PRELIMINARY DECISION
AusNet Services distribution determination 2016 to 2020

Attachment 6 – Capital expenditure

October 2015

AUSTRALIAN ENERGY REGULATOR

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Note

This attachment forms part of the AER's preliminary decision on AusNet Services' revenue proposal 2016–20. It should be read with all other parts of the preliminary decision.

The preliminary 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

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Attachment 17 - Negotiated services framework and criteria

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Contents

Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AMI	Advanced metering infrastructure
augex	augmentation expenditure
capex	capital expenditure
CCP	Consumer Challenge Panel
CESS	capital expenditure sharing scheme
CPI	consumer price index
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
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

Shortened form	Extended form
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue and 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

6 Capital expenditure

Capital expenditure (capex) refers to the investment made in the network to provide standard control services. This investment mostly relates to assets with long lives (30-50 years is typical) and these costs are recovered over several regulatory periods. On an annual basis, however, the financing cost and depreciation associated with these assets are recovered (return of and on capital) as part of the building blocks that form AusNet Services' total revenue requirement.[1]

This attachment sets out our preliminary decision on AusNet Services' total forecast capex. Further detailed analysis is in the following appendices:

- Appendix A - Assessment Techniques
- Appendix B - Assessment of capex drivers
- Appendix C - Demand
- Appendix D - Predictive modelling approach and scenarios
- Appendix E - VBRC: confidential appendix

6.1 Preliminary decision

We are not satisfied AusNet Services' proposed total forecast capex of $1,690.0 million ($2015) reasonably reflects the capex criteria.[2] This is 3.1 per cent lower than the AER's allowance for the 2011–15 regulatory control period ($1,743.6 million) and 3.9 per cent lower than actual capex for the 2011–15 period ($1,759.2 million). We are satisfied that our substitute estimate of $1,471.1 million ($2015) reasonably reflects the capex criteria. Table 6.1 outlines our preliminary decision.

Table 6.1 Our preliminary decision on AusNet Services' total forecast capex ($2015, million)

	2016	2017	2018	2019	2020	Total
AusNet Services' proposal	364.6	338.5	332.7	334.9	319.3	1690.0
AER preliminary decision	295.9	301.9	295.6	296.2	281.5	1471.1
Difference	-68.7	-36.6	-37.1	-38.7	-37.8	-218.9
Percentage difference (%)	-18.8	-10.8	-11.2	-11.6	-11.8	-13.0

1 NER, cl. 6.4.3(a).

2 AusNet Services included the $1,690.0 million ($2015) figure in the regulatory proposal it submitted in April 2015. AusNet Services subsequently informed us that an Australian Tax Office ruling would affect its capex and revenue forecasts for the 2016–20 regulatory control period (see AusNet Services, *Letter to AER: ATO Ruling on liabilities from Victorian Government's Powerline Replacement Fund contributions – amendments to 2016-20 revenue proposal*, 6 July 2015). We expect AusNet Services will provide all relevant information regarding this change to the capex and revenue forecasts in its revised regulatory proposal; which we will address in our final decision.

Source: AusNet Services, Electricity distribution price review 2016–20, 30 April 2015, pp. 123–124; AER analysis.

Note: Numbers may not add up due to rounding.

Note: The figures above do not include equity raising costs. For our assessment of equity raising costs, see attachment 3.

Table 6.2 summarises our findings and the reasons for our preliminary decision.

These reasons include our responses to stakeholders' submissions on AusNet Services' regulatory proposal. In the table we present our reasons by 'capex driver' (for example, augmentation, replacement, and connections). This reflects the way in which we tested AusNet Services' total forecast capex. Our testing used techniques tailored to the different capex drivers, taking into account the best available evidence. Through our techniques, we found some aspects of AusNet Services' proposal, such as customer connections, were consistent with the NER. We found AusNet Services' proposal associated with other capex drivers, particularly augex and repex, were higher than an efficient level, inconsistent with the NER.[3] Consequently, our findings on augex and repex largely explain why we are not satisfied with AusNet Services' proposed total forecast capex.

Our findings on the capex drivers are part of our broader analysis and should not be considered in isolation. Our preliminary decision concerns AusNet Services' total forecast capex for the 2016–20 period. We do not approve an amount of forecast expenditure for each capex driver. However, we use our findings on the different capex drivers to arrive at an alternative substitute estimate for total capex. We test this total estimate of capex against the requirements of the NER (see section 6.3 for a detailed discussion). We are satisfied that our estimate represents the total forecast capex that as a whole reasonably reflects the capex criteria.

Table 6.2 Summary of AER reasons and findings

Issue	Reasons and findings
Total capex forecast	AusNet Services proposed a total capex forecast of $1,690.0 million ($2015) in its proposal. We are not satisfied this forecast reflects the capex criteria. We are satisfied our substitute estimate of $1,471.1 million ($2015) reasonably reflects the capex criteria. Our substitute estimate is 13 per cent lower than AusNet Services' proposal. The reasons for this decision are summarised in this table and detailed in the remainder of this attachment.
Forecasting methodology, key assumptions and past capex performance	We consider AusNet Services' key assumptions and forecasting methodology are generally reasonable. Where we identified specific areas of concern, we discuss these in the appendices to this capex attachment.
Augmentation capex	We do not accept AusNet Services' forecast augex of $313.8 million ($2015) as a reasonable estimate for this category. We consider that $267.4 million ($2015) is a reasonable estimate for AusNet Services to meet forecast demand growth and satisfy the capex criteria. We accept that the majority of AusNet Services' augex forecast

[3] NER, cll. 6.5.7(c) and (d).

Issue	Reasons and findings
	reasonably reflects the capex criteria. However, we consider that AusNet Services' forecasts of maximum demand do not reflect a realistic expectation of demand over the 2016–20 period, which means that AusNet Services' demand-related augex forecast is likely overstated. We also find that AusNet Services proposed augex to place underground power lines that are currently adversely affected by overhanging vegetation may not be necessary in order to comply with the capex objectives.
Customer connections capex	We are satisfied AusNet Services' forecast is a reasonable estimate for this category. We have included an amount of $368.2 million ($2015) in our substitute capex estimate. In determining this, we are satisfied that the forecast methodology AusNet Services has relied on produces a reasonable estimate of the capex it requires to meet the capex objectives and have included this in our substitute estimate.
Asset replacement capex (repex)	We do not accept AusNet Services' forecast repex of $901 million ($2015) as a reasonable estimate for this category. We consider our alternative estimate of $758 million ($2015) will allow AusNet Services to meet the capex objectives and have included this amount in our alternative estimate. Our alternative estimate is 16 per cent lower than AusNet Services' proposed repex. We do not accept AusNet Services' proposed increase to repex for the categories it reported under SCADA and "other". For SCADA we considered the information explaining the reasons for the proposed increase are not sufficient and predictive modelling supports AusNet Services' historical level of repex continuing. For the "other" repex, predictive modelling did not identify the need for a significant increase from historical expenditure on "other" repex. We estimated an amount higher than AusNet Services' actual historical expenditure on these categories, but lower than its proposed expenditure.
Non-network capex	We accept AusNet Services' forecast non-network capex of $208.6 million ($2015) as a reasonable estimate of the efficient costs a prudent operator would require for this category. We have included it in our alternative estimate of total capex for the 2016–20 regulatory control period. AusNet Services' forecast non-network capex is 7 per cent lower than actual non-network capex in the 2011–15 regulatory control period. We are satisfied that the forecast reduction in non-network capex reflects the underlying drivers of expenditure in this category.
Capitalised overheads	We do not accept AusNet Services' proposed capitalised overheads of $172.8 million ($2015). We have instead included in our substitute estimate of overall total capex an amount of $168.5 million ($2015) for capitalised overheads. Given that our assessment of AusNet Services' proposed direct capex demonstrates that a prudent and efficient distributor would not undertake the full range of direct expenditure contained in AusNet Services' proposal, it follows that we would expect some reduction in the size of AusNet Services' capitalised overheads. We reduced AusNet Services' capitalised overheads accordingly.
Real cost escalators	In respect of real material cost escalators (leading to cost increases above CPI), AusNet Services accepted the AER's application of CPI indexation as a proxy for forecasts of escalation of materials costs in real terms over the 2016–20 regulatory control period. Our approach to real materials cost escalation does not affect the proposed application of labour and construction cost escalators which apply to AusNet Services' forecast capex for standard control services. We are not satisfied AusNet Services' proposed real labour cost escalators which form part of its total forecast capex reasonably reflect a realistic expectation of the cost inputs required to achieve the capex objectives over the 2016–20 regulatory period. We discuss our assessment of forecast our labour price growth for AusNet Services in attachment 7. The difference between the impact of the real labour cost escalation proposed by AusNet Services and that accepted by the AER in its capex decision is $25.4 million ($2015).

Source: AER analysis.

We consider that our overall capex forecast addresses the revenue and pricing principles. In particular, we consider our overall capex forecast provides AusNet Services a reasonable opportunity to recover at least the efficient costs it incurs in:

- providing direct control network services; and
- complying with its regulatory obligations and requirements.[4]

As set out in appendix B we are satisfied that our overall capex forecast is consistent with the national electricity objective (NEO). We consider our decision promotes efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity.

We also consider that overall our capex forecast addresses the capital expenditure objectives.[5] In making our preliminary decision, we specifically considered the impact our decision will have on the safety and reliability of AusNet Services' network. We consider this capex forecast should be sufficient for a prudent and efficient service provider in AusNet Services' circumstances to be able to maintain the safety, service quality, security and reliability of its network consistent with its current obligations.

6.2 AusNet Services' proposal

AusNet Services proposed total forecast capex of $1,690 million ($2015) for the 2016–20 regulatory control period.[6] This is $45.7 million ($2015) below AusNet Services' actual capex of $1,735.7 million ($2015) for the 2011–15 regulatory control period.[7]

AusNet Services expected replacement to be the largest capex category, accounting for approximately 46 per cent of its total forecast capex. Connections and augmentation expenditure are the next largest categories, accounting for approximately 19 per cent and 16 per cent of total forecast capex.[8]

Using its own capex categorisation, AusNet Services stated that expenditure on safety to mitigate and reduce the risk of bushfire ignition is a major driver of its capex forecast. Safety expenditure forms the largest component of AusNet Services' total forecast capex at $627.4 million ($2015).[9] Of this, $273 million relates to augmentation works, while $354 million relates to replacement programs.[10]

Figure 6.1 shows AusNet Services' forecast capex for each year of the 2016–20 regulatory control period. It also shows AusNet Services' actual capex for each year of the 2011–15 regulatory control period.

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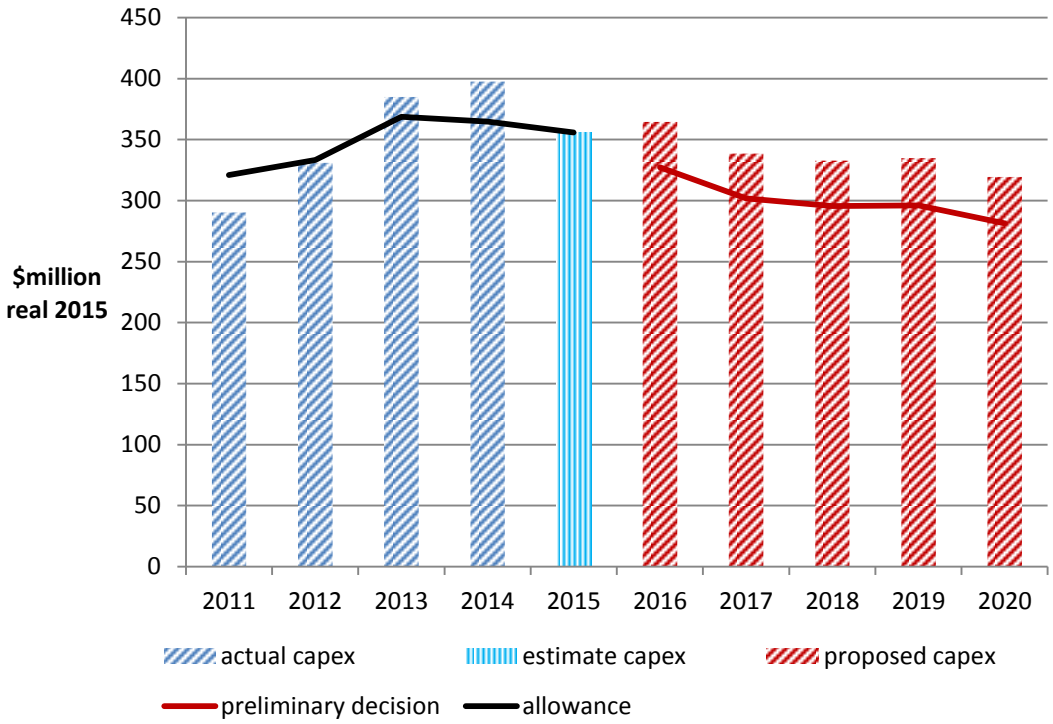
4 NEL, s. 7A.
5 NER, cl. 6.5.7(a).
6 This is net capex, which does not include government and customer contributions.
7 This includes estimated capex for the 2015 regulatory year.
8 AusNet Services, *Electricity distribution price review 2016–20*, 30 April 2015, pp. 124–125. (AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015).
9 This is gross capex, which may include government and/or customer contributions.
10 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, pp. 123–124.

Figure 6.1 AusNet Services' total actual and forecast capex 2011–2020



Source: AER analysis.

6.3 AER's assessment approach

This section outlines our approach to capex assessments. It sets out the relevant legislative and rule requirements, and outlines our assessment techniques. It also explains how we derive an alternative estimate of total forecast capex against which we compare the distributor's total forecast capex. The information AusNet Services provided in its regulatory proposal, including its response to our RIN, is a vital part of our assessment. We also took into account information that AusNet Services provided in response to our information requests, and submissions from other stakeholders.

Our assessment approach involves the following steps:

- Our starting point for building an alternative estimate is the distributor's regulatory proposal.[11] We apply our various assessment techniques, both qualitative and quantitative, to assess the different elements of the distributor's proposal. This analysis informs our view on whether the distributor's proposal reasonably reflects the capex criteria in the NER at the total capex level.[12] It also provides us with an

[11] AER, *Better regulation: Explanatory statement: Expenditure forecast assessment guideline,* November 2013, p. 7; see also AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, pp. 111 and 112.

[12] NER, cl. 6.5.7(c).

alternative forecast that we consider meets the criteria. In arriving at our alternative estimate, we weight the various techniques we used in our assessment. We give more weight to techniques we consider are more robust in the particular circumstances of the assessment.

- Having established our alternative estimate of the *total* forecast capex, we can test the distributor's total forecast capex. This includes comparing our alternative estimate total with the distributor's total forecast capex and what the reasons for any differences are. If there is a difference between the two, we may need to exercise our judgement as to what is a reasonable margin of difference.

If we are satisfied the distributor's proposal reasonably reflects the capex criteria in meeting the capex objectives, we will accept it. The capital expenditure objectives (capex objectives) referred to in the capex criteria, are to:[13]

- meet or manage the expected demand for standard control services over the period
- comply with all regulatory obligations or requirements associated with the provision of standard control services
- to the extent that there are no such obligations or requirements, maintain service quality, reliability and security of supply of standard control services and maintain the reliability and security of the distribution system
- maintain the safety of the distribution system through the supply of standard control services.

If we are not satisfied, the NER requires us to put in place a substitute estimate that we are satisfied reasonably reflects the capex criteria.[14] Where we have done this, our substitute estimate is based on our alternative estimate.

The capex criteria are:[15]

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

The AEMC noted '[t]hese criteria broadly reflect the NEO [National Electricity Objective]'.[16] Importantly, we approve a total capex forecast and not particular categories, projects or programs in the capex forecast. Our review of particular

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13 NER, cl. 6.5.7(a).

14 NER, cl. 6.12.1(3)(ii).

15 NER, cl. 6.5.7(c).

16 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 113.

categories or projects informs our assessment of the total capex forecast. The AEMC stated:[17]

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

In deciding whether we are satisfied that AusNet Services' proposed total forecast capex reasonably reflects the capex criteria, we have regard to the capex factors.[18] In taking the capex factors into account, the AEMC noted:[19]

> …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.

Table 6.5 summarises how we took the capex factors into consideration.

More broadly, we note that in exercising our discretion, we take into account the revenue and pricing principles set out in the NEL.[20] In particular, we take into account whether our overall capex forecast provides AusNet Services a reasonable opportunity to recover at least the efficient costs it incurs in:

- providing direct control network services; and
- complying with its regulatory obligations and requirements.[21]

Expenditure Assessment Guideline

The rule changes the AEMC made in November 2012 required us to make and publish an Expenditure Forecast Assessment Guideline for electricity distribution (Guideline).[22] We released our Guideline in November 2013.[23] The Guideline sets out our proposed general approach to assessing capex (and opex) forecasts. The rule changes also require us to set out our approach to assessing capex in the relevant framework and approach paper. For AusNet Services, our framework and approach paper stated that we would apply the Guideline, including the assessment techniques outlined in it.[24] We may depart from our Guideline approach and if we do so, we need to provide reasons. In this determination, we have not departed from the approach set out in our Guideline.

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17 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. vii.

18 NER, cl. 6.5.7(e).

19 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 115.

20 NEL, ss. 7A and 16(2).

21 NEL, s. 7A.

22 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 114.

23 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013.

24 AER, *Final Framework and approach for the Victorian Electricity Distributors: Regulatory control period commencing 1 January 2016*, 24 October 2014, pp. 119–120.

We note that RIN data form part of a distributor's regulatory proposal.[25] In our Guideline we stated we would "require all the data that facilitate the application of our assessment approach and assessment techniques". We also stated that the RIN we issue in advance of a distributor lodging its regulatory proposal would specify the exact information we require.[26] Our Guideline made clear our intention to rely upon RIN data during distribution determinations.

6.3.1 Building an alternative estimate of total forecast capex

The following section sets out the approach we apply to arrive at an alternative estimate of total forecast capex.

Our starting point for building an alternative estimate is the distributor's proposal.[27] We review the proposed forecast methodology and the key assumptions that underlie the distributor's forecast. We also consider the distributor's performance in the previous regulatory control period to inform our alternative estimate.

We then apply our specific assessment techniques to develop an estimate and assess the economic justifications that the distributor puts forward. Many of our techniques encompass the capex factors that we are required to take into account. Appendix A and appendix B contain further details on each of these techniques.

Some of these techniques focus on total capex; others focus on high level, standardised sub-categories of capex. Importantly, while we may consider certain projects and programs in forming a view on the total capex forecast, we do not determine which projects or programs the distributor should or should not undertake. This is consistent with the regulatory framework and the AEMC's statement that the AER does not approve specific projects. Rather, we approve an overall revenue requirement that includes an assessment of what we find to be an efficient total capex forecast.[28]

We determine total revenue by reference to our analysis of the proposed capex and the various building blocks. Once we approve total revenue, the distributor is able to prioritise its capex program given its circumstances over the course of the regulatory control period. The distributor may need to undertake projects or programs it did not anticipate during the distribution determination. The distributor may also not require some of the projects or programs it proposed for the regulatory control period. We consider a prudent and efficient distributor would consider the changing environment throughout the regulatory control period in its decision-making.

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25 NER, cll. 6.8.2(c2) and (d).

26 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 25.

27 AER, *Better regulation: Explanatory statement: Expenditure forecast assessment guideline,* November 2013, p. 7; AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, pp. 111 and 112.

28 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. vii.

As we explained in our Guideline:[29]

> Our assessment techniques may complement each other in terms of the information they provide. This holistic approach gives us the ability to use all of these techniques, and refine them over time. The extent to which we use each technique will vary depending on the expenditure proposal we are assessing, but we intend to consider the inter-connections between our assessment techniques when determining total capex … forecasts. We typically would not infer the findings of an assessment technique in isolation from other techniques.

In arriving at our estimate, we weight the various techniques we used in our assessment. We weight these techniques on a case by case basis using our judgement. Broadly, we give more weight to techniques we consider are more robust in the particular circumstances of the assessment. By relying on a number of techniques, we ensure we consider a wide variety of information and can take a holistic approach to assessing the distributor's capex forecast.

Where our techniques involve the use of a consultant, we consider their reports as one of the inputs to arriving at our preliminary decision on overall capex. Our preliminary decision clearly sets out the extent to which we accept our consultants' findings. Where we apply our consultants' findings, we do so only after carefully reviewing their analysis and conclusions, and evaluating these against outcomes of our other techniques and our examination of AusNet Services' proposal.

We also take into account the various interrelationships between the total forecast capex and other components of a distributor's distribution determination. The other components that directly affect the total forecast capex include:

- forecast opex
- forecast demand
- the service target performance incentive scheme
- the capital expenditure sharing scheme
- real cost escalation
- contingent projects.

We discuss how these components impact the total forecast capex in Table 6.4.

Underlying our approach are two general assumptions:

- The capex criteria relating to a prudent operator and efficient costs are complementary. Prudent and efficient expenditure reflects the lowest long-term

[29] AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 12.

cost to consumers for the most appropriate investment or activity required to achieve the expenditure objectives.[30]

- Past expenditure was sufficient for the distributor to manage and operate its network in past periods, in a manner that achieved the capex objectives.[31]

6.3.2 Comparing the distributor's proposal with our alternative estimate

Having established our estimate of the total forecast capex, we can test the distributor's proposed total forecast capex. This includes comparing our alternative estimate of forecast total capex with the distributor's proposal. The distributor's forecast methodology and its key assumptions may explain any differences between our alternative estimate and its proposal.

As the AEMC foreshadowed, we may need to exercise our judgement in determining whether any 'margin of difference' is reasonable:[32]

> 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 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.

As noted above, we draw on a range of techniques, as well as our assessment of elements that impact upon capex such as demand and real cost escalators.

Our decision on the total forecast capex does not strictly limit a distributor's actual spending. A distributor might spend more on capex than the total forecast capex amount specified in our decision in response to unanticipated expenditure needs.

The regulatory framework has a number of mechanisms to deal with such circumstances. Importantly, a distributor does not bear the full cost where unexpected events lead to an overspend of the approved capex forecast. Rather, the distributor bears 30 per cent of this cost if the expenditure is subsequently found to be prudent

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30 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, pp. 8 and 9. The Australian Competition Tribunal has previously endorsed this approach: see : Application by Ergon Energy Corporation Limited (Non-system property capital expenditure) (No 4) [2010] ACompT 12; Application by EnergyAustralia and Others [2009] ACompT 8; Application by Ergon Energy Corporation Limited (Labour Cost Escalators) (No 3) [2010] ACompT 11; Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14; Application by AusNet Services Distribution Pty Limited [2012] ACompT 1; Re: Application by ElectraNet Pty Limited (No 3) [2008] ACompT 3 ; Application by DBNGP (WA).

31 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 9.

32 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 112.

and efficient. Further, the pass through provisions provide a means for a distributor to pass on significant, unexpected capex to customers, where appropriate.[33] Similarly, a distributor may spend less than the capex forecast because they have been more efficient than expected. In this case the distributor will keep on average 30 per cent of this reduction over time.

We set our alternative estimate at the level where the distributor has a reasonable opportunity to recover efficient costs. The regulatory framework allows the distributor to respond to any unanticipated issues that arise during the regulatory control period. In the event that this leads to the approved total revenue underestimating the total capex required, the distributor should have sufficient flexibility to allow it to meet its safety and reliability obligations by reallocating its budget. Conversely, if there is an overestimation, the stronger incentives the AEMC put in place in 2012 should result in the distributor only spending what is efficient. As noted, the distributor and consumers share the benefits of the underspend and the costs of an overspend under the regulatory regime.

6.4 Reasons for preliminary decision

We applied the assessment approach set out in section 6.3 to AusNet Services. In this preliminary decision, we are not satisfied AusNet Services' total forecast capex reasonably reflects the capex criteria. We compared AusNet Services' capex forecast to the alternative capex forecast we constructed using the approach and techniques outlined in appendices A and B. AusNet Services' proposal is materially higher than ours. We are satisfied that our alternative estimate reasonably reflects the capex criteria.

Table 6.3 sets out the capex amounts by driver that we included in our alternative estimate of AusNet Services' total forecast capex for the 2016–20 regulatory control period.

Table 6.3 Our assessment of required capex by capex driver 2016–20 ($2015, million)

Category	2016	2017	2018	2019	2020	Total
Augmentation	48.42	61.62	57.72	49.92	49.72	267.4
Connections	74.3	74.1	74.5	72.3	73.0	368.2
Replacement	161.0	150.8	149.2	152.2	145.2	758.4
Non-Network	37.4	41.5	41.1	48.0	40.6	208.6
Capitalised overheads	33.7	33.7	33.7	33.7	33.7	168.5
Labour escalation adjustment	-3.2	-4.4	-5.2	-6.1	-6.6	-25.4

[33] NER, r. 6.6.

Category	2016	2017	2018	2019	2020	Total
Gross Capex (includes capital contributions)	351.3	357.3	351.0	350.0	335.6	1745.7
Capital Contributions	55.5	55.4	55.4	53.8	54.0	274.0
Net Capex (excluding capital contributions)	296.3	301.9	295.6	296.2	281.5	1471.5

Source: AER analysis.

Note: Numbers may not add up due to rounding.

We discuss our assessment of AusNet Services' forecasting methodology, key assumptions and past capex performance in the sections below.

Our assessment of capex drivers are in appendices A and B. These set out the application of our assessment techniques to the capex drivers, and the weighting we gave to particular techniques. We used our reasoning in the appendices to form our alternative estimate.

6.4.1 Key assumptions

The NER requires AusNet Services to include in its regulatory proposal the key assumptions that underlie its proposed forecast capex. AusNet Services must also provide a certification by its Directors that those key assumptions are reasonable.[34]

The key assumptions and inputs that underlie AusNet Services' capex forecasts are:[35]

- demand forecasts
- reliability
- asset condition and risk assessments, and failure data
- capex / opex interactions
- project cost estimates and unit rates
- cost escalators
- overheads.

We assessed AusNet Services' key assumptions in the appendices to this capex attachment.

6.4.2 Forecasting methodology

[34] NER, cll. S6.1.1.1(2), (4) and (5).

[35] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, pp. 118–122.

The NER requires AusNet Services to inform us about the methodology it proposes to use to prepare its forecast capex allowance before it submits its regulatory proposal.[36] AusNet Services must include this information in its regulatory proposal.[37]

AusNet Services stated it developed its expenditure programs and projects using data and risk modelling. It also used top down assessment to develop its program.[38] The main points of AusNet Services' forecasting methodology are:[39]

- Except in cases where outputs are mandated, AusNet Services undertook cost benefit analysis to develop its capex forecast. It used the revised value of the Value of Customer Reliability (VCR) as an input in this analysis.
- AusNet Services undertook quality assurance including:
    - review of historical rates and volumes
    - inclusion of competitively tendered contract conditions
    - internal review and governance processes across Finance, Service Delivery and Asset Management divisions
- AusNet Services consulted with consumers through a variety of forums. AusNet Services used this consultation to gauge customer attitudes regarding its chosen investment approaches and forecasts.

To determine its overall capex forecast, AusNet Services stated it reviewed its total capital program using a top-down method.[40] In applying the top-down method, AusNet Services made the following modifications to its bottom-up forecast:[41]

- incorporating the new VCR rate
- omitting projects whose level of uncertainty are likely to impact on the accuracy of the projects' capex forecast;
- assuming that an improved technique can be implemented to limit the number of pole replacements
- utilising conservative assumptions to forecast replacement volumes for some asset categories
- excluding minor and incidental programs from the forecast.

We consider AusNet Services' forecasting methodology is generally reasonable. Where we identified specific areas of concern, we discuss these in the appendices to this capex attachment.

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36 NER, cll. 6.8.1A and 11.60.3(c).
37 NER, cl. S6.1.1(2).
38 AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, pp. 104 and 125.
39 AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, pp. 114–117.
40 AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 125.
41 AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 126.

The Victorian Energy Consumer and Use Alliance (VECUA) considered the Victorian distributors overly relied on bottom up methodologies with insufficient regard to top down methods.[42] Origin Energy supported the application of both a top down and bottom up assessment:[43]

> to demonstrate that a level of overall restraint has been brought to bear. This dual exercise is necessary to ensure that forecast costs, including unit rates, have not been overstated and that inter-relationships and synergies between projects or areas of work which are more readily identified at a portfolio level are adequately accounted for.

As we noted in previous determinations, the drawback of deriving a capex forecast through a bottom-up assessment is it does not of itself provide sufficient evidence that the estimate is efficient. Bottom up approaches tend to overstate required allowances as they do not adequately account for inter-relationships and synergies between projects or areas of work. In contrast, reviewing aggregated areas of expenditure or the total expenditure, allows for an overall assessment of efficiency.[44]

6.4.3 Interaction with the STPIS

We consider our approved capital expenditure forecast is consistent with the setting of targets under the STPIS. In particular, we should not set the capex allowance such that it would lead to AusNet Services systematically under or over performing against its STPIS targets. We consider our approved capex forecast is sufficient to allow a prudent and efficient service provider in AusNet Services' circumstances to maintain performance at the targets set under the STPIS. As such, it is appropriate to apply the STPIS as set out in attachment 11.

In making our preliminary decision, we specifically considered the impact our decision will have on the safety and reliability of AusNet Services' network.

In its submission, the Consumer Challenge Panel (CCP) noted the following explanation from the AEMC:[45]

> …operating and capital expenditure allowances for NSPs should be no more than the level considered necessary to comply with the relevant regulatory obligation or requirement, where these have been set by the body allocated to that role. Expenditure by NSPs to achieve standards above these levels should be unnecessary, as they are only required to deliver to the standards set. It would also amount to the AER substituting a regulatory obligation or requirement with its own views on the appropriate level of reliability, which

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42 VECUA, *Submission: Victorian distribution networks' 2016–20 revenue proposals*, 13 July 2105, p. 19.

43 Origin Energy, *Submission to Victorian electricity distributors regulatory proposals*, 13 July 2015, p. 8.

44 For example, see AER, *Preliminary decision: Ergon Energy determination 2015−16 to 2019−20: Attachment 6 − Capital expenditure*, April 2015, pp. 22–23.

45 CCP, *Advice to the AER: AER's Preliminary Decision for SA Power Networks for 2015-20 and SA Power Networks' revised regulatory proposal*, August 2015, p. 27.

would undermine the role of the standard setting body, and create uncertainty and duplication of roles.

NSPs are still free to make incremental improvements over and above the regulatory requirements at their own discretion. Such additional expenditure will not generally be recoverable, through forecast capital and operating expenditure. However, DNSPs are also provided with annual financial incentives to improve reliability performance under the STPIS.

We consider our substitute estimate is sufficient for AusNet Services to maintain the safety, service quality and reliability of its network consistent with its obligations. Our provision of a total capex forecast does not constrain a distributor's actual spending—either as a cap or as a requirement that the forecast be spent on specific projects or activities. It is conceivable that a distributor might wish to spend particular capital expenditure differently or in excess of the total capex forecast in our decision. However, such additional expenditure is not included in our assessment of expenditure forecasts as it is not required to meet the capex objectives. We consider the STPIS is the appropriate mechanism to provide distributors with the incentive to improve reliability performance where such improvements reflect value to the energy customer.

Under our analysis of capex drivers, we explained how our analysis and certain assessment techniques factor in safety and reliability obligations and requirements.

6.4.4 AusNet Services' capex performance

We looked at a number of historical metrics of AusNet Services' capex performance against other distributors in the NEM. We also compared AusNet Services' capex forecast against historical trends. These metrics are largely based on outputs of the annual benchmarking report and other analysis using data the distributors provided for the annual benchmarking report. The report includes AusNet Services' relative partial and multilateral total factor productivity (MTFP) performance, capex per customer and maximum demand, and AusNet Services' historical capex trend.

