



DRAFT DECISION
AusNet Services transmission
determination
2017–18 to 2021–22

Attachment 6 – Capital
expenditure

July 2016

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Note

This attachment forms part of the AER's draft decision on AusNet Services' revenue proposal 2017–22. It should be read with other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – maximum allowed revenue

Attachment 2 – regulatory asset base

Attachment 3 – rate of return

Attachment 4 – value of imputation credits

Attachment 5 – regulatory depreciation

Attachment 6 – capital expenditure

Attachment 7 – operating expenditure

Attachment 8 – corporate income tax

Attachment 9 – efficiency benefit sharing scheme

Attachment 10 – capital expenditure sharing scheme

Attachment 11 – service target performance incentive scheme

Attachment 12 – pricing methodology

Attachment 13 – pass through events

Attachment 14 – negotiated services

Contents

Note	6-2
Contents	6-3
Shortened forms	6-6
6 Capital expenditure	6-8
6.1 Draft decision	6-8
6.2 AusNet Services' proposal	6-11
6.3 AER's assessment approach	6-12
Expenditure Assessment Guideline	6-15
6.3.1 Building an alternative estimate of total forecast capex	6-15
6.3.2 Comparing the service provider's proposal with our alternative estimate	6-17
6.4 Reasons for draft decision	6-18
6.4.1 Efficiency review of past capital expenditure	6-19
6.4.2 Key assumptions	6-20
6.4.3 Forecasting methodology	6-21
6.4.4 AusNet Services' capex performance	6-22
6.4.4.1 AusNet Services' historical capex trends	6-23
6.4.5 Interrelationships	6-25
6.4.6 Consideration of the capex factors	6-26
A Assessment techniques	6-28
A.1 Economic benchmarking	6-28
A.2 Trend analysis	6-29
A.3 Methodology review	6-30
A.4 Predictive modelling	6-31
B Assessment of capex drivers	6-32

B.1	Alternative estimate	6-32
B.2	Forecast repex.....	6-32
B.2.1	Position	6-32
B.2.2	AusNet Services' revenue proposal.....	6-33
B.2.3	AER repex findings	6-33
	Historical and forecast repex trends.....	6-33
	Methodology review - key findings	6-36
	Project cost estimation.....	6-36
	Top-down adjustment to cost estimates	6-40
	Assessment of economic risk based approach	6-42
	Application of demand forecasts	6-42
	Estimation of safety risk	6-44
	Quantifying safety risk.....	6-46
	AusNet Services' operating environment.....	6-47
	AusNet Services' safety risk controls.....	6-49
	Summary	6-51
	Asset replacement programs	6-52
	CBD station rebuilds and major station replacement projects.....	6-54
	Summary of repex findings	6-56
	West Melbourne Terminal Station project	6-57
	Predictive modelling.....	6-58
	Network health indicators.....	6-59
	Asset condition	6-61
	Asset failure performance	6-62
	Asset age profile	6-63
B.3	Forecast non-network capex.....	6-67
B.3.1	Position	6-67
B.3.2	AusNet Services' proposal	6-68

B.3.3	Information and communications technology capex	6-70
B.3.4	Fleet capex	6-72
Fleet asset disposals		6-72
B.4	Forecast capitalised overheads	6-74
B.4.1	Position	6-74
B.4.2	Our assessment	6-74
C	Demand	6-76
D	Contingent projects	6-80
E	Statement of efficiency – 2014-15 capex	6-81
E.4.1	Position	6-81
E.4.2	AER approach	6-81
E.4.3	AER assessment	6-82
F	Information and communications technology capex - confidential appendix	6-85

Shortened forms

Shortened form	Extended form
AARR	aggregate annual revenue requirement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASRR	annual service revenue requirement
augex	augmentation expenditure
capex	capital expenditure
CCP	Consumer Challenge Panel
CESS	capital expenditure sharing scheme
CPI	consumer price index
DRP	debt risk premium
EBSS	efficiency benefit sharing scheme
ERP	equity risk premium
MAR	maximum allowed revenue
MRP	market risk premium
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NSP	network service provider

Shortened form	Extended form
NTSC	negotiated transmission service criteria
opex	operating expenditure
PPI	partial performance indicators
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
repex	replacement expenditure
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue and pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
STPIS	service target performance incentive scheme
TNSP	transmission network service provider
TUoS	transmission use of system
WACC	weighted average cost of capital

6 Capital expenditure

Capital expenditure (capex) refers to the capital expenses incurred in the provision of prescribed transmission services. This investment mostly relates to assets with long lives and these costs are recovered over several regulatory control periods. On an annual basis, however, the financing cost and depreciation associated with these assets are recovered (return on and of capital) as part of the building blocks that form AusNet Services' total revenue requirement.¹

This attachment sets out our draft decision on AusNet Services' proposed total forecast capex for the 2017–22 regulatory control period. Further detailed analysis is in the following appendices:

- Appendix A - Assessment techniques
- Appendix B - Assessment of capex drivers
- Appendix C - Demand
- Appendix D - Contingent projects
- Appendix E - Statement of efficiency
- Appendix F - Information and communications technology capex (confidential)

6.1 Draft decision

We are not satisfied that AusNet Services' proposed total forecast capex of \$745.6 million (\$2016-17) for the 2017–22 regulatory control period reasonably reflects the capex criteria. We have substituted it with our estimate of AusNet Services' total forecast capex for the 2017–22 regulatory control period. We are satisfied that our substitute estimate of \$573.1 million (\$2016–17) reasonably reflects the capex criteria. Table 6.1 outlines our draft decision. The difference is largely due to our findings that AusNet Services has adopted an overly conservative approach to quantifying risk.

Table 6.1 Draft decision on AusNet Services' total forecast capex (\$2016–17, million)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
AusNet Services' proposal	178.9	155.3	151.6	140.5	119.3	745.6
CPI adjustment	-3.2	-2.8	-2.7	-2.5	-2.1	-13.3
AusNet Services' proposal (CPI adjusted)	175.7	152.5	148.9	137.9	117.1	732.2
Non CPI adjustment	-19.2	-30.6	-42.6	-39.0	-27.7	-159.1

¹ NER, cl. 6A.5.4(a).

AER draft decision	156.5	121.9	106.3	99.0	89.4	573.1
Total adjustment	-22.4	-33.4	-45.3	-41.5	-29.8	-172.5
Total adjustment (%)	-12.5%	-21.5%	-29.9%	-29.5%	-25.0%	-23.1%

Source: AusNet Services, *Revenue proposal*, October 2015, p. 81; AER analysis

Note: Numbers may not add up due to rounding.

We are guided by the NER in our assessment of a network service provider's capex forecasts (and indeed many other aspects of the service provider's revenue proposal). The NER requires us to accept the forecast of required capex included in a building block proposal if we are satisfied that the total of the forecast capex for the regulatory control period reasonably reflects the criteria set out in clause 6A.6.7(c) of the NER. In the event that we are not so satisfied, the NER guides us to substitute the service provider's forecast of required capex with one that we are satisfied does meet the capex criteria.

We use a variety of techniques in arriving at a forecast of required capex that we are satisfied meet the capex criteria, including economic benchmarking, trend analysis, predictive modelling, and a review of forecasting methodology, inputs and assumptions. We also have regard to stakeholder submissions in arriving at our findings.

A summary of our reasons and findings that we present in this attachment and appendix B is set out in Table 6.2. In the table we present our reasons largely by 'capex category' such as station rebuilds and non-network capex. This reflects the way in which we tested AusNet Services' proposed total forecast capex. Our testing used techniques tailored to the different capex categories taking into account the best available evidence. Through our techniques, we found some aspects of AusNet Services' proposal were not consistent with the NER. Our findings on AusNet Services' quantification of safety and reliability risks, and the cost estimation methodology used to derive project cost estimates largely explain why we are not satisfied that AusNet Services' proposed total forecast capex meets the capex criteria.

Our findings on the capex categories are part of our broader analysis of overall expenditure and should not be considered in isolation. We do not approve an amount of forecast expenditure for each capex category. Our draft decision concerns AusNet Services' total forecast capex for the 2017–22 regulatory control period. We use our findings on the different capex categories to arrive at a substitute estimate for total capex. We then test this total estimate of capex against the NER requirements. 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 \$745.6 million (\$2016–17) in its proposal. We are not satisfied this forecast reflects the capex criteria.

We are satisfied our substitute estimate of \$573.1 million (\$2016–17) reasonably reflects the capex criteria. Our substitute estimate is 23 per cent lower than AusNet Services' proposal.

The reasons for this draft decision are summarised in this table and detailed in the remainder of this attachment.

Forecasting methodology, key assumptions and past capex performance	<p>Our concerns involve some aspects of AusNet Services' forecasting methodology and key assumptions which are material to our view that we are not reasonably satisfied that its proposed total forecast capex reasonably reflects the capex criteria.</p> <p>AusNet Services' forecasting methodology predominately relies upon a bottom-up build of projects and programs (or bottom-up assessment) to estimate the forecast expenditure. As discussed in recent determinations, bottom up approaches have tendency to overstate the efficient capex as they do not adequately account for inter-relationships and synergies between projects or areas of work. AusNet Services has made an explicit adjustment of 0.89 per cent to the total capex forecast to reflect the cost savings that are expected at the portfolio level. While we consider AusNet Services' planning strategy to be reasonable, we have not accepted this 0.89 per cent adjustment is likely to capture expected cost efficiencies at the portfolio level. We have also identified some deficiencies with AusNet Services' forecasting methodology and key assumptions such that the total capex forecast is not reasonably likely to reflect the capex criteria. These issues include:</p> <ul style="list-style-type: none"> • over-estimation of project cost estimates resulting in an overestimation of the capex forecast • over-estimation of safety related risks from asset failures resulting in an overestimation of the capex forecast • over-estimation of energy at risk from asset failures resulting in an overestimation of the capex forecast. <p>In constructing our alternative estimate we have addressed these aspects of AusNet Services' forecasting methodology and key assumptions.</p>
CBD station rebuilds	<p>We do not accept AusNet Services' forecast repex of \$109.5 million (\$2016-17), excluding overheads. In particular, on the basis that AusNet Services has overestimated safety risk, energy at risk and project costs we consider that a lower amount of capex is prudent and efficient. We have instead included in our substitute estimate of overall total capex an amount of \$64.9 million (\$2016-17) for repex related to CBD station rebuilds.</p>
Major stations replacement	<p>We do not accept AusNet Services' forecast repex of \$177.5 million (\$2016-17), excluding overheads. In particular, on the basis that AusNet Services has overestimated safety risk, energy at risk and project costs we consider that a lower amount of capex is prudent and efficient. We have instead included in our substitute estimate of overall total capex an amount of \$100.4 million (\$2016-17) for repex related to major stations.</p>
Asset replacement programs	<p>We do not accept AusNet Services' forecast repex of \$230.5 million (\$2016-17), excluding overheads. In particular, on the basis that AusNet Services has overestimated safety risk and project costs we consider that a lower amount of capex is prudent and efficient. We have instead included in our substitute estimate of overall total capex an amount of \$199.1 million (\$2016-17) for repex related to asset replacement programs.</p>
Safety, security and compliance	<p>We do not accept AusNet Services' forecast repex of \$65.9 million (\$2016-17), excluding overheads. In particular, on the basis that AusNet Services has overestimated safety risk and project costs we consider that a lower amount of capex is prudent and efficient. We have instead included in our substitute estimate of overall total capex an amount of \$56.9 million (\$2016-17) for repex related to safety security and compliance.</p>
Non-network capex	<p>We do not accept AusNet Services' forecast non-network capex of \$105.8 million (\$2016-17), excluding overheads. We have instead included an amount of \$99.4 million (\$2016-17).</p>

We accept AusNet Services' forecasts for motor vehicles and buildings and property capex as reasonably reflecting required expenditure in these categories. We do not accept AusNet Services' forecast for ICT capex. In our view, AusNet Services' IT forecast does not reflect the efficient costs of a prudent operator. We consider that AusNet Services has not supported some elements of its forecast either with business cases or other supporting information.

Capitalised overheads	<p>We do not accept AusNet Services' proposed forecast of capitalised overheads of \$56.5 million (\$2016-17). We have instead included in our substitute estimate of overall total capex an amount of \$52.4 million (\$2016-17) for capitalised overheads.</p> <p>We reduced AusNet Services' capitalised overheads to reflect the reductions we made to their total capex forecast, particularly those components with overheads</p>
Real cost escalators	<p>We are 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 2017–22 regulatory period. AusNet Services' forecast methodology is consistent with our approach in our recent Victorian distribution determinations and our updated forecasts. We will consider updating these forecasts for the latest available data as part of our final decision. We discuss our assessment of forecast our labour price growth for AusNet Services in attachment 7.</p> <p>AusNet Services has also used CPI estimates to represent its capex forecast in 2016-17 dollars. We substituted these estimates for the actual CPI. This has reduced AusNet Services' forecast capex by \$13.3 million over the 2017-22 regulatory control period. AusNet Services has not proposed to apply real cost escalation for materials in its capex forecast. We have accepted this approach.</p>

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.

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. 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.

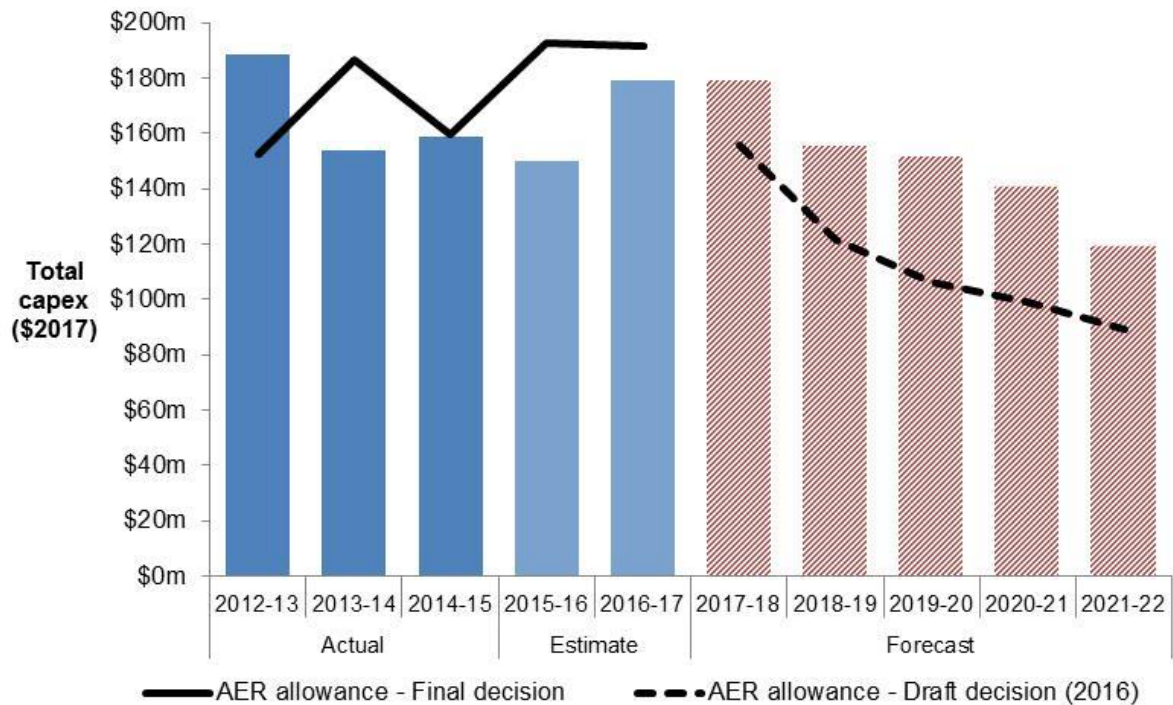
6.2 AusNet Services' proposal

AusNet Services proposed total forecast capex of \$745.6 million (\$2016–17) for the 2017–22 regulatory control period. This is \$85.2 million (\$2016–17) or 10 per cent below AusNet Services' actual and estimated capex of \$830.8 million for the 2012–17 period.

AusNet Services' capex forecast relates to only replacement of network assets. AusNet Services' has not proposed augmentation related capex as AEMO is responsible for the planning and procuring augmentation of AusNet Services' shared transmission network. Using its own capex categorisation, AusNet Services' proposed expenditure on major station rebuilds is a major driver of its capex forecast and the profile of its forecast, accounting for around 42 per cent of its capex forecast.² Asset replacement programs addressing specific plant items or asset condition issues for particular types of assets (e.g. circuit breakers) is the next largest category, accounting for approximately 34 per cent of total forecast capex.³

Figure 6.1 shows AusNet Services' forecast capex for each year of the 2017–22 regulatory control period. It also shows AusNet Services' actual capex for each year of the 2012–17 period.

Figure 6.1 AusNet Services' total actual and forecast capex



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

² AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p.82.

³ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 59.

we compare the service provider's total forecast capex. The information AusNet Services provided in its revenue proposal, including its response to our RIN, is an important part of our assessment. We have also taken into account information that AusNet Services provided in response to our information requests, and submissions from stakeholders.

Our assessment approach involves the following steps:

- Our starting point is AusNet Services' revenue proposal.⁴ We apply our various assessment techniques, both qualitative and quantitative, to assess the different elements of AusNet Services' proposal. This analysis informs our view on whether AusNet Services' proposal reasonably reflects the capex criteria set out in the NER.⁵ It also provides us with an alternative forecast that we consider meets the criteria. In arriving at our alternative estimate, we weight the various techniques 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 service provider's total forecast capex. This includes comparing our alternative estimate total with the service provider'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 that the service provider's proposal reasonably reflects the capex criteria in meeting the capex objectives, we accept it. The capital expenditure objectives (capex objectives) referred to in the capex criteria are to:⁶

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

If we are not satisfied, the NER requires us to put in place a substitute estimate which we are satisfied reasonably reflects the capex criteria.⁷ Where we have done this, our substitute estimate is based on our alternative estimate.

⁴ AER, *Expenditure Forecast Electricity Transmission Guideline*, November 2013, p. 9; see also AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, pp. 111 and 112.

⁵ NER, cl. 6A.6.7(c).

⁶ NER, cl. 6A.6.7(a).

⁷ NER, cl. 6A.14.1(2)(ii).

The capex criteria are:

- 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 that '[t]hese criteria broadly reflect the NEO [National Electricity Objective]'.⁸ Importantly, we approve a total capex forecast and not particular categories, projects or programs in the capex forecast. Our review of particular categories or projects informs our assessment of the total capex forecast. The AEMC stated:⁹

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.¹⁰

In taking these factors into account, the AEMC has noted that:¹¹

...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.¹² 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.¹³

⁸ AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 113 (AEMC Economic Regulation Final Rule Determination).

⁹ AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. vii.

¹⁰ NEL, cl. 6A.6.7(e).

¹¹ AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. 115.

¹² NEL, ss. 7A and 16(2).

¹³ NEL, s. 7A.

Expenditure Assessment Guideline

We published our Expenditure Forecast Assessment Guideline for electricity transmission (Guideline) in November 2013.¹⁴ The Guideline sets out our proposed general approach to assessing capex (and opex) forecasts. This assists in providing transparency and predictability in regulatory processes and outcomes. We also 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.¹⁵ 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.

We note that the RIN data form part of a service provider's revenue proposal.¹⁶ 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 issued in advance of a service provider lodging its revenue proposal would specify the exact information we require.¹⁷ Our Guideline made clear our intention to rely upon RIN data in transmission revenue 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 AusNet Services' proposal.¹⁸ We review the proposed forecast methodology and the key assumptions that underlie the forecast. We also consider its 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 AusNet Services put 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 service provider should or should not

¹⁴ AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013.

¹⁵ AER, *Final decision - Framework and approach for AusNet Services: Regulatory control period commencing 1 April 2017*, April 2015, pp. 25–26.

¹⁶ NER, cl. 6A.10.1(c).

¹⁷ AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 25.

¹⁸ AER, *Better regulation: Explanatory statement: Expenditure forecast assessment guideline*, November 2013, p. 7; and AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, pp. 111 and 112.

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.¹⁹

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

As we explained in our Guideline:²⁰

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 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 to be 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 service provider's capex forecast.

We also take into account the various interrelationships between the total forecast capex and other components of a service provider's transmission 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.

¹⁹ AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. vii.

²⁰ AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 12.

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 cost to consumers for the most appropriate investment or activity required to achieve the expenditure objectives.²¹
- past expenditure was sufficient for AusNet Services to manage and operate its network in past periods, in a manner that achieved the capex objectives.²²

6.3.2 Comparing the service provider's proposal with our alternative estimate

Having established our estimate of the total forecast capex, we can test the service provider's proposed total forecast capex. This includes comparing our estimate of forecast total capex with AusNet Services' proposal. AusNet Services' forecasting 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:²³

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 service provider's actual spending. A service provider might spend more on capex than the total forecast

²¹ AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, pp. 8 and 9. The 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 United Energy Distribution Pty Limited [2012] ACompT 1; Re: Application by ElectraNet Pty Limited (No 3) [2008] ACompT 3 ; Application by DBNGP (WA) Transmission Pty Ltd [2012] ACompT 6.

²² AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 9.

²³ AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. 112.

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 service provider does not bear the full cost where unexpected events lead to an overspend of the approved capex forecast. Rather, the service provider bears 30 per cent of this cost if the expenditure is subsequently found to be prudent and efficient. Further, the pass through provisions provide a means for a service provider to pass on significant, unexpected capex to customers, where appropriate.²⁴ Similarly, a service provider may spend less than the capex forecast because they have been more efficient than expected. In this case the service provider will keep on average 30 per cent of this reduction over time.

We set our alternative estimate at the level where the service provider has a reasonable opportunity to recover efficient costs. The regulatory framework allows the service provider 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 service provider 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 service provider only spending what is efficient. As noted, the service provider and consumers share the benefits of the underspend and the costs of an overspend under the regulatory regime.

