DRAFT DECISION
Ausgrid
Distribution determination
2019−24

Attachment 5 – Capital expenditure

November 2018

AUSTRALIAN ENERGY REGULATOR

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Note

This attachment forms part of the AER's draft decision on Ausgrid's 2019–24 distribution determination. It should be read with all other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – Annual revenue requirement

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Regulatory depreciation

Attachment 5 – Capital expenditure

Attachment 6 – Operating expenditure

Attachment 7 – Corporate income tax

Attachment 8 – Efficiency benefit sharing scheme

Attachment 9 – Capital expenditure sharing scheme

Attachment 10 – Service target performance incentive scheme

Attachment 11 – Demand management incentive scheme

Attachment 12 – Classification of services

Attachment 13 – Control mechanism

Attachment 14 – Pass through events

Attachment 15 – Alternative control services

Attachment 16 – Negotiated services framework and criteria

Attachment 17 – Connection policy

Attachment 18 – Tariff structure statement

Contents

Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
augex	augmentation expenditure
CAM	cost allocation methodology
capex	capital expenditure
CCP10	Consumer Challenge Panel
CPI	consumer price index
distributor	distribution network service provider
ECA	Energy Consumers Australia
EMCa	Energy Market Consulting associates
Expenditure Assessment Guideline	Expenditure Forecast Assessment Guideline for Electricity Distribution
EUAA	Energy Users Association of Australia
EUE	expected unserved energy
ICT	information and communications technology
LiDAR	light detection and ranging
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NSP	network service provider
opex	operating expenditure
OTI	operational technology and innovation
PIAC	Public Interest Advocacy Centre
PQ	power quality

Shortened form	Extended form
RAB	regulatory asset base
repex	replacement expenditure
RIN	regulatory information notice
SAIDI	system average interruption duration index
SAIFI	system average interruption frequency index
SCS	standard control services
STPIS	service target performance incentive scheme
VCR	value of customer reliability

5 Capital expenditure

Capital expenditure (capex) refers to the investment made in the network to provide standard control services. This investment mostly relates to assets with long lives (30–50 years is typical) and these costs are recovered over several regulatory periods.

On an annual basis, the financing and depreciation costs associated with these assets are recovered (return of and on capital) as part of the building blocks that form Ausgrid's total revenue requirement.[1]

This attachment sets out our draft decision on Ausgrid's total distribution capex forecast. Further detailed analysis is provided in the following appendices:

- Appendix A – Assessment techniques
- Appendix B – Assessment of capex drivers
- Appendix C – Engagement and information-gathering process
- Appendix D – Replacement capex (repex) modelling approach
- Appendix E – Demand
- Appendix F – Ex-post prudency and efficiency review

We have based our draft decision on our analysis of the information we have received to date. We will be informed by Ausgrid's revised proposal, submissions and further analysis in arriving at our final decision in April 2019.

5.1 Draft decision

In assessing forecast capital expenditure, we are guided by the National Electricity Objective (NEO), and underpinning capex criteria and objectives set out in the National Electricity Rules (NER). We must accept a distributor's capex forecast if we are satisfied that the total forecast for the regulatory control period reasonably reflects the capex criteria.[2]

This criteria outlines that a distributor's capex forecast must reasonably reflect the efficient costs of achieving the capex objectives, the costs that a prudent operator would require to achieve the capex objectives, and a realistic expectation of the demand forecast and cost inputs required to achieve the capex objectives.[3]

The capex objectives relate to a distributor's ability to comply with regulatory obligations and maintain the quality, reliability and security of supply of standard control services.[4]

1 NER, cll. 6.5.2, 6.5.5.
2 NER, cl. 6.5.7(c).
3 NER, cl. 6.5.7(c)(1).
4 NER, cl. 6.5.7(a).

Where a distributor is unable to demonstrate that its proposal complies with the capex criteria and objectives, the NER require us to set out a substitute estimate of total capex that we are satisfied reasonably reflects the capex criteria, taking into account the capex factors.[5]

Ausgrid has not demonstrated that its total net capex forecast of $2,965.8 million ($2018–19) reasonably reflects the capex criteria. Our substitute estimate of $2,209.8 million ($2018–19) is 25 per cent below Ausgrid's forecast. We are satisfied that our substitute estimate reasonably reflects the capex criteria. Table 5.1 outlines our draft decision.

Table 5.1 Draft decision on Ausgrid's total net capex forecast ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Ausgrid's proposal	687.6	593.9	578.1	574.9	531.2	2,965.8
Draft decision	522.2	447.7	449.9	430.8	359.2	2,209.8
Difference	-165.4	-146.2	-128.2	-144.1	-172.0	-755.9
Percentage difference (%)	-24%	-25%	-22%	-25%	-32%	-25%

Source: AER analysis.

Note: The figures above do not include equity raising costs, capital contributions and disposals. For our assessment of equity raising costs, see attachment 3. Numbers may not sum due to rounding.

Table 5.2 summarises our findings and the reasons for our draft decision by capex driver (e.g. augmentation, replacement, connections etc.). This reflects the way we have assessed Ausgrid's total capex forecast.

Our findings on the capex drivers are part of our broader analysis and should not be considered in isolation. We do not approve an amount of forecast expenditure for each individual capex driver. However, we use our findings on the different capex drivers to assess a distributor's proposal as a whole and arrive at a substitute estimate for total capex where necessary.

Our assessment highlighted that several capex drivers associated with Ausgrid's proposal, such as augmentation, replacement and non-network expenditure, are likely to be higher than an efficient level and therefore are not likely to reasonably reflect the capex criteria,[6] taking into account the capex factors and the revenue and pricing principles.[7]

[5] NER, cl. 6.12.1(3)(ii).
[6] NER, cll. 6.5.7(c), (d).
[7] NEL, cll. 7(a), 16(2).

We therefore formed a substitute estimate of total capex. We test this total estimate of capex against the capex criteria (see appendix B for a detailed discussion). We are satisfied that our substitute estimate represents a total capex forecast that reasonably reflects the capex criteria. As set out in appendix B, we are satisfied our total capex forecast forms part of an overall distribution determination that will or is likely to contribute to the achievement of the NEO to the greatest degree.

Table 5.2 Summary of AER reasons and findings

Issue	Reasons and findings
Total capex forecast	Ausgrid proposed a total net capex forecast of $2,965.8 million ($2018–19) in its initial proposal. We do not accept Ausgrid's total capex forecast, as it has not demonstrated that its forecast reasonably reflects the capex criteria. We are satisfied our substitute estimate of $2,209.8 million ($2018–19) reasonably reflects the capex criteria. Our substitute estimate is 25 per cent lower than Ausgrid's initial proposal. The reasons our position are summarised in this table, and detailed in this attachment and appendix B.
Forecasting methodology, key assumptions and past capex performance	Ausgrid's governance and management framework led to a significantly overstated total capex forecast. Ausgrid has applied its forecasting methodology inconsistently and many programs and projects lacked sufficient cost-benefit analysis. In addition, Ausgrid has not applied a sufficient top-down assessment to its total capex forecast. We discuss specific areas of concern in section 5.4 and in the appendices to this attachment.
Augmentation capex (augex)	Ausgrid proposed forecast augex of $189.1 million ($2018–19). Ausgrid has not justified that this forecast reasonably reflects the capex criteria. We have included $168.6 million ($2018–19) in our substitute estimate. Ausgrid did not demonstrate that its forecast augex is prudent and efficient. Our bottom-up review found that Ausgrid has not demonstrated the need for a number of its proposed programs and projects. Our concerns are specific to individual programs and projects rather than common issues that arise in multiple projects.
Customer connections capex	Ausgrid proposed revised forecast gross customer connections capex of $607.8 million ($2018–19). We are satisfied that this amount would form part of a total forecast capex that reasonably reflects the capex criteria and have included this in our substitute estimate. Ausgrid has demonstrated that its forecast customer connections capex is prudent and efficient.
	Ausgrid proposed forecast repex of $1,673.1 million ($2018–19). Ausgrid has not demonstrated that this forecast reasonably reflects the capex criteria. We have included an amount of $1,207.5 million

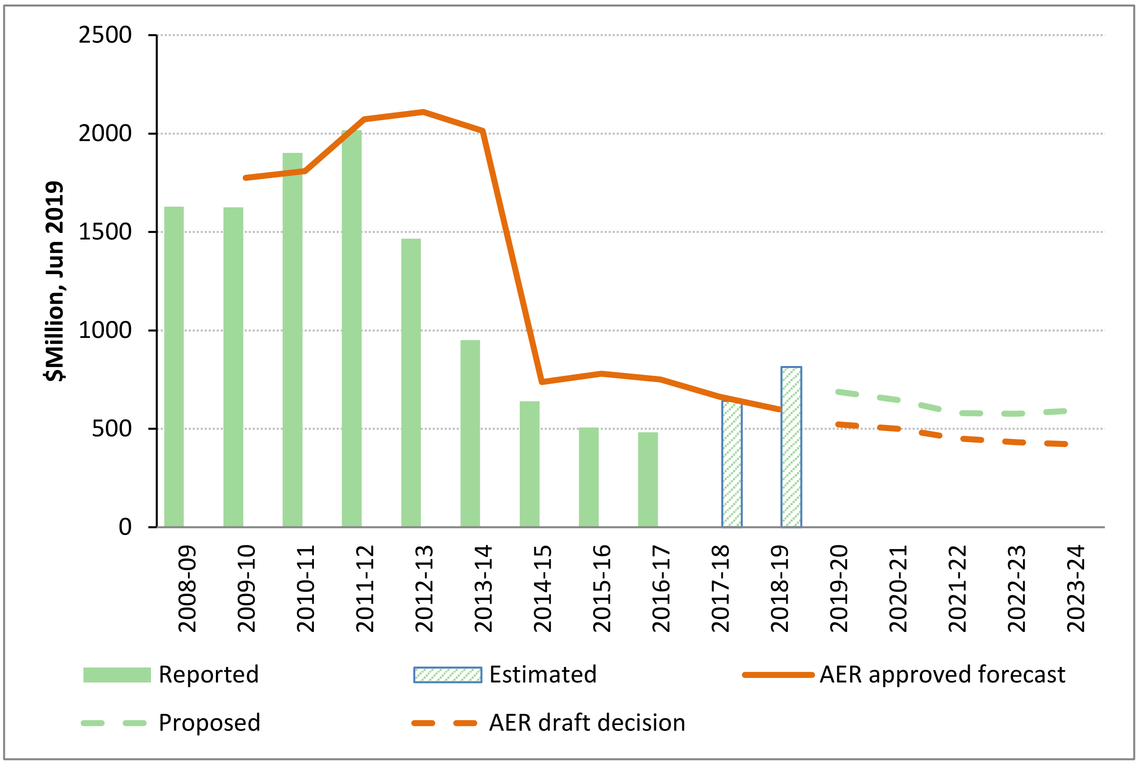
Issue	Reasons and findings
Replacement capex (repex)	($2018–19) in our substitute estimate. Ausgrid has not demonstrated that its repex forecast is prudent and efficient. In particular, Ausgrid's modelled repex is significantly greater than our predictive modelling threshold.[8] Our modelling results compare Ausgrid's proposed repex forecast with other distributors' historical unit costs and expected asset replacement lives at the asset category level. A bottom-up review also found that Ausgrid has not justified the repex for many of its replacement programs and projects.
Non-network capex	Ausgrid proposed forecast non-network capex of $548.0 million ($2018–19). Ausgrid has not established that this forecast reasonably reflects the capex criteria. We have included $345.4 million in our substitute estimate. Ausgrid did not demonstrate that its forecast for each category of non-network capex is prudent and efficient. There was insufficient options analysis and cost-benefit assessment accompanying the information and communications technology (ICT) / operating technology and innovation (OTI) and buildings and property forecasts. A key concern raised by stakeholders was a lack of a clear explanation from Ausgrid about how it has incorporated the ex-ante benefits of the programs into the overall expenditure proposal.
Capitalised overheads	Ausgrid proposed forecast capitalised overheads of $621.3 million ($2018–19). Ausgrid has not justified that this forecast reasonably reflects the capex criteria. We have included an amount of $577.1 million in our substitute estimate of total capex. While we are generally satisfied with Ausgrid's forecasting methodology, we consider that capitalised overheads vary, in part, with direct capex. Therefore, we have made an adjustment to capitalised overheads to reflect the lower direct costs in our substitute estimate compared with Ausgrid's proposal.

5.2 Ausgrid's proposal

For the 2019–24 regulatory control period, Ausgrid proposed total forecast net capex of $2,965.8 million ($2018–19). Ausgrid's 2019–24 capex forecast is $175.8 million (6 per cent) higher than its actual/estimated net capex of $2,790.0 million over the 2014–19 regulatory control period. Figure 5.1 outlines Ausgrid's historical capex performance vs its 2019–24 capex forecast.

8 The repex model threshold is the highest result of two key scenarios that are based on the historical performance of all distributors in the NEM. More detail is outlined in appendix D.

Figure 5.1 Ausgrid's historical vs forecast capex ($2018–19, million)



Source: AER analysis.

Note: Net capex (including disposals).

The key drivers of Ausgrid's capex proposal are:

- Augmentation – $189.1 million
- Connections – $52.2 million
- Replacement – $1,673.1 million
- Non-network – $548.0 million
- Capitalised overheads – $621.3 million

5.3 AER's assessment approach

In determining whether Ausgrid's proposal reasonably reflects the capex criteria, we use various qualitative and quantitative assessment techniques to assess the different elements of Ausgrid's proposal.[9] In appendix B, we discuss the weight we placed on some capex factors relative to others and how we came to our position.

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

More broadly, we also take into account the revenue and pricing principles set out in the National Electricity Law (NEL).[10] In particular, we take into account whether our overall capex forecast provides Ausgrid with a reasonable opportunity to recover at least the efficient costs it incurs in:[11]

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

When assessing capex forecasts, we also consider that:

- the efficiency criteria and the prudency criteria in the NER 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;[12] and
- past expenditure was sufficient for the distributor to manage and operate its network in previous periods, in a manner that achieved the capex objectives.[13]

5.3.1 Considerations in applying our assessment techniques

Appendix A outlines our assessment approach and appendix B details how we came to our position on Ausgrid's total capex forecast. In summary, some of these assessment techniques focus on total capex, while others focus on standardised sub-categories of capex. Importantly, while we may consider certain programs and projects in forming a view on the total capex forecast, we do not determine which programs or projects a distributor should or should not undertake.

This is consistent with our ex-ante incentive based regulatory framework. We base our approach on approving an overall ex-ante revenue requirement that includes an assessment of what we find to be a prudent and efficient total capex forecast.[14] Once the ex-ante allowance is established, distributors are incentivised to provide services at the lowest possible cost because their returns are determined by the actual costs of providing services. If distributors reduce their costs to below the estimate of efficient costs, the savings are shared with consumers in future regulatory periods.

This ex-ante incentive-based regulatory framework recognises that the distributor should have the flexibility to prioritise its capex program given its circumstances over the course of the regulatory control period. The distributor may need to undertake programs or projects that it did not anticipate during the distribution determination process. The distributor also may not need to complete some of the programs or projects it proposed during the forecast regulatory control period if circumstances

10 NEL, ss. 7A, 16(2).

11 NEL, s. 7A.

12 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, pp. 8–9.

