11 and 2011–12. This resulted in 'unexpected and uncontrollable increase in vegetation growth' that led to additional vegetation management (inspection and clearance) costs, particularly in 2012–13.[161] This is also the reason given by ActewAGL for a recent vegetation management cost pass through to recover additional costs incurred in 2012–13.[162]

We did not accept ActewAGL's pass through application because we were not satisfied that ActewAGL had undertaken prudent operational risk management that could have prevented or mitigated the effect of the event.[163] Our analysis in that process uncovered inefficiencies in ActewAGL's vegetation management practices as the reason for increased costs, rather than rainfall.[164] We maintain this view, and discuss ActewAGL's efficiency further below.

In terms of comparison with other peers, Figure A.19 compares ActewAGL with its peers on a cost per kilometre of overhead route line length basis.

Figure A.19 Average vegetation management costs per overhead route line length for 2008–09 to 2012–13 per customer density ($2013–14)



Source: Category analysis RIN, Table 2.7.2; Economic benchmarking RIN, Table 5.2.1; AER analysis.

161 ActewAGL, *Regulatory Proposal*, 2014, p. 218.
162 ActewAGL, Vegetation management cost pass through, November 2013.
163 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, p. 6.
164 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, pp. 17-26, appendix B.

ActewAGL has very high costs compared to most of its peers on this measure, with the exception of Energex and Ausgrid. In our view, this corroborates the findings from our other assessment techniques that vegetation management may be a source of material inefficiency.

As we note in section A.4.1, our preferred metric is costs per kilometre of vegetation maintenance span. However, due to differences in some service providers' estimation assumptions, a significant difference exists in terms of the percentages of overhead route line length they classify as maintenance spans. For some service providers maintenance spans are only a small part of overhead route line length, while for others they makes up the vast majority of overhead route line length. Therefore, we consider overhead route line length is a better measure of the area of network that requires vegetation management.

Reasons for high expenditure

ActewAGL proposed 2012–13 as the base year for estimating (the majority of) its total forecast opex proposal using a hybrid base-step-trend approach. Likewise, we are using this year to determine an estimate of total forecast opex using the single year revealed expenditure approach. This means that while we are interested in understanding ActewAGL's historical inefficiency, we are particularly interested in its practices as at 2012–13. This is the same year for which ActewAGL submitted its vegetation management cost pass through application for increased expenditure.

We consider evidence of inefficiency in ActewAGL's vegetation management in 2012–13 exists. First, in response to a request for further information, ActewAGL submitted that the current level of annual 'urgent' clearance costs is inefficient and scope exists to reduce it in the forecast period.[165]

Second, we maintain the view we expressed in our analysis of ActewAGL's vegetation management cost pass through application that several inefficiencies exist in ActewAGL's vegetation management practices, including in:

- contracting practices
- risk management
- urgent clearance.

We agree that ActewAGL's backyard reticulation presents a unique challenge that could potentially lead to increased vegetation management costs. However, on the evidence before us, our view is that backyard reticulation is likely only to be part of the reason for high vegetation management expenditure in the base year. We are also not convinced that rural operating environment factors should materially impact on ActewAGL's vegetation management expenditure.

Information provided by ActewAGL

In response to a request for further information, ActewAGL submitted reasons to justify its vegetation management costs. This information states that the current level of annual 'urgent' clearance costs (approximately 20 per cent of total vegetation management expenditure) is inefficient.[166] ActewAGL submits that it expects it can reduce these costs by 40 per cent by increasing its use of LiDAR (light detection and ranging). As we discuss further below, we consider ActewAGL could aim to further reduce (or potentially eliminate) urgent clearance work.

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165 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, p. 37.
166 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, p. 37.

Inefficiency in contracting practices

In its cost pass through application (and again in its regulatory proposal[167]), ActewAGL submitted it faced increased costs in 2012–13 due to higher than average rainfall in the preceding two years. ActewAGL considered the 'unexpected increased vegetation growth' meant the scale of vegetation growth and encroachment on clearance zones was not apparent until ActewAGL's preparation for the 2012–13 bushfire season.[168] ActewAGL, therefore, considered it needed to undertake "urgent" vegetation clearing works on some private urban properties. The *Utilities Act 2000* does not enable to ActewAGL to recover its costs from land holders in urgent circumstances.[169] These costs were the subject of ActewAGL's application. Our analysis in this process demonstrated hourly rate contracting was a key driver of increased expenditure.

ActewAGL employs hourly rate contracting as the primary means of undertaking vegetation management activities. Under this type of contracting arrangement, the risk associated with low productivity lies with the service provider, and hence consumers.

The contractor has little incentive to drive increased productivity because this form of contract does not provide an incentive for effective vegetation clearance that would minimise regrowth effect and future clearing costs. During the cost pass through review process, TasNetworks submitted an expert report that provides evidence that hourly rate contracting arrangements are potentially more inefficient than other forms of contracting.[170] Some service providers may use hourly rate contracting arrangements. However, such arrangements are typically only for emergency work, rather than for a 'business as usual' approach to vegetation management.[171]

Similarly, Essential Energy provided documentation with its 2014-19 regulatory proposal that supports the view that hourly rate contracting arrangements are potentially more inefficient than other forms of contracting.[172] Following a strategic review of its vegetation management practices, Essential Energy also identified issues with its contracting arrangements:[173]

> The hourly rate model creates little or no incentive for contractors to deploy resources efficiently as all of their costs are covered. In fact the reverse is the case with an hourly rate model creating an incentive to over service the business.

Essential Energy's vegetation management expenditure in the 2009–14 period – like ActewAGL's – increased steadily each year. As a consequence Essential Energy has undertaken to move to an outcomes based contractor management model and has forecast a decrease in annual vegetation management costs arises due to achievement of efficiencies through a number of strategic reform initiatives.[174]

In our final determination on ActewAGL's vegetation management cost pass through application, we explained that information submitted by ActewAGL in that process clearly showed increasing contractor costs were a major contributing factor to increased vegetation management costs over

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167 ActewAGL, *Regulatory Proposal*, 2014, p. 218.
168 ActewAGL, Vegetation management cost pass through, November 2013, p. 3.
169 ActewAGL, Vegetation management cost pass through, November 2013, p. 17.
170 Aurora Energy, *Submission on the AER's draft determination on ActewAGL's cost pass through application*, 20 June 2014, p. 1.
171 AER, Final Determination – *ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, Appendix B.
172 For example, Essential Energy, Vegetation Management Strategy and Implementation Plan for Additional Expenditure – FY 2013 to 14, February 2013, p. 11.
173 Essential Energy, Executive Leadership Group Meeting Item 6.2 (appendix) Vegetation Management Review Findings, 2014, p. 13.
174 Essential Energy, Executive Leadership Group Meeting Item 6.2 (appendix) Vegetation Management Review Findings, 2014, p. 9; Essential Energy, Regulatory Proposal, p. 73.

time.[175] ActewAGL did not provide evidence that it had reviewed its use of hourly rate contracts as part of its overall vegetation management strategy when requested. Accordingly, we concluded that ActewAGL's contracting arrangements were a key driver of inefficient vegetation management expenditure.[176] On the basis of the information before us, we see no reason to change our view for this determination.

Lack of prudent operational risk management

In addition to contracting inefficiencies, we also considered it was not evident, based upon the information it provided in support of its pass through application, that ActewAGL had a strategy to effectively monitor, anticipate and respond to changes in vegetation growth. ActewAGL did not appear to have responded to evidence of significant vegetation growth in a timely manner such that it could take operational risk management initiatives in mitigation. Accordingly, we considered it unclear how ActewAGL would prevent or mitigate additional costs from changes in vegetation growth rates.[177]

Further, our technical advisory group (TAG) considered that ActewAGL had not submitted any evidence that showed it recognised the escalating costs or its growing unit costs such that it could respond in a managed way to reduce the cost impact of the regrowth event. TAG observed:[178]

> Good industry practice requires review of costs and performance, particularly in response to significant events and this is not evident in the information provided by ActewAGL either in its earlier or most recent responses. Rather the information the TAG has reviewed suggests that ActewAGL simply continued its standard practices in the face of growing cutting volumes, growing costs, and increasing unit cost trends that would have been apparent in management key performance indicators. This view is reinforced by the advice from ActewAGL that it does not keep records and data of the volume of its vegetation management activities.[179]

TAG considered the lack of key information will impact strategy development, governance practices (such as monitoring key performance indicators), work planning, efficiency improvement and risk management. TAG's view was that ActewAGL's vegetation management costs in the 2009–14 period are inefficient and that its reactive management of the regrowth event did not reasonably minimise or avoid the associated costs. Rather, it contributed to the cost increases.[180]

We are satisfied that the analysis we conducted for the final determination on ActewAGL's vegetation management cost pass through remains relevant to considering material inefficiency in base year opex.

Urgent clearance

ActewAGL submits that annual urgent clearance costs are approximately 20 per cent of total vegetation management costs. It expects greater use of LiDAR will enable it to reduce urgent clearance costs by 40 per cent by the end of the forecast period.[181]

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175 ActewAGL, *Vegetation management cost pass through: response to second additional information request,* February 2014, p. 9.

176 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, pp. 21–26.

177 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, pp. 17–26.

178 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, Appendix B, p. 4–5.

179 ActewAGL, *Vegetation management cost pass through: response to second additional information request,* February 2014.

180 AER, *Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year*, July 2014, Appendix B, p. 4–5.
ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, p. 37.

The relevant section of the *Utilities Act 2000* is section 110(8). ActewAGL may carry out vegetation management "in urgent circumstances" without giving notice to the land holder:

> (8) In urgent circumstances in which it is necessary to protect—
>
> (a) the integrity of a network or a network facility; or
>
> (b) the health or safety of people; or
>
> (c) public or private property; or
>
> (d) the environment;
>
> subsections (2) and (3) do not apply and the utility may carry out the operations at its own expense.

The phrase "urgent circumstances" is important. ActewAGL is entitled to recover reasonable costs when acting in accordance with section110(6) following a notice to the land holder to take vegetation management action. As long as ActewAGL properly provides notice to the land-holder in accordance with its obligations in section 110, it may recover reasonable expenses associated with vegetation management if the land-holder does not comply with its responsibilities pursuant to the notice:

> (6) If the land-holder does not carry out the activity in accordance with a requirement in the notice mentioned in subsection (3)(c)—
>
> (a) the utility may carry out the activity; and
>
> (b) the reasonable expenses thus incurred by the utility are a debt due to the utility by the land-holder.

In the cost pass through final determination, we considered that ActewAGL's reactive approach to vegetation management was the reason it incurred additional costs in purported "urgent circumstances". Had ActewAGL used a more prudent and efficient pre-emptive strategy, it would have had ample time to adopt a considered and managed response to the greater than normal vegetation regrowth before the 2012–13 bushfire season.[182] That is, a more prudent approach would have eliminated the need for the "urgent" work.

In addition, statements in ActewAGL's regulatory proposal suggest it seeks to minimise reactive work in some instances because customers are more comfortable with planned outages than unplanned outages. In 2003, ActewAGL and ACTEW Corporation commissioned NERA and AC Nielson to conduct a study on customers' willingness to pay over a twelve month period. ActewAGL submits:[183]

> The study found that customers were less concerned with planned (than unplanned) outages of a given duration, as long as they were given sufficient notice of that outage (two to seven days prior notice).

ActewAGL goes on to state:[184]

> ActewAGL Distribution has continued to undertake a relatively high proportion of planned (rather than reactive) maintenance on the network in recognition of this finding and the difficulties associated with accessing backyard reticulation to address unplanned outages.

In our view, this suggests that if ActewAGL adopted a more proactive approach to vegetation management it should be able to minimise undertaking "urgent" work on private land. In such cases, uncooperative land holders would be responsible for the costs rather than ActewAGL's entire

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182 AER, Final Determination – ActewAGL Distribution cost pass through application – Vegetation management costs for the 2012–13 regulatory year, July 2014, pp. 19–20.
183 ActewAGL, Regulatory Proposal, 2014, pp. 40–41.
184 ActewAGL, Regulatory Proposal, 2014, pp. 40–41.

customer base. However, ActewAGL's current reactive practices seem to be resulting in ActewAGL unnecessarily incurring inefficient expenditure.

ActewAGL submits that annual urgent clearance costs are approximately 20 per cent of total vegetation management costs. It expects greater use of LiDAR will enable it to reduce urgent clearance costs by 40 per cent by the end of the forecast period.[185]

ActewAGL's statements in its most recent submission about reducing urgent vegetation management costs tends to suggest ActewAGL agrees it could improve its approach by reducing the amount of reactive work it performs.[186]

Backyard reticulation

ActewAGL submits that backyard reticulation imposes significant costs, unique to its network.[187] While ActewAGL's backyard reticulation obligations may account for some of the gap between ActewAGL and its peers in performing vegetation management, we consider it does not wholly justify the level of expenditure in the base year.

Network characteristics

Backyard reticulation accounts for a relatively small proportion of ActewAGL's network. Of its total route line length, approximately 52 per cent is underground, which means that more than half of ActewAGL's network does not require vegetation management. As a proportion of total route line length, the 755 km of backyard reticulation represents approximately 15 per cent.

Table A.13 ActewAGL's line length characteristics (km)

	2008-09	2009-10	2010-11	2011-12	2012-13
Backyard reticulation line length	726	726	726	755	755
Other overhead route line length	1,581	1,581	1,581	1,641	1,641
Total overhead route line length	**2,307**	**2,307**	**2,307**	**2,396**	**2,396**
Underground circuit line length	2,370	2,456	2,535	2,614	2,694
Total route line length	**4,677**	**4,763**	**4,842**	**5,010**	**5,090**

Source: Economic Benchmarking RIN, Table 6.1.2; Category Analysis RIN, Table 2.7.1; ActewAGL, Response to information request 018 of 5 August 2014, received 12 August 2014.
Note: We are assuming underground circuit length and route length kilometres would be the same.

However, of this 15 per cent, ActewAGL is primarily responsible for active vegetation management for only 9.9 km (1.3 per cent) of backyard reticulation lines. This equates to 0.2 per cent of ActewAGL's total network route line length and 0.4 per cent of its overhead route line length. Land holders have primary responsibility for managing vegetation for the remaining 98.7 per cent of backyard reticulation line length (31 per cent of ActewAGL's overhead route line length). In addition, the ACT government Territory and Municipal Services has primary responsibility for managing vegetation under all urban line length on public land.[188] In total, this means that ActewAGL has primary responsibility for only 12 per cent of vegetation management under its overhead network, comprising predominantly rural spans.

185 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, p. 37.
186 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, p. 37.
187 ActewAGL, Regulatory Proposal, 2014, pp. 22–23, 242–243.
188 ActewAGL, Response to information requested on 17 September 2014, received 24 September 2014.

Land holder responsibilities

In its regulatory proposal, ActewAGL explains that land holder responsibilities do not necessarily eliminate the need for ActewAGL to incur expenditure:[189]

> While it is the lessees' [land holder] responsibility to maintain trees away from powerlines, many ignore their responsibilities, even following formal notice from ActewAGL Distribution. The Utilities Act requires ActewAGL Distribution to cover the costs of emergency tree-cutting and associated removal of debris, even if the lessee had previously been requested to remedy the situation.

Additionally, in response to a request for further information, ActewAGL quantified several examples of the incremental expenditure associated with backyard reticulation (relating to maintenance and vegetation management activities). In particular, ActewAGL cited costs of $2.0 million per annum for:[190]

- notification letters prior to inspections
- cancelled inspections
- additional time for inspections
- access issues (primarily due to scaffolding requirements).

ActewAGL's reasons for these costs include locked gates and animals that prevent access and require a revisit, time taken to enter property and time taken to erect scaffolding.[191]

Our estimate, based on the information provided by ActewAGL, is that approximately half of this $2.0 million amount relates to vegetation management and the remainder is associated with maintenance activities.

While land holders may result in some additional incremental costs to ActewAGL, ActewAGL is entitled to receive revenue from them. In 2012–13, for example, ActewAGL invoiced $0.1 million to land holders for vegetation clearing costs incurred (that are recoverable from the land holder). ActewAGL submitted that its reported vegetation management expenditure excludes this revenue but states in most cases there is a significant cost in debtor management and bad debt write-offs.[192] Irrespective of the costs associated with collecting revenue, ActewAGL has neglected to include revenue from land holders as a potential mitigating factor to the additional costs it says are associated with backyard reticulation.

Notwithstanding this, the approximately $1.0 million of additional costs attributable to backyard reticulation equates to approximately 20 per cent of vegetation management opex, which is a material amount.

ActewAGL further submits that the trimming approach of property occupants can lead to additional inspections and increasing costs.[193] Urban vegetation management costs, therefore, amount to 50 per cent of total vegetation management opex, despite ActewAGL not being primarily responsible for trimming most of the vegetation.[194]

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189 ActewAGL, Regulatory Proposal, 2014, pp. 22–23.
190 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 22–24.
191 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 22–23.
192 ActewAGL. Response to follow up information request 024 of 17 September 2014, received 24 September 2014.
193 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 35–36.
194 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 36–37.

Inspections and trimming

ActewAGL advises property occupants that it will conduct an inspection 7 days prior to the inspection. If ActewAGL finds vegetation encroaching minimum clearance distances, it issues the occupant with a notice to clear the vegetation. ActewAGL estimates it issues notices to 20 per cent of the properties it inspects. ActewAGL conducts a second inspection 21 days after the initial inspection and organises clearing if the land holder has not performed the clearance.[195]

The *Utility Networks (Public Safety) Regulation 2001* defines the minimum clearances for trimming.[196] While ActewAGL, in its notices to land holders, suggests trimming an extra distance to allow for regrowth, occupants often choose not to trim beyond the minimum requirements because it is not a regulatory requirement. This, ActewAGL submits, shortens the time for vegetation to encroach within clearances of overhead lines, creating another cycle of additional inspections (which increases costs).[197]

ActewAGL submits that the principal driver of urban vegetation management is the labour cost incurred in conducting inspections. ActewAGL has attempted to mitigate its inspection costs by conducting targeted advertising campaigns and by introducing a new system that allows vegetation inspectors to wirelessly log inspection information and issue notices to occupants as they conduct inspections.[198]

Conclusions on backyard reticulation

We acknowledge ActewAGL may incur additional costs associated with backyard reticulation assets. Indeed, on a per unit basis, the costs associated with access to the rear of the properties could be significant. Costs include inspections, negotiations with land holders, specialist equipment and reinstatement of any damage (to garden beds, for example). Audits and administrative costs may not be insignificant.

However, as we observed above, the proportion of backyard reticulation lines relative to ActewAGL's overhead route line length is 31.5 per cent. ActewAGL has primary responsibility for trimming only 0.4 per cent of this proportion of its overhead network. We are satisfied that ActewAGL has been able to demonstrate that backyard reticulation and the associated issues with land holders does result in incremental vegetation management (and maintenance) costs that other service providers do not incur. Accordingly, we have included an allowance for backyard reticulation as an operating environment factor. We discuss this further in section A.5.6.

However, on the evidence before us, our view is that backyard reticulation is likely only to be part of the reason for high vegetation management expenditure in the base year. We consider ample evidence exists that demonstrates ActewAGL's inefficient vegetation management practices are the primary cause of its high unit costs in comparison to its peers.,

Rural issues

ActewAGL submits it does not face the problems in rural areas because it has full control of vegetation management. However, ActewAGL submits rural areas pose their own problems because forested areas are the predominate location for zone substations. This is due to an apparent (but not cited) planning requirement that the sub-transmission network remains out of sight. ActewAGL

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195 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 36–37.
196 *Utility Networks (Public Safety) Regulation 2001*, regulations 25-26.
197 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 35–36.
198 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 35–36.

considers this requirement results in high reactive maintenance costs. It seems this is due to bushfires being an inevitable part of living in the ACT.[199]

ActewAGL's submission is not, in our view, persuasive. Regardless of the degree of susceptibility to bushfires in the ACT, ActewAGL should be able to proactively manage and control bushfire mitigation expenditure. It may or may not be common for zone substations in other networks to be located in forested areas. However, we do not accept that of itself, this should result in increased *reactive* vegetation management. Given ActewAGL knows the location of its zone substations and it knows those in forested areas may be more susceptible to bushfires, ActewAGL should be able to proactively manage the surrounding vegetation to mitigate the impact of bushfires.

[199] ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 33–34. 37.

A.5 The net impact of operating environment adjustments

We are satisfied that differences in operating environment factors, not accounted for in Economic Insights' benchmarking models, may account for up to 30 per cent of the apparent difference in efficiency between ActewAGL and the comparison service providers.[200] We have come to this conclusion after assessing 37 different operating environment factors that we, service providers, and other stakeholders identified in the process of this review and in response to our draft benchmarking report.

To account for operating environment factors not adjusted for in our benchmarking techniques, we have identified operating environment adjustments. For each operating environment factor identified, we considered if it is necessary to provide an operating environment adjustment for it. We determined which factors require an adjustment using three operating environment adjustment criteria. Where we were satisfied that an operating environment adjustment is required we assessed the factor to estimate its impact on service providers' opex.

We identified five operating environment factors that require operating environment adjustments. The first adjustment is to account for the effect of differences in capitalisation. The second accounts for the impact of standard control services connection costs. The third accounts for the impact of backyard reticulation. The fourth accounts for differences in taxes and levies. The fifth accounts for differences in occupational health and safety regulations. The table below summarises the adjustments.

Table A.14 Summary of operating environment adjustments

Capitalisation policy	Standard Control Services Connections	Backyard reticulation	Taxes and Levies	OH&S regulations	Total
17.6%	4.5%	2.8%	2.3%	0.5%	27.7%

Source: AER analysis.

During the course of our investigation, we identified additional operating environment factors that did not meet the operating environment adjustment criteria because they would not create material differences in opex. These include:

- building regulations
- bushfires
- corrosive Environments
- environmental regulations
- grounding Conditions
- natural disasters
- planning regulations
- proportion of 11kV and 22kV lines

[200] The comparison service providers are all service providers that have efficiency scores above 0.75 on our Cobb Douglass SFA benchmarking model, which is our preferred economic benchmarking method. The efficiency target is based on the customer weighted average efficiency score for these service providers.

- proportion of hardwood poles
- service lines
- shape factors
- skills required by different service providers
- subtransmission
- topography
- traffic management.

Although individually the effects of these operating environment factors on opex may not be material, their combined effect may be.[201]

We are satisfied that the total operating environment adjustment to the efficiency score for ActewAGL should be positive 30 per cent. We consider that it is appropriate to take a more holistic view of the possible effects of operating environment factors on ActewAGL's opex. As a result, we have used the operating environment adjustments identified as an indication of the total impact that operating environment factors may have on ActewAGL's costs.

We have considered all of the submissions made to us on operating environment factors, but not all service providers have had the same opportunities to provide information on the operating environment factors that affect their costs yet. Our review has focused on the operating environment factors affecting ActewAGL and the NSW service providers in the context of the current draft determination. In future we expect that other service providers and stakeholders will provide further information on the effect of operating environment factors. Following the AEMC,[202] we have separated the analysed factors into five groups which are considered separately below:

- customer factors
- endogenous factors
- geographic factors
- jurisdictional factors
- network factors.

A.5.1 Approach to operating environment factors

It is important to recognise that 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 opex. It is desirable to adjust for material operating environmental differences to ensure that when comparisons are made across service providers, we are comparing like with like to the greatest extent possible. Oakley Greenwood

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201 We note that these operating environment factors may not all affect costs in the same direction. That is some of these factors may advantage ActewAGL and some may disadvantage it.

202 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

note that by identifying the effect of operating environment factors on costs we can determine the extent to which cost differences are exogenous or due to inefficiency.[203]

In our assessment, we have directly incorporated operating environment factors into our models where possible. Where we have not been able to do this we have considered the quantum of the impact of the operating environment factors on the opex of ActewAGL relative to the comparison service providers. The operating environment adjustment serves to account for differences in opex between ActewAGL and the comparison firms not related to efficiency.