The NER sets out that we must have regard to our annual benchmarking report.[46] This section shows how we have taken it into account. We consider this high level benchmarking at the overall capex level is suitable to gain an overall understanding of AusNet Services' proposal in a broader context. However, in our capex assessment we have not relied on the high level benchmarking metrics set out below other than to gain a high level insight into AusNet Services' proposal. We have not used this analysis deterministically in our capex assessment.

AusNet Services supported the use of benchmarking to form a high level view of efficiency. However, AusNet Services stated benchmarking is more valuable for information, rather than as a basis for setting a firm's capex forecast. AusNet Services considered benchmarking is one of a number of factors the AER should take into

[46] NER, cl. 6.5.7(e).

account when assessing capex forecasts. Further, the AER should continue direct and thorough engagement with the firm to inform its assessment.[47]

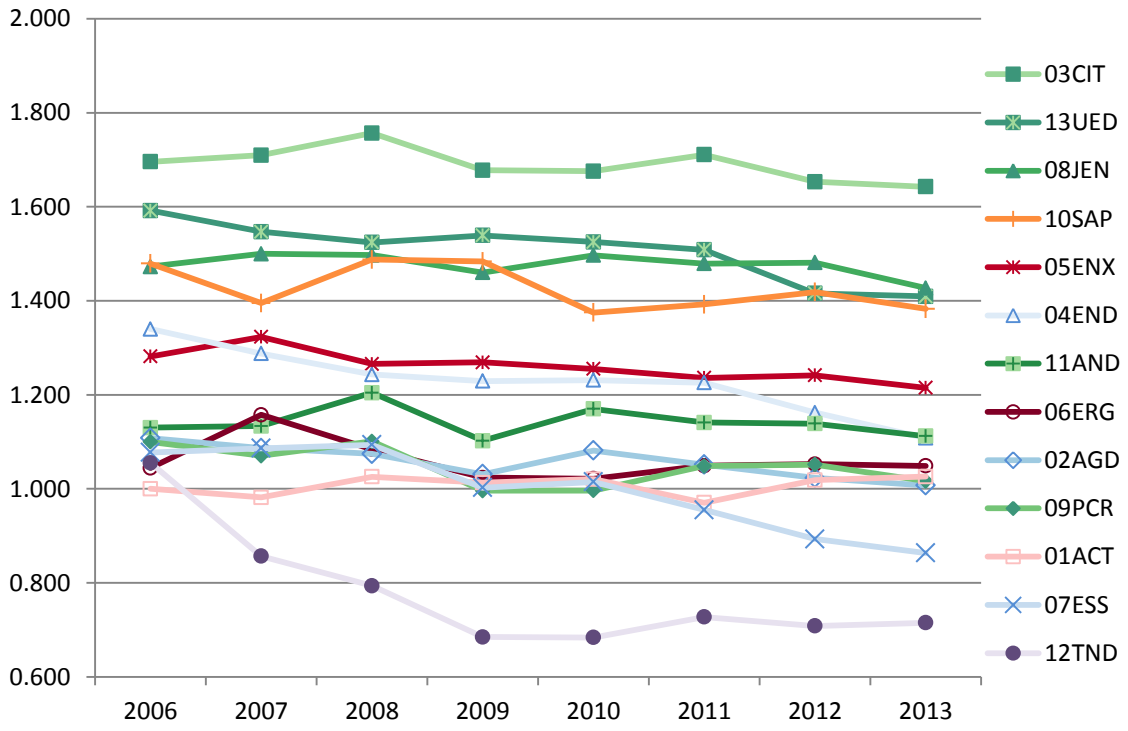
This is consistent with our approach for this distribution determination. As we stated in section 6.3, our assessment approach for this distribution determination is consistent with the expenditure assessment guideline, which stated:[48]

> When we assess capex and opex forecasts, we will use a number of assessment techniques to form a view on the reasonableness of the forecast… We typically would not infer the findings of an assessment technique in isolation from other techniques.

Partial factor productivity of capital and multilateral total factor productivity

Figure 6.2 shows a measure of partial factor productivity of capital from our benchmarking report. This measure incorporated the productivity of transformers, overhead lines and underground cables. AusNet Services was the median performer in this metric for much of the eight years from 2006 to 2013.

Figure 6.2 Partial factor productivity of capital (transformers, overhead and underground lines)



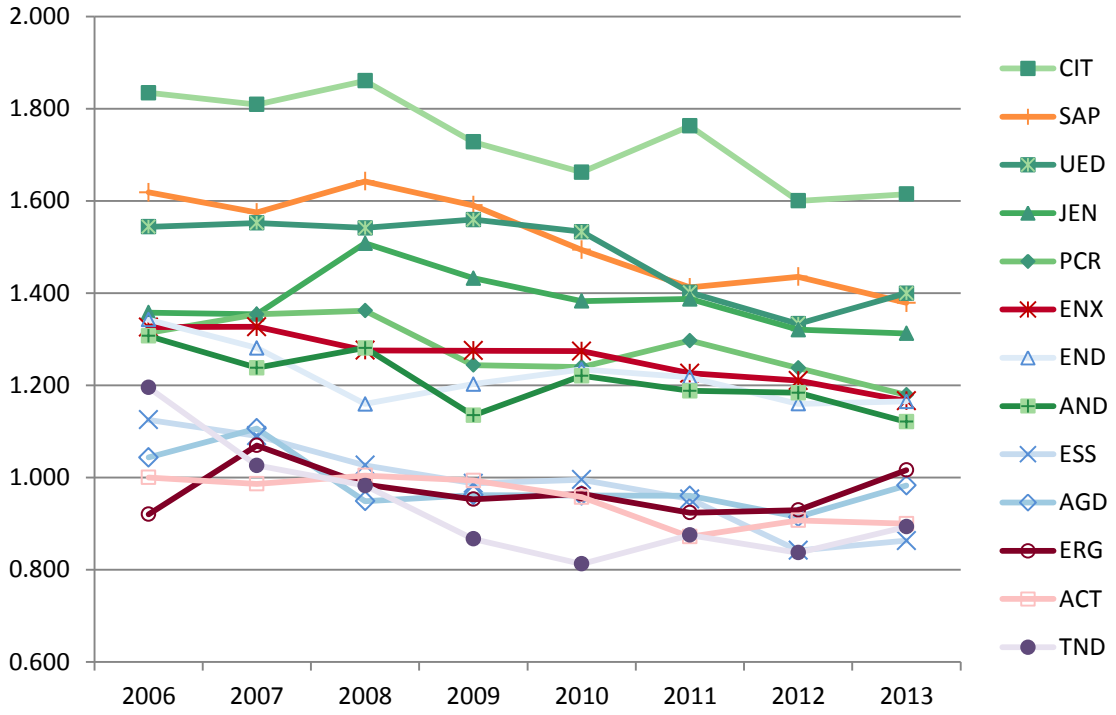
[47] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 127.

[48] AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 12.

Source: AER, *Electricity distribution network service providers: Annual benchmarking report*, November 2014, p. 33.

Figure 6.3 shows that AusNet Services ranks similarly on MTFP. MTFP measures how efficient a business is in terms of its inputs (costs) and outputs (energy delivered, customer numbers, ratcheted maximum demand, reliability and circuit line length). AusNet Services included similar analysis in its regulatory proposal, but noted the significant increase in its bushfire and safety program will likely depress capex productivity in future.[49]

Figure 6.3 Multilateral total factor productivity



Source: AER, *Electricity distribution network service providers: Annual benchmarking report*, November 2014, p. 31.

6.4.4.1 Relative capex efficiency metrics

Figure 6.4 and Figure 6.5 show capex per customer and per maximum demand, against customer density. Unless otherwise indicated as a forecast, the figures represent the five year average of each distributor's actual capex for the years 2008–12. We considered capex per customer as it reflects the amount consumers are charged for additional capital investments.

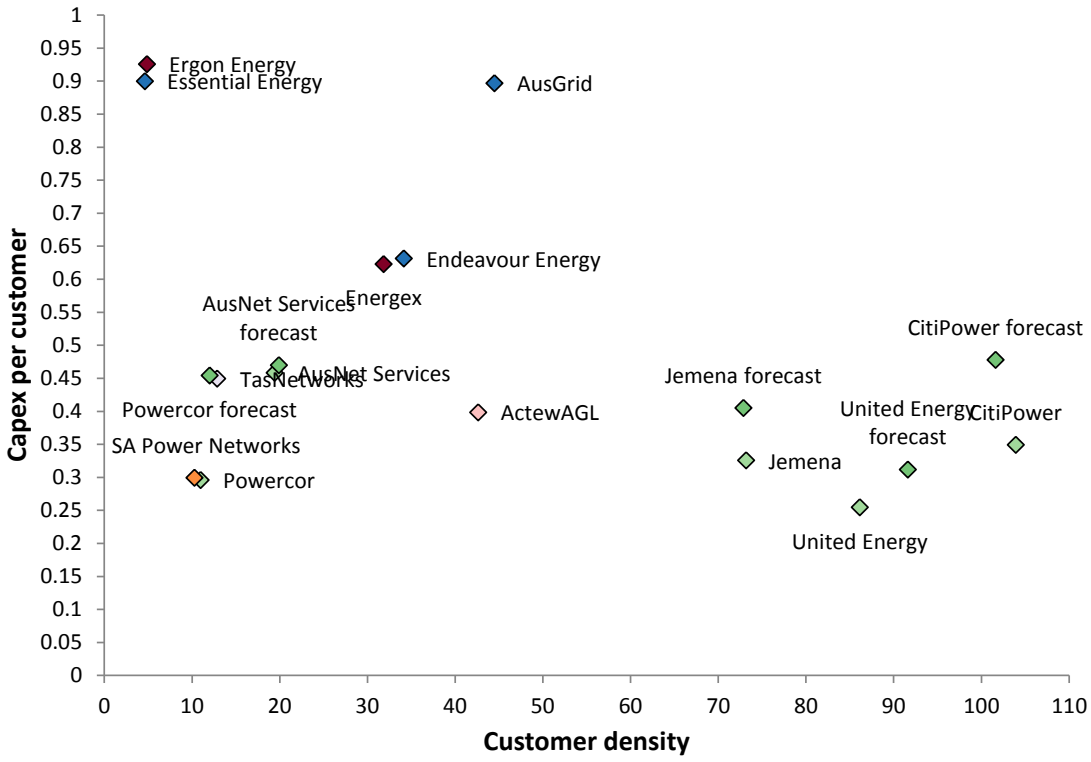
Figure 6.4 and Figure 6.5 show the Victorian distributors generally performed well in these metrics compared to other distributors in the NEM in the 2008–12 years. For completeness, we also included the other Victorian distributors' proposed capex for the

[49] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 130.

2016–20 regulatory control period in the figures. However, we do not use comparisons of AusNet Services' total forecast capex with the total forecast capex of the other Victorian distributors as inputs to our assessment. We consider it is appropriate to compare AusNet Services' forecast only with actual capex. This is because actual capex are 'revealed costs' and would have occurred under the incentives of a regulatory regime.

Figure 6.4 shows AusNet Services was the median performer in the capex per customer metric among the lower density networks in the 2008–12 years. AusNet Services' capex per customer will increase slightly in the 2016–20 regulatory control period based on their proposed forecast capex.

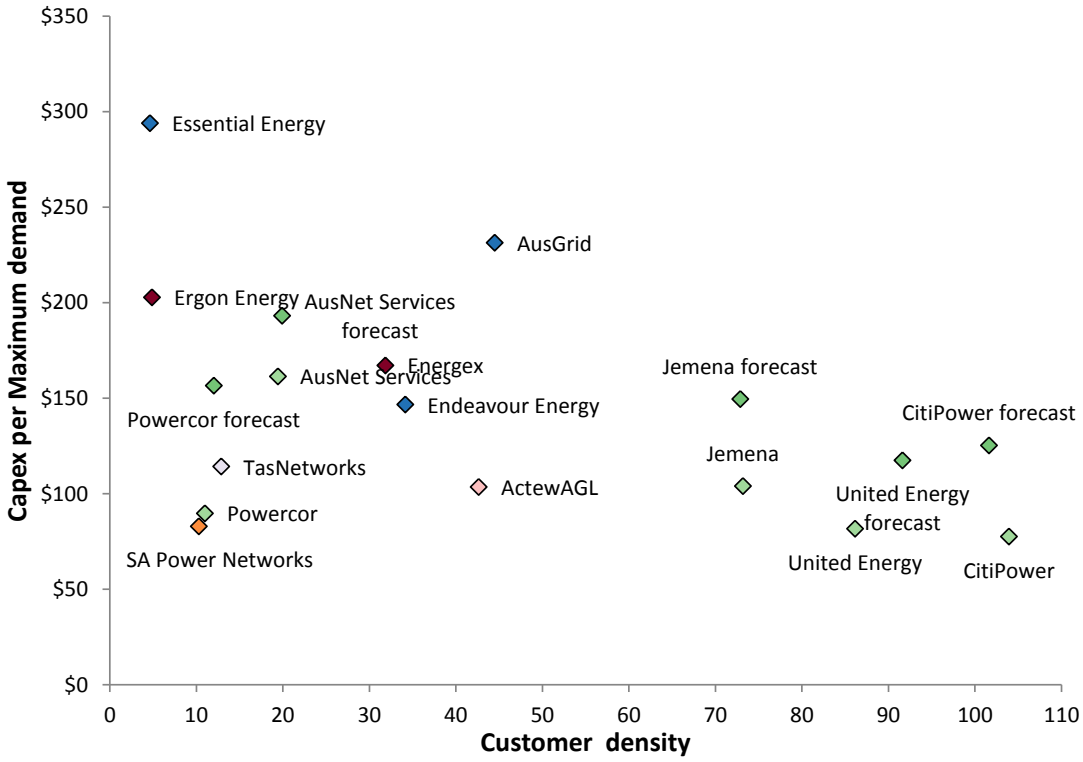
Figure 6.4 Capex per customer (000s, $2013–14), against customer density



Source: AER analysis.

Similar to Figure 6.4, Figure 6.5 shows AusNet Services was the median performer in the capex per maximum demand metric among the lower density networks in the 2008—12 years. AusNet Services' capex per maximum demand will increase slightly in the 2016–20 regulatory control period based on their proposed forecast capex.

Figure 6.5 Capex per maximum demand (000s, $2013–14), against customer density



Source: AER analysis.

The Consumer Utilities Advocacy Centre (CUAC) expressed concern about the large increases in capex some Victorian distributors proposed and the decline in productivity in recent years.[50]

The Victorian Greenhouse Alliances (VGA) noted the increases in the capex forecast of the Victorian distributors. The VGA considered the increased capex forecasts were concerning given over-investment over recent regulatory periods has led to excess levels of network capacity and declining network utilisation. The VGA also expressed concern that the Victorian distributors proposed such high levels of capex at a time of:[51]

- declining capacity utilisation
- reduced average asset age for most asset categories
- static or falling demand and consumption
- reductions in the reliability standards.

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50 CUAC, *Submission: Victorian electricity distribution pricing review (EDPR) 2016 to 2020*, 13 July 2015, p. 2.

51 VGA, *Submission: Local Government response to the Victorian electricity distribution price review (EDPR) 2016–20*, July 2015, p. 33.

The Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and the VECUA made similar points in their submissions.[52]

Appendix B details our assessment of AusNet Services' capex categories. These assessments, along with the high level analysis in this section 6.4.4, were inputs into our preliminary decision on AusNet Services' total capex for the 2016–20 regulatory control period. We consider our assessment has taken into account the issues and concerns stakeholders raised in their submissions. Figure 6.1 shows our preliminary decision capex forecast is 13.6 per cent lower than AusNet Services' actual capex in the 2011–15 regulatory control period. By comparison, AusNet Services' proposed capex is 2.6 per cent lower than its actual capex for the 2011–15 period regulatory control period.

To arrive at our preliminary decision, we considered the issues noted in these submissions, such as lower demand and declining utilisation in the network. For example, we consider AusNet Services' demand forecast does not reflect a realistic expectation of demand over 2016–20 and substituted a lower demand forecast. Our assessment of AusNet Services' augex forecast reflects this lower demand forecast (see appendix C). Importantly, our assessment considered many other factors such as asset age and condition. We discuss these, and other issues relevant to AusNet Services' capex proposal, in detail in appendix B.

AusNet Services' historic capex trends

We compared AusNet Services' capex proposal for the 2016–20 regulatory control period against the long term historical trend in capex levels.

Figure 6.6 shows actual historic capex and proposed capex between 2001 and 2020. This figure shows AusNet Services forecasted slightly lower capex in the 2016–20 regulatory control period compared to actual capex in the 2011–15 regulatory control period. However, AusNet Services' capex forecast for the 2016–20 regulatory control period is still significantly higher than historical levels.

AusNet Services noted safety-related capex represented a much larger proportion of capex compared to historical levels. This is due to the 'unique safety and bushfire mitigation circumstances which apply to AusNet Services' network.'[53] AusNet Services stated its forecast capex, net of safety capex, is eight per cent below the long term historical average.[54]

The CCP noted capex in the current period occurred under the 'old' national electricity rules, which the CCP considered overtly incentivised investment.[55] The CCP further

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[52] DEDJTR, *Submission to Victorian electricity distribution pricing review – 2016 to 2020*, 13 July 2015, p. 6; VECUA, *Submission: Victorian distribution networks' 2016–20 revenue proposals*, 13 July 2105, pp. 6 and 18.

[53] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 127.

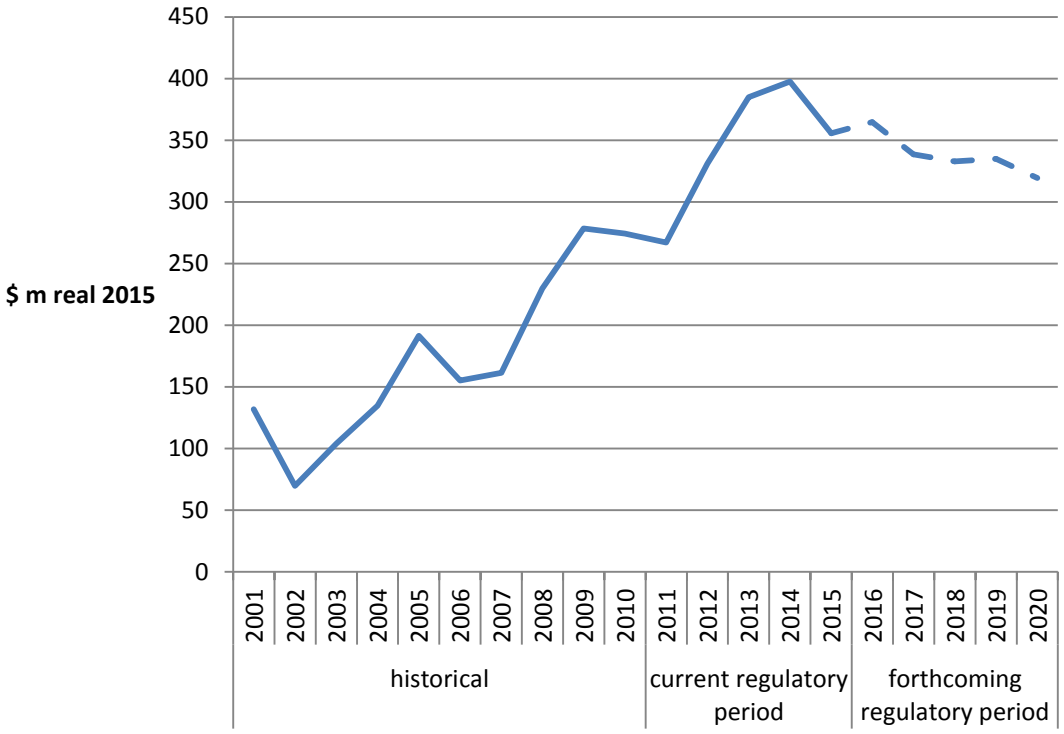
[54] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 128.

[55] That is, prior to the AEMC's changes to the NER in November 2012.

noted the NER did not apply in Victoria prior to 2011. Despite the lower incentive in prior to 2011, the CCP noted that reliability did not suffer.[56]

Our detailed assessment in appendix B examined whether the increase in capex is reasonably reflective of the capex criteria.

Figure 6.6 AusNet Services total capex - historical and forecast for 2001–2020



Source: AER analysis.

6.4.5 Interrelationships

There are a number of interrelationships between AusNet Services' total forecast capex for the 2016–20 regulatory control period and other components of its distribution determination (see Table 6.4). We considered these interrelationships in coming to our preliminary decision on total forecast capex.

[56] CCP, *Submission: Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 5 August 2015, p. 41.

Table 6.4 Interrelationships between total forecast capex and other components

Other component	Interrelationships with total forecast capex
Total forecast opex	There are elements of AusNet Services' total forecast opex that are specifically related to its total forecast capex. These include the forecast labour price growth that we included in our opex forecast in Attachment 7. This is because the price of labour affects both total forecast capex and total forecast opex. More generally, we note our total opex forecast will provide AusNet Services with sufficient opex to maintain the reliability of its network. Although we do not approve opex on specific categories of opex such as maintenance, the total opex we approve will in part influence the repex AusNet Services needs to spend during the 2016–20 period.
Forecast demand	Forecast demand is related to AusNet Services' total forecast capex. Growth driven capex, which includes augex and customer connections capex, is typically triggered by a need to build or upgrade a network to address changes in demand or to comply with quality, reliability and security of supply requirements. Hence, the main driver of growth-related capex is maximum demand and its effect on network utilisation and reliability.
Capital Expenditure Sharing Scheme (CESS)	The CESS is related to AusNet Services' total forecast capex. In particular, the effective application of the CESS is contingent on the approved total forecast capex being efficient, and that it reasonably reflects the capex criteria. As we note in the capex criteria table below, this is because any efficiency gains or losses are measured against the approved total forecast capex. In addition, in future distribution determinations we will be required to undertake an ex post review of the efficiency and prudency of capex, with the option to exclude any inefficient capex in excess of the approved total forecast capex from AusNet Services' regulatory asset base. In particular, the CESS will ensure that AusNet Services bears at least 30 per cent of any overspend against the capex allowance. Similarly, if AusNet Services can fulfil their objectives without spending the full capex allowance, it will be able to retain 30 per cent of the benefit of this. In addition, if an overspend is found to be inefficient through the ex post review, AusNet Services risks having to bear the entire overspend.
Service Target Performance Incentive Scheme (STPIS)	The STPIS is interrelated to AusNet Services' total forecast capex, in so far as it is important that it does not include any expenditure for the purposes of improving supply reliability during the 2016–20 regulatory control period. This is because such expenditure should be offset by rewards provided through the application of the STPIS. Further, the forecast capex should be sufficient to allow AusNet Services to maintain performance at the targets set under the STPIS. The capex allowance should not be set such that there is an expectation that it will lead to AusNet Services systematically under or over performing against its targets.
Contingent project	A contingent project is interrelated to AusNet Services' total forecast capex. This is because an amount of expenditure that should be included as a contingent project should not be included as part of AusNet Services' total forecast capex for the 2016–20 regulatory control period. We did not identify any contingent projects for AusNet Services during the 2016–20 period.

Source: AER analysis.

6.4.6 Consideration of the capex factors

As we discussed in section 6.3, we took the capex factors into consideration when assessing AusNet Services' total capex forecast.57 Table 6.5 summarises how we have taken into account the capex factors.

Where relevant, we also had regard to the capex factors in assessing the forecast capex associated with capex drivers such as repex, augex and so on (see appendix B).

Table 6.5 AER consideration of the capex factors

Capex factor	AER consideration
The most recent annual benchmarking report and benchmarking capex that would be incurred by an efficient distributor over the relevant regulatory control period	We had regard to our most recent benchmarking report in assessing AusNet Services' proposed total forecast capex and in determining our alternative estimate for the 2016–20 regulatory control period. This can be seen in the metrics we used in our assessment of AusNet Services' capex performance.
The actual and expected capex of AusNet Services during any preceding regulatory control periods	We had regard to AusNet Services' actual and expected capex during the 2011–15 and preceding regulatory control periods in assessing its proposed total forecast. This can be seen in our assessment of AusNet Services' capex performance. It can also be seen in our assessment of the forecast capex associated with the capex drivers that underlie AusNet Services' total forecast capex. For non-network capex, we rely on trend analysis to arrive at an estimate that meets the capex criteria.
The extent to which the capex forecast includes expenditure to address concerns of electricity consumers as identified by AusNet Services in the course of its engagement with electricity consumers	We had regard to the extent to which AusNet Services' proposed total forecast capex includes expenditure to address consumer concerns that AusNet Services identified. AusNet Services has undertaken engagement with its customers and presented high level findings regarding its customer preferences.
The relative prices of operating and capital inputs	We had regard to the relative prices of operating and capital inputs in assessing AusNet Services' proposed real cost escalation factors. In particular, we have not accepted AusNet Services' proposal to apply real cost escalation for labour.
The substitution possibilities between operating and capital expenditure	We had regard to the substitution possibilities between opex and capex. We considered whether there are more efficient and prudent trade-offs in investing more or less in capital in place of ongoing operations. See our discussion about the interrelationships between AusNet Services' total forecast capex and total forecast opex in Table 6.4 above.
Whether the capex forecast is consistent with any incentive scheme or schemes that apply to AusNet Services	We had regard to whether AusNet Services' proposed total forecast capex is consistent with the CESS and the STPIS. See our discussion about the interrelationships between AusNet Services' total forecast capex and the application of the CESS and the STPIS in Table 6.4 above.
The extent to which the capex forecast is referable	We had regard to whether any part of AusNet Services'

57 NER, cll. 6.5.7(c), (d) and (e).

Capex factor	AER consideration
to arrangements with a person other than the distributor that do not reflect arm's length terms	proposed total forecast capex or our alternative estimate is referable to arrangements with a person other than AusNet Services that do not reflect arm's length terms. We do not have evidence to indicate that any of AusNet Services' arrangements do not reflect arm's length terms.
Whether the capex forecast includes an amount relating to a project that should more appropriately be included as a contingent project	We had regard to whether any amount of AusNet Services' proposed total forecast capex or our alternative estimate relates to a project that should more appropriately be included as a contingent project. We did not identify any such amounts that should more appropriately be included as a contingent project.
The extent to which AusNet Services has considered and made provision for efficient and prudent non-network alternatives	We had regard to the extent to which AusNet Services made provision for efficient and prudent non-network alternatives as part of our assessment. In particular, we considered this within our review of AusNet Services' augex proposal.
Any other factor the AER considers relevant and which the AER has notified AusNet Services in writing, prior to the submission of its revised regulatory proposal, is a capex factor	We did not identify any other capex factor that we consider relevant.

Source: AER analysis.

A Assessment techniques

This appendix describes the assessment approaches we applied in assessing AusNet Services' total forecast capex. We used a variety of techniques to determine whether the AusNet Services total forecast capex reasonably reflects the capex criteria. Appendix B sets out in greater detail the extent to which we relied on each of the assessment techniques.

The assessment techniques that we apply in capex are necessarily different from those we apply in the assessment of opex. This is reflective of differences in the nature of the expenditure we are assessing. As such, we use some assessment techniques in our capex assessment that are not suitable for assessing opex and vice versa. We set this out in our expenditure assessment guideline, where we stated:[58]

> Past actual expenditure may not be an appropriate starting point for capex given it is largely non-recurrent or 'lumpy', and so past expenditures or work volumes may not be indicative of future volumes. For non-recurrent expenditure, we will attempt to normalise for work volumes and examine per unit costs (including through benchmarking across distributors) when forming a view on forecast unit costs.
>
> Other drivers of capex (such as replacement expenditure and connections works) may be recurrent. For such expenditure, we will attempt to identify trends in revealed volumes and costs as an indicator of forecast requirements.

Below we set out the assessment techniques we used to asses AusNet Services' capex.

A.1 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report. The NER requires us to consider the annual benchmarking report as it is one of the capex factors.[59] Economic benchmarking applies economic theory to measure the efficiency of a distributor's use of inputs to produce outputs, having regard to environmental factors.[60] It allows us to compare the performance of a distributor against its own past performance, and the performance of other distributors. Economic benchmarking helps us to assess whether a distributor's capex forecast represents efficient costs.[61] As the AEMC stated, 'benchmarking is a critical exercise in assessing the efficiency of a NSP'.[62]

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58 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, p. 8.

59 NER, cl. 6.5.7(e)(4).

60 AER, *Better regulation: Explanatory statement: Expenditure forecasting assessment guidelines,* November 2013.

61 NER, cl. 6.5.7(c).

62 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 25.

A number of economic benchmarks from the annual benchmarking report are relevant to our assessment of capex. These include measures of total cost efficiency and overall capex efficiency. In general, these measures calculate a distributor's efficiency with consideration given to its inputs, outputs and its operating environment. We considered each distributor's operating environment in so far as there are factors outside of a distributor's control that affect its ability to convert inputs into outputs.[63] Once such exogenous factors are taken into account, we expect distributors to operate at similar levels of efficiency. One example of an exogenous factor we took into account is customer density. For more on how we derived these measures, see our annual benchmarking report.[64]

In addition to the measures in the annual benchmarking report, we considered how distributors performed on a number of overall capex metrics, including capex per customer, and capex per maximum demand. We calculated these economic benchmarks using actual data from the previous regulatory control period.

The results from economic benchmarking give an indication of the relative efficiency of each of the distributors, and how this has changed over time.

A.2 Trend analysis

We considered past trends in actual and forecast capex as this is one of the capex factors under the NER.[65]

Trend analysis involves comparing a distributor's forecast capex and work volumes against historical levels. Where forecast capex and volumes are materially different to historical levels, we seek to understand the reasons for these differences. In doing so, we consider the reasons the distributor provides in its proposal, as well as changes in the circumstances of the distributor.

In considering whether the total forecast capex reasonably reflects the capex criteria, we need to consider whether the forecast will allow the distributor to meet expected demand, and comply with relevant regulatory obligations.[66] Demand and regulatory obligations (specifically, service standards) are key drivers of capex. More onerous standards will increase capex, as will growth in maximum demand. Conversely, reduced service obligations or a decline in demand will likely cause a reduction in the amount of capex the distributor requires.

Maximum demand is a key driver of augmentation or demand driven expenditure. Augmentation often needs to occur prior to demand growth being realised. Hence, forecast rather than actual demand is relevant when a business is deciding the

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63 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012,* 29 November 2012, p. 113. Exogenous factors could include geographic factors, customer factors, network factors and jurisdictional factors.

64 AER, *Electricity distribution network service providers: Annual benchmarking report*, November 2014.

65 NER, cl. 6.5.7(e)(5).

66 NER, cl. 6.5.7(a)(3).

augmentation projects it will require in an upcoming regulatory control period. To the extent actual demand differs from forecast, however, a business should reassess the need for the projects. Growth in a business' network will also drive connections related capex. For these reasons it is important to consider how trends in capex (in particular, augex and connections) compare with trends in demand (and customer numbers).

For service standards, there is generally a lag between when capex is undertaken (or not) and when the service improves (or declines). This is important when considering the expected impact of an increase or decrease in capex on service levels. It is also relevant to consider when service standards have changed and how this has affected the distributor's capex requirements.

We looked at trends in capex across a range of levels including at the total capex level, and the category level (such as growth related capex, and repex) as relevant. We also compared these with trends in demand and changes in service standards over time.

A.3 Category analysis

Expenditure category analysis allows us to compare expenditure across NSPs, and over time, for various levels of capex. The comparisons we perform include:

- overall costs within each category of capex
- unit costs, across a range of activities
- volumes, across a range of activities
- asset lives, across a range of asset classes which we use in assessing repex.

Using standardised reporting templates, we collected data on augex, repex, connections, non-network capex, overheads and demand forecasts for all distributors in the NEM. The use of standardised category data allows us to make direct comparisons across distributors. Standardised category data also allows us to identify and scrutinise different operating and environmental factors that affect the amount and cost of works performed by distributors, and how these factors may change over time.