13 AER, AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 9.

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

change. We consider a prudent and efficient distributor would consider the changing environment throughout the regulatory control period and make decisions accordingly.

Therefore, recognising the interplay between the broader incentive framework and program and project investment considerations, when reviewing a capex forecast we use a combination of bottom-up and top-down assessment techniques. Assessment of the bottom-up build of forecasts including underlying assumptions is an informative way to establish whether the forecast capex at the program or project level is prudent and efficient. Many of the techniques we apply at this level encompass the capex factors that we are required to consider. However, we are also mindful that a narrow focus on only a bottom-up assessment may not itself provide sufficient evidence that the forecast is prudent and efficient. Bottom-up approaches tend to overstate required allowances, as they do not adequately account for interrelationships and synergies between programs, projects or areas of work.

Thus, we also review the prudency and efficiency of aggregate expenditure areas or the total capex forecast. Top-down analysis provides us with assurance that the entire expenditure program is prudent and efficient, and allows us to consider a distributor's total capex forecast. We use holistic assessment approaches that include a suite of techniques such as trend analysis, predictive modelling and detailed technical reviews. Consistent with our holistic approach, we take into account the various interrelationships between the total capex forecast and other components of a distributor's distribution determination, such as forecast operating expenditure (opex) and Service Target Performance Incentive Scheme (STPIS) interactions.[15]

In the event we are not satisfied a distributor's proposed capex forecast reasonably reflects the capex criteria, we are required to determine a substitute estimate. We do so by applying our various assessment techniques. We then use our judgement to determine the weight we place on each technique, based on all of the relevant information available to us.

Broadly, we give greater weight to techniques that we consider are more robust in the particular circumstances of the assessment. By relying on several techniques, we ensure we consider a wide variety of information and take a holistic approach to assessing the distributor's capex forecast. Where our techniques involve the use of a consultant, their reports are considered when we form our draft decision position on total forecast capex.

Importantly, our decision on the total capex forecast does not limit a distributor's actual spending. We set the forecast at the level where the distributor has a reasonable opportunity to recover its efficient costs. As noted previously, a distributor may spend more or less on capex than the total forecast amount specified in our decision in response to unanticipated expenditure needs or changes.

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15 NEL, s. 16(1)(c).

The regulatory framework has a number of mechanisms to deal with these circumstances. Importantly, a distributor does not bear the full cost where unexpected events lead to an overspend of the approved capex forecast. Rather, the distributor bears 30 per cent of this cost if the expenditure is subsequently found to be prudent and efficient. Further, the pass through provisions provide a means for a distributor to pass on significant, unexpected capex to customers, where appropriate.[16]

Similarly, a distributor may spend less than the capex forecast because it has operated at a more efficient level than expected. In this case, the distributor will keep on average 30 per cent of this reduction over time, with the remaining benefits shared with its customers.

5.3.2 Safety and reliability considerations

Our position in this draft decision is that our approved capex forecast will provide for a prudent and efficient service provider in Ausgrid's circumstances to maintain performance at the targets set out in the STPIS. Therefore, it is appropriate to apply the STPIS, as set out in attachment 11. The STPIS provides incentives to distributors to further improve the reliability of supply only where customers are willing to pay for these improvements.

Our analysis in appendix B outlines how our assessment techniques factor in network safety and reliability. We consider our substitute estimate will allow Ausgrid to maintain the safety, service quality and reliability of its network, consistent with its legislative obligations.

5.3.3 Interrelationships

Consistent with our holistic approach, we take into account the various interrelationships between a distributor’s total capex forecast and other components of its distribution determination, such as forecast opex, forecast demand, the Capital Expenditure Sharing Scheme (CESS) and STPIS interactions.

Specific capex opex interrelationships relating to Ausgrid's proposed demand management solutions for augex and repex projects are discussed in sections B.2.3 and B.4.3, respectively.

5.4 Reasons for draft decision

We applied the assessment approach set out in section 5.3 and appendix A to Ausgrid. We do not accept that Ausgrid's total capex forecast reasonably reflects the capex criteria. We outline how we have applied our assessment techniques and how we came to our position in appendix B. We are required to set out a substitute estimate, which we are satisfied reasonably reflects the capex criteria.

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16 NER, cl. 6.6.1.

As part of our assessment, we engaged Energy Market Consulting associates (EMCa) to undertake a detailed review of Ausgrid's total capex proposal. Overall, we agree with EMCa's conclusion that Ausgrid's governance and management processes detract from its capacity to make prudent and efficient expenditure decisions.[17]

Based on its review of Ausgrid's governance and risk management documents and processes, EMCa concluded that a "forecast produced through Ausgrid's governance process is not a reasonable forecast of prudent and efficient requirements".[18] EMCa also noted that Ausgrid's application of cost-benefit analysis is limited to major projects for sub-transmission cables, and 11kV and 33kV switchboard replacements.[19] We also found that based on the information before us, Ausgrid was not able to substantiate the prudency and efficiency of its forecast for several programs and projects and at the total capex level.

Consistent with previous decisions, distributors generally provide material to demonstrate the prudency and efficiency of their forecasts. This includes risk-based cost-benefit analysis with all feasible options considered, reasoning for the application of key inputs in the forecast, demonstration of a top-down challenge (or genuine testing of the forecast) and any other evidence that supports a rigorous forecasting methodology.

Overall, we observed that the lack of necessary supporting material was a distinct characteristic throughout Ausgrid's capex proposal. We also note the delays in receiving responses to information requests throughout the review process. In putting together its revised proposal, we encourage Ausgrid to have particular regard to our observations throughout this draft determination, particularly where we have noted a lack of supporting material to justify the prudency and efficiency of its forecast.

Table 5.3 sets out the capex amounts by driver that we have included in our substitute estimate of Ausgrid's total capex forecast for the 2019–24 regulatory control period. The reasons for our substitute capex forecast of $2,209.8 million are summarised below.

17 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 24.

18 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 25.

19 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 34.

Table 5.3 Assessment of required capex by driver – 2019–24 ($2018–19, million)

Category	Total
Augmentation	168.6
Connections	29.2
Replacement	1,207.5
Non-network	345.4
Capitalised overheads	577.1
Gross capex	**2,906.4**
Less capital contributions	578.7
Less disposals	117.9
Net capex	**2,209.8**

Source: AER analysis.

Note: Numbers may not add up due to rounding.

Augmentation

Ausgrid has not justified that its proposed augex of $189.1 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $168.6 million ($2018–19) in our substitute estimate.

Consistent with EMCa's findings, we consider that Ausgrid has not provided sufficient supporting material or demonstrated good governance practices for some augex projects or programs. For example, Ausgrid has not justified an increase in expenditure for some programs compared with the current regulatory control period.

For a number of projects, Ausgrid has not demonstrated that it considered alternative augex or non-network solutions. For these projects or programs, Ausgrid has not justified that its forecast forms part of an overall capex proposal that reasonably reflects the capex criteria. In particular, Ausgrid did not demonstrate that a number of its proposed augmentation programs are prudent and efficient on the basis that:

- the adjustment made to account for feeder load diversity for its 11kV network reinforcement program appears arbitrary and has the potential to overstate feeder loads;
- increases above historical expenditure for its High Community Impact Assets Reliability Program are unsupported;
- evidence provided by Ausgrid subsequent to its regulatory proposal supports a lower augex requirement for its LV distributor capacity program/distribution centre capacity program; and
- Ausgrid's proposed augex for new reactive support did not provide a robust options analysis to demonstrate that it had proposed the lowest cost solution.

Further, Ausgrid did not demonstrate:

- that a number of its proposed augmentation projects are prudent and efficient on the basis that alternative augmentation solutions or non-network measures of lesser scope have not been considered (Rozelle STS, White Bay ZS, Pyrmont STS); and
- a need for strategic property acquisitions for future zone substations in the Sydney and Hunter areas.

Connections

Ausgrid has exhibited its revised proposed connections capex of $607.8 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have included this amount in our substitute estimate. Notably:

- this amount reflects Ausgrid working with us to correct modelling errors that resulted in a revised forecast less than Ausgrid's initial proposal of $637.2 million for gross connections capex; and
- Ausgrid's revised proposed net connections capex—which is funded by Ausgrid and contributes to the regulatory asset base—is 65 per cent lower than actual/estimated net connections capex in the 2014–19 regulatory control period.

Replacement

Ausgrid has not demonstrated its proposed repex of $1,673.1 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $1,207.5 million ($2018–19) in our substitute estimate.

Modelled repex

- Ausgrid's forecast for modelled repex ($930 million) is $266 million above our 'repex model threshold' ($664 million). Our repex modelling scenarios compare a distributor's historical repex performance with the historical performance of other distributors in the National Electricity Market (NEM), by comparing the median unit cost and expected asset replacement life for a range of asset categories.
- While we acknowledge that our approach to repex modelling has changed since Ausgrid's 2014–19 determination, we presented our refined approach to Ausgrid in March 2018 and sought feedback. In addition, we provided updated repex modelling results in June 2018, but Ausgrid did not engage with us on these results until late August 2018. More information relating to our engagement with Ausgrid is outlined in appendix C.
- If a distributor's forecast exceeds our modelling results, we do not necessarily reject the forecast deterministically. We use our modelling results to target a more detailed bottom-up assessment. If the proposed repex is sufficiently justified and shown to be prudent and efficient, we will accept it. If the distributor has not provided sufficient justification, we can use our modelling results to arrive at a substitute estimate.

- We used our modelling results to target a more detailed bottom-up assessment of Ausgrid's repex forecast. However, in its April 2018 submission, Ausgrid only applied program or project-level risk-based quantitative cost-benefit analysis to 23 per cent of its repex forecast.[20] In August 2018, Ausgrid provided additional cost-benefit analysis for several key modelled repex programs. However, extremely conservative input assumptions and modelling techniques with a lack of rigour underpinned this analysis. Therefore, Ausgrid has not sufficiently justified that its modelled repex forecast is prudent and efficient.
- Given we only received a sample of bottom-up cost-benefit analysis spreadsheets, we are unable to form our substitute estimate of this repex component using reasonable input assumptions and more accurate modelling comparisons. In the absence of robust risk-based cost-benefit analysis, we have relied on our repex modelling results to determine our substitute estimate of modelled repex.
- We have included our repex model threshold amount of $664 million for modelled repex in our substitute estimate. Based on the available information, we are satisfied that our repex modelling results would form part of a total forecast capex that reasonably reflects the capex criteria. More detail on our repex modelling approach is discussed in appendices B and D.

132kV underground cables

- Ausgrid's forecast for the 132kV underground cable asset category ($165 million) is significant and we have therefore assessed this category separately. There are 20 individual projects within this repex program for the 2019–24 regulatory control period. Ausgrid has justified that 10 of these projects are prudent and efficient, primarily using risk quantification and cost-benefit analysis. We have included $93 million in our substitute estimate based on these 10 projects.
- Ausgrid's analysis indicates that the optimal investment timing for the other 10 projects occurs after the 2019–24 regulatory control period. It submitted that the primary replacement driver for these projects is to reduce environmental risk in accordance with its undertaking with the New South Wales Environment Protection Authority (EPA).[21] Ausgrid stated that in accordance with this undertaking, it is seeking to reduce the environmental risk of leaking cables by at least 50 per cent in the next regulatory period, and it has a commitment to replace all of the 132kV underground cables by 2034.[22]
- We acknowledge that Ausgrid's 132kV underground cables pose risks to the environment. However, throughout our ongoing engagement, Ausgrid did not provide any evidence or documentation of a specific compliance obligation that requires it to remove a certain number of underground cables or reduce its

20 Ausgrid, *Response to information request 016, Question EMCaAUS066 repex CBA,* July 2018, p.1.

21 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018, p. 9.

22 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018, p. 9.

environmental risk by a certain amount each regulatory control period. We engaged with the EPA on this issue on 27 September.

- In a submission, the EPA noted its "support for Ausgrid's continuation" of its environmental management strategy.[23] We consider and Ausgrid's analysis indicates that our position of including 10 out of Ausgrid's 20 proposed 132kV underground cable replacement projects in our substitute estimate will minimise a large degree of the inherent environmental risk that these cables pose and help Ausgrid to improve its environmental performance. We conveyed this position to the EPA during a meeting on 27 September 2018[24] and via email on 16 October 2018[25].

Unmodelled repex

- Ausgrid's unmodelled repex forecast ($578 million) includes programs that we do not typically consider to be repex. These programs (strategic property acquisitions and ADMS) total $74 million and are discussed in augex and non-network capex, respectively.
- Ausgrid's remaining unmodelled repex forecast ($504 million) is a 12 per cent increase on its actual unmodelled repex during the 2014–19 regulatory control period. As noted above, Ausgrid only applied program or project-level risk-based quantitative cost-benefit analysis to 23 per cent of its repex forecast.[26]
- This is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in more detail in section B.1. Ausgrid has not justified that this component of its repex forecast would form part of a total capex forecast that reasonably reflects the capex criteria.
- We have included $450 million in our substitute estimate, based on the historical level of repex Ausgrid has spent on unmodelled repex asset categories in the first four years of the current period. [27] Weighing up all material before us, we are satisfied that our substitute estimate is prudent and efficient.

Non-network

- Ausgrid's has not justified that its proposed non-network capex of $548.0 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $345.4 million ($2018–19) in our substitute estimate.
- At an entire non-network capex level, we have found insufficient options analysis and cost-benefit assessment accompanying Ausgrid's proposal. This is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's

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23 EPA, *Replacement of fluid-filled underground transmission cables,* September 2018, p. 1.

24 Meeting between the AER and EPA to discuss Ausgrid's 132kV underground cables, 27 September 2018.

25 AER, *Email to EPA – Ausgrid's 2019–24 regulatory proposal,* October 2018.

26 Ausgrid, *Response to information request 016, Question EMCaAUS066 repex CBA,* July 2018, p.1.

27 NER, cl. 6.5.7(e).

governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in more detail in section B.1.

ICT/OTI capex

- Ausgrid's forecast for non-network ICT capex ($216 million) is on average, 40 per cent higher than its actual non-network ICT capex during the 2014–19 regulatory control period. Ausgrid did not provide sufficient justification for this component of its non-network capex forecast.
- Ausgrid did not include quantitative cost-benefit assessment for any ICT or OTI projects in its proposal. When we asked for this information, Ausgrid submitted that it's "analysis has focused on the quantifiable risks as opposed to benefits."[28] Ausgrid therefore had not sufficiently demonstrated that its proposed non-network ICT forecast was prudent and efficient.
- We formed our substitute estimate of $137 million for non-network ICT capex having regard to Ausgrid's historical level of expenditure over the first four years of the current period and the technical review provided by EMCa. Weighing up all material before us, we are satisfied that our substitute estimate is prudent and efficient.