We have used three criteria to help us decide whether or not an operating environment factor should be accounted for:

1. **Is it outside of the service provider's control?** The first criterion is that an operating environment factor should be outside the control of service provider's management. Where the effect of an operating environment factor is within the control of service provider's management we would not generally provide an adjustment for the operating environment factor.[204] Adjusting for that factor may mask inefficient investment or expenditure.

2. **Is it material?** The second criterion is that an operating environment factor should create material differences in service providers' opex. Where the effect of an operating environment factor is not material, we would generally not provide an adjustment for the factor. Many factors may influence a service provider's ability to convert inputs into outputs

3. **Is it accounted for elsewhere?** The third criterion is that the operating environment factor should not have been accounted for elsewhere. Where the effect of an operating environment factor is accounted for elsewhere, we have not provided an adjustment for that factor. To do so would be to double count the effect of the operating environment factor. [205]

A.5.2 Customer factors

Customer Density

We are satisfied that it is not necessary to provide an operating environment adjustment for customer density. An adjustment for customer density does not satisfy operating environment adjustment criterion three. On the basis of second stage regression analysis of the opex MPFP results, we are satisfied that output variables sufficiently account for the effects of customer density.

Ausgrid, Endeavour Energy, and Essential Energy have all raised topographic conditions as an operating environment factor that will affect the benchmarking results.[206] [207] [208]

Customer density is a useful proxy for identifying the distance between customers. As each service provider has an obligation to serve existing customers, we assume that this is therefore an exogenous factor. Customer density, in and of itself, does not drive costs. Factors correlated with customer density are the underlying cost drivers. These include:

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203 Oakley Greenwood, *Review of NSW DBs Regulatory Submissions*, 5 August 2014, p. 16.

204 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

205 For example, our models capture the effect of line length on opex by using circuit length as an output variable. In this context, an operating environment adjustment for circuit length would double count the effect of route line length on opex. Another example is that we exclude metering services from our economic benchmarking data. In this case, an operating environment adjustment would remove the metering services from services providers' benchmarked opex twice.

206 Ausgrid, *Attachment 5.33* to *Regulatory proposal*, 2014, p. 3.

207 Endeavour Energy, *Attachment 0.12* to *Regulatory proposal*, 2014, p. 3.

208 Essential Energy, *Attachment 5.*4 to *Regulatory proposal*, 2014, p. 5.

- Asset exposure - A shorter line will be less exposed to degradation from the elements and damage from third parties.
- Asset numbers - The need to service customers that are spaced further apart will require additional substations, length of lines or cables to provide the same level of service.
- Travel times - the time taken to travel between customers or assets increases as those assets or customer are spaced further apart.
- Traffic management - traffic management requirements typically increase proportionally to the volumes of traffic on, or adjacent, to the worksite.
- Asset complexity - The complexity of assets in a given location - for example; multiple circuits on a pole, or circuits in a substation.
- Proximity to third party assets - Increased urban density results in more third-party overhead and underground asset being in proximity to electrical assets. This proximity requires increased co-ordination, planning, design, and installation costs.
- Proportion of overhead and underground - Increased urban density can result in greater obligations or constraints on the service providers in relation to the augmentation or construction of underground/overhead assets. Maintenance of underground assets is typically reduced compared with overhead assets.
- Topographical conditions - adverse topographical conditions such as swamps and mountainous terrain, amongst other things will typically result in less habitable areas and increased costs associated with access to these areas.

Each of the above factors will affect network opex differently. It is obvious that some will have more of an adverse effect on rural services, while others will have a more adverse effect on urban services. The following table summarises the effect of the factors on networks depending on their respective customer density.

Table A.15 Customer density factor impacts

Factor	Opex benchmark benefit
Asset exposure	Urban networks
Asset numbers	Urban networks
Travel times	Urban networks
Traffic management	Rural networks
Asset complexity	Rural networks
Proximity to third-party assets	Rural networks
Proportion of overhead and underground	Urban networks
Topographical conditions	Urban networks

Source: AER analysis.

The cost relationships explored in the table are simplifications. In reality, some may not be linear. For example, travel times may initially decrease as customer density increases but then increase again. This is because traffic congestion is likely to affect CBD areas more than urban or rural areas. We

have made these simplifications to help demonstrate the effect that customer density may have on costs.

The fact that it is a simplification aside, the table demonstrates that it is not evident what the overall impact of customer density is on service providers' opex. Given the complexity of the above factors, it is clear that it is important to consider the impacts of customer density in any benchmarks that are undertaken.

We have considered a number of measures for aggregating the impacts from the above factors. Historically, industry benchmarks have used a number of representative measures including:

- customer density measured as customers per (circuit) km of line (cust/km)
- energy density measured as energy delivered per (circuit) km of line (kWh/km)
- demand density measured as demand per (circuit) km of line (MVA/km)
- customer density measured as customers per square kilometre of service territory.

The use of service territory as a density measure has proven problematic. This is due to the difficulty in accurately measuring service territory items such as lakes, national parks, and unpopulated areas. As the networks do not incur costs for areas that are un-serviced, customers per square kilometre of service area is not a useful measure for opex or service comparisons.

A number of benchmarking studies and reviews have considered the relative merits of the different remaining density measures identified above (customer, energy and demand).[209][210][211] As the ratios of energy and demand are relatively similar on a per customer basis, it is not clear whether there is any greater intrinsic benefit from any one of these density measures.

As customer density per kilometre is a relatively easy concept to understand, we have adopted this as our standard approach.

We are satisfied that an adjustment for customer density is not required. It raises the third operating environment criterion. The effect of customer density appears to have been captured by other variables in Economic Inisghts' benchmarking models. Economic Insights carried out statistical analysis that shows that the MPFP benchmarking models account for customer density.[212]

Because the MTFP and opex cost function models use customer numbers, line length and demand as outputs (like the MPFP model) we are satisfied that they will also account for customer density. Density measures are ratios of customer numbers, energy throughput, and demand to line length.

Customer requirements

We are satisfied it is not necessary to provide an operating environment adjustment for customer requirements. An adjustment for customer requirements raises the issues in our operating environment adjustment criterion three. Special customer requirements are accounted for elsewhere in Economic Insights' benchmarking models. This is because our economic benchmarking data only

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209 Benchmarking Opex and Capex in Energy Networks, Working Paper no.6, May 2012, p. 18.
210 Western Power: Transmission & Distribution Network cost analysis & Efficiency benchmarks Volume II, Theoretical framework June 2005, Benchmark Economics.
211 Aurora Energy, A comparative analysis: Aurora Energy's Network cost structure, Benchmark Economics.
212 EI, *Economic Benchmarking of Operating Expenditure for NSW and ACT Electricity DNSPs*, November 2014, p. 24.

capture information on network services. An adjustment would therefore be likely to lead to double counting.

ActewAGL said in its regulatory proposal that the requirements of some of its customers affect its costs.[213] ActewAGL said that because it is located in Canberra it has a high proportion of strategically important institutions that require a high level of security of supply.

All service providers have customers with high security of supply requirements. Examples of these include hospitals, state parliaments, military installations, banks, stock exchanges, and telecommunications facilities. Many manufacturing industries also have very high requirements for supply security due to the costs of lost production and equipment damage.

We are satisfied that an adjustment for customer requirements would not be appropriate because connection services are excluded from our economic benchmarking data. Connection services are not included in network services. Because connection services are excluded from network services, connection services cannot affect benchmarking that uses network services data. Connection services include the opex and capex incurred for new connections or the modification of connections. These services can include the addition of feeders to a customer's premises for increased redundancy or upstream augmentation. Therefore, the services required to provide additional security of supply to customers with special requirements are connection services. We acknowledge that the modifications required by special customers may lead to service providers incurring additional opex to service the new assets. However, the additional inputs are also reflected in outputs, such as line length and ratcheted peak demand, in Economic Insights' benchmarking models.

Also, there are no explicit regulatory requirements on ActewAGL to provide a higher level of security of supply to customers with special requirements.[214] Therefore, customer requirements will not lead to cost differences between ActewAGL and other service providers that are unrelated to efficiency. ActewAGL identified several ways in which servicing customers with special requirements will lead to higher ongoing opex such as difficulties in access, confidentiality agreements and ongoing maintenance of additional feeders and substations. 215 As mentioned earlier, all service providers have customers with special requirements. Therefore, to the extent that customers with special requirements impose costs on ActewAGL, they will also impose costs on other service providers.

Further, customers with high reliability and security of supply requirements will tend to take non-network measures to protect themselves from potential outages. For example, they often have back-up supply systems and generators to ensure continuous supply in the event of a distribution system outage. They also often also have systems such as batteries and powerline conditioners to prevent temporary disruptions in supply from affecting sensitive systems such as computer servers. In addition, customers may be required to fund non-standard connections through capital contributions.

Mix of demand to non-demand customers

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in the ratio of demand to non-demand customers in our economic benchmarking. It also raises the issues we identify in operating environment factor criteria three. To the extent that the ratio of demand to non-demand customers does have an impact on costs, Economic Insights' benchmarking models account for it.

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213 ActewAGL, *Regulatory proposal*, 2014, p. 243.
214 ActewAGL, *Response to Information Request AER ACTEW 027 - OPEX*, 3 September 2014, p. 2.
215 ActewAGL, *Response to Information Request AER ACTEW 027 - OPEX*, 3 September 2014, p. 2.

Ausgrid's consultant Evans and Peck raised differences in customer classifications as a factor that may impede like for like comparisons.[216] They said this would affect line lengths and value per customer. The AEMC also raised the mix of industrial and residential customers as an exogenous factor that may be relevant when benchmarking service providers. [217]

An adjustment for the ratio of demand to non-demand customers is not necessary because the extent that the ratio of demand to non-demand customers has an effect on costs, our Economic Insights' benchmarking models account for that effect. The models takes into account peak demand and customer numbers, which should capture the effect of differences in the ratio of demand to non-demand customers. The data used also exclude metering and connection costs. Therefore, Economic Insights' benchmarking models account for the main factors through which demand customers may impose higher costs on service providers than non-demand customers.

Population growth

We are satisfied that it is not necessary to provide an operating environment adjustment for population growth. An adjustment for population growth and its effect on customer numbers would raise operating environment adjustment criterion three. Economic Insights' models account for population growth through customer numbers and peak demand.

Evans and Peck have identified population growth as an operating environment factor it considers would affect benchmarking results.[218] It did not say that the process of customer growth in itself manifests itself in cost differences,[219] but that the location of growth may create differentials in costs. Evans and Peck list a number of reasons for why it considers brownfields developments are higher cost than green-fields developments.[220]

Population growth (or decline) affects all service providers. Some service providers will experience higher growth than others and some areas of their networks will experience more growth than others.

We are satisfied that it is not necessary to provide an operating environment adjustment for population growth because Economic Insights' benchmarking models account for it. Customer numbers and peak demand are output variables in Economic Insights' MTFP, MPFP and opex cost function benchmarking models.

We are also satisfied that it is not necessary to provide an operating environment adjustment for differences in population growth in greenfields and brownfields developments because connection costs are not included in our economic benchmarking data. Brownfields developments may have higher connection costs than greenfields developments. However Economic Insights' benchmarking models use network services data. Network services exclude connection services. Because network services do not include connection services, connection services cannot affect benchmarking that uses network services data.

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216 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. iii.

217 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

218 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, pp. 53–55.

219 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 28.

220 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, pp. 38–39.

Load growth

We are satisfied that it is not necessary to provide an operating environment adjustment to account for differences in load growth. It raises operating environment adjustment criterion three. Economic Insights' benchmarking models account for load growth.

Ausgrid's consultant Evans and Peck raised load growth as a possible operating environment factor that may impede like for like comparison between service providers.[221]

An adjustment for load growth is not necessary because to the extent that load growth has an effect on costs, Economic Insights' benchmarking models accounts for that effect. Economic Insights' MTFP, MPFP, and opex cost function models account for changes in network capacity by including ratcheted peak demand as an output variable.

Load factor

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in load factor. It raises operating environment adjustment criterion two and three. It is unlikely that load factor will to lead to material differences in opex between services providers. The relevant cost driver is peak demand, which Economic Insights' benchmarking models account for.

Evan's and Peck say that the Load factor and duration for SA and Victoria give service providers in those states a natural cost advantage.[222] Load factor is a network's average demand divided by its peak demand.

Service providers design electricity networks to taking into account the expected peak demand for electricity services. While the actual energy usage on a network is important from a billing perspective, energy is not the driver for capital expenditure, and as a result, it is not the driver for opex either. The higher peak demand, the more assets will be required to accommodate those peaks.

We are satisfied that an adjustment for load factor is not necessary because load factor does not drive costs. The relevant cost driver is peak demand. As mentioned above service providers design electricity networks accounting for the expected peak demand. While the "peakiness" of the load may alter the timing of some demand driven projects, the magnitude of the peak will be the primary driver for this form of expenditure.

Further, we are satisfied that an adjustment for load factor is not required because Economic Insights' benchmarking models account for differences in peak demand. Ratcheted peak demand is an output in Economic Insights' MTFP, MPFP and opex cost function benchmarking models. As mentioned above it is peak demand that determines the capacity required by a network, not load factor.

Route line length

We are satisfied that it is not necessary to provide an operating environment adjustment to account for differences in route line length. It raises operating environment adjustment criterion three. Economic Insights' benchmarking models account for route line length.

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221 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, pp. 28–29.

222 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, pp. 26–27.

An adjustment for route line length is not necessary because to the extent that route line length has an effect on costs, Economic Insights' benchmarking models account for that effect. The MTFP, MPFP, and opex cost function models account for changes in route line length. Circuit length is included as an output in all of these models.

Economies of scale

We are satisfied that it is not necessary to provide an operating environment adjustment for economies of scale. It raises operating environment adjustment criterion three. The benchmarking model that we are using as the basis of our forecast of base opex, the Cobb Douglas SFA opex cost function, accounts for economies of scale.

ActewAGL has claimed that because it is the smallest service providers it does not have access to the same economies of scale as other service providers. As a result, they consider that their costs will appear to be higher than for all other services that have access to greater economies of scale.[223]

We are satisfied that an adjustment for economies of scale is unnecessary because the Cobb Douglas and Translog functional forms, which are used in Economic Insights' opex cost function benchmarking models, account for economies of scale. This is because both functions permit the estimation of the cost elasticities of the output variables. That is, the estimated coefficients of the output variables.

Cost elasticity with respect to an output represents how responsive opex is to a change in that output. The sum of the cost elasticities of individual outputs gives the returns to scale factor. If the sum of the cost elasticities is less than one, the underlying technology exhibits increasing returns to scale. Conversely, decreasing returns to scale will result if the sum of cost elasticities is greater than one. Equal cost elasticities, therefore, will result in constant returns to scale. For example, if opex increases by one per cent as a result of each output increasing by the same proportion, then this implies constant returns to scale.

A.5.3 Endogenous factors

Capitalisation policy

We are satisfied that it is necessary to provide ActewAGL a positive 17.6 per cent operating environment adjustment for differences in capitalisation. Although an adjustment for differences in capitalisation policy does not satisfy operating environment criteria one, not adjusting for differences in capitalisation policies may penalise ActewAGL for actions unrelated to efficiency.

ActewAGL has raised differences in capitalisation policies as a factor that may affect benchmarking of service providers.[224] ActewAGL considers that because it expenses more costs than other service providers do, it will be disadvantaged in benchmarking. The NSW service providers have also raised capitalisation as an issue that may affect benchmarking results. [225]

Capitalisation policies may affect the amount of opex recorded. Utilisation of capital will affect the amount of opex required. The relative efficiency of a service provider's opex and capex will also affect

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223 ActewAGL, *Regulatory proposal*, 2014, p. 243.

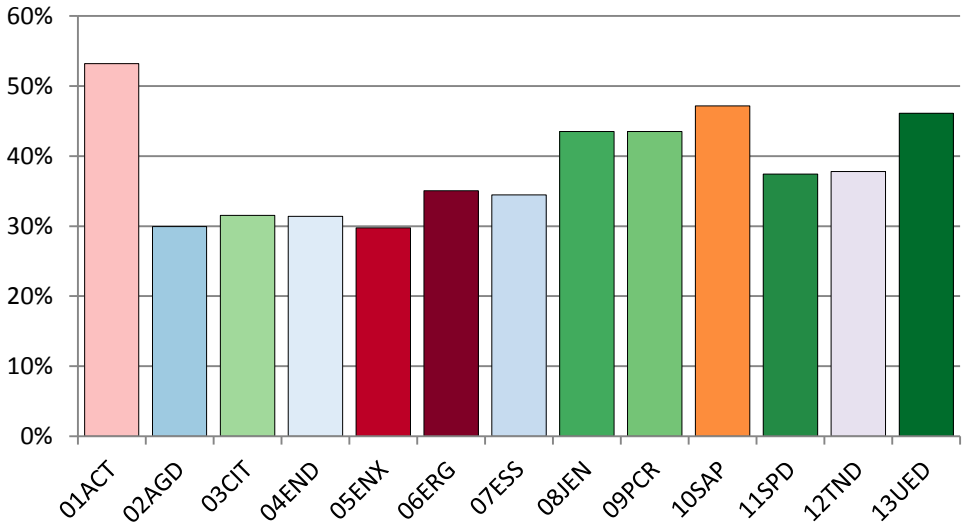
224 ActewAGL, Operating and capital expenditure 'site visit' clarifications, 3 October 2014, pp. 7–11.

225 Ausgrid, *Regulatory Proposal: Attachment* 5.33, 2014, p. 19.
Endeavour Energy, *Regulatory Proposal: Attachment* 0.12, 2014, p. 20.
Essential Energy, *Regulatory Proposal: Attachment 5.4*, 2014, p. 26.
Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 5.

the opex to capex ratio, as will service providers' location in their asset replacement cycles. A high opex to capex ratio may simply reflect the efficient utilisation of opex and capital. For instance, SA Power Networks and United Energy, which are two of the best ranking service providers in our benchmarking results, have high opex to capex ratios. Where service providers are spending more on capex, we would also expect more overheads to be allocated to capex.

We are satisfied that differences in capitalisation policies will affect ActewAGL's benchmarking results relative to the comparison service providers. Although capitalisation policies are determined by service providers' management, capitalisation policies may lead to differences in opex that are unrelated to efficiency. This is because they reflect accounting differences rather than economic differences. Because ActewAGL is an outlier in terms of the amount of costs that it expenses we are satisfied that it is necessary to provide an operating environment adjustment. ActewAGL expenses more costs, as a percentage of total expenditure, than any other service provider in the NEM.[226] This is shown in Figure A.20 below. Actew AGL expenses some costs that other service providers capitalise and during the benchmarking period capitalised more costs than they propose to over the 2014 to 2019 period.

Figure A.20 Average opex as a percentage of totex, 2006 to 2013



Source: Economic benchmarking RIN data

An example of some of the costs that ActewAGL expenses that other service providers capitalise are vehicle and computer costs.[227] During the benchmarking period, ActewAGL employed operating leases for most of its vehicles. In 2012–13 it incurred around $2.5 million ($ nominal) in operating lease expenses for vehicles. Service providers in NSW and in Victoria on the other hand have finance lease arrangements, which have the effect of adding these asset values to the asset base. [228] Also, during the benchmarking period ActewAGL leased all of its computers. In 2012–13 ActewAGL estimated that its opex was $0.4 million ($nominal) higher than other service providers because it leases computers rather than capitalising them. In total ActewAGL considers that its opex will be $3 million higher than other service providers because of its capitalisation approach on these two cost categories.

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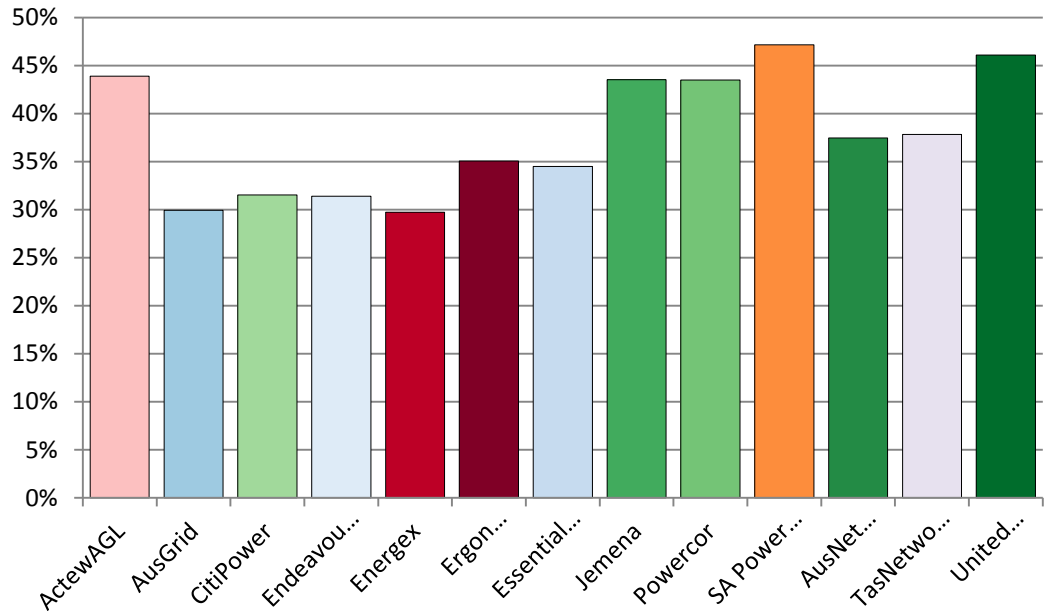
226 Economic Benchmarking RIN data
227 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, p. 11.
228 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, p. 11.

In June 2013 the AER accepted a new cost allocation method (CAM) for ActewAGL.[229] McGrathNicol advised ActewAGL that its new approach is more consistent with the practices of other service providers.[230] As a result to changes in its CAM ActewAGL has made a $7.2 million ($2013–14) adjustment to its base year. This adjustment is for changes in ActewAGL's capitalisation approach and changes in the allocation of corporate overheads. The change in capitalisation approach will lead to ActewAGL allocating $9.9 ($2013–14) million to capex instead of opex. This indicates that ActewAGL's annual opex may have been higher during the benchmarking period due to its capitalisation policy.

Taking this into consideration, we are satisfied that a 17.6 per cent operating environment adjustment is appropriate for ActewAGL's capitalisation policies. ActewAGL's vehicle and computer costs and its change in CAM provide some quantum of the effects of ActewAGL's capitalisation policy. Together these costs represent 17.6 per cent of ActewAGL's base year opex.[231]

Figure A.21 shows that when, for the benchmarking period, ActewAGL's annual opex is reduced by 17.6 per cent and its annual capex is increased by the dollar reduction in opex, its average opex to capex ratio becomes comparable to that of Powercor, SAPN and United Energy. These three service providers are included in our comparison service providers. Effectively a 17.6 per cent adjustment brings ActewAGL's opex to capex ratio into line with these three comparison service providers, which combined have the greatest weight in ActewAGL's efficiency target.

Figure A.21 Percentage of costs expensed as a percentage of total expenditure



Source: Economic Benchmarking RIN data, AER analysis

Risk appetite

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in the risk appetites of service providers' network owning corporations. Service providers choose their risk appetite.

229 AER, Final Decision: ActewAGL Distribution Revised Cost Allocation Method, June 2013.
230 ActewAGL, Letter to AER, Cost allocation methodology, 2 November 2012.
231 When the $7.2 million CAM adjustment is reversed.

Ausgrid's consultant Evans and Peck said differences in the risk appetites of service providers' network owning corporations may shape the costs of service providers and therefore impede like for like comparison.[232] Evans and Peck did not provide any further explanation about how differences in risk appetite would impede comparisons.

Part of the role of a corporation's management is to select the level of risk that they are willing to bear.[233] The quality of a firm's management is an endogenous factor that does not require an adjustment.[234]

Work and operating procedures

We are satisfied that it is not necessary to provide an adjustment for work and operating procedures. Work and operating procedures are under the direct control of service providers' management.