A.4 Predictive modelling

Predictive modelling uses statistical analysis to determine the expected efficient costs over the regulatory control period associated with the demand for electricity services for different categories of works. We have two predictive models:

- the repex model
- the augex model (used in a qualitative sense).

The use of the repex and augex models is directly relevant to assessing whether a distributor's capex forecast reasonably reflects the capex criteria.[67] The models draw

[67] NER, cl. 6.5.7(c).

on actual capex the distributor incurred during the preceding regulatory control period. This past capex is a factor that we must take into account.[68]

The repex model is a high-level probability based model that forecasts asset replacement capex (repex) for various asset categories based on their condition (using age as a proxy), and unit costs. If we consider a distributor's proposed repex does not conform to the capex criteria, we use the repex model (in combination with other techniques where appropriate) to generate a substitute forecast.

The augex model compares utilisation thresholds with forecasts of maximum demand to identify the parts of a network segment that may require augmentation.[69] The model then uses capacity factors to calculate required augmentation, and unit costs to derive an augex forecast for the distributor over a given period.[70] In this way, the augex model accounts for the main internal drivers of augex that may differ between distributors, namely peak demand growth and its impact on asset utilisation. We can use the augex model to identify general trends in asset utilisation over time as well as to identify outliers in a distributor's augex forecast.[71]

For our preliminary decision we have relied on input data for the augex model to review forecast utilisation of individual zone substations to assess whether augmentation may be necessary to alleviate capacity constraints. We use this analysis both as a starting point for our further detailed evaluation, and as a cross-check on our overall augex estimate. We have not otherwise used the augex model in our assessment of AusNet Services' augex forecast.

A.5 Engineering review

We drew on engineering and other technical expertise within the AER to assist with our review of AusNet Services' capex proposals.[72] We also relied on the technical review of our consultant, Energeia, to assist with our review of distributors' capex proposals. These involved reviewing AusNet Services' processes, and specific projects and programs of work.

Appendix B discusses in detail our consideration of these reviews in our assessment of AusNet Services' capex forecast.

Origin Energy submitted the AER must continue to apply technical assessments in concert with its benchmarking techniques to ensure a prudent balance between asset risk and input costs.[73]

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68 NER, cl. 6.5.7(e)(5).

69 Asset utilisation is the proportion of the asset's capability under use during peak demand conditions.

70 For more information, see: AER, *Guidance document: AER augmentation model handbook,* November 2013.

71 AER, *'Meeting summary – distributor replacement and augmentation capex', Workshop 4: Category analysis work-stream – Replacement and demand driven augmentation (Distribution),* 8 March 2013, p. 1.

72 AER, *Better regulation: Explanatory statement: Expenditure forecast assessment guideline*, November 2013, p. 86.

73 Origin Energy, *Submission to Victorian electricity distributors regulatory proposals*, 13 July 2015, p. 1.

B Assessment of capex drivers

We present our detailed analysis of the sub-categories of AusNet Services' forecast capex for the 2016–20 regulatory control period in this appendix. These sub-categories reflect the drivers of forecast capex over the 2016–20 period. These drivers are augmentation capex (augex), customer connections capex, replacement capex (repex), reliability improvement capex, capitalised overheads and non-network capex.

As we discuss in the capex attachment, we are not satisfied that AusNet Services' proposed total forecast capex reasonably reflects the capex criteria. In this appendix we set out further analysis in support of this view. This further analysis also explains the basis for our alternative estimate of AusNet Services' total forecast capex that we are satisfied reasonably reflects the capex criteria. In coming to our views and our alternative estimate we applied the assessment techniques that we discuss in appendix A.

This appendix sets out our findings and views on each sub-category of capex. The structure of this appendix is:

- Section B.1: alternative estimate
- SectionB.2: forecast augex
- Section B.3: forecast customer connections capex, including capital contributions
- Section B.4: forecast repex
- Section B.5: Victorian Bushfires Royal Commission
- Section B.6: forecast capitalised overheads
- Section B.7: forecast non-network capex.

In each of these sections, we examine sub-categories of capex which we include in our alternative estimate. For each such sub-category, we explain why we are satisfied the amount of capex that we include in our alternative estimate reasonably reflects the capex criteria.

B.1 Alternative estimate

Having examined AusNet Services' proposal, we formed a view on our alternative estimate of the capex required to reasonably reflect the capex criteria. Our alternative estimate is based on our assessment techniques, explained in section 6.3 and appendix A. Our weighting of each of these techniques, and our response to AusNet Services' submissions on the weighting that should be given to particular techniques, is set out under the capex drivers in appendix B.

We are satisfied that our alternative estimate reasonably reflects the capex criteria.

B.2 Forecast augex

AusNet Services proposes a forecast of $313.8 million ($2015) for augmentation capex (augex), excluding overheads. This is a 31 per cent decrease compared to actual augex incurred in the 2011–15 regulatory control period (primarily driven by reductions in demand-related augex).

Augmentation is typically triggered by the need to build or upgrade the network to address changes in demand and network utilisation. However, it can also triggered by the need to upgrade the network to comply with quality, safety, reliability and security of supply requirements.

As set out in Table 6.6, AusNet Services' proposed augex forecast is comprised of capex to meet forecast maximum demand, capex related to the Victorian Bushfire Royal Commission (VBRC) recommendations, and other safety augex.

Table 6.6 AusNet Services' proposed augex ($2015, million, excluding overheads)

Category	2016	2017	2018	2019	2020	Total
VBRC	28.8	28.0	28.2	28.4	28.7	142.1
Safety	45.5	16.4	15.3	13.6	13.4	104.2
Demand	8.2	20.3	17.3	11.0	10.7	67.5
Total augex proposal	82.5	64.7	60.8	53.0	52.8	313.8

Source: AusNet Services regulatory proposal, April 2015; reset RIN; AER analysis.

Our estimate of required augex for AusNet Services for the 2016–20 period is $267.4 million ($2015), a reduction of 14.8 per cent from AusNet Services' proposed augex forecast. We accept that the majority of AusNet Services' augex forecast reasonably reflects the capex criteria. However, we consider that AusNet Services' forecasts of maximum demand do not reflect a realistic expectation of demand over the 2016–20 period, which means that AusNet Services' demand-related augex forecast is likely overstated. We also find that AusNet Services proposed augex to place underground powerlines that are currently adversely affected by overhanging vegetation may not be necessary in order to comply with the capex objectives.

We have formed this view after reviewing all of the material submitted by AusNet Services in its regulatory proposal, its supporting documentation and responses to requests for further information, and submissions from stakeholders. Our review used a combination of top-down and bottom-up assessment techniques to estimate the efficient and prudent capex that AusNet Services will require to meet its obligations

given expected demand growth and safety obligations. This is consistent with the overall approach set out in our Expenditure Forecast Assessment Guideline.[74]

First, we considered AusNet Services' proposed expenditure in the context of past expenditure, demand and current network utilisation.[75] As set out in section B.2.1, we found that AusNet Services' forecasts of maximum demand likely do not reasonably reflect a realistic expectation of demand over the 2016–20 period. The available evidence suggests that maximum demand will remain generally flat over the 2016–20 period, which is consistent with the Australian Energy Market Operator's (AEMO) independent forecasts for AusNet Services' network.

On the basis of our analysis, and information provided by AusNet Services, we consider that a forecast of $52 million reflects the prudent and efficient amount to meet a realistic expectation of demand over the 2016–20 period. This is 22.8 per cent less than AusNet Services' proposal, which is primarily within its forecast augex for distribution substations and its low voltage network.

Second, we reviewed AusNet Services key safety-related augex programs (both VBRC and other safety), worth $246 million ($2015) over the 2016–20 period. On the basis of our review, we are satisfied that an amount of $215 million reasonably reflects the capex criteria and have included in this our alternative estimate.

We have included AusNet Services' proposed augex relating to the VBRC and for additional animal/bird proofing in our preliminary decision because we are satisfied that this capex reasonably reflects the capex criteria. However, we have not included AusNet Services proposed augex to place underground powerlines that are currently adversely affected by overhanging vegetation. This is because it is unclear how this augex interacts or overlaps with the funding AusNet Services receives through the Victorian Powerline Replacement Fund to underground or insulate powerlines in high-bushfire areas. We intend to seek more information about this potential overlap when we consider AusNet Services revised proposal (as set out in section B.2.2).

Table 6.7 sets out a breakdown of the amount of forecast augex we have included in our alternative estimate, including the differences to AusNet Services' proposal.

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74 AER, *Explanatory Statement - Expenditure Forecast Assessment Guideline*, November 2013, p. 82.

75 This is supported by the AER's augex model to generate trends in asset utilisation. We have not otherwise used the augex model to estimate forecast augex.

Table 6.7 AER's alternative estimate of augex ($2015, million, excluding overheads)

	2016	2017	2018	2019	2020	Total
AusNet Services proposal	82.5	64.7	60.8	53	52.8	313.8
Adjustment to demand-augex	-3.1	-3.1	-3.1	-3.1	-3.1	-15.4
Removal of powerline undergrounding	-31	0	0	0	0	-31
AER alternative estimate	48.42	61.62	57.72	49.92	49.72	267.4
Difference	-41.31%	-4.76%	-5.07%	-5.81%	-5.83%	-14.79%

Source: AER analysis.

Our reasoning and findings are set out in the remainder of this section.

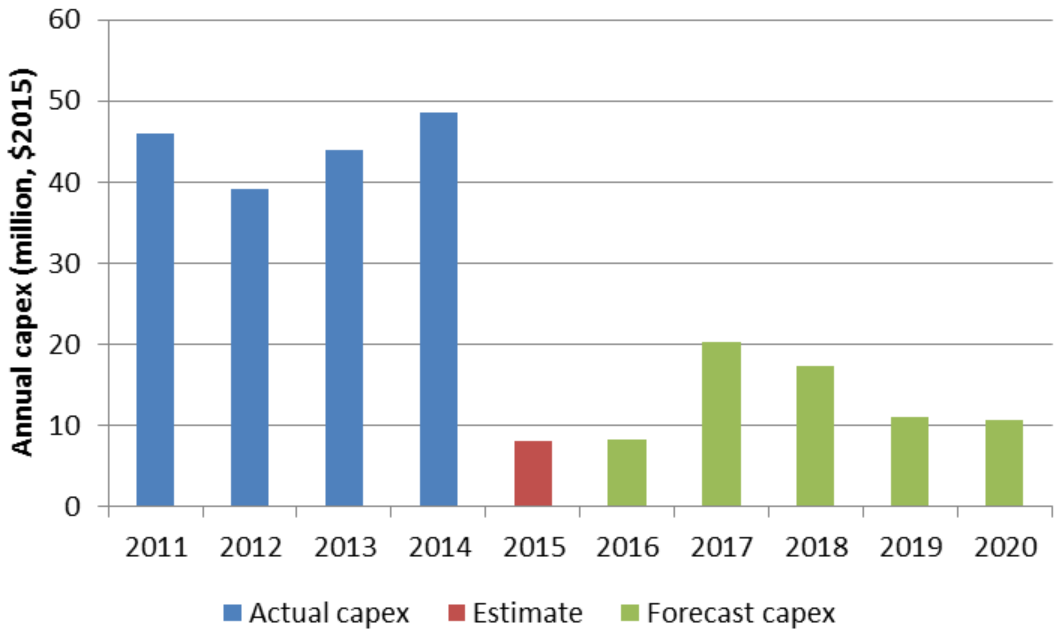
B.2.1 Demand-augex

AusNet Services proposes $67 million in augex to respond to forecast maximum demand over the 2016–20 period. Figure 6.7 shows that this demand-related augex forecast is 64 per cent lower when compared to actual demand-driven augex AusNet Services' spent over the 2011–15 regulatory control period. This capex comprises approximately four percent of its proposed total capex program.[76]

AusNet Services' demand-driven augex proposal consists of $12.0 million ($2015) for a sub-transmission line, $23.3 million ($2015) for new distribution feeders and $30 million ($2015) for distribution substations, to meet localised load growth.[77] AusNet Services forecast that it does not require any new zone substations, additional zone substation transformers in the 2016–20 period.[78]

[76] AusNet Services, *Regulatory Proposal 2016–2020*, 30 April 2015, Appendix 7A, p. 41.
[77] AusNet Services, *Regulatory Proposal 2016–2020*, 30 April 2015, Appendix 7A, pp. 40–41.
[78] AusNet Services, *Regulatory Proposal 2016–2020*, 30 April 2015, Appendix 7A, p. 41.

Figure 6.7 AusNet Services' demand-driven capex historic actual and proposed for 2016–20 period ($2015, million, excluding overheads)



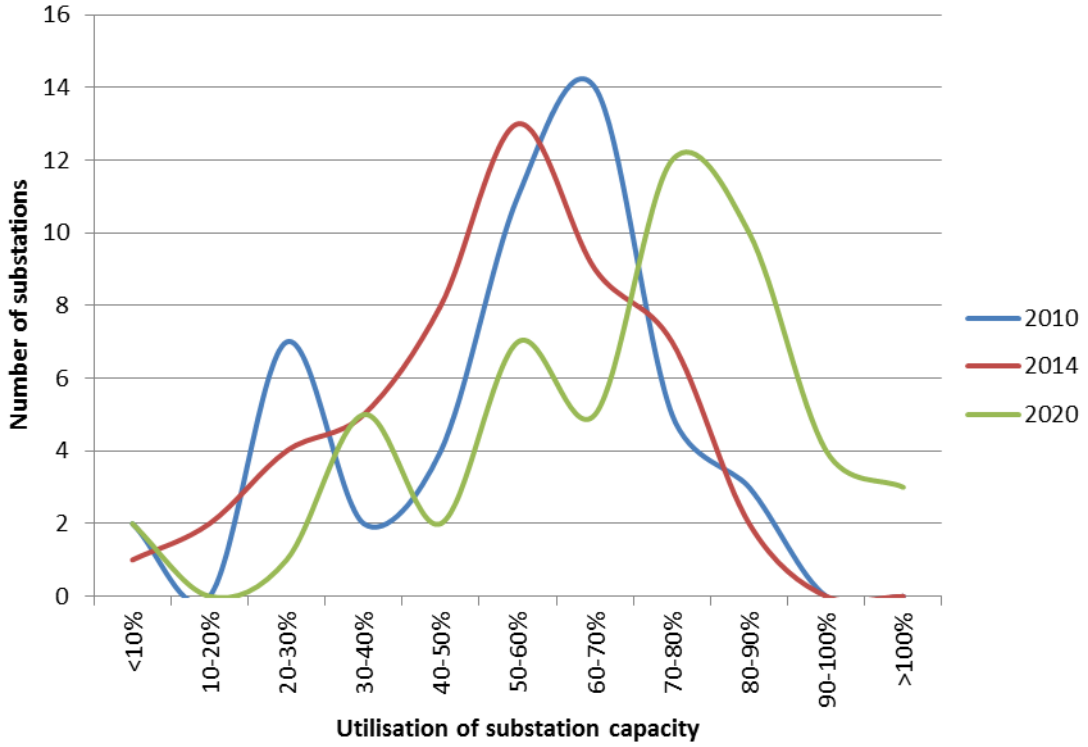
Source: AER analysis, AusNet Services' response to AER AusNet 002 and 013.

To examine the impact of a maximum demand on the need for network augmentation, we have looked at network utilisation. Network utilisation is a measure of the installed network capacity that is, or is forecast to be, in use. Where utilisation rates decline over time (such as from a decline in maximum demand), it is expected that total augex requirements would similarly fall.

Figure 6.8 shows AusNet Services' zone substation utilisation between 2010 and 2014, and forecast utilisation in 2020 (at the end of the regulatory period). Between 2010 and 2014 AusNet Services undertook zone substation augmentation, which is shown in a decrease in the number of substations operating above 60 per cent of their maximum capacity. The flattening of maximum demand between 2010 and 2014 also contributed to reduction in the utilisation of the network.

The forecast of zone substation utilisation in 2020 is based on AusNet Services' forecast demand at each substation and existing levels of capacity (without additional augmentation). The increase in utilisation across its network reflects AusNet Services' expectations on demand growth between 2015 and 2020 (shown in Figure 6.8 as a shift to the right in network utilisation forecast in 2020).

Figure 6.8 AusNet Services' zone substation utilisation 2010 and 2014 actual, and 2020 forecast



Source: AER analysis, AusNet Services' reset RIN.

Note: Utilisation is the ratio of maximum demand and the normal cyclic rating of each substation for the specified years.[79]

While AusNet Services forecast increases in the number of highly utilised substations by 2020, it did not propose to augment any zone substations as part of its augex forecast. However, as part of its replacement capex forecast, AusNet Services proposed to replace a number of older zone substation transformers with newer transformers of higher capacity (e.g. Bainsdale, Pakenham and Seymour zone substation rebuild projects). This capex is considered in section B.4.

The majority of its augex forecast is proposed for associated distribution assets such as distribution feeders and distribution substations. An increase in the load and utilisation at the substation level may indicate that augmentation on downstream assets is required. This is consistent with AusNet Services' forecast utilisation.

AusNet Services proposed some demand growth over the 2016–20 period and maximum demand levels are forecast to be higher than the recent period. However, as we outline in appendix C, we consider that the available evidence points to flat peak

[79] Normal cyclic rating is the maximum peak loading based on a given daily load cycle that a substation can supply each day of its life under normal conditions resulting in a normal rate of wear.

demand growth for the 2016–20 period. While AusNet Services has significantly decreased its proposed augex compared to the 2011–15 period, its demand-augex may be slightly overstated when compared to a more realistic expectation of demand over the 2016–20 period.

To determine the likely overestimation of AusNet Services' demand augex, we:

- determined a realistic demand forecast for AusNet Services over the 2016–20 period based on AEMO forecasts
- assessed the impact of adopting a realistic demand forecast to AusNet Services' demand-related proposal.

First, based on information available at the time of making this preliminary decision, we consider that AEMO's 2014 connection point forecasts for AusNet Services reflect a realistic expectation of demand over the 2016–20 period. This is for the reasons set out in appendix C.

Second, to determine the impact of adopting a realistic demand forecast on AusNet Services' demand-related proposal, we asked AusNet Services to explain the sensitivity of its augex to forecast maximum demand. In particular, we asked it to demonstrate the change in these capex forecasts from a +/- five per cent change in maximum demand. We asked this because recent evidence we received during our assessment of (NSW distributor) Ausgrid's augex forecasts for the 2014–19 regulatory control period suggested that there may be linear relationships between changes in demand forecasts and augex for its high voltage network.[80]

AusNet Services response stated that a five per reduction in maximum demand by the end of the 2016–20 period means that there is effectively no maximum demand growth over the period.[81] This is consistent with our analysis of a realistic demand forecast.

Table 6.8 sets out the impact of no demand growth on AusNet Services' demand augmentation proposal, based on information provided by Ausnet Services. This suggests that there is a proportionate relationship between a reduction in demand and a reduction in capex for those aspects of its capex proposal that have a direct relationship with demand.[82]

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80 Analysis of Ausgrid's modelling demonstrated that there was a positive linear relationship between a change in forecast demand and a change in its expenditure requirements for HV feeders. See AER, *Draft decision Ausgrid distribution determination*, Attachment 6, November 2014, p. 61.

81 AusNet Services, *Response to AER information request IR# 15*, 19 August 2015, pp. 1-3.

82 AusNet Services, *Response to AER information request IR#* 15, 19 August 2015, pp. 1-3.

Table 6.8 Relationship between augex projects and demand

Category	Proportion sensitive to demand growth	Proposed capex ($2015, m)	Reduction in capex ($2015, m)
Distribution feeders	0%	24.1	0.0
Sub-transmission augmentation	0%	12.3	0.0
Distribution substations and LV (routine supply improvement)	33%	8.0	-2.6
Distribution substations and LV (summer preparation works)	100%	2.7	-2.7
Distribution substations and LV (distribution transformer upgrades)	50%	20.3	-10.1
Total		67.5	-15.4

Source: AER analysis; Ausnet response to information request 15, 19 August 2015.

Based on this information, we consider that reducing AusNet Services' proposed augex by $15.4 million will likely result in a prudent and efficient amount to meet a realistic expectation of demand over the 2016–20 period. This is based on an assumption that flat peak demand over this period is realistic and that AusNet Services will not require the capex that is related to demand growth as proposed in Table 6.8. This results in an alternative estimate of $52.1 million for demand-related augex for the 2016–20 regulatory control period.

We understand that AusNet Services in the process of updating its demand forecasts as part of the 2015 distribution annual planning report. We also note that in September 2015, AEMO published updated connection point demand forecasts for Victoria. We will consider updated demand forecasts and other information (such as AEMO's revised connection point forecasts) in our final decision to reflect the most up to date data.

A number of submissions commented on network utilisation:

- The Consumer Challenge Panel submitted that AusNet Services' existing utilisation data and declining peak demand supports a view that there is little need for augmentation capex.[83] It also observed that AusNet Services proposes a significant reduction in tis augmentation capex, unlike similar networks like Powercor.[84]
- The VECUA and the Victorian Greenhouse Alliances also submitted that there were significant investments in the Victorian networks over recent regulatory periods

[83] CCP Sub-panel 3, *Response to proposals from Victorian electricity distribution network service providers*, August 2015, p. 17.

[84] CCP Sub-panel 3, *Response to proposals from Victorian electricity distribution network service providers*, August 2015, p. 17.

which has led to excess levels of network capacity and declining network utilisation.[85] Both submitted that we should consider this evidence closely in our capex assessment.

As noted by these stakeholders, we agree that current levels of network utilisation are important factors to consider in reviewing augmentation requirements over time. However, in terms of determining a level of augex for the 2016–20 regulatory control period, it is also necessary to consider future demand and forecast network utilisation over this period. We considered this above.

B.2.2 Safety-augex

AusNet Services proposes $246 million for bushfire and other safety augmentation. Table 6.9 sets out the components of AusNet Services' safety augex forecast.

Table 6.9 AusNet Services' safety augmentation expenditure forecast ($2015, million, excluding overheads)

	2016	2017	2018	2019	2020	Total
VBRC related expenditure	28.8	28.0	28.2	28.4	28.7	142.1
Overhang Removals	31.0	0.0	0.0	0.0	0.0	31.0
Animal / Bird Proofing	11.2	11.3	11.4	11.5	11.6	57.1
Other safety augex	3.3	5.1	3.8	2.1	1.8	16.1
Total safety augex	74.3	44.4	43.5	42.0	42.1	246.3

Source: AER analysis; AusNet Services regulatory proposal.

We have included $215 million ($2015) for safety-related augex in our alternative estimate. We accept that AusNet Services' forecast augex relating to the VBRC and animal and bird proofing reasonably reflects the capex criteria and we have included it in our alternative estimate. However, we have not included AusNet Services forecast augex to place underground power lines that are currently adversely affected by overhanging vegetation. This is because it is unclear how this augex interacts or overlaps with the funding AusNet Services receives through the Victorian Powerline Replacement Fund to place underground or insulate powerlines in high-bushfire areas. We intend to seek more information about this potential overlap when we consider AusNet Services revised proposal.

We consider AusNet Services' proposed capex for VBRC, animal and bird proofing, and powerline undergrounding below.

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[85] Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016–20 Revenue Proposals*, 13 July 2015 , pp. 4 and 22–24; Victorian Greenhouse Alliances, *Local Government Response to the Victorian Electricity Distribution Price Review 2016-20* , 13 July 2015, pp. 33–34.

VBRC related capex

AusNet Services proposes $142 million to install vibration dampeners and armour rods, and replace SWER lines, to comply with existing safety obligations resulting from the Victorian Bushfire Royal Commission (VBRC).

We have assessed this capex in section B.5. On the basis of the reasons set out in that appendix, we have included AusNet Services proposed $142 million within our alternative estimate of augex.

Bird and animal proofing

AusNet Services proposed $57.1 million to increase insulation on high voltage pole-top structures in hazardous bushfire risk areas to proof against bird and animal contact. This is to help prevent bird and animal 'electricity flashovers' (e.g. arc ignition) which have been identified as a bushfire ignition risk. As set out in AusNet Services' Bushfire Mitigation Plan, animals and birds cause 7 per cent of total network asset fires and up to 12 per cent of all ground fires (the second highest cause after trees) on its network.[86]

AusNet Services currently 'proofs' existing pole top structures as part of its bushfire mitigation program, with 30 per cent of its complex high voltage structures already animal proofed.[87] AusNet Services proposed to proof another 18 per cent of existing poles over the 2016–20 period, and another 21 per cent of poles that will be replaced over the 2016–20 period.[88] These will be targeted in hazardous bushfire risk areas.

We are satisfied that AusNet Services has demonstrated the need for animal and bird proofing of high voltage pole stop structures. This is based on the relatively high rate of fire starts due to animal and bird contact with these assets (in particular ground fires). AusNet Services also proposed to proof a large amount of pole-tops during asset replacement, which demonstrates some consideration of efficiencies. Based on the information in front of us, we are satisfied that this capex reasonably reflects the prudent and efficient amount to maintain safety on the network and comply with AusNet Services obligations under its Bushfire Mitigation Plan and Electricity Safety Management Scheme.

However, we have some questions about the overall scope of the program. In particular, AusNet Services has not demonstrated how is has prioritised its animal and bird proofing and whether they are located in the highest bushfire risk areas. While we have included this capex in our preliminary decision, we intend to seek more information in relation the scope of the full program when we consider AusNet Services

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86 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7B, pp. 9–10; AusNet Services, *Bushfire Mitigation Plan*, July 2014, p. 33.

87 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7B, p. 21.

88 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7B, p. 21; AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7A, p. 68.

revised proposal. We encourage AusNet Services to provide additional information in its revised proposal about how it has targeted the poles for additional animal proofing.

Placing powerlines underground due to vegetation overhang

AusNet Services proposed $31 million to place underground power lines that are currently adversely affected by overhanging vegetation posing a bushfire safety risk.

Under the *Electricity Safety (Electric Line Clearance) Regulations 2010*, AusNet Services is required to remove overhanging vegetation by removing the tree or reconfiguring the network.[89] We provide AusNet Services with opex for vegetation management that allows it remove trees and overhanging vegetation that pose safety risks or are within minimum clearance distance (see Attachment 7 for more detail).

AusNet Services proposed this capex, in addition to its business as usual vegetation management operations, because it stated it identified a number of locations where it is impractical to remove or trim significant trees to obtain the prescribed clearance space above the powerlines.[90] AusNet Service submitted this program will reconfigure the network (through undergrounding specific power lines) to obtain the prescribed clearance space above the power lines. AusNet Services does not otherwise appear to face a regulatory obligation to place underground powerlines that are adversely impacted by overhanging vegetation (such as through it Bushfire Mitigation Plan and Electricity Safety Management Scheme).

We have not included AusNet Services proposed capex for placing underground powerlines that are adversely impacted by overhanging vegetation in our alternative estimate in this preliminary decision. While we recognise that AusNet Services has obligations to maintain minimum clearance from powerlines, the scope of this program appears unclear. In particular, we consider there may be some overlap with other expenditure programs. This means we are not satisfied that this capex is necessarily required in order to comply with the capex objectives to maintain network safety or comply with its clearance obligations under *Electricity Safety (Electric Line Clearance) Regulations 2010*.

A key reason for our conclusion is that AusNet Services also receives $60 million funding through the Victorian Powerline Replacement Fund to underground or insulate powerlines in high-bushfire areas. We currently provide for this within our repex alternative estimate, with the government funding being counted as a capital contribution (zero net capex).[91]

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89 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, AusNet Services, *Regulatory Proposal 2016–2020*, 30 April 2015, Appendix 7A, p. 65.

90 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7A, p. 65; AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, Appendix 7B, p. 25.

91 Following the ATO Ruling on liabilities from Victorian Government's Powerline Replacement Fund, we expect AusNet Services will submit a revised capex model with the correct allocations which we will address in our final decision.

The proposed $31 million to underground powerlines is in addition to the $60 million government funded program. Both programs appear to perform similar functions to insulate powerlines to reduce the risk of bushfires. It is not clear on the information in front of us whether there is overlap in the specific powerlines AusNet Services will underground under both programs, and hence whether there is overlap or double-counting in proposed capex to comply with AusNet Services' clearance obligations.

AusNet Services' proposed capex for undergrounding due to overhanging vegetation is primarily contained in 2016 (with zero capex proposed for the remainder of the 2016–20 period). This might suggest that further undergrounding will be funded solely through the Victorian Powerline Replacement Fund.

We also consider that AusNet Services had not provided sufficient information about why its required vegetation clearances cannot be achieved through its normal vegetation management practices in these locations. This further supports not including additional augex within our alternative estimate in our preliminary decision.

B.3 Forecast customer connections capex, including capital contributions

Connections capex is incurred by AusNet Services to connect new customers to its network and where necessary augment the shared network to ensure there is sufficient capacity to meet the new demand.

New connection works can be undertaken by AusNet Services or a third party. The new customer provides a contribution towards the cost of the new connection assets. This contribution can be monetary or in contributed assets. In calculating the customer contribution, AusNet Services is required to take into account the forecast revenue anticipated from the new connection[92]. These contributions are subtracted from total gross capex and as such decrease the revenue that is recoverable from all consumers. Customer contributions are sometimes referred to as capital contributions or capcons.

The mix between net capex and capcons is important as it determines from whom and when AusNet Services recovers revenue associated with the capex investment. For works involving a customer contribution, AusNet Services recovers revenue directly from the customer who initiates the work at the time the work is undertaken. This is different from net capex where AusNet Services recovers revenue for this expenditure through both the return on capital and return of capital building blocks that form part of the calculation of AusNet Services' annual revenue requirement.[93] That is, AusNet Services recovers net capex investment across the life of the asset through revenue received for the provision of standard control services. AusNet Services has forecast $368.2 million ($2015–16) of expenditure for connection works for the 2016–20

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92 In Victoria, the Essential Services Commission's (ESCV) Guidelines 14 and Guideline 15 determine the customer connection charges.

93 For more information on the building blocks included in the determination of AusNet Services' annual revenue requirement see our attachments on the Regulatory Asset Base and Regulatory Depreciation.

regulatory control period, net of customer contributions. Table 6.10 shows AusNet Services' forecast for connections expenditure and customer contributions.

Table 6.10 AusNet Services proposed connections capex ($2015–16, million, excluding overheads

Category	2016	2017	2018	2019	2020	Total
Gross connections capex	74.3	74.1	74.5	72.3	73.0	368.2
Customer contributions	55.5	55.4	55.4	53.8	54.0	274.0
Net connections capex	18.9	18.7	19.1	18.5	18.9	94.1

Source: AusNet Services RIN data (note: numbers may not add due to rounding).

We accept both AusNet Services' net connections capex forecast and customer contributions forecast and have included these in our substitute estimate of net capex.

In determining that AusNet Services' forecasts meet the capex criteria, we considered:

- the trends in AusNet Services' connections capex across time, and
- AusNet Services' forecast methodology.

We note the stakeholders have raised some concerns with the classification of connection services.[94] We discuss this further in our determination of service classifications.

B.3.1 Trend analysis

As we note in section A.2 when assessing AusNet Services' connections capex we have considered the trends in actual and forecast capex.[95] We have used this analysis to provide context to AusNet Services' proposal, in particular trend analysis has allowed us to:

- gauge the degree to which AusNet Services' proposal is consistent with past connections capex, and
- understand variations between AusNet Services' capex allowances for connections and that incurred in the 2011–15 regulatory control period.