Buildings and property capex

- Ausgrid's forecast for buildings and property capex ($208 million) is on average, 157 per cent higher than its actual buildings and property capex during the 2014–19 regulatory control period. However, Ausgrid did not provide sufficient information to justify that this forecast would form part of a total capex forecast that reasonably reflects the capex criteria.
- There was a lack of sufficient options analysis and cost-benefit assessment undertaken in developing this forecast. We consider that it is likely that, as Ausgrid has demonstrated historically, Ausgrid will be able to spend lower its forecast through re-scoping, deferring or not completing the projects included within the proposal.
- Our substitute estimate for buildings and property is $135 million, a reduction of 35 per cent to Ausgrid's proposal. This position was informed by EMCa's views. We are satisfied that this substitute would form part of a total capex forecast that reasonably reflects the capex criteria.

Fleet, plant and other capex

- Ausgrid's forecast for fleet and plant capex ($124 million) is on average, 107 per cent higher than its actual fleet and plant capex during the 2014–19 regulatory control period. However, Ausgrid did not provide sufficient information to justify that this forecast would form part of a total capex forecast that reasonably reflects the capex criteria.

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[28] Ausgrid, *Response to AER information request 020*, July 2018.

- Our substitute estimate of fleet and plant capex is $73 million ($2018–19). Ausgrid has not demonstrated the prudency and efficiency of its proposed change in policy to replace elevated work platforms (EWPs) at a 10-year life. We have adjusted Ausgrid's fleet and plant capex forecast to reflect Ausgrid's historical replacement practices.

ADMS

- Our substitute estimate does not include Ausgrid's proposed $41 million for its ADMS program (proposed as repex). While we consider that there may be a need for this program, Ausgrid did not provide sufficient information to justify that its chosen option would form part of a total capex forecast that reasonably reflects the capex criteria. Given the absence of a base-case option considered in the analysis provided to us, we have made no allowance for this program in our substitute estimate.

Capitalised overheads

- We do not accept Ausgrid's capitalised overheads forecast of $621.3 million ($2018–19). We are satisfied that $577.1 million for forecast capitalised overheads would form part of a total capex forecast that reasonably reflects the capex criteria and have included this in our substitute estimate.
- We are generally satisfied with Ausgrid's forecasting methodology, but we consider that capitalised overheads vary, in part, with direct capex. Therefore, we have adjusted capitalised overheads to reflect the lower direct costs in our substitute estimate compared with Ausgrid's proposal.

Modelling adjustments

- We typically update the 2017–18 CPI input in a distributor's capex model from forecast inflation to actual inflation. We also typically update the forecast labour cost escalators in its capex model to be consistent with the labour cost escalators in the opex attachment (attachment 7).
- However, due to modelling issues, we were unable to reflect these changes in Ausgrid's draft decision capex model. We consider that these changes are likely to immaterially reduce our total draft decision total capex forecast. However, as this is part of our standard approach, we will work with Ausgrid in the lead up to its revised proposal and our final decision to accurately reflect these updates in our final decision capex model.

A Assessment techniques

This appendix describes the approaches we applied in assessing whether Ausgrid's total capex forecast reasonably reflects the capex criteria. Appendix B sets out in greater detail the extent to which we relied on each of these techniques.

The techniques that we apply in capex are necessarily different from those we apply when assessing opex. This is reflective of differences in the nature of the expenditures that distributors propose. We outline this in the Expenditure Assessment Guideline.[29]

A.1 Trend analysis

We consider past trends in actual and forecast capex as this is one of the capex factors.[30] We also consider trends at the asset category level to inform our view on the prudency and efficiency of a distributor's capex forecast.

Trend analysis involves comparing a distributor's forecast capex and volumes against historical levels. Where forecast capex and volumes are materially different to historical levels, we seek to understand the reasons. In doing so, we consider the reasons the distributor provides in its initial proposal, as well as any potential changing circumstances.

In considering whether the total capex forecast reasonably reflects the capex criteria, we need to consider whether the forecast will allow the distributor to meet expected demand and comply with relevant regulatory obligations.[31] Demand and regulatory obligations (specifically service standards) are key capex drivers. More onerous standards or growth in maximum demand will increase capex. Conversely, reduced service obligations or a decline in demand will likely cause a reduction in the capex the distributor requires.

Maximum demand is a key driver of augmentation or demand-driven expenditure. Augmentation (augex) often needs to occur prior to demand growth being realised. Forecast demand, rather than actual demand, is therefore most relevant when a distributor is deciding the augmentation projects it will require in the forecast regulatory control period. However, a distributor should continually reassess project needs over time as new information about population growth and energy usage becomes available. Growth in a distributor's network will also drive connections-related capex. For these reasons, it is important to consider how capex trends, particularly for augex and connections, compare with demand and customer number trends.

There is generally a lag between when capex is undertaken or not and when a distributor's service improves or declines. This is important when considering the

29 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 8.

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

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

expected change in service levels following an increase or decrease in capex. It is also relevant to consider when service standards have changed and how this has affected the distributor's capex requirements.

For the three distributors in NSW, an amendment to the licence conditions came into effect on 1 July 2014.[32] This amendment removed the design planning requirements that imposed a particular standard on the design and planning of the network. Without these requirements, distributors should only undertake capex where the benefits outweigh the costs. We have had regard to this change when undertaking our trend analysis.

We analysed capex trends across a range of levels including at the total capex level and the category level (e.g. augex, connections and repex). We also compared these with demand trends and any relevant changes in service standards.

A.2 Category analysis

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

- overall costs within each category of capex;
- unit costs across a range of activities;
- volumes across a range of activities; and
- expected asset lives across a range of repex asset categories.

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

A.3 Predictive modelling

Background

Our repex model is a statistical based model that forecasts asset replacement capex for various asset categories based on their condition (using age as a proxy), unit costs and expected asset replacement lives. We only use the repex model to assess forecast repex that can be modelled. This typically includes high-volume, low-value asset categories and generally represents a significant component of total forecast repex.

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32 For more information, refer to https://www.ipart.nsw.gov.au/files/sharedassets/website/trimholdingbay/electricity_-_regulatory_instruments_-_dnsp_conditions_14_-_19_-_july_2014.pdf.

The repex model forecasts the volume of assets in each category that a distributor would expect to replace over a 20-year period. The model analyses the age of assets already in commission and the time at which, on average, these assets would be expected to be replaced, based on historical replacement practices. We refer to this as the calibrated expected asset replacement life. We derive a total replacement expenditure forecast by multiplying the forecast replacement volumes for each asset category by an indicative unit cost.

We can use the repex model to advise and inform us where to target a more detailed bottom-up review and assist us to define a substitute estimate if necessary. We can also use the model to compare a distributor against other distributors in the NEM[33]. We have also had regard to feedback from distributors on some of the underlying assumptions and modelling techniques throughout our ongoing engagement during both the pre-proposal and proposal stages.

Scenario analysis

Our repex modelling approach analyses four scenarios that consider both a distributor's historical replacement practices and the replacement practices of other distributors in the NEM. The current approach builds on our assessment in previous determinations by considering intra-industry comparative analysis for unit costs and expected asset replacement lives. The four scenarios analysed are:

1. historical unit costs and calibrated expected replacement lives
2. comparative unit costs and calibrated expected replacement lives
3. historical unit costs and comparative expected replacement lives
4. comparative unit costs and comparative expected replacement lives.

Comparative unit costs are the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM. Comparative replacement lives are the maximum of a distributor's calibrated expected replacement life and the median expected replacement life across the NEM.

The 'cost, lives and combined' scenarios rely on a comparative analysis technique that compares the performance of all distributors in the NEM. The technique analyses the two variable repex model inputs – unit costs and expected replacement lives.

The 'cost scenario' analyses the level of repex a distributor could achieve if its historical unit costs were improved to comparative unit costs. The 'lives scenario' analyses the level of repex a distributor could achieve if its calibrated expected replacement lives were improved to comparative expected replacement lives.

Previous distribution determinations where we have used the repex model have primarily focused on the 'historical scenario'. This scenario forecasts a distributor's

33 This includes Power and Water Corporation.

expected repex and replacement volumes based on its historical unit costs and asset replacement practices (which are used to derive expected replacement lives).

Repex model threshold

Our 'repex model threshold' is defined taking these results and other relevant factors into consideration. For the 2019–24 determinations, our approach is to set the repex model threshold equal to the highest result out of the 'cost scenario' and the 'lives scenario'.[34]

This approach considers the inherent interrelationship between the unit cost and expected replacement life of network assets. For example, a distributor may have higher unit costs than other distributors for particular assets, but these assets may in turn have longer expected replacement lives. In contrast, a distributor may have lower unit costs than other distributors for particular assets, but these assets may have shorter expected replacement lives. Further details about our repex model are outlined in appendix D.

A.4 Assessment of bottom-up and top-down methodologies

In assessing whether Ausgrid's capex forecast is prudent and efficient, we examined the forecasting methodology and underlying assumptions used to derive its forecast. In particular, some of the evidence that we can use to evaluate the prudency and efficiency of a bottom-up forecast at the program or project level is:

- identifying and quantifying all reasonable options in a cost-benefit analysis, including deferral or 'do nothing' scenarios;
- cost-benefit analysis that incorporates a proper quantified risk assessment, where the most beneficial program or project is selected, or clear and justified reasoning as to why another option was chosen; and
- reasons to support the expenditure timing for the forecast regulatory control period, particularly if the expenditure may have been deferred in previous regulatory control periods.

Our industry practice application note[35], which relates to asset replacement planning, aims to assist network businesses with this bottom-up forecast. The final industry practice application note will be published in late November 2018. We therefore encourage Ausgrid to have regard to the final application note and the consultation process in its revised proposal.

[34] Our modelling approach means the 'historical scenario' will always be higher than the 'cost scenario' and the 'lives scenario', and the 'combined scenario' will always be lower than the 'cost scenario' and the 'lives scenario'.

[35] For more information, refer to https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/industry-practice-application-note-for-asset-replacement-planning.

The industry practice application note does not replace published guidelines. Rather, it supplements the guidelines by outlining principles and approaches that accord with good industry practice, asset management strategies and risk management practices. Good asset management and risk management practices are often aligned with international standards of practice, such as ISO 55000 for asset management and ISO 31000 for risk management. These practices and approaches are consistent with what we have considered in previous decisions, and the industry practice application note helps to articulate these practices and approaches.

In addition to a bottom-up build, a holistic and strategic consideration or assessment of the entire forecast capex portfolio would be evidence that some discipline has been applied at the top-down level. In particular, a top-down assessment would give us confidence that:

- the bottom-up builds have been subject to overall checks against business governance and risk management arrangements;
- synergies between programs or projects have been identified, which may reduce the need for, scope or cost of some programs or projects over the forecast regulatory control period;
- subjectivity from the bottom-up forecasts has been addressed; and
- the timing and prioritisation of capital programs and projects have been determined over both the short and long term, such that delivery strategy has been considered.

A.5 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report.[36] The NER require us to have regard to the annual benchmarking report, as it is one of the capex factors.[37] Economic benchmarking applies economic theory to measure the efficiency of a distributor's use of inputs to produce outputs, having regard to the operating environment and network characteristics.[38]

Economic benchmarking allows us to compare the performance of a distributor against its own past performance and the performance of other distributors. It also helps to assess whether a distributor's capex forecast represents efficient costs.[39] The AEMC stated:

> "Benchmarking is a critical exercise in assessing the efficiency of a distributor".[40]

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36 AER, *Annual benchmarking report: Electricity distribution network service providers*, December 2017.

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

38 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 78.

39 NER, cl. 6.5.7(c).

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

Several economic benchmarks from the annual benchmarking report are relevant to our capex assessment. These include measures of total cost efficiency and overall capex efficiency. In general, these measures calculate a distributor's efficiency with consideration given to its inputs, outputs and its operating environment.

We consider each distributor's operating environment in so far as there are factors outside of a distributor's control that affect its ability to convert inputs into outputs.[41] Once we consider these exogenous factors, we expect distributors to operate at similar efficiency levels. One example of an exogenous factor we consider is customer density.

A.6 Other assessment factors

We considered several other factors when assessing Ausgrid's total capex forecast. These factors included:

- safety and reliability statistics (SAIDI and SAIFI);
- internal technical and engineering review;
- external consultant review;
- submissions made by various stakeholders; and
- other information provided by Ausgrid.

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

B Assessment of capex drivers

This appendix outlines our detailed analysis of the categories of Ausgrid's capex forecast for the 2019–24 regulatory control period. These categories are augex, customer connections capex, repex, and non-network capex.

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

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

- Section B.1: substitute estimate
- Section B.2: forecast augex
- Section B.3: forecast customer connections capex (including capital contributions)
- Section B.4: forecast repex
- Section B.5: forecast non-network capex
- Section B.6: forecast capitalised overheads

In each of these sections, we explain why we are satisfied the amount of capex that we have included in our substitute estimate reasonably reflects the capex criteria.

B.1 Substitute estimate

Our substitute estimate of Ausgrid's total net capex forecast for the 2019–24 regulatory control period is $2,209.8 million ($2018–19). We analysed Ausgrid's proposal and determined that it had not demonstrated that its forecast reflects the capex criteria. We then set out our substitute estimate of total capex, which we are satisfied reasonably reflects the capex criteria, taking into account the capex factors[42] and revenue and pricing principles.[43]

We have derived our substitute estimate using the assessment techniques explained in section 5.3 and appendix A. Our weighting of each of these techniques is set out under each of the capex drivers below. We also had regard to Ausgrid's investment governance framework, approach to risk management and capex forecasting methodologies, which are discussed below.

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

[43] NEL, ss. 7(a), 16(2).

Review of Ausgrid's governance, risk management and expenditure forecasting

Our consideration of Ausgrid's governance and risk management framework, and capital expenditure forecasting methods informed our assessment of its total capex forecast. Origin Energy submitted:

> "As part of the previous determination process, the AER highlighted concerns around the governance of capex forecasting which resulted in replacement capital forecast being overstated… For this reason, we strongly encourage the AER to reassess these practices to ensure they have been properly addressed".[44]

Consistent with previous decisions, distributors generally provide material to demonstrate the prudency and efficiency of their forecasts. This includes risk-based cost-benefit analysis with all feasible options considered, reasoning for the application of key inputs in the forecast, demonstration of a top-down challenge (or genuine testing of the forecast) and any other evidence that supports a rigorous forecasting methodology. For any forecast capital program or project, we would expect that a distributor's Board would have considered a range of different options, cost-benefit analysis and other rigorous quantitative evaluation as part of its capital planning process.

As part of our assessment, we engaged EMCa to undertake a detailed review of Ausgrid's total capex proposal. Overall, we agree with EMCa's conclusion that Ausgrid's governance and management processes detract from its capacity to make prudent and efficient expenditure decisions.[45]

EMCa discovered "systemic issues"[46] with Ausgrid's governance and management framework, which are listed below:

- Ausgrid's capital planning process does not include top-down guidance sufficient to link its assessment of a reasonable and prudent level of investment to its intended service levels;
- Ausgrid's process is likely to have led to an overestimation of project and program requirements;
- Ausgrid's documentation includes indications that its work program is not entirely "needs driven";
- it is likely that some projects may be subsequently rationalised, found not to be justified or displaced by alternative lower cost network or non-network options; and
- it is likely that a forecast produced through Ausgrid's governance process is not a reasonable forecast of the prudent and efficient requirements.[47]

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44 Origin Energy, *Regulatory proposals for NSW electricity distributors 2019–24,* August 2018, p. 3.