Evans and Peck raised the issue of work and operating procedures as an operating environment factor in its report for Ausgrid. Evans and Peck indicate that differences work and operating procedures may affect both operating and capital cost drivers.[235]

It is the role of service providers' management to seek and implement ways to improve the effectiveness and efficiency of the service provider's work and operating procedures. Because the effectiveness and efficiency of a service providers' work and operating procedures are a result of the quality of a service providers management, they are endogenous to the business and we do not consider it appropriate to account for them when benchmarking.[236]

Work conditions

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in work conditions. Service providers' managements are able to negotiate the agreements that they make with their workers.

Evans and Peck raised the issue of wage rates as an operating environment factor in its report for Ausgrid. Evans and Peck indicate that differences in wage rates and stand-down provisions in awards may affect both operating and capital cost drivers.[237]

The service providers in the NEM all have enterprise agreements.[238] A service provider's management has discretion in reaching an agreement that it strikes with its workforce. The deal that it makes represents a trade-off. The agreement might provide for lower wage rates in return for higher non-salary conditions. Alternatively, it might provide higher wage rates in exchange for productivity improvements. This is a simplification of reality but it illustrates the trade-off. Depending on the service provider's goals, it may be efficient to negotiate various entitlements with employees.

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232 Evans and Peck, Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs, November 2012, p. i.

233 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.

234 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

235 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 63.

236 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

237 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 63.

238 Fairwork commision, *Find an agreement*, available at: https://www.fwc.gov.au/awards-and-agreements/agreements/find-agreement. [last accessed 20 August 2014].

The two service providers with the highest efficiency scores on our Cobb Douglass SFA opex cost function, Powercor and CitiPower, have on average the highest and second highest labour cost per average staffing level in the NEM.[239] Both of these service providers are Victorian but economy wide Victorian wage rates are on average lower than those in the ACT, NSW, and Queensland.[240]

We therefore do not consider it appropriate to make a further adjustment for work conditions.

A.5.4 Geographic factors

Bushfire risk

We are satisfied that it is not necessary to provide an operating environment adjustment for bushfire risk. An operating environment factor adjustment for differences in bushfire risk between ActewAGL and the comparison firms does not satisfy operating environment adjustment criterion two. It does not appear that differences in bushfire risk between ActewAGL and the comparison service providers will lead to material differences in opex. This is because it is not clear if ActewAGL or the comparison service providers face higher costs because of bushfire risk.

Evans and Peck state that the Fire Danger Index published by the Australasian Fire and Emergency Service Authorities implies that the ACT and Victorian service providers have an equal risk of fire danger. [241]

However, it is unclear if ActewAGL will face greater bushfire risk than the comparison service providers. Some of the information available suggests that bushfire risk is higher in the ACT than in Victoria and South Australia, while some suggests that Victoria and South Australia are higher risk. Although some of our comparison service providers are not likely to face high bushfire risks, such as CitiPower, we have weighted ActewAGL's efficiency target according to the number of customers that the comparison service providers have. This means that the efficiency target is weighted towards predominantly rural service providers with higher bushfire risk.

Forecasts from Deloitte Access Economics of the total economic costs of bushfires for 2014, in Table A.16, suggests that the forecast economic cost of bushfires is higher for the ACT than for Victoria and South Australia. We have normalised the forecast cost of bushfires by Gross State Product. This is to prevent population and physical size from interfering with comparisons. While not a perfect measure, we are satisfied that it is preferable to normalising by area or population.

Table A.16 Forecast economic cost of bushfires for 2014

	ACT	NSW	Qld	SA	Tas	Vic
GSP ($m 2013)	35 088	476 434	290 158	95 123	24 360	337 493
Forecast cost of bushfires 2014 ($m 2013)	55	45	0.0	46	41	178
% of GSP	0.16%	0.01%	0.00%	0.05%	0.17%	0.05%

Source: Deloitte Access Economics[242] and ABS.[243] [244]

[239] Category Analysis RIN.

[240] ABS, 6302.0 - Average Weekly Earnings, Australia, May 2014, available at: http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/6302.0Main%20Features7May%202014?opendocument&tabname=Summary&prodno=6302.0&issue=May%202014&num=&view= . [last accessed 18 September 2014].

[241] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, pp. 62–63.

However, major bushfires have tended to occur more frequently in South Australia and Victoria than the ACT. Table A.17, which shows the location, and impacts, of major Australian bushfires of the 1900 to 2008 period, demonstrates this.

Table A.17 Significant bushfires and bushfire seasons in Australia 1900 to 2008

Date	States	Homes destroyed	Deaths
February 14, 1926	Victoria	550	39
January 8-13, 1939	Victoria and NSW	650	79
Summer 1943-44	Victoria	885	46
February 7, 1967	Tasmania	1557	64
January 8, 1969	Victoria	230	21
February 16, 1983	Victoria and SA	2253	60
February 18, 2003	ACT	530	4
January 11, 2005	South Australia	93	9

Source: Haynes et al.[245]

Also when normalised by population, South Australia, and Victoria experienced more deaths as a result of bushfire than the ACT. We have normalised by population rather than area because bushfires in unpopulated areas are unlikely to cause many deaths. This is shown in Table A.18**Error! Reference source not found.**.

Table A.18 Deaths as a result of bushfires per 100,000 people by state 1900 to 2008

	ACT	NSW	Qld	SA	Tas	Vic
Deaths	5	105	17	44	67	296
Average population 1900-2008[246]	122 524	3 804 434	1 688 122	911 524	324 896	2 818 053
Deaths per 100,000 residents	4	3	1	5	21	11

Source: Haynes et al[247] and ABS.[248]

Another indicator of bushfire risk is the bushfire related regulations that apply to a service provider. The regulations with which a service provider must comply are a direct imposition on a service provider's costs. It is not clear if regulations related to mitigating bushfire risk were more stringent in the ACT or Victoria during the benchmarking period. There were increased regulatory obligations placed on the Victorian service providers after the Black Saturday bushfires, but over the total

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242 DEA, Scoping study of a cost benefit analysis of bushfire mitigation: Australian Forest Products Association, May 2014, p. 12.
243 ABS, 5220.0 - Australian National Accounts: State Accounts, 2012-13.
244 ABS, 6401.0 - Consumer Price Index.
245 We used the average population over 1900 to 2008 rather than the current population to account for how population size may have changed over the period.
246 We used the average population over 1900 to 2008 rather than the current population to account for how population size may have changed over the period.
247 Haynes, K. et al.,Australian bushfire fatalities 1900-2008: exploring trends in relation to the 'prepare, stay and defend or leave early' policy, Environmental Science & Policy, vol. 13 no. 3, May 2010, p. 188.
248 3105.0.65.001 - Australian Historical Population Statistics, 2014.

benchmarking period, vegetation management regulations were stricter for Victorian service providers in some respects and stricter for ActewAGL in others.

The Victorian *Electricity Safety (Electric Line Clearance) Regulations 2010* prescribe (among other things) minimum clearance spaces for power lines in Victoria.[249] These superseded the previous regulations that came into effect in 2005. The *Utility Networks (Public Safety) Regulation 2001* defines minimum clearances for vegetation in the ACT.[250] The requirements in the ACT regulations are more stringent in some circumstances and more lenient in others relative to both versions of the Victorian regulations. The Victorian regulations require varying clearances depending on the type of cable, length of the span and the bushfire risk of the area within which the line is located. Further, it is unclear from the *Utility Networks (Public Safety) Regulation 2001* if the vegetation management clearances prescribed in the regulation apply to ActewAGL or if they only apply to the general public.

The Royal Commission into the 2009 Bushfires recommended changes to the operation and management of the Victorian distribution system. These obligations do not exist in the ACT and include: reducing the length of the asset inspection cycles, improving the efficacy of asset inspections, modifying the operation of reclosers, retrofitting vibration dampers to longer spans of power line, and fitting spreaders to power lines to minimise clashing.

On balance, we consider that it is uncertain whether ActewAGL's network faces greater or lesser risk of bushfire than the comparison service providers, which are located in South Australia and Victoria. Because of this uncertainty, we consider that there is not enough evidence at this stage to suggest that ActewAGL or the comparison service providers have a relative cost advantage or disadvantage due to bushfire risk.

Therefore, we are satisfied that an adjustment for bushfire risk does not satisfy operating environment adjustment criterion two. This is because it is not clear if ActewAGL or the comparison service providers face higher costs because of bushfire risk.

Corrosive environments

We are satisfied that an operating environment adjustment is not necessary for corrosive environments. An adjustment for corrosive environments raises our operating environment adjustment criterion two. All service providers have assets that corrosive elements affect.

Evans and Peck raise the issue of corrosion as an operating environment factor. They consider that the presence of corrosive atmospheres containing things such as salts (in coastal environments) and acid sulphates (in soils) affect maintenance costs.[251]

While salts affect assets in coastal areas, dusts affect assets in inland areas. These differences may lead to differences in design and operational considerations. However, there is not sufficient evidence to conclude that these differences will lead to material differences in opex. We have, however, included this factor as part of the overall allowance for operating environment factors.

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249 Electricity Safety (Electric Line Clearance) Regulations 2010, Schedule, 27 February 2013.
250 *Utility Networks (Public Safety) Regulation 2001*, regulations 25–26.
251 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 38.

Grounding conditions

We are satisfied that an operating environment adjustment is not necessary for grounding conditions. An adjustment for grounding conditions raises operating environment adjustment criterion two. The installation of earth grids is a very small part of service providers' costs. Also, there is likely to be as much variation in grounding conditions within service providers' service areas as between service providers.

Evans and Peck say that rocky terrain and high resistivity soils make the installation of earth grid, to provide effective protection, more complex.[252] Evans and Peck provide no further information on how this will affect service providers differently.

Electricity distribution requires the use of earthing or grounding connection to aid in the protection and monitoring of the network. In rural areas, service providers use the earth as the return path for some forms of electricity distribution[253]. These systems require service providers to create an electrical earth, usually from embedding conductors or rods in the ground. The effectiveness of these earths varies depending on the soil type and the amount of moisture in the soil.

The installation and maintenance of earth grids are a very small part of service provider's costs. Further, all service providers will have areas of their networks that provide more challenging grounding conditions than others do. It is likely that there is a greater degree of difference in grounding conditions within networks than between networks. Although there may be differences in grounding costs between networks, there is not sufficient evidence to conclude that these differences are material. We have, however, included this factor as part of the overall allowance for operating environment factors.

Natural disasters

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in the natural disasters faced by ActewAGL and the comparison service providers. An operating environment adjustment for natural disasters raises operating environment criterion two. Although the human impact of natural disasters is considerable, on average, the economic costs to ActewAGL and our comparison service providers are not likely to lead to material differences in opex.

When considering the effect of natural disasters, we have not considered bushfires. This is because bushfires may have a human cause whereas natural disasters do not. We have separately considered the effect of bushfires above.

Evan's and Peck identified major weather events as an operating environment factor that may affect benchmarking results.[254] Evans and Peck present analysis from the Bureau of Transport Economics (BTE) that estimate the magnitude of the costs imposed by disasters in Australia. These costs include the estimated costs of bushfires, cyclones, earthquakes, floods, landslides, and severe storms in Australia over the period 1967–1999.[255]

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252 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 38.

253 Single Wire Earth Return (SWER).

254 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, pp. 66-67.

255 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 66.

We are satisfied that natural disasters are not likely to lead to material differences opex relative to our comparison service providers. Data from BTE suggest that natural disasters are not likely to create material differences in opex between service providers. Data from the category analysis RIN also suggest that natural disasters do not create a material difference in opex between the ActewAGL and our comparison service providers.

When considering the impact of natural disasters on service providers' costs, it is appropriate to consider the average cost impact. While the cost of a natural disaster may be material when compared to total expenditure for a given year, service providers insure themselves against the costs of natural disasters. This mitigates the financial impact of natural disasters. Effectively, service providers amortise the costs of responding to natural disasters through insurance. This helps to alleviate cash flow volatility that natural disasters may cause. Because service providers amortise the cost of natural disasters, the average cost of natural disasters is more appropriate for the purpose of comparisons across service providers.

Data from the BTE suggests that natural disasters are unlikely to materially affect service providers' costs. These data estimate the total economic cost of natural disasters over the period 1967 to 1999. Table A.19 shows these data. We have normalised the average annual cost of natural disasters by Gross State Product. This is to prevent population and physical size from interfering with comparisons. While not a perfect measure, we are satisfied that it is preferable to normalising by area or population.

We have also excluded costs associated with bushfires because we have considered bushfires separately from natural disasters. We have also excluded earthquakes because they only affect NSW in the sample period, and Victoria and South Australia have a similar earthquake risk to NSW.[256] Even if the comparison service providers, which are located in Victoria and South Australia, were four times more likely to incur costs than a hypothetical state average firm, on average, less than 0.25 per cent of their costs would be due to natural disasters.

Table A.19 Average cost of natural disasters as a percentage of GSP 1967–1999: comparison by state

	ACT	NSW	QLD	SA	TAS	VIC
GSP in 2013 ($m 2013)	35088	476434	290158	95123	24360	337493
Average annual cost of natural disasters ($m 2013)[257]	0.3	492.3	360.5	51.8	11.6	92.1
% of GSP	0.00%	0.10%	0.12%	0.05%	0.05%	0.03%

Source: BTE[258] and ABS.[259] [260]

Our category analysis data also suggest that differences in costs due to natural disasters are unlikely to cause material differences in opex between ActewAGL and the comparison service providers. Emergency response expenditure on major events and major event days provides some indication of the effect of natural disasters on service providers costs. On average the share of major event day

256 Geoscience Australia, *Earthquake Hazards*, available at http://www.ga.gov.au/darwin-view/hazards.xhtml. last accessed 18 August 2014.
257 Excludes costs associated with bushfires.
258 BTE, *Economic costs of natural disasters in Australia,* 2001, p. 35.
259 ABS, 5220.0 - Australian National Accounts: State Accounts, 2012–13.
260 ABS, 6401.0 - Consumer Price Index.

emergency response expenditure, as a percentage of opex expenditure is less than 1 per cent for most service providers.

Emergency response expenditure during major event days appears to make up a higher proportion of opex for most of the comparison service providers than for ActewAGL. However, the proportion for CitiPower and United Energy appears similar to ActewAGL's. Further, not all emergency response expenditure on major event days will relate to natural disasters. We have, however, included this factor as part of the overall allowance for operating environment factors.

Shape factors

We are satisfied that it is not necessary to provide an operating environment adjustment for shape factors. An operating environment adjustment for shape factors raises operating environment adjustment criterion three. To the extent that service providers must extend their networks to accommodate natural boundaries, our economic benchmarking models account for this through circuit length.

Evans and Peck say that natural boundaries, such as water and national parks, surrounding electricity networks impose costs on service providers.[261] These costs manifest themselves through imposing constraints on network planning.

We are satisfied that our economic benchmarking accounts for the effect of shape factors through circuit length. Although some service providers may be required to traverse or travel around natural boundaries, when this occurs, the service providers' line length will also increase. As circuit length is an output variable in our MTFP, MPFP, and opex cost functions, Economic Insights' benchmarking models account for this effect.

Skills required by service providers

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in skills required by service providers. An adjustment for differences in skills required by service providers raises operating environment adjustment criterion two. Differences in the skills required by service providers are not likely to lead to material differences in costs. All service providers require broadly the same skills.

Ausgrid's consultant Evans and Peck identified differences in the skills required by service providers an operating environment factor that may affect benchmarking results.[262] Evans and Peck do not provide any explanation as to how this may impede like for like comparisons.

An adjustment is not necessary because differences in the skills required by service providers are unlikely to lead to a material difference in costs. Service providers require employees with similar qualifications and skills. We are benchmarking the same core services provided by all networks. We have, however, included this factor as part of the overall allowance for operating environment factors.

Temperature

We are satisfied that an operating environment adjustment factor is not required for differences in temperatures. An adjustment for differences in temperatures raises operating environment adjustment

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[261] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, pp. 45–46.

[262] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 38.

criterion three. Economic Insights' benchmarking models capture the effects of temperature on opex through ratcheted peak demand.

We are satisfied ratcheted peak demand captures all increases in demand including those due to differences in air conditioning penetration. Economic Insights' MTFP, MPFP, and opex cost function benchmarking all include ratcheted peak demand as an output variable. This captures the effect of temperature on opex.

Topographical conditions

We are satisfied that it is not necessary to provide an operating environment adjustment for topographical conditions. An operating environment adjustment for topographical conditions does not meet operating environment adjustment criterion two. All service providers are likely to have areas where topography adversely affects costs.

Ausgrid, Endeavour Energy, and Essential Energy have all raised topographic conditions as an operating environment factor that will affect the benchmarking results.[263] [264] [265] The AEMC also raised topography as an exogenous factor that may affect benchmarking. 266

Evans and Peck, in the report commissioned by Ausgrid, state that service providers in NSW and Victoria have a natural cost advantage due to the topography of those regions.[267] They do not explain why they consider this is the case for NSW, but they do mention that the major population centres of Victoria are flat with little vegetation. Evans and Peck provide three maps that use different scales to support this.

Adverse topographical conditions will affect many NEM service providers. For example, the Great Dividing Range runs through some distribution network areas. Also, there are the Flinders Range in South Australia, the Grampians in Western Victoria and the West Coast Range in Tasmania. Operating in mountainous regions may lead to higher costs in some operating areas such as maintenance, emergency response, and vegetation management due to access issues. Most of the comparison service providers operate in a relatively flat area compared to ActewAGL. Therefore, ActewAGL may have a cost disadvantage relative to some of the comparison service providers due to topography. On the other hand, AusNet Services, one of the comparison service providers, has a similar amount of topographical variation in its operating area.

ActewAGL has not raised topography as an issue it considers affects its costs relative to other service providers. We have, however, included this factor as part of the overall allowance for operating environment factors.

A.5.5 Jurisdictional factors

Building regulations

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in building regulations across jurisdictions. This is because it raises operating environment adjustment criterion two. The Building Code of Australia (BCA) provides a set of nationally consistent,

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263 Ausgrid, *Attachment 5.33* to *Regulatory Proposal*, p. 3.
264 Endeavour Energy, *Attachment 0.12* to *Regulatory Proposal*, p. 3.
265 Essential Energy *Attachment 5.*4 to *Regulatory Proposal*, p. 5.
266 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.
267 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 41.

minimum necessary standards of relevant safety (including structural safety and safety from fire), health, amenity and sustainability objectives for buildings and construction.[268]

Ausgrid's consultant Evans and Peck identified differences in building regulations as an operating environment factor that may affect benchmarking results.[269] Evans and Peck do not provide any explanation as to how this may impede like for like comparisons.

The Australian Building Codes Board (ABCB) is a Council of Australian Government standards writing body that is responsible for the National Construction Code (NCC) that comprises the BCA and the Plumbing Code of Australia (PCA). It is a joint initiative of all three levels of government in Australia and was established by an intergovernment agreement (IGA) signed by the Commonwealth, States and Territories on 1 March 1994. Ministers signed a new IGA, with effect from 30 April 2012.[270] The BCA contains technical provisions for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity.[271]

We are satisfied that an operating environment adjustment for differences in building regulations is unnecessary because there will not be material differences in opex between service providers in different jurisdictions due to consistent building regulations.

Capital contributions

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in capital contribution policies. This raises operating environment criterion three. Our economic benchmarking uses network services data, which exclude services for which capital contributions are payable.

Ausgrid's consultant Evans and Peck said differences in capital contribution policies may affect benchmarking of service providers.[272] Evans and Peck said that differences in capital contributions policies make it difficult to draw any conclusions on the effect of capital contributions on different service providers.

We are satisfied that differences in capital contribution policies do not affect the data used in our economic benchmarking for ActewAGL and therefore, an adjustment for differences in capital contribution policies does not meet operating environment criterion three. Users will make a capital contribution when they connect to the network, depending on the type of connection, or require a change to their connection. New connections and changes to connections are connection services for the purpose of our economic benchmarking RIN.[273] Network services do not include connection services in our economic benchmarking RIN. 274 Because the data that we have used for our economic benchmarking exclude connection services, capital contributions cannot affect the results of the benchmarking.

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268 ABCB, The Building Code of Australia, available at; http://www.abcb.gov.au/about-the-australian-building-codes-board . [last accessed 4 September 2014].
269 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 5.
270 ABCB, About the Australian Building Codes Board, available at; http://www.abcb.gov.au/about-the-australian-building-codes-board . [last accessed 4 September 2014].
271 ABCB, The Building Code of Australia, available at; http://www.abcb.gov.au/about-the-australian-building-codes-board . [last accessed 4 September 2014].
272 Evans and Peck, Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs, November 2012, pp. 31–32.
273 AER, Economic Benchmarking RIN for distribution service providers: Instructions and Definitions, November 2013, p. 44.
274 AER, Economic Benchmarking RIN for distribution service providers: Instructions and Definitions, November 2013, p. 44.

Contestable services

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in contestable services across jurisdictions. This raises operating environment adjustment criterion three. Our economic benchmarking only includes costs incurred in providing Network services. Network services do not include contestable services.

Ausgrid, Endeavour Energy, and Essential Energy all raised contestability of services as an operating environment factor that will affect benchmarking results.[275] [276] [277] Beyond saying that they 'play a major part in explaining differentials in cost structures' none of the NSW service providers gave any explanation of how differences in markets for contestable services would affect benchmarking.

We are satisfied that that it is not necessary to provide an adjustment for differences in contestable services. Our economic benchmarking only includes costs incurred in providing network services. Contestable services are not included in network services. Because we have excluded contestable services from network services, contestable services cannot affect benchmarking that uses network services data.

Environmental regulations

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in environmental regulations across jurisdictions. It raises operating environment adjustment criterion two. Environmental regulations are not likely to create material differences in costs between ActewAGL and our comparison service providers.

Ausgrid's consultant Evans and Peck identified differences in environmental regulations as an operating environment factor that may affect benchmarking results.[278] Evans and Peck did not provide any explanation as to how this may impede like for like comparisons, nor did they identify environmental regulations that would affect service providers' costs.

We investigated how environmental regulations may lead to material differences for the opex that service providers require, but were unable to find any reliable evidence that such differences exist. The way various jurisdictions administer environmental regulation varies considerably.[279] While the Commonwealth has some involvement, most environmental planning functions are carried out by state or local governments. We consider it is likely that differences in environmental regulations faced by service providers will lead to differences in costs, but we do not have any evidence to suggest that these differences are material.

We are satisfied that an adjustment for environmental regulation because we were unable to identify any environmental regulations that would lead to material differences in opex. We have, however, included this factor as part of the overall allowance for operating environment factors.

Occupational Health and Safety Regulations

We are satisfied that it is necessary to provide ActewAGL with a positive 0.5 per cent operating environment adjustment for differences in Occupational Health and Safety Regulations (OH&S). This

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275 Ausgrid, *Attachment 5.33* to *Regulatory proposal*, 2014, p. 3.
276 Endeavour Energy, *Attachment 0.12* to *Regulatory proposal*, 2014, p. 3.
277 Essential Energy, *Attachment 5.*4 to *Regulatory proposal*, 2014, p. 5.
278 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 38.
279 Productivity Commission, *Performance Benchmarking of Australian Business Regulation: Local Government as Regulator*, July 2012, pp. 386–390.

is because an operating environment adjustment criterion for OH&S regulations satisfies all three operating environment factor criteria. OH&S regulations are outside of the control of service providers. Differences in OH&S regulation are likely to create material differences in opex between ActewAGL and the comparison firms. Economic Insights' benchmarking models do not account for differences in OH&S regulations.

Ausgrid's consultant Evans and Peck identified differences in OH&S regulations as an operating environment factor that may affect benchmarking results.[280] Evans and Peck did not provide any explanation as to how this may impede like for like comparisons. ActewAGL noted that in 2011 the implementation of the Work Health and Safety Act 2011(ACT) imposed additional costs on it that had not existed previously.[281] It also notes that NSW and Victoria already had many of these more stringent requirements before the implementation of the harmonised OH&S legislation.