6.4 Reasons for draft decision

We applied the assessment approach set out in section 6.3 to AusNet Services. In this draft 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 2017–22 regulatory control period.

Table 6.3 Draft decision assessment of required capex by capex driver 2017–22 (\$2016-17, million)

Category	2017–18	2018–19	2019–20	2020–21	2021–22	Total
CBD station rebuilds	23.5	13.5	14.7	9.1	4.1	64.9
Major stations replacement	42.5	16.1	10.9	15.6	15.4	100.4

²⁴ NER, r. 6.6.

Asset replacement programs	39.6	44.4	40.4	39.0	35.6	199.1
Safety, security and compliance	11.7	11.1	11.7	10.6	11.8	56.9
Non-network	27.4	25.3	17.2	15.1	14.4	99.4
Total direct costs	144.7	110.4	94.9	89.4	81.3	520.7
Capitalised overheads	11.8	11.5	11.4	9.6	8.1	52.4
Total capex	156.5	121.9	106.3	99.0	89.4	573.1

Source: AER analysis.

Note: Numbers may not add up due to rounding. The AER draft decision numbers include updated CPI estimates to escalate the forecasts into 2016-17 dollars.

Our alternative estimate of \$573.1 million is \$172.5 million lower than AusNet Services' forecast of \$745.6 million. The key components of our draft decision include:

- reductions in repex related to estimated risks associated with safety (\$99.0 million) based on a more realistic assumption of the probability of safety related outcomes
- reductions in repex related to reliability risk (\$44.1 million) driven by updated forecasts of transmission connection point demand and adoption of the AEMO forecasts
- reductions in project cost estimates to ensure the forecast is unbiased (\$13.5 million)
- reductions resulting from the application of updated CPI figures (\$13.3 million)
- reductions in non-network ICT expenditure (\$4.6 million), where this expenditure has not been supported by business cases or where no supporting information was provided.

Our assessments of capex drivers are in appendix 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.

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

6.4.1 Efficiency review of past capital expenditure

The capex incentive regime aims to ensure that only capex that is efficient should enter the regulatory asset base to be recovered from consumers.²⁵ We are required to

²⁵ AEMC, *Final Position Paper - National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 15 November 2012, p. v.

provide a statement on whether past expenditure included in the roll forward of the regulatory asset base is efficient and prudent.²⁶ For this decision, our statement relates only to the 2014-15 regulatory year.²⁷

We have assessed the extent to which the roll forward of the regulatory asset base from the 2014-17 regulatory control period to the commencement of the 2017-22 regulatory control period contributes to the achievement of the capital expenditure incentive objective.²⁸ The capital expenditure objective essentially requires that only prudent and efficient expenditure is included in the regulatory asset base.

Our approach to this assessment is consistent with our Capital Expenditure Incentive Guideline.²⁹ Our Guideline outlines a two stage process for assessing whether past expenditure is likely to be efficient and prudent.³⁰ The first stage considers whether a service provider has over-spent against its approved total capex forecast and whether the service provider's expenditure compares favourably with previous levels of capex and with other service providers.

As discussed in appendix E, our assessment of AusNet Services' past capex relates only to the 2014-15 regulatory year. We are satisfied that AusNet Services' actual capex was likely to be prudent and efficient on the basis that:

- AusNet Services has under-spent its total capex against our approved total capex forecast; and
- economic benchmarking analysis does not suggest that expenditure in the 2014-15 regulatory year was inefficient relative to previous levels of efficiency performance.

6.4.2 Key assumptions

The NER requires AusNet Services' to include in its revenue 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.³¹

The key assumptions and inputs that underlie AusNet Services' capex forecasts are.³²

- compliance with applicable regulatory and legislative requirements
- demand forecasts
- the value of customer reliability

²⁶ NER cl. 6A.14.2.(b)

²⁷ The NER requires that this statement will not apply to the regulatory year in which the Expenditure Incentive Guideline was published. As the Guideline was published in December 2013, our statement and assessment of whether any expenditure should be excluded from the RAB only covers the 2014-15 regulatory year.

²⁸ NER cl. S6A.2.2A

²⁹ AER, *Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, November 2013.

³⁰ AER, *Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, November 2013, pp.19-22.

³¹ NER, cll. S6.1.1.1(2), (4) and (5). NER, cll. S6A.1.1(2), (4) and (5).

³² AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, pp. 70-77.

- asset condition and failure risk assessments
- project cost estimates and unit rates
- capex portfolio efficiency
- capex / opex interactions
- cost escalators.

We assessed AusNet Services' key assumptions in appendices B and C to this capex attachment. We have identified concerns with some of the key assumptions relied upon by AusNet Services' either in how they were formulated or applied (e.g. we have used updated demand forecasts and adopted some alternative assumptions/inputs used to quantify risk). These concerns contribute to our draft decision that we are not satisfied that AusNet Services' forecast capex reasonably reflects the capex criteria.

6.4.3 Forecasting methodology

The NER requires AusNet Services to set out the methodology it proposes to use to prepare its forecast capex allowance before it submits its revenue proposal.³³ AusNet Services' must include this information in its revenue proposal.³⁴

AusNet Services submitted that its forecasting methodology for replacement expenditure has two stages:³⁵

- Stage 1: project based evaluation (bottom up); and
- Stage 2: aggregation and efficiencies (top down).

AusNet Services' submitted that the key aspects of stage one involves:³⁶

- an economic evaluation which focuses on the expected cost of asset failure to determine the need for replacement
- identification of technically feasible options to address the identified risk
- the preferred option is selected and a detailed project scope and detailed project cost is estimated
- the economic timing of the preferred option is established by comparing the annualised cost of the selected option with the annual incremental benefits, where the economic timing is identified as the point in time where the annualised incremental benefits just exceed the annualised costs.

AusNet Services' submitted that the keys aspects of stage two involves identifying synergies and savings when bottom up forecasts are aggregated, where:³⁷

³³ NER, cl. 6A.10.1B.

³⁴ NER, cl. 6A.10.1.

³⁵ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 65.

³⁶ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 67.

- minor replacement works may be included in a major replacement project to attain synergies in project design, project management and project establishment costs
- project based replacement may be combined with AEMO's shared network augmentation requirements or the distributor's connection augmentation needs
- project timing is reviewed so that projects with the highest asset failure risks are addressed more quickly, while lower risk projects may be deferred
- a review is undertaken of the affordability and deliverability of the total replacement expenditure forecasts.

In relation to non-network expenditure AusNet Services' submitted that with the exception of IT systems, expenditure on assets is generally non-recurrent in nature, which reflects the economic lifecycle of each asset. AusNet Services submitted that the IT expenditure forecast is based on its corporate IT strategy.³⁸

We consider that AusNet Services' forecasting methodology which adopts a risk based economic planning approach reflects good industry practice. Where we identified specific areas of concern, these relate to some of the input assumptions used in AusNet Services' forecasting methodology.

6.4.4 AusNet Services' capex performance

We have looked at a number of historical metrics of AusNet Services' capex performance to help inform our assessment of AusNet Services' proposed capex forecast. This includes AusNet Services' relative multilateral total factor productivity (MTFP) performance from our annual benchmarking report, and its proposed forecast capex allowance against historical trends.

We note that the NER sets out that we must have regard to our annual benchmarking report. 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 our high level benchmarking metrics set out below other than to note that these metrics generally support the outcomes of our other techniques. We have not used this analysis deterministically in our capex assessment.

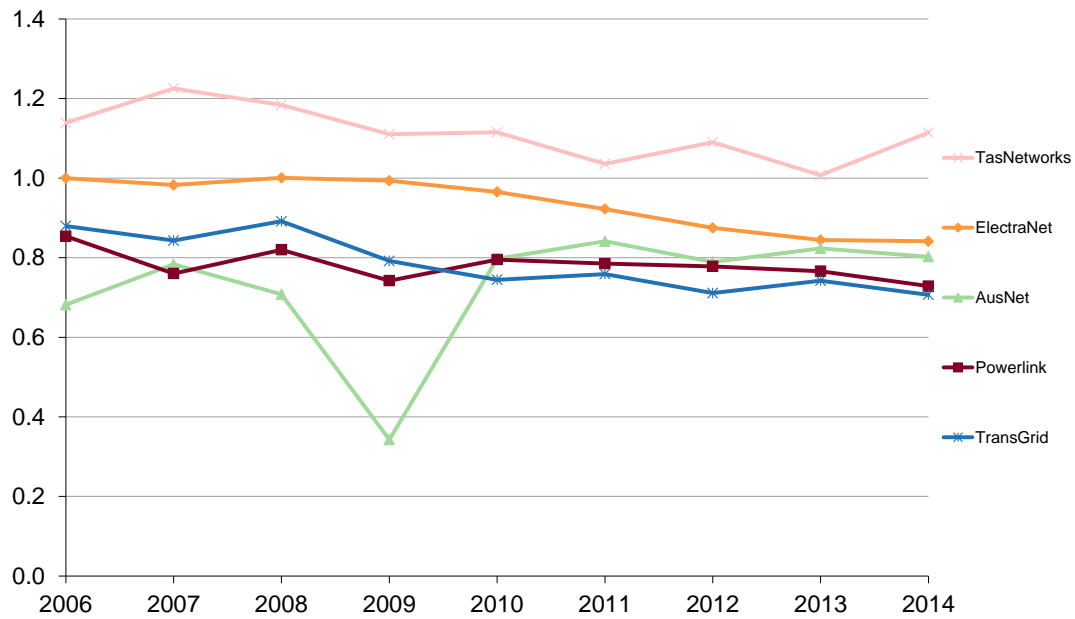
Figure 6.2 shows AusNet Services' MTFP performance over time and relative to the other service providers. MTFP measures how efficient a business is in terms of its inputs (costs) and outputs (customer numbers, ratcheted maximum demand, reliability, circuit line length and energy delivered). These results show that AusNet Services' cost efficiency has remained relatively steady since 2010 and is closely aligned to the industry average.³⁹

³⁷ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 68.

³⁸ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 101.

³⁹ AusNet Services' MTFP outcome in 2009 was affected by the result of an explosive failure at the South Morang terminal station and a conductor drop on the Bendigo to Ballarat line.

Figure 6.2 Relative MFTP performance of transmission networks



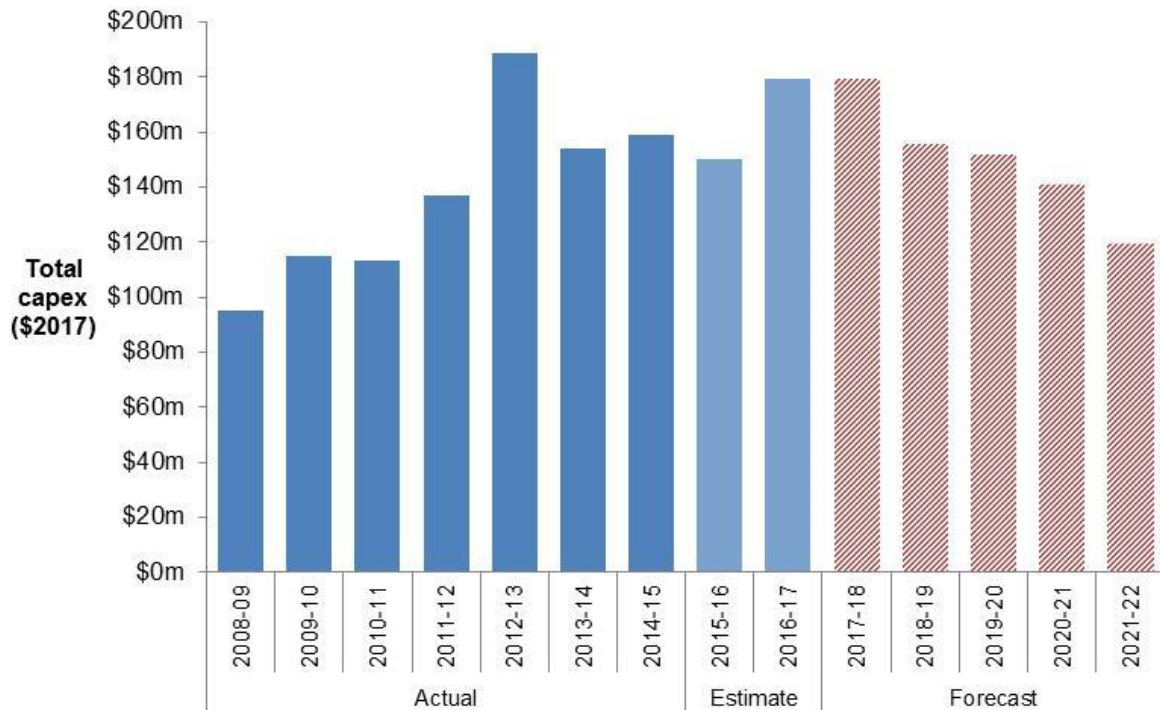
Source: AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015, p.11.

6.4.4.1 AusNet Services' historical capex trends

We compared AusNet Services' capex proposal for the 2017–22 regulatory control period against the long term historical trend in capex levels.

Figure 6.3 shows actual historic capex and proposed capex between 2008 and 2022. This figure shows AusNet Services forecasted slightly lower capex in the 2017–22 regulatory control period compared to actual/estimated capex in the 2014–17 period. AusNet Services' capex forecast for the 2017–22 regulatory control period is also forecast to decline to relatively low levels compared to historical expenditure.

Figure 6.3 AusNet Services total capex - historical and forecast (\$2016-17)



Source: AER analysis

AusNet Services stated its forecast capex is on average eight per cent lower than actual and estimated capex in the 2014–17 regulatory control period, but slightly above the long term historical average in the period prior to 2014-15.⁴⁰

The CCP submitted that despite the forecast reduction in estimated expenditure from the 2014–17 regulatory control period, AusNet Services' forecast remains approximately 20 per cent higher than capex in the period prior to 2008. The CCP also commented that AusNet Services' capex forecast is front loaded and suggested that the timing of expenditure should be examined on the basis that a flatter expenditure profile would reduce prices for consumers.⁴¹

The EUCV expressed concern regarding the contribution of forecast capex to continuing growth in AusNet's Services' regulatory asset base. The EUCV also commented that in an environment of falling or static consumption and peak demand growth that:⁴²

⁴⁰ AusNet Services, *Revenue proposal 2017–22*, 31 October 2015, p. 59.

⁴¹ Consumer Challenge Panel (Panel 5), *Submission on AusNet Services' transmission revenue review 2017-2022*, 8 February 2016, p. 19.

⁴² EUCV, *Submission on AusNet Services' transmission revenue review 2017-2022*, 9 February 2016, pp. 12–26.

- the capex proposal continues the trend of higher costs and increasing under-utilisation; and
- is not justified given AusNet Services ability to maintain reliability performance.

Our detailed assessment in appendix B takes into account these submissions. In appendix B we examine whether AusNet Services' revenue proposal reflects its expected operating environment.

6.4.5 Interrelationships

There are a number of interrelationships between AusNet Services' total forecast capex for the 2017–22 regulatory control period and other components of its transmission determination (see Table 6.4). We considered these interrelationships in coming to our draft decision on total forecast capex.

Table 6.4 Interrelationships between total forecast capex and other components

Other component	Interrelationships with total forecast capex
Total forecast opex	<p>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.</p> <p>More generally, we note our total opex forecast will provide AusNet Services with sufficient opex to maintain the reliability and safety 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 2017–22 period.</p>
Forecast demand	<p>Forecast demand is related to AusNet Services' total forecast capex. The need and timing of asset replacement is impacted on forecast demand as this affects the risk of unserved energy as a result of asset failure. Hence, a key driver of replacement related capex is maximum demand and its effect on network utilisation and reliability.</p>
Capital Expenditure Sharing Scheme (CESS)	<p>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, we are required to undertake an ex post review of the efficiency and prudence 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 over-spend is found to be inefficient through the ex post review, AusNet Services risks having to bear the entire overspend.</p>
Service Target Performance Incentive Scheme (STPIS)	<p>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 2017–22 regulatory control period. This is because such expenditure should be offset by rewards provided through the application of the STPIS.</p> <p>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.</p>
Contingent project	<p>A contingent project is interrelated to AusNet Services' total forecast capex. This is because</p>

Other component	Interrelationships with total forecast capex
	<p>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 2017–22 regulatory control period.</p> <p>AusNet Services proposed a contingent project but has subsequently advised that its contingent project proposal is no longer required since it lodged its revenue proposal.</p>

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.⁴³ 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 replex and non-network capex (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 for the 2017–22 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	<p>We had regard to AusNet Services' actual and expected capex during the 2013–17 regulatory control period and preceding regulatory control periods in assessing its proposed total forecast.</p> <p>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 and programs that underlie AusNet Services' total forecast capex.</p> <p>For non-network capex, we rely in part on trend analysis to arrive at an estimate that meets the capex criteria.</p>
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 has relied on the adoption of the value of customer reliability in its economic analysis to reflect customer preferences in developing its forecast capex.
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 accepted AusNet Services' proposed cost escalation for labour.
The substitution possibilities between operating	We had regard to the substitution possibilities between opex and

⁴³ NER, cl. 6.5.7(c), (d) and (e).

Capex factor	AER consideration
and capital expenditure	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 to arrangements with a person other than the service provider that do not reflect arm's length terms	We had regard to whether any part of AusNet Services' 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. Based on the information provided by AusNet Service's we are satisfied that the capex forecast is based on arrangements that 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 most recent National Transmission Network Development Plan (NTNDP), and any submissions made by AEMO, in accordance with the Rules, on the forecast of AusNet Services' required capex	Given the planning arrangements in Victoria, AusNet Services' capex forecast does not included augex related capex and so we have not had regard to the most recent NTNDP.
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. AusNet Services submitted that it considered that there were no viable alternatives to replacement capex.
Any relevant project assessment conclusions report required under clause 5.6.6 of the NER	There are no relevant project assessment conclusions reports relevant to AusNet Services to which we have had regard.
Any other factor the AER considers relevant and which the AER has notified AusNet Services in writing, prior to the submission of its revenue 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 have applied in assessing AusNet Services' proposed forecast capex. The extent to which we rely on each of the assessment techniques is set out in appendix B.

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 being assessed. 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 Guideline, where we stated:⁴⁴

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 DNSPs) 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.

The assessment techniques that we have used to assess AusNet Services' capex are set out below.

A.1 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report. We are required to consider economic benchmarking as it is one of the capex factors under the NER.⁴⁵ Economic benchmarking applies economic theory to measure the efficiency of a service provider's use of inputs to produce outputs, having regard to operating environment factors.⁴⁶ It allows us to compare the performance of a service provider against its own past performance, and the performance of other service providers. Economic benchmarking helps us to assess whether a service provider's capex forecast represents efficient costs.⁴⁷ As stated by the AEMC, 'benchmarking is a critical exercise in assessing the efficiency of a NSP'.⁴⁸

⁴⁴ AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p.8.

⁴⁵ NER, cl. 6A.6.7(e)(4).

⁴⁶ AER, *Explanatory Statement: Expenditure Forecasting Assessment Guidelines*, November 2013.

⁴⁷ NER, cl. 6A.6.7(c)

⁴⁸ AEMC, *National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 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 service provider's efficiency with consideration given to its inputs, outputs and its operating environment. We have considered each service provider's operating environment insofar as there are factors that are outside of a NSP's control but which affect a NSP's ability to convert inputs into outputs.⁴⁹ Once such exogenous factors are taken into account, we expect service providers to operate at similar levels of efficiency. One example of an exogenous factor that we have taken into account is customer density. For more on how we have forecast these measures, see our annual benchmarking report.⁵⁰

For the TNSPs we consider this economic benchmarking can give an indication of how the efficiency of each service provider has changed over time. We accept that it is not currently robust enough to draw conclusions about the relative efficiency of these service providers.

A.2 Trend analysis

We have considered past trends in actual and forecast capex. This is one of the capex factors that we are required to have regard to.⁵¹

Trend analysis involves comparing service providers forecast capex and work volumes against historic levels. Where forecast capex and volumes are materially different to historic levels, we have sought to understand what has caused these differences. In doing so, we have considered the reasons given by the service providers in their proposals, as well as changes in the circumstances of the service provider.

In considering whether a business' capex forecast reasonably reflects the capex criteria, we need to consider whether the forecast will allow the business to maintain reliability and safety performance, and comply with relevant regulatory obligations.⁵² The requirement to maintain reliability and safety, including regulatory obligations (specifically, service standards) are key drivers of capex. More onerous standards will typically increase capex, conversely, reduced service obligations will likely cause a reduction in the amount of capex required by a service provider.

Maximum demand is also a driver of replacement expenditure as changes in demand will affect the economic value of asset failure. As replacement often needs to occur prior to demand growth being realised, forecast rather than actual demand is relevant when a business is deciding what replacement projects will be required in an upcoming regulatory control period. However, to the extent that revised forecasts differ from the

⁴⁹ See AEMC, *National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, November 2012, p.113. Exogenous factors could include geographic factors, customer factors, network factors and jurisdictional factors.

⁵⁰ AER, *Annual Benchmarking Report*, 2014.

⁵¹ NER, cl. 6A.6.7(e)(5).

⁵² NER, cl. 6A.6.7(a)(3).

initial demand forecast, a service provider should incorporate this updated information in a timely manner and should reassess the need and timing for the projects.

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 in 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 a NSP's capex requirements.

We have looked at trends in capex across a range of levels, including at the total capex level, for replacement and non-network capex, and categories of replacement and non-network capex as relevant.

A.3 Methodology review

We have considered the methodology that AusNet Services has used to determine its capex forecasts, including assumptions, inputs and models. This has involved reviewing whether AusNet Services' methodology is a sound basis for developing expenditure forecasts that reasonably reflect the capex criteria.⁵³

Where we are not satisfied that the forecasting methodology is likely to reasonably reflect prudent and efficient costs, we have adjusted the methodology such that it is a reasonable basis for developing expenditure forecasts that reasonably reflect the capex criteria. In some circumstances we may consider the methodology to be reasonable but may not consider the inputs or assumptions used in a service providers' proposed forecasting methodology to be reasonable.