45 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 24.

46 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 24.

EMCa also noted several key concerns with Ausgrid's capital expenditure forecasting methods:

- the justification information provided is high-level in nature and in most cases in insufficient evidence to justify the need and timing;
- we did not see sufficient analysis of available condition information, defect rates, failures rates or other data that would assist in supporting or otherwise assessing the proposed replacement volumes; and
- the replacement programs that Ausgrid proposes are developed to target and treat risks where "the benefits of ameliorating the risks outweigh the costs", but its application of the cost-benefit analysis method is limited to major projects for sub-transmission cables and 11kV and 33kV switchboard replacements.

As noted above, based on its review of Ausgrid's governance and risk management documents and processes, EMCa concluded that a "forecast produced through Ausgrid's governance process is not a reasonable forecast of prudent and efficient requirements".[48] We also found that based on the information before us, Ausgrid was not able to substantiate the prudency and efficiency of its forecast for many programs and projects and at the total capex level.

Overall, we observed that the lack of necessary supporting material was a distinct characteristic throughout Ausgrid's capex proposal. We also note the delays in receiving responses to information requests throughout the review process. In putting together its revised proposal, we encourage Ausgrid to have particular regard to our observations throughout this draft determination, particularly where we have noted a lack of supporting material to justify the prudency and efficiency of its forecast.

B.2 Forecast augex

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

B.2.1 Ausgrid's proposal

Ausgrid has proposed forecast augex of $189.1 million ($2018–19). Ausgrid submitted that some parts of its network are growing quickly due to a rapid increase in large customer connections for transport infrastructure projects, residential high-rise developments and digital infrastructure projects (data centres).[49] It highlighted the

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47 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, pp. 21–24.

48 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 25.

49 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 88.

following as significant aspects of the augex program for the 2019–24 regulatory control period:[50]

- most new asset investments will be on 11kV 'hotspots' of the network;
- the proposal to establish Macquarie Park 132/33kV sub-transmission substation, providing increase capacity to meet new data centre and telecommunication customers, together with potential expansion of education facilities; and
- the proposal to construct a 33kV busbar and switch room at the Rozelle 132/33kV sub-transmission substation, to provide a firm permanent 33kV connection point for part of the WestConnex motorway development.

B.2.2 Position

The information Ausgrid has presented to date does not demonstrate that its capex forecast of $189.1 million ($2018–19) for augmentation is prudent and efficient. We have included $168.6 million ($2018–19) of augmentation expenditure in our substitute estimate. This is a reduction of $20.5 million (11 per cent). We consider that this amount is prudent and efficient, and would form part of a total forecast capex allowance that reasonably reflects the capex criteria. In coming to this view, we have assessed:

- trend analysis comparing recent actual and forecast expenditure;
- the forecast peak load on Ausgrid's network;
- the utilisation rates of Ausgrid’s assets;
- the project documentation accompanying Ausgrid's proposal and any further information provided by Ausgrid;
- advice from engineering and technical experts; and
- stakeholder submissions including the Public Interest Advocacy Centre (PIAC) and Energy Consumers Australia (ECA).

Consistent with EMCa's findings, we consider that Ausgrid has not provided sufficient supporting material or demonstrated good governance practices for some augex projects or programs. For example, Ausgrid has not justified an increase in expenditure for some programs compared with the current regulatory control period.

For a number of projects, Ausgrid has not demonstrated that it considered alternative augex or non-network solutions. For these projects or programs, Ausgrid has not justified that its forecast forms part of an overall capex proposal that reasonably reflects the capex criteria. Table B.2.1 summaries Ausgrid’s proposal and our alternative amounts for augex.

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50 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 89.

Table B.2.1 Draft decision on Ausgrid's total forecast augex ($2018–19, million)

	2019	2020	2021	2022	2023	Total
Initial regulatory proposal	27.0	51.7	46.6	29.8	34.1	189.1
AER draft decision	25.8	57.8	39.8	23.4	21.7	168.6
Total difference b/w the AER decision and initial proposal	-1.2	6.1	-6.7	-6.4	-12.3	-20.6
Percentage difference b/w AER decision and initial proposal (%)	-4%	-12%	-15%	-21%	-36%	-11%

Source: AER analysis.

Note: Numbers may not add up due to rounding.

Our findings are:

- Ausgrid has not demonstrated that a number of its proposed augmentation programs are prudent and efficient on the basis that:
  - the adjustment made to account for feeder load diversity for its 11kV network reinforcement program appears arbitrary and has the potential to overstate feeder loads;
  - increases above historical expenditure for its High Community Impact Assets Reliability Program are unsupported;
  - evidence provided by Ausgrid subsequent to its proposal supports a lower augex requirement for its LV distributor capacity program/distribution centre capacity program; and
  - Ausgrid's proposed augex for new reactive support did not provide a robust options analysis to demonstrate that it had proposed the lowest cost solution.
- Ausgrid has not demonstrated that a number of its proposed augmentation projects are prudent and efficient on the basis that alternative augmentation solutions or non-network measures of lesser scope have not been considered (Rozelle STS, White Bay ZS, Pyrmont STS);
- Ausgrid has demonstrated the need for a number of its larger proposed augmentation programs and projects, including:
  - Alexandria subtransmission substation – a third transformer would be required to supply the WestConnex stage 3A and other loads; and
  - Macquarie subtransmission substation – the size of expected loads exceeds the capacity of the existing network. We are satisfied with Ausgrid's scope of potential network solutions and its conclusion that construction of a new 132/33kV substation is the most efficient solution.

- Ausgrid has not demonstrated a need for strategic property acquisitions for future zone substations in the Sydney and Hunter areas. Ausgrid should have reasonably been able to identify the need for future zone substations in specific areas given its planning horizons.

B.2.3 Reasons for our position

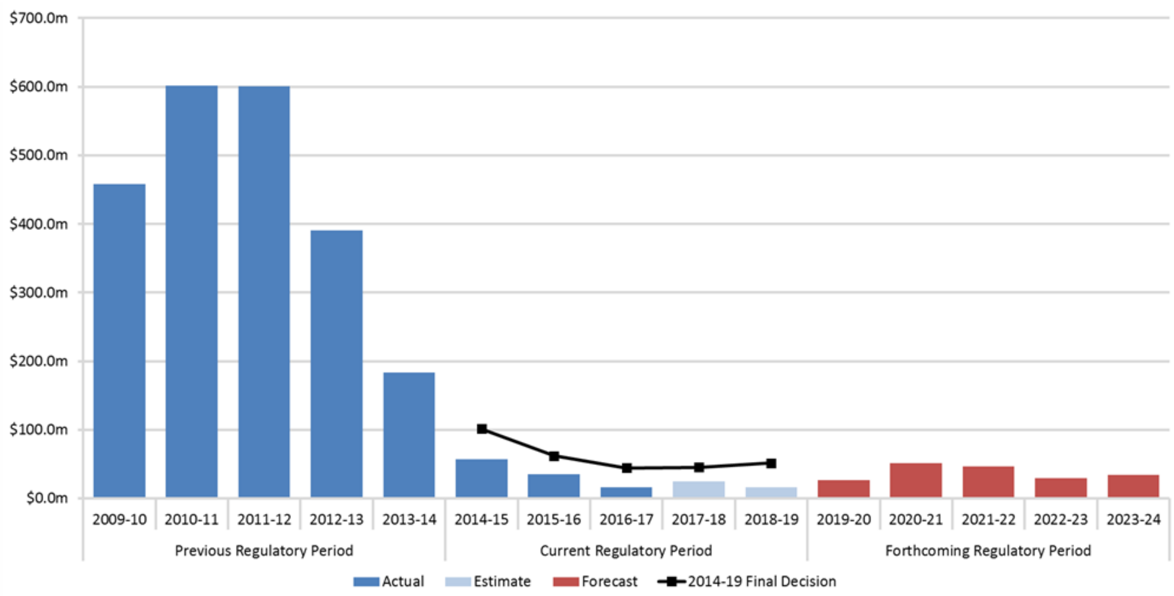
In coming to our position, we have considered the trend of historical and forecast expenditure, the accompanying demand forecast and asset utilisation. We then focused on the documentation accompanying Ausgrid's proposal and any further information Ausgrid provided in the process of our review.

Trend analysis

The NER require that we consider the actual and expected capital expenditure during any preceding regulatory control period.[51] Our use of trend analysis is to gauge how Ausgrid's historical actual augex compares to its expected augex for the 2019–24 regulatory control period.

Figure B.2.1 shows Ausgrid's actual/estimated augex since 2009–10 and its forecast augex for the 2019–24 regulatory control period, and the previously approved augex amount.

Figure B.2.1 Ausgrid's historical and forecast augex ($2018–19)



Source: Ausgrid, RIN Responses; AER, Final decision distribution determination – Ausgrid 2015 – Capex model; April 2015.

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

Figure B.2.1 indicates that Ausgrid has forecast an increase in augex in the 2019–24 regulatory control period. Average annual augex is forecast to increase from $30.0 million per annum in the 2014–19 regulatory control period to $37.8 million in the 2019–24 regulatory control period. Over the 2014–19 period, Ausgrid expects to underspend the allowance of $305.4 million by $155.3 million or 51 per cent.

While Ausgrid has forecast an increase in augex relative to the 2014–19 regulatory control period, it remains well below the levels of expenditure incurred during the 2009–14 regulatory control period. Ausgrid submitted that the shift to lower growth capex reflects its ability to draw on the capacity of past investments to meet new growth.[52] We note that the repeal of deterministic planning criteria in NSW was a major factor for the capex reduction in 2014–19 regulatory control period.

An increasing or decreasing trend in total augex by itself is not enough for us to determine whether a distributor's proposed augex is prudent and efficient. However, in light of our concerns regarding Ausgrid's expenditure governance and management process, we have closely analysed the supporting material for the programs and projects where Ausgrid has forecast an increase in augex compared with the current period.

Demand forecast

Peak demand is a fundamental driver of a distributor's forecast augex. Ausgrid must deliver electricity to its customers and build, operate and maintain its network to manage expected changes in demand for electricity. We have considered Ausgrid's peak demand forecast relative to the Australian Energy Market Operator's (AEMO) independent forecast of peak demand on Ausgrid's network.

We consider Ausgrid's system peak demand forecasts to be reasonable. Its forecast is higher than AEMO's forecast, and while both forecast positive growth between 2018 and 2024, AEMO forecasts the rate of peak demand growth to increase after 2025. A major reason for the difference in forecasts is the treatment of block loads (connection of large customers) in the peak demand forecast, where Ausgrid can account for additional information available from direct liaison with its customers.

We have some concerns that Ausgrid's methodology may overstate its peak demand forecast in some areas, and understate it in others. We will review any revisions that Ausgrid makes to its demand forecast it its revised proposal.

For the purpose of augmentation, Ausgrid's forecast indicates that the demand drivers are predominantly large projects such as infrastructure projects and data centres, rather than general load increases. Therefore, Ausgrid should target its proposed augmentation to address these demand pressures at a local level as they arise. Our review of the peak demand forecasts is outlined in Appendix E.

52 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 89.

Asset utilisation

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

Figure B.2.2 shows Ausgrid's zone substation utilisation between 2013–14 and 2017–18, and forecast utilisation in 2023–24. Between 2013–14 and 2017–18, Ausgrid's utilisation of its existing network increased, with a greater number of zone substations being utilised at a rate of 40 per cent or greater of the available capacity. This is consistent with Ausgrid's own analysis of asset utilisation, which indicated an improvement in 2016 and 2017, following a decrease in utilisation from 2011 to 2015 following the peak investment.[53] ECA also noted that Ausgrid's current asset utilisation (49 per cent of capacity), recognising that it has improved from 2015 levels, but that it remains below historical levels, with utilisation at 64 per cent in 2006.[54]

Based on Ausgrid's demand forecast, the trend of increased utilisation will continue to 2023–24, with a greater number of the existing zone substations expected to be utilised at 50 per cent or more. A small number of zone substations are expected to be utilised at close to capacity (80 per cent or more), which may indicate a need to augment the network in some areas.

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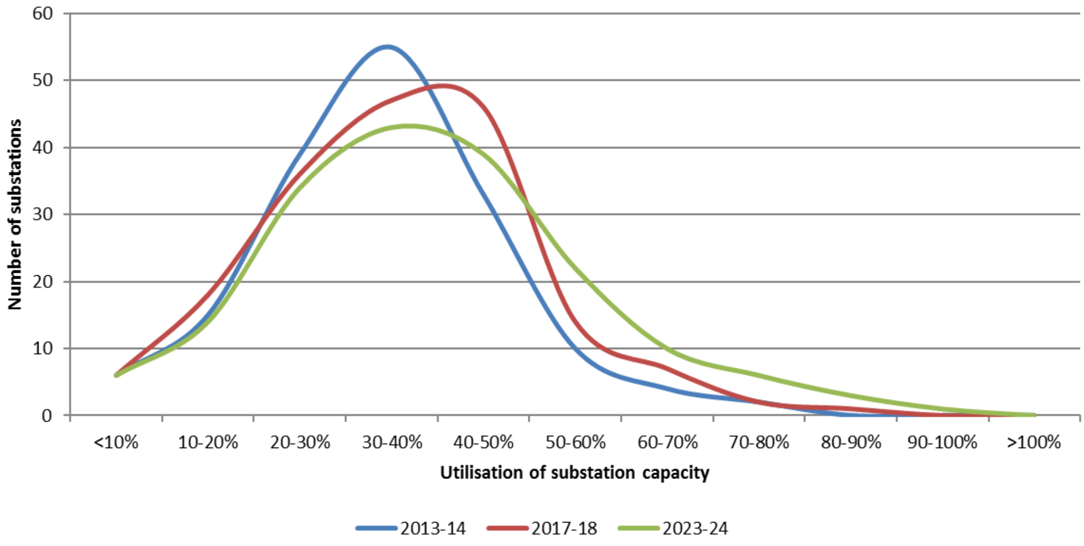
53 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 75.

54 Energy Consumers Australia, *Ausgrid regulatory proposal 2019–24: Submission to the AER issues paper,* August 2018, p. 8.

Figure B.2.2 Ausgrid's zone substation utilisation, 2013–14 and 2017–18 (actual) and 2023–24 (forecast)



Source: AER analysis, Ausgrid's reset RIN. Utilisation rates are based on 'substation normal cyclic' zone substation capacities.

Assessment of supporting augmentation material

We have reviewed the supporting evidence provided to assess whether Ausgrid has justified that its proposed $189.1 million augex is prudent and efficient, and would form part of a total forecast that reasonably reflects the capex criteria. Our assessment approach varies based on the nature of the augmentation measure proposed.

Good governance and risk management processes infer that the distributor is properly assessing whether:

- its capital programs are least cost options to meeting their operational requirements;
- resources have been put to their most efficient use;
- alternatives have been considered; and
- the timing of projects is appropriate.

The discussion of our assessment of Ausgrid's augex is separated into programs where we consider more information is required to justify the augex program and other augex where we have not identified any material issues. We have also included an assessment of strategic property acquisitions, which has affects both augex and repex. We discuss these programs in the sections below.