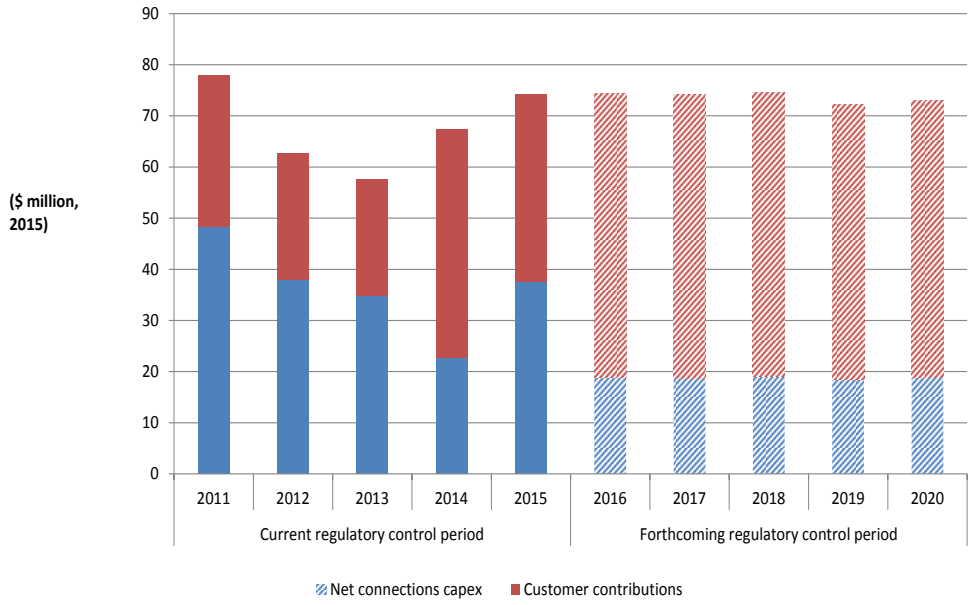
Actual and forecast customer connections

[94] Consumer Challenge Panel 3, *Victorian DNSPs revenue reset comments on DNSPs proposal*, August 2015, p. 54–56.
Vector, *Submission on the AER's Issues Paper on Victorian Electricity Distribution Pricing Review for 2016-2020,* 13 July 2015 pp. 4–5.

[95] This is one of the capex factors to which we are required to have regard to under the NER (NER, cl. 6.5.7(a)(5)).

Figure 6.9 shows the trend in AusNet Services' actual and forecast gross connections capex by both net connections capex and customer contributions.

Figure 6.9 AusNet Services connections and capital contributions, historic actual and proposed for 2016–20 period ($2015–16, million)



Source: AusNet Services RIN data.

Figure 6.9 shows that between 2011 and 2015 gross connections capex has been relatively stable across the period with a dip in the middle years of the period. We note that AusNet Services is forecasting gross connections capex in line with its recent expenditure. We further note that there is a significant shift in the proportion of customer contributions in the forecast compared to the current period.

Historic spend

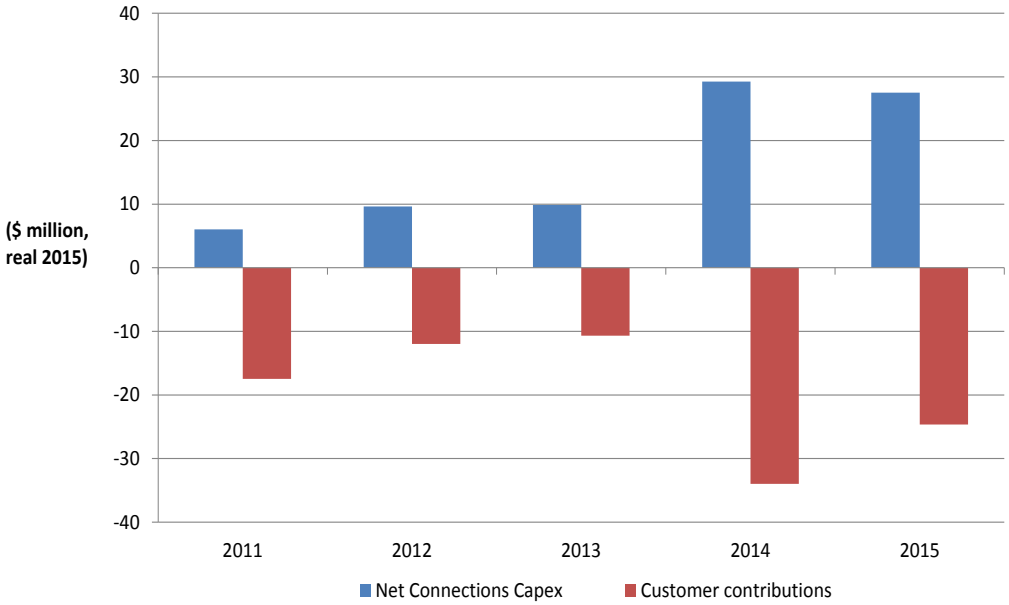
In determining whether we are satisfied that AusNet Services' forecast connections capex meets the criteria in the rules we must have regard to AusNet Services' actual and expected capex during any preceding regulatory periods.[96] We note that AusNet Services is forecasting to underspend its gross connections capex allowance in the current regulatory period by $55.4 million ($2015–16).[97]

Figure 6.10 compares AusNet Services' connections capex spend in the 2011–15 regulatory control period with the allowance included in the capex determination.

[96] NER 6.5.7(e)(5).

[97] Comparing the 2011–15 allowance in AER Victorian Distribution Determinations 2011-15 - Final Decisions - Table 8.24 (adjusted for inflation) with AusNet Services RIN data. We recognise these differences potentially involve differences in conversions to real $2015, revisions to service classifications or changed cost allocation methods.

Figure 6.10 AusNet Services 2011–15 regulatory control period connections capex actual and allowed (million, $2015–16)



Source: 2011–15 allowance in AER Victorian Distribution Determinations 2011–15 - Final Decisions - Table 8.24 (adjusted for inflation)
AusNet Services RIN data.

In its proposal, AusNet Services noted that with respect to its historic connections capex:

> While overall connections are expected to be higher than forecast, the mix of connections has been significantly different. The number of residential connection projects has been around 10% higher than forecast but the number of commercial connection projects has been almost half (46% lower). The likely cause of this difference has been subdued economic conditions in Victoria exacerbated by the high Australian dollar's impact upon the export sector. AusNet Services' industrial customer base contains a large trade exposed manufacturing sector. Customer contributions have been higher than forecast, therefore, while gross capex is expected to be 29% below the 2011–15 EDPR benchmark, net capex will be 45% below.[98]

We note that a major feature of the regulatory framework is the incentives AusNet Services has to achieve efficiency gains whereby actual expenditure is lower than the allowance. Differences between actual and allowed connections capex could be the result of efficiency gains, forecasting errors or some combination of the two.

We have been mindful of the above trends when assessing AusNet Services' forecast methodology for the 2016–20 regulatory control period.

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[98] AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, pp. 158–159.

B.3.2 AusNet Services forecasting methodology

AusNet Services is proposing a "business as usual" gross capex forecast. However, AusNet Services notes that net capex will be lower because of a forecast increase in contributions.[99] AusNet Services produces its gross connections capex for a series of connection activities codes based on customer type.[100] For each of these connection activities AusNet Services has relied on a unit rate and volume forecast to generate its forecast.[101]

In determining whether we are satisfied that AusNet Services' forecast meets the capex criteria, we have assessed both the unit rates and volumes which underpin the connections capex forecast. We discuss these in turn below.

Unit rates

AusNet Services uses different methods to derive the unit rates for low and high volume connection types:[102]

- For low volume large connection activities, AusNet Services has relied on a historic average unit cost derived from data over the 2010-2013 period.[103] This is on the basis that these type of activities are volatile across time and require smoothing across a number of years.[104]
- For more recurrent connection activities with high volume and a relatively consistent scope of work, AusNet Services has relied on a base-trend approach for the forecast. These connection activities have unit rates with low variance over time. AusNet Services has used 2014 base year unit rates for these activities.

We are satisfied that AusNet Services' unit rates are reasonable given they are based on verifiable historical data. We have sought to verify this by assessing the unit rates included in AusNet Services' forecast and note that these are consistent when compared to the historical unit rates underlying the current period expenditure.[105] Further, we note that the use of historic expenditure works in step with the regulatory framework to reveal efficient costs over time.

Volumes

AusNet Services takes the above unit rates and multiplies these by volume forecasts for each connection category. AusNet Services produces each volume forecast by

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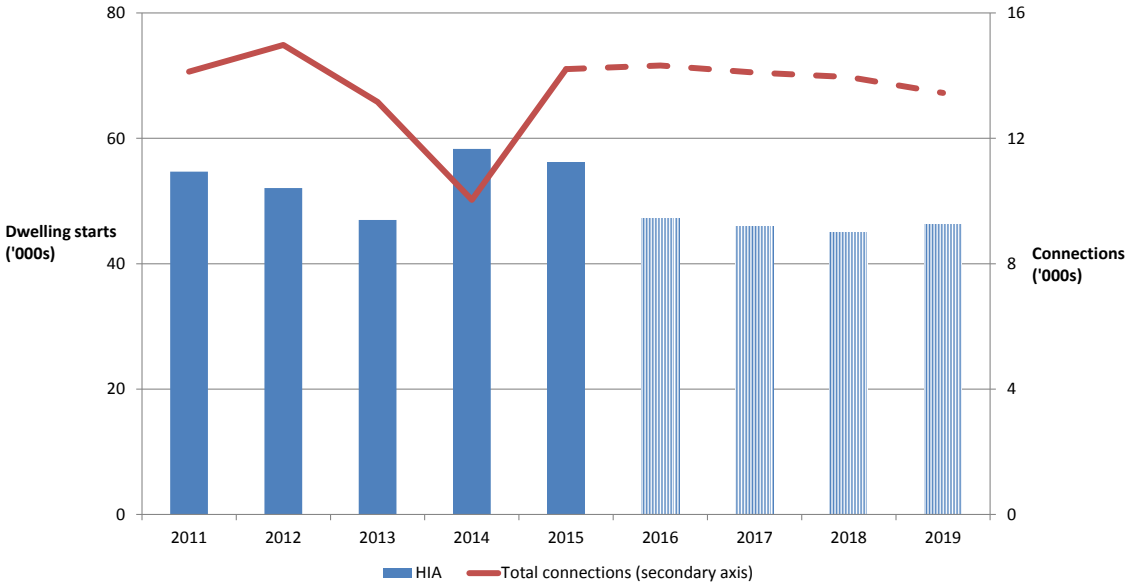
99 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015 p. 160.
100 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015 p. 159.
101 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015 p. 160.
102 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015 p. 160.
103 This includes large commercial and industrial, low density housing development and cogeneration connection activities.
104 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, p. 160.
105 This is based on comparing the volume weighted unit costs reported within AusNet Services' RIN data across the forecast and current regulatory control periods.

applying a trend approach to the historic proportion for each activity included in its forecast connection volumes included as part of its opex forecast.[106]

We are satisfied that the volume forecasts underlying AusNet Services' forecast represent a realistic expectation of the volume connection activity Ausnet Services will be required to undertake over the 2016–20 regulatory control period. We have determined this by comparing the historical and forecast trend in connection activities to other available data we consider correlates well with connection activity. We discovered they follow a similar trend. Further, as we note in our opex attachment, we are satisfied that the trend in forecast customer numbers represents a reasonable forecast.

Figure 6.11 shows the aggregate historical and forecast connections underlying AusNet Services forecast, which we have compared to the actual and forecast new dwelling data for Victoria published by the Housing Institute of Australia (HIA).[107] We consider the HIA is a reasonably well accepted industry standard indicator of commercial and industrial connection activity. HIA is a private-sector industry association comprising mainly house construction contractors. HIA forecasts have been used by the industry since 1984.[108]

Figure 6.11 ACIF and HIA Victorian dwelling growth actual and forecast



Source: AST Distribution Connections Capex Forecast Model (Public) and HIA Housing Forecasts - May 2015.

[106] AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, p. 159.

[107] HIA Housing Forecasts - May 2015.

[108] Mills, Anthony and Harris, David and Skitmore, Martin R., *The Accuracy of Housing Forecasting in Australia*, Engineering Construction and Architectural, Management, 2003, 10(4): pp, 245–253 (accessed from: http://eprints.qut.edu.au/archive/00004441/).

We note that the forecast series of both the HIA forecast and AusNet Services follow the same plateauing across the forecast period. With this in mind, we are satisfied that the volume growth rates relied on by AusNet Services to produce its connections represent a reasonable forecast.

As such we are satisfied that AusNet Services' combination of the unit rates and volume forecasts represents a reasonable forecast of gross connections capex and have included this amount in our alternative capex forecast.

Customer Contributions

When a new customer connects to the network, it is required to provide a contribution towards the cost of the connection assets. This contribution can be monetary or in contributed (gifted assets).

In this section we considered AusNet Services' application of the relevant guideline to forecast customer contributions. We considered the forecast of contributions, by

- assessing whether the forecast was prepared in accordance with the relevant connection charge guideline
- comparing the forecast to the trends in actual customer contributions, and
- assessing the reasonableness of AusNet Services' forecasting methodology.

Connection Charge Guideline

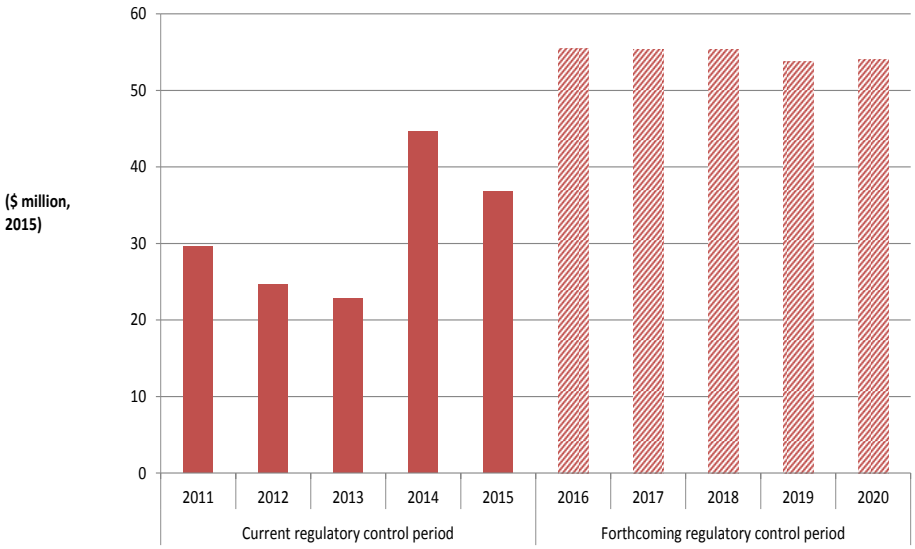
At the time of making this preliminary decision, AusNet Services was required to follow the Essential Services Commission's (ESCV) Guidelines 14 and Guideline 15 to determine the customer connection charges. In September 2015, we were advised that the Victorian Government intended to implement Chapter 5A of the NER for the 2016–20 regulatory control period. This change will impact on how the customer contribution is calculated.

This preliminary decision sets out our views on the methodology used by AusNet Services to determine its customer contribution under the old framework. We intend to work with the Victorian Government and AusNet Services to fully implement the change to the AER's connection charging guideline under Chapter 5A of the rules. We expect that AusNet Services will base its revised proposal on the new charging framework and also consider, where relevant, our consideration of their existing methodology.

Actual and forecast customer contributions

Figure 6.12 shows the trend in AusNet Services' actual and forecast customer contributions, and compares customer contributions for the 2011–15 regulatory control period with AusNet Services' forecast for the 2016–20 regulatory control period.

Figure 6.12 AusNet Services' customer contributions historic actual and proposed for 2016–20 period ($2015–16, million)



Source: AusNet Services RIN data.

To determine whether we are satisfied this forecast meets the capex criteria, we have assessed the methodology AusNet Services has relied on to produce this forecast.

AusNet Services forecast methodology

We understand from AusNet Services connections capex forecast model that AusNet Services' has adopted the following steps to generate its forecast of customer contributions:

- for each connection activity included in the connections capex forecast, AusNet has split out the total historical gross capex and the amount of customer contributions received for both 2013 and 2014
- for each year a historical cost recovery rate has been derived and averaged across the two years, and
- this average historical cost recovery rate is then applied to each gross connection activity forecast to separate contributions and net capex for the forecast period.[109]

This approach generates a forecast after applying current policy settings to the calculation of forecast customer contributions. AusNet Services' forecast proposal reflects a change in policy which changes some of the parameters underlying this forecast. In its proposal, AusNet Services notes:[110]

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[109] AST Distribution Connections Capex Forecast Model (Public).

[110] AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, p. 159.

> For the new regulatory control period, AusNet Services proposes to introduce a marginal cost of reinforcement (MCR) to better reflect the true costs borne by AusNet Services (and other customers) when a new customer connects. AusNet Services' published customer connection policies will be changed accordingly to ensure customers understand the basis of the calculation.
>
> The AER has approved the introduction of a MCR for other Victorian DNSPs in previous regulatory decisions. AusNet Services considers its proposed methodology is consistent with these previous decisions.
>
> Along with changes to the proposed X-Factor used in the calculation of the incremental revenue and other minor changes to the contribution model, AusNet Services' new approach is expected to increase the contribution rate from an average of 32% to 52% in the 2016–20 period.
>
> The new approach advances the NEO because:
>
> - it reduces an inefficient cross-subsidy from our existing customer base to new customers, thereby reducing longer term costs;
> - it is more aligned with the national connections framework making a future transition easier both for AusNet Services and new connecting customers;
> - it reduces the longer term stranding risk on the network as more cost has been recovered upfront from the causer;
> - it was discussed with our existing customer base with no strong objections raised.

We are satisfied that AusNet Services' use of historical percentage rates is derived from a sufficiently large sample of projects. Further, we note that in combination with the trending approach applied to generate its gross connections forecast, we are satisfied that it has demonstrated that the sample used is reflective of the projects included in its forecast.

With respect to AusNet Services' effecting a change in policy to determine its forecast, we are satisfied this is consistent with previous guidance we have given on the ability for service providers to recover the full marginal cost of reinforcement.[111] We also note that that given the relatively stable forecast in gross connections capex, AusNet Services' approach yields a significant increase in the proportion of the gross forecast capex being recovered through customer contributions than was the situation in the 2011–15 regulatory control period. As such, we have sought to identify what is driving this by understanding the forecast inputs to the capital contribution formula.[112]

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[111] AER Guidance Paper, *The AER's Conclusion on the Benchmark Upstream Augmentation Charge Rates for Citipower's Network*, June 2010, p. 4.

[112] That is, Capital contribution = Incremental costs – incremental revenue.

We note that AusNet Services highlighted in its 2014 Distribution Annual Planning Report a large number of areas with stable or declining demand.[113] We have cross-checked this claim against independent load forecasts produced by AEMO which predicted that whilst peak demand is maintained, average customer load is forecast to decline in comparison to the 2011–15 regulatory control period.[114] Fundamentally, the customer contribution is determined by deducting the incremental revenue that AusNet Services will receive from the new customer over a fixed period, from the incremental cost of the connection.[115] Therefore, where the incremental revenue from the customer is expected to decline, the 'gap' between incremental cost and revenue widens. This has the effect of increasing the contribution required from the new customer.

In summary, we are satisfied that the customer contributions forecast by AusNet Services are consistent with the requirements set out in Guideline 14 and 15. However, as noted above, this estimate will likely be amended in AusNet Services' revised proposal to take account of the implementation of Chapter 5A of the NER.

B.4 Forecast repex

Repex is driven by the inability of network assets to meet the needs of consumers and the overall network. The decision to replace can be based on cost, quality, safety, reliability, security, or a combination of these factors. In the long run, a service provider's assets will no longer meet the requirements of consumers or the network and will need to be replaced, refurbished or removed.[116] Replacement is commonly driven when the condition of the asset means that it is no longer economic or safe to be maintained. It may also occur due to jurisdictional safety regulations, or because the risk of using the asset exceeds the benefit of continuing to operate it on the network. Technological change may also advance the timing of the replacement decision and the type of asset that is selected as the replacement.

Electricity network assets are typically long-life assets and the majority will remain in use for far longer than a single five year regulatory period. Many of these assets have economic lives of 50 years or more. As a consequence, a service provider will only replace a portion of its network assets in each regulatory control period. The majority of network assets will remain in commission well beyond the end of any single regulatory control period.

Our assessment of repex seeks to establish the portion of AusNet Services' assets that will likely require replacement over the 2016–20 regulatory control period, and the associated expenditure. AusNet Services' forecast of repex includes estimates of the

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113 AusNet Services, *2014 Distribution Annual Planning Report.*

114 AEMO, *2015 National Electricity Forecasting Report*, June 2015.

115 The period is set in Guideline 14 and forecasts of incremental revenue and costs are made over 15 years for a business customer and 30 years for a residential customer.

116 Assets may also be replaced due to network augmentation. In these cases the primary reason for the asset expenditure is not the replacement of an asset that has reached the end of its economic life, but the need to deploy new assets to augment the network, predominantly in response to changing demand.

capex it considers necessary to comply with safety obligations implemented in response to the 2009 Victorian Bushfire Royal Commission (VBRC). AusNet Services also included estimates in its augex forecast for VBRC. Our analysis of AusNet Services' repex and augex forecast for VBRC is included together at appendix B.5, as the expenditure driver is related. The repex aspects are then included in the total repex forecast, while the augex aspects are included in the augex forecast at appendix B.2.

B.4.1 Position

We do not accept AusNet Services' proposed repex of $901 million. We have instead included in our alternative estimate of overall total capex, an amount of $758 million ($2015) for repex, excluding overheads. This is 84 per cent of the amount that AusNet Services' proposed. We are satisfied that this amount reasonably reflects the capex criteria.

B.4.2 AusNet's proposal

AusNet Services' proposed forecast repex of $901 million. AusNet submitted that this expenditure is driven by:[117]

- deterioration in asset condition associated with increasing asset age, environmental conditions (such as the Gippsland floods) and identified fleet problems (such as string bark wooden poles)
- reduced opportunity to replace poor condition assets as part of augmentation related projects
- asset failure risk, which may cause reliability impact, risk of collateral asset damage, safety risk to public and field personnel), environmental damage from asset failure (oil spills)
- technical obsolescence
- third party damage.

We address AusNet Services' submission as part of our assessment below.

B.4.3 AER approach

We have applied several assessment techniques to assess AusNet Services' forecast of repex against the capex criteria. These techniques were:

- analysis of AusNet Services' long term total repex trends
- predictive modelling of repex based on AusNet Services' assets in commission
- review of AusNet Services' approach to forecasting replacement expenditure to meet its safety and reliability obligations

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[117] AusNet Services, *Regulatory Proposal, 2016–20*, April 2015, p. 150.

- consideration of various asset health indicators and comparative performance metrics.

We use predictive modelling to assist us in assessing approximately 66 per cent of AusNet Services' proposed repex. This assessment is considered in combination with the findings of our consultant, Energeia, who provided technical advice on AusNet Services' repex forecast. For the remaining categories of expenditure, we may use predictive modelling where suitable asset age data and historical expenditure are available, but will also rely on analysis of historical expenditure. We explain the reasons for this approach in the "other repex categories" section below.

We note that the assessment of long term trends, the consideration of asset health indicators and comparative metrics are also considered as part of our assessment process. However, we have not ultimately used these to reject AusNet Services' forecast of repex or develop our alternative estimate. Our findings from these assessment techniques are consistent with our overall conclusion.

In its report on the Victorian distributor's the CCP considered that the suite of approaches we use in our assessment or repex provides a much better top down approach to identifying the upper bounds for efficient capex proposals than appears to be the view of the distributors'.[118]

Trend analysis

We recognise the limitations of expenditure trends, especially in circumstances where replacement needs may change over time (e.g. a distributor may have a lumpy asset age profile or legislative obligations may change over time). In recognising these limitations, we have used this analysis to draw general observations in relation to the modelled categories of repex. However, we have relied on trend analysis to assist our assessment of the unmodelled categories of repex.

Predictive modelling

Our predictive model, known as the repex model, can be used to predict a reasonable amount of repex AusNet Services would require if it maintains its current risk profile for condition-based replacement into the next regulatory period. Using what we refer to as calibrated replacement lives in the repex model gives an estimate that reflects AusNet Services' 'business as usual' asset replacement practices. We explain the calibrated replacement life scenario, along with other input scenarios, below.

As part of the 'Better Regulation' process we undertook extensive consultation with service providers on the repex model and its inputs. The repex model we developed through this consultation process is well-established and was successfully implemented it in a number of revenue determination processes including the recent

[118] Consumer Challenge Panel Sub Panel 3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, August 2015, p. 38.

NSW/ACT decisions. It builds on repex modelling we undertook in previous Victorian and Tasmanian distribution pricing determinations.[119] The CCP countered the view of the distributors that there are significant shortcomings in our repex modelling approach. The CCP recognised that predictive modelling is part of our overall approach which also uses other techniques such as trend analysis.[120]

The repex model has the advantage of providing both a bottom up assessment, as it is based on detailed sub-categories of assets using data provided by the service providers, and once aggregated it provides a well-founded high level assessment of that data. The model can also be calibrated using data on AusNet Services' entire stock of network assets, along with AusNet Services' recent actual replacement practices, to estimate the repex required to maintain its current risk profile.

Notably, we can use the calibrated repex model to capture a number of the drivers put forward by AusNet Services' in its submission. This includes replacement drivers related to the deterioration in asset condition; environmental conditions; fleet problems; asset failure risk; risk of collateral asset damage; safety risk to public and field personnel, environmental damage from asset failure; technical obsolescence; and third party damage. This is because the calibrated repex model captures the replacement practices from the last period, which include each of these drivers listed above.

We recognise that predictive modelling cannot perfectly predict AusNet Services' necessary replacement volumes and expenditure over the next regulatory period, in the same way that no prediction of future needs will be absolutely precise. However, we consider the repex model is suitable for providing a reasonable statistical estimate of replacement volumes and expenditure for certain types of assets, where we are satisfied we have the necessary data. We note that the service providers (including AusNet Services) rely on similar predictive modelling to support their forecast amount for repex.

We use predictive modelling to estimate a value of 'business as usual' repex for the modelled categories to assist in our assessment. However, predictive modelling is not the only assessment technique we have relied on in assessing AusNet Services' proposal. Our other techniques, which are qualitative in nature, allow us to form a view on whether or not 'business as usual' expenditure appropriately reflects the capex criteria.

Any material difference from the 'business as usual' estimate could be explained by evidence of a non-age related increase in asset risk in the network (such as a change in jurisdictional safety or environmental legislation) or evidence of significant asset

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[119] We first used the predictive model to inform our assessment of the Victorian distributors' repex proposals in 2010. We undertook extensive consultation on this technique in developing the Expenditure Forecasting Assessment Guideline. We have since used the repex model to inform our assessment of repex proposals for Tasmanian, NSW, ACT, QLD and SA distributors.

[120] Consumer Challenge Panel Sub Panel 3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016-2020 regulatory period*, August 2015, p. 38.

degradation that could not be explained by asset age. AusNet Services faces a number of new safety obligations arising from the recommendations of the VBRC. These are assessed at appendix B.5 of this preliminary decision.

Technical review

We engaged Energeia to perform a technical review of AusNet Services' proposed repex. Energeia assessed AusNet Services' approach to forecasting, in particular, whether AusNet Services' forecast repex in order to maintain its safety and reliability, or whether it was seeking to improve these outcomes. In doing so, Energeia took account of indicators of safety and reliability, forecast expenditure, and qualitative information from AusNet Services on the matters it has regard to when forecasting repex. Energeia's review was limited to the six asset categories included in the repex model.

As set out above, we considered Energeia's findings in assessing whether AusNet Services' forecast will allow it to prudently and efficiently maintain the safety and reliability of its network. all Victorian network businesses have used predictive modelling as part of their initial proposal. this allows us to have confidence that the use of the repex model is suitable in either accepting a network business's proposal, or in arriving at our alternative estimate.

Asset health indicators and comparative performance metrics

We have used a number of asset health indicators with a view to observing asset health. While providing some context for our decision, we have not relied on these indicators to any extent to inform our alternative estimate, they have provided context for our decision and the findings are consistent with our overall conclusion.

Similar to trend analysis, our use of these high level benchmarks has been to inform the relative efficiency of AusNet Services' previous repex. However, we have not used this analysis in rejecting AusNet Services' proposal and in developing our alternative estimate. We used this analysis as a cross-check with the findings of other techniques.

B.4.4 AER repex findings

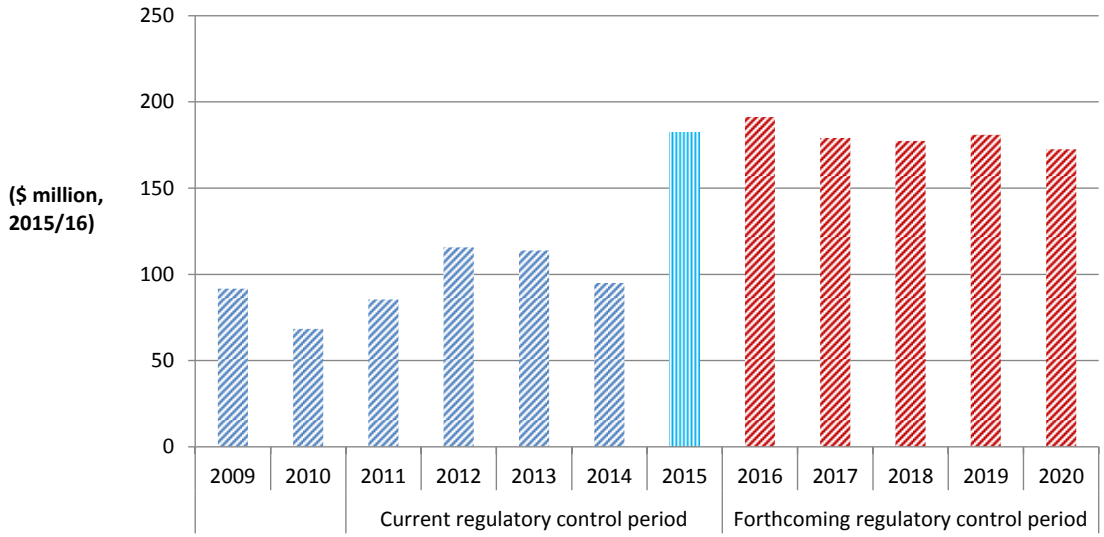
Trends in historical and forecast repex

We have conducted a trend analysis of repex. The NER requires that we consider the actual and expected capital expenditure during any preceding regulatory control period.[121].Our use of trend analysis is to gauge how AusNet Services' historical actual repex compares to its expected repex for the 2016–20 regulatory control period. Figure 6.13 shows AusNet Services' repex spend has been variable across time. AusNet

[121] NER, cl. 6.5.7(e)(5).

Services a significant increase in the amount of repex for the 2016–20 period compared to that which it spent in the 2011–15 period.

Figure 6.13 AusNet Services—Actual and forecast repex ($ million, 2015/16)



Source: Reset RIN 2016–20 - Consolidated Information, 2009-2013 Category Analysis RIN and 2014 Category Analysis RIN.

AusNet Services in its proposal notes about the increase repex:

> The proportion of capex for replacement of assets is forecast to increase from approximately 28% (2011–15) to 44% (2016–20) of total network capex. The high level drivers of this increase include: deterioration in asset condition associated with increasing asset age; reduced opportunity to replace poor condition assets as part of augmentation related projects; improved condition data; risk analysis and application of more advanced asset management techniques and analysis. The specific asset categories driving increased expenditure include: poles; cross-arms; Overhead lines (conductor); and Zone Substation major rebuild projects.[122]

When assessing the repex AusNet Services requires for the 2016–20 period, we have been mindful of the above trend and the reasons AusNet Services has provided for the increase.