We are satisfied that an operating environment factor adjustment for OH&S regulations meets operating environment adjustment criterion one. The decision on the form that OH&S regulations take belongs to the legislative bodies of the Commonwealth, States and Territories. An operating environment factor adjustment for OH&S regulation meets operating environment adjustment criterion two because it has the potential to materially affect service providers' costs. An operating environment adjustment for OH&S regulations meets operating environment adjustment criterion three because there are no variables in Economic Insights' benchmarking models that reflect differences in OH&S regulations.

In the NEM, all jurisdictions, except Victoria, have enacted the Work Health and Safety Act and Work Health and Safety Regulations.[282] While enforcement activities may vary slightly across jurisdictions the main cost driver of OH&S costs will be the regulations and law with which businesses must comply. In this respect, we are satisfied that there will not be material cost differences between jurisdictions that have enacted the model laws. However, there is likely to be a cost differential between service providers in Victoria and those in other jurisdictions. Because the comparison firms are predominantly Victorian, this is likely to likely to lead to cost differentials between the comparison firms and ActewAGL.

We are satisfied that a positive 0.5 per cent operating environment adjustment to ActewAGL is appropriate. The Victorian state government employed PricewaterhouseCoopers (PwC) to estimate the costs of implementing the new OH&S laws would impose on commerce in Victoria. According to PwC, the annual impost of the implementing the laws would be up to $796 million ($2011–12).[283] The Gross State Product for Victoria in FY 2012 was $328 595 million ($2011–12).[284]

This would mean that the impact of complying with the Act on the Victorian economy would be equivalent to 0.24% of Gross State Product. Electricity distribution work environments may present more danger than the average work environment across the economy. With this in mind, a 0.24% adjustment may underrepresent the potential cost advantage for Victorian Electricity distribution

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280 Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australian service providers*, November 2012, p. 38.

281 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, pp. 38.

282 Safework Australia, Jurisdictional progress on the model work health and safety laws, available at: thehttp://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/pages/jurisdictional-progress-whs-laws. [last accessed 4 September 2014]

283 PricewaterhouseCoopers, *Impact of the Proposed National Model Health Work and Safety Laws in Victoria*, April 2012, p. 7.

284 ABS, *5220.0 - Australian National Accounts: State Accounts, 2011-12*, November 2012.

businesses. The PwC report suggests that the annualised ongoing costs for power generators would be almost two and a half times greater than for the majority of other businesses.[285]

Therefore, we have assumed that an electricity distributor would face two and a half as many costs due to a change in OH&S laws compared to the hypothetical economy wide average firm. This suggests that relative to a Victorian service provider, service providers in other NEM jurisdictions require 0.6 per cent more opex. When this is weighted by the proportion of customers Victorian service providers have of the comparison firms, this leads to a 0.5 per cent adjustment.

Licence conditions

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in licence conditions across jurisdictions. It raises operating environment adjustment criteria two and three. Licence conditions are not likely to materially affect opex because reliability standards are similar for ActewAGL and most of our comparison service providers over the 2014-19 period. Also, Economic Insights' benchmarking models take reliability requirements into account in two ways: reliability is an output and so are some measures of physical assets.

Planning regulations

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in planning regulations across jurisdictions. It raises operating environment adjustment criterion two. Differences in planning regulations are not likely to create material differences in opex across jurisdictions.

ActewAGL submitted that planning regulations would affect its opex through its obligations under the *Emergencies Act 2004 (ACT)* and planning rules that affect its vegetation management costs.[286] We have considered the effect of ActewAGL's obligations under the *Emergencies Act 2004 (ACT)* below. We have considered the impact of planning rules on ActewAGL's vegetation management in section A.4.3.

ActewAGL submitted that under the *Emergencies Act 2004 (ACT)* and in particular, the Emergencies (Emergency Plan) 2014 (No 1) made under the *Emergencies Act*, it is required under the *Utilities (Emergency Planning Code) Determination 2011 (ACT)* to implement an emergency management plan that is consistent with the ACT Government's Emergency Plan requirements. ActewAGL did not quantify the extent of the costs it incurs in excess of other service providers in implementing its emergency management plan.[287]

With regard to other general planning regulations, it is not clear if ActewAGL has a greater or lesser regulatory burden than the comparison service providers. The Productivity Commission carried out a review of planning regulations in April 2011.[288] The finding of this review was that given the extent of differences, it is a challenge to compare the planning systems of the states and territories: individual indicators are often heavily qualified and thus so are comparisons between jurisdictions.[289] As a

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285 PricewaterhouseCoopers, *Impact of the Proposed National Model Health Work and Safety Laws in Victoria*, April 2012, p. 9.

286 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, pp. 32–37.

287 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, pp. 31–33.

288 Productivity Commission, Performance Benchmarking of Australian Regulation: Review of Planning Regulations, April 2011.

289 Productivity Commission, Performance Benchmarking of Australian Regulation: Review of Planning Regulations, April 2011, Volume 1, p. XXVIII.

result, the Productivity Commission did not attempt to construct an overall 'league table' of state and territory performance.[290]

We are satisfied that an adjustment for planning regulations in the ACT is unnecessary because ActewAGL has not demonstrated that the ACT's planning regulations would materially increase its opex relative to the comparison service providers. We consider that the requirement to produce and implement an emergency management plan under the *Emergencies Act 2004 (ACT)* may require ActewAGL to incur additional opex relative to the comparison service providers. However, we do not have any information to suggest such potential increases in costs would be material.

We consider that most service providers will have emergency management plans in place for extreme events such as natural disasters, bushfires, and terrorism. It is possible that *the Emergencies Act 2004 (ACT)* places more stringent requirements on the development and implementation of ActewAGL's emergency management plan than other service providers, but ActewAGL has not made it clear how and if these extra requirements impose material costs. We have, however, included this factor as part of the overall allowance for operating environment factors.

Standard control services connections

We are satisfied that it is necessary to provide a positive 4.5 per cent operating environment adjustment for differences in the treatment of connection services between ActewAGL and the comparison service providers because it triggers all of our operating environment adjustment criteria.

Our economic benchmarking data takes into account differences in service classifications across jurisdictions by using data on network services. Network services only include the provision of the core 'poles and wires' component of distribution services. They exclude other services that distributors provide including metering and public lighting. Because the benchmarking data only include information on network services, the results will only reflect differences in network services. Therefore, differences in the classification of standard control and alternative control services will not affect Economic Insights' benchmarking models.

However, while service classification will not affect the benchmarking models, service classification must be considered when applying the results to produce our opex forecast. This is because if we do not provide an operating environment adjustment for service classification, service providers that provide standard control services that are not network services will be penalised. ActewAGL classifies some of the costs it incurs for connection services as standard control services.

Our opex forecast, based on the Cobb Douglas SFA opex cost function, is for network services so it excludes connection services. Therefore, in order to make our network services forecast comparable to ActewAGL's standard control services opex forecast it is necessary to make an adjustment to account for connection services. In the base year, connection services accounted for $1.4 million ($2013) in expenditure. If this is added to our forecast base year opex this leads to a 4.5 per cent increase in ActewAGL's opex.

We determine service providers' service classifications, so the adjustment triggers criterion one. Adding connection services to our forecast network services opex leads to a 4.5 per cent increase in ActewAGL's opex, so the adjustment triggers criterion two. Our benchmarking excludes all costs included in connection services, so the adjustment triggers criterion three. Therefore, we consider that

[290] Productivity Commission, Performance Benchmarking of Australian Regulation: Review of Planning Regulations, April 2011, Volume 1, p. XXXI.

it is appropriate to provide an operating environment factor of 4.5 per cent to ActewAGL for standard control services connections.

Taxes and levies

We are satisfied that it is necessary to provide ActewAGL an operating environment adjustment to account for jurisdictional differences in taxes and levies because it triggers all three of our operating environment criteria. We are satisfied that a positive 2.5 per cent operating environment adjustment for differences in jurisdictional differences taxes and levies is appropriate for ActewAGL.

ActewAGL has said that its benchmarking results will be affected by the Energy Industry Levy (EIL).[291] This is because the EIL is an ACT specific tax that does not exist in other jurisdictions. In 2012–13 the EIL was $0.71 million ($2013). If this is added to our forecast base year opex this leads to a 2.3 per cent increase in ActewAGL's opex.

We are satisfied that a 2.3 per cent operating environment adjustment for differences in jurisdictional differences taxes and levies is appropriate for ActewAGL.

The decision on what taxes and levies should be collected belongs to state and territory legislative bodies. We consider that $0.71 million ($2012–13) is material with reference to ActewAGL's annual operating expenditure in the base year. Also, there are no variables in Economic Insights' benchmarking models to reflect the difference in opex between ActewAGL and the comparison point firms due to the EIL.

We do note however, that our benchmarking data do exclude the effects of other ACT specific taxes and levies such as UNFT.

Traffic management requirements

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in traffic management requirements. Traffic management requirements are not likely to lead to material differences in opex between service providers.

Evans and Peck say that traffic management regulations may affect comparison of opex across networks. They do not explain, how or whom they would affect.[292]

As noted in the customer density section above, traffic management costs generally correlate with the volume of traffic near the worksite. We consider that traffic management will have a greater overall impact on expenditure in higher density areas than in lower density areas. However, our economic benchmarking models account for this.

We recognise that each Australian state and territory has different standards for the development and implementation of traffic control plans at roadwork sites. This includes issues such as signage, speed zones, etc. Each of the states and territories has different levels of training requirements including:

- traffic management planners (approvers and designers),
- worksite supervision and control.

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[291] ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, p. 38.

[292] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 38.

However, State and territory road authorities generally base their traffic control at roadwork sites requirements on AS1742 Part 3: Guide to traffic control devices for works on roads[293].

Overall, we are satisfied that differences in traffic management regulations and traffic management needs are unlikely to materially affect costs at the total opex level. Differences in traffic management regulations are likely to represent a small portion of the total difference between traffic management costs. Traffic management costs are only a portion of project costs. Not all projects incur traffic management costs. We have, however, included this factor as part of the overall allowance for operating environment factors.

A.5.6 Network factors

Backyard reticulation

We are satisfied that it is necessary to provide a positive 2.8 per cent operating environment adjustment for ActewAGL's backyard reticulation. Backyard reticulation is beyond the control of ActewAGL, it is likely to lead to an increase in opex relative to other service providers, and it is not accounted for elsewhere in Economic Insights' benchmarking models.

ActewAGL has identified backyard reticulation as an operating environment factor that is likely to affect its benchmarking results.[294] ActewAGL considers that backyard reticulation increases its vegetation management and maintenance opex.

Backyard reticulation is a description for the ACT practice of running overhead lines along the rear property boundaries in urban residential areas. ActewAGL halted this practice in favour of undergrounding a number of decades ago, but there remains a legacy of backyard reticulation lines in many ACT suburbs. Backyard reticulation is only applicable to approximately 15 per cent of low voltage overhead lines in the ACT.[295]

In response to a request for further information, ActewAGL quantified several examples of the incremental expenditure associated with backyard reticulation.[296] In particular, ActewAGL cited costs of $2.0 million per annum for:[297]

- notification letters prior to inspections
- cancelled inspections
- additional time for inspections
- access issues (primarily due to scaffolding requirements).

Our view is that backyard reticulation places an uncertain set of barriers between the assets and ActewAGL's staff (or contractors) not present for other service providers. These incremental costs are the equivalent of approximately 2.8 per cent of ActewAGL's base year opex.[298]

While, as we discuss in section A.4.3, we consider material inefficiencies exist in ActewAGL's vegetation management practices, we are satisfied backyard reticulation presents some unique

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293 National Approach to Traffic Control at Work Sites, Publication no: AP-R337/09, Austroads 2009, p 1.
294 ActewAGL, *Regulatory Proposal*, 2014, p. 243.
295 AER ActewAGL 018 - Vegetation Questions_12aug2014.docx, p. 1.
296 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 22–24.
297 ActewAGL, Response to information request of 23 September 2014, received 3 October 2014, pp. 22–24.
298 Prior to adjusting ActewAGL's base opex for its change in CAM.

challenges for ActewAGL. No other service provider has backyard reticulation in its network so the incremental costs may influence the benchmarking results to ActewAGL's disadvantage. It also meets is not accounted for in Economic Insights' benchmarking models.

Therefore, we are satisfied that a positive 2.8 per cent operating environment factor is appropriate for backyard reticulation. Section A.4.3 discusses backyard reticulation in more detail in the context of vegetation management.

Proportion of hardwood poles

We are satisfied that it is not necessary to provide an operating environment adjustment for the proportions of different pole types used by ActewAGL. The proportion of different pole types used by ActewAGL is not likely to lead to material differences in opex between it and the comparison service providers.

ActewAGL has identified the proportion of hardwood poles as an operating environment factor that is likely to affect its benchmarking results.[299] Because hardwood poles have a shorter asset life and require more maintenance than steel or concrete poles ActewAGL says that it will have higher maintenance costs.[300]

Wood poles have been the primary asset for most service providers for over a hundred years.[301] In Australia, most service providers relied on the use of hardwood poles until the availability and cost of hardwood poles began to make other alternatives more cost effective. In recent times, service providers have deployed concrete, steel, fibreglass and softwood poles as alternatives. Each pole type has distinct advantages and disadvantages in terms of overall costs and performance.

We are satisfied that the proportion of hardwood poles in ActewAGL's network will not lead to material differences in total opex because most of the comparison service providers have similar proportions of hardwood poles.

We agree that hardwood poles typically have a higher maintenance cost than steel or concrete poles. This additional cost typically revolves around the need to test the remaining strength of a wood pole on a periodic basis. However, we disagree that this places ActewAGL at a disadvantage as category analysis RIN information shows ActewAGL has a smaller proportion of wood poles than some other service providers, including CitiPower and Powercor.

Therefore, overall we are satisfied that the proportion of hardwood poles reported by ActewAGL should not result in a material increase in opex relative to the comparison firms. We have, however, included this factor as part of the overall allowance for operating environment factors.

Asset age

We are satisfied that it is not necessary to provide an operating environment factor for differences in asset age between ActewAGL and the comparison service providers. It raises operating environment criterion two. The age profiles of ActewAGL and the comparison service providers are similar, and therefore should not lead to material differences in their opex.

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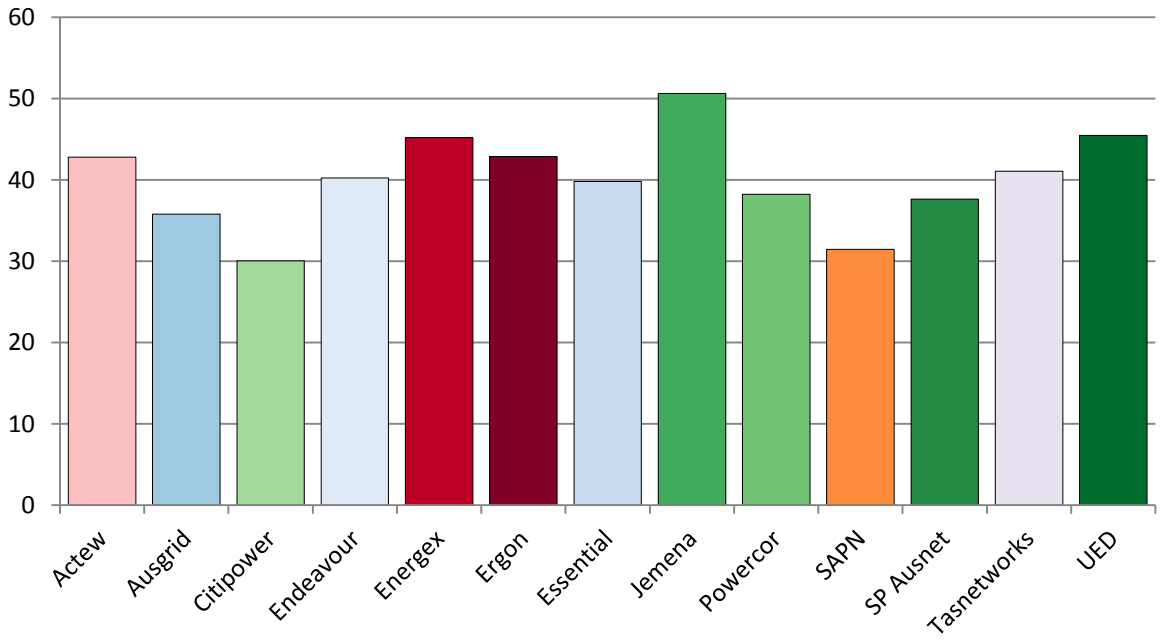
299 ActewAGL, *Regulatory proposal*, 2014, p. 243.
300 ActewAGL, *Regulatory proposal*, 2014, p. 171.
301 Noting that South Australia has pioneered the use of the Stobie pole since commencement of the distribution system in that state.

The NSW service providers submitted that one of the reasons like for like comparisons between service providers cannot be made effectively to draw conclusions about efficiency is differences in the age of service providers' assets. [302] [303] [304]

We are satisfied that an operating environment adjustment for asset age is unnecessary because the weighted average remaining life (WARL) of ActewAGL's and the comparison firms' assets seem to be similar. The WARL represents the average remaining life of a service provider's assets weighted by the value of those assets. Figure A.22 below compares all NEM service providers' WARLs.

Figure A.22 Weighted average remaining life for each NEM service provider



Source: Category analysis RIN data, AER Analysis.

While the WARLs for the comparison service providers and ActewAGL seem similar, the comparison service providers' WARLs, with the exception of UED, seem slightly lower than ActewAGL's. This implies that their asset bases are slightly older. Therefore, ActewAGL may have a slight cost advantage relative to the comparison firms on maintenance opex because their networks are, on average, younger so their assets should require less maintenance.

Therefore, we are not satisfied an adjustment for asset age is warranted.

Proportion of 22kV and 11kV lines

We are satisfied that it is not necessary to provide an operating environment adjustment for the proportions of 22kV and 11kV lines in the network. This is because an adjustment would not satisfy operating environment adjustment criterion two. Operating a network using a 22 kV high-voltage distribution system rather than an 11kV high-voltage distribution system is unlikely to create material differences in opex between service providers.

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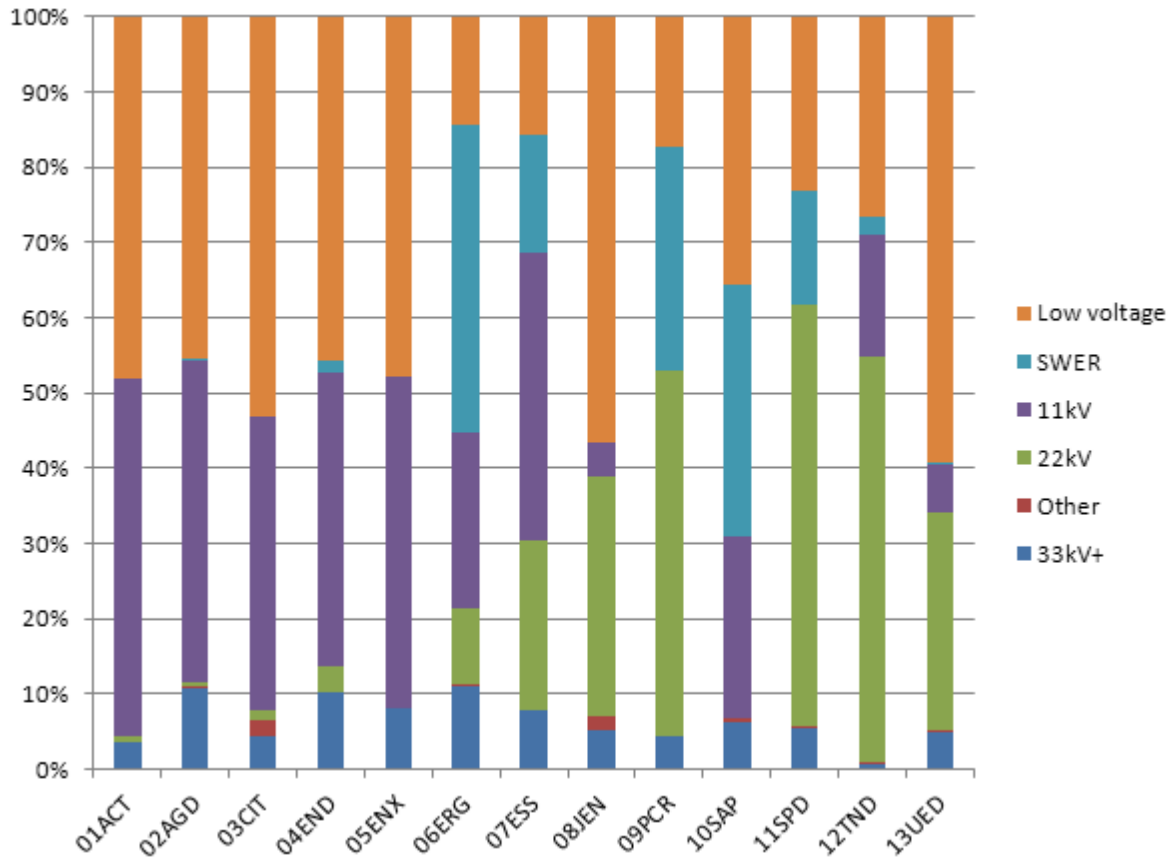
302 Ausgrid, Regulatory Proposal: *Attachment 5.33* to *Regulatory proposal*, p. 3.
303 Endeavour Energy, Regulatory Proposal: *Attachment 0.12* to *Regulatory proposal*, p. 3.
304 Essential Energy, Regulatory Proposal: *Attachment 5.*4 to *Regulatory proposal*, p. 5.

Evans and Peck have claimed that because Victoria operates a 22 kV high-voltage distribution system they have a cost advantage over service providers that operate 11kV distribution systems.[305] They claim that this represents a cost advantage and will manifest itself in lower operation and maintenance costs.[306]

ActewAGL operates a high-voltage distribution network that is predominantly 11kV. The Comparison service providers operate both 11kV and 22kV high voltage distribution networks. Victorian service providers have mostly changed their high-voltage networks to a 22kV model with the notable exception of CitiPower. CitiPower maintains a predominantly 11kV high-voltage distribution network. SA Power Networks also has a predominantly 11kV high-voltage distribution network.

Figure A.23 Line voltages by length



Source: Economic Benchmarking RIN data, AER analysis.

The high-voltage distribution networks are the key means for the distribution of electricity over middle distances such as between suburbs and across small regional areas.

Simplistically, a doubling of the voltage will provide a doubling of the capacity of the line. In the case of high-voltage lines, a 22kV line will potentially have twice the capacity of an 11kV line. Electricity networks typically face two line-design limitations: distance and capacity. As mentioned above, a

[305] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 17.

[306] Evans and Peck, *Review of factors contributing to variations in operating and capital costs structures of Australia DNSPs*, November 2012, p. 5.

22kV network has the potential to provide twice the capacity of a similar 11kV line. The 22kV line can also cover a greater distance than an 11kV line serving the same electrical load.

In practice, this will result in an 11kV network design that has more 11kV feeders to service the same customer loads and a larger number of lower capacity zone substations to service these feeders. On the other hand, a 22kV network design will have fewer feeders and a smaller number of higher capacity zone substations.

We are satisfied that an adjustment for the proportion of 11kV and 22kV lines in a network is not necessary because the configuration of the high-voltage distribution system should not materially affect opex.

We note that Powercor and AusNet, and CitiPower and SAPN, represent the two extremes in terms of 11kV and 22kV networks - Powercor and AusNet are predominantly 22kV systems while CitPower and SAPN has a predominantly 11kV system. If this factor were material to the costs of the service providers, we would expect this to be most apparent when comparing these four service providers. Our MPFP and opex cost function benchmarking indicate that SAPN, Powercor and AusNet have very similar levels of expenditure and performance suggesting that this factor is not material to overall performance. In any case, given each of these service providers are in our group of benchmark service providers, we consider no further adjustment is necessary for this factor. We have, however, included this factor as part of the overall allowance for operating environment factors.