In relation to AusNet Services' proposed amount for repex we have focused on the following key inputs used in its expenditure forecasting methodology:

- unit cost estimation used to derive project cost estimates
- proposed top down adjustment to the total capex forecast for projected cost savings
- the estimation of safety risk associated with asset failures; and
- the selection of demand forecasts to estimate the risk of unserved energy resulting from asset failures.

We have considered these factors as they relate directly to our assessment of whether AusNet Services' proposal reflects the efficient costs that a prudent operator would require to achieve the capex objectives.

⁵³ AER, *Expenditure Forecasting Assessment Guideline*, December 2013.

A.4 Predictive modelling

In recent transmission decisions, we have not used the repex model for estimating a business as usual estimate of repex. This is largely because of the nature of asset replacement in transmission.

In distribution, service providers tend to have a relatively more consistent asset replacement profile over time. This more frequent and steady replacement means that historical replacement data over a short period (five years) has been used to make a reasonable estimation of a service provider's replacement needs in the next regulatory control period.

Transmission, however, is characterised by fewer assets that are high value in nature, and are replaced in groups, leading to lumpy expenditure over time. This infrequency of replacement and fewer assets means that it is more difficult to use the repex model, given the historical data available is for a short period. We consider that repex modelling of transmission assets will become more viable as our collection of historical replacement information grows in the coming years.

While we consider that repex modelling is currently not ideal for the majority of transmission assets, some asset groups may be suitable for modelling as a first pass assessment. The assets in question are replaced on a more constant basis than most transmission assets, and are more suitable for modelling based on the historical data available. For AusNet Services, one group of assets we consider may be suitable are the SCADA and network protection assets.

B Assessment of capex drivers

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 (refer to 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 repex

Asset replacement expenditure (repex) involves replacing an asset with its modern equivalent where the asset has reached the end of its economic life. Economic life takes into account the age, condition, technology or operating environment of an existing asset. In general, we classify capex as repex where the expenditure decision is primarily based on the existing asset's inability to efficiently maintain its service performance requirement.

B.2.1 Position

We do not accept AusNet Services' proposed repex of \$583.3 million (\$2016-17, excluding overheads). We instead included in our alternative estimate of overall total capex an amount of \$421.3 million (\$2016-17) for repex, excluding overheads. This is 28 per cent lower than AusNet Services' proposal. We are satisfied that this amount reasonably reflects the capex criteria.

In coming to this view, as we discuss in Appendix A, we applied:

- trend analysis, comparing past trends in total actual and forecast repex for the proposed repex programs⁵⁴
- a methodology review of AusNet Services expenditure forecasting methodology, including key inputs and assumptions; and
- use of predictive modelling to assess the proposed expenditure for some repex proposed programs.

Table 6.6 summarises AusNet Service's proposal and our alternative amount for repex.

⁵⁴ NER, cl. 6A.6.7(e)(5).

Table 6.6 Final decision on AusNet Services' total forecast repex (\$2016-17, million)

	2017-18	2018-19	2019-20	2020-21	2021-22	Total
AusNet Services' proposal	137.3	115.9	120.9	114.0	95.3	583.3
CPI adjustment	-2.5	-2.1	-2.2	-2.0	-1.7	-10.4
AusNet Services' proposal (CPI adjusted)	134.8	113.8	118.7	111.9	93.6	572.8
Non CPI adjustment	-17.5	-28.8	-41.0	-37.6	-26.7	-151.5
AER draft decision	117.3	85.0	77.8	74.4	66.9	421.3
Total adjustment	-20.0	-30.8	-43.1	-39.6	-28.4	-162.0
Total adjustment (%)	-14.5%	-26.6%	-35.7%	-34.8%	-29.8%	-27.8%

Source: AER analysis.

Note: Numbers may not add up due to rounding.

B.2.2 AusNet Services' revenue proposal

AusNet Services' forecast repex is \$583.3 million (excluding overheads). AusNet Services submitted that this expenditure is driven by:⁵⁵

- the requirement to continue to meet obligations to provide a safe and reliable supply by replacing assets in poor condition
- the age and condition of assets which influence the profile of asset replacement required
- key planning assumptions, including demand forecasts and the VCR; and
- emerging trends, including reduced consumption and increase in utilisation risk.

B.2.3 AER repex findings

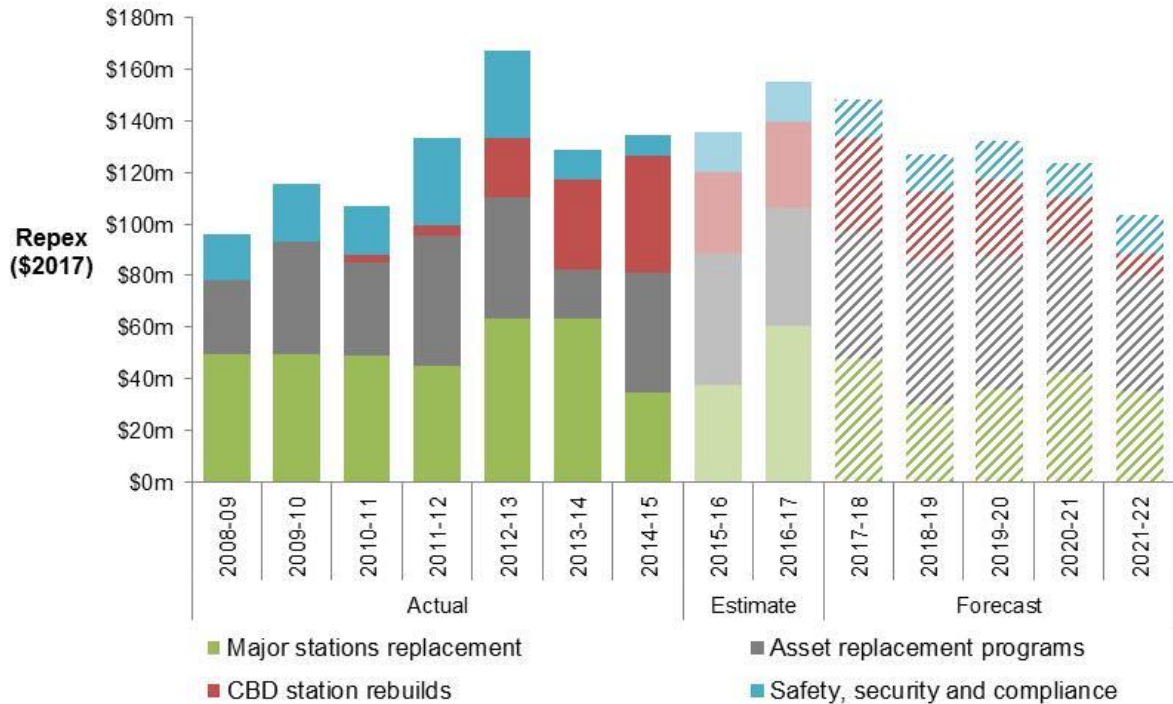
Historical and forecast repex trends

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. Our use of trend analysis for total repex is to gauge how AusNet Services' historical actual repex compares to its expected repex for the 2017-22 regulatory

⁵⁵ AusNet Services, *Revenue proposal 2017–2022*, 30 October 2015, p. 60.

control period. Figure 6.4 shows AusNet Services' repex spend has been steadily increasing over time but is forecast to then decline over the 2017-22 regulatory control period.

Figure 6.4 AusNet Services - Actual and forecast total repex (\$2016-17)



Source: Reset RIN 2017-22, 2008-13 Category Analysis RIN, 2013-14 Category Analysis RIN and 2014-15 Category Analysis RIN.

AusNet Services has forecast a decline in major station replacement expenditure (including CBD station rebuilds) over the 2017-22 regulatory control period. We note that the forecast reduction in major station replacement expenditure has resulted in the forecast for overall repex to decline over this period. AusNet Services submitted that the reduction in major replacement expenditure reflects a combination of:⁵⁶

- significant reductions in forecast demand between 2013 and 2014; and
- the reduction in AEMO's value of customer reliability in 2014 has resulted in updates to the economic timing of uncommitted major projects.

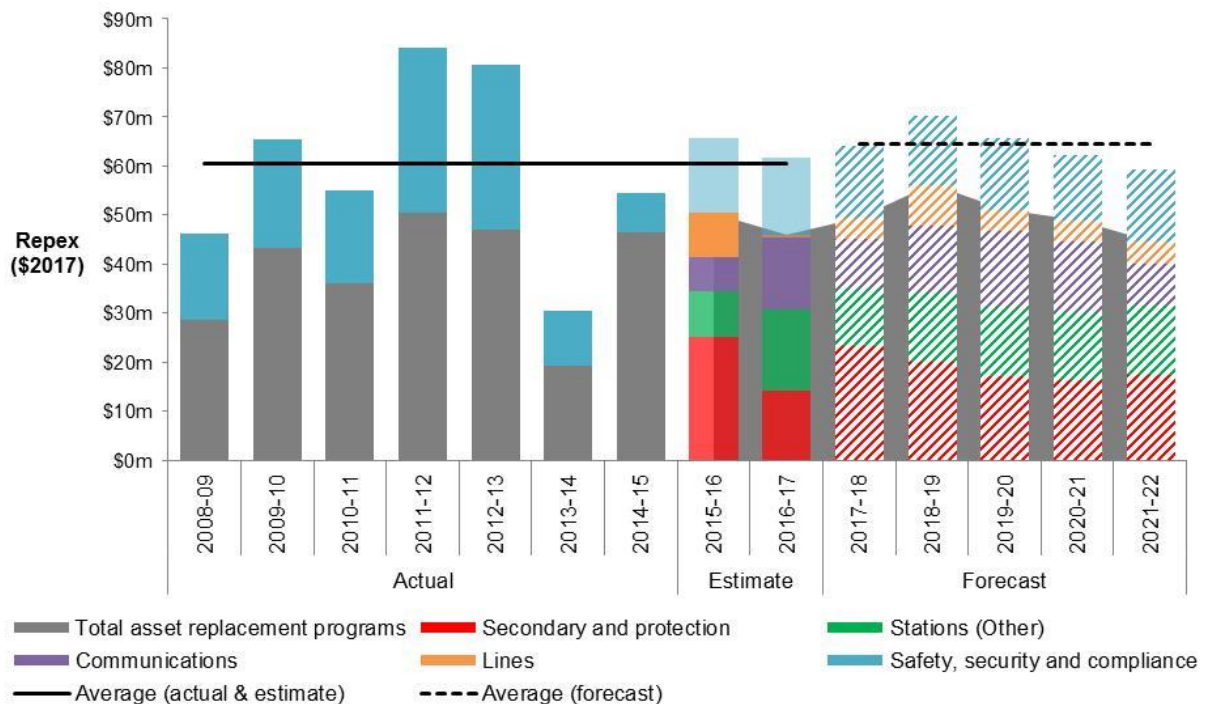
An increasing or decreasing trend in *total capex* does not, in and of itself, indicate that a service provider has proposed repex that is likely to reflect or not reflect the capex criteria. In the case of AusNet Services, which has proposed an average annual decrease in repex from the last regulatory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

⁵⁶ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 84.

use our trend analysis on key programs, a methodology review, predictive modelling, the views of stakeholders, and the material put forward by AusNet Services in support of its forecast, to help us form a view on whether AusNet Services has sufficiently justified its proposed total repex.

We have also had regard to historical and forecast expenditure trends in our assessment of AusNet Services' key repex programs given this expenditure is expected to be ongoing and relatively recurrent in nature.

Figure 6.5 AusNet Services - Actual and forecast program repex (\$2016-17)



Source: AusNet Services, *Revenue proposal 2017-22*, 30 October 2015

Note: these figures include overheads.

Figure 6.5 shows that AusNet Services' proposed repex program expenditure is forecast to increase over the 2017-22 regulatory control period. However, this forecast increase is predominately offset by the proposed reduction in safety, security and compliance related expenditure from previous periods.

AusNet Services submitted that the higher forecast for repex program expenditure than in previous periods can be explained by the reduced expenditure on major stations redevelopments.⁵⁷ AusNet Services submitted that its repex programs are driven by:⁵⁸

⁵⁷ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p. 85.

⁵⁸ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, pp. 95-97.

- secondary and protection replacement (\$95 million) to address compliance issues and obsolescence of these assets
- stations replacement not including major station related repex (\$69 million) to replace circuit breakers (\$29 million) that are expected to show advanced deterioration over the next five to 10 years; and
- communication asset replacement (\$62 million) to replace systems that are no longer supported by vendors and for which spare parts can no longer be obtained.

AusNet Services did not provide historical information to compare historical and forecast program costs for secondary and protection, stations (other) and communications capex. However, as AusNet Services proposed an average annual increase of around 20 per cent for its total repex program forecast (excluding safety, security and compliance related repex) we consider that these proposed repex programs for secondary and protection; stations (other) and communications capex are likely to be higher than in previous periods.⁵⁹ As outlined in appendix A we applied predictive modelling to protection and communication repex to test AusNet Services' proposed overall amounts for these programs (refer to our predictive modelling discussion below).

We also reviewed AusNet Services' circuit breaker program as well as the proposed ground wire and instrument transformer programs. We have identified a systemic overestimation of safety related risk for these programs. This is discussed in our key findings as part of our methodology review below.

Methodology review - key findings

We have reviewed AusNet Services' expenditure forecasting methodology, including key input assumptions in assessing whether the capex forecast reasonably reflects the capex criteria.

Our assessment of AusNet Services' key assumptions is outlined below.

Project cost estimation

AusNet Services' project cost estimation methodology is set out in appendix 4E to its revenue proposal.⁶⁰ AusNet Services describes the project cost estimates used to develop its capex forecast as P(50) estimates, meaning the estimates have a 50 per cent confidence factor of not being exceeded at project completion.⁶¹

⁵⁹ AusNet Services' actual/estimated average annual expenditure over the 2008 to 2017 period related to its repex programs was around \$40 million compared to its forecast average annual expenditure of \$50 million over the 2017-22 regulatory control period.

⁶⁰ AusNet Services, *Appendix 4E: Cost Estimating Methodology - Transmission Regulatory Reset 2017/18-2021/22*, 8 September 2015.

⁶¹ AusNet Services, *Appendix 4E: Cost Estimating Methodology - Transmission Regulatory Reset 2017/18-2021/22*, 8 September 2015, pp. 5 and 17.

The estimated project costs in AusNet Services' revenue proposal reflect three types of cost estimate, depending on the development stage of the project:⁶²

- indicative estimates – used for options analysis and works prioritisation
- planning estimates – used for business case development; and
- control estimates – conducted prior to the build phase, following completion of a detailed scope of works and detailed design documentation.

The majority (91 per cent) of AusNet Services' forecast network capex in the 2017–22 regulatory control period is based on either an indicative or planning estimate. Both of these estimate types include an allowance for risk or a contingency.

AusNet Services' indicative estimates provide approximate costs for the determination of project feasibility, options analysis and selection.⁶³ The P(50) indicative estimates include a nominal risk allowance of, on average, around five per cent. AusNet Services stated that this nominal risk allowance accounts for any additional scope that is not considered when the indicative estimate is prepared. For example, this may include the unforeseen replacement of an asset that is in worse condition than assumed when compiling the indicative estimate. AusNet Services' submitted that it is prudent and efficient to include this risk allowance at the options analysis stage rather than conduct a more detailed project scoping exercise as this will be required only if the option is pursued further.⁶⁴

AusNet Services' submitted that it prepares planning estimates once the preferred option to proceed has been identified. The P(50) planning estimates include an allowance for 'project specific uncertainties' of, on average, around 5.6 per cent.⁶⁵ AusNet Services submitted that the project uncertainties can include:⁶⁶

- internal factors such as potential variations in the scope of work, unit costs, volumes or construction methods
- external factors such as a natural event or a major safety incident, a change to planned assumptions, stakeholder issues, the availability of resources or materials, delayed access to site, industrial relations, and contractual issues.

⁶² AusNet Services, *Response to Questions Raised at 19-20 April Site Visit - Analysis supporting the 5% risk allowance included in P50 estimates*, 29 April 2016, p. 1.

⁶³ AusNet Services, *Appendix 4E: Cost Estimating Methodology - Transmission Regulatory Reset 2017/18-2021/22*, 8 September 2015, pp. 6–7.

⁶⁴ AusNet Services, *Response to Questions Raised at 19-20 April Site Visit - Analysis supporting the 5% risk allowance included in P50 estimates*, 29 April 2016, p. 1.

⁶⁵ AusNet Services, *Response to Questions Raised at 19-20 April Site Visit - Analysis supporting the 5% risk allowance included in P50 estimates*, 29 April 2016, pp. 1–2.

⁶⁶ AusNet Services, *Appendix 4E: Cost Estimating Methodology - Transmission Regulatory Reset 2017/18-2021/22*, 8 September 2015, pp. 17–18.

AusNet Services described both its indicative and planning estimates as P(50) estimates, meaning the actual project cost is equally likely to be above or below the estimated cost.

In our view, good estimating practice involves the periodic review of cost estimates against actual costs to correct forecast unit rates and scope definitions. Over time this process reduces and controls cost estimating error. Within a portfolio of works, where projects of similar types are repeated over time and where estimating error is controlled as described above, the variation at the overall portfolio level between forecast and actual costs will tend to zero. That is, if cost estimates are unbiased, then over time the ratio of observed project overestimation to underestimation should be around 50:50.

We tested whether this was the case, using planning estimate and actual cost data provided by AusNet Services for a portfolio of 185 projects completed since 2007.⁶⁷ The results of this analysis are set out in Table 6.7 below. The project data is set out in chronological order and grouped into annual results.

Table 6.7 Analysis of AusNet Services' estimating residuals 2007–2015

Year	Number of Projects	Actual capex (\$000)	Total overestimation residual (\$000)	Total underestimation residual (\$000)	Contribution of overestimations to total variation	Contribution of underestimations to total variation
2007	1	1,925	930	0	100%	0%
2008	1	13,024	2,444	0	100%	0%
2009	18	21,226	3,405	2,613	57%	43%
2010	17	30,294	3,695	661	85%	15%
2011	35	20,768	6,779	2,144	76%	24%
2012	21	29,421	3,458	1,945	64%	36%
2013	65	172,922	12,603	25,620	33%	67%
2014	24	42,510	6,363	3,105	67%	33%
2015	3	2,848	75	671	10%	90%
Totals	185	334,938	-	-	-	-
Average	-	-	-	-	64%^a	36%^a

Source: AusNet Services, *RINs Schedule 1 - 4.2.b. Basis for top-down capex adjustment*, 30 October 2015; AER analysis.

a: These averages exclude the 2007, 2008 and 2015 years because there is an unrepresentative number of projects in each year. This does not have a material effect on the averages.

⁶⁷ AusNet Services, *RINs Schedule 1 - 4.2.b. Basis for top-down capex adjustment*, 30 October 2015.

This analysis indicates there is a bias towards overestimation for these projects. AusNet Services overestimated the cost in 112, or 61 per cent, of the 185 projects. If the project cost estimates were unbiased then the residual underestimates and overestimates should be around a 50:50 ratio. In five of the six years of data with representative numbers of projects (2009-2014), the contribution of overestimates to the total estimating error is greater than the contribution of underestimates. On average, the ratio of overestimates to underestimates is approximately 64:36.

We undertook further analysis to quantify the extent of this bias. To do this, we calculated the average adjustment to the estimated project costs that would be required to remove the observed overestimation. We found that reducing AusNet Services' project cost estimates by 4.6 per cent removes the observed overestimation bias for the portfolio of historical projects and delivers an overall ratio of overestimates to underestimates approaching 50:50. That is, on average, AusNet Services overestimated the actual cost of each of the 185 historical projects by 4.6 per cent. We consider this to be evidence of a systemic issue in AusNet Services cost estimation methodology.⁶⁸

On this basis, we are not satisfied that AusNet Services' forecast capex reasonably reflects the efficient costs that a prudent operator would require to achieve the capex objectives.⁶⁹ We consider that AusNet Services' cost estimation methodology results in cost estimates which are upwardly biased and tend to overestimate actual outturn project costs. As such, AusNet Services' P(50) cost estimates are in fact more likely to be underspent than exceeded relative to actual costs, and are therefore likely to overestimate the cost of AusNet Services' capital works program in the 2017–22 regulatory control period.

In developing our alternative estimate of forecast capex in the 2017–22 regulatory control period, we have made an adjustment to AusNet Services' cost estimates to account for the overestimation bias discussed above. In our view, a likely factor contributing to the overestimation bias is AusNet Services' inclusion of a risk allowance in both its indicative and planning cost estimates, as discussed above. Other possible sources of the observed estimation error might include the achievement of efficiencies in the overall portfolio versus the individual project estimates, or changes in scope or unit costs. However, irrespective of the underlying cause of the observed overestimation bias, our view is that an adjustment to AusNet Services' project cost estimates is necessary to address the systemic bias observed in AusNet Services cost estimation methodology.

For these reasons, in modelling our alternative estimate of forecast capex for the 2017–22 regulatory control period we have reduced AusNet Services' indicative and planning cost estimates by 4.6 per cent. This adjustment addresses the observed overestimating bias arising from AusNet Services' cost estimating methodology. We

⁶⁸ We also undertook a regression analysis of AusNet Services' individual project forecasting errors, which did not show any trend towards improvement in forecasting accuracy to indicate this systemic issue has been corrected.

⁶⁹ NER, cl. 6A.6.7(c).

consider that this adjustment will provide for cost estimates that are likely to be consistent with P(50) estimates, and therefore reflect a realistic expectation of prudent and efficient costs. The impact of this adjustment is shown in Table 6.10.