An increasing or decreasing trend does not, in and of itself, indicate that a service provider has proposed repex that is likely to reflect or not reflect the capex criteria. In the case of AusNet Services, which has proposed an increase in repex from the last regulatory period, we must consider whether it has sufficiently justified that this

[122] AusNet Services, *Regulatory Proposal 2016–20*, *Appendix 7A: Network Capital Expenditure Overview 2016–2020*, April 2015, p. 5.

increase is required to reflect the capex criteria. We use our predictive modelling, the advice of our consultants, the views of stakeholders, the material put forward by AusNet Services' in support of its forecast, and our consideration of any repex required to meet the new safety obligations arising from the recommendations of the VBRC, to help us form a view on whether AusNet Services has sufficiently justified its increase in repex from the last period.

Predictive modelling

We use predictive modelling to estimate how much repex AusNet Services is expected to need in future, given how old its current assets are, and based on when it is likely to replace the assets. We modelled six asset groups using the repex model. These were poles, overhead conductors, underground cables, service lines, transformers and switchgear. To ensure comparability across different service providers, these asset groups have also been split into various asset sub categories.

We have sufficient replacement volume, cost and asset age data for these modelled categories at a granular level. This gives us the ability to assess the outcomes of benchmark data across all distributors in the NEM. For other categories, we do not necessarily have sufficient data to allow such comparison, for example, repex without an associated age profile. In this instance, we rely more heavily on other assessment techniques such as business cases and high level justifications put forward by the service providers. However, where we have age and historical volumes, we may still choose to use the repex model to test both the service provider's proposal and our own findings. Our predictive modelling process is described further at appendix D. In total, the assets in these six categories represent 66 per cent of AusNet Services' proposed repex.

AusNet Services provided suitable asset age data for SCADA and the specialised categories of capex it defined that were not classified under the six asset groups above (referred to as "other" asset categories). Given the availability of data for AusNet, and the significant increase in expenditure proposed in the next regulatory period, we have considered the outcome of predictive modelling, along with a qualitative review of AusNet Services' proposal on these expenditure items and comparison with historical trends. By comparison, pole top structures were not modelled. To date we have not considered pole top structures as suitable to include in the repex model because of their relationship to pole replacement. That is, when a pole is replaced, it usually includes the structure, such that it is difficult to predict the number of structures that will be replaced independent of the pole category. Where we are unable to directly use predictive modelling for pole top structures we have placed more weight on analysis of historical repex, trends, and information provided by the service provider.

We consider the best estimate of business as usual repex for AusNet Services is provided by using calibrated asset replacement lives and unit costs derived from AusNet Services' recent forecast expenditure. This estimate uses AusNet Services' own forecast unit costs, but it effectively 'calibrates' the proposed forecast replacement volumes to reflect a volume of replacement that is consistent with AusNet Services' recent observed replacement practices, rather than relying on a purely aged based

indicator. We have assessed this finding in the context of our technical review before forming a view as to the appropriate repex component of capex for AusNet Services. We set out below our views on their suitability for use in our assessment.

In total, for all six modelled categories, we have accepted the amount of $593 million ($2015) in our alternative estimate of total forecast capex, which reflects AusNet Services' forecast for the modelled categories.

Our technical consultant, Energeia, assessed AusNet Services' approach to forecasting, In particular, whether AusNet Services' forecast repex was necessary in order to maintain its safety and reliability, or whether it was seeking to improve these outcomes above historical levels. Energeia concluded that AusNet Services' forecast of repex volume drivers may be unrealistic, but that its forecast unit prices appear to largely be reasonable. As such, Energeia concluded that the distributors' forecasts do not necessarily reflect a prudent and efficient level of asset replacement. However, it found, that the forecast reasonably reflects future replacement requirements given current levels of prudency and efficiency. This compliments our approach of developing a business as usual estimate of repex that continues the service provider's current replacement practices.

Our modelling estimates future repex by allowing AusNet Services' the opportunity to continue its current replacement practices in the next period. This is the approach that AusNet Services has undertaken to maintain the safety and reliability of its network and meet the capex objectives. In our modelling, we found that AusNet Services' forecast for the modelled categories was consistent with our estimate of business as usual repex, and have accepted AusNet's forecast for these repex categories. We explain in the section on business as usual repex why we consider trending forward AusNet Services' current practices results in an estimate which reflects the capex criteria.

Model inputs

The repex model uses the following inputs:

- The asset age profile input is the number of assets in commission and when each one was installed.
- The replacement life input is a mean replacement life and standard deviation (i.e. on average, how old assets are when they are replaced).
- The unit cost input is the unit cost of replacement (i.e. on average, how much each asset costs to replace).

In appendix D, we describe using the repex model to create three scenarios. In each of the three modelling scenarios (base case scenario, calibrated scenario and benchmark scenario) we combined different data for the final two inputs.

Under all scenarios, the first input is AusNet Services' asset age profile (how old AusNet Services' existing assets are). This is a fixed input in all three scenarios.

The second and third inputs can be varied by using different input assumptions about:

- how long we expect an asset to last before it needs replacing; and
- how much it costs to replace it.

The repex model takes the replacement life input for each asset category and applies it to the actual age of the assets in each asset category. In doing this it calculates how many assets are likely to need replacement in the near future.[123] The model then applies the unit cost input to calculate how much expenditure is needed for that amount of replacement in each asset category. This is aggregated to a total repex forecast for each of the next 20 years.

In the remaining part of this section, we outline the replacement lives and unit cost inputs we tested in the repex model to assess AusNet Services' proposed repex. As part of our assessment, we compared the outcomes of using AusNet Services' estimated replacement lives and its unit costs, both forecast and historical, with the replacement lives and unit costs achieved by other NEM distributors. We also used the repex model to determine calibrated replacement lives that are based on AusNet Services' past five years of actual replacement data (its replacement practices). These reflect AusNet Services' immediate past approach to replacement.[124] We calculated historic unit costs by dividing historic expenditure by historic volumes and forecast unit costs by dividing forecast expenditure by forecast volumes. Detail on how we prepared the model inputs is at appendix E of this preliminary decision.[125]

'Business as usual' repex

The calibrated asset life scenario gives an estimate based on AusNet Services' current risk profile, as evidenced by its own replacement practices. Our estimate brings forward the current replacement practices that AusNet Services has used to meet the capex objectives in the past. Calibrated replacement lives use AusNet Services' recent asset replacement practices to estimate a replacement life for each asset type. These replacement lives are calculated by using AusNet Services' past five years of replacement volumes, and its current asset age profile (which reveals how many, and how old, AusNet Services' assets are), to find the age at which, on average, AusNet Services' replaces its assets.

The calibrated replacement life may be different to the "nameplate" or nominal replacement age of the asset (which we considered under the "base case" scenario). AusNet Services reports these expected asset lives as part of its RIN response. However these reflect expectations of lives from engineering and manufacturing

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123 The repex model predicts replacement volumes for the next 20 years.

124 For discussion on how we prepared each of the inputs see AER, *Preliminary decision, Energex distribution determination Attachment 6: Capital expenditure*, *Appendix E :Predictive modelling approach and scenarios*, *May 2015.*

125 AER, *Preliminary decision, Energex distribution determination, Attachment 6: Capital expenditure, appendix E*, May 2015.

information, rather than observations of the economic lives achieved on the network. Using the lives provided in the RIN response in the repex model provides estimates of repex that greatly exceed AusNet Services' own expectation of its replacement needs over the next period. From this, we observe that, in general, these technical estimates of asset life tend to understate the actual lives achieved on the network, and are a conservative estimate of the observable economic life of the assets, when compared to the calibrated replacement life.

The calibrated asset life scenario has been our preferred modelling scenario in recent reviews of other service providers.[126] This is because we considered the calibrated replacement lives formed the basis of a business as usual estimate of repex, as they are derived from the service provider's actual replacement practice observed over the past five years and the observable (or revealed) economic replacement lives of the assets.

A service provider decides to replace each asset at a certain time by taking into account the age and condition of the asset, its operating environment, and its regulatory obligations. If the service provider is currently meeting its network reliability, quality and safety requirements by replacing assets when they reach a certain age, then by adopting the same approach to replacement in future they are likely to continue to meet its obligations. Consequently, the estimates derived from the model reflect the replacement practices that AusNet Services has used in the past to meet the capex objective of maintaining the safety and reliability of the network.

If underlying circumstances are different in the next regulatory control period, then this approach to replacement may no longer allow a service provider to meet its obligations. We consider a change in underlying circumstances to be a genuine change in the underlying risk of operating an asset, genuine and justifiable evidence that there has been a change in the expected non-age related condition of assets from the last regulatory control period, or a change in relevant regulatory obligations (e.g. obligations governing safety and reliability).

If we are satisfied that there is evidence of a change in a service provider's underlying circumstances, we will accept that future asset replacement should not be based on a business as usual approach. This means that where there is evidence that a service provider's obligations have changed then it may be necessary to provide a forecast of repex different to the business as usual estimate. This alternative forecast would be required in order to satisfy us that the amount reasonably reflects the capex criteria.

Where there are new obligations (or fewer obligations) we can use the service provider's past practices as a first step before estimating the impact of the change. The new safety obligations arising from the VBRC recommendations represent a change in circumstances from the 'business as usual' practices of the last period. The impacts of these are set out in appendix B.5 and, as noted above, are included within our

[126] See final decisions for NSW, Queensland and South Australian distributors.

consideration of total repex. We do not consider that AusNet Services has identified other new obligations for the next regulatory period that cannot be captured by adopting the 'business as usual' forecast of repex. Consequently, we have relied on our estimate from the calibrated repex model, in combination with our findings in relation to the new safety obligations, in assessing whether AusNet Services proposed repex reasonably reflects the capex criteria.

As noted above, we are satisfied that with the exception of additional funding to address the impact of new safety obligations a business as usual approach to repex will provide AusNet Services with sufficient capex to manage the replacement of its assets and meet the capex objectives of maintaining safety, reliability and security of the distribution system.

That said, we have also considered whether the service provider's replacement practices from the last regulatory control period did more than maintain safety, reliability and security of the distribution system, such that applying the business as usual approach for asset replacement may result in replacement practices that provide for expenditure over and above what is necessary to satisfy the capex objectives. In considering the efficiency of recent replacement practices, we place some weight on the ex-ante capex incentive framework under which the service providers' operate.

There are incentives embedded in the regulatory regime that encourage a service provider to spend capex efficiently (which may involve spending all of the allowance, less or more, in order to meet the capex objectives). A service provider is only funded in the regulatory control period to meet the capex allowance. The service provider keeps the funding cost obtained over the regulatory control period of any unspent capex for that period, and, conversely, bears the funding cost of any capital expenditure that exceeds the allowance. In this way, the service provider has an incentive to spend efficient capex, or close to the allowance set by the regulator, as it is essentially rewarded (penalised) for any underspend (overspend). This provides some assurance that a service provider reacting to these incentives will undertake efficient capex to meet the capex objectives. This means that to some extent we can rely on the ex-ante capex framework to encourage the service providers to engage in efficient and prudent replacement practices.

Going forward, this incentive will be supplemented by a Capital Expenditure Sharing Scheme, which will provide a constant incentive to spend efficient capex over the regulatory control period, as well as the ability to exclude capex overspends from the RAB as part of an ex-post review. These additional arrangements will provide us with greater confidence that the service provider's past replacement practices are likely to reflect efficient and prudent costs, such that business as usual asset replacement approach is likely to be consistent capex objectives.

Possible future rule changes may also extend the regulatory investment test for distribution (RIT-D) to repex. Such a change would make it incumbent upon the service provider to develop credible options for asset replacement, including considering whether the asset life could be extended or whether the asset could be retired rather than replaced.

Finally, the collection of a longer period of data on changes in the asset base as part of our category analysis RIN will provide us with further information into the service providers' asset replacement practices over a longer period of time. This will further inform our understanding of business as usual replacement practice to estimate repex. More time series data would also strengthen our ability to use benchmarked information (e.g. asset life inputs) in the repex model in the future, which is intended to drive further efficiency in replacement expenditure.

Calibrated scenario outcomes

The calibrated repex model scenario, which was described in the last section, provides an estimate of replacement volumes for the next period. In order to estimate how much repex is required to replace this estimated volume of assets, we must multiply the volume by the cost of replacing a single asset (unit cost). We tested two unit cost assumptions, based on data provided by AusNet Services:

- AusNet Services' own historical unit costs from the current regulatory period. These reflect the unit costs AusNet Services' has incurred over the last five years (revealed costs).
- AusNet Services' own forecast unit costs for the next regulatory period. These reflect the unit costs AusNet Services' expects to incur over the next five years.

Applied to the forecast volumes predicted from calibrated replacement lives, the repex model estimates $490 million of repex when using AusNet Services' historical unit costs, and $602 million using forecast unit costs. AusNet Services' own proposed forecast repex is $593 million for the six modelled asset categories.[127]

There is a significant difference between the calibrated scenario outcomes when using AusNet Services' historical or forecast unit costs, with AusNet Services' own proposed forecast repex being closer to the forecast unit cost estimates. AusNet Services' forecast unit costs for the next five years are, on average, higher than its unit costs over the last five years. However, in the absence of a reasonable explanation of why costs would be materially higher, we would not expect forecast unit costs to be higher than historical unit costs given the incentive framework encourages a distributor to become more cost efficient over time.

We compared AusNet Services' unit costs to benchmark unit costs from across the NEM. These are based on the unit costs of all NEM distributors across the consistent asset categories we use in the repex model. These are based on our category analysis data. In summary, we take unit cost observations from across the NEM and find an average unit cost, a lower quartile unit cost, and the lowest unit cost in the NEM for each asset category. When applied in the repex model with calibrated asset lives, average benchmark unit costs produced an outcome of $608 million. This is higher

[127] AusNet Services' forecast of $593 million for the six modelled categories also included $74 million for new obligations arising from the recommendations of the VBRC.

than when using either of AusNet Services' unit costs with calibrated asset lives. It is also higher than AusNet Services' own proposed forecast repex of $593 million.

In summary, AusNet Services' own forecast repex of $593 for the six modelled categories is consistent with our calibrated scenario modelling outcomes when using its own unit costs, and is lower than when using benchmark unit costs. Therefore we are satisfied AusNet Services' forecast repex reasonably reflects its business as usual replacement requirements and we have included this amount in our alternative estimate of total forecast capex. We also note that this amount includes approximately $74 million of asset replacement identified by AusNet services as new obligations arising from the recommendations of the VBRC (see appendix B.5).

Other repex categories

Repex categorised as supervisory control and data acquisition (SCADA), network control and protection (collectively referred to hereafter as SCADA); pole top structures; and assets identified in the "other" category have generally not been included in the repex model in recent decisions. However, AusNet Services provided suitable age and expenditure data to allow the SCADA and "other" categories to be modelled. Given the availability of data for AusNet Services and the significant increase in expenditure proposed in the next regulatory period, we have considered the outcome of predictive modelling, along with a qualitative review of AusNet Services' proposal on these expenditure items and comparison with historical trends. Together these categories of repex account for $308 million (34 per cent) of AusNet Services' proposed repex.

As noted in appendix D, we did not consider pole top structures were suitable for inclusion in the model because of their relationship to pole replacement. That is, when a pole is replaced, it usually includes the structure, such that it is difficult to predict the number of structures that will be replaced independent of the pole category. Where we are unable to directly use predictive modelling for pole top structures we have placed more weight on an analysis of historical repex, trends, and information provided by AusNet Services in relation to these categories. Our analysis of these is included below.

We consider that the replacement of network assets is likely to be relatively recurrent between periods. We recognise there will be period-on-period changes to repex requirements that reflect the lumpiness of the installation of assets in the past. Using predictive tools such as the repex model allows us to take this lumpiness into account in our assessment. For repex categories we cannot model, historical expenditure is our best high level indicator of the prudency and efficiency of the proposed expenditure. Where past expenditure was sufficient to meet the capex criteria it can be a good indicator of whether forecast repex reasonably reflects the capex criteria. This is due to the predictable and recurrent nature of repex.[128]

[128] AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013, pp. 7–9.

For unmodelled asset categories we consider that if the forecast expenditure for the next period is similar or lower than the expenditure in the last period, the distributor's forecast is likely to satisfy the capex criteria. If forecast repex exceeds historical expenditure, we would expect the distributor to sufficiently justify the increase.

We have accepted AusNet Services' proposed repex for pole top structures of $127 million. However, we do not accept AusNet Services' proposed repex for SCADA ($107 million) or "other" repex categories ($73 million). We are instead satisfied that AusNet Services' SCADA repex from the 2010–15 period of $24 million, and repex of $14.4 million reflecting the outcome of modelling for the "other" categories are sufficient to meet business as usual requirements, and reasonably reflect the capex criteria.

We explain the reasons for our decision in the remainder of this section. There is also support from submissions that AusNet Services' proposed total repex may not reasonably reflect the capex criteria. While we are satisfied that AusNet Services' proposed repex for the six modelled categories reasonably reflects the capex criteria, our assessment of the remainder of AusNet Services total forecast repex does not support the entirety of its proposed increase to repex.

The CCP stated that it is consumer experience that should be the core drive of repex levels, concluding that consumers are satisfied with current levels of repex and therefore they see no need for a step increase in repex. It considered that the distributors' proposed increase to the overall level of repex is not justified as current reliability levels do not suggest there is a need to increase repex. The CCP was of the view that the residual ages of the distributors' assets have maintained or improved over time, opex spending has been increasing, and condition based assessments appear subjective and likely conservative.[129]

The CCP questioned the Victorian distributor's arguments that condition based monitoring has identified more assets at risk than occurred in the past, necessitating more repex. It considered that unless there are exogenous reasons causing faster deterioration of assets than what occurred in the past, the only reason for significant increases in repex would be:

- a more conservative approach is being used to establish asset condition
- distributors are applying less care in their maintenance practices.

Since the Victorian distributors' have not had an overall reduction in network performance the CCP considers that the first cause above is more likely. This leads the CCP to conclude that greater conservatism is being applied to condition assessments than was applied in the past.[130]

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[129] Consumer Challenge Panel Sub Panel 3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–20 regulatory period*, August 2015, p. 47.

[130] Consumer Challenge Panel Sub Panel 3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–20 regulatory period*, August 2015, p. 52.

The CCP was also concerned with the approach of the service providers to assessing asset health, considering that the bulk of assessments are being made on a subjective qualitative basis. For example, visual inspections which will vary between individuals, and that the context for an inspection may produce greater conservatism like performing an assessment following bushfires. The CCP also questioned the assertion that increased failure rates have driven the increased proposed repex.[131]

The Victorian Greenhouse Alliance was concerned with the significant increases to repex the Victorian distributors are proposing. It considered this was concerning given that over-investment in the networks over recent regulatory periods has led to excess levels of network capacity and declining network utilisation. It is also found it concerning that high revenue proposals were being put forward at a time of declining capacity utilisation, a reduced average asset age for most asset categories, static or falling demand and consumption, and reductions in the excessive reliability standards.[132] The Victorian Greenhouse Alliance also noted there was little information in the proposals on asset condition. It considered this makes it difficult to assess the validity of the distributors' claims, and that the distributors should provide greater transparency on asset age trends and asset condition data.[133]

Our assessment of SCADA and Other repex revealed concerns with the levels proposed, consistent with the concerns raised in submissions. We do not accept AusNet Services' proposed repex of $308 million for these categories. We are instead satisfied that an amount of $165 million reflects the capex criteria.

In relation to the six modelled categories, the assessment we have conducted essentially provides expenditure for a continuation of the replacement practices that AusNet Services has used in the last regulatory period to meet the capex objectives. The ex-ante efficiency incentives embedded in the regulatory regime, provides a degree of assurance that a service provider responding to these incentives in the past will have engaged in replacement practices are prudent and efficient. We have also considered the expenditures related to obligations arising from the recommendations of the VBRC in appendix B.5.

Pole top structures

AusNet Services has forecast $127 million of repex on pole top structures over the 2016–20 regulatory control period. This is a 37 per cent per cent decrease over its pole top structures repex in the 2011–15 period.

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131 Consumer Challenge Panel Sub Panel 3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–20 regulatory period*, August 2015, p. 47.

132 Victorian greenhouse alliance, *Local Government Response To The Victorian Electricity Distribution Price Review (EDPR) 2016–20*, July 2015, p. 7.

133 Victorian greenhouse alliance, *Local Government Response to the Victorian Electricity Distribution Price Review (EDPR) 2016–20*, July 2015, p. 34.

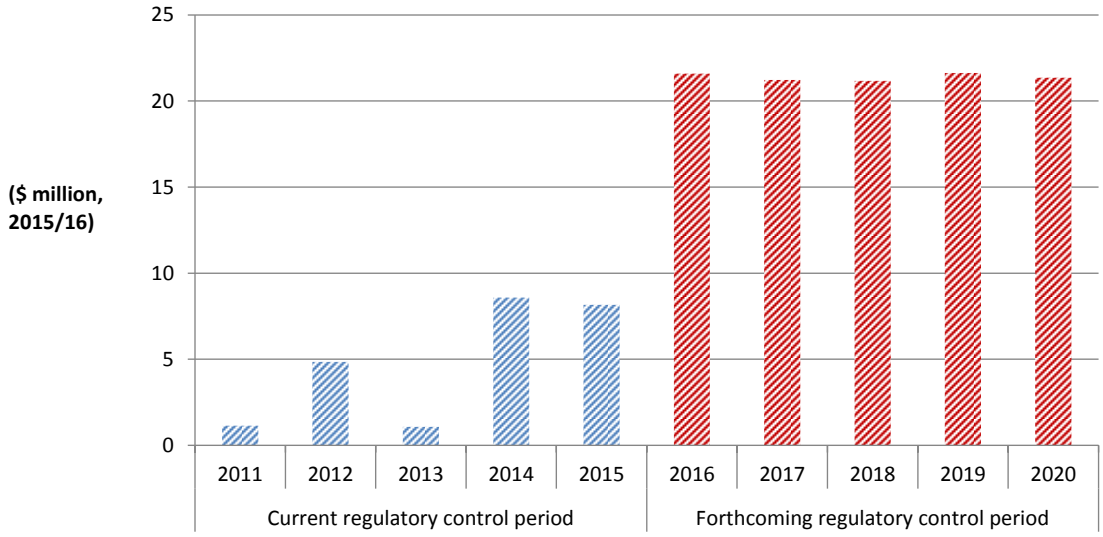
As noted above, we consider repex is likely to be relatively recurrent between periods, and that historical repex can be used as a good guide when assessing AusNet Services' forecast.

Given AusNet Services' forecast is significantly lower than its expenditure in the last period, we are satisfied that AusNet Services' forecast repex for pole top structures of $127 million reasonably reflects the capex criteria and have included this amount in our alternative estimate of total forecast capex.

SCADA, network control and protection

AusNet Services' proposal includes $107 million for replacement of SCADA, network control and protection (collectively referred to as SCADA). This is four times higher than its SCADA repex in the 2010–15 period, or an increase of $83 million, shown in Figure 6.14.

Figure 6.14 AusNet Services' actual and proposed SCADA repex ($2015–16)



Source: Reset RIN 2016–20 - Consolidated Information, 2009-2013 Category Analysis RIN and 2014 Category Analysis RIN

AusNet Services' proposal does not sufficiently set out the reason for this significant increase in expenditure

AusNet Services' identifies $37.6 million of SCADA in its proposal document,[134] and some other projects that contribute to the $107 million of SCADA in the RIN. Our review of the documentation provided by AusNet Services did not identify supporting

[134] AusNet Services, *Regulatory Proposal, 2016–20*, April 2015, pp. 124, 150.

explanation or business cases justifying AusNet Services' proposed increase in SCADA repex.

As noted above, there was sufficient data for us to test AusNet Services' proposed SCADA repex in the repex model. Using calibrated replacement lives in the repex model results in a forecast of $18 million with AusNet Services' forecast unit costs, or $25 million with historical unit costs. Respectively, these estimates are below or almost identical to AusNet Services' actual historical repex on SCADA ($24 million), and are significantly lower than its proposed forecast SCADA repex.

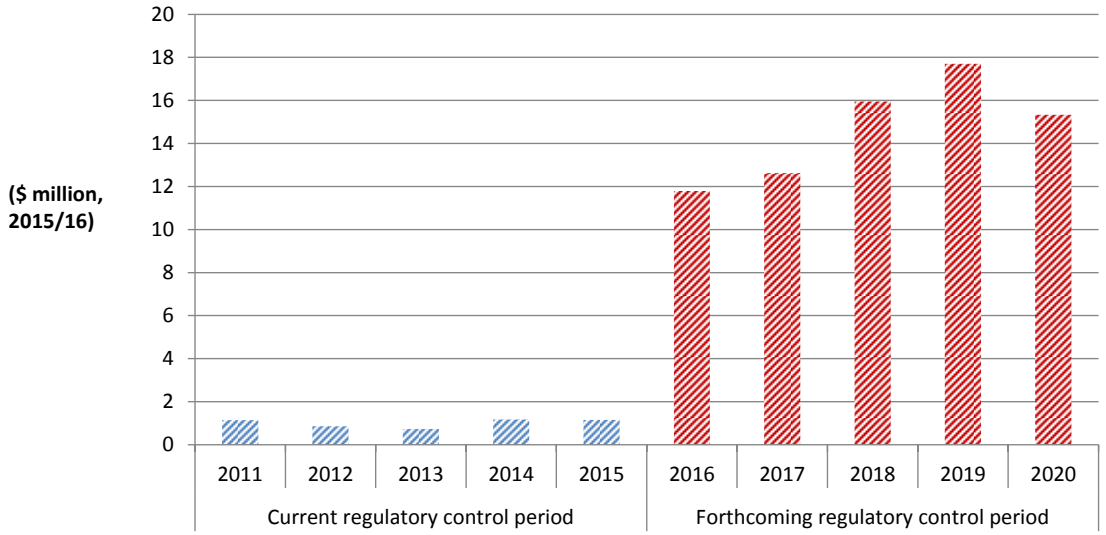
In summary, we consider the information explaining the reasons for the proposed increase are not sufficient and predictive modelling supports AusNet Services' historical level of repex continuing. Therefore we do not consider the step increase proposed by AusNet Services in SCADA repex is sufficiently justified. In the absence of any persuasive reason to depart from AusNet Services' historical repex from the last regulatory period, we are satisfied that AusNet Services' SCADA repex from the 2010–15 period of $24 million reasonably reflects the capex criteria.

Other repex

AusNet Services' categorised a number of assets under an "Other" asset group in its RIN response. AusNet Services' forecast $73 million of repex for these assets for the 2016–20 regulatory control period. This represents a $68 million increase over the 2011–15 regulatory control period, shown in Figure 6.15. The assets include:

- current transformers
- voltage transformers
- station services
- earthing
- capacitor bank
- neutral earth resistors
- surge diverters
- site repairs
- regulators.

Figure 6.15 AusNet Services actual and proposed other category repex ($2015–16)



Source: Reset RIN 2016–20 - Consolidated Information, 2009-2013 Category Analysis RIN and 2014 Category Analysis RIN

AusNet Services does not reference its proposed repex for these "other" categories in its regulatory proposal. It does not set out reasons for this significant increase in expenditure. As with our findings on the expenditure related to SCADA we question the degree to which asset condition could deteriorate so significantly between regulatory periods. However, AusNet Services has outlined expected replacement volumes, unit rates, condition information and asset ages which map to some of these categories.[135]

We accept there is a need to replace a number of these assets. However, AusNet Services' supporting information does not convincingly justify why it needs to spend significantly more repex on some of these categories in the forthcoming period. AusNet Services does not have convincing business cases with reasonable options analysis or sufficient cost-benefit analysis to justify the proposed repex. In several cases the supporting information for the proposed projects appeared inconsistent. For example listed unit rates were significantly different to the proposed volumes and proposed expenditure, or proposed replacement volumes were significantly higher than the apparent number of assets in commission.

As was the case with SCADA repex, AusNet Services provided asset age information and expenditure data that allowed the use of predictive modelling on these assets. In the absence of qualitative information justifying the proposed expenditure, we consider the repex model may be used as a tool to verify AusNet Services' proposal.

[135] AusNet Services, *Regulatory Proposal, 2016–20, Appendix 7A Network Capital Expenditure Overview; Appendix 7C Unit Rates*, April 2015.

The repex model did not identify the need for a significant increase from historical expenditure on “other” repex. Using calibrated replacement lives in the repex model results in a forecast of $14.4 million using AusNet Services’ forecast unit costs. This is higher than AusNet Services’ actual historical expenditure, but lower than its proposed expenditure of $73 million.

Given the absence of information explaining the proposed increase and the outcomes from predictive modelling, we do not consider the step increase proposed by AusNet Services in other repex is sufficiently justified. We note that the outcome of predictive modelling is higher than AusNet Services' historical replacement expenditure of $5 million on other repex. We do not consider AusNet Services has established the proposed step increase is required to meet the capex criteria. We are satisfied that repex of $14.4 million, reflecting the outcome of the repex model, is sufficient to meet business as usual requirements, and reasonably reflects the capex criteria.

Network health indicators

As noted above, we have looked at network health indicators and benchmarks to form high level observations about whether AusNet Services’ past replacement practices have allowed it to meet the capex objectives. While this has not been used directly either to reject AusNet Services’ repex proposal, or in arriving at an alternative estimate, the findings are consistent with our overall findings on repex. In summary we observed that:

- the measures of reliability and asset failures show that outages on AusNet Services’ network have been stable across time (see Trends in reliability and asset failure, along with Table 1 and Figure 1)
- measures of AusNet Services’ network assets residual service lives and age show that the overall age of the network is being maintained. Using age as a high level proxy for condition, this suggests that historical replacement expenditures have been sufficient to maintain the condition of the network (see Trends in the remaining service life and age of network assets, along with Figure 2)
- asset utilisation has reduced in recent years which means assets are more lightly loaded, this is likely to have a positive impact on overall asset condition (see Asset utilisation discussion below).

Further, the value of customer reliability has recently fallen. Other things being equal, this fall should result in the deferral of repex as the value customers place on reliability for replacement projects has fallen.

The above indicators generally suggest that replacement expenditure in the past period has been sufficient to allow AusNet Services to meet the capex objectives. This is consistent with our overall findings on repex from our other assessment techniques.

The asset health indicators are discussed in more detail below.

Trends in reliability and asset failure

Asset failure is a significant contributor to the volume of sustained interruptions on AusNet Services' network. Table 6.11 shows that, over the 2009–14 period 27.4per cent of total interruptions on AusNet Services' network were caused by the failure of assets.[136]

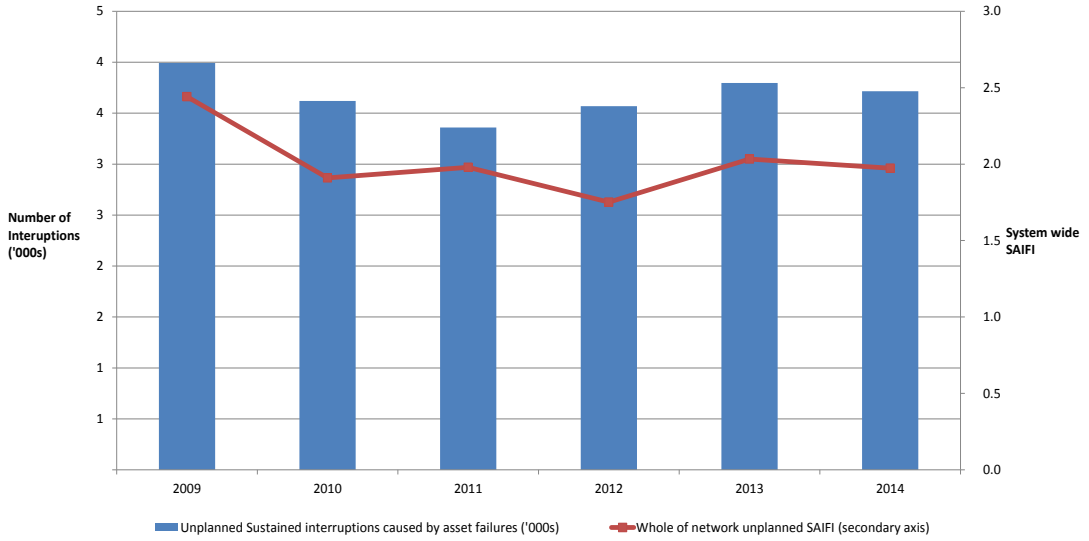
Table 6.11 AusNet Services - contribution of asset failures to non-excluded sustained interruptions

	2009	2010	2011	2012	2013	2014
Sustained interruptions caused by asset failures	29.1%	27.5%	25.4%	26.8%	29.4%	66.1%

Source: AusNet Services- CA RIN – 6.3 Sustained Interruptions

Figure 6.16 compares sustained interruptions caused by asset failure with the System Average Interruption Frequency Index (SAIFI), which is an aggregate measure of the frequency of sustained interruptions on the network.[137]

Figure 6.16 Relationship between system wide SAIFI and non-excluded interruptions caused by asset failures



Source: AusNet Services- CA RIN – 6.3 Sustained Interruptions and EBT RIN - Whole of network unplanned SAIFI

136 These measures do not include planned outages, momentary outages, major event days and excluded events.

137 SAIFI: The total number of unplanned sustained customer interruptions divided by the total number of distribution customers. Unplanned SAIFI excludes momentary interruptions (one minute or less). SAIFI is expressed per 0.01 interruptions.