Ratio of overhead and underground lines

The AEMC raised the mix of underground and overhead lines as an operating environment factor that we may need to take into account when benchmarking service providers. [307]

We are satisfied that an adjustment for the ratio of overhead and underground lines would not satisfy operating environment adjustment criterion three because Economic Insights' opex cost functions have a variable for the ratio of overhead and underground lines.

Service cables

We are satisfied that it is not necessary to provide an operating environment factor for differences in responsibilities for service cables because it would not lead to a material difference in opex between ActewAGL and the comparison service providers.

Actew AGL has submitted that it considers that differences in responsibilities for service lines between it and Victorian service providers may lead to it benchmarking unfavourably.[308] ActewAGL submits that, with regard to underground cables, the Victorian service providers are not responsible for boundary cables running from a pit or pillar into the customers' premises. ActewAGL however is responsible for these cables. ActewAGL considers it will be disadvantaged in benchmarking because these service cables are not included in line length.

We do not consider that ActewAGL will be disadvantaged. The data we have used in our benchmarking excludes service lines for all service providers. Therefore, our line length measures are valid for comparison between service providers. However, we do consider that ActewAGL may incur

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307 AEMC, *Rule determination: National Electricity Amendment (Economic Regulation of Network Service Providers)*, November 2012, p. 113.

308 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, pp. 7–8.

some additional cost, relative to the comparison service providers, to maintain underground service cables.

However, the extra maintenance opex ActewAGL incurs on underground service cables is not likely to be material. ActewAGL's maintenance on underground cables represented on average 2.2 per cent of its total opex over the 2009 to 2013 period. The expenditure on underground service cables of that 2.2 per cent is likely to be small. For overhead cables, service line maintenance made up on average over the 2009 to 2013 period 13.7 per cent of total overhead asset maintenance. This implies that maintenance expenditure on underground service lines may be around 0.3 per cent of ActewAGL's total opex. Therefore, we consider an adjustment is unnecessary.

Subtransmission

We are satisfied that it is not necessary to provide an operating environment adjustment for differences in subtransmission network configuration between ActewAGL and the comparison service providers. An adjustment for differences in subtransmission network configuration raises operating environment adjustment criterion two. We consider differences in subtransmission configuration between ActewAGL and the comparison service providers are not likely to lead to material differences in opex.

ActewAGL raised the issue of subtransmission in response to our draft benchmarking report.[309] ActewAGL considers that because its subtransmission assets are dual function assets we should exclude them from our benchmarking analysis. ActewAGL also considers that its subtransmission assets will lead to them being disadvantaged in our MTFP benchmarking.[310]

The transition point between transmission and distribution varies across jurisdictions and within service providers. All service providers take supply from transmission Grid Exit Points (GXPs) across a range of voltages. The NSW service providers own and operate a proportionally larger group of assets at the higher voltages. Queensland GXPs are also typically at the higher voltage levels than those of other states. Tasmania has the lowest GXP voltages of all the NEM service providers on average. We also note the dual sub-transmission transformation step that accompanies the higher sub-transmission voltages. NSW, Queensland, and South Australia have all reported dual transformation assets.[311]

We consider that it is appropriate to include ActewAGL's subtransmission network in our benchmarking. All of the networks in the NEM have some subtransmissmission assets. Some may have more than others, but where this appears that it may affect our benchmarking we will provide an operating environment adjustment to account for it.

However, we are satisfied that an operating environment factor for differences in subtransmission network is unnecessary in ActewAGL's case because subtransmission accounts for a smaller proportion of its network than the comparison service providers' networks. While this may suggest that a negative operating environment adjustment may be appropriate, ActewAGL's relatively small scale and its higher voltage subtransmission network may offset this.

To assess the potential impact of the differences in subtransmission networks we investigated a number of approaches including:

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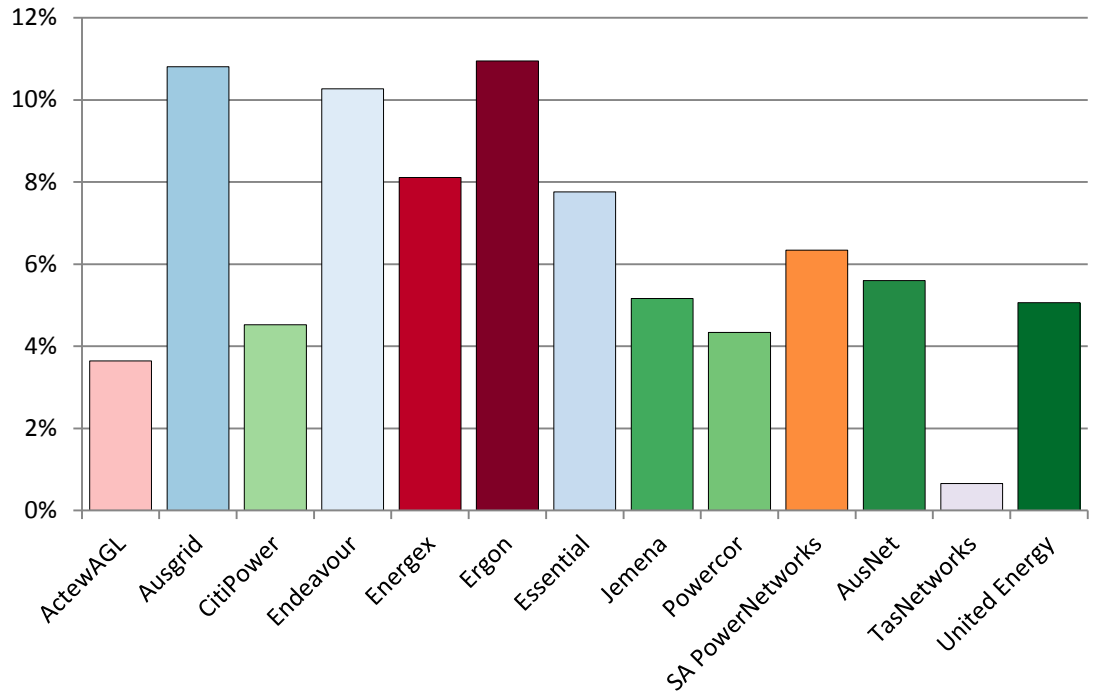
309 ActewAGL, Response to the AER's Draft Annual Benchmarking Report, 22 August 2014, p. 10.
310 ActewAGL, Capital and operating expenditure 'site visit' clarifications, 3 October 2014, pp. 29 to 30.
311 Economic Benchmarking RIN data.

- comparison of RAB values[312]
- comparison of replacement values[313]
- two stage transformation capacity comparisons[314]
- overall substation capacity comparisons[315]
- line length values.[316]

The most robust and consistent data set that we for the above measures was line length. We selected that data set because we have information to compare the volume of subtransmission assets and the operating costs of subtransmission assets by line length. This was not the case for other data sets. Figure A.24 provides the subtransmission line length as a percentage of total line length for each service provider.

Figure A.24 Subtransmission circuit length as a percentage of total circuit length



Source: Economic Benchmarking RINs.

The above figure shows that subtransmission lines represent a small proportion of total network line length. ActewAGL has the second smallest proportion of sub-transmission lines - representing 3.6 per cent of its network. Subtransmission lines on average, weighted by customer numbers, comprise 5.3 per cent of the comparison service providers' networks.

This suggests that relative to the comparison firms, ActewAGL has a cost advantage. However, ActewAGL's size and the voltage of its subtransmission system may offset this. Being a relatively

312 Economic Benchmarking RIN data.
313 Category Analysis RIN data.
314 Economic Benchmarking RIN data.
315 Economic Benchmarking RIN data.
316 Economic Benchmarking RIN data.

small service provider, ActewAGL may not be able to achieve the same economies of scale that the larger comparison firms may be able to in their subtransmission networks. Additionally, ActewAGL's subtransmission network is exclusively 132kV, while in general the subtransmission networks of the comparison firms are 66kV. These things in combination may offset the advantage of having less subtransmission, relative to the comparison firms.

A.6 Our conclusions on base year opex

This section explains how we make an adjustment for the purpose of estimating opex that reasonably reflects the opex criteria.

We have demonstrated in the preceding sections that all the evidence (quantitative and qualitative) points towards the need for an adjustment to ActewAGL's base year opex. Our expert consultant has provided advice that the economic benchmarking results are robust and reinforce each other.[317] In turn, the category analysis results and detailed review corroborate the benchmarking results.

In particular, the detailed labour review provides evidence of workforce inefficiencies within ActewAGL. We consider certain provisions in ActewAGL's enterprise agreement are more restrictive than the equivalent provisions in even the NSW service providers' enterprise agreements. Combined with increasing volumes and costs of labour, structural problems and cultural issues, ActewAGL appears to have some significant labour issues. Further, the evidence suggests ActewAGL's vegetation management practices are also inefficient. Customers should not be asked to fund more than those costs that reasonably reflect the opex criteria.

However, our operating environment factor review confirms significantly more operating environment differences than the NSW service providers. We consider this explains part of the gap shown by the benchmarking results.

Following the advice of Economic Insights,[318] detailed examination of operating environment factors and sources of inefficiency, we consider it is appropriate to adjust ActewAGL's base year opex, but modified in two ways.

First, our assessment techniques account for material differences in the operating environments of service providers in different ways. We recognise, however, that benchmark modelling may not incorporate all possible differences between service providers. The AEMC has provided guidance on how we should have regard to benchmarking in this way:[319]

> The intention of a benchmarking assessment is not to normalise for every possible difference in networks. Rather, benchmarking provides a high level overview taking into account certain exogenous factors. It is then used as a comparative tool to inform assessments about the relative overall efficiency of proposed expenditure.
>
> …
>
> If there are some exogenous factors that the AER has difficulty taking adequate account of when undertaking benchmarking, then the use to which it puts the results and the weight it attaches the results can reflect the confidence it has in the robustness of its analysis.

Following our detailed examination of operating environment factors in the previous section, we consider it is appropriate to provide a 30 per cent allowance for those operating environment differences not completely captured by our preferred benchmarking model (Cobb Douglas SFA). We have incorporated operating environment factors as a margin for additional input use into the Cobb Douglas SFA modelling, on the recommendation of our expert consultant, Economic Insights.[320]

Second, in the application of the benchmarking techniques (including Cobb Douglas SFA), we consider a cautious approach to making an adjustment is appropriate to mitigate the potential risk of

317 Economic Insights, 2014, p. 51.
318 Economic Insights, 2014, p. 37.
319 AEMC, Rule Determination, 29 November 2012, pp. 107–108, 113.
320 Economic Insights, p. iv.

modelling and data error. On the recommendation of Economic Insights, our ultimate adjustment is significantly more conservative than the raw Cobb Douglas SFA result. We have done this by comparing ActewAGL's efficiency to a modified benchmark comparison point.

Economic theory suggests that the appropriate benchmark reference point for efficient opex is an efficient service provider. Using the Cobb Douglas SFA model, CitiPower which is the most efficient service provider for this model has a score of 95 per cent. This score represents our estimate of the efficiency at which the (Australian) benchmark efficient firm[321] would be using its opex to provide core network services, before considering service providers' unique operating factors not already accounted for in the modelling.

However, we have (in line with the approach recommended by Economic Insights) applied a benchmark comparison point that is the weighted average of all networks with efficiency scores above 0.75.[322] This allows a margin for the potential effect of any modelling uncertainty and data error. Under this approach the (modified) benchmark comparison point is 10.5 per cent lower than the minimum cost NEM frontier business as indicated by the Cobb Douglas SFA model.

We have adopted the weighted average of the top five service providers (those service providers with efficiency scores greater than 0.75) for the reasons Economic Insights outlines in its report.[323] Combined with the allowance for operating environment differences, the benchmark level of efficiency is approximately 30.5 per cent less than the level for the frontier service provider predicted by the Cobb Douglas SFA model.

A.6.1 Determining the adjustment

All our analysis indicates that ActewAGL's base year opex is materially inefficient.

However, the results of the models presented in this appendix represent ActewAGL's average distance from the frontier over the benchmarking period.[324] Consequently this does not directly compare to ActwAGL's base year opex (which is the 2012–13 year) because the average opex will reflect its average network characteristics over the eight year period.

Hence, to calculate our estimate of efficient base year opex we have, on the recommendation of Economic Insights, trended forward the average efficient opex by the change in outputs, input prices[325] and technical efficiency to properly reflect conditions in the base year. This is consistent with our approach to trending forward expenditure for the 2014–19 period using our rate of change approach.

Table A.20 presents our comparison of ActewAGL's proposed base year against our estimated efficient base year opex. This estimate is trended forward to the base year, and takes into account our preferred benchmark comparison point and our additional allowance for other operating environment factors. Table A.20 shows the reduction in opex required to reach our estimate of a base year opex that is suitable for forecasting total opex to reasonably reflect the opex criteria.

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321 We have measured the frontier based on Australian service providers only. If we included the international service providers in our calculations, CitiPower may not be the frontier business.
322 Economic Insights, 2014, p. 51.
323 Economic Insights, 2014, pp. 47–48.
324 Economic Insights, 2014, p. 46.
325 Also referred to as real prices in the expenditure forecast assessment guideline.

Table A.20 Comparison of estimated efficient base opex against proposed base opex

	ActewAGL
Proposed base opex, nominal	95.4
- jurisdictional schemes, nominal	-22.0
- New CAM, nominal	-6.9
Adjusted base opex, nominal	66.5
Base opex, real 2013–14 (end of year)	68.7
Substitute base, real 2013–14 (end of year)	**42.2**
Difference in base opex	24.5
Percentage opex reduction	**36.5%**

Source: AER analysis.

As we explain above, our additional allowance for operating environment factors and the modified benchmark comparison point is significant so the ultimate adjustment is much lower than the raw benchmarking results suggest.

We consider the results for ActewAGL are reasonable, particularly when we consider them in light of the detailed review results. Our labour review, for example, suggested ActewAGL has significantly increased both the size and cost of its permanent workforce over the 2009–14 period.

ActewAGL's regulatory proposal also suggests structural and cultural issues existed in the 2009–14 period. Even if ActewAGL was able to implement the recommendations of the MHC review, our view it is unlikely ActewAGL would have been able to resolve all the identified problems by 2012–13.

Further, it has a very restrictive enterprise agreement in some respects. For example, the outsourcing provisions in ActewAGL's enterprise agreement are much stricter than even those of even the NSW service providers, who Deloitte considers have quite restrictive and inefficient arrangements. The NSW service providers are able to outsource (providing they follow proper consultation procedure) if they can demonstrate it is commercially advantageous. ActewAGL, on the other hand, cannot do this. For the only component of core standard control services opex that ActewAGL does outsource – vegetation management – the evidence suggests ActewAGL is not managing its contractors efficiently.

In addition, ActewAGL's enterprise agreement specifically states that no employee will be made redundant through the use of contractors. The trade off for this is ActewAGL can restructure its workforce and initiate involuntary redundancies. The price for this, however, is generous entitlements. The minimum payout of 31 weeks (or 57 weeks if the employee is 45 or older) is well in excess of any other service provider's enterprise agreement.

B Opex rate of change

Our forecast of total opex includes an allowance to account for efficient changes in opex over time.

There are several reasons why efficient opex for each year of a regulatory control period might differ from expenditure in the base year.

As set out in our Expenditure forecast assessment guideline (our Guideline), we have developed an opex forecast incorporating the rate of change to account for the following factors:[326]

- price change[327]
- output change
- productivity change.

This appendix contains our assessment of the opex rate of change for use in developing our forecast alternative estimate of total opex.

B.1 Position

Our forecast of the overall rate of change is 0.66 per cent higher on average than ActewAGL's over the forecast period.

Table B.1 shows ActewAGL's and our overall rate of change in percentage terms for the 2014–19 period.

The differences in each forecast rate of change component are:

- our forecast price change is on average 0.16 percentage points lower than ActewAGL's
- our forecast of output change is on average 0.82 percentage points higher than ActewAGL's
- our forecast of productivity change is the same as ActewAGL's.

The reasons for the differences between each rate of change component are discussed below.

Our rate of change assessment methodology and the reasons for taking this position are discussed in the sections below.

Table B.1 ActewAGL and AER rate of change (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
ActewAGL	0.44	0.92	1.09	1.12	1.17
AER	0.48	1.67	1.96	2.02	1.82
Difference	0.04	0.75	0.88	0.90	0.65

Source: AER analysis.

326 AER. *Better Regulation explanatory statement expenditure forecast assessment guideline*, November 2013, p. 61.
327 We note the guidelines referred to price growth, output growth and productivity growth. We have changed the term growth to change to reflect that these components can be either positive or negative.

B.2 ActewAGL's proposal

Table B.2 shows ActewAGL's proposed annual change in opex for each rate of change component as reported in ActewAGL's reset RIN. ActewAGL used a different methodology to form its view about the opex rate of change than the approach set out in our Guideline. This is because ActewAGL's rate of change only included economies of scale rather than an overall opex productivity change. Each of these components is discussed below.

Table B.2 ActewAGL's proposed opex by rate of change drivers for standard control services opex and dual function assets opex ($000 2013–14)

	2014/15	2015/16	2016/17	2017/18	2018/19
Base opex	68 155	68 155	68 155	68 155	68 155
Price change (cumulative)	584	1 160	1 895	2 660	3 473
Output change (cumulative)	21	74	93	109	129
Productivity change (cumulative)	–	–	–	–	–

Note: Step changes and other adjustments also affect the annual change in opex.
Source: ActewAGL reset RIN table 2.16.1.

Forecast price change

ActewAGL's forecast price change includes price changes for labour and other costs.

ActewAGL in conjunction with Ausgrid, Endeavour Energy, Essential Energy and Transend commissioned Competition Economics Group (CEG) to estimate cost escalation factors.[328]

For labour price changes ActewAGL engaged Independent Economics to forecast the WPI for general labour, the utilities industry and the professional services industry.[329]

For other price changes ActewAGL applied CPI and materials escalation based on construction labour forecasts in CEG's report.[330]

Forecast output change

ActewAGL's forecast output change is driven by its forecast capital expenditure. As new assets are commissioned the number of assets will increase. ActewAGL forecasts higher maintenance costs commensurate with the increased asset base.[331]

ActewAGL noted that its output change measure only includes the change in core assets included in Riva, its asset management software, and not all assets. ActewAGL further noted that since not all assets have been included in Riva, economies of scale have been taken into account by not including the growth in assets that have not been included in Riva.[332]

328 CEG, *Escalation factors affecting expenditure forecasts*, December 2013, p. 1
329 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 226.
330 ActewAGL, *Response to Reset RIN*, table 2.14.1.
331 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 233.
332 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 233.

Forecast productivity change

ActewAGL noted that it incorporated implicit productivity improvements, through economies of scale, in its operating expenditure proposal as a part of its output change. ActewAGL also noted that its forecast opex did not include additional costs that will be incurred with the forecast expansion of its network and new connections. [333]

ActewAGL noted that an explicit productivity measure imposed by us would need to account for future changes to regulatory requirements and industry standard practice. ActewAGL further noted that future regulatory requirements and change to industry standard practice may more than offset any productivity gains that could be achieved over the 2014–19 period.[334]

Rate of change

The rate of change approach applies a percentage change to the previous year's opex. Table B.2 above expresses the impact of each rate of change component in dollar terms. To allow for a like with like comparison, we have expressed each of ActewAGL's rate of change components in annual percentage terms below in Table B.3.[335]

Table B.3 ActewAGL's opex rate of change (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
Price change	0.43	0.84	1.06	1.09	1.15
Output change	0.02	0.08	0.03	0.02	0.03
Productivity change	0.00	0.00	0.00	0.00	0.00
Rate of change	0.44	0.92	1.09	1.12	1.18

Source: AER analysis.

B.3 Assessment approach

As discussed above, our assessment of the annual change in expenditure is made in the context of our assessment of ActewAGL's proposed total forecast opex.

The rate of change itself is a build-up of various components to provide an overall holistic number that represents our forecast of annual change in overall opex during the 2014–19 period. We consider the rate of change approach captures all drivers of changes in efficient base opex except for material differences between historical and forecast step changes. The rate of change approach takes into account the service provider's inputs and outputs, and how well it utilises these inputs and outputs.

The rate of change formula for opex is:

$$\Delta Opex = \Delta price + \Delta output - \Delta productivity$$

Where Δ denotes the proportional change in a variable.

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333 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 233.
334 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 234.
335 Since a rate of change driver such as price change is made up of various escalators, such as labour and materials. Our conversion from a dollar figure impact to a percentage impact is the equivalent of applying a weighted average of all the escalations used in the price change measure.

Our starting point for assessing the service provider's proposed change in annual expenditure is to disaggregate the service provider's proposal into the three rate of change components. This enables us to identify where there are differences in our estimate and the service provider's estimate of the components of the rate of change. While individual components in the service provider's proposed annual change in expenditure may differ from our rate of change component forecasts, we will form a view on the overall rate of change in deciding what to apply to derive our alternative opex forecast.

We also take into account whether the differences in the rate of change components are a result of differences in allocation or methodology. For example, a service provider may allocate economies of scale to the output change component of the rate of change, whereas we consider this to be a productivity change. Irrespective of how a service provider has built up or categorised the components of its forecast rate of change, our assessment approach considers all the relevant drivers of the opex rate of change.

Since our rate of change approach is a holistic approach we cannot make adjustments to one component without considering the interactions with other rate of change components. For example, if we were to the adjust output to take into account economies of scale, we must ensure that economies of scale have not already been accounted for in our productivity change forecast. Otherwise, this will double count the effect of economies of scale.

Price change

Under our rate of change approach we adjust opex by the forecast change in prices. The price change is made up of labour price changes and non-labour (which includes materials) price changes. The change in prices accounts for the price of key inputs that do not move in line with the CPI and form a material proportion of ActewAGL's expenditure.

To determine the appropriate forecast change in labour prices we have assessed forecasts from Independent Economics, BIS Shrapnel and Deloitte Access Economics (DAE). These forecasts are based on the consultants' view of general macroeconomics trends for the utilities industry and the overall Australian economy. Our consideration of the choice of labour price forecast is discussed below in section B.4.2.

Output change

The 'output change' captures the change in expenditure due to changes in the level of outputs delivered, such as increases in the size of the network and the customers serviced by that network. An increase in the quantity of outputs is likely to increase the efficient opex required to service its outputs.

Under our rate of change approach, a proportional change in output results in the same proportional change in expenditure. For example, if the only output measure is maximum demand, a 10 per cent increase in maximum demand results in a 10 per cent increase in expenditure. Any subsequent adjustment for economies of scale is considered as a part of productivity.

To measure output change, we select a set of output measures and apply a weighting to these measures. We have chosen the same output change measures and weightings as used in Economic

Insight's economic benchmarking report.[336] This ensures output change is measured consistently through time and across service providers.

The historical output change for ActewAGL has been obtained from our Economic Benchmarking RIN. The Economic Benchmarking RIN provides a consistent basis to benchmark the inputs and outputs of each service provider. This allows us to consistently compare the change in output overtime and across service providers.

The forecast output change has been calculated based on forecasts obtained from the reset RIN which have been prepared on the same basis as the Economic Benchmarking RIN.

More information on how we have estimated output change is discussed below in section B.4.3.

Productivity

Our change in productivity measure is based on our expectations of the productivity an efficient service provider in the distribution industry can achieve. Our forecast productivity is based on analysis from Economic Insights' economic benchmarking analysis.[337] However, we have also assessed whether the historical productivity from 2006–13 reflects a reasonable expectation of the benchmark productivity that can be achieved for the forecast period.

If inputs increase at a greater rate than outputs then a service provider's productivity is decreasing. Changes in productivity can have different sources. For example, changes in productivity may be due to the realisation of economies of scale or technical change, such as the adoption of new technologies. We expect efficient service providers to pursue productivity improvements over time.