Top-down adjustment to cost estimates

AusNet Services' proposal is based on a bottom up estimate of project and program costs to determine its forecast capex over the 2017-22 regulatory control period. However, AusNet Services also proposed a negative adjustment of 0.89 per cent to its total capex forecast to account for cost savings expected to be achieved at a portfolio level when compared to individual project based planning estimates.⁷⁰ This top down adjustment reduced AusNet Services' total forecast capex by \$6.7 million (\$2016–17).

AusNet Services derived its proposed portfolio level cost efficiency adjustment by comparing forecast and actual expenditure outcomes from recently completed transmission projects.⁷¹ AusNet Services calculated the quantum of the top-down adjustment based on the total observed estimation error on a sample of 185 projects completed since 2007. AusNet Services' method of calculation is shown in the equation below:

Cumulative estimating error

Total estimated cost

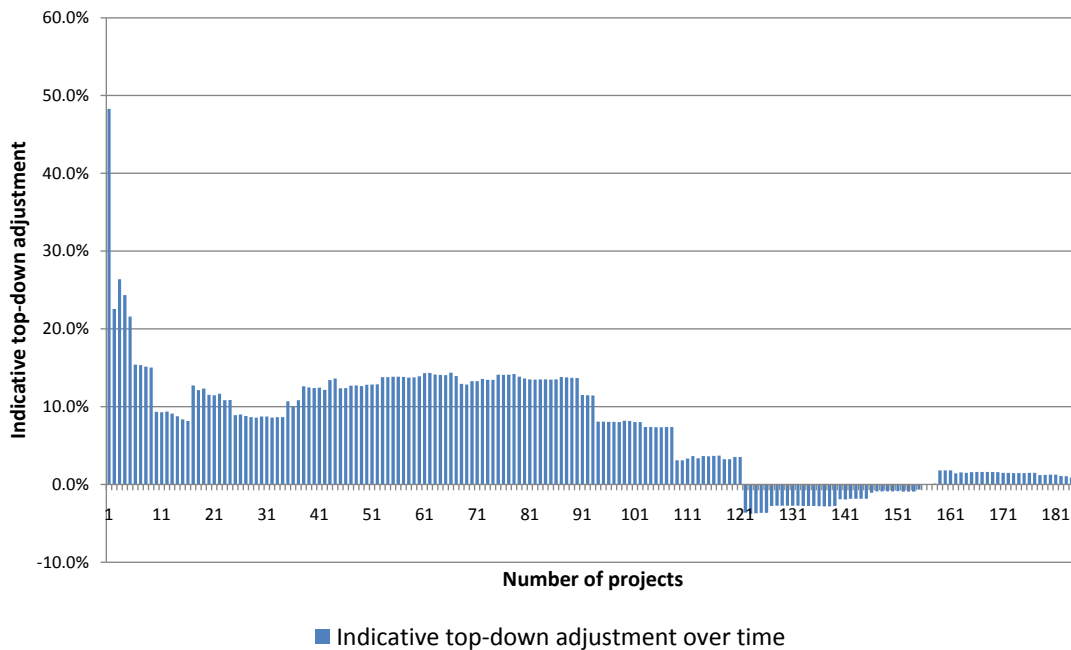
We reviewed the basis for AusNet Services' estimation of expected portfolio level efficiencies and consider AusNet Services has not provided evidence to justify why this calculation provides a valid estimate of the portfolio efficiencies it might achieve in the 2017–22 regulatory control period. For this reason, we are not satisfied that AusNet Services' proposed adjustment reflects a reasonable estimate of the scope for efficiencies or the aggregate estimating error which may exist in the overall capex forecast.

In AusNet Services' calculation, the cumulative estimating error (numerator) is the sum of positive and negative project estimating residuals (project cost over runs and under runs) for the portfolio of historical projects. As the number of projects increases, the numerator is expected to remain small and fluctuate around zero as positive and negative residuals are added to the sample. However, as the number of projects increases the total portfolio cost (denominator) grows ever larger as comparatively large positive project costs are added. Consequently, over time this calculation will converge towards small percentages around zero which are a function of the choice of sample size. This is illustrated in Figure 6.6, which shows the calculated 'efficiency adjustment' over time as each completed project is added to the portfolio.

⁷⁰ AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, pp. 75–76.

⁷¹ AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, pp. 75–76.

Figure 6.6 AusNet Services' top-down efficiency adjustment over time



Source: AusNet Services, *RINs Schedule 1 - 4.2.b. Basis for top-down capex adjustment*, 30 October 2015; AER analysis.

As can be seen in Figure 6.6, AusNet Services' calculation approaches zero over time, and includes both positive and negative values. The final data point shows AusNet Services' proposed top-down adjustment for portfolio efficiencies of 0.89 per cent based on the portfolio of 185 historical projects. However, at different points in the series, this figure is both significantly higher, and negative. For example, based on a sample of the first 80 projects completed, the top-down adjustment would have been 13.6 per cent. Based on a sample of the first 130 projects, the adjustment would have been -2.7 per cent, seemingly indicative of 'portfolio inefficiencies' rather than portfolio efficiencies if AusNet Services' interpretation of this figure is valid.

In summary, in our view, the significance attributed to this calculation by AusNet Services as a measure of portfolio efficiencies is not valid. The choice of sample and sample size will determine the size and direction of the resulting adjustment. AusNet Services' interpretation of this calculation as representative of expected portfolio efficiencies is not supported. AusNet Services' calculation will always produce small values, which could reasonably be either positive or negative. AusNet Services has not provided evidence supporting its interpretation of these values as being indicative of cost savings which might be expected at a portfolio level compared with project based estimates.

For these reasons, we do not accept AusNet Services' proposed top-down adjustment of 0.89 per cent as a reasonable input assumption in determining our alternative estimate of forecast capex. The exclusion of the 0.89 per cent top-down reduction increases AusNet Services' forecast capex by \$6.7 million.

As discussed above, we have made a top-down adjustment to AusNet Services' network capex of 4.6 per cent, which accounts for the observed level of project cost overestimation across AusNet Services' historical project portfolio. That adjustment may, in part, relate to historical portfolio level efficiencies achieved by AusNet Services, as well as other possible sources of cost overestimation such as variations in scope or unit costs. Nonetheless, the purpose of that 4.6 per cent adjustment for project cost estimation is not to specifically capture likely portfolio cost efficiencies, but simply to correct for the actual observed cost overestimation bias in AusNet Services project cost estimates.

Assessment of economic risk based approach

AusNet Services' expenditure forecasting methodology is based on a quantified risk based approach that supports an economic analysis. This approach adopts a risk based cost benefits analysis, where the benefits are the avoided costs of the risks and the cost is the proposed network investment. We note that the approach is standardised across all investments (although the analysis differs across aspects of AusNet Services' proposal). The following risks are quantified:⁷²

- supply security risk – load at risk that would not be supplied in the event of an asset failure, evaluated based on AEMO's terminal station demand forecast and the latest value of customer reliability (VCR)
- health and safety risk – the hazards to the safety of any person in an event of asset explosive failure, for example human injury and fatality
- environmental risk – the threat of adverse effects on the environment, for example environmental impacts due to oil leaks.
- plant collateral damage risk – the potential collateral damage of adjacent plants due to an asset explosive failure.

Our assessment of AusNet Services' methodology has identified some issues related to AusNet Services' demand forecasts used to estimate the costs to customers from the loss of supply and its estimation of the cost of safety related risks. These are discussed below.

Application of demand forecasts

The forecast level of maximum demand at transmission network connection points is a key input assumption for AusNet Services' asset replacement planning and forecast capex. AusNet Services' uses maximum demand forecasts to assess the load at risk under unplanned outage conditions. This assessment, combined with estimates of the economic value placed on reliability by customers, then forms part of AusNet Services' economic evaluation of asset replacement decisions.⁷³ For example, a lower demand

⁷² AusNet Services, *AMS 10-24 Asset Renewal Planning Guide - PUBLIC*, October 2015, p.19.

⁷³ AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, p. 71.

forecast reduces the economic benefit of asset replacements as a lower volume of energy is assumed to be unserved following an asset failure.

AusNet Services does not produce transmission connection point maximum demand forecasts. In Victoria, AEMO is responsible for planning and procuring transmission network augmentations and is also responsible for producing transmission connection point maximum demand forecasts.⁷⁴ The Victorian DNSPs also prepare their own individual distribution network maximum demand forecasts.

AusNet Services submitted that it considers both AEMO's demand forecasts and demand forecasts prepared by the Victorian DNSPs' when assessing major station projects. AusNet Services considers both sources of demand forecasts are relevant to its replacement planning. Rather than adopting a single set of demand forecasts to apply in assessing all station asset replacement projects, AusNet Services selects the forecast (or an average of the two forecasts) that it considers best reflects the likely future demand at each station, based on:⁷⁵

- actual historical demand; and
- its understanding of network trends and developments.

In preparing its forecast of major station capex for the 2017–22 regulatory control period, AusNet Services' considered the 2014 versions of these two demand forecasts.⁷⁶ AusNet Services' explained the approach taken to select the applicable demand forecast for each of the forecast major station projects. In most cases, this was based on a comparison of actual (not weather normalised) historical demand with the starting point and trend of each (weather normalised) demand forecast. The demand forecast applied by AusNet Services' in each case was:⁷⁷

- Templestowe terminal station – DNSP forecast
- Springvale terminal station – DNSP forecast
- West Melbourne terminal station –DNSP forecast
- Ringwood terminal station – DNSP forecast
- Fishermans Bend terminal station – average of DNSP and AEMO forecasts.

Having reviewed AusNet Services' application of maximum demand forecasts in its asset replacement planning for major station projects, we are not satisfied that the resulting capex forecasts reflect a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives.⁷⁸ This is because:

⁷⁴ AusNet Services, *Response to AER information request IR#015*, 26 April 2016, p. 2.

⁷⁵ AusNet Services, *Response to AER information request IR#015*, 26 April 2016, p. 2.

⁷⁶ AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, p. 71.

⁷⁷ AusNet Services, *Response to AER information request IR#015*, 26 April 2016, pp. 2–12.

⁷⁸ NER, cl. 6A.6.7(c)(3).

- the demand forecasts applied in determining the quantified economic risk of asset failure do not reflect current expectations of demand. Although the 2014 versions of these demand forecasts were the latest available to AusNet Services in preparing its revenue proposal, more recent versions of these demand forecasts published in 2015 are now available.
- the demand forecasts reflect, in whole or in part, the 2014 Victorian DNSP maximum demand forecasts which we concluded in our 2015 preliminary decisions for the Victorian DNSPs did not reflect a realistic expectation of demand.⁷⁹

We acknowledge that AusNet Services has submitted that it intends to consider the impact of the updated 2015 demand forecasts in its revised proposal. However, in our view, AusNet Services should also apply a consistent set of demand forecasts based on the same forecasting methodology. This would ensure consistency in the economic assessment and prioritisation of projects across its major station replacement portfolio.

We consider that the basis for selecting a demand forecast should have greater regard to the merits and robustness of the underlying demand forecasting methodology, rather than the perceived fit of the forecast with historical demand data. In our view, the AEMO transmission connection point forecasts are based on a robust demand forecasting methodology and key input assumptions.⁸⁰ Further, applying AEMO's demand forecasts would enhance consistency in planning both across AusNet Services' major station replacement portfolio, and between AusNet Services' asset replacement planning and AEMO's network augmentation planning. This is discussed further in appendix C of this decision.

For these reasons, in modelling our alternative estimate of forecast capex we have used AEMO's 2015 transmission connection point demand forecasts to quantify the expected reliability cost of asset failure where relevant across AusNet Services' major station projects. The impact of this adjustment is shown in Table 6.10 below.

Estimation of safety risk

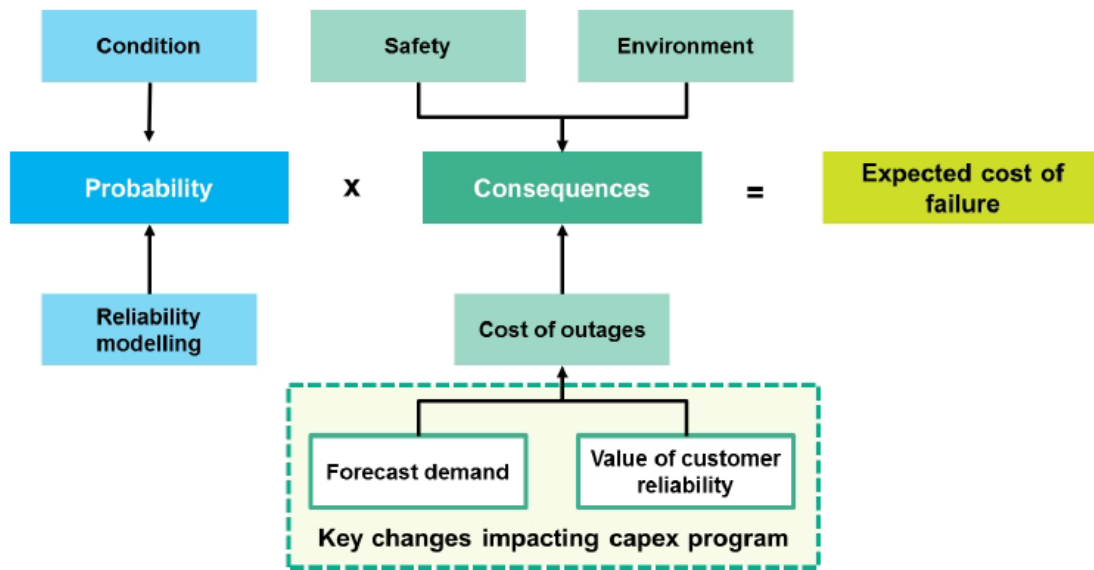
AusNet Services undertakes an economic analysis to support all asset replacement and maintenance decisions.⁸¹ This process involves an assessment of asset condition and reliability modelling to determine the probability of asset failure, as well as an assessment of the consequences in terms of outage, safety and environmental costs, to determine the expected cost of asset failure. This process is outlined at a high level in Figure 6.7 below.

⁷⁹ AER, *Preliminary Decision - CitiPower distribution determination 2016–2020 – Attachment 6*, October 2015; AER, *Preliminary Decision - Powercor distribution determination 2016–2020 – Attachment 6*, October 2015; AER, *Preliminary Decision - United Energy distribution determination 2016–2020 – Attachment 6*, October 2015; AER, *Preliminary Decision - AusNet Services distribution determination 2016–2020 – Attachment 6*, October 2015; and AER, *Preliminary Decision - Jemena distribution determination 2016–2020 – Attachment 6*, October 2015.

⁸⁰ See for example AER, *Preliminary Decision - Powercor distribution determination 2016–2020 – Attachment 6*, October 2015, pp. 6–152 to 6–153.

⁸¹ AusNet Services, AMS 10-24 Asset Renewal Planning Guideline, 12 October 2015, p. 66.

Figure 6.7 AusNet Services' economic evaluation methodology



Source: AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, p. 67.

AusNet Services submitted that it then identifies a range of technically feasible options to address the identified risk, and project cost estimates for each option. It then compares the costs and benefits (in terms of avoiding the expected costs of asset failure) of each option using Net Present Value (NPV) models to determine the preferred economic option.⁸²

Applying quantified risk assessments in the context of sound asset management practices, as AusNet Services does, is consistent with good practice within the electricity industry.⁸³ However, we have some concerns with AusNet Services' application of its safety risk analysis which affects the economic justification of AusNet Services' forecast capex. These concerns relate to AusNet Services' assumptions that:

- someone is, at all times, in the immediate vicinity of a safety related asset failure
- existing controls designed to mitigate safety risk to employees and the public are not effective.

We are concerned that these assumptions are not realistic, and therefore create a disconnection between the actual level of risk faced by AusNet Services in operating its network, and the assumed level of risk used to justify forecast asset replacement capex. AusNet Services' assumptions are not supported by the information provided in

⁸² AusNet Services, Appendix 4A: Network Capital Expenditure Overview - 2017 to 2022, 30 October 2015, pp. 16–17.

⁸³ In general, AusNet Services' processes for assessing options to manage the remaining life of assets accords with the principles and practices required under ISO 55000 (Asset Management). Further, AusNet Services' risk analysis is largely quantitative and is based on principles and practices that accord with ISO 31000 (Risk Management).

its revenue proposal to justify its forecast capex. Given these assumptions are not supported and our view that these assumptions are not realistic, we consider that AusNet Services' estimation of safety risk costs and therefore its forecast asset replacement capex is likely to be overstated.

We consider a more realistic estimate of the likelihood that a person is in the vicinity of a safety related asset failure is in the order of one per cent of the time, rather than 100 per cent of the time as assumed by AusNet Services. Our estimate is informed by our internal engineering and technical expertise, and knowledge of network asset management practices. We recognise that our alternative estimate is an approximation based on assumptions regarding the typical frequency and duration of a person being in the vicinity of assets that fail. While we consider our assumptions to be more realistic, we expect AusNet Services to provide further information in its revised proposal to support any alternative assumptions.

Our analysis and conclusions on these issues are set out in further detail below.

Quantifying safety risk

The quantification of safety risk is one of the key components in AusNet Services' economic evaluation of asset replacement requirements. Safety risk relates to the risk that assets fail in such a way that could result in serious injury or fatality to an employee or member of the public. AusNet Services quantifies this safety risk with reference to:⁸⁴

- the likelihood of major asset failure for the relevant asset class
- the probability of that failure presenting a safety risk, for example due to explosive failure or fire
- the risk consequence of a fatality in dollar terms.

AusNet Services' approach is expressed in the following equation:

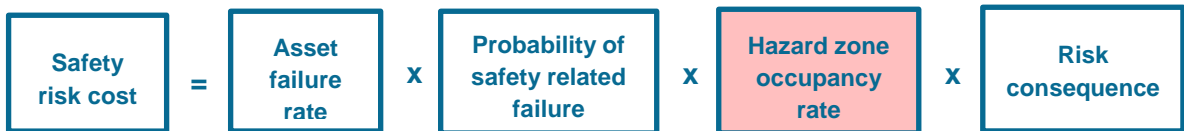
$$\boxed{\text{Safety risk cost}} = \boxed{\text{Asset failure rate}} \times \boxed{\text{Probability of safety related failure}} \times \boxed{\text{Risk consequence}}$$

In relation to the various factors in this equation, we have identified some concerns regarding AusNet Services' analysis of asset failure rates and safety related failure rates, as discussed in the network health section of this attachment. However, we accept that AusNet Services' estimate of the risk consequence in the above equation is likely to be reasonable. AusNet Services estimates the risk consequence of a fatality based on the principle that risks to workers and the public should be minimised to be as low as reasonably practicable (the ALARP principle). That is, safety risk should be

⁸⁴ AusNet Services, AMS 10-24 Asset Renewal Planning Guideline, 12 October 2015, pp. 27–28.

proactively managed until the cost of doing so becomes grossly disproportionate to the benefits. AusNet Services' methodology estimates the direct safety benefits and escalates this by a disproportionality factor of three to identify an appropriate cost of preventing a fatality.⁸⁵ We consider this provides a conservative but reasonable estimate of the consequences of safety risk, consistent with the ALARP principle.

Nonetheless, we consider AusNet Services' methodology for quantifying the cost of safety risk omits a key factor, resulting in a significant overestimation of the likely expected cost of safety risk. Our concern is that the equation above assumes that a person (whether an employee/contractor or member of the public) will be in the equipment hazard zone at all times. That is, AusNet Services' methodology implies that a fatality occurs in every instance of a safety related asset failure. It does not account for the likelihood that a person will actually be in the vicinity of an asset at the time of failure. This is an unrealistic assumption which does not reflect AusNet Services' actual operating environment, and has the effect of overestimating the cost of safety risk in AusNet Services' economic justification of forecast repex. In our view, the following equation reflects a more realistic approach to quantifying safety risk:



The question then becomes what is a realistic estimate of the likelihood that a person will be in the vicinity of a transmission network asset when it fails—the hazard zone occupancy rate. For this draft decision, we have estimated the likely hazard zone occupancy rate with regard to:

- the physical characteristics and operating environment of AusNet Services transmission network
- the effect of existing safety controls which mitigate the risk of asset failure and limit exposure to potentially dangerous equipment.

These factors are discussed in turn below.

AusNet Services' operating environment

AusNet Services' transmission network consists of high voltage lines supported by tower structures running through dedicated easements to connect generation facilities with distribution loads at terminal stations. The location and nature of these assets, together with the asset management practices applied in operating, maintaining and refurbishing them, determine the typical length of time that employees might work in proximity to each asset in any given year.

⁸⁵ AusNet Services, AMS 10-24 Asset Renewal Planning Guideline, 12 October 2015, p. 27.

Electricity transmission network assets typically have long asset lives, in the order of 40 to 70 years in most cases. They also require relatively little physical intervention in terms of visual inspection, maintenance or refurbishment in order to continue operating in a safe and reliable manner over their designed life expectancy.

As such, AusNet Services' terminal stations are not permanently staffed, and consist of large secure areas visited only periodically by trained staff to undertake:

- routine inspection and operation work – for example, annual diagnostic testing as part of a condition monitoring program, though operational and monitoring work is increasingly conducted remotely through automated network operations and non-intrusive scanning techniques
- periodic maintenance work – most assets require some periodic maintenance (for example every 5–10 years) to ensure continued safe operation and achievement of expected asset life
- major rebuild or refurbishment work – undertaken when assets are nearing end of life (for example, 50 to 60 years after installation)

On this basis, we consider that an AusNet Services employee or member of the public is more likely to be in the immediate vicinity of any given station asset for the equivalent of only a few days in any year rather than the 24 hour / 7 day basis assumed by AusNet Services. This estimate is an approximation informed by our internal engineering and technical expertise, and knowledge of network asset management practices regarding the typical frequency and duration of employee attendance at a terminal station site in an average year, as set out below:

- operations – an average crew of two people, on site on one occasion each year, for a total annual switchyard exposure of approximately one hour per year
- inspections – an average crew of two people, on site on two occasions each year, for a total annual switchyard exposure of approximately four hours per year
- periodic maintenance – an average crew of six people, on site for one week every five years, for a total annual switchyard exposure of approximately 30 hours per year
- major refurbishment – an average crew of ten people, on site for twelve weeks every fifty years, for a total annual switchyard exposure of approximately 60 hours per year.