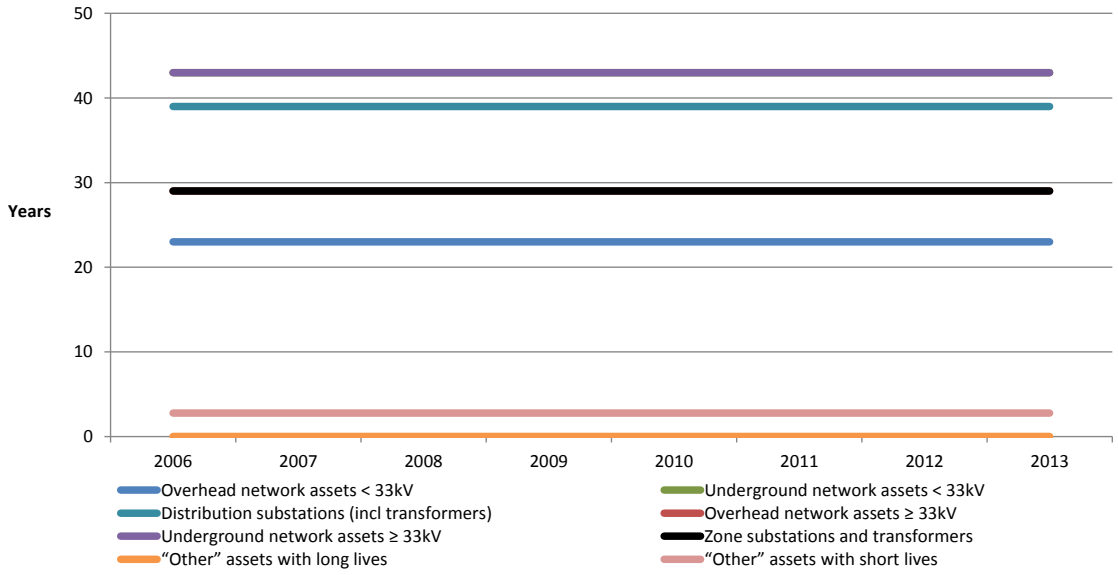
Figure 6.16 shows AusNet Services' outages due to asset failures have generally been flat across time and its SAIFI has also been flat. The overall stability in both of these measures indicates that the replacement practices from the last period have been sufficient to meet the capex objectives.

Trends in the remaining service life and age of network assets

Another factor which we have considered when assessing AusNet Services' repex requirements for the 2016–20 period is the trend in AusNet Services' residual asset life across time. We are satisfied that residual service life is a reasonable high-level proxy for asset condition. Asset condition is a key driver of replacement expenditure.

Figure 6.17 shows that AusNet Services' residual asset lives have been flat over the period 2006–2013. This means that, on average, AusNet Services' network assets are staying the same age.

Figure 6.17 AusNet Services estimated residual service life network assets



Source: AusNet Services- EBT RIN - 4. Assets (RAB) - Table 4.4.2 Asset Lives – estimated residual service life (Standard control services)

We acknowledge limitations exist when using estimated residual service life to indicate the trend in the underlying condition of network assets. Large volumes of network augmentation and connections can result in a large stock of new assets being installed in the network, which may bring down the network's average age. In this way, the residual service life of the assets may increase without necessarily addressing any underlying asset condition deterioration.

Noting the above, the flat trend in residual lives (where age is a proxy for asset condition) suggests that the health of AusNet Services' asset base has been maintained.

Asset utilisation

We consider the degree of asset utilisation can impact asset condition for certain network assets. As set out in the augex section B.5, we note AusNet Services has experienced a steady decrease in utilisation levels at its zone substations between 2010 and 2014. AusNet Services undertook zone substation augmentation projects between 2010 and 2014 that led to a decrease in the number of substations operating above 60 per cent of their maximum capacity. We note that the flattening of demand between 2010 and 2014 may have contributed to a reduction in the utilisation of the network. As of 2014, there are no substations operating above their maximum capacity.

We are satisfied this demonstrates that AusNet Services' network has spare capacity in its network based on past investments. All things being equal, we expect a positive correlation between asset condition and lower network utilisation exists for certain asset classes.

However we recognise that:

- The relationship between asset utilisation and condition is not uniform between asset types. For example; poles and fuses.
- The relationship is not necessarily linear (e.g. condition may not be materially impacted until a threshold point is reached).
- The condition of the asset may be difficult to determine (e.g. overhead conductor). As such early-life asset failures may be due to utilisation or, more commonly, a combination of factors (e.g. utilisation and vibration).

While noting these issues, we consider that AusNet Services' asset utilisation has not been high, and we do not expect any material deterioration of AusNet Services' network assets is likely to have occurred in recent years due to high utilisation of the assets.

B.5 Victorian Bushfires Royal Commission

B.5.1 Bushfire safety-related capital expenditure

AusNet Services proposed a forecast of $142.2 million ($2015) for bushfire safety–related capex (including overheads and escalation). This is driven by a mandatory bushfire safety mitigation program for the 2016–20 period.

We accept AusNet Services' proposed $142.2 million ($2015) forecast and have included this amount in their augmentation capital expenditure (augex).

In coming to this view, we have assessed the AusNet Services bushfire safety capex proposals. Based on our assessment, we find that the proposed capex for the bushfire safety program reasonably reflects the capex criteria and therefore we have included the proposed capex in our estimate of AusNet Services' capex requirements.

Our assessment of this program is contained in the section below.

This proposed capex amount for the program is incremental to AusNet Services' business as usual capex related to bushfire risk management. Table 6.12 sets out the proposed components of the program.

Table 6.12 AusNet Services proposed capex for a bushfire mitigation program ($2015, million, including overheads & escalation)

Strategy	Proposed capex
Vibration Dampers & Armour Rods Retrofit	141.144
SWER ACRs	1.002
Total	**142.146**

Source: AST Distribution Capex Model (Confidential), '2.17 Step changes', Vibration Dampers & Armour Rods & Replace SWER OCRs with ACRs.

AER assessment approach

For bushfire safety related capex there are three potential bases for consideration of a funding requirement. These are:

1. Approved projects are set out in the companies' Electrical Safety Management Scheme (ESMS) or Bushfire Mitigation Plan (BMP). We rely on Energy Safe Victoria to establish need. We then assess the efficiency of the forecast cost. These projects are assessed in accordance with the capital expenditure objectives to determine if they are necessary to comply with applicable regulatory obligations or requirements associated with the provision of standard control services.[138]
2. Business As Usual (BAU): Capex which we assess along with other capex in attachment 6. We use the tools outlined in attachment 6 to assess the efficiency of the forecast. These capex projects relate to maintaining the quality, reliability or security of supply of standard control services or the reliability or security of the distribution system through the supply of standard control services or the safety of the distribution system through the supply of standard control services.[139]
3. Pending regulations from the Victorian Government which will implement aspects of recommendation 27 of the Victorian Bushfires Royal Commission (VBRC). The timing and scope of the regulations are not yet known. We want to provide the distributor with a mechanism to recover the prudent costs associated with the regulations while ensuring that consumers pay no more than necessary for the implementation of the regulations.

Our first order of assessment is to consider whether a proposed expenditure fits into one of these broad categories. This helps us to determine which are the most

[138] NER, cl. 6.5.7(a)(2).
[139] NER, cl. 6.5.7(a)(3) & (4).

appropriate tools to assess whether a proposal satisfies the capital expenditure objectives.[140] We also consider if the amount sought is compliant with the capital expenditure criteria, particularly if the cost is prudent and efficient.[141]

In this assessment we have considered confidential material concerning the individual project estimates. This is contained in the confidential appendix to attachment 6.

Assessment of AusNet Services' proposal

Based on the evidence submitted by AusNet Services and other information before us, we are satisfied that the bushfire mitigation program is required to maintain the reliability and safety of the network and to comply with applicable regulatory obligations or requirements and would be a prudent and efficient investment in the network.

In summary, we consider that:

- AusNet Services' proposed capex for armour rods, vibration dampers and SWER ACRs is required to maintain the reliability and safety of its network and to comply with applicable regulatory obligations or requirements.
- This obligation arises from AusNet Services' Electrical Safety Management Scheme. The scheme includes a mandatory Bushfire Management Plan. This plan incorporates actions to respond to three directions received from Energy Safe Victoria (ESV). The Directions require AusNet Services to take measures to fit additional vibration dampers, armour rods and line spacers throughout its network by 1 November 2020 and to fit automatic circuit reclosers to SWER lines in accordance with a program of work agreed with Energy Safe Victoria.
- AusNet Services' proposed capex for armour rods, vibration dampers and SWER ACRs is a prudent and efficient investment. The costs to be incurred are derived from actual contract outcomes. The volume estimates are derived from the AusNet Services GIS system and are consistent with the directions issued by ESV. We consider the estimating methodology to be sound. Accordingly, the resultant cost estimate for each activity is a reasonable estimate of the least cost necessary to satisfy the capex objectives.
- The AusNet Services VBRC proposal does not include any BAU capex.
- Although AusNet Services has proposed to use a pass-through mechanism to fund future obligations associated with potential regulations to implement recommendation 27 of the VBRC, we consider a contingent project approach may be preferable. We discuss this later in this section.

For these reasons, we accept that AusNet Services' proposed capex for the bushfire mitigation program satisfies the capex criteria. Each of these reasons is discussed further below.

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[140] NER, cl. 6.5.7(a).

[141] NER, cl. 6.5.7(c)(1) & (2).

Regulatory obligation

Victorian electrical safety framework

In Victoria, the safety obligations of major electricity companies are contained in the *Electricity Safety Act 1998* (Vic). Section 99 of this Act mandates that major electricity companies must submit an approved Electricity Safety Management Scheme (ESMS) to Energy Safe Victoria for acceptance.[142] These schemes are regulated by Energy Safe Victoria. Each of the five Victorian distributors is classed as a 'major electricity company' under this Act.

It is compulsory for AusNet Services to comply with the accepted ESMS for its network.[143] Further, the Act requires that each major electricity company must submit a Bushfire Mitigation Plan for its network to Energy Safe Victoria and must comply with that plan.[144] The Bushfire Mitigation Plan forms part of an accepted ESMS.[145] This legislated requirement applies to the whole of AusNet Services' network including urban areas of the network.

On 4 January 2011 Energy Safe Victoria issued two directions under s 141 of the Electricity Safety Act to AusNet Services. A major electricity company must comply with a direction under s 141 of this Act that applies to it.[146] The first direction required that AusNet Services inspect all powerlines in its network and fit armour rods and vibration dampers by 1 November 2020 where the existing installation did not conform to the Victorian Electricity Supply Industry standard.[147] The second Direction required the fitting of spacers where the existing installation did not conform to the Victorian Electricity Supply Industry standard.[148] We note that AusNet Services has not sought a separate allowance in relation to the fitting of spacers. The third direction was issued on 5 April 2012. This direction required the installation of new generation electronic automatic circuit reclosers (ACRs) to single line earth return (SWER) lines.[149]

Two mechanisms exist for a major electricity company to address a safety concern of when it arises. The first is to voluntarily propose to address the safety hazard by including an undertaking in their ESMS or the Bushfire Mitigation Plan to undertake a specific activity to address the hazard. If a proposed change to their ESMS is approved by the safety regulator, the activity becomes an obligation which must be carried out.

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142 *Electricity Safety Act 1998* (Vic), s. 99.

143 *Electricity Safety Act 1998* (Vic), s. 106.

144 See, *Electricity Safety Act 1998* (Vic), ss. 113A, 113B and 113C.

145 *Electricity Safety Act 1998* (Vic), s. 113D.

146 *Electricity Safety Act 1998* (Vic), s. 141(4).

147 Energy Safe Victoria, *Direction under section 141(d)(2) of the Electricity Safety Act 1998 - Fitting of armour rods and vibration dampers*, 4 Jan 2011.

148 Energy Safe Victoria, *Direction under section 141(d)(2) of the Electricity Safety Act 1998 - Fitting of spacers*, 4 Jan 2011.

149 Energy Safe Victoria, *Direction under section 141(d)(2) of the Electricity Safety Act 1998 - Installation of new generation electronic automatic circuit reclosers (ACRs) to single line earth return (SWER) lines,* 5 April 2012.

The second mechanism is the creation of a new regulatory obligation by the Government or an action by a Government agency under existing legislation. The issuance of a direction by Energy Safe Victoria falls into this category. AusNet Services' VBRC capex proposal is wholly in response to regulatory obligations imposed by the directions of ESV. The proposal has been assessed on this basis.

We note that AusNet Services proposed that possible future obligations be managed as pass through events in the next regulatory control period. We discuss this proposal later in this section.

The mandatory safety obligations of AusNet Services relate to two project categories which we now assess:

Armour rods, vibration dampers and spacers

Armour rods are a fitting used to protect the power conductor from damage due to bending, compression, abrasion and fatigue due to wind-induced vibration and flashovers. They are helical rods wound over the conductor where it sits on an insulator. Vibration dampers are an additional device to reduce fatigue caused through wind-induced vibration. They are often helical rods wound over the conductor a short distance away from the cross arm. Spacers are insulated rods that are tied between the conductors to stop them from clashing in windy conditions.

If a regulatory obligation exists in an ESMS or BMP it follows that the activity is also required to maintain the reliability and safety of the network. For AusNet Services these obligations are contained in the Bushfire Mitigation Plan at section 8.3.11.[150] Accordingly, AusNet Services has demonstrated it has an obligation to undertake this work in the next regulatory control period.

In reaching our conclusion, we have also taken into account the interrelationship between this proposed expenditure and other expenditure proposed by AusNet Services. We are satisfied this is a discrete program of work that does not fall within AusNet Services' business as usual level of capex and opex to manage asset fire safety.

We next assess whether the proposed allowance satisfies the capex criteria.[151] AusNet Services provided a copy of their Bushfire Mitigation Plan.[152] The plan states: [153]

> A retro-fitting program has been developed and implemented for the installation of conductor vibration dampers, which in accordance with industry standards, requires the fitting of armour rods. Application of armour rods and vibration dampers is scheduled for approximately 60,000 pole top structures by the

[150] AusNet Services, *Bushfire Mitigation Plan, Doc. No. BFM 10-01*, 22 July 2014, p. 19.
[151] NER, cl. 6.5.7(c)(1) & (2).
[152] AusNet Services, *Bushfire Mitigation Plan*, *Doc. No. BFM 10-01*, 22 July 2014.
[153] AusNet Services, *Bushfire Mitigation Plan*, *Doc. No. BFM 10-01*, 22 July 2014, p. 19

> December 2015, and a further 120,000 by December 2020 in accordance with a Plan approved by ESV in 2012.

AusNet Services has prepared updated forecasts for armour rods and vibration dampers (110,000) based on consideration of its GIS data, progress on the initial program exceeding initial targets and work expected to be completed in conjunction with other network activities. We have reviewed the methodology used to generate this forecast. We consider the methodology to be sound. As the basis of this forecast is the result of a survey to establish a program to complete the works, adjusted for works completed or programmed to be completed in the 2011–15 regulatory control period, we accept these forecasts.

The costs to be incurred for each activity are derived from actual contract rates used by AusNet Services. AusNet Services states:

> Safety program works are delivered by a combination of internal and external resources depending upon the region, the program and work delivery volumes. The unit rates selected are the average across the network and are not reflective of highest or lowest rates.[154]

In comparison to the unitised rate of Powercor for the installation of vibration dampers and armour rods, the unitised rate proposed by AusNet Services is significantly greater. However, the unitised rates proposed by AusNet Services are derived from contracts with independent service providers. We are satisfied the contracts were properly entered into on a competitive basis, based on a detailed work specification. The unitised rate is a market tested rate.

A major reason for differences in these rates for each distributor is the difference in the number of armour rods requiring treatment as a proportion of the total number of spans relative to the number of vibration dampers required on the same span. This arises for historical reasons. When the lines were first constructed the decision to fit armour rods was left to the discretion of the local regional management of the former owner, the State Electricity Commission Victoria. The areas serviced by AusNet Services have low rates of existing installation. This leads to a higher average cost of rectification. For this activity there are also likely to be significant differences in mobilisation, outage and traffic management costs between the AusNet Services rate and the Powercor rate. On this basis, we accept the AusNet Services unitised rate is efficient.

For armour rods and vibration dampers we accept AusNet Services' forecast of $141.144 million ($2015, including overheads & escalation).[155]

Accordingly, the resultant cost estimates are a reasonable estimate of the least cost necessary to reasonably reflect the capex criteria.

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[154] AusNet Services, *Regulatory Proposal 2016–20*, *Appendix 7C - Unit Rates (Confidential)*, p. 13

[155] AST Distribution Capex Model (Confidential), '2.17 Step changes', Vibration Dampers & Armour Rods

Single Wire Earth Return (SWER) Automatic Circuit Reclosers (ACRs)

SWER is a low–cost type of powerline construction most commonly used for small loads in rural and remote areas. This requirement relates to fitting ACRs that can be remotely controlled on high fire risk days to isolate powerlines should a fault occur.

If a regulatory obligation exists in an ESMS or BMP it follows that the activity is also required to maintain the reliability and safety of the network. These obligations are contained in the Bushfire Mitigation Plan at section 8.3.8.[156] Accordingly, AusNet Services has demonstrated it has an obligation to undertake this work in the next regulatory control period.

In reaching our conclusion, we have also taken into account the interrelationship between this proposed expenditure and other expenditure proposed by AusNet Services. We are satisfied this is a discrete program of work that does not fall within AusNet Services' business as usual level of capex to manage asset fire safety.

We next assess whether the proposed allowance satisfies the capex criteria. AusNet Services provided a copy of their Bushfire Mitigation Plan.[157] The plan states:[158]

> AusNet Services … will progressively replace all SWER OCRs by the end 2015. The new ACRs offer remote controlled capability to modify electrical protection settings that take into consideration environmental conditions, such as Total Fire Ban and Code Red days.

AusNet Services' forecast for outstanding works is derived from a physical count of installations not completed from the total program of replacements. As noted above, AusNet Services has an obligation under its Bushfire Mitigation Plan to complete this work in 2015. However, a small number of installations will not be completed by the end of 2015. This work will continue into 2016.

The costs to be incurred for each activity are derived from actual contract rates used by AusNet Services. AusNet Services states:[159]

> Safety program works are delivered by a combination of internal and external resources depending upon the region, the program and work delivery volumes. The unit rates selected are the average across the network and are not reflective of highest or lowest rates.

We have considered the unitised rate per installation claimed by AusNet Services. This rate is low compared to reported costs for other distributors and represents a favourable contract. However, we consider this rate is inconsistent with the volume forecast and total budget for this program. The unitised rate proposed by AusNet Services is derived from contracts with independent service providers and reflects

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156 AusNet Services, *Bushfire Mitigation Plan*, *Doc. No. BFM 10-01*, 22 July 2014, p. 17.

157 AusNet Services, *Bushfire Mitigation Plan*, *Doc. No. BFM 10-01*, 22 July 2014.

158 AusNet Services, *Bushfire Mitigation Plan, Doc. No. BFM 10-01*, 22 July 2014, p. 17.

159 AusNet Services, *Regulatory Proposal 2016–20*, *Appendix 7C - Unit Rates (Confidential)*,30 April 2015, p. 13.

average outturn costs. We are satisfied the contracts were properly entered into on a competitive basis, based on a detailed work specification. The unitised rate is a market tested rate. On this basis, we accept the AusNet Services unitised rate is efficient. Having regard to the overall program of replacement works and the number of outstanding installations, we consider the AusNet Services estimate of costs to complete the program is reasonable.

For SWER ACRs we accept AusNet Services' forecast of $1.002 million ($2015, including overheads & escalation) reasonably reflects the capex criteria.[160]

Future regulatory obligations

Following the Victorian Bushfires Royal Commission (VBRC) 67 recommendations were made, of which eight relate directly to the safety of electrical distribution networks in Victoria. Another relevant recommendation is recommendation 27:

> The State amend the Regulations under Victoria's Electricity Safety Act 1998 and otherwise take such steps as may be required to give effect to the following:
>
> - the progressive replacement of all SWER (single-wire earth return) power lines in Victoria with aerial bundled cable, underground cabling or other technology that delivers greatly reduced bushfire risk. The replacement program should be completed in the areas of highest bushfire risk within 10 years and should continue in areas of lower bushfire risk as the lines reach the end of their engineering lives
>
> - the progressive replacement of all 22-kilovolt distribution feeders with aerial bundled cable, underground cabling or other technology that delivers greatly reduced bushfire risk as the feeders reach the end of their engineering lives. Priority should be given to distribution feeders in the areas of highest bushfire risk.

The Victorian Government is developing a regulatory requirement to give effect to recommendation 27. In particular, work is being undertaken by the Victorian Government to develop suitable regulatory standards for the use of new technologies such as Rapid Earth Fault Current Limiting (REFCL) devices and a new type of insulated line as major tools to reduce the risk of powerline faults igniting bushfires. We have included a brief description of the new REFCL technology in a later section.

These regulations are expected to apply in High Bushfire Risk Areas (HBRA) of the State and will involve a mandatory program of installing REFCLs and a change to the design standards that apply to new line construction and the reconstruction of assets in certain areas (Codified Areas). However, this Victorian Government program is not yet in place. The timing and scope of the regulations are not currently known.

AusNet Services have recognised this impending development in their regulatory proposal. They propose the AER apply a regulatory change pass through event to any

[160] AST Distribution Capex Model (Confidential), '2.17 Step changes', Replace SWER OCRs with ACRs

regulatory change or changes that apply in the next regulatory control period.[161] We agree that a pass through event can reasonably be applied to this program. However, we note that Powercor has proposed that the pending regulatory changes be dealt with as contingent projects.[162] We have therefore, considered whether either approach is preferable (contingent project or pass through event) and the trigger event which should apply to a contingent project.

Having considered the respective proposals of AusNet Services and Powercor, we consider a contingent project approach is preferable. Our preference is to apply a common regulatory approach to all affected service providers. We prefer to deal with the costs of the Victorian government regulations consistently across distributors. This ensures that the cost of the regulation is recovered from customers in the same manner. It also allows us to compare the costs and impacts on customers more transparently so that we can ensure that consumers pay no more than necessary for the implementation of the regulation. This is particularly important because the cost and timing of the regulation are not yet known.

We note that the contingent project mechanism was added to the NER to assist distribution networks faced with potentially large but uncertain capital requirements to manage the risk of being required to fund major investments at short notice. We consider the planned Victorian regulations are an example of the uncertainty that AusNet Services will face in the next regulatory control period. We also note that AusNet Services has, in its regulatory proposal, noted that satisfying the trigger requirements for a pass-through event may be problematic.

To minimise the risk that the appropriate capital amounts may be difficult to accurately identify our preference is to deal with the capital need progressively across the next regulatory control period. This can be achieved by dealing with the contingent project program in tranches. By doing so both the service providers and the AER can better identify costs as they arise in the initial tranche of projects and apply corrections based on actual outcomes to the second and any subsequent tranches of projects. Each tranche must be sized to meet the applicable materiality threshold.

To achieve operational efficiencies the AER will allow projects to be swapped between tranches so long as this does not result in double counting for the purposes of assessing whether the trigger for a tranche has occurred.

For a contingent project a trigger event must be defined. We consider there are three factors which, taken collectively, form the necessary conditions as a trigger event. The first is a regulatory event. This is passage by the State of Victoria of a law or regulations or other regulatory instrument that gives effect to recommendation 27 of the Victorian Bushfires Royal Commission, whether in part or in full. The second is the formation of capital projects into suitably sized tranches. We will require that all the projects which constitute a tranche are listed in a regulatory instrument or a bushfire

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[161] AusNet Services, *Regulatory Proposal 2016–20*, April 2015, p. 260.

[162] Powercor, *Regulatory Proposal 2016–20*, April 2015, p. 143

mitigation plan approved by Energy Safe Victoria for completion in the 2016–20 regulatory control period. The third arm of our trigger event is that every project incorporated in a tranche must be subject of a detailed design investigation which accurately identifies the scope of works and proposed costings when submitted to the AER. We would expect a similar degree of detail to accompany a pass through application if AusNet Services continues with that approach.

We invite AusNet Services to further consider whether they wish to apply a pass through event as set out in this section or modify their proposal to apply one or more contingent projects to meet this need.

We will apply the same approach to contingent projects for AusNet Services as we have applied to Powercor, taking into account any necessary differences. In our preliminary determination for Powercor we accept Powercor's proposal that two contingent project event categories be created to address capital needs arising from new regulations to be introduced by the Victorian Government to implement recommendation of the VBRC. These categories are:

1. The installation of equipment to achieve a new earth fault standard; and
2. The introduction of new design standards for asset construction and replacement in high consequence bushfire ignition areas of the State.

Each contingent project category is to contain one or more tranches. These contingent projects are subject to the three part trigger:

1. Passage by the State of Victoria of a law or regulations or other regulatory instrument that gives effect to recommendation 27 of the Victorian Bushfires Royal Commission, whether in part or in full.
2. The formation of capital projects into tranches. All the projects which constitute a tranche must be listed in a regulatory instrument or a bushfire mitigation plan approved by Energy Safe Victoria for completion in the 2016–20 regulatory control period.
3. Every project incorporated in a tranche must be subject of a detailed design investigation which accurately identifies the scope of works and proposed costings.

Rapid Earth Fault Current Limiting (REFCL) Technology

The Victorian Government is currently investigating technology solutions which have the potential to reduce the cost of minimising the risk of a powerline fault igniting a fire. The REFCL is a relatively new technology which may have cost advantages. Its potential for bushfire mitigation is promising. It is an extension of resonant earth system technology, which is commonly used in Europe and elsewhere. The REFCL device is capable of detecting when a power line has fallen to the ground and can almost instantaneously shut off power on the fallen line.

B.6 Forecast capitalised overheads

Capitalised overheads are costs associated with capital works that have been capitalised in accordance with AusNet Services' capitalisation policy. They are generally costs shared across different assets and cost centres.

B.6.1 Position

We do not accept do not accept AusNet Services' proposed capitalised overheads. We instead included in our alternative estimate of overall total capex an amount of $168.5 million ($2015) for capitalised overheads. This is 2.5 per cent lower than AusNet Services' proposal of $172.8 million ($2015). We are satisfied that this amount reasonably reflects the capex criteria.

B.6.2 Our assessment

We consider that reductions in AusNet Services' forecast expenditure should see some reduction in the size of its total overheads. Our assessment of AusNet Services' proposed direct capex demonstrates that a prudent and efficient DNSP would not undertake the full range of direct expenditure contained in AusNet Services' regulatory proposal. It follows that we would expect some reduction in the size of AusNet Services' capitalised overheads. We do accept that some of these costs are relatively fixed in the short term and so are not correlated to the size of the expenditure program. However, we maintain that a portion of the overheads should vary in relation to the size of the expenditure.

Our assessment in the Queensland distribution determinations found Energex's overheads comprised 75 per cent fixed and 25 per cent variable components. We consider this split of fixed and variable overheads components is also reasonable for AusNet Services. If AusNet Services does not consider this split is reasonable for its circumstance, it may provide a more appropriate split, with evidence, in its revised regulatory proposal.

We have also considered the relationship between opex and capex, specifically whether it is necessary to account for the way the CAM allocates overheads between capex and opex in making this decision. We considered this was not necessary in order to satisfy the capex criteria. This is because our opex assessment sets the efficient level of opex inclusive of overheads. It has accounted for the efficient level of overheads required to deliver the opex program by applying techniques which utilise the best available data and information for opex.

The starting point of our capitalised overheads assessment is AusNet Services' proposal, which is based on their CAM. As such, AusNet Services' forecast application of the CAM underlies our estimate. We have only reduced the capitalised overheads to account for the reduced scale of AusNet Services' approved capex based on assessment techniques best suited to each of the capex drivers. In doing so we have accounted for there being a fixed proportion of capitalised overheads.

As a result of a $157.7 million ($2015) reduction in AusNet Services' direct capex that attract overheads, we consider a reduction of $4.3 million ($2015) reasonably reflect the capex criteria.

B.7 Forecast non–network capex

The non-network capex category for AusNet Services includes expenditure on information and communications technology (ICT), buildings and property (including furniture and equipment), and motor vehicles. AusNet Services proposed $208.6 million ($2015) for non-network capex, compared to actual expenditure of $224.5 million for the 2011–15 regulatory control period. It proposed $172.1 million for ICT capex, compared to $196.8 million in the previous period. It has also proposed $36.4 million for the other non-network capex categories, compared to $27.8 million in the previous period.

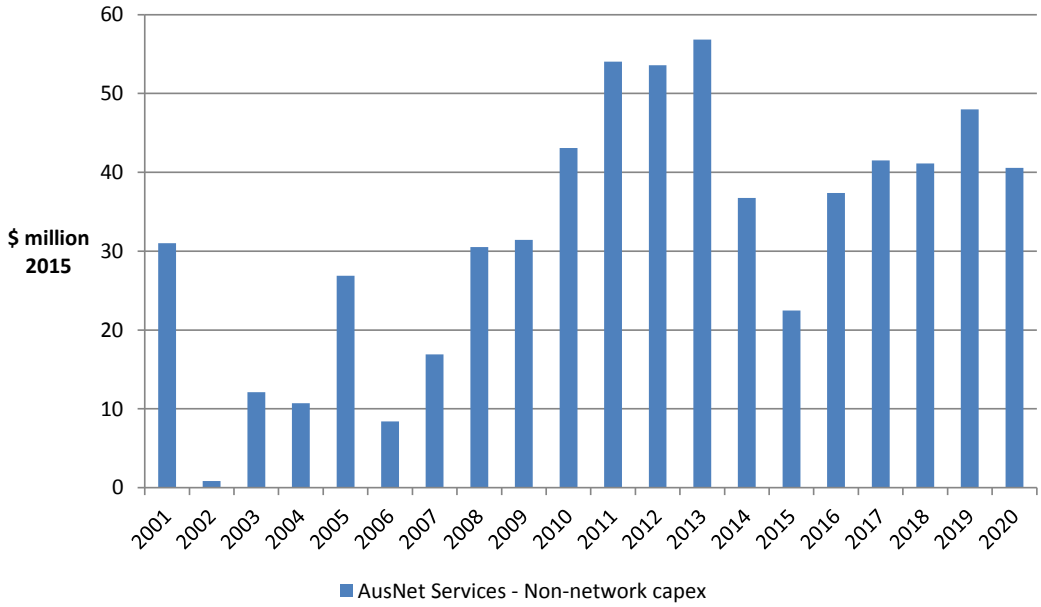
B.7.1 Position

As part of our estimate of the total capex required for the 2016–20 regulatory control period, we accept that AusNet Services' forecast of non-network capex of $208.6 million ($2015) is a reasonable estimate of the efficient costs that a prudent operator would require for this capex category.[163] We have included it in our estimate of total capex for the 2016–20 regulatory control period.