In the explanatory statement to our Guideline we noted that we would apply a rate of change to estimate final year opex (taking into account an efficiency adjustment, if required), to account for the shift in the productivity frontier.[338]

Since forecast opex must reflect the efficient costs of a prudent firm, it must reflect the productivity improvements it is reasonable to expect a prudent service provider can achieve. All else equal, a price taker in a competitive market will maintain constant profits if it matches the industry average productivity improvements reflected in the market price. If it is able to make further productivity improvements, it will be able to increase its profits until the rest of the industry catches up, and this is reflected in the market price. Similarly, if a service provider is able to improve productivity beyond that forecast, it is able to retain those efficiency gains for a period.[339]

Since both outputs and inputs are taken into account, our productivity measure accounts for labour productivity and economies of scale. The effect of industry wide technical change is also included.

More information on how productivity has been estimated is discussed below in section B.4.4.

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336 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, pp. 40–41.
337 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 38.
338 AER, *Better regulation explanatory statement expenditure forecast assessment guideline*, November 2013, p. 65.
339 AER, *Better regulation explanatory statement expenditure forecast assessment guideline*, November 2013, p. 66.

Other considerations

Interaction with our base opex and step changes

As noted above, the rate of change approach is used in conjunction with our assessment of efficient base opex and step changes to determine total opex. We cannot make adjustments to base opex and step changes without also considering its effect on the opex rate of change, and, in particular, productivity.

For example, if we adjust an inefficient service provider's base opex to that of an efficient service provider we must also set the productivity to reflect an efficient service provider's productivity.

This interrelationship is also important for our step change assessment. Our forecast rate of change is influenced by historical data. Our measured productivity will include the effect of past step changes which typically increase a service provider's inputs. This will lower our measured productivity. If we include an allowance for step changes in forecast opex, there is a risk that a service provider will be compensated twice for step changes.[340]

Comparison with our previous cost escalation approach

Under our previous approach to setting the trend in opex, we assessed real cost escalations (this is similar to price change) and output change separately. Any productivity changes were assessed based on labour productivity for real cost escalations and economies of scale for output change.

This approach is less robust than our opex rate of change approach because accounting for both labour productivity and economies of scale separately could result in double counting productivity effects.

In practice, this meant that we could either apply labour productivity or economies of scale but not both. In our recent determinations we applied an adjustment for economies of scale rather than labour productivity because economies of scale estimates were more robust than labour productivity estimates. However, we noted this approach did not account for all productivity changes and that a single productivity measure would be more accurate.[341]

B.4 Reasons for position

To provide greater detail on how we have estimated our forecast rate of change, the sections below have been separated into the three main rate of change components. Where relevant these components have been compared to ActewAGL's rate of change using information provided in the reset RIN.

B.4.1 Overall rate of change

To forecast our overall opex, we have adopted a higher average rate of change to ActewAGL's forecast rate of change. This difference is driven by our different forecasts for output change and price change.

Our forecast of the output change is higher than ActewAGL's. For output change, our forecast is based on the weighted average increase in customer numbers, circuit length and ratcheted maximum

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340 Economic Insights, Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs, 8 September 2014, p. 42.

341 AER, Final decision SP AusNet Transmission Determination 2014–15 to 2016–17, January 2014, pp. 64–65

demand used in Economic Insights' opex cost function.[342] ActewAGL's output change is based on its capital expenditure which is then adjusted for economies of scale.

Our forecast price change is lower than ActewAGL's forecast price change. This is driven by the difference in labour price changes. ActewAGL used forecasts from Independent Economics to establish its estimate whereas we have used an average of Deloitte Access Economics' (DAE) and Independent Economics' forecasts.

The difference between the output change forecasts is greater than the difference between the price change forecasts. So overall our forecast rate of change is higher than ActewAGL's rate of change.

In estimating our rate of change, we considered ActewAGL's proposed method and forecast changes in prices, outputs and productivity, as set out in its opex model and reset RIN response.

Table B.4 shows ActewAGL's and our overall rate of change and each rate of change component in percentage terms for 2014–19.

Table B.4 AER and ActewAGL's overall rate of change (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
ActewAGL					
Price change	0.43	0.84	1.06	1.09	1.15
Output change	0.02	0.08	0.03	0.02	0.03
Productivity change	0.00	0.00	0.00	0.00	0.00
Overall rate of change	**0.44**	**0.92**	**1.09**	**1.12**	**1.17**
AER					
Price change	0.53	0.61	0.90	0.96	0.76
Output change	–0.04	1.05	1.06	1.05	1.05
Productivity change	0.00	0.00	0.00	0.00	0.00
Overall rate of change	**0.48**	**1.67**	**1.96**	**2.02**	**1.82**
Difference	**0.04**	**0.75**	**0.88**	**0.90**	**0.65**

Source: AER analysis.

B.4.2 Price change

For the forecast opex price changes we adopted a 62 per cent weighting for labour price and 38 per cent non-labour. Our forecast for the labour price change is based on forecasts of the Electricity, Gas, Water and Waste services (EGWWS) industry and our forecast for non-labour price change is the CPI. Table B.5 shows ActewAGL's proposed forecast price change and our price change.

[342] Our approach to setting the rate of change is consistent with Economic Insights' econometric modelling which we have also used in assessing and adjusting ActewAGL's base opex.

Table B.5 AER and ActewAGL's forecast real price change (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
ActewAGL forecast price change	0.43	0.84	1.06	1.09	1.15
AER forecast price change	0.53	0.61	0.90	0.96	0.76

Source: AER analysis.

The difference in the price change forecasts is driven by the following two reasons:

1. ActewAGL attributed a different proportion of opex to labour than we did. Opex for labour increases at a faster rate than non-labour under both price approaches so, all else equal, a higher proportion of labour will result in a higher price change.
2. ActewAGL used Independent Economics' labour price forecasts which are higher than our use of an average of Independent Economics and Deloitte Access Economics.

Although ActewAGL applied different weightings for labour and non-labour to us, we do not consider this to be a significant driver of the difference between ActewAGL's and our forecast of price change.

We consider the difference between ActewAGL's labour price forecast and our labour price forecast to be the main driver of the difference between the two forecasts.

These two factors are discussed in detail below.

Opex price weightings

The forecast price change is weighted to account for the proportion of opex that is labour and non-labour. Since opex is not comprised entirely of labour costs, it would not be appropriate to adjust opex by only labour prices.

We have adopted a 62 per cent weighting for labour and 38 per cent for non-labour. The labour component is forecast based on the Electricity, Gas, Water and Waste Services (EGWWS) industry and the non-labour component is forecast based on the consumer price index (CPI).

These weightings are broadly consistent with Economic Insight's benchmarking analysis which applied weight of 62 per cent EGWWS wage price index (WPI) for labour and 38 per cent for five producer price indexes (PPIs) for non-labour. The five PPI's cover business, computing, secretarial, legal and accounting, and public relations services.[343]

As discussed in our assessment of ActewAGL's forecasting method section (appendix D), ActewAGL adopted a hybrid base, step, trend and bottom-up forecast of opex. This is why ActewAGL did not adopt a single set of weights for its price change forecast. For some of ActewAGL's opex categories, such as network operating costs, the proportion of labour in their forecast is lower than ours, and for other categories, such as network maintenance, the proportion of labour in their forecast is higher than ours. Overall, however, ActewAGL's opex weightings are not a driver of the difference between ActewAGL's forecast price change and our forecast price change.[344]

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343 Economic Insights, Measurement of Inputs for Economic Benchmarking of Electricity Network Service Providers, 22 April 2013, p. 4.

344 Economic Insights, Measurement of Inputs for Economic Benchmarking of Electricity Network Service Providers, 22 April 2013, p. 4.

Forecast of producer price indices and CPI

For the purposes of forecasting we have applied the forecast CPI rather than forecasts for each PPI. We recognise that the use of PPI's for historical purposes and CPI for forecasts may be inconsistent. However, sensitivity analysis from Economic Insights showed there to be no material difference between using the CPI or PPI in the economic benchmarking results. This is because the change in PPI's follows a similar trend to the change in CPI.[345]

To forecast CPI we adopt the Reserve Bank of Australia's (RBA's) Statement of Monetary Policy and for the years beyond that we apply the mid-point of the RBA's target band. We consider forecasts of the CPI to be more robust than forecasts of the PPI's because the CPI is a more aggregated measure and forecasts of the CPI are more readily available. Further the CPI is subject to the RBA's Statement of Monetary Policy's target band which provides a more robust basis for economists to produce their forecasts. For this reason we have used forecast CPI, rather than PPI's, to forecast the non-labour component of price changes. Economic Insights noted that while the use of these PPIs is likely to be more accurate for historical analysis, it is unlikely to be practical for applications requiring forecasts of the opex price index such as the rate of change. This is because it is very difficult to obtain price forecasts at a finely disaggregated level other than by simple extrapolation of past trends.[346]

If the forecasts of the five PPI's can be forecast with similar accuracy to the CPI, then we would consider the five PPI's to also be an appropriate opex price deflator. However, at this stage we do not consider robust forecasts of the five PPI's are available.

Labour price change

Our choice of the labour price measure seeks to select the efficient labour price for an efficient service provider on the opex frontier. To determine the efficient labour price we require a forecast of the benchmark labour price. We consider forecasts of the EGWWS industry, produced by expert forecasters, to be an appropriate benchmark for ActewAGL's labour price. This is because the EGWWS classification includes labour in the electricity industry and provides a benchmark labour price for comparable staff within the utilities industry. Since ActewAGL's labour is classified within the EGWWS industry, this provides a reasonable comparison with similar labour.

Labour industries

We consider only EGWWS labour should be applied for the labour component of the price change.

ActewAGL commissioned labour forecasts for the following industries:

- utilities
- professional services
- general labour.

The labour price forecasts for these industries are then applied to varying degrees depending on the opex category in ActewAGL's opex model.[347]

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345 Economic Insights, Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs, 20 October 2014, p. 13.

346 Economic Insights, Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs, 20 October 2014, p. 13.

347 ActewAGL, ActewAGL Opex model.

The Australian Bureau of Statistics (ABS) previously advised:

> ... regardless of the type of job, if the job was selected from a business classified to the electricity, gas, water and waste services industry, the jobs pay movements contributes to this industry.[348]

The ABS takes into account the nature of the business, not the nature of the work undertaken, when allocating a job to an industry. The ABS labour price statistics for the EGWWS industry reflects both specialised electricity distribution network related labour and general labour.

We consider regardless of the nature of the task, if labour is employed by a business that operates in the utilities industry, then it should be escalated by the EGWWS industry forecast. For this reason we have adopted the EGWWS classification for all labour.

Labour forecasts used in non-labour inputs

ActewAGL's applied labour forecasts for engineering construction labour to some of its materials escalation. ActewAGL is therefore applying a labour based measure to forecast non-labour based price increase. We do not consider adopting a labour forecast for materials escalation is reasonable.

ActewAGL's Reset RIN response listed several materials price changes for various assets.[349] ActewAGL's opex model used a price change for 'materials' which is the same as the price change for its 'Zone substation civils' category.[350] This is also the same as ACIL Allen Consulting's forecasts of engineering construction labour used in CEG's report to ActewAGL.[351]

ActewAGL's consultant CEG noted that construction forecasts likely contain a significant labour component. CEG also stated that construction costs specific to the utilities industry sector, if available, have already been adequately measured by the utilities industry labour estimates.[352]

This suggests that ActewAGL's materials price change is based on a labour price change.

As discussed above, in the opex weightings section, we have adopted CPI for non-labour inputs as we consider it the most reliable forecasting index for non-labour price. We note Ausgrid,[353] Essential Energy[354] and Endeavour Energy[355] proposed CPI rates for materials/non-labour escalation.

Choice of labour forecast

To forecast labour we have adopted the average of DAE's and Independent Economics wage price index (WPI) forecasts for the EGWWS sector.

We consider an averaging approach that takes into account the consultant's forecasting history, if available, to be the best methodology for forecasting labour price change.

This is based on our previous analysis in relation to SP AusNet's gas distribution network which was corroborated by Professor Borland.[356] When considering appropriate labour price change forecasts for the SP AusNet gas distribution network we adopted an average of the forecasts prepared by DAE and

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348 ABS, *Email from Kathryn Parlor to Fleur Gibbons*, 8 July 2010.
349 ActewAGL, A3 - Regulatory reset (5 year) RIN report template – Consolidated information.xlsx, Table 2.14.1.
350 ActewAGL's opex model.
351 CEG, Escalation factors affecting expenditure forecasts, December 2013, p. 29.
352 CEG, Escalation factors affecting expenditure forecasts, December 2013, p. 29.
353 Ausgrid, p. 56.
354 Essential Energy, p. 75.
355 Endeavour Energy, p. 90.
356 AER, *Access arrangement final decision SPI Networks (Gas) Pty Ltd 2013–17, Part 3: Appendices*, March 2013, p. 7.

BIS Shrapnel. We took this approach because DAE typically forecasts lower than actual WPI and BIS Shrapnel typically forecast higher than actual WPI for the Australian EGWWS sector.

Previous analysis by DAE and the AER showed that DAE under forecasted price change at the national level. In contrast BIS Shrapnel over forecasted price change and by a greater margin.[357]

We previously adopted the average of the forecasts from BIS Shrapnel and DAE to obtain a labour price measure for SP AusNet's gas distribution network.[358]

ActewAGL engaged Independent Economics to provide labour forecasts. We cannot compare the past accuracy of Independent Economics labour forecasts to DAE and BIS Shrapnel because Independent Economics were not engaged by service providers to provide labour forecasts in our past decisions.

However, we can compare Independent Economics forecasts against DAE's and BIS Shrapnel's forecasts of the NSW EGWWS sector for 2013–14 to 2018–19. These forecasts are shown in Table B.6. Independent Economics has the highest forecasts in both nominal and real terms. This indicates that taking an average of DAE and Independent Economics forecasts produce similar results to taking an average of DAE and BIS Shrapnel.

Table B.6 Comparison of consultant labour forecasts for NSW EGWWS industry (per cent)

	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	Average
Nominal							
Deloitte	3.20	3.30	2.90	3.40	3.50	3.30	3.27
Independent Economics	3.07	3.59	3.94	4.56	4.87	4.71	4.12
BIS Shrapnel	3.60	3.40	3.70	4.20	4.50	4.70	4.02
Real							
Deloitte	0.60	0.60	0.40	0.50	1.00	0.90	0.67
Independent Economics	1.53	1.11	1.46	1.95	1.94	1.93	1.65
BIS Shrapnel	0.80	0.60	1.20	1.70	2.00	2.20	1.42
CPI							
Deloitte	2.70	2.50	2.50	2.90	2.50	2.40	2.58
Independent Economics	1.52	2.45	2.45	2.56	2.88	2.72	2.43
BIS Shrapnel	2.80	2.80	2.50	2.50	2.50	2.50	2.60

Source: Deloitte Access Economics, Independent Economics and BIS Shrapnel.

We note Independent Economics forecasts were produced earlier than DAE's and BIS Shrapnel's. The Independent Economics forecasts that were used in CEG's report were dated December 2013.[359]

357 AER, *Powerlink Final decision*, p. 54, April 2012.
358 AER, *Access arrangement final decision SPI Networks (Gas) Pty Ltd 2013–17, Part 3: Appendices*, March 2013, p. 7.
359 CEG, Escalation factors affecting expenditure forecasts, December 2013.

DAE and BIS Shrapnel's forecasts were produced more recently. BIS Shrapnel's report for Jemena Gas Networks (JGN) was dated April 2014[360] and DAE's report was dated July 2014. This means both BIS Shrapnel and DAE's forecasts potentially reflect more recent data than Independent Economics' forecasts. We would expect the updated forecasts from the consultants to be lower for the revised proposal.

The Australia wide EGWWS for 2013–14 was 3.04 per cent in nominal terms[361] and CPI was 3.02 per cent for the same period.[362] This results in a 0.02 per cent real increase in the price of national EGWWS labour. All consultant forecasts for 2013–14 EGWWS labour are higher than the ABS' actual figures.

We note BIS Shrapnel's updated forecasts in its April 2014 report are lower than its forecasts November 2013 report.[363] We would expect that if Independent Economics updates its labour forecasts to reflect the most up to date data, then its revised labour forecast will be lower than the forecasts in its December 2013 report.

The Major Energy Users (MEU) noted forecasts by DAE and BIS Shrapnel typically overestimate the WPI and that the AER does not assess the actual accuracy of the forecasts over time.[364]

We have assessed the forecasting performance of both DAE and BIS Shrapnel and, as noted above, we have found that DAE typically forecasts below the actual WPI and BIS Shrapnel forecasts above. We have addressed this issue by averaging consultants' forecasts.

We consider the consultants should take the recent ABS data into account when providing updated forecasts. We cannot assess the consultants' models; however, we consider the forecasts should reflect current expectations of the forecast period.

We note labour price escalation numbers are not finalised and will be updated prior to the final decision to reflect the most up to date data.

For the purpose of this draft decision, we take the view that an average of DAE and Independent Economics forecasts would be the most reliable predictor of labour price changes.

Labour productivity

Our preferred approach to productivity is to adopt an overall electricity distribution specific productivity adjustment rather than adjusting the forecast EGWWS labour price change for EGWWS labour productivity.

The use of electricity distribution specific productivity rather than EGWWS wide productivity is supported by Independent Economics which noted:[365]

> There are significant difficulties in measuring productivity in the utilities sector generally and the electricity distribution sector in particular. Hence, it is suggested adjusting for productivity is better undertaken on the

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360 BIS Shrapnel, *Real labour and material cost escalation forecasts to 2019/20 – Australia and New South Wales*, April 2014.

361 ABS, 6345.0 - Wage Price Index, Australia, Table 9b. Ordinary Hourly Rates of Pay Excluding Bonuses: Sector by Industry, Original (Quarterly Index Numbers), 12 August 2014.

362 ABS, 6401.0 - Consumer Price Index, Australia, Tables 3 and 4. CPI: Groups, Weighted Average of Eight Capital Cities, Index Numbers and Percentage Changes, 22 July 2014.

363 BIS Shrapnel, Real labour cost escalation forecasts to 2018/19 – Australia and New South Wales, November 2013.

364 Major Energy Users, *Tasmanian Electricity Transmission Revenue Reset A response by the Major Energy Users Inc*, August 2014, p. 28.

365 Independent Economics, Labour cost escalators for NSW, the ACT and Tasmania, 18 February 2014, p. 6.

basis of a detailed assessment of specific sources of productivity gains within the industry rather than attempting to infer productivity gains using the broader data published by the ABS.

Since the data for a distribution industry specific productivity measure is available, from our economic benchmarking analysis and this is preferred over an EGWWS labour productivity adjustment, we have applied a distribution industry specific measure.

Further discussion on how we have accounted for productivity is discussed below in section BB.4.4.

B.4.3 Output change

We have adopted the following output change measures and their respective weightings:

- customer numbers (67.6 per cent)
- circuit length (10.7 per cent)
- ratcheted maximum demand (21.7 per cent).

These output measures are consistent with the output variables used in our opex cost function analysis to measure productivity. This approach is consistent with our Guideline.[366]

The outputs chosen by Economic Insights were based on three selection criteria.

First, the output aligns with the NEL and NER objectives. The NER expenditure objectives for both opex and capex are to:

- meet or manage the expected demand for standard control services over that period
- comply with all applicable regulatory obligations or requirements associated with the provisions of standard control services
- to the extent that there is no applicable regulatory obligation or requirement in relation to:
    i. the quality, reliability or security of supply of standard control services
    ii. the reliability or security of the distribution system through the supply of standard control services

to the relevant extent:

    iii. maintain the quality, reliability and security of supply of standard control services
    iv. maintain the reliability and security of the distribution system through the supply of standard control services

- maintain the safety of the distribution system through the supply of standard control services.

Second, the output reflects services provided to customers.

Third, only significant outputs should be included. While service providers provide a wide range of services, costs are dominated by a few key outputs. Only those key outputs should be included to keep the analysis consistent with the high level nature of economic benchmarking. [367]

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[366] AER, Better Regulation *Expenditure Forecast Assessment Guideline* for Electricity Distribution, November 2013, p. 23.

The process for selecting the output specification is discussed in our base opex appendix and Economic Insights' benchmarking report.[368]

Our rate of change approach assumes any change in output results in the same proportional change in opex. For example, a 10 per cent increase in weighted average output change results in a 10 per cent increase in opex.

We used the customer numbers, circuit length and maximum demand reported in ActewAGL's reset RIN. This produces an average annual growth rate of 1.05 per cent for customer numbers, 1.17 per cent for circuit length and zero per cent for ratcheted maximum demand.

ActewAGL's forecast output change is driven by its capital expenditure resulting in additional maintenance costs. Since ActewAGL did not include all of its opex assets, it considers it has implicitly adjusted for economies of scale by only increasing opex for some of its output change.[369]

We note demand forecasting is related to capex, however for the purposes of our draft decision we have maintained the use of the outputs in ActewAGL's reset RIN. However, as discussed in our capex attachment, demand forecasts may be updated prior to the final decision.

ActewAGL's and our forecast output change is shown below in Table B.7.

Table B.7 AER and ActewAGL forecast output change (per cent)

	2014–15	2015–16	2016–17	2017–18	2018–19
ActewAGL forecast output change	0.02	0.08	0.03	0.02	0.03
AER forecast output change	–0.04	1.05	1.06	1.05	1.05

Source: AER analysis.

The difference between the two forecast output change accounts for approximately one per cent of the difference between the two rates of change approaches.

Our assessment of forecast demand is discussed in the demand forecasting section of the capex attachment 6. For the purposes of setting the rate of change, we have used ActewAGL's Reset RIN response to obtain the trend in the output change.

B.4.4 Productivity

We have applied a zero per cent productivity change in estimating our overall rate of change. This is based on Economic Insights' recommendation to apply zero productivity change for the NSW and ACT distribution network service providers and our assessment of overall productivity trends for the forecast period.[370] ActewAGL also proposed a productivity change of zero per cent. However, ActewAGL's reasons for arriving at zero productivity change are different to ours.

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367 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 9.

368 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, pp. 9–12.

369 ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 233.

370 Economic Insights, *Economic Benchmarking Assessment of Operating Expenditure for NSW and ACT Electricity DNSPs*, 8 September 2014, p. 52.

Our Guideline state that we will incorporate forecast productivity in the rate of change we apply to base opex when assessing opex. The forecast productivity change will be the best estimate of the shift in the productivity frontier. [371]

We consider past performance to be a good indicator of future performance under a business as usual situation. We have applied forecast productivity based on historical data for the electricity transmission and gas distribution industries where we consider historical data to be representative of the forecast period.

To reach our best estimate of forecast productivity we have taken into account all available information. This includes Economic Insights' economic benchmarking, ActewAGL's proposal, our expectations of the distribution industry in the short to medium term, and observed productivity outcomes from electricity transmission and gas distribution industries.

We have applied a zero productivity forecast for ActewAGL and the NSW service providers for the following reasons:

- While data from 2006–13 period indicates negative productivity for distribution network service providers on the efficient frontier, we do not consider this is representative of long term trends and our expectations of forecast productivity in the medium term. The increase in the service provider's inputs, which is a significant factor contributing to negative productivity, is unlikely to continue for the forecast period.
- Measured productivity for electricity transmission and gas distribution industries are positive for the 2006–13 period and are forecast to be positive.
- ActewAGL and the NSW service providers proposed either zero or positive productivity for the forecast period.

Each of these reasons is discussed in detail in the section below.

Forecast outlook and historical productivity

As noted above the forecast productivity is our best estimate of the shift in the frontier for an efficient service provider. Typically we consider the best forecast of this shift to be based on recent data. However, this requires a business as usual situation where the historical data is representative of what is likely to occur in the forecast period. [372]

Analysis from Economic Insights using MTFP and opex cost function models showed that from 2006 to 2013, the distribution industry experienced negative productivity change.[373] This means that for the distribution industry inputs specified under the models increased at a greater rate than the measured outputs.