Our assumptions suggest that a hazard zone occupancy rate of around 95 hours per year, or approximately 1 per cent of the time in any year (8,760 hours) rather than 100 per cent as AusNet Services assumes in its cost of risk calculations, is likely to represent a more realistic order of magnitude for this probability. We consider our estimate is a more realistic input assumption to quantify safety risks and therefore the

prudent volume of asset replacement expenditure required to achieve the capex objectives.⁸⁶

AusNet Services' safety risk controls

The National Electricity Objective encourages efficient investment in, and efficient operation and use of electricity services with respect to (amongst other things) the safety of electricity supply and the national electricity system.⁸⁷ We are required to approve a capex forecast if we are satisfied the expenditure reasonably reflects the efficient costs that a prudent operator would require to achieve the capex objectives, which include maintaining the safety of the transmission system through the supply of prescribed transmission services.⁸⁸ Consistent with these objectives, AusNet Services incurs both operating and capital expenditures which directly or indirectly address safety risk for both employees and the public. Further, AusNet Services operates its network in accordance with technical and occupational health and safety standards, policies, work practices and procedures designed to minimise hazards and maintain a safe working environment.⁸⁹

AusNet Services' risk management framework states that:⁹⁰

Potential Exposure will be estimated for each risk in terms of the total plausible worse case impact arising from a risk assuming all current controls fail.

This may be a legitimate assumption in the context of assessing the maximum possible consequences of safety risks, as it accounts for the full potential consequence in the event that a risk materialises. However, in quantifying the actual risk cost and therefore the benefit that might be achieved by eliminating that risk, it is important to also account for the likelihood of the risk materialising. To some extent, this depends on the controls in place to manage or mitigate that risk.

The list below sets out some examples of the risk controls and programs that AusNet Services has in place to avoid, mitigate or manage safety consequences which might arise from an asset failure:

- employee safety training, safe working practices and personal safety equipment such as pocket sized electromagnetic frequency devices for personal protection and warning⁹¹
- installation of fall arrest systems and maintenance access systems on station racks and transformers⁹²

⁸⁶ NER, cl 6A.6.7(c).

⁸⁷ NEL, section 7.

⁸⁸ See NER, cl 6A.6.7(a)(4) and cl 6A.6.7(c).

⁸⁹ For example, in accordance with relevant provisions of the *Occupational Health and Safety Act 2004*, *Electricity Safety Act 1998* and associated regulations.

⁹⁰ AusNet Services, *RM001-2006 Risk Management Policy & Framework*, 27 March 2013, p. 9.

⁹¹ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 17.

⁹² AusNet Services, *Appendix 4A: Network Capital Expenditure Overview – 2017 to 2022*, 30 October 2015, p. 38.

- insulator replacement and condition monitoring programs, and increased use of non-ceramic insulators with non-hazardous failure modes⁹³
- terminal station infrastructure security, including fencing, CCTV surveillance, lighting and access control to prevent unauthorised access to terminal station areas⁹⁴
- fire protection systems, designed to extinguish fires which may ignite around terminal station assets or in station buildings⁹⁵
- the application of modern, safe station design, including separation of control buildings from switchyard areas and the installation of sound and blast walls, railings and fall arrest systems⁹⁶
- condition monitoring and diagnostic testing such as oil testing and dissolved gas analysis, moisture and sulphur dioxide checks, and real time online monitoring of circuit breakers, capacitor voltage transformers and power transformers which assists in both avoiding imminent failures and developing trends for failure probability⁹⁷
- de-energising equipment during planned refurbishment, maintenance and testing work. For example, AusNet Services undertakes the following condition monitoring work while equipment is off-line: power transformer condition monitoring, circuit breaker interrupter contact resistance tests, circuit breaker operating time tests, motor testing on motorised disconnectors, and insulator voltage tests⁹⁸
- use of portable and fixed radio frequency (RF) partial discharge scanners to identify faults and impending failures on substation equipment:
 - AusNet Services described RF scanning as ‘the most powerful technique available to date to avoid potential explosive or hazardous failures impinging network reliability and people safety’.⁹⁹
 - AusNet Services submitted that portable RF scanning has been used extensively in the current regulatory control period to avoid potential explosive failures and ensure safe working areas for maintenance and augmentation projects.¹⁰⁰
 - AusNet Services has also developed a fixed RF monitoring system capable of detecting partial discharge activity across an entire terminal station, non-intrusively and on a 24 hour / 7 day basis. This technology is in place at the

⁹³ AusNet Services, *Appendix 4A: Network Capital Expenditure Overview – 2017 to 2022*, 30 October 2015, p. 39; and AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 18.

⁹⁴ AusNet Services, *Appendix 4A: Network Capital Expenditure Overview – 2017 to 2022*, 30 October 2015, p. 44.

⁹⁵ AusNet Services, *Appendix 4A: Network Capital Expenditure Overview – 2017 to 2022*, 30 October 2015, p. 43.

⁹⁶ AusNet Services, *Appendix 4A: Network Capital Expenditure Overview – 2017 to 2022*, 30 October 2015, p. 19.

⁹⁷ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, pp. 10-11.

⁹⁸ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 10.

⁹⁹ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 13.

¹⁰⁰ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 12.

Springvale terminal station, and will be deployed at other terminal stations where major work is planned, which are the highest risk sites due to asset age, condition and worker exposure.¹⁰¹

The overall purpose and effect of the measures outlined above is to, in various ways, mitigate or eliminate safety risks and maintain a safe working environment for employees. Practically, these measures have the effect of both:

- reducing the need for employees to work in close proximity to potentially hazardous equipment, thereby reducing the hazard zone occupancy rate (for example, through the use of non-invasive station scanning and remote operations), and
- making the potentially hazardous zone safer (for example, by de-energising equipment, providing advanced warning of possible asset failure or through the use of specific safety equipment).

We have not made any specific adjustment to our estimate of the hazard zone occupancy rate to account for the effect of AusNet Services' safety controls, which is difficult to quantify. Nonetheless, we consider that these safety controls add further weight to our conclusion that AusNet Services' assumed 100 per cent hazard zone occupancy rate is unrealistic, and that our alternative 1 per cent estimate is likely to be a conservative but reasonable approximation of this probability.¹⁰²

Summary

As discussed above, AusNet Services has assumed in its economic modelling that all safety related asset failures result in a fatality, implying that (a) the hazard zone is always occupied and (b) existing risk controls (which are funded through operating or capital expenditure allowances) are not effective. In making this draft decision, we must consider whether the forecasting methodology and assumptions applied to forecast required levels of capex are realistic, and result in forecasts which reasonably reflect the efficient costs that a prudent operator would require to achieve the capex objectives.¹⁰³ Given our conclusions regarding a realistic estimate of the hazard zone occupancy rate and the effect of AusNet Services' extensive risk controls, we are not satisfied that this is the case.

We recognise that safety is of critical importance. However, AusNet Services' assumption that the hazard zone is always occupied and that existing safety risk controls are not effective leads to a disconnection between the forecast repex requirement and the actual safety risk associated with operating the network. AusNet Services' forecast repex reflects an inflated estimate of safety risk. An efficient estimate of AusNet Services' repex requirements must take account of AusNet

¹⁰¹ AusNet Services, *AMS 10-13 Condition Monitoring*, 16 September 2015, p. 15.

¹⁰² We also tested our estimate by considering AusNet Services' estimate for hazard zone occupation set out in its instrument transformer risk assessment, and found our estimate of 1 per cent to be conservative relative to the hazard zone occupancy rate assumed by AusNet Services in that case.

¹⁰³ NER, cl. 6A.6.7(c).

Services' actual operating practices and reflect the actual safety risks presented by its operating environment.

In modelling our alternative estimate of forecast repex for this draft decision, we have assumed that a realistic estimate of the likelihood that a person will be in the hazard zone of a given asset is in the order of 1 per cent. As discussed above, this estimate is informed by our internal technical expertise and knowledge of network asset management practices, and reflects our understanding of the typical frequency and duration of employee attendance at a terminal station site in an average year, taking into account the different types of work undertaken on the network. AusNet Services' safety risk controls further reduce the likelihood that any person will be in the vicinity of a safety related asset failure. We note that this is an approximation of the overall hazard zone occupation rate, which may vary for different asset types and locations. We expect that, as the asset manager, AusNet Services will be well placed to consider, as we have done, what a realistic estimate of the hazard zone occupancy rate may be, and provide information to substantiate any alternative estimate to inform our final decision.

It is important to note that while amending the assumed hazard zone occupancy rate might reduce the forecast of required capex, this does not increase the actual level of network risk. This is because the reduced estimate of capex is commensurate with the quantified risk (based on realistic assumptions) that justifies that level of capex. Further, the existing obligations and risk controls that AusNet Services has to avoid, mitigate or manage safety risks for employees and the general public will of course remain in place.

In the sections below, we have attempted to quantify the impact of AusNet Services' approach to estimating safety risk on its forecast replacement capex program for the 2017–22 regulatory control period. As noted above, AusNet Services' economic evaluation methodology including its assessment of the cost of safety risk is applied generally across its replacement capex forecasting. However, safety risk is unlikely to be a significant factor for some asset types which do not fail in an explosive or otherwise dangerous manner. We therefore examined a sample of AusNet Services' asset replacement programs and major station projects to ascertain the significance of AusNet Services' safety risk assumptions for the economic justification of the forecast capex.

Asset replacement programs

Based on the information available to us, we reviewed in detail a sample of three asset replacement programs accounting for approximately 20 per cent of asset replacement program capex, representing the following asset types:

- instrument transformers
- ground wires
- circuit breakers.

Our review focussed on the implications of AusNet Services' overestimation of safety risks as this issue is systemic and therefore likely to be relevant to AusNet Services'

other asset replacement programs. In reviewing each program, we corrected for AusNet Services' overestimation of safety risk as appropriate in the economic modelling for each program. This provided a revised estimate of the expected cost of asset failure, in present value terms, for each program. We then assessed whether the revised economic modelling continued to support the full asset replacement program as proposed by AusNet Services, or whether the reduced safety risk justified a smaller replacement program. The results of our analysis are shown in Table 6.8 below.

Table 6.8 Impact of reduced safety risk cost on efficient asset replacement program capex (\$2015–16)

Asset replacement program	AusNet Services' efficient capex (\$m)	AER modelled efficient capex (\$m)	Adjustment (\$m)	Adjustment (%)
Instrument transformers	7.4	7.4	-	-
Ground wire	19.,0	19.0	-	-
Circuit breakers	29.,6	25.0	-4.6	-15.6%
Total	56.0	51.4	-4.6	-8.2%

Source: AusNet Services, *TRR Capex Forecast Model 2017–22*, 30 October 2015; AER analysis.

We found that, in the case of the proposed circuit breaker replacement program, reducing the estimated safety risk cost as outlined above reduced the benefits provided by the program such that the capex proposed by AusNet Services is not economically justified. In our view, based on a realistic estimation of safety risk, the efficient level of capex for the circuit breaker replacement program is approximately 15.6 per cent lower than AusNet Services' proposal.

For the instrument transformer and ground wire replacement programs, we found that reducing the estimated safety risk cost did not alter the economic justification of the program as proposed by AusNet Services. In the case of instrument transformers, this was because (contrary to its standard methodology) AusNet Services' model already included a factor to account for the probability of a person being in the hazard zone at the time of a failure event.¹⁰⁴ In the case of the ground wire replacement program, the revised economic modelling showed no change to the preferred economic option.

In our view, the results of our amended modelling of the economic justification of these sample programs is likely to reflect the overall impact of AusNet Services' systemic overestimation of safety risk on its forecast capex for asset replacement programs. This is because, as observed in this sample of programs, it is likely that safety risk is of varying significance in different types of assets. Some assets, such as circuit breakers

¹⁰⁴ AusNet Services' modelling for the instrument transformers asset type appears to imply a hazard zone occupation rate less than the rate of 1 per cent assumed in this draft decision.

and instrument transformers, have a known history of explosive asset failure.¹⁰⁵ Other network assets do not fail in a manner that is likely to affect employee or public safety. Therefore, although AusNet Services applies its risk quantification methodology generally, the effect of the overestimation of safety risk will vary across different programs. This was also shown in our review of a sample of major station projects, as discussed below. We consider that the weighting reflected in the sample, whereby one of the three programs has been found to be sensitive to the safety risk estimation issue, is a reasonable approximation of the broader significance of this issue across the remaining asset replacement programs.

For these reasons, in modelling our alternative estimate of forecast capex for the 2017–22 regulatory control period, we have reduced AusNet Services' forecast capex for asset replacement programs by 8.2 per cent. This adjustment addresses the overestimation of safety risk apparent in AusNet Services' economic justification of asset replacement programs. We are satisfied that this adjustment will provide for asset replacement program expenditure which reflects a realistic expectation of prudent and efficient costs.

CBD station rebuilds and major station replacement projects

We reviewed a sample of six major station projects accounting for approximately 83 per cent of CBD station rebuilds/major station replacement capex, including:

- West Melbourne Terminal Station (WMTS) rebuild
- Springvale Terminal Station (SVTS) redevelopment
- Fishermans Bend Terminal Station (FBTS) refurbishment stage 2
- Templestowe Terminal Station (TSTS) transformer and circuit breaker replacement
- Ringwood Terminal Station (RWTS) transformer and circuit breaker replacement
- Heywood Terminal Station (HYTS) circuit breaker replacement.

We did not review the remaining major station projects in detail as these projects are already well underway, with the majority of expenditure expected to be incurred in the 2014–17 regulatory control period.

For each project, we adjusted AusNet Services' economic model to account for the overestimation of safety risk by including an assumed 1 per cent hazard zone occupation rate in the safety risk calculation input. This provided a revised estimate of the expected benefits (avoided asset failure risks) for each project. We then assessed whether the revised economic modelling continued to support the full project as proposed by AusNet Services, or whether the reduced safety risk cost justified a reduced scope of work in the 2017–22 regulatory control period. We did this by converting the revised estimate of expected benefits into an equivalent capital value

¹⁰⁵ AusNet Services, *AMS 10-54 Circuit breakers*, 22 July 2015, p. 14; and AusNet Services, *AMS 10-64 Instrument transformers*, 14 August 2015, p. 4.

project, assuming the same project timing as proposed by AusNet Services. The results of our analysis are shown in Table 6.9 below.

Table 6.9 Impact of reduced safety risk cost on efficient major station capex (\$2016–17)

	WMTS	SVTS	FBTS	TSTS	RWTS	HYTS	Total
AusNet Services' proposal	96.5	68.7	33.5	22.2	10.4	5.2	236.5
CPI adjustment	-1.7	-1.2	-0.6	-0.4	-0.2	-0.1	-4.2
AusNet Services' proposal (CPI adjusted)	94.8	67.5	32.9	21.8	10.2	5.1	232.3
Safety related adjustment	-36.0	-24.1	-11.6	-3.3	-	-	-74.9
Safety related adjustment (%)	-37.9%	-35.7%	-35.2%	-14.9%	-	-	-32.3%

Source: AusNet Services, *Attachments 5F-5K - economic models*; and AER analysis.

Note: Numbers may not add up due to rounding.

We found that, in the case of four of the six major station projects, reducing the estimated safety risk cost as outlined above reduced the benefits provided by the project such that the capex proposed by AusNet Services is not economically justified. In our view, based on a realistic estimation of safety risk, the efficient level of capex for these six projects is, on average, approximately 32.3 per cent lower than AusNet Services' proposal.

For both the HYTS circuit breaker replacement project and the RWTS transformer and circuit breaker replacement project, our alternative estimate of project benefits (avoided risks) exceeded the proposed project cost, such that the full project scope remains economically justified. However, in all other cases, AusNet Services' forecast project capex exceeds the efficient level of expenditure which, in our view, reflects a more realistic estimate of safety risks. On this basis, we consider that AusNet Services' forecast major station capex is sensitive to the assumed level of safety risk associated with asset failures, and therefore does not reasonably reflect the efficient costs that a prudent operator would require to achieve the capex objectives.¹⁰⁶

For these reasons, in modelling our alternative estimate of forecast capex for the 2017–22 regulatory control period we have reduced AusNet Services' forecast capex for the six major station projects discussed above by 32.3 per cent.¹⁰⁷ This adjustment

¹⁰⁶ NER, cl. 6A.6.7(c).

¹⁰⁷ We have not made any adjustment to forecast capex for the remaining major station projects which are already underway, with the majority of expenditure expected to be incurred in the 2014–17 regulatory control period.

addresses the overestimation of safety risk apparent in AusNet Services' economic justification of these projects. We are satisfied that this adjustment will provide for major station project capex which is economically justified and reflects a realistic expectation of prudent and efficient costs.

Summary of repex findings

Based on our findings in this section B.2.3, we have reduced AusNet Services' forecast capex by \$143.1 million to account for our alternative assumptions on the cost of safety and reliability risk. Table 6.10 summarises AusNet Services' proposed repex and our alternative estimate of required repex, with reference to the impact of our adjustments for the various reasons discussed in section B.2.3 of this draft decision.

Table 6.10 Draft decision - Summary of impact of adjustments to repex programs (\$2016-17)

	Repex program				Total
	CBD station rebuilds	Major station replacement	Asset replacement	Safety, security, and compliance	
AusNet Services' proposal	109.5	177.5	230.5	65.9	583.3
CPI adjustment	-2.0	-3.2	-4.1	-1.2	-10.4
AusNet Services' proposal (CPI adjusted)	107.6	174.3	226.3	64.7	572.8
Cost estimate adjustment	-	-	-10.5	-3.0	-13.5
Removal of AusNet's proposed cost efficiency adjustment (-0.89%)	1.0	1.6	2.0	0.6	5.1
Safety risk adjustment	-36.0	-39.0	-18.7	-5.4	-99.0
Reliability risk adjustment	-7.6	-36.5	-	-	-44.1
Total non CPI adjustment	-42.6	-73.9	-27.2	-7.8	-151.5
AER draft decision	64.9	100.4	199.1	56.9	421.3
Total adjustment	-44.6	-77.1	-31.3	-9.0	-162.0
Total adjustment (%)	-40.7%	-43.4%	-13.6%	-13.6%	-27.8%

Source: AER analysis

Note: Numbers may not add up due to rounding

We are satisfied that our alternative amounts reflect a realistic expectation of cost inputs and demand forecast required to achieve the capex objectives. However, we note in relation to AusNet Services' West Melbourne Terminal Station project which is part of the CBD rebuild program that there may be additional factors which may be relevant to the scope and timing of this project. This is discussed below.

West Melbourne Terminal Station project

AusNet Services proposed the West Melbourne Terminal Station (WMTS) project as part of its CBD rebuild program. We note that in relation to the WMTS project, AusNet Services submitted that it needs to replace its 22 kV assets by 2019. However, the replacement of these assets can be avoided if CitiPower decommissions its 22 kV assets connected to the WMTS. In our recent distribution determination for CitiPower, we have included an amount of capex for CitiPower to decommission its 22kV assets.¹⁰⁸ AusNet Services submitted that these avoided costs are expected to provide savings of \$43 million over the two forthcoming regulatory control periods (including savings of \$17 million in the 2017-22 regulatory control).¹⁰⁹ AusNet Services also submitted that its forecast for the WMTS project is \$17 million lower on the basis that it will not be replacing its 22 kV assets.

Based on our findings in relation to risk quantification discussed above, we consider that network risk has been overstated and so forecast expenditure has been overstated, including expenditure for the WMTS project. Our assessment of the WMTS using updated and more realistic assumptions indicates that the economic value of avoided network risks is lower leading to a lower scope/volume of works that we are satisfied reasonably reflects the capex criteria. However, we would expect AusNet Services to coordinate the scope and timing of its work program with CitiPower at the WMTS, to realise the expected efficiencies related to the decommissioning of its 22kV assets. AusNet Services' scope of works for the WMTS project includes:¹¹⁰

- like for like replacement of the 220 kV switchgear with AIS
- like for like replacement of the 66 kV switchgear with three AIS buses and one GIS bus
- replacement of the 150 MVA 220/66 kV transformers with three 225 MVA 220/66 kV transformers
- replacement of protection and control systems in a new control building.

Based on the information available (other than the avoided costs associated with the retirement of the 22kV assets) we are not able to assess the extent of AusNet Services' proposed scope of works that may be related to CitiPower's 22 kV

¹⁰⁸ AER, *Final decision - CitiPower distribution determination 2016-20 - Attachment 6*, May 2016.

¹⁰⁹ AER, *Final decision CitiPower distribution determination, attachment 6 - capital expenditure - May 2016*, p.6-46.

¹¹⁰ AusNet Services, *Project planning report XA14 - WMTS (PUBLIC)*, October 2015, p. 29.

decommissioning project for assets connected to the WMTS. CitiPower's scope of works for assets connected to the WMTS includes:¹¹¹

- decommissioning of its 22 kV sub-transmission network supplied from WMTS; and
- upgrading its 66 kV sub-transmission network connected to WMTS.

We note that AusNet Services' project scope of its preferred option includes the like for like replacement of some assets, which may suggest that some of the proposed scope of works at the WMTS is independent of CitiPower's program. Relevantly, to the extent that AusNet Services' proposed scope of works is linked to CitiPower's proposed scope of works at the WMTS, this may be relevant to the scope and timing of works for the WMTS project (and proposed expenditure). We expect AusNet to provide further clarification in its revised proposal as to the relevance of CitiPower's 22 kV decommissioning project on its proposed scope of works at the WMTS.