Assessment of augex programs where further information is required

We consider some of Ausgrid's proposed augex programs are not supported by the information provided. These programs account for $117.6 million of Ausgrid's augex proposal. We have included $92.5 million for these programs in our substitute estimate of capex.

Our findings highlight the concerns raised by EMCa that Ausgrid's expenditure governance and management processes detract from its capacity to make prudent and efficient expenditure decisions.[55] We discuss each of these programs in the section below.

11kV network reinforcement program

Ausgrid has proposed $63.7 million of augex for reactive augmentation of its 11kV network. The proposed amount is over 60 per cent higher than what it expects to spend over the 2014–19 regulatory control period ($39 million).[56] This is a business-as-usual augex program, but it submitted that the move away from deterministic planning standards in 2014 has 'released' material capacity in the 11kV network.

Ausgrid submitted that this capacity has, in places, now been taken up by load growth and the network now requires augmentation to cater for increased loads as they emerge.[57] Ausgrid has undertaken its own modelling to identify the feeders on its network that would be subject to outages, based on forecast loads. It then translates capacity shortages into its capex forecast based on an investment value of $250/kVA. In other words, Ausgrid will augment if the cost to augment is $250/kVA or less. Ausgrid's historical average threshold is $404/kVA.[58]

Ausgrid has also proposed a $5 million opex step change for demand management to mitigate against a further $17 million of augmentation.[59] Without the proposed step change, Ausgrid's proposed capex for 11kV network augmentation is $80.7 million. Our opex position, which is outlined in further detail in attachment 6, is to not accept the step change to mitigate against further 11kV augmentation. We have had regard to the capex-opex interrelationship in our assessment of this augex program.

Ausgrid provided modelling for the Canterbury-Bankstown area, demonstrating how it applied network reliability performance data to convert its forecast load into a load at risk forecast for each local feeder.[60] It also provided calculations of the feeder loads, demonstrating how it has derived the feeder loads from its zone substation forecasts.[61]

We reviewed the modelling provided for the Canterbury-Bankstown area. We consider that Ausgrid's methodology to forecast augmentation needs on its 11kV network is reasonable. Ausgrid's modelling accounted for potential double-counting where there are multiple failure points on a feeder by only including the larger failure to the load at

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55 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 24.

56 Ausgrid, *Response to information request 034,* August 2018, p. 1.

57 Ausgrid, *Response to information request 019, Parts 1–3 and 9–12 response,* July 2018, p. 7.

58 Ausgrid, *Response to information request 019, Parts 1–3 and 9–12 response,* July 2018, p. 8.

59 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, pp. 135–136.

60 Ausgrid, *Response to information request 039 – Augex – Canterbury Bankstown – Augex summary,* August 2018.

61 Ausgrid, *Response to information request 045 – Canterbury-Bankstown feeder loads,* September 2018.

risk calculation. The load forecast excludes spot loads and load transfers and therefore the augmentation need is only driven by underlying growth in local areas.

However, to account for the diversity between feeder peaks and zone substation peaks, Ausgrid has applied a 10 per cent increase to all reapportioned downstream distribution substation forecasts, which are used to derive the feeder forecasts.[62] While it is appropriate to apply a diversity factor to account for the differences in peak loads, the 1.1 factor that Ausgrid has applied appears to be arbitrary. A diversity factor of this size may be overstating feeder loads and therefore Ausgrid's expenditure requirements for this program.

In the absence of any evidence to justify Ausgrid's proposed diversity factor, we have included $58.4 million in our substitute estimate. We have derived our substitute estimate from Ausgrid's current period expenditure, ignoring low expenditure years of 2016–17 and 2017–18. We recognise that Ausgrid may need to engage in a greater amount of 11kV augmentation than will be incurred in the 2014–19 regulatory control period. We therefore consider that the higher annual expenditures incurred during this period provide a reasonable indication of the augex required in the 2019–24 regulatory control period. We consider this amount to be prudent and efficient and would form part of a total forecast capex that reasonably reflects the capex criteria.

High community impact assets reliability program

This program relates to the management of the risk of Wide Area Outages (WAOs). WAOs have the potential to affect large numbers of customers and/or critical infrastructure.[63] In the current period, Ausgrid has committed to one project to improve supply to Sydney Harbour Tunnel, and commenced two other projects to improve performance at five zone substations.[64]

For the 2019–24 regulatory control period, Ausgrid has proposed $9 million.[65] We have concerns that Ausgrid has not identified any specific high community impact reliability issues, or otherwise provided the necessary supporting material to justify its forecast expenditure for this program.

While further works to reinforce assets that have significant community impact may be required in the 2019–24 regulatory control period, in the absence of information regarding any projects, an increase in expenditure above historical levels is not justified. We have included $4.5 million in our substitute estimate, consistent with expenditure in the current period, based on an assumed need for one large and one small project.

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62 Ausgrid, *Response to information request 045,* September 2018, p. 2.

63 Ausgrid, *Response to information request 009, Covering note,* June 2018, p. 4.

64 Ausgrid, *Response to information request 019, Parts 1–3 and 9–12 response,* July 2018, p. 6.

65 Ausgrid, *Response to information request 019, Parts 1–3 and 9–12 response,* July 2018, p. 6; *Response to information request 034, Clarification of reported figures,* August 2018, p. 2.

New reactive support

Ausgrid proposed $10.2 million to install reactive plant in three locations across its network: two in the Sydney inner metropolitan network and one in the Singleton area.[66]

Sydney inner metropolitan

Ausgrid explained that its inner metropolitan network is highly meshed and consists of a majority of underground cables, including oil-filled cables, that provide a significant source of 'charging current' and generate a significant amount of reactive power. The reactive power supports the network to prevent voltage instability ensuring reliable operation of the network.[67] Ausgrid has proposed to progressively retire a number of 132kV oil-filled cables in the 2019–24 regulatory control period. Ausgrid considers this could lead to insufficient reactive margin in the inner metro area.[68] Ausgrid explained that the driver of this program to maintain voltage stability is in accordance with schedule S5.1.8 of the NER.[69]

Ausgrid has indicated that its assessment for the need for reactive support equipment in the inner metro area remains preliminary. For example, Ausgrid has noted that the project is dependent on TransGrid's Powering Sydney's Future project, and at the time of submitting the regulatory proposal, only a very high-level options analysis was completed.[70] Ausgrid submitted that its preferred solution was progressed pending review, and that all options, including demand management, will be investigated in further detail as part of a joint planning exercise between itself and TransGrid.

We have not included new reactive support augex in our substitute estimate. We require Ausgrid to provide a cost-benefit analysis and business plans to support this expenditure, noting that cable retirement, in and of itself, does not result in reactive shortage. In the absence of the necessary supporting material, we do not consider that the proposed expenditure forms part of a total capex forecast that reasonably reflects the capex criteria. Importantly, Ausgrid has indicated that in its revised proposal, it would provide evidence once investigations are complete and new information, including an updated demand forecast, is taken into account. Ausgrid also said it would provide graphs and charts demonstrating the reactive shortage, if available.[71]

Singleton area

In the Singleton area, Ausgrid has identified that the power factor at Muswellbrook Bulk Supply Point (BSP) does not comply with the automatic access standard required under NER S5.3.5.[72] Ausgrid is required to maintain the power factors on its network

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66 Ausgrid, *Response to information request 009 – AER question reply reactive support,* June 2018, p. 1.

67 Ausgrid, *Response to information request 009 – AER question reply reactive support,* June 2018, p. 2.

68 Ausgrid, *Response to request 019 – 4 new reactive support,* August 2018, p. 1.

69 Ausgrid, *Response to information request 009 – AER question reply reactive support,* June 2018, p. 1.

70 Ausgrid, *Response to information request 009 – AER question reply reactive support,* June 2018, p. 3.

71 Ausgrid, *Response to request 019 – 4 new reactive support,* August 2018, p. 2.

72 Ausgrid, *Response to information request 009 – AER question reply reactive support,* June 2018, pp. 4–5.

within permissible ranges during critical loading periods, to ensure satisfactory voltage levels and power system security.

For 50–250kV assets, distributors must ensure a power factor range of 0.95 to unity, for loads equal or greater than 30 percent of maximum demand at the connection point.[73] Ausgrid provided data demonstrating that the power factor at the Muswellbrook BSP has been below 0.95 for approximately 60 per cent of the year between April 2017 and March 2018, and that demand has been above 30 per cent of maximum demand 99.5 per cent of the time over the same period.[74]

Ausgrid identifies two potential solutions, which are to install reactive plant at Singleton STS or improve local power factors via demand management. Ausgrid proposed the installation of new reactive plant in its regulatory proposal, but it noted that a future detailed study would determine the preferred option. Ausgrid submitted that it will present the preferred option and more details of the project with its revised proposal.[75]

Ausgrid's proposal to rectify power factor levels in the Singleton area is justified. However, in the absence of detailed information on Ausgrid's options analysis, it has not demonstrated that the proposed installation of new reactive plant represents the least-cost option to meeting its requirements. Accordingly, we have not included an allowance for the proposed reactive plant in our substitute estimate, but we will consider any additional supporting material provided by Ausgrid in its revised proposal.

Conditional projects

Ausgrid has classified a number of augmentation projects as 'conditional projects'. It includes $34.6 million of projects under this classification. We have included $29.6 million in our substitute estimate for conditional projects.

Ausgrid uses this classification for anticipated projects that have uncertainty about whether they will be required in the 2019–24 regulatory control period and typically rely on a trigger that is outside of its direct control, such as large developments or customer loads. Ausgrid explains that to account for the uncertainty of projects in its regulatory proposal, it:[76]

> "... weights each [project] with a probability that is estimated as the likelihood of the project proceeding. The funding requested for each conditional project is weighted by the probability of proceeding. For example, if a project is given a 10% probability, we request 10% of the full project cost in our capital forecast. This conditional project approach has been used by Ausgrid in previous regulatory submissions to reflect the reality that some of these projects will likely proceed as planned and some will not, but some funding allocation will be

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73 NER, cl. 5.3.5.

74 Ausgrid, *Response to request 019 – 4 new reactive support,* August 2018, p. 3.

75 Ausgrid, *Response to request 019 – 4 new reactive support,* August 2018, p. 6.

76 Ausgrid, *Response to information request 019, Question 13,* July 2018, p. 1.

required for Ausgrid to respond to customer and network needs within the regulatory period.

The probability of a conditional project to proceed is based on the evidence of commitment demonstrated by the customers.

The general rule we apply to determine the percentage is as follows:

- 10% probability or less: an enquiry received by the customer via email or letter, or media coverage received, or political support provided for a development.
- Between 10% and 50%: investigations have been completed by Ausgrid to assess feasibility of supply, or several meetings and/or emails received in last 12 months.
- Between 50% and 90%: a network solution has been identified and some design work has been completed, and there is public display information.
- More than 90%: a connection offer has been sent to the customer and/or a Development Application has been approved."

In assessing Ausgrid's conditional projects, we first sought supporting information on the connection inquiry from the respective customer to verify the probability of each conditional project. We then reviewed the conditional projects using an approach consistent with our review of Ausgrid's other proposed augmentation projects.

Ausgrid has not fully justified its proposed augex for the White Bay zone substation and the Pyrmont subtransmission substation. We would expect Ausgrid to have performed a robust options analysis for these projects to identify the most prudent and efficient augex or non-network solution. We also do not accept the proposal for Macquarie University zone substation. Ausgrid has not provided information on the potential load to supports its view that a new zone substation is required in the forecast period. These proposals and our decision are discussed below.

White Bay zone substation

Ausgrid proposed to establish a new 33/11kV zone substation in the vicinity of White Bay in the inner west area of Ausgrid's network. The purpose will be to supply additional residential and commercial loads generated by the development of the “Bay Precinct” managed by Urban Growth (a NSW government agency).[77] Ausgrid anticipate the need for this to arise around 2028, but the pace of local development could accelerate under the management of Urban Growth.

Ausgrid assigned a 10 per cent probability of proceeding based on the early stages of connection applications and subsequent lack of detailed load and timeframe information. Ausgrid identified five options including 33kV supply from Rozelle STS, multiple 11kV network configurations including new zone substations and supply from

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[77] Ausgrid, *Attachment 5.16 – Augmentation major projects, April 2018,* p. 13.

existing substations, and demand management.[78] It considered a new 33/11kV zone substation as its preferred solution.

Although a new White Bay zone substation may ultimately be required and economically justifiable, Ausgrid has not considered options that may help to defer the substation with low-cost or temporary solutions. In particular, Ausgrid has not conducted a cost-benefit analysis to test the merits of alternative options to the proposed augmentation measure.

An alternative augmentation measure is to supply the White Bay area from Rozelle STS through a temporary 33/11kV transformer and 33kV cables operating at 11kV initially until load increase justifies a new zone substation in the future. Ausgrid stated that it considered this option but dismissed it due to technical difficulties that include the distance to the White Bay Terminal, congested cable route, space constraints at Rozelle STS and supply reliability.[79] These difficulties do not justify dismissing these options. The cable route distance is under 3km, within the reach of 11kV feeders. Ausgrid does not necessarily need to install additional 11kV cables that would aggravate route congestion. It could install 33kV cables for the future White Bay zone substation and initially operate them as an 11kV feeder.

The temporary solution suggested above does not require Ausgrid to build a 33/11kV zone substation at Rozelle, but merely a temporary 33/11kV transformer and an outdoor 11kV CB cubicle in the substation yard. Both the transformer and the cables could be reused for the White Bay zone substation so there would be little wasted investment. The temporary solution would not reduce supply reliability because it would not be a single source supply, but a supplement to the existing 11kV network in the White Bay area.

Ausgrid provided a further response citing technical difficulties for the solution, provided an approximate $5 million cost estimate, and explained that further investigation of this design modification would be required to determine feasibility.[80] Given the probability of proceeding within the next five years is 10 per cent, we have adopted this probability in our substitute estimate.

In the absence of cost-benefit analysis having regard to alternative augmentation measures including temporary network measures, Ausgrid has not justified its preferred augmentation measure to supply potential load in the White Bay area.

<u>Pyrmont subtransmission substation</u>

Ausgrid proposed to upgrade one Pyrmont STS power transformer from 60MVA to 120MVA, to maintain reliability of supply at 33kV in the Pyrmont, Camperdown and Blackwattle Bay area of its network.[81] This is primarily to cater for double

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78 Ausgrid, *Attachment 5.16 – Augmentation major projects, April 2018,* pp. 13–14.

79 Ausgrid, *Response to information request 041 – White Bay and Pyrmont,* August 2018, p. 1.

80 Ausgrid, *Response to information request 048,* September 2018, p. 5.

81 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, pp. 16–17.

contingencies, as Pyrmont STS supplies some major customers.[82] Ausgrid submitted that due to a large proportion of the load being already almost constant (e.g. from data centre loads), there may be limited opportunity available to take a transformer out of service for maintenance, and serve high-value commercial customers with N–1 reliability.[83]

Ausgrid assigned a 50 per cent probability of proceeding based on likelihood of the need to augment, should additional load from new data centres and other commercial loads eventuate.[84] We requested that Ausgrid provide its assessment of EUE at Pyrmont STS, and its data showed that a transformer outage would create a negligible reliability risk.[85] The low EUE indicates a potential for Ausgrid to utilise non-network measures to address that risk, rather than engage in additional network augmentation.