According to Economic Insights' modelling, the average annual output change from 2010 to 2013 for the distribution industry was 0.6 per cent. During this period, the output measures of customer

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371 AER, *Better regulation explanatory statement expenditure forecast assessment guideline*, November 2013, p. 65.
372 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 41.
373 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, pp. 20, 40.

numbers and circuit length grew by 1.2 per cent and 0.5 per cent respectively. Maximum demand decreased by 4.1 per cent from its peak in 2009.[374]

However, total input quantity increased by 2.8 per cent per annum from 2010 to 2013.[375] This has been driven by substantial increases in both opex and capital inputs.

We consider the increase in inputs, relative to outputs, could be driven by one or all of the following factors:

- An increase in regulatory obligations which increases a service provider's costs without an increase in its outputs. Following the Victorian bushfires of February 2009, the Victorian service providers received step change increases in excess of 10 per cent of the approved opex requirement. Economic Insights considers step changes to have a significant impact on measured productivity.[376] The interaction between step change and productivity is discussed in the other considerations section below.
- Increased opex and capital to meet forecast increases in outputs, such as reliability due to regulatory obligations. For example, Endeavour Energy noted that substantial investment was required during the 2009–14 regulatory period to meet its Licence Conditions.[377]
- Inefficient use of inputs which means more inputs were required to service a service provider's outputs. Economic Insights identified substantial efficiency gaps for ActewAGL and the NSW service providers.[378]

If these above drivers are the basis for the observed negative productivity in the recent past, we need to consider whether drivers will persist in the forecast period.

First, we do not expect the 2.8 per cent average annual growth in inputs from 2010 to 2013 to continue into the forecast period.

A key driver of the increase in opex and capital inputs during 2009–14 was the increased reliability standards in 2007.

DAE estimated the overall cost of meeting the 2007 Licence Conditions was $1.9 billion for Ausgrid, $614 million for Endeavour Energy and $465 million for Essential Energy.[379] Given the change in Licence conditions was a one off obligation, that has since been amended, we would not expect a similar increase in inputs in the forecast period.

Economic Insights considers the greater use of opex and capital inputs from 2006–13 will result in excess capacity for 2014–19.[380] This means the service providers are unlikely to require the same growth in inputs for the forecast period. Endeavour Energy noted that its investments to meet Licence

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374 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, pp. 44–45.
375 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 45.
376 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 42.
377 Endeavour Energy, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 46
378 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. v.
379 Deloitte Access Economics, *NSW DNSP labour analysis draft report*, p. 9.
380 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, p. 45.

Conditions have provided sufficient capacity in its existing network to meet forecast demand growth and will continue to do so in the coming years.[381] Endeavour Energy also noted that capex will shift from a focus on meeting maximum demand to maintaining reliability.[382] Essential Energy also identified the need for investment to meet capacity and Licence Conditions has subsided.[383]

Second, the increase in inputs due to regulatory obligations observed during 2009-13 is unlikely to persist into the forecast period.

For Victorian service providers, we note the one off step increase in opex to meet their regulatory obligations after the 2009 Victorian Bushfires substantially increased their inputs. Further significant step changes in Victorian bushfire regulations are unlikely over forecast period.

The third potential source of observed negative productivity is the increase in inefficient use of inputs by service providers during the 2006–13 data period. After allowing for operating environment factors and modelling limitations, Economic Insights found the opex of ActewAGL and the NSW service providers was much higher than the opex incurred by a benchmark efficient service provider.[384] We do not consider that the past inefficiency of a service provider should be included in our forecast of productivity.

Other industries and proposed productivity

In estimating forecast productivity for the distribution industry we have also had regard to the electricity transmission and gas distribution industry, and ActewAGL's and the NSW service provider's productivity forecasts.

Measured declines in productivity in the electricity distribution sector are unlikely to reflect longer term trends. Economic Insights notes:

> We also note that a situation of declining opex partial productivity is very much an abnormal situation as we normally expect to see a situation of positive technical progress rather than technical regress over time. While we acknowledge the distinction between the underlying state of technological knowledge in the electricity distribution industry and the impact of cyclical factors that may lead to periods of negative measured productivity growth, the latter would be expected to be very much the exception, step change issues aside.

Further both the electricity transmission and gas distribution industries experienced positive opex productivity growth during the 2006–13 period.[385] For electricity transmission network service providers average industry productivity was 0.85 per cent and for gas distribution Jemena Gas Networks proposed an average opex productivity of 0.95 per cent of which 0.83 per cent was attributed to the shift in the frontier.[386]

Cyclical factors and regulatory obligations for the distribution sector may be the reason for the lower measured productivity in the distribution industry compared to the transmission and gas distribution industries. Over the medium to long term, however, we expect the distribution network service providers to have productivity change rates comparable to the electricity transmission and gas distribution industries.

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381 Endeavour Energy, *Regulatory proposal,* p. 46.
382 Endeavour Energy, *Regulatory proposal*, p. 2.
383 Essential Energy, *Regulatory proposal*, p. 77.
384 Economic Insights, *Economic benchmarking assessment of operating expenditure for NSW and ACT electricity DNSPs*, 20 October 2014, pp. 46–51.
385 AER, *TransGrid transmission determination – draft decision*, Attachment 7, Appendix A, November 2014; AER, *JGN gas distribution determination – draft decision*, Attachment 7, November 2014.
386 AER, *JGN gas distribution determination – draft decision*, Attachment 7, November 2014.

We also note ActewAGL and the NSW electricity distribution service providers forecast zero or positive productivity for the forecast period. Further several forecasts indicated that increases in output will be offset by efficiency improvements. For example, ActewAGL and Endeavour Energy forecast economies of scale will offset most of their output growth. [387]

Essential Energy proposed zero per cent productivity change[388] and Ausgrid proposed productivity savings of $47 million[389] for its standard control services.

[387] ActewAGL, *Regulatory proposal 2015–19 Subsequent regulatory control period*, 10 July 2014, p. 233; Endeavour Energy, *Response to information request END003*, 29 July 2014.
[388] Essential Energy, *Reset RIN,* table 2.16.1.
[389] Ausgrid, *Reset RIN,* table 2.16.1.

C Step changes

Step changes allow for adjustments to the efficient base level of opex to account for changed circumstances in the forecast period that we have not otherwise addressed in our alternative opex forecast. We typically allow step changes to base opex for changes to ongoing costs associated with new regulatory obligations and for efficient capex/opex trade-offs.[390] Step changes may be positive or negative.

This appendix sets out our consideration of step changes in determining our opex forecast for ActewAGL for the 2014–19 period.

C.1 Draft position

We have included a $1.4 million step change for ActewAGL's increased regulatory compliance costs in our alternative opex forecast. We are not satisfied that adding step changes for other cost drivers identified by ActewAGL would lead to a forecast of opex that reasonably reflects the opex criteria.

We outlined our approach to assessing step changes in our Expenditure forecast assessment guideline (our Guideline).[391] Only part of one of the step changes ActewAGL proposed is consistent with our Guideline.

A summary of the revenue impact and the reason for our draft position is outlined below in Table C.1. Our detailed reasoning is set out in section C.4.

Table C.1 Summary of our decision on ActewAGL's proposed step changes

	ActewAGL ($million)	AER ($million)	Reasons
Environment, health safety and quality (EHSQ)	**2.8**	0.0	The cost of meeting regulatory obligations are reflected in the efficient base level of opex and the regulatory requirements in 2015-20 are not more onerous than in 2009–14.
Regulatory compliance and strategy	**8.6**	1.4	Some new regulatory obligations.
Technical standards	**1.5**	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex.
Safe work practices	**3.5**	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex
Contractor management	**3.1**	0.0	Not a new regulatory obligation. A prudent and efficient service provider should be able to meet this regulatory obligation from an efficient base level of opex.
Network operations and	**2.1**	0.0	The efficient base level of opex already accounts for opex needed to provide standard control distribution

390 AER, *Expenditure forecast assessment guideline*, November 2013, pp.11 and 24.
391 AER, *Expenditure forecast assessment guideline*, November 2013, p. 11.

call centre			services.
Network OT support	**4.8**	0.0	The efficient base level of opex already accounts for opex needed to provide standard control distribution services.
Corporate services	**10.1**	0.0	Not a new regulatory obligation.
Capitalisation corporate services	**-1.2**	0.0	Not specifically considered as a step change. Taken into account in setting an efficient base level of opex.
Total	**35.3**	1.4	

Source: ActewAGL, *Regulatory proposal*, June 2014, p.227, AER analysis.

C.2 ActewAGL's proposal

ActewAGL proposed nine step changes above its base opex.[392] They total $35.3 million over the 2014–19 period and represent nine per cent of ActewAGL's proposed total opex. Many of the step changes contained multiple components (the regulatory compliance step change bundled seven smaller step changes and the corporate services step change bundled six smaller step changes). The step changes ActewAGL proposed are set out below in Table C.2.

Table C.2 ActewAGL's proposed step changes ($ million, 2013–14)

	2014-15	2015-16	2016-*17	2017-18	2018-19	Total
Environment, health safety and quality (EHSQ)	0.7	0.7	0.5	0.5	0.4	**2.8**
Regulatory compliance and strategy	2.2	1.1	1.0	2.1	2.1	**8.6**
Technical standards	0.4	0.3	0.3	0.3	0.3	**1.5**
Safe work practices	0.7	0.7	0.7	0.7	0.7	**3.5**
Contractor management	0.6	0.6	0.6	0.6	0.6	**3.1**
Network operations and call centre	0.4	0.4	0.4	0.4	0.4	**2.1**
Network OT support	1.3	1.9	0.8	0.8	0.01	**4.8**
Corporate services	1.4	1.7	2.0	2.4	2.7	**10.1**
Capitalisation corporate services	1.0	0.1	-1.3	-0.8	-0.3	**-1.2**
Total	8.8	7.4	5.1	7.0	6.9	**35.3**

Source: ActewAGL, *Regulatory proposal*, June 2014, p. 227.

C.3 Assessment approach

When assessing a service provider's proposed step changes, we consider whether they are needed for the total opex forecast to reasonably reflect the opex criteria.[393] Our assessment approach is consistent with the approach specified in our Guideline.[394]

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[392] ActewAGL, *Regulatory proposal*, June 2014, Section 8.7.3, p.227-232; ActewAGL, *Regulatory proposal - Attachment B10 Operating expenditure step changes*, June 2014.

[393] NER, clause 6.6.5(c).

As a starting point, we assess whether the proposed step changes in opex are already compensated through other elements of our opex forecast, such as the base efficient opex or the 'rate of change' component. Step changes should not double count costs included in other elements of the opex forecast.

We generally consider an efficient base level of opex is sufficient for a prudent and efficient service provider to meet all existing regulatory obligations. This is the same regardless of whether we forecast an efficient base level of opex based on the service provider's revealed efficient costs or the efficient costs of comparable benchmark providers. We only include a step change in our opex forecast if we are satisfied a prudent and efficient service provider would need an increase in its opex to meet the opex criteria.

We forecast opex by applying an annual 'rate of change' to the base year for each year of the forecast period. The annual rate of change accounts for efficient changes in opex over time. It incorporates adjustments for forecast changes in output and price. Therefore, when we assess the proposed step changes we need to ensure that the cost of the step change is not already accounted for in the annual rate of change. The following explains this principle in more detail.

A step change should not double count the costs of increased volume or scale compensated through the forecast change in output. We account for output growth by applying a forecast output growth factor to the opex base year. If the output growth measure used captures all changes in output then step changes that relate to forecast changes in output will not be required. For example, a step change is not required for the maintenance costs of new office space required due to the service provider's expanding network. The opex forecast has already been increased (from the base year) to account for forecast network growth.[395]

By applying the rate of change to the base year opex, we adjust our opex forecast to account for real price increases. A step change should not double count price increases already compensated through this adjustment. Applying a step change for costs that are forecast to increase faster than CPI will likely yield a biased forecast if we don't also apply a negative step change for costs that are increasing by less than CPI. A good example is insurance premiums. A step change is not required if insurance premiums are forecast to increase faster than CPI because within total opex there will be other categories whose price is forecast to increase by less than CPI. If we add a step change to account for higher insurance premiums we might provide a more accurate forecast for the insurance category in isolation; however, our forecast for total opex as a whole will be too high.

Further to assessing whether step changes are captured in other elements of the opex forecast, we will assess the reasons for, and the efficient level of, the incremental costs (relative to that funded by base opex and the rate of change) that the service provider has proposed. In particular we have regard to:[396]

- whether there is a change in circumstances that affects the service provider's efficient forecast expenditure
- what options were considered to respond to the change in circumstances

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394 AER, *Expenditure forecast assessment guideline*, November 2013, pp.11 and 24. We said we would apply this guideline in our Stage 2, Framework and approach.

395 This is consistent with our decision in the Powerlink determination; AER, *Final decision: Powerlink transmission determination 2012–17*, April 2012, pp, 164–165.

396 AER, *Expenditure assessment forecast guideline*, November 2013, p. 11.

- whether the option selected was the most efficient option—that is, whether the service provider took appropriate steps to minimise its expected cost of compliance
- the efficient costs associated with making the step change and whether the proposal appropriately quantified all costs savings and benefits
- when this change event occurs and when it is efficient to incur expenditure, including whether it can be completed over the period
- whether the costs can be met from existing regulatory allowances or from other elements of the expenditure forecasts.

One important consideration is whether each proposed step change is driven by an external obligation (such as new legislation or regulations) or an internal management decision (such as a decision to increase maintenance opex). Step changes should generally relate to a new regulatory obligation or some change in the service provider's operating environment beyond its control. It is not enough to simply demonstrate an efficient cost will be incurred for an activity that was not previously undertaken. As noted above, the opex forecasting approach may capture these costs elsewhere.

Usually step changes are not required for discretionary changes in inputs.[397] Efficient discretionary changes in inputs (not required to increase output) should normally have a net negative impact on expenditure. For example, a service provider may choose to invest capex and opex in a new IT solution. The service provider should not be provided with a step change to finance the new IT since the outlay should be at least offset by a reduction in other costs if it is efficient.[398] This means we will not allow step changes for any short-term cost to a service provider of implementing efficiency improvements. We expect the service provider to bear such costs and thereby make efficient trade-offs between bearing these costs and achieving future efficiencies.

One situation where a step change may be required is when a service provider chooses an operating solution to replace a capital one.[399] For example, it may choose to lease vehicles when it previously purchased them. For these capex/opex trade-off step changes, we will assess whether it is prudent and efficient to substitute capex for opex or vice versa. In doing so we will assess whether the forecast opex over the life of the alternative capital solution is less than the capex in NPV terms.

C.4 Reasons for draft position

We have only included part of one of the step changes ActewAGL proposed in our alternative opex forecast.

As discussed in the base year opex appendix, we consider that significant material inefficiency exists in ActewAGL's historical opex. We consider that ActewAGL needs to decrease its opex relative to historical levels not increase it. To approve step changes in total opex, without a demonstrated need for extra funding, such as a material change in regulatory obligations or an efficient capex/opex trade-off, would be inconsistent with our approach to setting an efficient base level of opex.

In general ActewAGL proposed two drivers for step changes:

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397 AER, *Expenditure assessment forecast guideline*, November 2013, p. 24.

398 We did not accept a step change proposed by SP AusNet for a technology innovation program because such an innovation program should have been self-funding; AER, *Draft decision: SP AusNet Transmission determination 2013–18,* August 2013, pp. 240–241.

399 AER, *Expenditure assessment forecast guideline*, November 2013, p. 24; AER, *Explanatory guide: Expenditure assessment forecast guideline*, November 2013, pp. 51–52.

- a change in its strategies and policies
- a change in its regulatory obligations and the external environment.

Many of the changes ActewAGL proposed relate to discretionary business decisions about how to meet its current regulatory obligations. We consider an efficient base level of opex provides a sufficient amount of opex to meet existing regulatory obligations and a prudent service provider will prioritise its opex to best meet these regulatory obligations. We do not consider an increase in opex should be needed simply because a service provider wants to change the way that it provides these services. For example, ActewAGL stated its opex proposal was focussed, among other things, on improving safety[400] and this focus is reflected in several of its proposed step changes even though they are not necessarily associated with new regulatory obligations. Consumers should not need to fund ActewAGL's strategic decision about how to meet its current regulatory obligations. Our approach is consistent with the opex objectives which state that forecast opex is required to maintain the safety of the distribution system.

A further example is increased opex associated with IT projects. ActewAGL proposed several step changes related to IT. It proposed an increase in opex for additional staff to support the implementation of its Operational System Replacement (OSR) program and network operational technology (OT) program. We expect that a business would only invest in IT where the benefits of that investment are expected to outweigh the costs. The expectation of future benefits should be sufficient incentive to undertake this investment and no increase in opex is needed.

Other step changes ActewAGL proposed relate to non-recurrent costs associated with existing regulatory obligations. For example, ActewAGL proposed a step change for unanticipated costs associated with potential asbestos discoveries when constructing infrastructure in new areas of Canberra. However, appropriately dealing with asbestos is not a new regulatory obligation for ActewAGL and we expect ActewAGL to meet the costs of future asbestos discoveries from its efficient base level of opex. We recognise a service provider may at different times need to spend relatively less or more opex to meet its existing regulatory obligations. However, it is a prudent service provider's responsibility to manage compliance with all of its regulatory obligations within its total opex allowance over the entire regulatory control period. It can adjust its discretionary spending from year to year to most effectively manage those responsibilities. In other words, it is not enough to demonstrate that the costs of meeting an existing regulatory obligation changes when compared to the base year because as costs on some projects go up, costs on other projects go down. In general we consider total opex is reasonably recurrent.

We consider that most changes ActewAGL linked to regulatory obligations do not require an increase in total opex.

If a step change is due to a new regulatory obligation, a service provider must clearly demonstrate:

- how the regulatory obligation has changed or is forecast to change in the next regulatory control period
- why the regulatory obligation involves a forecast change in costs
- what options the service provider has undertaken to address the change in the regulatory obligation

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[400] ActewAGL, *Regulatory proposal*, June 2014, p. 209.

- why its preferred option is the best option.

Many of the step changes ActewAGL linked to regulatory obligations involved obligations which had already changed in the 2009–14 regulatory control period. In applying our forecasting approach, our underlying assumption is that where a regulatory obligation existed before or during the base year, the costs of complying with that obligation can be met from an efficient base level of opex. For example, ActewAGL proposed a step change for the costs of being required to publish a distribution annual planning report (DAPR) under the National planning and expansion framework (NPEF). However, distribution service providers were required to publish their first DAPR by 1 July 2013 so the cost of doing this should be reflected in the efficient base level of opex.

Other step changes ActewAGL proposed involve changes to regulatory obligations but it is not clear why ActewAGL expected this to increase its total opex. When considering a step change, it is not enough for a business to demonstrate that the regulatory obligation has changed. It must clearly demonstrate how and why this will lead to changes in costs. Regulatory obligations often change because they are periodically reviewed. This may not necessarily involve material changes in costs. For example, ActewAGL proposed a step change for additional technical standards expenditure arising from the updated Management of Electricity Networks Assets Code. We consider the costs of ActewAGL complying with updated industry standards should be met from its existing allowance. We are not satisfied the updated code has imposed a materially heavier burden on ActewAGL than previously.

Furthermore some step changes ActewAGL linked to regulatory obligations which have not yet changed. Where there is some uncertainty about what the regulatory obligation will be, we would expect a service provider to clearly explain what the likely change in obligation will be and the likely course of action the business will take to address the likely change. It is not enough for a service provider to simply state that regulatory obligations will change and this will involve costs. For example, ActewAGL proposed a step change to account for future but unspecified changes arising from a review of the ACT Strategic Bushfire Management Plan 2009.

The only new regulatory obligations for which we consider ActewAGL needs an increase in opex is for regulatory reporting, NECF obligations, and changes relating the AEMC rule changes for network tariffs and connection of embedded generation. This is because we are satisfied there is specific evidence of changes or likely changes in regulatory obligations and increased costs as a result of those changes.

Our detailed consideration of each individual step change is outlined below.

Environment, health safety and quality (EHSQ)

ActewAGL proposed this step change for a number of activities related to health and safety including:

- injury prevention
- bushfire mitigation
- climate risk and resilience
- unplanned safety events.

We have not included ActewAGL's forecast opex for these step changes in our forecast of total opex.

Injury prevention

ActewAGL considered that legislative change in the 2009–14 regulatory control period, including the *Work Health and Safety Act 2011* (WHS Act), will continue to drive cost increases in the 2014–19 period. This is because it expects 13 Codes of Practice listed by WorkSafe ACT are likely to be introduced under the WHS legislation and it will need to update health and safety procedures accordingly.

We did not include a step change for changes in the work health and safety legislation in our opex forecast. This is because we are not satisfied that the work health and safety obligations placed on ActewAGL have materially increased since 2012–13.

One of the key reasons for the introduction of the national WHS Act 2011 was to harmonise work health and safety legislation across jurisdictions in order to reduce regulatory burden. The regulatory impact statement (RIS) underpinning the harmonised WHS Act 2011 stated:[401]

> The harmonisation of work health and safety legislation is part of the COAG National Reform Agenda aimed at reducing regulatory burdens and creating a seamless national economy. These reforms aim to deliver more consistent regulation across jurisdictions and to reduce excessive compliance costs on business.

We examined whether requirements under the WHS Act 2011 were more onerous than the requirements under its predecessor, the *Work Safety Act 2008* but have found no evidence that the obligations under the *Work Health Safety Act 2011* are more onerous than the requirements which existed under the *Work Safety Act 2008*.

Further, we do not consider the codes of practice ActewAGL stated are likely to be introduced in the 2014–19 period under the WHS legislation are new regulatory obligations. The codes of practice provide details on how to achieve the standards required under the existing WHS legislation. They are not new obligations. We expect service providers to comply with amended regulatory codes within the normal course of business.

Bushfire mitigation

ActewAGL proposed that recent bushfires and subsequent inquiries and litigation have identified the need to review existing industry bushfire mitigation standards. ActewAGL stated the ACT Strategic Bushfire Management Plan 2009 (SBMP) is currently under review and will result in future changes in planning and operations.

Consistent with our comments above, we have not included a step change in our alternative opex forecast to account for future unspecified changes in the ACT's bushfire mitigation standards or in ActewAGL's Bushfire Mitigation Strategy and Management Plan. Complying with bushfire mitigation standards is a normal obligation of providing network services. ActewAGL has not presented us with any evidence that likely changes in standards would be more onerous than existing standards.

Climate risk and resilience

ActewAGL stated it would need to understand how and when to adapt to potential increased risks from climate change.

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[401] Safework Australia, *Decision Regulation Impact Statement for National Harmonisation of Work Health and Safety Regulations and Codes of Practice*, 7 November 2011.

We did not provide a step change in our alternative opex forecast for this component of the step change. ActewAGL did not link it to a regulatory change nor did it specify or quantify the costs of this project. In any case, ActewAGL has been aware about the risks of climate change for some time. We would expect that as a prudent business it would have begun considering how these risks could impact on its business.

Unplanned safety events

ActewAGL proposed that development in the ACT has the potential for unanticipated costs associated with asbestos discoveries when constructing electricity distribution infrastructure in new and older areas of Canberra.

We do not consider including a step change for the potential for unanticipated costs is consistent with our Guideline. The risks associated with asbestos are not a new risk and ActewAGL did not link these costs to a new regulatory obligation. To the contrary, we consider the costs of constructing electricity infrastructure in new and older areas of Canberra are business as usual costs for ActewAGL. As discussed above, it is a prudent service provider's responsibility to manage compliance with all of its regulatory obligations within its total opex allowance over the entire regulatory control period and to adjust its discretionary spending from year to year to most effectively manage those responsibilities.

Regulatory compliance and strategy

ActewAGL proposed this step change of $8.6 million for a number of activities related to regulatory compliance including:

- increased regulatory reporting
- National Energy Customer Framework (NECF)
- National Planning and Expansion Framework (NPEF)
- consumer engagement
- AEMC - Network Pricing arrangements 2014
- review of network tariffs
- AEMC –connection of embedded generation.