Predictive modelling

As discussed in appendix A, while we consider that repex modelling at this stage may be of more limited application to the majority of transmission assets, some asset groups may be suitable for modelling. These assets are replaced on a more constant basis than most transmission assets (similar to distribution), and are more suitable for modelling based on the historical data available.

For AusNet Services, one group of assets we consider may be suitable for modelling are the SCADA and network protection assets. These assets map to the communication and network protection asset replacement forecast by AusNet Services. We used the repex model to derive an alternative estimate and have used this estimate to test AusNet Services' proposed amount for this program.

AusNet Services has forecast \$145 million of repex in this category, excluding overheads, which is approximately 63 per cent of AusNet Services' proposed expenditure for replacement programs. We consider that approximately two thirds, or \$101 million of this is suitable for repex modelling, based on the availability of asset age information and historical replacement data. The repex model output is \$95 million, approximately 5 per cent less than AusNet Services' forecast. This indicates that AusNet Services' proposed amount is consistent with its business as usual replacement practices.

However, as noted in our methodology review, we consider that reliance on business as usual replacement practices may overestimate AusNet Services' repex requirements as AusNet Services has systematically over-estimated safety risk and project cost estimates. Given this overestimation, we have reduced this expenditure to take into account our findings in relation to safety risk and project cost estimation. Further, we note that AusNet Services proposes to modernise its secondary and

¹¹¹ AER, *CitiPower distribution determination 2016-20*, May 2016.

protection assets such that use of the repex model to derive business as usual replacement amounts may be more limited which assumes like for like replacement. Given these considerations we have placed limited weight on our predictive modelling outcomes.

Network health indicators

AusNet Services' proposed capex must be consistent with the amount of capex it considers will be required to maintain the quality, reliability and security of supply of prescribed transmission services.¹¹² In considering this obligation we have had regard to network health indicators to gauge the likely health or condition of its network assets when considering the total forecast capex.

AusNet Services submitted it expects that its proposed capex will lead to a reduction in safety and environmental risk. Further, reliability risk is expected to remain broadly constant in monetary terms over the 2017-22 regulatory control period.¹¹³ Relevantly, AusNet Services considers that its forecast capex will support its ability to maintain the quality, reliability and security of supply of prescribed transmission services.¹¹⁴

AusNet Services provided a risk assessment summary outcome by asset type (reproduced in Table 6.11) of the expected impact of its forecast capex on risk.¹¹⁵

¹¹² NER, 6A.6.7(3)

¹¹³ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p.104.

¹¹⁴ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p.104.

¹¹⁵ AusNet Services, *Revenue proposal, Risk Management (PUBLIC VERSION)*, October 2015, p. 4.

Table 6.11 AusNet Services' risk assessment by asset type

Asset Type	Program	Risk Assessment
Tower	Reinforce 48 towers and install fall arrest systems on approximately 3,300 towers	Risk reduction obtained by strengthening towers and reducing the likelihood and consequence of a fall as less than a quarter of towers remain without fall arrest systems.
Conductor and Ground Wire	Replace approximately 150 km of standard ground wire and 70 km of OPGW.	Marginal increase in conductor risk but maintains risk of ground-wire population.
Circuit Breaker	Replace approximately 150 circuit breakers through proposed station rebuilds and targeted programs.	Maintains Risk
Instrument Transformer	Replace approximately 100 instrument transformers through proposed station rebuilds and targeted programs.	Maintains Risk
Disconnectors and Earth Switches	Replace / refurbish approximately 300 deteriorated Disconnectors and Earth Switches.	Maintains Risk
Power Transformer	Replace 10 power transformers, 22 bushings and complete various asset management activities to extend the life of 37 transformers.	Maintains Risk

Table 1 – Asset Type Risk Assessment

Source: AusNet Services, *Revenue proposal 2017-22*, 30 October 2015

AusNet Services submitted that asset replacement over the 2017-22 regulatory control period will largely be driven by:¹¹⁶

- the risk associated with power transformer, circuit breaker and instrument transformer failures; and
- safety related and safety compliance related expenditure.

We note that AusNet Services also submitted a projected overall network risk profile that estimates that network risk will decline over time. However, AusNet Services advised that the purpose of the estimated network risk profile is to "provide a high level context of the current risk profile and how the proposed implementation of the plan [asset management plan] affects the risk profile". While AusNet Services does not appear to use this overall network risk analysis, we note there are some limitations with its revised analysis as summarised in Table 6.11.¹¹⁷ In particular, AusNet Services'

¹¹⁶ AusNet Services, *Appendix 4A, Network capital expenditure overview*, October 2015, p.20.

¹¹⁷ AusNet Services has removed this overall network risk analysis from its 2016-17 to 2020-21 asset management plan.

revised risk assessment is unsubstantiated and does not provide an overall assessment of network risk. Qualitative representations of network risk are less meaningful than quantitative risk assessments as they provide no transparency into the information used to arrive at the risk categorisations and therefore limit meaningful assessment.

That said we have assessed AusNet Services' estimated risk in relation to major projects and some of its proposed repex programs.¹¹⁸ As outlined above, our findings are that AusNet Services overestimated network risks from an asset failure. As a result, we consider that AusNet Services has overestimated overall network risk and therefore expenditure required to achieve the capex objectives.

We have also considered the likely health of AusNet Services' network assets and its implications for forecast capital expenditure in terms of achieving the capex objectives. In particular, we have had regard to:

- application of AusNet Services' asset health index used as an input into the quantification of risk
- asset failure performance by major asset groups
- the age profile of AusNet Services' network by major asset group¹¹⁹; and
- actual and projected average remaining lives of major asset groups.

Asset condition

In developing its total capex forecast, AusNet Services has used an asset health index and various techniques to measure the health of different assets types.¹²⁰ Further, AusNet Services stated that it relies on asset condition data to determine the probability of failure which is used to develop its capex forecast. While we consider that the use of a health index and the identified techniques used to measure the health of major assets types is consistent with good industry practice, we have identified some issues, including:

- AusNet Services' analysis adopts one annual failure probability based on failure data for each type of asset and this failure probability is then applied to all asset failure modes. However, different failure modes (e.g. explosive failure, downed conductor) will result in different consequences and therefore different estimated risks.
- The asset type failure probability is derived by calibration using historical data. However the calibration process relies on an annual data point rather than employing a best fit estimator across the historical data set.

¹¹⁸ These repex programs included instrument transformers, circuit breakers and groundwires.

¹¹⁹ This indicator uses asset age as a proxy for asset condition.

¹²⁰ AusNet Services, *Revenue proposal 2017-22*, 30 October 2015, p.73.

- AusNet Services uses a discrete condition index scale and its allocation of an asset to one of the discrete scores within the spectrum of this condition index scale will determine the distribution of assets across the condition index scale spectrum. Our review of power transformer condition data suggests that AusNet Services' mapping of individual asset condition scores to the discrete condition index scale appears to exhibit a tendency to move an asset's condition to the next highest discrete condition scale point, rather than up or down to the nearest discrete condition index score.

While we are unable to assess the likely impact on forecast capex associated with assuming common failure modes to determine the probability of asset failure, there is some evidence to suggest that AusNet Services' mapping of individual asset scores to its health index may overestimate the probability of asset failure and therefore risk and forecast capex. However, whether this is the case will depend on whether AusNet Services' approach for power transformers is systemic across all asset groups.

We expect that AusNet Services is well placed to provide information to substantiate that its asset failure rates reasonably correspond with failure modes and the related consequences. We also expect that the calibration of the asset failure rates can be shown to result in a reasonably unbiased estimator of the asset's historical failure rates and that AusNet Services' mapping of equipment to its discrete condition index scale does not create a bias in the resulting failure rate estimates. AusNet Services should provide information to substantiate these aspects of its asset failure rates in its revised proposal.

Asset failure performance

We have had regard to AusNet Services' asset failure¹²¹ performance to provide high level observations regarding overall network health and to identify trends in asset deterioration.¹²² In circumstances where the historical trend exhibits a decrease (increase) in asset failures, this may suggest that past expenditure may have been higher (lower) than necessary to achieve the capex objectives, respectively. Figure 6.8 shows our analysis of AusNet Services' asset failure performance.

¹²¹ In our Explanatory Statement for Category Analysis RINs released in March 2014, we adopted the following definition for asset failure:

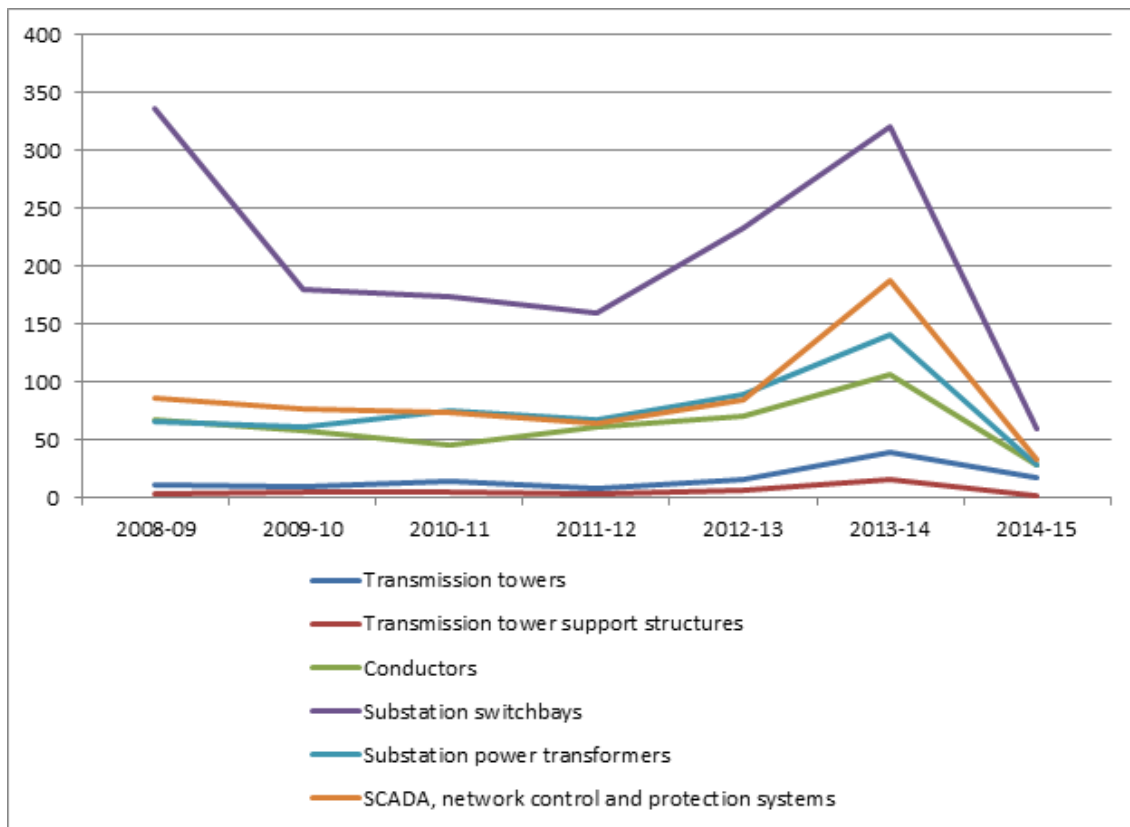
The failure of an asset to perform its intended function safely and in compliance with jurisdictional regulations, not as a result of external impacts such as:

- *extreme or atypical weather events; or*
- *third party interference, such as traffic accidents and vandalism; or*
- *wildlife interference, but only where the wildlife interference directly, clearly and unambiguously influenced asset performance; or*
- *vegetation interference, but only where the vegetation interference directly, clearly and unambiguously influenced asset performance.*

Excludes planned interruptions.

¹²² AusNet Services (transmission), 2014-15 - Category Analysis RIN - Templates.

Figure 6.8 AusNet Services' asset failures by asset type



Source: AER CA RIN 2014-15

Note: Asset failure data exhibits a sharp increase in 2013-14 followed by a sharp decrease in 2014-15. We are not aware of the reasons for this sharp increase and subsequent decrease.

In summary, a review of past performance indicates that:

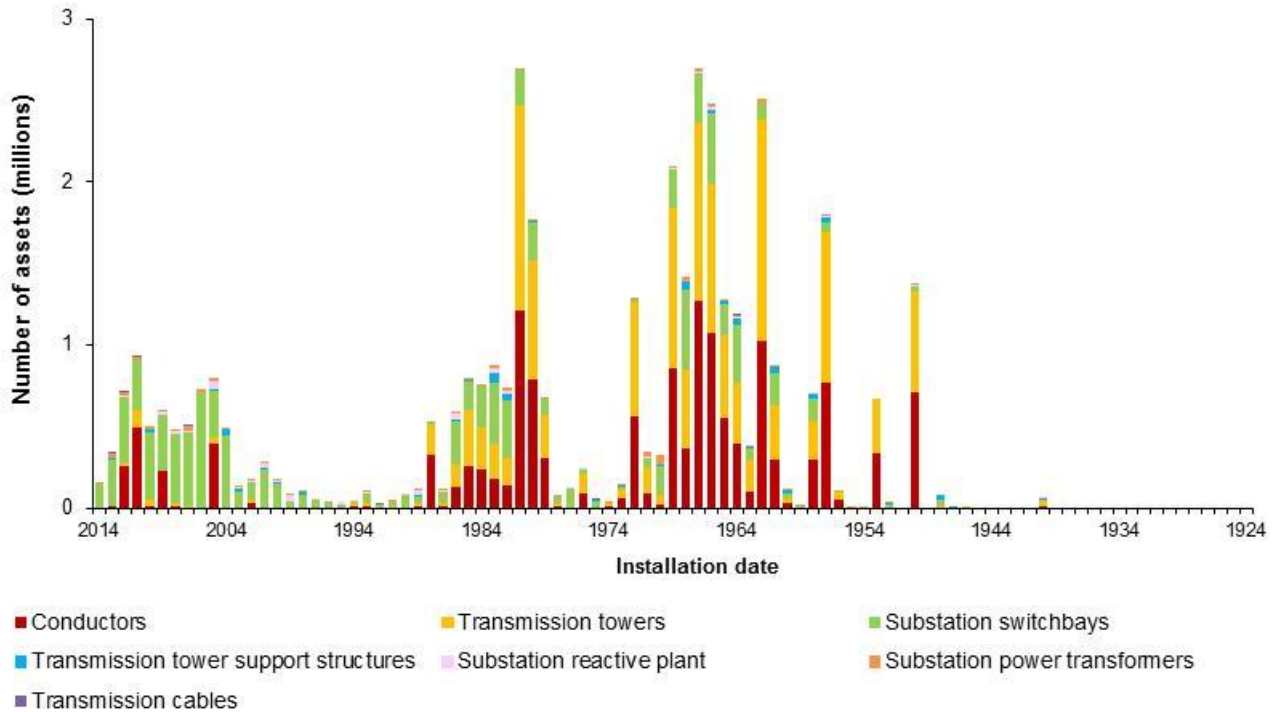
- asset failures by major asset group have been relatively steady over time (with the exception of switchbays which has declined over the period), with transmission towers and support structures experiencing the lowest failures
- the spread of failure rates between asset groups has reduced and are at their lowest levels over the period based on significant declines in 2014-15
- power transformer failure shows a steady increase over time but exhibits a sharp decline to historically low levels in 2014-15
- substation switch-bays exhibit the highest asset failures but has experienced the largest decline in 2014-15.

These historical trends suggest that past expenditure has been sufficient to maintain the quality, reliability and security of supply of prescribed transmission services.

Asset age profile

We have reviewed the asset age profile of AusNet Services' transmission network.¹²³ Figure 6.9 shows AusNet Services' current transmission network asset age profile.

Figure 6.9 AusNet Services' transmission network asset age profile



Source: AER analysis

AusNet Services' asset age profile indicates that:

- There is a relatively large stock of conductors and towers commissioned in the 1960's 1970's and 1980's. Based on information provided by AusNet Services we note that for the majority of transmission assets (transmission towers, transmission tower support structures, conductors and transmission cables) the number of assets in service beyond their expected mean economic life is relatively immaterial. This is consistent with AusNet Services' proposal, which has proposed minimal replacement of conductors and towers.
- There has been a significant amount of substation switchbay and substation power transformer replacement since 2004, but with a large stock of these assets still in commission from the 1960s. Based on information provided by AusNet Services we note that there are a material number of substation assets (substation switchbays, substation power transformers and substation reactive plant) in service beyond their mean economic lives. In particular, the majority of substation power transformers in service are beyond AusNet Services' estimated mean economic life

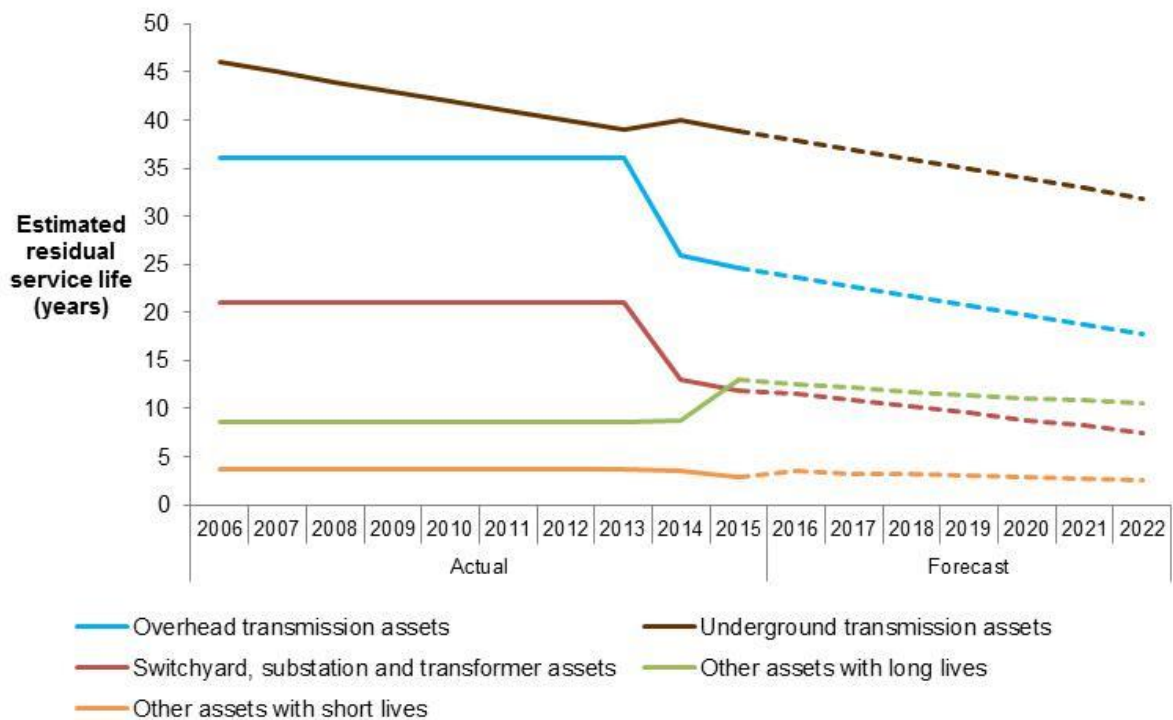
¹²³ AusNet Services (transmission), 2014-15 - Category Analysis RIN - Templates.

of 40 years. A significant proportion of substation switchbays are also still in service beyond AusNet Services' estimated mean economic life of 45 years.

Another asset health indicator which we have considered is AusNet Services' trend in average residual asset life over time, where residual service life is used as a high-level proxy for asset condition. Asset condition is a key driver of replacement expenditure.

Figure 6.10 shows that AusNet Services' residual asset lives have been flat over the period 2006–2013 (with the exception of underground assets). This means that, on average, AusNet Services' network assets are staying the same age.

Figure 6.10 AusNet Services' transmission residual network asset age profile



Source: AER analysis, *SP AusNet (transmission), 2006-13 - Economic Benchmarking RIN - Financial and non-financial information*,
AusNet Services (transmission), 2013-14 - Economic Benchmarking RIN - Financial and non-financial information,
AusNet Services (transmission), 2014-15 - Economic Benchmarking RIN - Financial and non-financial information,
AusNet Services (transmission), 2017-18 - 2021-22 - Regulatory Information Notice - Revenue proposal, October 2015.

AusNet Services has estimated residual life decreases significantly in 2014-15. However we do not consider that this sudden decrease is plausible and expect AusNet

Services to clarify this observation in its revised proposal. This observation was also commented on by the EUCV in its submission.¹²⁴ We note the estimated residual life is projected to decline over the 2017-22 regulatory control period.

Noting the above, the projected declining trend in residual lives (where age is a proxy for asset condition) suggests that the health of AusNet Services' asset base may be expected to deteriorate for conductors, substation and transformer assets and underground assets.

However, we acknowledge limitations exist when using estimated residual service life to indicate the trend in the underlying condition of network assets. Large volumes of recent replacements that may not be age driven 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.

¹²⁴ EUCV, *Submission on AusNet Services' transmission revenue review 2017-2022*, 9 February 2016, p. 17.

B.3 Forecast non-network capex

The non-network capex category for AusNet Services includes expenditure on information and communications technology (ICT), buildings and property, motor vehicles, and tools and equipment.

B.3.1 Position

We are not satisfied AusNet Services' forecast non-network capex reasonably reflects the capex criteria and therefore we do not accept the proposed amount. We have instead included an amount of \$99.4 million (\$2016–17) for non-network capex in our estimate of total capex which we are satisfied reasonably reflects the capex criteria. This is a reduction of 6 per cent. This is comprised of \$79.5 million for ICT capex and \$26.3 million for the other categories of non-network capex.