A number of large customers in the area have their own back-up supply arrangements in place, as Ausgrid acknowledges.[86] This indicates to us that:

- even where the EUE is negligible, a number of customers in the area have back-up arrangements in place such that their customers may experience no interruption to their electricity supply. We note that PIAC pointed to this scenario in its submission, limiting the need for network augmentation;[87] and
- there may be potential to utilise the existing back-up supply for network support. Ausgrid explained that there has not been detailed discussions with customers at this stage, but there has been a preliminary assessment of available funds, the scale of network support required and the potential customer support available.[88] Ausgrid considers that negotiation of such support may be possible but highly challenging.

Ausgrid has not demonstrated that if demand increases as forecast, the customers supplied from Pyrmont STS would be exposed to material risk of loss of supply when accounting for the both the low EUE and the back-up arrangements that those customers have in place. Further, we consider that Ausgrid should further explore the potential for non-network solutions through contractual arrangements with existing customers, to address scenarios where unserved energy may remain a possibility. Ausgrid has therefore not justified its proposed augex to add a new transformer to Pyrmont STS. We have therefore not included this amount in our substitute estimate.

82 Ausgrid, *Response to information request 041,* August 2018, p. 4.

83 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, pp. 16–17.

84 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, p. 16.

85 Ausgrid, *Response to information request 041,* August 2018, p. 2.

86 Ausgrid, *Response to information request 041,* August 2018, p. 3.

87 Public Interest Advocacy Centre, *Submission in response to the NSW DNSPs 2019–24 regulatory proposals and AER issues paper,* August 2018, p. 20.

88 Ausgrid, *Response to information request 041,* August 2018, pp. 4–5.

Macquarie University zone substation

Ausgrid proposed to establish a new 33/11kV zone substation to service Macquarie University's new developments.[89] Macquarie University has approached Ausgrid to discuss longer term site development plans and have provided an estimate of future load increases. Ausgrid explained that existing network assets have capacity to meet anticipated load increases, but there is uncertainty around the full extent of development. It has therefore assigned a 10 per cent probability for the new zone substation to go ahead in the forecast period[90], and reduced the proposed augex by 90 per cent accordingly.

Ausgrid has provided us with information on the anticipated load increase from Macquarie University, and note the following:

- Ausgrid did not provide information on the full extent of development that may occur during the 2019–24 regulatory control period. In particular, it did not provide information on the potential load that would need to be supplied through the new zone substation; and
- We have concerns that expenditure for the zone substation may not be incurred in the 2019–24 regulatory control period if it is indeed required. This is discussed further in confidential appendix G.

For these reasons, we do not consider that Ausgrid has justified its proposed capex for the Macquarie University zone substation. We have not included the proposed capex in our substitute estimate.

Macquarie subtransmission substation

Ausgrid proposed to establish a new 132/33kV substation adjacent to the existing Macquarie Park 132/11kV zone substation.[91] Ausgrid identified new major loads, anticipating a load growth up to 77MVA in the next five years.[92] This load would exceed zone substation spare capacity in the surrounding area by a significant amount. It considers that a 33kV supply is appropriate for the size of new load. Ausgrid assigned a 75 per cent probability of proceeding based on likelihood of the need to augment, and reduced the proposed augex by 25 per cent accordingly.[93]

Ausgrid has not done a cost-benefit analysis. However, given the size and nature of the proposed new load, the value of unserved energy would significantly exceed the proposed capital cost. Ausgrid has explored five network options including alternative configurations from Macquarie Park, construction of new zone substations and

89 Ausgrid, *Response to information request 045,* September 2018, pp. 1–2.

90 Ausgrid, *Response to information request 048,* September 2018, p. 3.

91 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, p. 5.

92 Ausgrid, *Planning report – Macquarie STS strategy,* May 2018, p. 4

93 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, p. 5.

installation of additional 11kV assets at existing zone substations to defer the need for 33kV supply.[94]

We consider that Ausgrid's options analysis is sound. Given the size and nature of the proposed new load, demand management and non-network solutions would be unsuitable. The preferred solution is sound in term of scope, and is the lowest cost of the options considered. We have therefore included an allowance for it in our substitute estimate.

<u>Assessment of other augmentation programs</u>

This section identifies augex programs we consider Ausgrid has justified in its regulatory proposal or subsequently provided us with updated information to include in our substitute estimate.

These programs reflect $64.3 million of Ausgrid's proposed augex. We have included $58.3 million in our substitute estimate. The difference reflects lower forecasts provided during our engagement with Ausgrid following its proposal. We have considered these updated forecasts and have included them in our substitute estimate of augex. We discuss each of these programs below.

Third transformer at Alexandria subtransmission substation

Ausgrid proposed to add a third 132/33kV transformer at Alexandria substation. This project is driven by the forecast increase in the load during the 2019–24 regulatory control period, from block loads the WestConnex project stage 3 and from new data centres.[95] Our discussion of the block loads including WestConnex load forecast is in confidential appendix G.

Ausgrid forecast that the demand at this zone substation would exceed the firm rating by 2020–21, but it also acknowledged that it has not applied scaling factors to adjust the block load forecast.[96]

Load transfer between Darling Harbour and Camperdown zone substations

Ausgrid proposed to install an 11kV feeder to transfer load from Darling Harbour Zone Substation to Camperdown Zone Substation. The increase in demand at Darling Harbour Zone is due to the transfer of existing load from neighbouring zone substations.

We note that Ausgrid's load forecast[97] shows a net load increase of 40MVA from 2016–17 to 2022–23. This includes 47MVA load transfer from the Camperdown and Blackwattle Bay zone substation to the Darling Harbour zone substation. This shows

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94 Ausgrid, *Planning report – Macquarie STS strategy,* May 2018, p. 4

95 Ausgrid, *Response to information request 009 – Alexandria Tx3,* June 2018, p. 1.

96 Ausgrid, *Response to information request 019 – 5_Tx3 Alexandria STS,* July 2018, p. 1.

97 Ausgrid, *Response to information request 019 – Question 7, Attachment 1_Darling Harbour 2017 forecast,* August 2018.

that the native demand at Darling Harbour will decrease if the loads from other zone substations are not transferred over. The load transfers are associated with the Camperdown 11kV conversion stage 6 work and the Blackwattle Bay load transfer project. Ausgrid stated:[98]

> "The majority of the increase in demand at Darling Harbour Zone is due to the transfer of existing load from neighbouring substations Blackwattle Bay and Camperdown whose legacy 5kV distribution networks are in the process of being decommissioned. Forecast block loads comprise about a third of the new demand at Darling Harbour zone substation which is substantially offset by decommissioning of existing distribution centres due to redevelopment. Net of these bulk transfers, there is little to no load growth."

We requested Ausgrid provide cost-benefit analysis demonstrating that when the augex for the load transfer is included in the project cost, decommissioning of the 5kV distribution network remains the most appropriate solution, which it provided.[99] Ausgrid's model may have overstated the unserved energy consequence because the model appears to assume that every circuit breaker failure would lead to the worst consequence, resulting in an entire bus section taken out of service and prolonged repair time. However, we found that if these assumptions are adjusted moderately, the annualised risk value (the benefit) still outweighs the annualised project cost. The proposed amount for this project is justified and have included it in our substitute forecast.

Rozelle subtransmission substation upgrade

Ausgrid initially proposed $17.4 million to construct a 33kV busbar and switch room at the Rozelle 132/33kV subtransmission substation (Rozelle STS), and to replace the existing 30MVA transformer with a 60MVA unit.[100] In subsequent engagement with us, it identified an alternative configuration that would reduce the forecast to $15.5 million.[101] The primary driver of this project is to supply major transport infrastructure and urban growth. Load growth at this substation is driven primarily by the WestConnex stage 3 and Western Harbour Tunnel loads.[102]

We have reviewed information on the load forecasts for the WestConnex project directly from Sydney Motorway Corporation and consider that Ausgrid's forecast of the load may be overstated. Our discussion of Ausgrid's WestConnex load forecast is in confidential appendix G. Ausgrid has justified its need to augment Rozelle STS, as the substation in its current configuration cannot serve the entire forecast load, but it has not justified the scope of the proposed augmentation. Ausgrid has not a done cost-benefit analysis for the Rozelle STS upgrade, as required by its internal planning policy, to identify the lowest cost solution to manage the proposed new loads.

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98 Ausgrid, *Response to information request 025 – Peak demand forecast,* July 2018, p. 14.

99 Ausgrid, *Response to information request 048, CBA Blackwattle Bay case study,* September 2018.

100 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, p. 8.

101 Ausgrid, *Response to information request 045,* September 2018, p. 11.

102 Ausgrid, *Attachment 5.16 – Augmentation major projects,* April 2018, pp. 8–9.

However, we recognise that Ausgrid would be unable to connect the multiple new loads and proposed inter-zone load transfers without a new switchboard. The value of expected unserved energy (EUE) for the unconnected load is likely to be many times greater than the project cost. Therefore, the expenditure is economically justifiable. We also consider that the proposed transformer upgrade is necessary to meet reliability and operational requirements.

Ausgrid proposed a configuration requiring three bus sections and 10 feeder panels (subsequently increased to 12 panels).[103] Ausgrid's forecast shows total Rozelle STS load will be below 60MVA beyond 2031–32.[104] At this load, there is an opportunity to defer some of the 33kV panel installation by at least 10 years. Based on information provided in the Feasibility Report, Ausgrid should only require two bus sections and six feeder panels to supply the existing and additional load. This is because the initial and ultimate STS configurations indicate that a number of the feeders would remain unused following augmentation, such that known loads could be served using the smaller configuration.[105] We included this configuration in our substitute estimate, which reflects a lower forecast than originally proposed by Ausgrid.[106]

Bypass reactor on feeder 907 at Canterbury subtransmission substation

Ausgrid initially proposed a project to bypass the reactor on 132kV feeder 907 at Canterbury STS. However, as part of the review process, Ausgrid stated that this project is no longer required, so we have therefore not included this amount in our substitute estimate.[107]

LV distributor capacity program/distribution centre capacity program

Ausgrid initially proposed this capex program to address general load growth, voltage levels and power quality issues in its low-voltage network. It includes $16.8 million and $6.5 million for the LV distributor capacity and distribution centre capacity programs, respectively.[108]

Ausgrid has explained that the volume of work is based on:[109]

- the existing overload list (701 distributors);
- future expected overloads (1182 distributors); and
- the expected percentage of these that will require work.

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103 Ausgrid, *Response to information request 045,* September 2018, p. 10.

104 Ausgrid, *Response to information request 019, Question 6 Attachment 1 – Rozelle STS 2017 forecast,* July 2018.

105 Ausgrid, *Response to information request 019, Question 6 Attachment 3 – Feasibility report: Rozelle 132/33kV STS expansion,* August 2017, p. 6.

106 Ausgrid, *Response to information request 045,* September 2018, p. 11.

107 Ausgrid, *Response to information request 009 – Reactor bypass,* June 2018, p.1.

108 Ausgrid, *Response to information request 017, Master capex list,* June 2018.

109 Ausgrid, *Response to information request 019, Parts 1–3 and 9–12 response,* July 2018, p. 11.

This is a reactive program where investments are made when conductors and/or fuse ratings are exceeded. Due to the large volume of LV assets, Ausgrid stated that the development of options does not occur as soon as a constraint has been identified. Rather, LV assets are assessed in order of priority based on the magnitude of identified constraints. Ausgrid bases its budget for the program on its internal expenditure model and is not a compilation of specific investments.[110]

Ausgrid's forecast for its LV distributor capacity program is lower than expected expenditure for the current period. However, we note that its expenditure in 2014–15 was particularly high (accounting for more than 40 per cent of total expenditure in 2014–19).[111]

We sought to understand the modelling approach behind Ausgrid's estimate for the LV distributor capacity program. It provided detail on an alternative model that used a bottom-up approach that estimates the expected volume of overloads and the typical historical costs to resolve these needs.[112] Ausgrid considered that this model was not sufficiently mature to be included with the regulatory proposal. It considered the new model to be more robust, and by applying this model could revise its augex forecast down to $14.6 million ($2017).[113] The modelling also indicated a revision to the forecast for the distribution centre capacity program of $3.9 million ($2017).

We reviewed the alternative modelling and are satisfied that Ausgrid has adopted a reasonable approach to address growth issues on the low-voltage network. The modelling splits overloads by asset type, allocates work requirements and volumes based on historical precedent, and accounts for project overlap by reducing duplicate expenditure from the forecast. We therefore accept Ausgrid's revised estimate of $18.4 million in our substitute estimate, escalated to 2018–19 dollars. We consider this amount to be prudent and efficient and would form part of a total forecast capex that reasonably reflects the capex criteria.

Strategic property acquisitions

Ausgrid proposed $43.6 million for strategic property acquisitions in the 2019–24 regulatory control period, covering both augmentation and replacement needs. However, it split the proposed capex according to the overall division of forecast area plan capex (being 84 per cent repex, 16 per cent augex).[114] Ausgrid proposed $6.7 million for strategic property acquisitions as part of its augex proposal. We have reallocated the capex based on the drivers of the land purchase, which results in a $39.8 million augex forecast.

110 Ausgrid, *Response to information request 009, Covering note,* June 2018, p. 8.

111 Ausgrid, *Response to information request 034,* August 2018, p. 2.

112 Ausgrid, *Response to information request 045, LV augmentation program forecast–final v.3.1,* September 2018.

113 Ausgrid, *Response to information request 045,* September 2018, pp. 4–5.

114 Ausgrid, *Response to information request 023,* July 2018, p. 8.

Ausgrid has proposed land purchases for three future zone substations:

- White Bay zone substation ($19.7 million)
- A new zone substation in Sydney ($16.3 million)
- A new zone substation in the Hunter region ($3.6 million)
- Ausgrid require a site upon which it would construct its proposed White Bay zone substation. In response to the need for the zone substation and land purchase, Ausgrid explained:[115]

> "The timing of this project is uncertain as indicated by the low probability allocated to the conditional project of substation construction. However, the need is considered to be more certain and this underpins the intention to acquire suitable land."

Ausgrid explained that it did not know the specific need for new zone substations in Sydney and Hunter Valley at this time, but a provisional allowance for these substations has been included in its forecast.[116] Ausgrid has taken a probabilistic approach to site purchases, identifying multiple potential areas in Sydney and Hunter where a site purchase may be required, but included an allowance for only one site purchase in both areas in its proposal.[117]

For the White Bay zone substation, we accept the rationale behind Ausgrid's proposed site purchase. Although we do not consider the Ausgrid has demonstrated the need to construct the White Bay zone substation in the 2019–24 regulatory control period, we consider it has demonstrated the ultimate need to build a zone substation in the area, and therefore the need to secure suitable land for this purpose early.