Figure 6.18 shows AusNet Services' actual and expected non-network capex for the period from 2001 to 2015, and forecast capex for the 2016–20 regulatory control period.

[163] AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, p. 124

Figure 6.18 AusNet Services' non-network capex 2001 to 2020 ($million, 2015)



Source: AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014*, template 2.6; AusNet Services, *RIN response for 2011-2015 regulatory control period, template 2.1.1*; AER analysis.

AusNet Services' forecast non-network capex for the 2016–20 regulatory control period is 7 per cent lower than actual and expected capex in the 2011–15 regulatory control period.[164]

Our analysis of longer term trends in non-network capex suggests that AusNet Services has forecast capex for this category at levels which are generally higher than the period prior to 2010, but relatively low compared to more recent years. Non-network capex in each year of the 2016–20 regulatory control period is forecast to be between 15 and 35 per cent lower than expenditure in the peak period from 2011 to 2013. In our view, this suggests that AusNet Services' forecast of non-network capex requirements in the 2016–20 regulatory control period is likely to be reasonable having regard to past expenditure[165], though further analysis of individual categories is required.

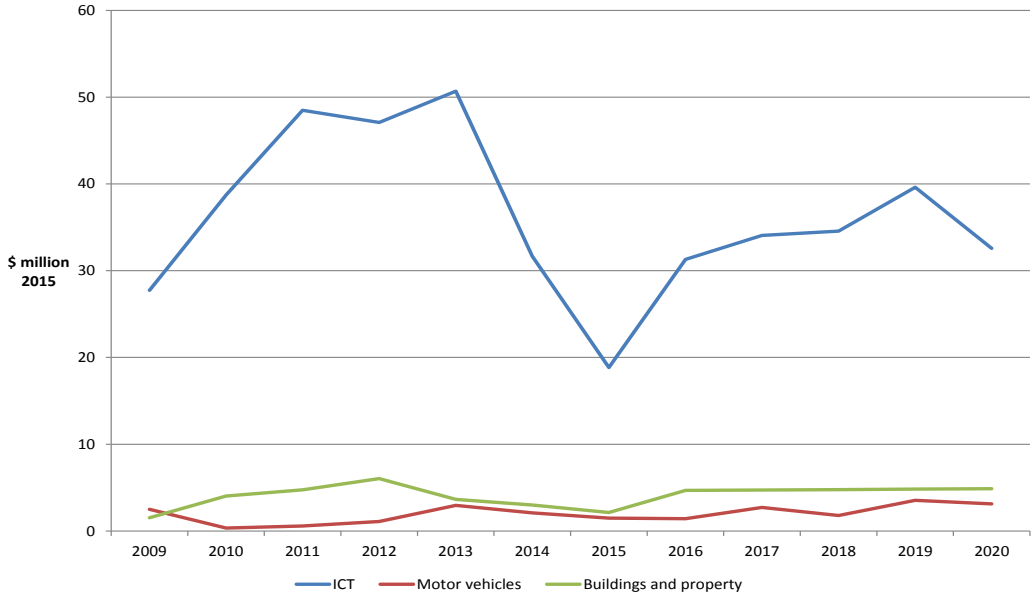
We have therefore also assessed forecast expenditure in each category of non-network capex. Analysis at this level has been used to inform our view of whether forecast capex is reasonable relative to historical rates of expenditure in each category, and to identify trends in the different category forecasts which may warrant

[164] AusNet Services, *Regulatory information notice* template 2.6; AusNet Services, *Category Analysis RIN 2014*, template 2.6; AER analysis.

[165] NER, cl. 6.5.7(e)(5).

further review.[166] Figure 6.19 shows AusNet Services' actual and forecast non-network capex by sub-category for the period from 2009 to 2020.

Figure 6.19 AusNet Services' non-network capex by category ($million, 2015)



Source: AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014*, template 2.6; AER analysis.

AusNet Services has forecast a reduction in ICT capex in the 2016–20 regulatory control period of 13 per cent, with minor increases in the smaller categories. The forecast expenditure for motor vehicles and other non-network capex, although increasing from the 2011–15 regulatory control period, is consistent with historical levels of expenditure in these categories.

We are satisfied that the reduction in ICT capex, and the forecast expenditure for other minor categories of non-network capex, reflect the high level drivers of expenditure in these categories and therefore reasonably reflect efficient costs. For example, the decline in ICT capex reflects that AusNet Services has recently completed a number of significant ICT investments and is approaching a point in its ICT investment profile which requires less capital investment.[167] The Consumer Challenge Panel submitted that AusNet Services' pattern of reducing ICT expenditure should be followed by other Victorian DNSPs.[168]

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166 NER, cl. 6.5.7(e)(5).

167 AusNet Services, *Regulatory Proposal 2016–20*, April 2015, p. 161.

168 CCP Sub-Panel 3, *Response to proposals from Victorian electricity distribution network service providers*, 5 August 2015, p. 59.

Motor vehicle capex reflects AusNet Services' vehicle replacement criteria, which we consider to be reasonable and in line with good industry practice.[169] Forecast non-network buildings capex reflects AusNet Services' identification of specific minor capital items required for office, depot and storage sites. The tools and equipment capex forecast is consistent with average historical expenditure in this category.[170] We are satisfied that AusNet Services' forecasting methodologies for these categories of non-network capex are likely to provide reasonable estimates of efficient capex requirements. Based on our category level review of AusNet Services' forecast non-network capex, we have not identified any areas for further specific review at the project or program level. We are satisfied that the forecast level of expenditure reasonably reflects the capex criteria.

In summary, having considered AusNet Services' regulatory proposal and had regard to the capex factors and submissions from interested parties[171] we are satisfied that total capex which reasonably reflects the capex criteria should include a forecast of $208.6 million for non-network capex, excluding overheads. Our estimate of total capex for the 2016–20 regulatory control period reflects this conclusion.

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169 AusNet Services, *Regulatory Proposal 2016–20*, *Appendix 7A: Network Capital Expenditure Overview 2016-20*, 30 April 2015, p. 71; and AusNet Services, *Response to AER Information Request # IR012 - Non-network capex*, 3 August 2015.

170 AusNet Services, *Regulatory Proposal 2016–20*, *Appendix 7A: Network Capital Expenditure Overview 2016-20*, 30 April 2015, p. 72.

171 Most relevantly, NER cl. 6.5.7(e)(5).

C Maximum demand forecasts

Maximum demand forecasts are fundamental to a distributor's forecast capex and opex, and to our assessment of that forecast expenditure.[172] This is because we must determine whether the capex and opex forecasts reasonably reflect a realistic expectation of demand forecasts. Hence accurate, or at least unbiased, demand forecasts are important inputs to ensuring efficient levels of investment in the network.

This attachment sets out our decision on AusNet Services' forecast network maximum demand for the 2016–20 regulatory control period. We consider AusNet Services' demand forecasts at the system level and the more local level.

System demand represents total demand in the AusNet Services distribution network. System demand trends give a high level indication of the need for expenditure on the network to meet changes in demand. Forecasts of increasing system demand generally signal an increased network utilisation which may, once any spare capacity in the network is used up, lead to a requirement for growth capex. Conversely forecasts of stagnant or falling system demand will generally signal falling network utilisation, a more limited requirement for growth capex, and the potential for the network to be rationalised in some locations.

Localised demand growth (spatial demand) drives the requirement for specific growth projects or programs. Spatial demand growth is not uniform across the entire network: for example, future demand trends would differ between established suburbs and new residential developments.

In our consideration of AusNet Services' demand forecasts, we have had regard to:

- AusNet Services' proposal
- AEMO's independent forecasts[173]
- a report by our internal economic consultant, Dr Darryl Biggar, on the forecasting methodologies underlying each Victorian electricity distributor's demand forecasts for 2016–20 (this report will be published alongside this preliminary decision)[174]
- long term demand trends and changes in the electricity market, and
- stakeholder submissions in response to AusNet Services' proposal (as well as submissions made in relation to the Victorian electricity distribution determinations more generally).[175]

These are set out in more detail in the remainder of this appendix.

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172 NER, cll. 6.5.6(c)(3) and 6.5.7(c)(3).

173 AEMO, *National electricity forecasting report for the National Electricity Market*, June 2014, p. 4-4.

174 Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015.

175 See AER, http://www.aer.gov.au/node/24446.

C.1 AER determination

We are not satisfied that AusNet Services' demand forecasts reflect a realistic expectation of demand over the 2016–20 regulatory control period. In determining a realistic expectation of demand over the 2016–20 period, we have had regard to the following factors:

- Changes observed in the electricity market and the way energy is consumed in recent years (e.g. strong uptake of solar PV, changing customer behaviours and energy efficiency measures) suggests that the strong positive demand growth seen in AusNet Services' network prior to 2009 is unlikely to return in the short to medium term. This is discussed in section C.3.
- AusNet Services' demand forecasting methodology is in effect estimating maximum demand using data and input assumptions from very different market conditions (in 2009). We are not satisfied that this reflects a realistic expectation of future demand over the 2016–20 period since we are not confident that the drivers used in AusNet Services' model are able to fully capture the changes in demand in recent years. This is discussed in section C.2 and C.4.
- Independent forecasts from the Australian Energy Market Operator (AEMO) better explain the actual demand pattern seen on all distributors' networks. This is because it does not assume a fixed structural relationship between demand and demand drivers over a long period and, instead, places greater reliance on industry knowledge and judgement. While not without its limitations, we consider that AEMO's forecasts better reflect recent changes in the electricity market. This is also discussed in section C.4.

We understand that AusNet Services (and the Victorian electricity businesses) are in the process of updating their demand forecasts as part of the 2015 distribution annual planning report (DAPR). We also note that in September 2015, AEMO published updated connection point demand forecasts for Victoria. These forecasts took into account actual 2015 summer demand data and some revisions to its forecasting methodology. We have not been able to take AEMO's updated connection point forecasts into account for this preliminary decision. However, we are open to AusNet Services submitting an updated demand forecast that accounts for the factors listed above, including the most recent demand data.

We consider the forecasts in our decisions should reflect the most current expectations of the forecast period. Hence, we will consider updated demand forecasts and other information (such as AEMO's revised connection point forecasts) in the final decision to reflect the most up to date data.

We have also received a number of consumer submissions that raise concerns with AusNet Services' and the other Victorian distributors maximum demand forecasts. The CCP submitted that we should pay particular attention to the distributors' maximum demand forecasts and whether they have been over estimated, given the following considerations:

- forecasts of maximum demand are key drivers of revenue requirements

- distributors forecasts exceed and contrast with AEMO's forecasts, and
- distributors have consistently over forecast maximum demands in the past.[176]

The Ethnic Communities Council of Victoria (ECCV) also supported us further examining the Victorian distributors' forecasts that exceed forecasts by AEMO.[177]

The VECUA also submitted that the Victorian distributors have consistently over estimated their peak demand and energy delivered projections. VECUA put forward that network distributors are insulated from volume risk through revenue cap regulation, which allows them to pass that risk on to customers. Therefore if the actual energy delivered is lower than forecast by networks' then networks will increase their prices to recover their guaranteed revenues. VECUA also considered it important to note:[178]

> …that the Victoria distributors were rewarded with windfall profits for their forecasting errors, as their revenue allowances included returns and depreciation on load-driven capex which they did not incur.

As set out in this appendix, we have closely examined AusNet Services' maximum demand forecasts and drawn similar observations to these submissions. A key part of our work has been to analyse AusNet Services' (and the other Victorian distributors) demand forecast with reference to AEMO's independent maximum demand forecasts. However, the VECUA submitted that AEMO has consistently over estimated its energy forecasts in recent years and has not fully considered the influence of future factors in reducing demand (such as energy efficiency schemes, automotive closures, cost reflective price structures and battery storage technology).[179] We do not agree with the VECUA and consider that AEMO's explanation of its forecasting methodology reveals that it has considered a wide variety of information in its forecast, including predictions for energy efficiency and automotive closures in Victoria and this represents an enhancement and improvement to its previous forecast approach.[180]

Further, the CCP and VECUA referred to AusNet Services demand forecasts as the only Victorian distributor to forecast lower energy consumption in the future compared to the past.[181] VECUA has submitted that AusNet Services demand forecasting

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176 CCP Sub-panel 3, *Response to proposals from Victorian electricity distribution network service providers*, August 2015, pp. 32–37.

177 Ethnic Community Council of Victoria, *Submission to the Australian Energy Regulator Victoria Electricity Pricing Review*, 15 July 2015, p. 4.

178 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016–20 Revenue Proposals*, 13 July 2015, pp. 14–16.

179 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016–20 Revenue Proposals*, 13 July 2015, p. 17.

180 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report*, June 2015, p. 11.

181 CCP Sub-panel 3, *Response to proposals from Victorian electricity distribution network service providers*, August 2015, pp. 35–37; Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, pp. 15–16.

methodology incorporates actual interval metering data, which it considers may account for the differences between AusNet Services forecast growth and other Victorian distributors.[182] The CCP considered that the AusNet Services approach to developing its forecast demand is a significant enhancement in forecasting future demand and is a direct outcome from the decision to mandate the roll out of the AMI program in Victoria.[183] We consider there is merit to these views (and will be useful as distributors develop their information capacity). However we have not directly taken this into account for our assessment of AusNet Services' maximum demand forecasts because it has not been necessary due our assessment approach which is based substantially on comparison with AEMO's demand forecasts.

C.2 AusNet Services' proposal

AusNet Services provided historical and forecast demand figures in their proposal and in the reset Regulatory Information Notice (RIN).[184] AusNet Services proposed approximately 1.1 per cent annual growth in maximum demand across the 2016–20 period. In its proposal, AusNet Services forecast an increase in peak demand in specific areas of its network to be driven by:

- increases in the penetration of air-conditioners by commercial businesses and residential households
- population growth in Melbourne's North and South-Eastern suburbs.

AusNet Services submitted that its forecast of peak demand growth is based on public information from the Victorian Government and smart meter data from its network.[185]

AusNet Services has developed its own demand forecasting methodology.[186] AusNet Services' proposal also included a summary of its demand forecasting method, including approaches to:

- demand drivers
- use of smart meter data
- accounting for economic conditions such as incomes and electricity prices
- projections of customer numbers by tariff class and customer growth rates per feeder (block loads are accounted for in these forecasts)
- and post model adjustments for changes in demand efficiency of new dwellings.[187]

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[182] Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016–20 Revenue Proposals*, 13 July 2015, p. 16.

[183] CCP Sub-panel 3, *Response to proposals from Victorian electricity distribution network service providers*, August 2015, pp. 35–37 and 44.

[184] AusNet Services reset RIN; AusNet Services, *Regulatory proposal: Electricity distribution price review 2016–20*, 30 April 2015, pp. 73–81, AusNet Services, *Regulatory Proposal 2016–20, Appendix 4B: Demand forecasting methodology,* April 2015.

[185] AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, p. 74

[186] AusNet Services, *Regulatory Proposal 2016–20, Appendix 4B: Demand forecasting methodology,* 30 April 2015.

AusNet Services' forecasting methodology is described in detail in Biggar's report.[188]

C.3 Demand trends

Our first step in examining AusNet Services' forecast of maximum demand is to look at whether the forecast is consistent with, or explained by, long term demand trends and changes in the electricity markets.

Figure 6.20 shows that over the last few years, the path of electricity demand seems to be changing. From 2006 to 2009, actual maximum demand on AusNet Services' network was growing steadily. Then from 2009 to 2012, demand flattened and declined. The decline in 2009 from historical demand growth has also been recorded for Victoria (as shown in Figure 6.21) and for the NEM. While there was some growth in demand between 2013 and 2014, this does not necessarily indicate a return to longer term growth in demand.

As shown further in Figure 6.20, AusNet Services' demand forecasts for the 2015–20 period are considerably higher than the actual demand observed for its network during 2006–14. AusNet Services forecast contrasts with AEMO's Connection Point Forecasts, published in September 2014, which forecasts little or no growth in connection point demand on AusNet Services' network for the same period.[189]

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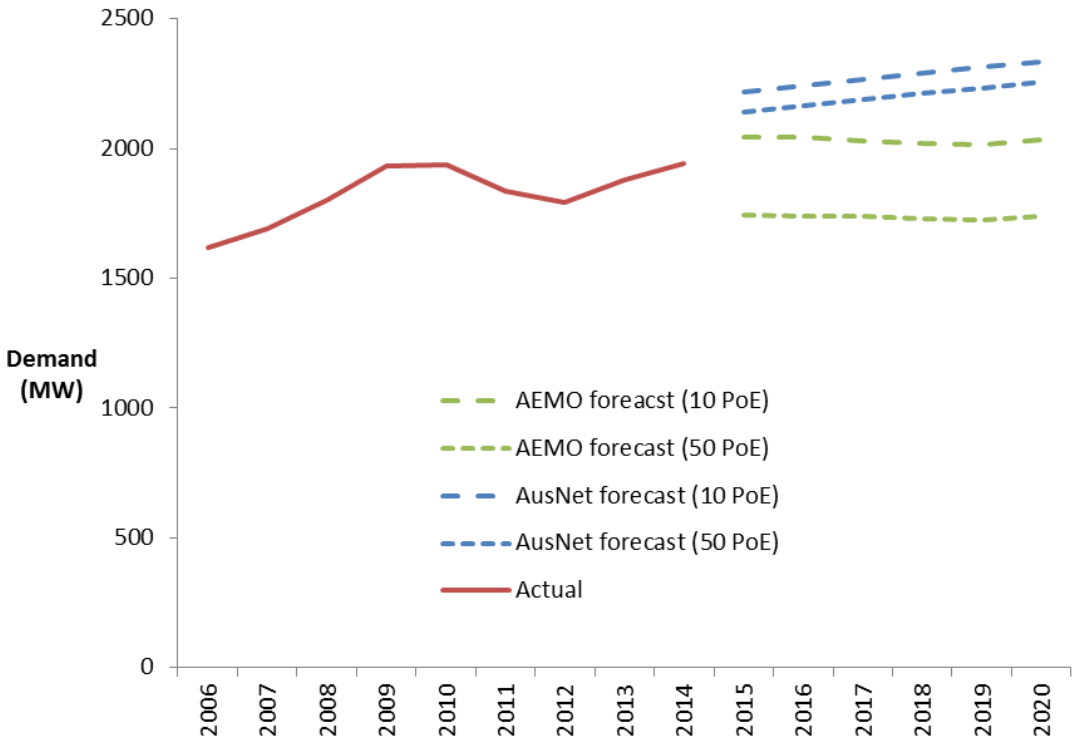
187 AusNet Services, *Regulatory Proposal 2016–20*, 30 April 2015, pp. 73–81.

188 Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, pp. 27–30.

189 AEMO, *Transmission Connection Point Forecasting Report for Victoria*, September 2014, pp. 12–13.

Figure 6.20 Comparison of peak demand forecasts of AusNet Services and AEMO (MW, non-coincident, summated connection point forecasts)

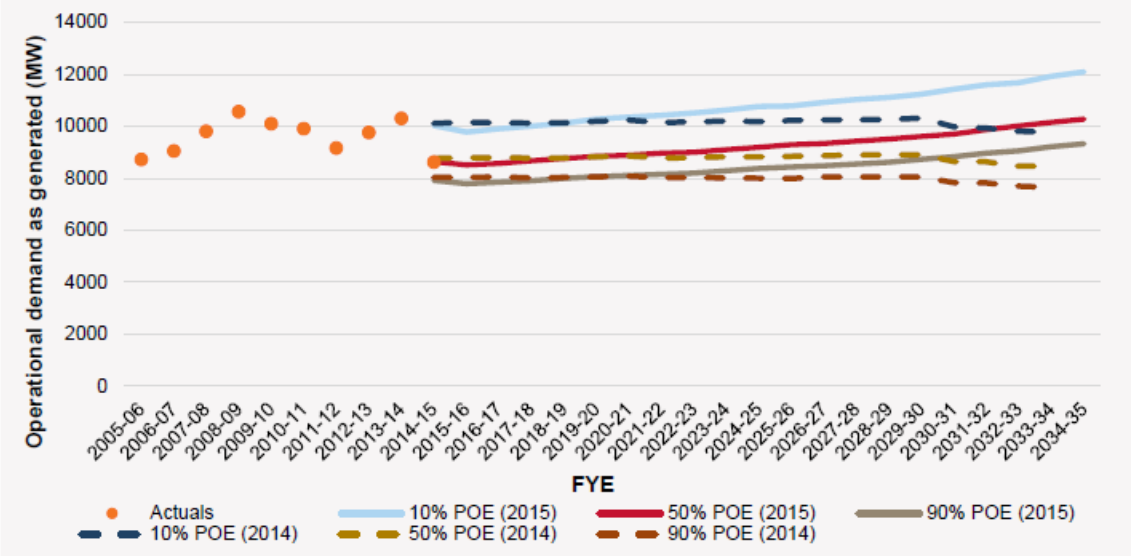


Source: AusNet Services regulatory proposal, AER analysis using AEMO data on transmission connection point forecasts; reset RIN; economic benchmarking RIN 2006–14.

Note: Actual demand over the 2006 to 2014 period reflects AusNet Services' actual maximum demand over this period (as reported in AusNet Services' economic benchmarking RIN data from 2006 to 2014). This is opposed to weather normalised historical maximum demand data.

Figure 6.21 shows AEMO's forecasts of maximum demand across Victoria. In its 2015 national electricity forecasting report, AEMO forecast a flattening of maximum demand for Victoria for 2015–2020. However, AEMO has forecast some growth in maximum demand over the next twenty years, which is a change from its 2014 national electricity forecasting report.

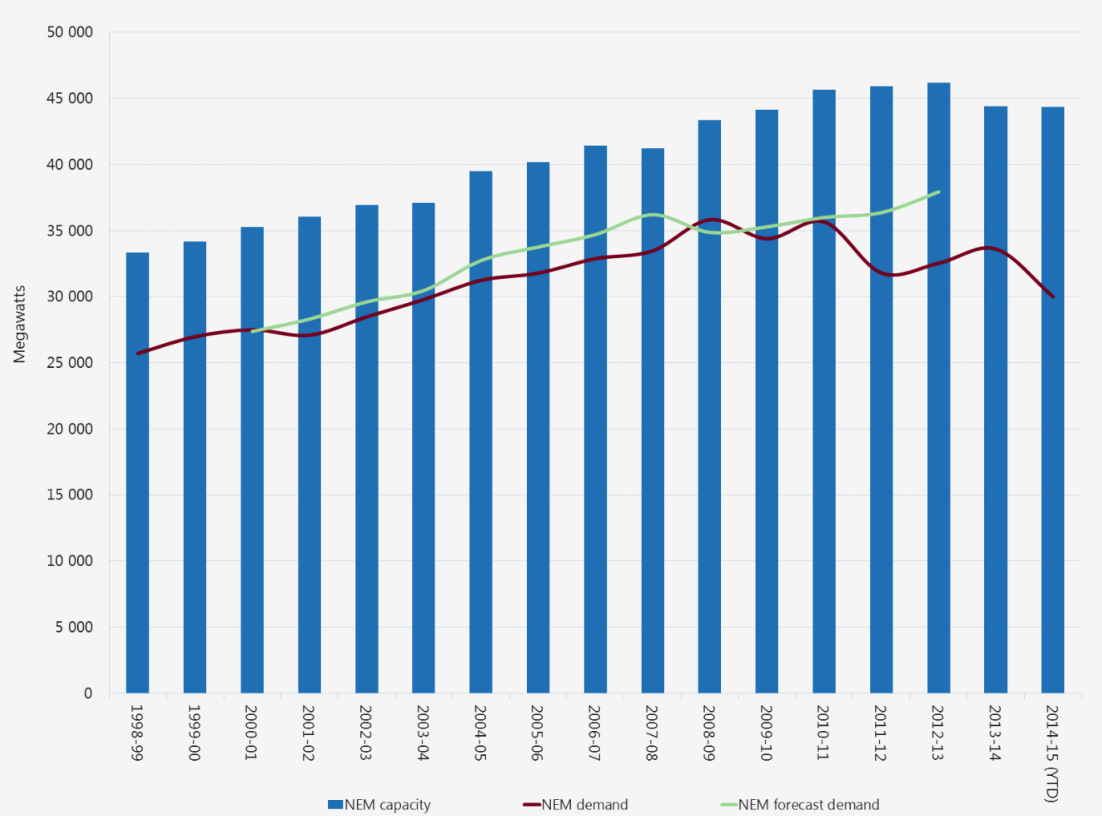
Figure 6.21 AEMO's maximum demand forecasts for Victoria



Source: AEMO, *2015 National Electricity Forecasting Report,* June 2015.

We see a similar change in peak demand patterns across the National Electricity Market (NEM). Figure 6.22 compares NEM peak demand together with the forecast peak demand two years ahead and total generation capacity, since the NEM began. It shows actual demand has been declining generally since 2008–09 across the NEM.

Figure 6.22 Comparison of historical generation capacity and peak demand across the NEM



Source: AER, accessed on 18 August 2015 at: https://www.aer.gov.au/node/9772.

Note: The step up in maximum demand in 2004–05 is as a result of Tasmania's entry to the NEM.

AusNet Services forecast moderate demand growth for 2015–20, whereas other independent forecasts from AEMO predict low or no growth over this period. While actual connection point demand increased on AusNet Services' network in 2013 and 2014 (see Figure 6.20), the observed changes in demand patterns within the span of nine years raises the question of whether the recent flattening of demand is an aberration (and demand will return to growth) or a realistic expectation of demand over the 2016–20 period.

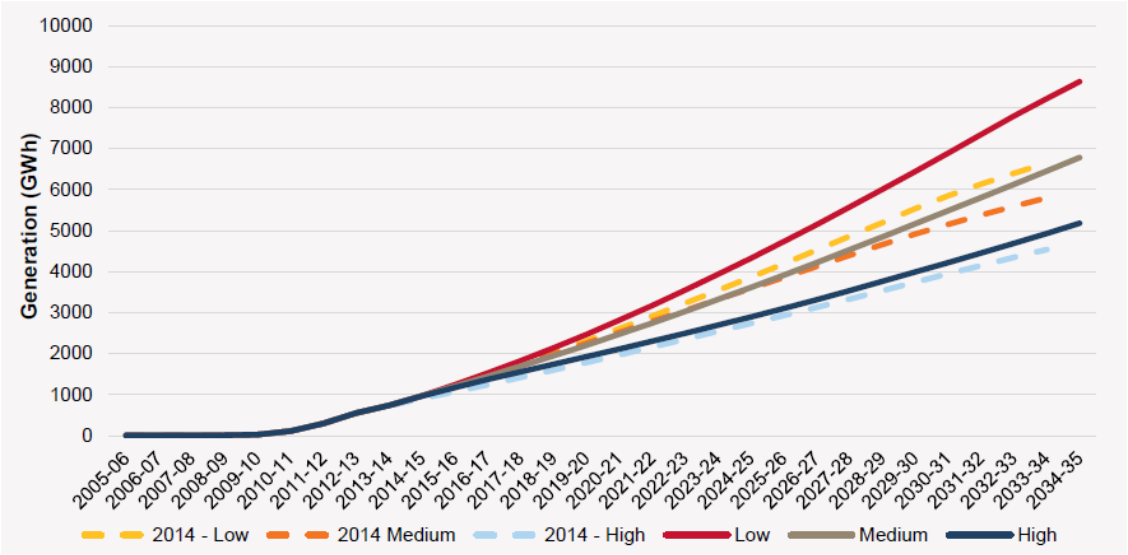
There have been some developments in the Australian and Victorian electricity markets over recent years that have influenced energy consumption and maximum demand patterns. First, across the NEM, growth in rooftop solar generation (PV) and energy efficiency (through the uptake of energy efficient appliances and building efficiency) has reduced electricity drawn from the grid. Rooftop PV generation has had the long term effect of reducing maximum demand and shifting the daily peak to later in the evening. Energy efficiency reduced overall energy consumption and has a downward impact on maximum demand.

In Victoria, AEMO reported that in the five years to 2014–15, consumption in the residential and commercial sector decreased due to rising prices and the uptake of

rooftop PV.[190] AEMO forecasts that there will be continued uptake of rooftop PV in the residential and commercial sectors.

To demonstrate, Figure 6.23 shows the projected capacity of solar PV systems across Victoria. From this figure we observe a projected substantial increase in the volume of installed rooftop solar PV capacity can be observed from 2010 to 2015, with capacity expected to continue to grow strongly to 2020 and beyond.[191]

Figure 6.23 Projected capacity of solar PV systems in Victoria



Source: AEMO 2015 National Electricity Forecasting Report, June 2015

However, we note that the impact of rooftop PV will likely have diminishing impacts on maximum demand over the longer term as peak daily demand shifts to the evening. This is recognised in AEMO's forecasting report.[192] We note that electricity storage (e.g. batteries) has the potential to significantly enhance the impact of solar generation on maximum demand on the distribution network. However, wide spread uptake of battery storage will probably not be significant over the 2016–20 period.

Second, energy efficiency also contributed to decreased consumption and AEMO forecasts that energy efficiency measures will continue.[193] Ongoing energy efficiency

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190 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report,* June 2015, p. 68.

191 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report,* June 2015, p. 73

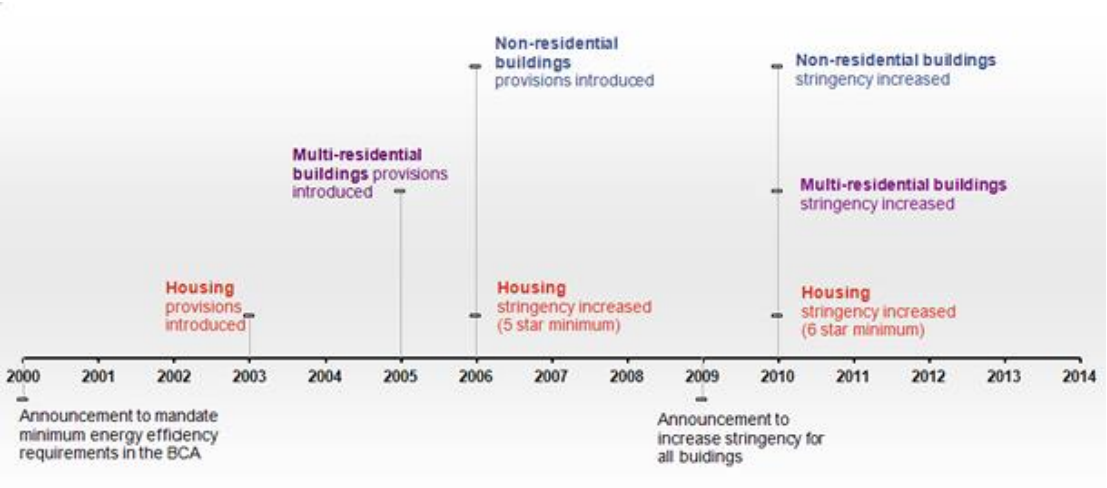
192 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report*, June 2015, p. 77

193 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report*, June 2015, p. 67.

measures such as mandatory energy efficiency building requirements[194] and other government incentives[195] have created an accumulative effect in slowing down demand growth over time. In addition, greater customer awareness of energy usage, improving appliance efficiencies and replacement of aging appliances will likely continue to put downwards pressure on consumption and maximum demand.[196]

Figure 6.24 gives an overview of government energy efficiency requirements in building provisions. From this timeline it can be inferred that the increasing energy efficiency requirements in building regulation are likely to have a cumulative effect on demand in the future.