In coming to this view, we have found based on the information available that AusNet Services' forecast non-network ICT capex of \$79.5 million (\$2016–17) does not reflect the efficient costs of a prudent operator. We consider that non-network ICT capex of \$73.3 million (\$2016–17) reasonably reflects AusNet Services' required capex for this category in the 2017–22 regulatory control period. This is a reduction of 8 per cent from AusNet Services' forecast ICT capex.

In modelling AusNet Services' allowed revenue for the 2017–22 regulatory control period, we have also accounted for forecast disposals of fleet assets which AusNet Services omitted from its revenue proposal.

Table 6.12 Final decision on AusNet Services' total forecast non-network capex (\$2016-17, million)

	2017-18	2018-19	2019-20	2020-21	2021-22	Total
AusNet Services' proposal	29.3	27.1	18.3	16.0	15.2	105.8
CPI adjustment	-0.5	-0.5	-0.3	-0.3	-0.3	-1.9
AusNet Services' proposal (CPI adjusted)	28.8	26.6	18.0	15.7	14.9	104.0
Non CPI adjustment	-1.4	-1.3	-0.7	-0.6	-0.5	-4.6
AER draft decision	27.4	25.3	17.2	15.1	14.4	99.4
Total adjustment	-1.9	-1.8	-1.1	-0.9	-0.8	-6.5
Total adjustment (%)	-6.6%	-6.5%	-5.9%	-5.7%	-5.2%	-6.1%

Source: AER analysis.

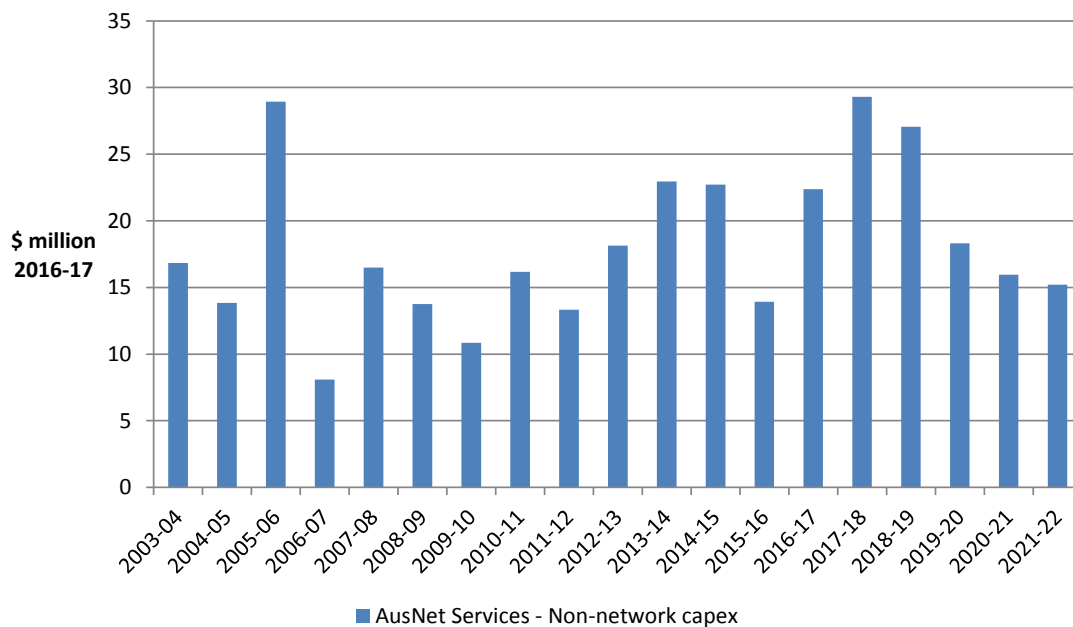
Note: Numbers may not add up due to rounding.

B.3.2 AusNet Services' proposal

AusNet Services proposed \$105.8 million (\$2016–17) for non-network capex in the 2017–22 regulatory control period, compared to \$100.1 million in the previous five year period.¹²⁵ The majority of the forecast non-network capex (\$79.5 million or 75 per cent) is ICT capex.

Figure 6.11 shows AusNet Services' actual and expected non-network capex for the period from 2003–04 to 2016–17, and forecast capex for the 2017–22 regulatory control period.

Figure 6.11 AusNet Services' non-network capex (\$2016-17)



Source: AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014–15*, template 2.6; AusNet Services, *Category Analysis RIN 2013–14*, template 2.6; AusNet Services, *Category Analysis RIN 2008–13*, template 2.6; SP AusNet, *Cost information templates, Historic capex by category*, February 2007; AER analysis.

AusNet Services' forecast non-network capex for the 2017–22 regulatory control period is, on average, 8 per cent higher per year than actual and expected capex in the 2014–17 regulatory control period.¹²⁶

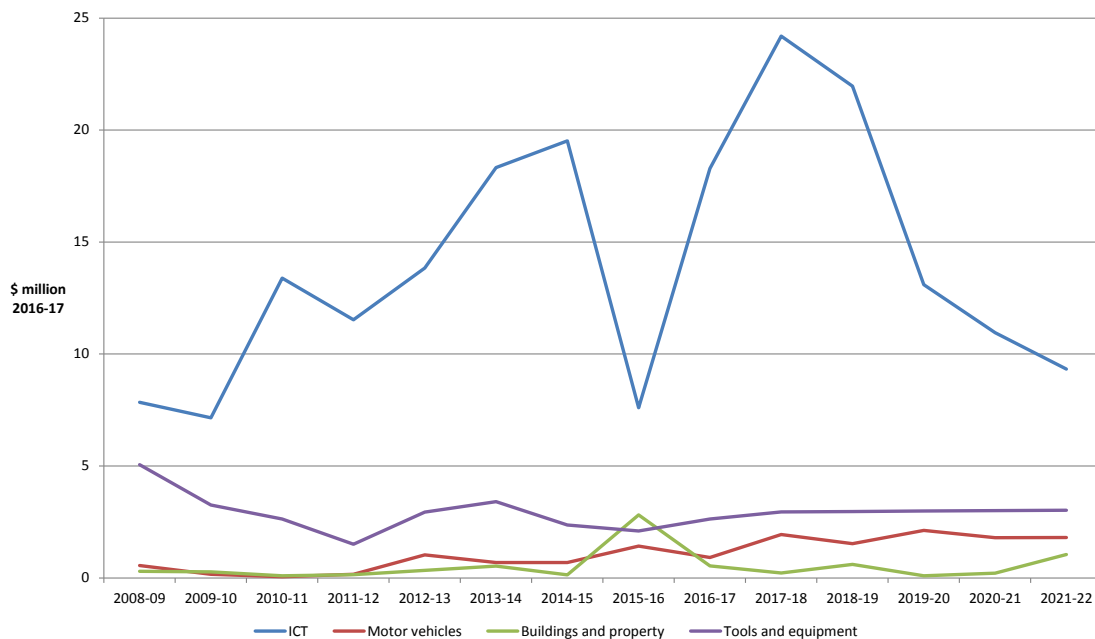
¹²⁵ AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014–15*, template 2.6; AusNet Services, *Category Analysis RIN 2013–14*, template 2.6; AusNet Services, *Category Analysis RIN 2008–13*, template 2.6; Excludes overheads.

¹²⁶ AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014–15*, template 2.6; AER analysis.

Our analysis of longer term trends in non-network capex suggests that AusNet Services has forecast capex returning over time to levels consistent with average historical expenditure for this category. Non-network capex for the final three years of the 2017–22 regulatory control period is forecast to be consistent with average expenditure in the years prior to the 2014–17 regulatory control period. However, non-network capex in the first two years of the 2017–22 regulatory control period is forecast to be higher than expenditure in any year since 2005–06. This profile appears to contribute to the 'front-loading' of total capex within the regulatory control period noted by the CCP.¹²⁷ We therefore consider that AusNet Services' forecast non-network capex program warrants further review to confirm the need for and timing of the proposed expenditure, with particular focus on the 2017–18 and 2018–19 years.

We have 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 further review.¹²⁸ Figure 6.12 shows AusNet Services' actual and forecast non-network capex by sub-category for the period from 2008 to 2022.

Figure 6.12 AusNet Services' non-network capex by category (\$2016-17, million)



Source: AusNet Services, *Regulatory information notice*, template 2.6; AusNet Services, *Category Analysis RIN 2014–15*, template 2.6; AusNet Services, *Category Analysis RIN 2013–14*, template 2.6; AusNet Services, *Category Analysis RIN 2008–13*, template 2.6; AER analysis.

¹²⁷ Consumer Challenge Panel (Panel 5), *Submission on AusNet Services' transmission revenue review 2017-2022*, 8 February 2016, p. 19.

¹²⁸ NER, cl. 6A.6.7(e)(5).

AusNet Services has forecast ICT capex at historically high levels in the first two years of the 2017–22 regulatory control period. This is driving the overall spike in non-network capex in those years shown in Figure 6.11. The EUCV expressed concern that AusNet Services considers that the IT capex used in the current period (or even the previous period) provides an argument to continue such projects at the same level of expenditure as in the past.¹²⁹

Forecast capex for motor vehicles is expected to increase by 83 per cent in the 2017–22 regulatory control period, continuing a trend evident in previous regulatory control periods. In contrast, AusNet Services has forecast tools and equipment capex in line with the long term average (revealed cost) expenditure in this category, and a substantial reduction in buildings and property capex in the 2017–22 regulatory control period.

We undertook a detailed review of the justification for AusNet Services' forecast ICT and motor vehicles capex to confirm the need and timing of the forecast expenditure. We have assessed AusNet Services' forecast capex using both trend analysis and individual project review where relevant. In our trend analysis, we have compared the proposed expenditure to historic expenditure, and sought to understand the reasons for material differences in forecast expenditure. In doing so, we have considered the underlying drivers of expenditure. For example, in relation to ICT capex we have considered the investment lifecycle stage the business is in and its particular needs in the forthcoming period. Where we have decided to review individual projects or programs, we have examined any business cases and other supporting documentation provided by AusNet Services to assess whether the expenditure reasonably reflects the capex criteria. Our conclusions are summarised below.

B.3.3 Information and communications technology capex

AusNet Services proposed \$79.5 million (\$2016–17, escalated, excluding overheads) for ICT capex for the 2017–22 regulatory control period. This is a 2.4 per cent increase above the \$77.6 million for the previous five years (2012–17). We do not accept this proposed forecast and instead substitute an amount of \$73.3 million for the reasons below.

We analysed the longer term trend for ICT capex which suggests that AusNet Services has forecast capex for this category at levels that are generally higher than the period prior to 2010, but similar to more recent years. We then conducted individual project reviews.

In its revenue proposal, AusNet Services provided a brief outline of its proposed ICT capex forecast, which was then further substantiated by its ICT Strategy.¹³⁰ However, we considered these two documents did not provide enough material to justify AusNet

¹²⁹ EUCV, *Response to AusNet revenue reset proposal for the 2017–2022 period*, p.19

¹³⁰ AusNet Services, *Transmission Revenue Review 2017–2022*, 30 October 2015, pp. 100–103. AusNet Services, *Appendix 4H: ICT Strategy 2017–2022 Electricity Transmission Network*, 30 October 2015.

Services' proposed ICT capex forecast. Therefore, we sought further information from AusNet Services, including requesting business cases, cost benefit analyses, supporting information, and the breakdown of costs between transmission and distribution networks.¹³¹ In response to this request, AusNet Services provided project justifications for 'a range of forecast projects which provide key details pertaining to the planned portfolio of work' and submitted that it did not currently have any approved business cases for its forecast ICT capex.¹³²

We reviewed AusNet Services ICT across its distribution and transmission businesses as well as transmission specific ICT capex.

AusNet Services shares its ICT services across its transmission, electricity distribution and gas distribution businesses. Of the proposed \$79.5 million, \$62.2 million, or 78 per cent, is for projects that are shared with AusNet Services distribution businesses.¹³³ We assessed this expenditure as part of the reset process for AusNet Services distribution and found that it was prudent and efficient.¹³⁴ We have reviewed the expenditure proposed by AusNet Services in its transmission proposal and also consider this expenditure to be prudent and efficient. We have included it in our alternative estimate.

We also reviewed the transmission specific ICT capex projects which total \$17.3 million.¹³⁵ Where AusNet Services provided sufficient justification for the expenditure, we accept that proposed forecast capex. AusNet Services' response to our information request provided further information regarding the transmissions specific projects, including the split between recurrent and non-recurrent expenditure and some project justifications.¹³⁶ This information provided sufficient justification for most of AusNet Services' forecast ICT capex.

However, we substituted an amount of \$11.7 million, on the basis that AusNet Services did not provide further information for a number of transmission specific projects that are non-recurrent expenditure. The specific projects are discussed in confidential appendix F. The projects are mentioned briefly in the ICT Strategy and in the spreadsheet providing the project breakdown, but no project justifications or business cases have been provided.¹³⁷ In the absence of any project justifications, it is not clear why these projects are required to achieve the capital expenditure objectives.¹³⁸

¹³¹ AER, *Information Request #008 – AusNet Tx – IT, comms, and other*, 10 December 2015.

¹³² AusNet Services, *Response to AER information request #008*, 13 January 2016, p. 3.

¹³³ AusNet Services, *Response to AER information request #008, Attachment 2 – TRR ICT Cost Breakdown.xlsx*, 13 January 2016.

¹³⁴ AER, *Final Decision - AusNet Services distribution determination 2016–2020 – Attachment 6*, May 2016.

¹³⁵ AusNet Services, *Response to AER information request #008, Attachment 2 – TRR ICT Cost Breakdown.xlsx*, 13 January 2016.

¹³⁶ AusNet Services, *Response to AER information request #008*, 13 January 2016.

¹³⁷ AusNet Services, *Appendix 4H: ICT Strategy 2017–2022 Electricity Transmission Network*, 30 October 2015, pp. 128-129. AusNet Services, *Response to AER information request #008, Attachment 2 – TRR ICT Cost Breakdown.xlsx*, 13 January 2016.

¹³⁸ NER, r. 6A.6.7(a).

Therefore, we have not included an amount for these projects in our alternative capex estimate. If AusNet Services provides further information on these projects in its revised proposal, we will consider that information and assess whether the expenditure is necessary to achieve the capital expenditure objectives in the NER.

In summary, we have included \$73.3 million for ICT capex in our alternative capex forecast. This includes an amount for the shared ICT projects with AusNet Services' distribution businesses and an amount for the transmission specific projects.

B.3.4 Fleet capex

AusNet Services proposed fleet capex of \$9.2 million (2016-17) for the 2017–22 regulatory control period.¹³⁹ This is an annual average of \$0.8 million (2016-17) or 84 per cent more than AusNet Services' annual actual and estimated fleet capex in the 2014–17 regulatory control period.¹⁴⁰

AusNet Services submitted that its owned vehicle fleet will increase during the 2017–22 regulatory control period compared to historic levels reflecting the cost efficiencies associated with purchasing, rather than leasing, vehicles.¹⁴¹ AusNet Services' regulatory information notice shows that although the total number of vehicles in its vehicle fleet during the 2017-22 regulatory control period is forecast to remain the same as current levels, the number of vehicles purchased is proposed to increase as a proportion of its total vehicle fleet.¹⁴²

We have reviewed AusNet Services' submission in respect of its proposed fleet capex for the 2017-22 regulatory control period and consider that AusNet Services' forecast fleet capex of \$9.2 million (2016-17) reasonably reflects the efficient costs that a prudent operator would require to meet the capex criteria.¹⁴³ We consider that AusNet Services' proposal to increase its proportion of vehicles it owns rather than leases is consistent with the practice of other electricity service providers in Australia and may result in cost efficiencies.¹⁴⁴ We also consider that AusNet Services' vehicle replacement criteria for passenger and light and heavy commercial vehicles are consistent with those of other Australian electricity service providers.¹⁴⁵

Fleet asset disposals

AusNet Services did not account for any disposals of fleet assets in its revenue proposal. In assessing AusNet Services' forecast non-network capex, we sought

¹³⁹ AusNet Services, *Revenue proposal 2017-22*, October 2015, p. 100.

¹⁴⁰ AusNet Services, *Revenue proposal 2017-22*, October 2015, p. 100.

¹⁴¹ AusNet Services, *Revenue proposal 2017-22*, October 2015, p. 103.

¹⁴² AusNet Services, *Revenue proposal, AusNet Regulatory Information Notice - Template-PUBLIC*, 29 January 2016, Table 2.6.3 Annual Descriptor Metrics - Motor Vehicles.

¹⁴³ NER, cl. 6.5.7(c)(1).

¹⁴⁴ NER, cl. 6.5.7(e)(7).

¹⁴⁵ AusNet Services, *Response to information request AusNet Services IR# 001b*, 10 December 2015.

further information regarding AusNet Services' forecast disposals of fleet assets in the 2017–22 regulatory control period.¹⁴⁶

In response to our information request, AusNet Services advised that it expected proceeds from the sale of fleet assets over the 2017–22 regulatory control period of \$1.0 million.¹⁴⁷ We have accounted for these disposals in modelling AusNet Services' allowed revenue for the 2017–22 regulatory control period.

¹⁴⁶ AER, *Information request to AusNet Services IR# 001b*, 3 December 2015.

¹⁴⁷ AusNet Services, *Response to information request AusNet Services IR# 001b*, 10 December 2015.

B.4 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.4.1 Position

We do not accept AusNet Services' proposed capitalised overheads as we are not satisfied the proposed capital overheads reasonably reflect the capex criteria. We instead included in our alternative estimate of overall total capex an amount of \$52.4 million (\$2016-17) for capitalised overheads. This is 7.2 per cent lower than AusNet Services' proposal of \$56.5 million (\$2016-17). We are satisfied that this amount reasonably reflects the capex criteria.

B.4.2 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 energy service provider would not undertake the full amount of direct expenditure contained in AusNet Services' revenue 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 of overheads in the Queensland distribution determination found that Energex's overheads comprised 75 per cent fixed and 25 per cent variable components. We considered this split of fixed and variable overheads components was also reasonable for our recent decision for AusNet Services Victorian distribution business. For the reasons set out in those decisions and based on the information available to us, we also consider that this split of fixed and variable overheads components is also reasonable for AusNet Services transmission network. It is open to AusNet Services in its revised proposal to provide evidence of a different split between fixed and variable components.

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 underpins 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 \$168.4 million (\$2016-17) reduction in AusNet Services' direct capex that attract overheads, we consider a reduction of \$4.1 million (\$2016-17) reasonably reflect the capex criteria.

C Demand

AusNet Services' economic evaluations of its proposed terminal station rebuild projects include an assessment of maximum demand forecasts at these terminal stations, in terms of the load at risk under unplanned outage conditions.¹⁴⁸ AusNet Services does not produce its own maximum demand forecasts because, as noted by AusNet Services, the Australian Energy Market Operator (AEMO) is responsible for preparing maximum demand forecasts for the transmission network in Victoria.¹⁴⁹ This is because AEMO plans and procures the augmentation of the transmission network in Victoria, which is owned and operated by AusNet Services.

Instead of applying AEMO's demand forecasts to its portfolio of terminal station rebuild projects, AusNet Services submitted that its terminal station demand forecasts are based on a combination of AEMO's 2014 forecasts and the Victorian electricity distributors 2014 forecasts.¹⁵⁰ ¹⁵¹ AusNet Services' approach to selecting terminal station demand forecasts is to use the forecast or a combination of the two 2014 forecasts from AEMO and Victorian distributors that, in its view, best reflects:¹⁵²

- the likely future demand at these terminal stations on the basis of actual historical demand in recent years; and
- its understanding of likely trends or developments.

AusNet Services applies the Victorian distributors' forecasts for the majority of its terminal station analysis because it judges that these forecasts are more realistic. These demand forecasts predict that demand will grow over 2017–22 regulatory control period at the relevant terminal stations.¹⁵³

We are not satisfied that these demand forecasts that AusNet Services adopts reflect a realistic expectation of demand required to achieve the capex objectives.¹⁵⁴ For the reasons set out below, we consider that AEMO's 2015 demand forecasts reflect a realistic expectation of demand.

AusNet Services' analysis of likely future demand is likely to mislead because it compares historical raw demand data with forecast demand to select the "best"

¹⁴⁸ AusNet Services, Transmission Revenue Review 2017–2022, October 2015, p. 71.

¹⁴⁹ PLEASE ADD REFERENCE

¹⁵⁰ AusNet Services, Transmission Revenue Review 2017–2022, October 2015, p. 71.

¹⁵¹ The two forecasts AusNet Services referred to are provided in AusNet Services, Transmission Revenue Review 2017–2022, October 2015, Appendix 4B, DNSP-Victorian Terminal Station Demand Forecasts for 2014–15 to 2024–25, Forecasts Prepared by Victorian Distribution Network Service Providers and Collated by AEMO, September 2014 and Appendix 4C, 2014 AEMO Transmission Connection Point Forecasting Report for Victoria, 30 October 2015.

¹⁵² AusNet Services, Response to AER questions #015 –Demand Forecasts, 26 April 2016, p.2.