For Sydney and Hunter, we recognise that Ausgrid has listed some potential locations for future site purchases based on development activity. However, we note that zone substation planning generally has a long lead-time, usually 5–10 years ahead of the required completion. In Ausgrid's case, its Distribution and Transmission Annual Planning Report indicates that it has a 10-year planning horizon for the dual-function assets including zone substations.[118] With land development and load forecast information, it is reasonable to expect that Ausgrid could identify the need for specific site purchases in the 2019–24 regulatory control period for zone substations required thereafter. In the absence of information demonstrating a reasonable need and likelihood for new zone substations within Ausgrid's own planning horizon, we do not consider capex for the site purchases to be prudent and efficient.

Ausgrid also incorporated land cost escalation into its forecast for strategic property acquisitions. Ausgrid engaged BIS Oxford Economics (BIS) to provide price forecasts

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115 Ausgrid, *Response to information request 023,* July 2018, p. 9.

116 Ausgrid, *Response to information request 023,* July 2018, p. 10.

117 Ausgrid, *Response to information request 023,* July 2018, pp. 10–11.

118 Ausgrid, *Distribution and transmission annual planning report,* December 2017, pp. 16–17.

of labour, materials, construction costs and land relevant to electricity distribution networks in New South Wales.[119] BIS forecast changes in land values in suburban, industrial and CBD areas, which indicate increases in land values through to 2023, after which industrial and CBD land values to begin to decrease.[120] For escalating the cost of all proposed strategic property acquisitions, Ausgrid used BIS's forecast of suburban land escalation.[121]

BIS's forecast of suburban land prices is inconsistent with recent data showing Sydney land values decreasing over the past year. For example, CoreLogic's figures indicate that Sydney home values have decreased more than 7 seven per cent year-on-year to August 2018.[122] We do not consider that a forecast for Sydney land prices continuing to trend upward can be supported having regard to most recent information on the housing market. Given present levels of uncertainty around future land prices (upward or downward), we consider that it is appropriate to apply no escalation to Ausgrid's proposed capex for strategic property purchases.

For strategic property purchases, we have included an unescalated allowance for a site purchase for White Bay zone substation of $17.8 million. We consider this amount to be prudent and efficient and would form part of a total forecast capex that reasonably reflects the capex criteria. Ausgrid provided its model for the unserved energy calculation[123]. After applying the scaled load,[124] the model shows that Ausgrid could defer the timing of project by two years from 2021 to 2023. The proposed amount for this project is justified and have included it in our substitute forecast.

B.3 Forecast customer connections

Connections capex is expenditure incurred to connect new customers to the network and, where necessary, augment the shared network to ensure there is sufficient capacity to meet the new customer demand.

The contestability framework in New South Wales allows customers to choose their own accredited service provider and negotiate efficient prices for connection services. Given the competition between service providers, we do not regulate the majority of connection services in New South Wales. However, some connection works that involve augmenting and extending the shared network to connect new customers are regulated and funded by all customers. These works are referred to as net connections capex.

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119 Ausgrid, *BIS Oxford Economics, RIN09, Real cost escalation forecasts to 2023/24,* September 2017.

120 Ausgrid, *BIS Oxford Economics, RIN09, Real cost escalation forecasts to 2023/24,* September 2017, p. 48.

121 Ausgrid, *Response to information request 023,* July 2018.

122 CoreLogic, *CoreLogic RP data daily home value index: monthly values,* August 2018, https://www.corelogic.com.au/research/monthly-indices, accessed 13 September 2018.

123 Ausgrid, *Response to information request 039 – CBA_Alexandria TX3-case study,* August 2018.

124 Ausgrid, *Figures for load scaling obtained from response to information request 025, excel document 'MCC and Applied Scaling Factors for FC Notes v2',* July 2018.

In NSW, the majority of capital contributions are made up of the value of assets constructed by third parties, which are then gifted to Ausgrid to be operated and maintained. In some cases, Ausgrid requires payments for connection works that are not contestable. These contributions are subtracted from total gross capex and decrease the revenue that is recovered from all customers.

B.3.1 Ausgrid's proposal

Ausgrid forecast $607.8 million ($2018–19) for connections capex for the 2019–24 regulatory control period. The forecast is $40.0 million—or 6 percent—lower than its actual connections expenditure of $647.8 million in 2014–19.[125]

Ausgrid’s forecast connections capex includes:

- net expenditure (costs incurred by Ausgrid) of $29.2 million; and
- capital contributions of $578.7 million.

Forecast net connections capex for the 2019–24 regulatory control period is 65 per cent lower than actual expenditure of $83.7 million in 2014–19. Only net connections capex is rolled into the regulatory asset base.

Revisions to connections capex forecast

In its proposal, Ausgrid forecast connections capex of $637.2 million, including net connections capex of $52.2 million and capital contributions of $585.0 million. Following an information request and subsequent consultation, Ausgrid provided corrected forecasts for net connections capex and for capital contributions. The revised forecast for:

- gross connections is 5 per cent lower than the proposal;
- net connections capex is 44 per cent lower than the proposal; and
- capital contributions is 1 per cent lower than the proposal.

The revisions were to address modelling errors in the original forecast.

Consideration of 'beneficiary pays' approach

Ahead of its proposal, Ausgrid engaged with stakeholders about its intention to change the way it applied its connection policy. The changes would mean that a larger share of connections expenditure would be borne by all network users, while a smaller share would be funded by the connecting customer.

An advocate of this approach is the Urban Development Institute of Australia (UDIA). It notes in its submission in response to our issues paper that:[126]

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125 Ausgrid, *Regulatory information notices and response to information request 004,* April 2018.

126 UDIA, *Submission on Ausgrid 2019–24 regulatory proposal*, August 2018.

> "It is critical that Ausgrid contributes to easing the cumulative cost of living pressures faced by consumers, by supporting housing delivery through its growth policies.
>
> …the underlying principle for growth infrastructure funding must be "beneficiary pays", whereby the beneficiary contributes to the network.
>
> …since Endeavour Energy has already moved toward the beneficiary pays approach, particularly for Greenfield development, we note Ausgrid would be an outlier in the NEM if it did not also embrace this approach."

However, the majority of stakeholders did not support these changes. Instead, they supported a 'causer pays' position and encouraged Ausgrid to maintain the status quo of relatively low network-funded connection works and relatively high capital contributions, as a proportion of gross connections capex. Ultimately, Ausgrid has not made any changes to the application of its connection policy in its proposal. As a result, Ausgrid's proposed net connections capex remains among the lowest in the NEM.

B.3.2 Position

We are satisfied that Ausgrid's proposed connections capex of $607.8 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. Table B.3.1 summarises Ausgrid's proposed connections capex for 2019–24.

Table B.3.1 Ausgrid's proposed connections capex for 2019–24 ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	2019–24
Net connections capex	6.0	8.0	6.0	5.4	3.8	29.2
Capital contributions	104.0	119.6	118.3	132.5	104.3	578.7
Total	110.0	127.5	124.3	137.9	108.1	607.8

Source: Ausgrid.

Note: Numbers may not add up due to rounding.

B.3.3 Reasons for our position

In coming to our position, we have analysed Ausgrid's methodology, historical costs and trends, and expected customer growth. We have also analysed Ausgrid's forecast capital contributions and its proposed connection policy.[127]

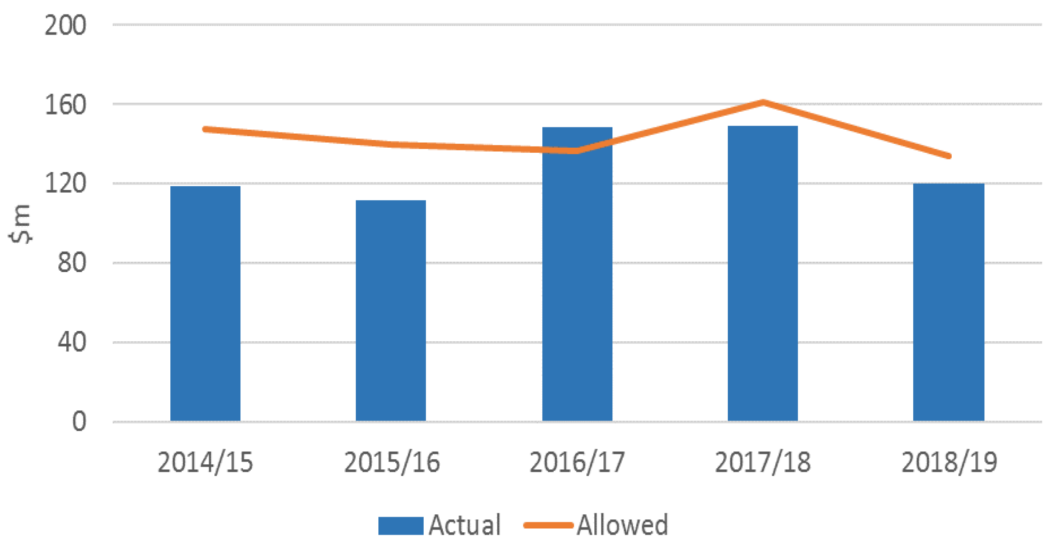
[127] Refer to attachment 17 for our assessment of Ausgrid's proposed connection policy.

B.3.3.1 Connections capex in 2014–19

Figure B.3.1 compares Ausgrid's 2014–19 actual/estimated gross connections capex with our allowance. Ausgrid estimates connections capex of $647.8 million in the current period. This is 10 per cent lower than our final determination allowance of $718.2 million.

Compared with our allowance, Ausgrid estimates that actual net connections capex will be 62 per cent lower, and capital contributions 14 per cent higher, in the 2014–19 regulatory control period. Ausgrid's less generous connections policy, which came into effect in 2014–15, resulted in a much higher proportion of connections capex being funded by the connecting customer.

Figure B.3.1 Annual gross connections capex, actual expenditure compared with allowance, 2014–19 ($2018–19, million)



Source: Ausgrid and AER.

B.3.3.2 Forecast connections capex compared with current period

Figure B.3.2 compares Ausgrid's 2019–24 forecast net connections capex and capital contributions with actual/estimated expenditure in 2014–19.

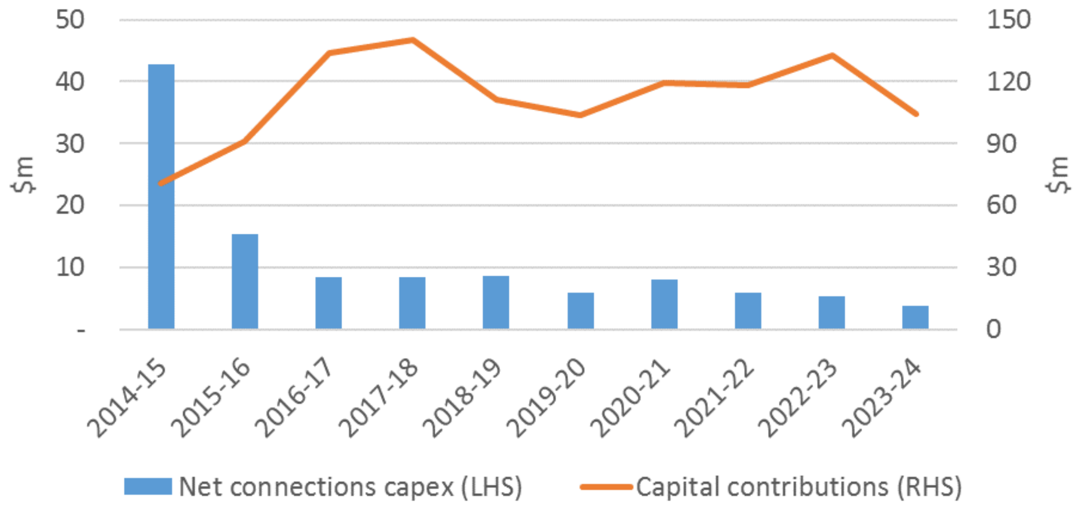
Net connections capex was high in 2014–15, reflecting the transition from Ausgrid's previous connections policy, and decreased by more than 80 per cent in the following two years. Over the same period capital contributions increased.

Compared with the current regulatory control period:

- forecast net connections capex for 2019–24 is 65 per cent lower, or 43 per cent lower (on average) if 2014–15 is excluded;

- forecast capital contributions is 6 per cent higher, or around the same (on average) if 2014–15 is excluded; and
- gross connections capex is 6 per cent lower.

Figure B.3.2 Annual net connections capex, 2014–15 to 2023–24 ($2018–19, million)



Source: Ausgrid.

In the 2019–24 regulatory control period, net connections capex is expected to account for only 5 per cent of gross connections capex. Ausgrid's proposed net connections capex is among the lowest in the NEM. This is because, in accordance with its connections policy, it requires customers to pay for connections in most circumstances.

B.3.3.3 Our assessment of forecast net connections capex

Ausgrid has forecast net connections capex for low-voltage (LV) and high-voltage (HV) customers and for major projects. Ausgrid expects around 100,000 new LV and HV customers, and around 20 major sub-transmission connections, will connect to its network in 2019–24.[128]

Ausgrid generally requires new customers to construct and fund the cost of dedicated connection assets. These are referred to as contestable services and are provided by an Accredited Service Provider (ASP). However, Ausgrid will fund the costs of connection-driven, predominantly shared network augmentations, or where it declares the connection as non-contestable for safety or network integrity reasons.

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[128] Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure,* April 2018, p. 37.

B.3.3.3.1 LV and HV connections

LV and HV connections make up the majority of new connections to Ausgrid's network. Ausgrid has used historical costs and volumes to calculate unit rates for LV and HV connections for residential and commercial customers. The historical average unit rates are multiplied by forecast new connections volumes, which are based on forecast construction activity provided by the Australian Construction Industry Forum (ACIF).[129]

In its proposal, Ausgrid forecast $39.0 million for LV and HV net connections capex. We requested details of Ausgrid's modelling and assumptions used to arrive at its estimate.[130] In its response, Ausgrid noted that it identified an error in its original modelling and has provided us with a revised model. The updated model calculates the net connections forecast for LV and HV net connections capex to be $15.6 million for 2019–24.

We assessed the revised model and had concerns with the number of new connections volumes reported, as it showed a significant decrease in volumes over the four years to 2016–17. We also had concerns about using connection capex data from 2013–14. This is because Ausgrid had a more 'generous' capital contribution approach before its current connection policy and as a result a different mix of connection works was included as net connections capex. For example, under the previous connection policy, Ausgrid funded relocatable equipment associated with contestable connection projects (e.g. transformers & HV switches).[131]

We raised our concerns with Ausgrid. It noted that the customer numbers in the revised model had been under-reported due to changes in how its systems captured connection works. Furthermore, Ausgrid agreed with us that using connections capex data incurred under its previous connection policy might bias its forecast.

Ausgrid resubmitted its LV and HV net connections capex model on 20 July 2018. The new model addresses the concerns we raised and provides forecasts based on unit rates and volumes over three different time periods (2014–17, 2015–17, and 2015–18). We consider that using 2015–18 as the base is preferable because:

- it is based on the most recent information;
- using a three-year average is more likely to reduce the effects of year-to-year volatility compared with a two-year average; and
- net connection costs incurred in 2014–15 were affected by the previous connection policy to a greater extent than costs in subsequent years.