Figure 6.24 Timeline of Energy Efficiency Requirements in Building Regulation



Source: Australian Building Codes Board (ABCB), accessed on 27 August 2015 at:
http://www.abcb.gov.au/en/work-program/energy-efficiency.aspx.

Finally, AEMO also forecast that Victoria is not expected to recover to its historical high level of operational consumption (in 2008–09) until 2030–31, when population is projected to be 1.7 million higher than in 2014–15.[197]

We consider that the combination of these factors support forecast reductions or softening of maximum demand even in the presence of economic and population growth. In particular, based on our assessment of independent forecasts from AEMO,

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194 Australian Building Codes Board (ABCB), *National Construction Code energy efficiency requirements*, http://www.abcb.gov.au/en/work-program/energy-efficiency.aspx , accessed on 27 August 2015.

195 Department of Industry and Science, *Your energy savings: Rebates*, http://yourenergysavings.gov.au/rebates?live_in%5B%5D=64&interested%5B%5D=82&=Search, accessed on 27 August 2015.

196 AEMO, *2015 National Electricity Forecasting Report: Overview*, June 2015, pp. 8–11.

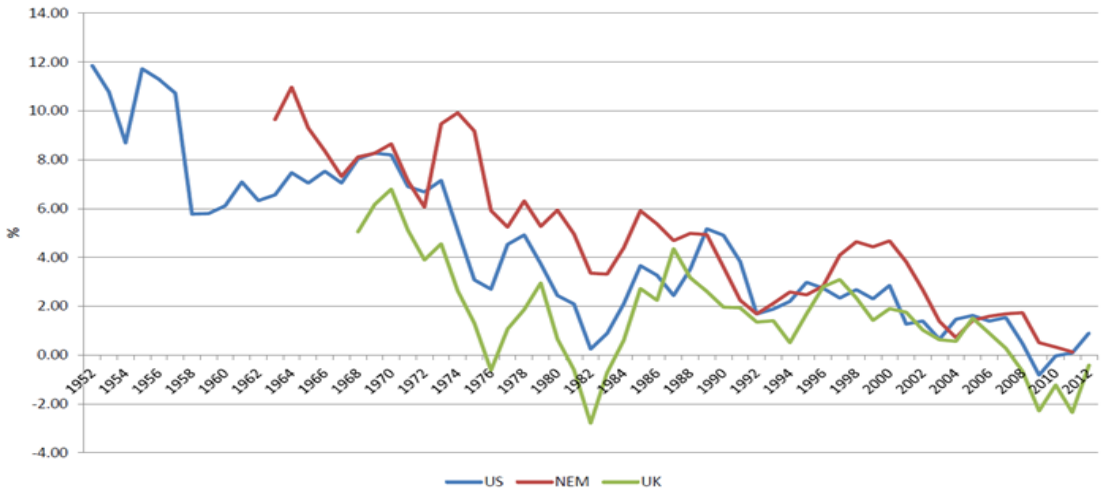
197 AEMO, *Detailed summary of 2015 electricity forecasts, 2015 National Electricity Forecasting Report*, June 2015, p. 67.

we consider the continuing presence of energy efficiency measures, improving appliance efficiencies and continued growth in rooftop PV will likely put downward pressure on demand, which may counteract any demand growth due to economic and population growth. Solar PV and energy efficiency are not transient or temporary phenomena, but rather fundamental changes in the way electricity is consumed.

As set out in section C.4 below, we consider that AusNet Services' forecasting methodology does not adequately capture the changes that we are observing in the Victorian electricity market. AusNet Services' methodology uses a limited data series which effectively locks in the relationship between peak demand and weather that occurred in 2009. We are not satisfied that this reflects a realistic expectation of future demand since we are not confident that the approach to weather normalisation used in AusNet Services' model is able to fully capture the observed changes in demand pattern in recent years.

We note this is consistent with international trends. Figure 6.25 highlights the fact that growth in electricity demand is currently low or zero in the USA and UK despite the existence of continued population growth and economic growth. In other words, this chart suggests that the impact of economic growth and population growth on electricity demand is being offset by other factors (such as improving energy efficiency). Taken together, it is reasonable to conclude that high growth is unlikely over 2016–20.[198]

Figure 6.25 Long term trends in electricity growth rates



Source: Energy Supply Association of Australia (ESAA).[199]

[198] Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, p. 11.

[199] Economic and Social Outlook Conference 2014, ESAA, 3 July 2014, p. 7, accessed on 18 August 2015 at: http://www.melbourneinstitute.com/downloads/conferences/Outlook2014/Outlook2014_slides/6_Warren,%20Matthew.pdf.

C.4 AusNet Services' forecasting methodology and assumptions

Our next step in examining AusNet Services' forecasts of maximum demand is to look at AusNet Services' methodology and whether it is likely to result in an unbiased demand forecast.

AusNet Services' forecasting methodology analysed a pool of historical data for the relationship between demand and temperature and considered only the highest maximum demand at a given temperature. In estimating the POE10 and POE50 temperatures, Dr Biggar observed that AusNet Services take a rolling set of ten peak annual temperatures. The POE10 value is the highest of this set and the POE50 is the median value.

In Biggar's 2015 report, he expressed concern that AusNet Services' approach will tend to over-estimate the POE10 and POE50 forecasts. Biggar stated that the issue with this approach is that a set of ten consecutive years may easily have temperature outcomes which are above or below the long term averages.

Biggar also noted AusNet Services are in effect estimating a relationship between per capita peak demand and temperature as it occurred in 2009.[200] This approach effectively locks in the relationship between maximum demand and temperature to past market conditions. If there are changes in the market which are not captured in the forecasting model, the model will not provide a reliable guide to future outcomes.

ACIL Allen, in their report comparing AusNet Services methodology to their methodology (commissioned by AusNet Services), stated:[201]

> Temperatures that are unusually high are, by definition, observed infrequently. Therefore, in AusNet Services the S-curve is calibrated to data that are outdated. In practice, the very high temperature observations in the normalisation process are likely to have been observed in 2009, because temperatures that year were extremely high.
>
> This means that AusNet Services methodology does not describe the relationship between very high temperatures and demand to the extent that there may have been changes since 2009. Those changes may be due to changing appliance efficiency or economic growth for example.

ACIL Allen view was that AusNet Services POE10 forecast is likely to be biased upwards and recommend that a longer time series of at least 30 years be used to estimate the 10 and 50 POE temperatures. ACIL Allen's reasons for this view are outlined below:[202]

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200 Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, pp. 27–30.

201 ACIL Allen, *Report to AusNet Services, Distribution demand forecasting: Comparison of AusNet Services and ACIL Allen methodologies*, 17 April 2015, pp. 15–23.

202 ACIL Allen, *Report to AusNet Services, Distribution demand forecasting: Comparison of AusNet Services and ACIL Allen methodologies*, 17 April 2015, pp. 15–23.

> This means at any point in time, there are only ten data points used to calculate the 10 and 50 POE temperature that is to calculate the 10 and 50 POE level of demand. We consider this isn't a sufficiently long time series to accurately reflect the possible distribution of temperatures that might be observed in the future…Moreover the last ten years contains the extreme weather events of 2009, which lie well above the 10 POE level of demand using a longer time series of temperature data. Using a 10 year rolling average, the 2009 highest maximum temperature is used to obtain the 10 POE average maximum demand. In our view this is likely to be biased upwards due to the extreme weather of 2009.

Dr Biggar acknowledged that AusNet Services' methodology is econometrically sophisticated, and has been prepared in good faith using tools which have proven robust and effective in the past.[203] In particular, Dr Biggar considered AusNet Services' approach of using S-curves should reduce the likelihood of over-estimating growth in regions that are approaching their natural growth limits. AusNet Services has also explicitly recognised that new customers tend to be more energy efficient than existing customers. However, AusNet Services' model implicitly forecasts a return to the temperature-demand relationship that occurred in 2009. Dr Biggar's 2015 report noted that AusNet Services approach to estimating the temperature-demand relationship combines data from many different years and therefore may not reflect a stable, robust relationship, especially since other evidence suggests that this curve has been shifting down over time (due to investment in solar PV and increasing energy efficiency). [204]

We have used AEMO's connection point demand forecasts as an independent comparison to AusNet Services' forecast. In September 2014, AEMO published its report on connection point demand forecasts for each of the Victorian electricity distributors for the 2014–2023 period. As noted previously, AEMO forecasts low or zero demand growth over the 2016–20 period.

AEMO's connection point demand forecasts are based on a methodology developed by ACIL Allen, which was developed after consultation during 2012–13 with all distribution businesses.[205] This methodology does not assume a particular long term structural relationship for demand over time. AEMO has decided to adopt a 'cubic' relationship with historical demand and adopts an "off the point approach" (which means that the demand forecast begins at the most recent point of actual demand).

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[203] Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, p. 1 and pp. 2–-30.

[204] Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, pp. 27–30.

[205] In December 2012, the Council of Australian Governments (COAG) released its energy market reform implementation plan. In this plan, AEMO will develop independent demand forecasts in 2013–14 to inform the Australian Energy Regulator's (AER) assessment of infrastructure investment plans submitted by Network Service Providers (NSPs). Further detail is provided at http://www.aemo.com.au/Electricity/Planning/Forecasting/AEMO-Transmission-Connection-Point-Forecasting.

ACIL Allen's "off-the-point" approach is not without its criticisms. In particular, it relies on judgement to adopt an alternative to a historical linear trend and to start the forecast at the most recent point, which can be arbitrary if not based on first principles or underlying economic phenomena.[206] However, we consider it is a better model for forecasting demand for AusNet Services' network for 2015–20 than AusNet Services' model. This is because ACIL Allen's model can control for changes in maximum demand over time due to economic growth and allows for more complex temperature relationships to be estimated. We also consider ACIL Allen's longer time series of at least 30 years more accurately reflects the possible distribution of temperatures that may be observed in the future. Because of this, we consider that AEMO's forecast is more likely to reflect a realistic expectation of demand over the 2016–20 period.

AusNet Services compares its demand forecasting methodology to ACIL Allen's in its regulatory proposal. Some of the issues raised by AusNet Services are:

- AusNet Services disagrees with AEMO's post model adjustments for energy efficiency and solar PV
- AEMO's forecasts for the terminal station that service the North and South-Eastern regions of Melbourne are lower than AusNet Services' forecasts. [207]

We took these into account. On balance, we are of the view that the key difference between the results from AusNet Services' and AEMO's forecasts is whether the relationship adopted between demand and temperature accurately reflects fundamental long term trends. In forming our view, we have recognised that each model has strengths and limitations. These are highlighted in our analysis above and Dr Biggar's report.[208] We do not consider AusNet Services' model appropriately reflects the changes we have observed in the electricity market. As stated previously, we are open to AusNet Services submitting an alternative forecast that captures the changes that we are observing for the electricity market in Victoria and recent declines in demand.

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[206] This was a source of criticism in Frontier Economics' peer review of AEMO's demand forecasts. See Frontier, "High level review of transmission connection point forecasts: Victoria", A report prepared for the Australian Energy Market Operator, September 2014.

[207] AusNet Services, *Regulatory proposal: Electricity distribution price review 2016–20*, 30 April 2015, pp. 80–81.

[208] Biggar, *2015 Victorian Electricity Distribution Pricing review: An Assessment of the Vic DNSP's Demand Forecasting Methodology*, August 2015, pp. 27–30.

D Predictive modelling approach and scenarios

This section provides a guide to our repex modelling process. It sets out:

- the background to the repex modelling techniques
- discussion of the data required to apply the repex model
- detail on how this data was specified
- description of how this data was collected and refined for inclusion in the repex model
- the outcomes of the repex model under various input scenarios.

This supports the detailed and multifaceted reasoning outlined in appendix A.

D.1 Predictive modelling techniques

In late 2012 the AEMC published changes to the National Electricity and National Gas Rules.[209] In light of these rule changes the AER undertook a "Better Regulation" work program, which included publishing a series of guidelines setting out our approach to regulation under the new rules.[210]

The expenditure forecast assessment Guideline (Guideline) describes our approach, assessment techniques and information requirements for setting efficient expenditure allowances for distributors.[211] It lists predictive modelling as one of the assessment techniques we may employ when assessing a distributor's repex. We first developed and used our repex model in our 2009–10 review of the Victorian electricity DNSPs' 2011–15 regulatory proposals and have also used it subsequently.[212]

The technical underpinnings of the repex model are discussed in detail in the Replacement expenditure model handbook.[213] At a basic level, the model predicts the volume of a distributor's assets that may need to be replaced over each of the next 20 years. This prediction is made by looking at the age of assets already in commission, and the time at which, on average, these assets would be expected to be replaced. The unit cost of replacing the assets is used to provide an estimate of replacement expenditure. The data used in the model is derived from the distributor's regulatory information notice (RIN) responses and from the outcomes of the unit cost and

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209 AEMC, *Rule Determination, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012.

210 See AER *Better regulation reform program* web page at http://www.aer.gov.au/Better-regulation-reform-program.

211 AER, *Expenditure Forecast Assessment Guideline for Electricity Distribution*, November 2013; AER, *Expenditure Forecast Assessment Guideline for Electricity Transmission*, November 2013.

212 AER Determinations for 2011–15 for CitiPower, Jemena, Powercor, SP AusNet, and United Energy.

213 AER, *Electricity network service providers: Replacement expenditure model handbook*, November 2013.

replacement life benchmarking across all distribution businesses in the NEM. These processes are described below.

D.2 Data specification process

Our repex model requires the following input data on a distributor's network assets:

- the age profile of network assets currently in commission
- expenditure and replacement volume data of network assets
- the mean and standard deviation of each asset's replacement life (replacement life).

Given our intention to apply unit cost and replacement life benchmarking techniques, we defined the model's input data around a series of prescribed network asset categories. We collected this information by issuing two types of RINs:

1. "Reset RINs" which we issued to distributors requiring them to submit this information with their upcoming regulatory proposal

2. "Category analysis RINs" which we issued to all distributors in the NEM.

The two types of RIN requested the same historical asset data for use in our repex modelling. The Reset RIN also collected data corresponding to the distributors' proposed forecast repex over the 2016–20 regulatory control period. In both RINs, the templates relevant to repex are sheets 2.2 and 5.2.

For background, we note that in past determinations, our RINs did not specify standardised network asset subcategories for distributors to report against. Instead, we required the distributors to provide us data that adhered to broad network asset groups (e.g. poles, overhead conductors etc.). This allowed the distributor discretion as to how its assets were subcategorised within these groups. The limited prescription over asset types meant that drawing meaningful comparisons of unit costs and replacement lives across distributors was difficult.[214]

Our changed approach of adopting a standardised approach to network asset categories provides us with a dataset suitable for comparative analysis, and better equips us to assess the relative prices of capital inputs as required by the capex criteria.[215]

When we were formulating the standardised network assets, we aimed to differentiate the asset categorisations where material differences in unit cost and replacement life existed. Development of these asset subcategories involved extensive consultation

[214] The repex model has been applied in the Victorian 2011–15 and Aurora Energy 2012–17 distribution determinations; AER, *Electricity network service providers: Replacement expenditure model handbook*, November 2013.

[215] NER, cl. 6.5.7(e)(6).

with stakeholders, including a series of workshops, bilateral meetings and submissions on data templates and draft RINs.[216]

D.3 Data collection and refinement

The new RINs represent a shift in the data reporting obligations on distributors. Given this is the first period in which the distributors have had to respond to the new RINs, we undertook regular consultation with the distributors. This consultation involved collaborative and iterative efforts to refine the datasets to better align the data with what we require to deploy our assessment techniques. We consider that the data refinement and consultation undertaken after the RINs were received, along with the extensive consultation carried out during the Better Regulation process, provide us with reasonable assurance of the data's quality for use in this part of our analysis.

To aid distributors, an extensive list of detailed definitions was included as an appendix to the RINs. Where possible, these definitions included examples to assist distributors in deciding whether costs or activities should be included or excluded from particular categories. We acknowledge that, regardless of how extensive and exhaustive these definitions are, they cannot cater for all possible circumstances. To some extent, distributors needed to apply discretion in providing data. In these instances, distributors were required to clearly document their interpretations and assumptions in a “basis of preparation” statement accompanying the RIN submission.

Following the initial submissions, we assessed the basis of preparation statements that accompanied the RINs to determine whether the data submitted complied with the RINs. We took into account the shift in data reporting obligations under the new RINs when assessing the submissions. Overall, we considered that the repex data provided by all distributors was compliant. We did find a number of instances where the distributors’ interpretations did not accord with the requirements of the RIN but for the purpose of proceeding with our assessment of the proposals, these inconsistencies were not substantial enough for a finding of non-compliance with the NEL or NER requirements.[217]

Nonetheless, in order that our data was the most up to date and accurate, we did inform distributors, in detailed documentation, where the data they had provided was not entirely consistent with the RINs, and invited them to provide updated data. Refining the repex data was an iterative process, where distributors returned amended consolidated RIN templates until such time that the data submitted was fit for purpose.

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[216] See AER *Expenditure forecast assessment guideline—Regulatory information notices for category analysis* webpage at http://www.aer.gov.au/node/21843.

[217] NER, cl. 6.9.1.

D.4 Benchmarking repex asset data

As outlined above, we required the following data on distributors' assets for our repex modelling:

- age profile of network assets currently in commission
- expenditure, replacement volumes and failure data of network assets
- the mean and standard deviation of each asset's replacement life.

All NEM distributors provided this data in the Reset RINs and Category analysis RINs under standardised network asset categories.

To inform our expenditure assessment for the distributors currently undergoing revenue determinations,[218] we compared their data to the data from all NEM distributors. We did this by using the reported expenditure and replacement volume data to derive benchmark unit costs for the standardised network asset categories. We also derived benchmark replacement lives (the mean and standard deviation of each asset's replacement life) for the standardised network asset categories.

In this section we explain the data sets we constructed using all NEM distributors' data, and the benchmark unit costs and replacement lives we derived for the standardised network asset categories.

D.4.1 Benchmark data for each asset category

For each standardised network asset category where distributors provided data we constructed three sets of data from which we derived the following three sets of benchmarks:[219]

- benchmark unit costs
- benchmark means and standard deviations of each asset's replacement life (referred to as "uncalibrated replacement lives" to distinguish these from the next category)
- benchmark calibrated means and standard deviations of each asset's replacement life.

Our process for arriving at each of the benchmarks was as follows. We calculated a unit cost for each NEM distributor in each asset category in which it reported replacement expenditure and replacement volumes.

[218] Vic, SA and QLD distribution network service providers—AusNet Services, United Energy, Jemena, Powercor, CitiPower, SA Power Networks, Energex and Ergon Energy.

[219] We did not derive benchmark data for some standardised asset categories where no values were reported by any distributors, or for categories distributors created outside the standardised asset categories.

To do this:

- We determined a unit cost for each distributor, in each year, for each category it reported under. To do this we divided the reported replacement expenditure by the reported replacement volume.
- Then we determined a single unit cost for each distributor for each category it reported under. We first inflated the unit costs in each year using the CPI index.[220] We then calculated a single unit cost. We did this by first weighting the unit cost from each year by the replacement volume in that year. We then divided the total of these expenditures by the total replacement volume number.

We formulated two sets of replacement life data for each NEM distributor:

- The replacement life data all NEM distributors reported in their RINs.
- The replacement life data we derived using the repex model for each NEM distributor. These are also called calibrated replacement lives. The repex model derives the replacement lives that are implied by the observed replacement practices of a distributor. That is, the lives are based on the data a distributor reported in the RIN on its replacement expenditure and volumes over the most recent five years, and the age profile of its network assets currently in commission. In this way, they can be said to derive from the distributors observed replacement practices. The calibrated lives the repex model derives can differ from the replacement lives a distributor reports.

We derived the benchmarks for an asset category using each of the three data sets above. That is, we derived a set of benchmark unit costs, benchmark replacement lives, and benchmark calibrated replacement lives for an asset category. To differentiate the two sets of benchmarked replacement lives, we refer to the benchmarks based on the calibration process as 'benchmarked calibrated replacement lives' and those based on replacement lives reported by the NEM distributors as 'benchmarked uncalibrated replacement lives'. We applied the method outlined below to each of the three data sets.

We first excluded Ausgrid's data, since it reported replacement expenditure values as direct costs and overheads. Therefore these expenditures were not comparable to all other NEM distributors which reported replacement expenditure as direct costs only. We then excluded outliers by:[221]

- calculating the average of all values for an asset category

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[220] We took into account whether the distributor reported on calendar or financial year basis.

[221] For the benchmarked calibrated replacement lives we performed two additional steps on the data prior to this. We excluded any means where the distributor did not report corresponding replacement expenditure. This was because zero volumes led to the repex model deriving a large calibrated mean which may not reflect industry practice and may distort the benchmark observation. We also excluded any calibrated mean replacement lives above 90 years. Although the repex model can generate these large lives, observations of more than 90 years exceed the number of years reportable in the asset age profile.

- determining the standard deviation of all values for an asset category
- excluding values that were outside plus or minus one standard deviation from the average.

Using the data set excluding outliers we then determined the:

- Average value:
    - benchmark average unit cost
    - benchmark average mean and standard deviation replacement life
    - benchmark average calibrated mean and standard deviation replacement life.
- One quartile better than the average value:
    - benchmark first quartile unit cost (below the mean)
    - benchmark third quartile uncalibrated mean replacement life (above the mean)
    - benchmark third quartile calibrated mean replacement life (above the mean).
- 'Best' value:
    - benchmark best (lowest) unit cost
    - benchmark best (highest) uncalibrated mean replacement life
    - benchmark best (highest) calibrated mean replacement life.[222]

D.5 Repex model scenarios

As noted above, our repex model uses an asset age profile, expected replacement life information and the unit cost of replacing assets to develop an estimate of replacement volume and expenditure over a 20 year period.

The asset age profile data provided by the distributors is a fixed piece of data. That is, it is set, and not open to interpretation or subject to scenario testing.[223] However, we have multiple data sources for replacement lives and unit costs, being the data provided by the distributors, data that can be derived from their performance over the last five years, and benchmark data from all distributors across the NEM. The range of

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[222] We did not determine quartile or best values for the uncalibrated standard deviation and calibrated standard deviation replacement lives. This is because we used the benchmark average replacement lives (mean and standard derivation) for comparative analysis between the distributors. However, the benchmark quartile and best replacement life data was for use in the repex model sensitivity analysis. The repex model only requires the mean component of an asset's replacement life as an input. The repex model then assumes the standard deviation replacement life of an asset is the square root of the mean replacement life. The use of a square root for the standard deviation is explained in more detail in our Replacement expenditure model handbook; AER, *Electricity network service providers: Replacement expenditure model handbook*, November 2013.

[223] It has been necessary for some distributors to make assumptions on the asset age profile to remove double counting. This is detailed at the end of this appendix.

different inputs allows us to run the model under a number of different scenarios, and develop a range of outcomes to assist in our decision making.

We have categorised three broad input scenarios under which the repex model may be run. These are explained in greater detail within our Replacement expenditure model handbook.[224] They are:

(1) The Base scenario – the base scenario uses inputs provided by the distributor in their RIN response. Each distributor provided average replacement life data as part of this response. As the distributors did not explicitly provide an estimate of their unit cost, we have used the observed historical unit cost from the last five years and the forecast unit cost from the upcoming regulatory control period in the base scenario.

(2) The Calibrated scenario – the process of "calibrating" the expected replacement lives in the repex model is described in the AER's replacement expenditure handbook.[225] The calibration involves deriving a replacement life and standard deviation that matches the distributor's recent historical replacement practices (in this case, the five years from 2011 to 2015). The calibrated scenario benchmarks the business to its own observed historical replacement practices.

(3) The Benchmarked scenarios – the benchmarked scenarios use unit cost and replacement life inputs from the category analysis benchmarks. These represent the observed costs and replacement behaviour from distributors across the NEM. As noted above, we have made observations for an "average", "first or third quartile" and "best performer" for each repex category, so there is no single "benchmarked" scenario, but a series of scenarios giving a range of different outputs.

The model can also take into account different wooden pole staking/stobie pole plating rate assumptions (see section D.3 for more information on this process). For the Victorian distributors, who exhibit high wooden pole staking rates relative to the rest of the NEM, we have not chosen to test different staking scenarios. A full list of the scenario outcomes is provided in Table 6.13 and Table 6.14 below.

[224] AER, *Electricity network service providers: Replacement expenditure model handbook*, November 2013.

[225] AER, *Electricity network service providers: Replacement expenditure model handbook, November 2013*, pp. 20–21.

Table 6.13 Repex model outputs – replacement lives

Replacement lives	
Base case (RIN)	$1.73 billion
Calibrated lives	$490 million
Benchmarked calibrated average	$998 million
Benchmarked calibrated third quartile	$786 million
Benchmarked calibrated best	$603 million

Source: AER analysis, using historic unit costs.

Table 6.14 Repex model outputs − unit costs

Unit cost	
Benchmarked average	$608 million
Benchmarked first quartile	$433 million
Benchmarked best	$357 million

Source: AER analysis, using calibrated replacement lives.

Data assumptions

Certain data points were not available for use in the model. For unit costs, this arose either because the distributor did not incur any expenditure on an asset category in the 2011–15 regulatory control period (used to derive historical unit costs) or had not proposed any expenditure in the 2016–20 regulatory control period (used to derive forecast unit costs). If both these inputs were not available, we used the benchmarked average unit cost as a substitute input.

In addition, we did not use a calibrated asset replacement life where the distributor did not replace any assets during the 2011−15 regulatory control period. This is because the calibration process relies on replacement volumes over the five year period to derive a mean and standard deviation, and using a value of zero may not be appropriate for this purpose. In the first instance, we substituted these values with the average calibrated replacement life of the broad asset group to which the asset subcategory belonged. Where this was not available, we used the benchmarked calibrated replacement life or the base case replacement life from the distributor.

While the majority of the data was provided in a form suitable for modelling, limited adjustments needed to be made for some of the data. For AusNet Services we blended some of their historic replacement categories according to their response to information requests.

Un-modelled repex

As detailed in the AER's repex handbook, the repex model is most suitable for asset categories and groups with a moderate to large asset population of relatively homogenous assets. It is less suitable for assets with small populations or those that are relatively heterogeneous. For this reason, we chose to exclude certain data (or asset categories) from the modelling process, and did not use predictive modelling to directly assess these categories. However, where suitable data was available, we used predictive modelling to test our other findings on these categories. We decided to exclude SCADA repex from the model for this reason. Expenditure on pole top structures was also excluded, as it is related to expenditure on overall pole replacement and modelling may result in double counting of replacement volumes. Other excluded categories are detailed in appendix D.3of this preliminary decision.[226]

D.6 The treatment of staked wooden poles

The staking of a wooden pole is the practice of attaching a metal support structure (a stake or bracket) to reinforce an aged wooden pole.[227] The practice has been adopted by distributors as a low-cost option to extend the life of a wooden pole. These assets require special consideration in the repex model because, unlike most other asset types, they are not installed or replaced on a like for like basis. To understand why this requires special treatment, we have described below the normal like-for-like assumption used in the repex model, why staked poles do not fit well within this assumption, and how we adapt the model inputs to take account of this.

D.6.1 Like-for-like repex modelling

Replacement expenditure is normally considered to be on a like-for-like basis. When an asset is identified for replacement, it is assumed that the asset will be replaced with its modern equivalent, and not a different asset. For example, conductor rated to carry low voltage will be replaced with conductor of the same rating, not conductor rated for high voltage purposes.

The repex model predicts the volume of old assets that need to be replaced, not the volume of new assets that need to be installed. This is simple to deal with when an asset is replaced on a like-for-like basis – the old asset is simply replaced by a new asset of the same kind. It follows that the volume of assets that needs to be replaced where like-for-like replacement is appropriate match the volume of new assets to be

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[226] For AusNet Services, we ran a limited set of modelling scenarios on SCADA and other repex, as suitable data was available. This was used to test the findings from our other techniques. For Powercor, we ran limited scenarios on pole top structures to test the findings from our other techniques. For each of these, we relied more on other assessment techniques, as detailed in Appendix A.

[227] The equivalent practice for stobie poles is known as "plating", which similarly provides a low cost life extension. SA Power Networks carries out this process. We applied the same process for modelling SA Power Networks' stobie pole plating data as we have for staked wooden poles. However, for simplicity, this section only refers to the staking process.

installed. The cost of replacing the volume of retired assets is the unit cost of the new asset multiplied by the volume of assets that need to be replaced.

D.6.2 Non-like-for-like replacement

Where old assets are commonly replaced with a different asset, we cannot simply assume the cost of the new asset will match the cost of the old asset's modern equivalent. As the repex model predicts the number of old assets that need to be replaced, it is necessary to make allowances for the cost of a different asset in determining the replacement cost. In running the repex model, the only category where this was significant was wooden poles.

Staked and unstaked wooden poles

The life of a wooden pole may be extended by installing a metal stake to reinforce its base. Staked wooden poles are treated as a different asset in the repex model to unstaked poles. This is because staked and unstaked poles have different expected lives and different costs of replacement.

When a wooden pole needs to be replaced, it will either be staked or replaced with a new pole. The decision on which replacement type will be carried out is made by determining whether the stake will be effective in extending the pole's life, and is usually based on the condition of the pole base. If the wood at the base has deteriorated too far, staking will not be effective, and the pole will need to be replaced. If there is enough sound wood to hold the stake, the life of the pole can be extended, and a stake can be installed. Consequently, there are two possible asset replacements (and two associated unit costs) that may be made by the distributor – a new pole to replace the old one or nailing a stake to the old pole.

The other non-like-for-like scenario related to staking is where an in-commission staked pole needs to be replaced. Staking is a one-off process. When a staked pole needs to be replaced, a new pole must be installed in its place. The cost of replacing an in-commission staked pole is the cost of a new pole.

Unit cost blending

We use a process of unit cost blending to account for the non-like-for-like asset categories.

For unstaked wooden poles that need to be replaced, there are two appropriate unit costs: the cost of a new pole; and the cost of staking an old pole. We have used a weighted average between the unit cost of staking and the unit cost of pole replacement to arrive at a blended unit cost.[228] We ran the model under a variety of

[228] For example, if a distributor replaces a pole with a new pole 50 per cent of the time, and stakes the pole the other 50 per cent of the time, the blended unit cost would be a straight average of the two unit costs. If the mix was 60:40, the unit cost would be weighted accordingly.

different weightings – including the observed staking rate of the business and observed best practice from the distributors in the NEM.

For the Victorian distributors, we adopted their own observed staking ratio.

For staked wooden poles being replaced, in the first instance, we used historical data from the distributors on the proportion of different voltage staked wooden poles being replaced to approximate the volume of each new asset going forward.[229] The unit cost of replacing a staked wooden pole is a weighted average based on the historical proportion of pole types replaced. Where historical data was not available, we used the asset age data to determine what proportion of the network each pole category represented, and used this information to weight the unit costs.

D.7 Calibrating staked wooden poles

Special consideration also has to be given to staked wooden poles when determining calibrated replacement lives. This is because historical volumes of replacements are used in calibration. The RIN responses provide us with information on the volume of new assets installed over the last five years. However, the model predicts the volume of old assets being replaced. Since the replacement of staked poles is not on a like-for-like basis, we make an adjustment for the calibration process to function correctly. That is, we need to know the number of staked poles that reach the end of their economic life so we can calibrate the model for when these assets are replaced. The category analysis RIN currently only provides us with information on how many new stakings have taken place, rather than how many were actually replaced. We sought, and were provided with this information directly from the distributors.

[229] Poles with different maximum voltages have different unit costs. An assumption needs to be made to determine, for example, how many new ">1kv poles" and how many new "1kv-11kv" need to be installed to replace the staked wooden poles.

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