We have included a step change of $1.4 million in our alternative opex forecast for: [402]

- regulatory reporting
- compliance with new obligations related to NECF connection charges
- AEMC rule changes for network pricing arrangements and the connection of embedded generation.

However we do not consider the other components ActewAGL identified as part of this step change should be included in our alternative opex forecast. This is consistent with views expressed by Origin

[402] The $1.4 million comprises $952,000 for regulatory reporting, $186,000 for NECF connection charges framework and implementation, $140,000 for the AEMC rule change for network pricing arrangements and $116,000 for the AEMC rule change for the connection of embedded generation.

Energy which submitted that many of the activities ActewAGL identified as driving its regulatory compliance step change should already be embedded in its recurrent opex allowance.[403]

Increased regulatory reporting

ActewAGL proposed it will spend $3.3 million to respond to the reset regulatory information notices (RINS), annual reporting RINS, benchmarking RINs and category analysis RINs we issue.

We have included $1.0 million for increased regulatory reporting costs in our alternative opex forecast. The costs we have and have not included in this step change are set out below:

- We have included the increased regulatory reporting costs of submitting the benchmarking, category analysis and reset RINS. The level of detail we requested in the benchmarking and category analysis RINs is greater than we have requested previously and the cost of submitting reset RINs is not included in the efficient base level of opex.
- We have not included the costs of completing category analysis RINs in 2017–18 as the information will be captured in the costs of completing a reset RIN.
- We have not included the costs of completing annual reporting RINs. They are not a new regulatory obligation and these costs are already included in the efficient base level of opex.
- We pro rata the consultancy costs accordingly.[404]
- We substituted lower labour costs than ActewAGL used in its estimate of the cost of increased regulatory reporting. ActewAGL's FTE cost estimates are based on the cost of an engineer at $232,500 per annum.[405] However, we consider regulatory reporting can be done by a less qualified employee. We substituted ActewAGL's most recent average labour cost of $180,000, as reported in its category analysis RIN data.[406]

National Energy Customer Framework (NECF)

ActewAGL proposed increased opex of around $0.3 million for expenditure related to:

- the quarterly reporting of NECF breaches
- the implementation of the customer connection charges.

We have included a step change in our alternative opex forecast for customer connection charges of around $0.2 million but not for the quarterly reporting of NECF breaches.

The NECF was introduced on 1 July 2012 and we approved a cost pass through of $1.9 million in January 2013 for the costs ActewAGL incurred to establish its customer framework.[407] ActewAGL

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403 Origin Energy, *Submission on ActewAGL regulatory proposal,* 22 August 2014, p. 3. Origin included changes in the regulatory and business operating environment, tracking business alignment with the regulatory submission, customer engagement, increased regulatory reporting and formulation of an AER approved connection charge policy and charging manual, strategic review of network tariffs and a Legal Compliance Framework.

404 ActewAGL, *Information request response ActewAGL 06* - Regulatory compliance step change, 24 July 2014, p. 8. ActewAGL provided a breakdown of the regulatory reporting costs. We allowed 85 per cent of the consultancy costs because we consider 85 per cent of the in house costs of regulatory reporting arise from a new regulatory obligation.

405 ActewAGL, *Regulatory proposal - Attachment B10 Operating expenditure step changes*, June 2014, p. 46-47; We derived the cost per FTE ActewAGL used in its estimation by dividing the engineer costs in table 12 by the four additional FTE's ActewAGL referred to on p. 46.

406 ActewAGL, *Category analysis RIN response*, table 7.2 Labour. The average labour cost Includes taxes, superannuation, on costs and corporate costs.

407 ActewAGL, *Information request response ActewAGL 06* - Regulatory compliance step change, 24 July 2014, p. 3.

stated the ongoing costs for reporting breaches are much higher than anticipated. ActewAGL assumed it would report two breaches per year at an annual cost of $23,000.[408] We have not included this component of the step change in our opex forecast because we do not consider a prudent service provider would assume it is going to breach the NECF, and hence the law, twice a year.

ActewAGL proposed a step change for the costs of implementing the Customer Connection Charges component of the NECF, which was deferred until 1 July 2014. The costs include training personnel, monitoring compliance, educating and responding to customer questions and a more frequent need to apply the cost revenue test.[409] We have included this component of the step change in our opex forecast because we are satisfied that the customer connection charges requirement of the NECF is a new and ongoing regulatory obligation for ActewAGL and the cost it proposed to comply with the NECF is not unreasonable. We also note that the service providers which provide the benchmark for our opex assessment are not required to comply with the NECF.[410]

National Planning and Expansion Framework 2012 (NPEF)

ActewAGL proposed increased opex of $0.8 million for expenditure related to the NPEF. ActewAGL stated under the NPEF it was required to:

- publish a distribution annual planning report (DAPR)
- investigate demand side solutions
- participate in the service target performance incentive scheme (STPIS).

We have not included an amount in our opex forecast for NPEF costs for the following reasons.

The goal of the NPEF is to establish a clearly defined and efficient planning process for distribution network investment. It requires distribution service providers to carry out an annual planning review and report on the outcomes. We consider the NPEF formalises the investment planning a prudent service provider should already be undertaking. It should not represent an additional cost to what a prudent service provider currently does. In any case, distribution service providers were required to publish their first DAPR by 1 July 2013, so the cost of doing this will already be included in the efficient base level of opex.

The AEMC gave distribution service providers nine months to publish their first demand side engagement document and establish a demand side engagement register. Six of these nine months fell in the base year. So we are satisfied ActewAGL should be able to meet this regulatory obligation from existing opex.

ActewAGL proposed a step change for increased STPIS reporting costs from 2015–16 when we will apply the service standards factor component of our national STPIS. However, STPIS reporting is not a new regulatory obligation for ActewAGL. It was already required to report STPIS data during the 2009–14 regulatory control period.

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408 ActewAGL, *Information request response ActewAGL 06* - Regulatory compliance step change, 24 July 2014, p. 8.

409 The cost revenue test is applied to all connection requests. The test compares the estimated cost of a new connection, including any system augmentation costs, against the estimated revenue expected from the connection. An upfront capital contribution is required toward the costs of connection equal to the deficit.

410 Victoria did not sign up to the National energy customer framework.

Consumer engagement

ActewAGL proposed a step change of $1.6 million to implement its consumer engagement strategy. The strategy includes the creation of a consumer representative panel and ongoing consultation.

We have not included a step change in opex for consumer engagement costs as part of our alternative opex forecast.

Changes to the NER in late 2012 require service providers to describe how they have engaged with consumers, and how they have sought to address any relevant concerns identified as a result of that engagement. ActewAGL was required to present this information in an overview report with its regulatory proposal.[411] Notwithstanding the rule change, we would expect a prudent service provider would already have programs in place to engage with consumers. The new NER requirement to address consumers' concerns in its regulatory proposal would not lead to a material increase in opex and could be funded through the efficient base level of opex of an efficient and prudent service provider. This view is consistent with Origin Energy and the Consumer Challenge Panel (CCP) which both submitted that they do not regard the core business of consumer engagement to be an additional cost and that it should already be reflected in ActewAGL's recurrent opex allowance.[412]

AEMC - Network pricing arrangements 2014

ActewAGL proposed increased opex of $0.1 million for expenditure related to the AEMC rule change regarding network pricing arrangements. ActewAGL proposed a forthcoming rule change by the AEMC will required it to implement new tariff structures and to engage with customers on network tariff matters.[413]

We have included $0.1 million in our opex forecast for costs relating to the AEMC rule change regarding network pricing arrangements. The new pricing framework created by the rule change involves a new set of obligations for ActewAGL relative to the current pricing rules. ActewAGL will be required to comply with long run marginal cost pricing structures and to consult with customers on the new framework.

Review of network tariffs

ActewAGL proposed increased opex of $2.4 million (including $1.8 million for consultants) for expenditure related to reviewing its network tariffs. In light of the AEMC rule change, technological change and changing demand patterns, ActewAGL stated it needed to engage consultants to undertake a strategic review of its network tariff strategy.

As discussed above, we have included an amount in our opex forecast to meet the new obligations directly relating to the AEMC rule change. However, we have not included an amount in our opex forecast for ActewAGL to undertake a strategic review of its network tariffs. While we accept it might be beneficial for ActewAGL to review its tariff structures, we do not consider a step change is needed for an internal management decision about how better to meet pricing obligations. This is consistent with our assessment approach and the Guideline. We also note that ActewAGL proposed a large increase in opex to pay for consultants to undertake the tariff review but it did not provide evidence to

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411 The new NER clause relevant to ActewAGL is 6.8.2(c1)(2).

412 Origin Energy, *Submission on ActewAGL regulatory proposal,* 22 August 2014, p. 3.
CCP subpanel 1, *Submission on ActewAGL regulatory proposal,* August 2014, p. 19.

413 AEMC, *Distribution network pricing arrangements draft rule change*, August 2014. http://www.aemc.gov.au/Rule-Changes/Distribution-Network-Pricing-Arrangements.

show how this option is the most efficient one, what other options it considered or how it would benefit consumers.

AEMC – Connection of Embedded Generation

ActewAGL proposed increased opex of around $0.1 million for expenditure related the AEMC rule change regarding the connection of embedded generation. ActewAGL stated the AEMC connection of embedded generation rule change in 2014 requires it to publish additional information and undertake additional processes.[414] The rule change provides a clearer, more transparent connection process with defined timeframes, and requires distributors to publish information to assist embedded generators. The new process aims to reduce the barriers to the connection of embedded generators to distribution networks.

We have included a step change of $0.1million for this AEMC rule change in our opex forecast because it increases the regulatory burden on ActewAGL. We consider the amount ActewAGL proposed to meet this new regulatory obligation is reasonable.

Technical standards, safe work practices and contractor management

ActewAGL proposed three step changes for:

- an additional staff member and specialist consultants for the technical standards team
- a new electrical safety documentation team of four
- a new contractor management team of four.

We do not consider any of these three step changes arise from a new regulatory obligation. Regulations are constantly updated or amended over time and compliance with current safety and technical standards is part of business as usual for a service provider.

We have not included a step change of $1.5 million for additional technical standards expenditure in our opex forecast. The updated Management of Electricity Networks Assets Code is not a new regulatory obligation and we are not satisfied it has imposed a materially heavier burden on ActewAGL than previously. We consider the costs of ActewAGL complying with updated industry standards and updating its five year technical standards plan should be met from the efficient base level of opex.

We have not included a step change of $3.5 million for an electrical safety documentation team in our opex forecast. ActewAGL stated the team would support the maintenance of its compulsory ISO9001 certification and ongoing compliance with the *Work Health and Safety Act 2011* (WHS Act) and the latest approved Code of Practice for Electrical Safety released in 2012–13 by the ACT Parliamentary Counsel. These are not new regulatory obligations.

We have not included a step change of $3.1 million for a contractor management team in our opex forecast. ActewAGL stated the team would oversee contractor management arrangements, particularly for safety and compliance with the *Work Health and Safety Act 2011* (WHS Act), and to maintain IHSAS 18001:2007 certification. ActewAGL's duty of care to contractors has not changed and the requirement to complete a Safe Work Method Statement has not changed for either employers or principal contractors from those adopted under the Work Safety Act 2008.

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[414] AEMC, *Connecting embedded generators rule change*, April 2014. http://www.aemc.gov.au/Rule-Changes/Connecting-embedded-generators.

Network operations and call centre and network OT support

ActewAGL proposed two step changes totalling $6.9 million for additional staff to support the implementation of its Operational System Replacement (OSR) program and network operational technology (OT) program. We have not included a step change for the support costs of either IT project in our opex forecast.

ActewAGL proposed the OSR and network OT projects on the basis that they provide a platform for meeting the requirements of NECF and STPIS. However these are not new regulatory obligations. The NECF was introduced on 1 July 2012 and we approved a cost pass through of $1.9 million in January 2013 for the costs ActewAGL incurred for the establishment and set up of the customer framework.[415] Further, ActewAGL has been required to report STPIS data for the 2009–14 regulatory control period.

As set out in our assessment approach, usually increases in costs are not required for discretionary changes in inputs.[416] Efficient discretionary changes in inputs (not required to increase output) should normally have a net negative impact on expenditure. If ActewAGL chooses to invest capex and opex in a new IT solution, such as the OSR and network OT programs, it should not be provided with an increase in its total opex to finance the new IT. This is because the outlay should be at least offset by a reduction in other costs if it is efficient. Generally, we will not allow step changes or change factors for any short-term cost to a service provider of implementing efficiency improvements. We expect an efficient service provider to bear such costs and thereby make efficient trade-offs between bearing these costs and achieving future efficiencies. We expect that a business would only invest in IT where the benefits of that investment are expected to outweigh the costs. The expectation of future benefits should be sufficient incentive to undertake this investment and no increase in opex support costs is needed.

Corporate services

We have not included ActewAGL's proposed corporate services step change of $10.1 million in our opex forecast.

ActewAGL proposed a step change in corporate services for:

- opex associated with the implementation of the core system replacement program (CSRP)
- software licence maintenance costs
- corporate capex
- legal obligations management system software
- providing tailored outcomes for injured employees and for the revision of policies to enhance return to work outcomes.

We have not included ActewAGL's proposed corporate services step change in our opex forecast because it is not driven by a new regulatory obligation or some other change in ActewAGL's operating environment beyond its control.

Nevertheless, we assess each of components of the corporate services step change below.

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415 ActewAGL, *Information request response ActewAGL 06* - Regulatory compliance step change, 24 July 2014, p. 3.
416 AER, *Expenditure assessment forecast guideline*, November 2013, p. 24.

Opex associated with the Implementation of the core system replacement program

ActewAGL stated it would incur opex associated with the implementation of the core system replacement program (CSRP). We have not included a step change for opex associated with the implementation of the CSRP in our opex forecast because we consider ActewAGL's decision to implement the program is an discretionary business decision. We expect a prudent and efficient service provider would make efficient trade-offs between bearing these costs and achieving future efficiencies.

Software licence maintenance costs

ActewAGL proposed this component of the step change because software licence costs historically increase at a higher rate than CPI. We have not included a step change for software licence maintenance costs in our opex forecast.

By applying the rate of change to the base year opex, we adjust our opex forecast to account for real price increases. As set out in our Guideline, a step change is not required if software licence maintenance costs are forecast to increase faster than CPI because within total opex there will be other categories whose price is forecast to increase by less than CPI. If we add a step change to account for higher software licence costs we might provide a more accurate forecast for the corporate services category in isolation; however, our opex forecast as a whole will be too high.

Corporate capex

ActewAGL proposed capex for the 2014–19 period for its final implementation of the Information and Communication Technology (ICT) systems replacement program. ActewAGL stated there would be ongoing opex related to these replacements such as licences and maintenance costs. We have not included a step change for this because the ongoing costs of software licences and maintenance is captured in base opex and because investment in IT should result in opex savings not opex increases. ActewAGL stated the systems replacement program was necessary to replace an overly complex patchwork of disparate and ageing systems. We consider the maintenance of a new and integrated system should cost less than the maintenance of old and ad hoc systems.[417]

Legal obligations management system software

ActewAGL stated that it upgraded its legal compliance framework during the 2009–14 regulatory control period to facilitate compliance with an increasing number of legislative and regulatory obligations. This included implementing its legal obligations management system software, which requires additional costs in the 2014–19 period. We have not included a step change for this our opex forecast because the ongoing costs of complying with legislative and regulatory obligations are business as usual for a service provider and should be funded from an efficient base level of opex.

Providing tailored outcomes for injured employees and for the revision of policies to enhance return to work outcomes.

ActewAGL stated that the revised corporate health strategy is driven by legislative requirements under the *Work Health and Safety Act 2011* (WHS Act), *Safety Rehabilitation Compensation Act 1988* and the *Workers Compensation Act 1951*. We have not included a step change to provide tailored outcomes for injured employees and for the revision of policies to enhance return to work outcomes in our opex forecast. This is because these legislative requirements are not new obligations and the cost

[417] ActewAGL provided a cost benefit analysis of its ICT expenditure proposal in attachment D10. In that analysis it reported the benefits of the capex project would include reduced opex.

of complying with them should be reflected in the efficient base level of opex. We discuss the fact that the WHS Act does not place a heavier burden on ActewAGL than its predecessor, in our assessment of the EHSQ step change.

Confidential step change

We have not included a step change for the component of the corporate services step change ActewAGL claimed as confidential.[418] We have not included it because it was not associated with a new regulatory obligation or with an efficient capex/opex trade-off.

Capitalisation corporate services

ActewAGL stated this negative step change of -$1.2 million is due to annual variations in the amount of corporate services to be capitalised under the approved CAM. We have taken this into account in assessing the efficiency of ActewAGL's base year expenditure. We have not specifically considered it as a step change.

[418] ActewAGL, *Regulatory proposal*, June 2014, p. 232.

D Opex forecasting method assessment

This appendix sets out our consideration of ActewAGL's forecasting methodology in determining our opex forecast for ActewAGL for the 2014–19 period.

Our estimate of total opex is unlikely to exactly match ActewAGL's forecast (see our assessment approach at the beginning of this opex attachment). Broadly, differences between the two forecasts can be explained by differences in the forecasting methods adopted and the inputs and assumptions used to apply the method. We have reviewed ActewAGL's forecast method to assess whether it explains why ActewAGL's forecast opex is higher than our own estimate.

D.1 Position

We are not satisfied that ActewAGL's forecasting method produces an opex forecast that reasonably reflects the opex criteria. We have not used category specific forecasting methods to separately forecast any of ActewAGL's opex categories other than debt raising costs in our substitute total opex forecast. We formed our substitute forecast total opex using our Expenditure forecast assessment guideline (our Guideline) approach with all opex categories other than debt raising costs included in base opex.

D.2 ActewAGL's proposal

ActewAGL describes its opex forecasting method in its regulatory proposal.[419] ActewAGL used a combination of zero-based and base year methods to forecast:[420]

- **'base year':** forecast opex in a single year (2012–13) was used as the starting point. Expenditure relating to projects or activities no longer relevant was removed and expenditure for projects or activities that were not in the base year was added (ActewAGL referred to these as step changes). ActewAGL used this approach to forecast network operating and other operating expenditure.[421]
- **'zero based':** forecast opex assumed a nil budget as the start point, with projects or activities required each year added in a bottom-up construction of expenditure. ActewAGL used this approach at the category level to forecast its network maintenance and vegetation management expenditure.[422]

D.3 Assessment approach

The first part of our assessment involved identifying any differences between ActewAGL's forecasting method and our own method as outlined in our Guideline. This involved reviewing:

- the description of ActewAGL's opex forecasting method in its regulatory proposal[423]
- the description of ActewAGL's opex forecasting method in its *Expenditure forecasting methodology*[424]

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419 ActewAGL, *Regulatory proposal*, 10 July 2014, pp. 221–222.
420 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221.
421 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221.
422 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221.
423 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221.
424 ActewAGL, *Expenditure forecasting methodology*, November 2013, pp. 16–18.

- the opex model used by ActewAGL to forecast total opex.

Having identified any differences we then examined the impact of them using ActewAGL's opex model.

D.4 Reasons for position

In assessing ActewAGL's forecasting method we sought to identify if and where ActewAGL's forecasting method departed from our guideline forecasting method. Where ActewAGL's forecasting method did depart from our guideline forecasting method we considered whether this departure explains the difference between ActewAGL's forecast of total opex and our own.

Under our guideline forecasting method we start with the actual expenditure in a base year. If actual expenditure in the base year reasonably reflects the opex criteria we set base opex equal to actual expenditure. If not, we apply an efficiency adjustment to ensure base opex reflects the opex criteria. We then apply a forecast rate of change to capture forecasting changes in prices, output and productivity. We then add or subtract any step changes to account for any other efficient expenditure not captured in base opex or the rate of change.[425]

As noted above, ActewAGL's opex forecasting method differs from our guideline forecasting approach in that it used a combination of zero-based and base year methods.[426]

Using category specific forecasting methods (such as ActewAGL's zero-based method) for some opex categories may produce better forecasts of expenditure for those categories but this may not produce a better forecast of total opex. Generally it is best to use the same forecasting method for all cost categories of opex because hybrid forecasting methods (that is, combing revealed cost and category specific methods) can produce biased opex forecasts inconsistent with the opex criteria. This view is consistent with a view expressed by Frontier Economics in a previous determination process, which stated:[427]

> We consider that it would be inappropriate for the AER to review each component of controllable opex individually to see whether it conformed to the same pattern as overall controllable opex. Such 'cherry-picking' would likely result in aggregate controllable opex being systematically and inefficiently over-forecast.

This is because, once an efficient base level of opex is determined, forecast total opex will systematically exceed the efficient level of opex if a category specific forecasting method is used to forecast opex categories:

- with low expenditure in the base year
- with a greater rate of change than total opex.

Within total opex we would expect to see some variation in the composition of expenditure from year to year. If we use a category specific forecasting method to forecast those categories where base year opex was low, but not for those where base opex was high, our forecast of total opex will systematically exceed the efficient level of opex.

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425 AER, *Expenditure forecast assessment guideline* for electricity distribution, November 2013, pp. 22–24.
426 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221
427 Frontier Economics, *Opex forecasting and EBSS advice for the SP AusNet final decision*, January 2014, p. iii.

ActewAGL's used its 'zero-based' forecasting method to forecast its network maintenance and vegetation management expenditure.[428] In this instance ActewAGL's zero-based forecasts of its network maintenance expenditure reduced its opex forecast by $5.4 million (2013–14), or 1.4 per cent, compared to leaving these costs in the base and escalating by the rate of change.

Similarly, if we exclude opex categories where expenditure is rising faster than total opex then the remaining categories will be rising at a slower rate than total opex or declining. If we apply the total opex rate of change to those remaining categories then the total opex forecast will systematically exceed the efficient level of opex.

As outlined in the *Expenditure Forecasting Assessment Guideline*, base year expenditure is escalated by the forecast rate of change in opex, which includes forecast price change.[429] If we exclude opex categories from our opex rate of change where expenditure is rising faster than total opex then the remaining categories will be rising at a slower rate than total opex or declining. If we apply the total opex rate of change to those remaining categories then the total opex forecast will systematically exceed the efficient level of opex. Frontier Economics made this point when it reviewed the forecasting method adopted by SP AusNet to forecast its electricity transmission opex:[430]

> In our view, such 'cherry-picking' would likely result in aggregate controllable opex being systematically and inefficiently over-forecast. This is because with overall controllable opex fairly stable over time, the exclusion of components forecast to rise from the single base year forecasting approach would imply that the remaining components of controllable opex—those subject to the single base year approach—would exhibit a falling trend. However, as a premise of the single base year approach is that future expenditure should mimic past expenditure, using such an approach to forecast expenditure components known to be in a falling trend would tend to result in the forecasts for these components being too high. Therefore, combining a bottom-up approach for rising trend components of opex with a single base year approach for falling trend components of opex would tend to result in an overall controllable opex forecast that systematically exceeded the efficient level of expenditure.

We note that the market price for certain opex items can, and does, change at a different rate than total opex. If we separately forecast those opex items because they are expected to increase in price more rapidly than the total opex basket, then we must also separately forecast opex items that increase in price less rapidly to avoid forecasting bias. Not doing so will systematically exceed the forecast opex required to meet the opex criteria. Moreover, the NER requires us to form a view on forecast total opex, rather than on subcomponents.

For the above reasons we have not used category specific forecasting methods to separately forecast any of ActewAGL's opex categories in our substitute total opex forecast. We formed our substitute forecast total opex using our guideline forecasting approach with all opex categories included in base opex.

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428 ActewAGL, *Regulatory proposal*, 10 July 2014, p. 221.
429 AER, *Expenditure forecast assessment guideline for electricity distribution*, November 2013, pp. 22–23.
430 Frontier Economics, *Opex forecasting and EBSS advice for the SP AusNet final decision*, January 2014, p 17.