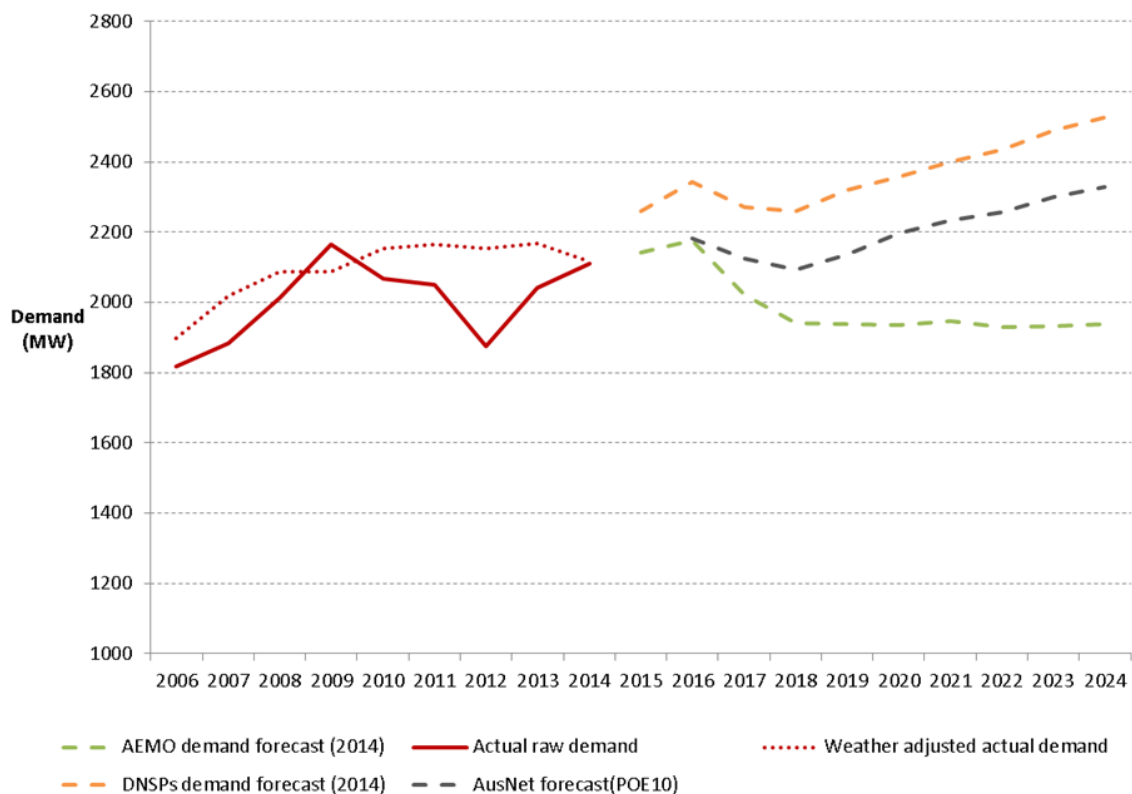
¹⁵³ AusNet Services, Transmission Revenue Review 2017–2022, October 2015, supporting documents: planning reports.

¹⁵⁴ NER, cl. 6A.6.7(c)(3).

demand forecast for a particular terminal station. The use of actual demand data is problematic because actual data often contain the impact of random weather factors which make it difficult to draw any inferences about changes in the underlying level of demand. A more sound and widely accepted approach to forecasting demand is removing the effect of random weather factors on observed electricity demand (called weather-adjusted demand).

Figure 6.13 compares historical raw and weather adjusted demand for AusNet Services' proposed terminal station projects, the forecasts from AEMO and the distributors, and the overall forecast AusNet Services adopts. This figure shows actual demand experienced peaks and troughs due to changes in weather, whereas the underlying weather adjusted demand trend, as expected, is flatter. Relevantly, AEMO's demand forecast of flat demand growth over 2017-22 is consistent with the trend observed in the actual weather adjusted demand for AusNet Services' portfolio of terminal station rebuild projects.

Figure 6.13 Demand for AusNet Services' portfolio of terminal station rebuild projects (MW, non-coincident transmission connection points, POE10, summer)



Source: AEMO, 2014 *Victoria connection point forecast report*; AusNet Services, *Terminal Station economic models* (received in response to information request 09); AusNet Services, *Transmission Revenue Review 2017–2022*, October 2015, Appendix 4B; AusNet Services, *2015 terminal station demand forecasts*, available at [http://www.ausnetservices.com.au/CA257D1D007678E1/Lookup/Projects2/\\$file/TCPR%20TSDemandForecast.xlsx](http://www.ausnetservices.com.au/CA257D1D007678E1/Lookup/Projects2/$file/TCPR%20TSDemandForecast.xlsx).

AusNet Services submitted that its approach to selecting demand forecast is also based on an understanding of likely trends and developments. While AusNet Services provided no further information, we note that AEMO's demand forecasting methodology does take into account 'block loads' (e.g. changes in large loads from a large directly connected customer).

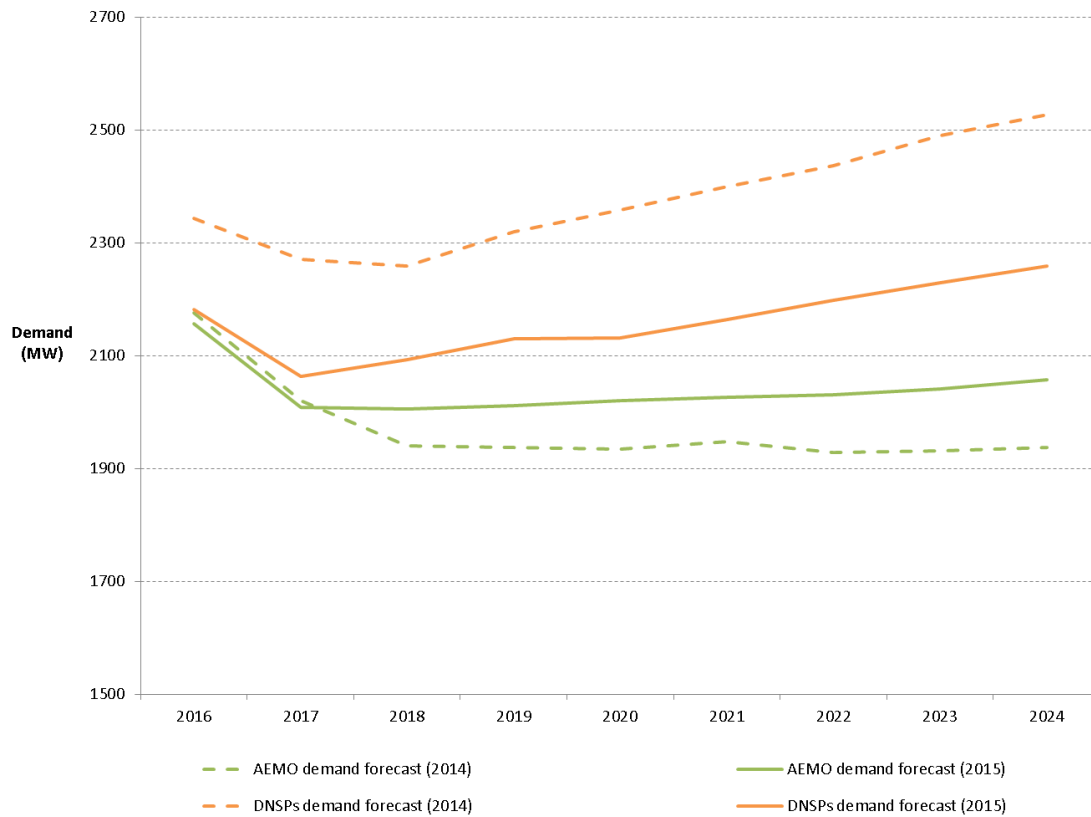
We consider that applying a single demand forecasting methodology to forecast terminal station demand will result in forecasts that reflect realistic expectations of demand. We consider that AEMO's terminal station demand forecasts reflect a realistic expectation of demand for AusNet Services' network because it is based on a consistent and well established forecasting methodology. This is consistent with the position we adopted in our final decision for the Victorian distributors 2016-20 regulatory determinations, including on demand forecasts.

Further, applying AEMO's terminal station demand forecasts will ensure consistency between replacement planning by AusNet Services and network augmentation planning by AEMO in Victoria. This will ensure that network assets are replaced or upgraded on a consistent basis across the transmission network. We note that AusNet Services submitted that in identifying synergies or savings, project based replacement may be combined with AEMO's shared network augmentation requirements. To ensure that these savings or synergies are realised we would expect that a consistent application of the AEMO demand forecasts should be applied.

AusNet Services' analysis is also based on AEMO's and the Victorian distributors 2014 forecasts, which were the most recently published forecasts available at the time AusNet Services developed its revenue proposal.¹⁵⁵ Both AEMO and the Victorian DNSPs have since published updated 2015 forecasts. Figure 6.14 below compared the 2014 and 2015 forecasts for AEMO and the Victorian distributors. This shows that the distributors' forecasts are significantly lower and are now more consistent with AEMO's, which has also been updated.

¹⁵⁵ AusNet Services, Response to AER questions #015 –Demand Forecasts, 26 April 2016, p.2.

Figure 6.14 Change in demand forecasts between 2014 and 2015 (MW, non-coincident transmission connection points, POE10, summer)



Source: AEMO, *2015 Victoria connection point forecast report*; AusNet Services, *Transmission Revenue Review 2017–2022*, October 2015, Appendix 4B; AusNet Services, *2015 terminal station demand forecasts*, available at [http://www.ausnetservices.com.au/CA257D1D007678E1/Lookup/Projects2/\\$file/TCPR%20TSDemandForecast.xlsx](http://www.ausnetservices.com.au/CA257D1D007678E1/Lookup/Projects2/$file/TCPR%20TSDemandForecast.xlsx)

For this draft decision, we have re-estimated the economic evaluations of AusNet Services proposed terminal station rebuild projects by applying AEMO’s 2015 forecasts. We expect that AusNet Services will also consider the impact of updated demand forecasts on forecast capex in the context of its revised proposal.

D Contingent projects

AusNet Services proposed one contingent project for the 2017–22 regulatory control period to replace the synchronous condensers¹⁵⁶ at the Brooklyn and Templestowe terminal stations at an approximate cost of \$70 million.¹⁵⁷

Generally, contingent projects are significant network projects that may be reasonably required to be undertaken in order to achieve the capex objectives. However, unlike other proposed capex projects, the need for the project and the associated costs are not certain. Expenditure for such projects does not form part of our assessment of the total forecast capex that we approve in this determination. Such projects are linked to unique investment drivers and are triggered by a defined 'trigger event'. The occurrence of the trigger event must be probable during the regulatory control period.¹⁵⁸

In proposing the replacement of the Brooklyn and Templestowe synchronous condensers as a contingent project, AusNet Services submitted that it was awaiting advice from AEMO as to whether the expected future benefits of the two synchronous condensers are sufficient to justify their replacement.¹⁵⁹ AusNet Services defined the trigger event for the proposed contingent project as:¹⁶⁰

Formal confirmation from AEMO that the magnitude of the expected benefits provided by the synchronous condensers justify the replacement of the Brooklyn and/or Templestowe Terminal Station synchronous condensers with reactive plant providing a similar, or reduced, level of service.

On 7 April 2016, AusNet Services submitted that it had received advice from AEMO that the synchronous condensers are no longer justified by market benefits and will not need to be replaced. AusNet Services submitted the proposed contingent project was therefore no longer required.¹⁶¹

Based on the advice received from AEMO and AusNet Services, we are satisfied that the proposed contingent project to replace the Brooklyn and Templestowe synchronous condensers is not required to be undertaken to meet the capex objectives.¹⁶² We have therefore not approved any contingent projects for AusNet Services in the 2017–22 regulatory control period.

¹⁵⁶ Synchronous condensers maintain voltage stability and improve power factor on the transmission network.

¹⁵⁷ AusNet Services, *Transmission Revenue Review 2017–2022 Appendix 4G: Proposed Contingent Project*, 27 October 2015.

¹⁵⁸ NER, cl. 6A.8.1(c)(5).

¹⁵⁹ AusNet Services, *Transmission Revenue Review 2017–2022 Appendix 4G: Proposed Contingent Project*, 27 October 2015, p. 3.

¹⁶⁰ AusNet Services, *Transmission Revenue Review 2017–2022 Appendix 4G: Proposed Contingent Project*, 27 October 2015, p. 4.

¹⁶¹ AusNet Services, *Transmission Revenue Reset: Update on Synchronous Condensers*, 7 April 2016.

¹⁶² NER, cl. 6A.8.1(b)(1).

E Statement of efficiency – 2014-15 capex

As set out in our final framework and approach decision, we are required to provide a statement on whether past expenditure included in the regulatory asset base is efficient and prudent.¹⁶³ We have also assessed the extent to which the roll forward of the regulatory asset base from the 2014-17 regulatory control period to the commencement of the 2017-22 regulatory control period contributes to the achievement of the capital expenditure incentive objective.¹⁶⁴ The capital expenditure objective essentially requires that only prudent and efficient expenditure is included in the regulatory asset base.

The NER requires that the last two years of the previous regulatory control period (for the purposes of this decision, the 2014-17 regulatory control period) are excluded from the ex-post assessment of past capex.¹⁶⁵ Further, the NER prescribes that the review period does not include the regulatory year in which the first Capital Expenditure Incentive Guideline was published (2013-14) or any regulatory year that precedes that regulatory year.¹⁶⁶ Accordingly, our ex-post assessment only applies to the 2014-15 regulatory year.

E.4.1 Position

We are satisfied that AusNet Services capital expenditure in the 2014-15 regulatory year reasonably reflects the capital expenditure criteria.

E.4.2 AER approach

We have conducted our assessment of the efficiency of past capex consistent with the approach set out in our Capital Expenditure Incentive Guideline (the Guideline). In our Guideline we outlined a two stage process for undertaking an ex-post assessment of capital expenditure:¹⁶⁷

- Stage one - initial consideration of capex performance;
- Stage two - detailed assessment of capex projects and project management planning processes.

The first stage considers whether the TNSP has overspent against its allowance and past capex performance. We have also used our benchmarking analysis to form our view regarding the likely efficiency of past capex.

¹⁶³ NER cl. 6A.14.2.(b)

¹⁶⁴ NER cl. S6A.2.2A

¹⁶⁵ NER, cl. S6A.2.2A(a).

¹⁶⁶ NER, cl. 11.59.4(a).

¹⁶⁷ AER, *Capital Expenditure Incentive Guideline*, November 2013, pp. 19–22.

In accordance with our Guideline we would only proceed to a more detailed assessment (stage two), if a TNSP had overspent against its allowance, and its capex performance covered by the period of our ex-post assessment suggests that levels of capex may not be efficient or do not compare favourably to other TNSPs.

E.4.3 AER assessment

We have reviewed AusNet Services' capex performance for the 2014-15 regulatory year. This assessment has considered AusNet Services':

- out-turn capex relative to the regulatory allowance given the incentive properties of the regulatory regime for a TNSP to minimise costs; and
- past capex performance in terms of efficiency.

AusNet Services has underspent relative to its approved capex for 2014-15. Given, AusNet Services has underspent against its regulatory allowance in the 2014-15 regulatory year, this supports the view that this expenditure is consistent with the capital expenditure objective.

We have also had regard to some measures of input cost efficiency as published in our latest annual benchmarking report.¹⁶⁸ We recognise that there is no perfect benchmarking model, and as noted by AusNet Services we have been cautious in our initial application of these techniques for assessing the efficiency of expenditure in recent transmission determinations.¹⁶⁹ However, we consider that our benchmarking models are the most robust measures of economic efficiency available and we can use this measure to draw conclusions regarding a TNSP's efficiency over time.

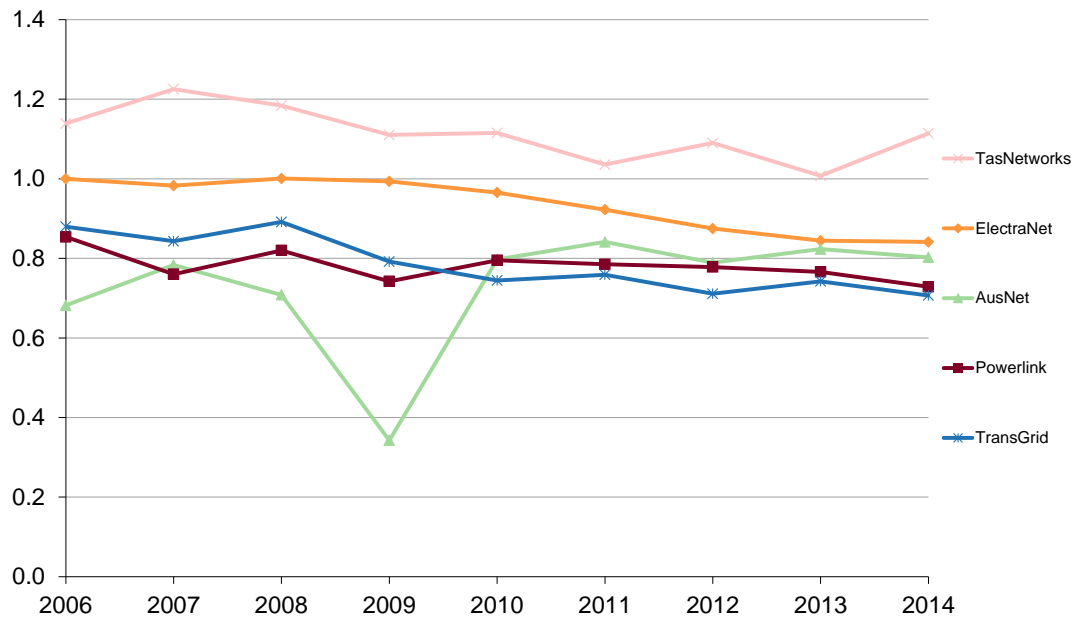
As discussed in section 6.4.4, we have compared AusNet Services capex performance over time and with other TNSPs to assess the efficiency of its past capex. Figure 6.15 shows AusNet's capex performance as measured by a 'multilateral' method which enables comparison of productivity levels and productivity trends.¹⁷⁰

¹⁶⁸ AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015.

¹⁶⁹ AusNet Services, *Revenue proposal 2017–22*, 30 October 2015, p 78.

¹⁷⁰ Productivity index number (PIN) techniques use an index to determine the relationship between outputs and inputs. They measure productivity by constructing a ratio of inputs used for total output delivered. The PIN analysis used is multilateral total factor productivity (MTFP). MTFP relates total inputs to total outputs.

Figure 6.15 Relative MTFP performance of transmission networks



Source: AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015, p.11.

Figure 6.15 indicates that AusNet Services' input cost efficiency, including capex inputs, has declined in 2014-15 by 2.5 per cent relative to 2013. However, AusNet Services' productivity performance in 2014 was 10 per cent higher than its average level of productivity over 2006-13. In summary, in examining AusNet Services' longer term historical trends we observe that AusNet Services':

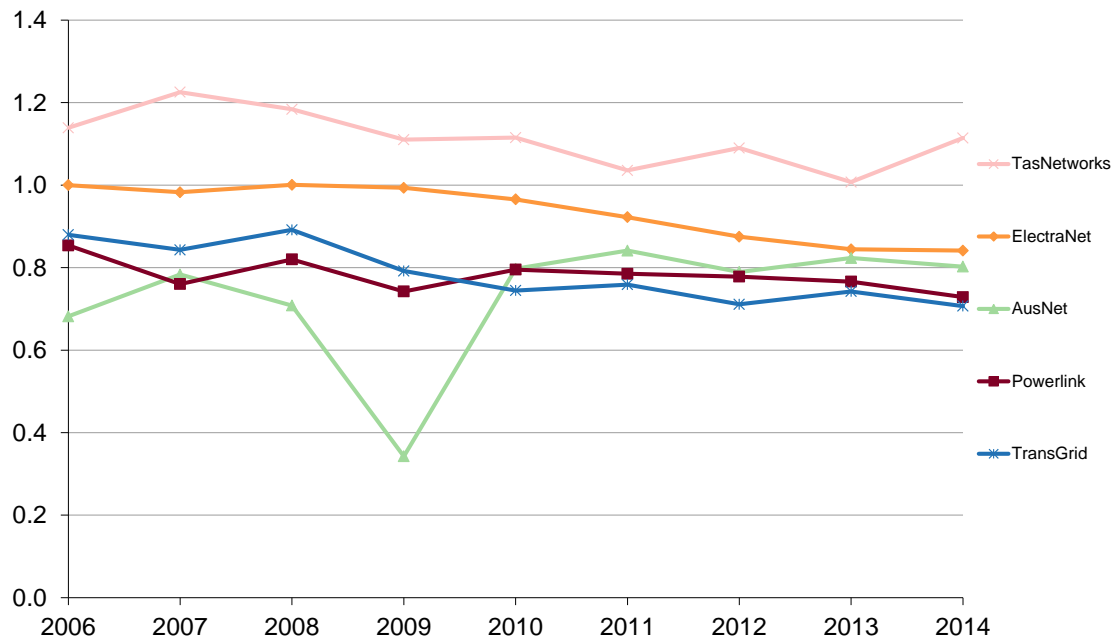
- has improved its input cost efficiency over time and its efficiency performance has been relatively stable since 2010¹⁷¹
- input cost efficiency performance since 2010 has been consistent with the industry average productivity performance.¹⁷²

We have also considered AusNet Services' capital input cost efficiency. As shown in Figure 6.16, AusNet Services' performance on this measure is also consistent with its MTFP performance.

¹⁷¹ AusNet Services' efficiency performance in 2009 was affected by an explosive failure at South Morang and a conductor drop on the Bendigo to Ballarat line.

¹⁷² We have previously recognised that inter TNSP comparisons should be treated with caution as AEMO's planning and augmentation costs of AusNet's Services transmission network may not be fully reflected in past levels of capex which may overstate AusNet Services productivity performance.

Figure 6.16 Capital partial factor productivity for 2006–14



Source: AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015

In conclusion, we consider that these capex performance outcomes support the efficiency of AusNet Services capex in the 2014-15 regulatory year. As a result, consistent with our Guideline we do not consider it is necessary to proceed to a detailed assessment of the efficiency of AusNet Services' capex projects/programs and project management/planning processes. That said we note that AusNet Services has demonstrated that it has considered its changing operating environment over the 2014–17 regulatory control period, consistent with a prudent and efficiency service provider. In particular, AusNet Services has deferred some expenditure forecast in the 2014–17 regulatory control period due to reductions in forecast demand and the value of unserved energy. While this may not be directly applicable to the 2014-15 regulatory year, this indicates that AusNet Services has sound asset management processes consistent with good industry practice.

F Information and communications technology capex - confidential appendix