By using 2015–18 as the base for its forecast, Ausgrid estimates $15.9 million for LV and HV net connections capex in 2019–24. We are satisfied that this is a reasonable

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129 The Australian Construction Industry Forum (ACIF) produces biennial forecasts of demand and activity in the construction industry over a 10-year period.

130 Ausgrid, *Response to information request 004,* July 2018.

131 Ausgrid, *Response to information request 004,* update July 2018.

estimate of efficient costs required by Ausgrid for the 2019–24 regulatory control period that would form part of a total forecast capex that reasonably reflects the capex criteria.

Forecast new connections volumes

New connections volumes are forecast using historical SCS new connections volumes, which are the number of connection jobs where Ausgrid has funded some element of the new connection. A forecast growth rate is calculated by using ACIF building forecasts for residential and non-residential buildings for each year through to 2023–24. This growth rate is then used to calculate the forecast number of SCS new connections volumes for each year over the 2019–24 regulatory control period. Finally, LV and HV net connections capex is determined by multiplying the forecast new connection volumes by the 2015–18 average unit rates for each LV and HV connection category.

We are satisfied that Ausgrid's forecasting approach for new connections is reasonable. It is based on industry forecasts and is comparable with the long-term housing forecasts from the NSW Department of Planning. Ausgrid's forecast new connections volumes contribute to a lower forecast of net connections capex compared with the current regulatory control period.

B.3.3.3.2 Major connections

Ausgrid has forecast $13.2 million for major connection projects. Ausgrid has provided customer connection advices for each project including project scope, options analyses, project requirements and timing advices. Forecasts for conditional projects are weighted by the likelihood of the project going ahead, depending on the planning stage.

The majority of the project expenditure will be customer-funded. Some costs relate to the non-contestable augmentation element for each project and these costs are included in Ausgrid's forecast net connections capex. We have assessed the documentation and are satisfied that the forecast major connections expenditure is justified.

B.3.3.4 Our assessment of capital contributions

In its proposal, Ausgrid forecast $585.0 million for capital contributions. Ausgrid resubmitted its capital contributions model with its response to information request 004. The revised model contained two amendments:

- an increase of $1.3 million to account for HV augmentation that was inadvertently missed in the original calculations; and
- a decrease of $7.6 million following the reversal of a major project that was inadvertently double-counted in the original calculations.

These amendments reduced its forecast capital contributions by $6.3 million to $578.7 million.

Ausgrid's forecast for capital contributions is $31.2 million, or 6 per cent, higher than expected capital contributions in the current period. The increase is largely due to lower capital contributions in 2014–15 and 2015–16 of around $70 million and $90 million, respectively, as some projects approved under the old connection policy were being completed in the current period. These projects attracted a lower rate of capital contributions than they otherwise would under the current connection policy. For example, relocatable equipment was network-funded under the old connection policy, whereas under the new policy customers will generally fund these assets.

Ausgrid has based its forecast for capital contributions on actual contributions received in 2016–17. We asked Ausgrid why they have used a single year as the basis for its forecast, and not a three-year average as it did for estimating net connections capex. It replied that:[132]

> The reason for using 2016/17 data as the base year is that this is believed to most accurately reflect the quantum and value of contributed assets since this year was not impacted by Ausgrid's previous connection policy. Contributions in years prior to this included a level of network funded material for relocatable equipment (primarily transformers and HV switches in distribution substations). 2014/15 and 2015/16 also included the completion of some legacy projects where the customer funding had been determined and agreed under the previous policy.

Based on this response, and in the context of a reduction in forecast gross connections capex compared with the current period, we accept that the forecasting approach is reasonable.

B.4 Forecast repex

Replacement capital expenditure (repex) must be set at a level that allows a distributor to meet the capex criteria. Replacement can occur for a variety of reasons, including when:

- an asset fails while in service or presents a real risk of imminent failure;
- a condition assessment of the asset determines that it is likely to fail soon (or degrade in performance, such that it does not meet its service requirement) and replacement is the most economic option[133];
- the asset does not meet the relevant jurisdictional safety regulations and can no longer be safely operated on the network; and
- the risk of using the asset exceeds the benefit of continuing to operate it on the network.

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132 Ausgrid, *Response to information request 004,* July 2018.

133 A condition assessment may relate to assessment of a single asset or a population of similar assets. High value/low volume assets are more likely to be monitored on an individual basis, while low value/high volume assets are more likely to be considered from an asset category wide perspective.

The majority of network assets will remain in efficient use for far longer than a single five-year regulatory control period (many network assets have economic lives of 50 years or more). As a result, a distributor will only need to replace a portion of its network assets in each regulatory control period. Our assessment of repex seeks to establish the proportion of Ausgrid's assets that will likely require replacement over the 2019–24 regulatory control period and the associated capital expenditure.

B.4.1 Ausgrid's proposal

Ausgrid has proposed forecast repex of $1,673.1 million ($2018–19) for the 2019–24 regulatory control period. In summary, Ausgrid has submitted that the key drivers for this expenditure are:

- ensuring the safety of customers, staff and the general public;
- meeting compliance obligations; and
- maintaining the current level of network reliability.[134]

B.4.2 Position

We do not accept that Ausgrid's proposed repex of $1,673.1 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have included an amount of $1,207.5 million ($2018–19) in our substitute estimate of total capex. This represents a 28 per cent reduction. We are satisfied that our substitute estimate would form part of a total capex forecast that reasonably reflects the capex criteria.

B.4.3 Reasons for our position

We applied several techniques to assess Ausgrid's proposed repex forecast against the capex criteria, as well as considering stakeholder submissions. These techniques include:

- trend analysis;
- repex modelling;
- bottom-up and top-down assessments;
- technical and engineering review; and
- network health indicator assessment.

Our repex assessment has been broadly split into three main components. Table B.4.1 outlines Ausgrid’s proposal and our recommended position for each of these three repex components, including the primary approach that we have used to determine our substitute estimate.

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[134] Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 82.

Table B.4.1 Ausgrid's repex proposal by component ($2018–19, million)

Repex component	Ausgrid's proposal	Substitute estimate	Primary approach used to determine substitute estimate[135]
Modelled repex	$930	$664	Repex model
132kV underground cables	$165	$93	Detailed bottom-up project assessment
Unmodelled repex	$578	$450	Historical trend analysis
Total	**$1,673**	**$1,207**	

Source: AER analysis.

Note: Numbers may not add up due to rounding.

Below we outline the reasons for our positions based on our assessment of Ausgrid's total repex forecast and the three key repex components in table B.4.1, including which assessment techniques we have used. We also considered Ausgrid's broader governance and management framework and capital expenditure forecasting methods in forming our position on total repex. EMCa focused heavily on these operational aspects in its overall review of Ausgrid's total capex forecast.

Total repex

At the total repex level, we relied on trend analysis, top-down and bottom-up assessments, and technical and engineering review to form our position on Ausgrid's forecast. We also considered stakeholder submissions that related to Ausgrid's total repex forecast. Throughout Ausgrid's repex proposal, there are often discrepancies between its detailed bottom-up program and project build, and its submitted reset RIN. EMCa also observed these discrepancies in its review of Ausgrid's total repex forecast.[136]

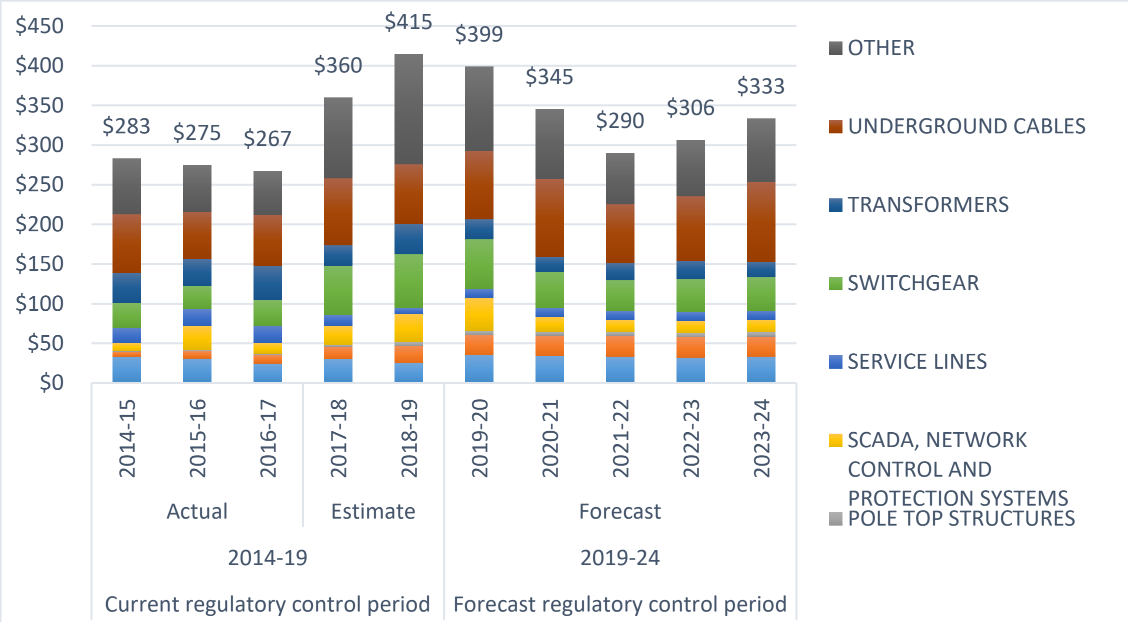
Trend analysis

Figure B.4.1 highlights that Ausgrid is forecasting an increase in repex over the 2019–24 regulatory control period. Ausgrid is also forecasting an increase in asset replacement volumes over the same period, as highlighted below throughout the 'modelled repex' and 'unmodelled repex' sections.

[135] As noted, we have used several techniques to assess Ausgrid's repex forecast. Table B.4.1 outlines the main approach we have used to determine our substitute estimate.

[136] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 85.

Figure B.4.1 Ausgrid's historical vs forecast repex (by asset group) ($2018–19, million)



Source: AER analysis

Figure B.4.1 highlights that based on the three years of actual data in the current period, Ausgrid is estimating a significant increase in repex in the final two years of the current period. It is then forecasting that its required level of repex over the forecast period is likely to be more in line with these two estimate years.[137] Ausgrid is also forecasting a significant increase in replacement volumes for several asset groups, including poles, overhead conductors and underground cables. More detailed analysis of these asset groups is discussed in 'modelled repex'.

Throughout our ongoing engagement with Ausgrid, it has indicated that its first three years of actual repex in the current period are not representative of its repex requirements over the forecast period, primarily due to the lease transaction that was finalised in 2016–17. It has also indicated that it expects to spend very close to its initial repex estimate in 2017–18.

However, figure B.4.2 demonstrates that the fifth year of the current period is significantly higher than Ausgrid's revealed level of repex over the preceding years. We therefore sought to ensure that this higher level of repex, which carries on into the forecast period, was sufficiently justified. However, Ausgrid did not sufficiently justify the increases in both repex and replacement volumes to these higher levels for the 2019–24 regulatory control period in its proposal and in subsequent information request responses.

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

Top-down and bottom-up assessments

Ausgrid's proposal stated:

> "Once we have developed a bottom-up forecast of the replacement needs, a top-down review is undertaken considering trends of assets over their standard life, using the AER's repex model to verify that these bottom-up forecasts are reasonable and in line with historic levels".[138]

However, we have not found any evidence that Ausgrid has conducted this top-down review. Ausgrid's verification using our repex model relies on outdated benchmark unit cost data and does not consider comparative expected asset replacement lives or our refined repex modelling approach. More information on this approach is discussed in 'modelled repex' and can be found in appendix D. We presented our repex modelling approach, including preliminary modelling results, to Ausgrid during our capex deep dive session in Melbourne on 22 March 2018. We also provided Ausgrid with updated modelling results in June 2018 and sought feedback on our approach. In mid-August, later in the process, Ausgrid engaged with us on this aspect of its proposal.

In addition, EMCa's review identified that "Ausgrid appears to have developed its repex forecast essentially from a bottom-up build of proposed programs and projects" and "there is little evidence of portfolio-level forecasting methods".[139] Consistent with previous decisions, we note that a lack of a top-down review generally indicates that the distributor has not adequately accounted for the interrelationships, effect overlapping[140] and synergies between programs, projects and work areas, which is likely to inflate forecast expenditure. EMCa also observed this about Ausgrid's overarching governance and management framework and its capital expenditure forecasting methods.

From a bottom-up perspective of Ausgrid's total repex forecast, we sought underlying cost-benefit analysis for a range of programs and projects, to ensure that these programs and projects were prudent and efficient. In response to this information request, Ausgrid stated that it had only applied cost-benefit analysis to "23 per cent of its total repex forecast" and that a "quantitative risk assessment process" was only used on its major projects.[141] Ausgrid therefore had not sufficiently demonstrated that its proposed repex forecast was prudent and efficient. This is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1.

We provided this feedback to Ausgrid throughout our ongoing engagement. In response, Ausgrid provided cost-benefit analysis spreadsheets for six of its main repex

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138 Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure,* April 2018, p. 12.

139 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 41.

140 For example, replacing a zone substation asset and a feeder would both improve supply reliability, but these effects are typically analysed in isolation.

141 Ausgrid, *Response to information request 016, Question EMCaAUS066 repex CBA,* July 2018, p.1.

programs in August 2018. We typically expect distributors to provide this information and supporting justification during the pre-engagement stage or when proposals are submitted. We discuss these cost-benefit analysis spreadsheets below in 'modelled repex'.

Technical and engineering review

As noted above, we engaged EMCa to conduct a review of Ausgrid's total repex forecast. In regards to this forecast at the total repex level, EMCa stated:

> "Ausgrid has not explained why it considers the repex amount that it has proposed is at an appropriate level. Its proposed figure has not been justified against NER criteria or against Ausgrid's stated corporate objectives".[142]

EMCa also stated that Ausgrid's "repex forecast…is not efficient, prudent and reasonable and therefore does not meet the NER expenditure criteria".[143] Specifically, EMCa found the following systemic issues:

- lack of supporting justification for the programs and projects included in the proposed forecast expenditure, with examples of programs not documented in the supporting justification;
- low level of alignment between the expenditure forecast and the submitted RIN data;
- examples where the modelled outcomes were not adequately supported by the supporting information, including the basis of input assumptions; and
- insufficient analysis of risk and options to determine the most efficient risk treatment option.[144]

Overall, Ausgrid has not established that its total repex forecast of $1,673 million ($2018–19) is prudent and efficient, and its forecast would not form part of a total capex forecast that reasonably reflects the capex criteria. Below we discuss the basis for our substitute estimate, including why we are satisfied it would form part of a total capex forecast that reasonably reflects the capex criteria.

Modelled repex

Ausgrid's proposal includes $930 million in modelled repex. We do not consider that this forecast would form part of a total capex forecast that reasonably reflects the capex criteria. Our substitute estimate for this repex component is $664 million. Our reasons for this position are discussed below. To assess Ausgrid's modelled repex, we relied on trend analysis, repex modelling, bottom-up assessment, and a technical and engineering review to form our position.

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142 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 42.

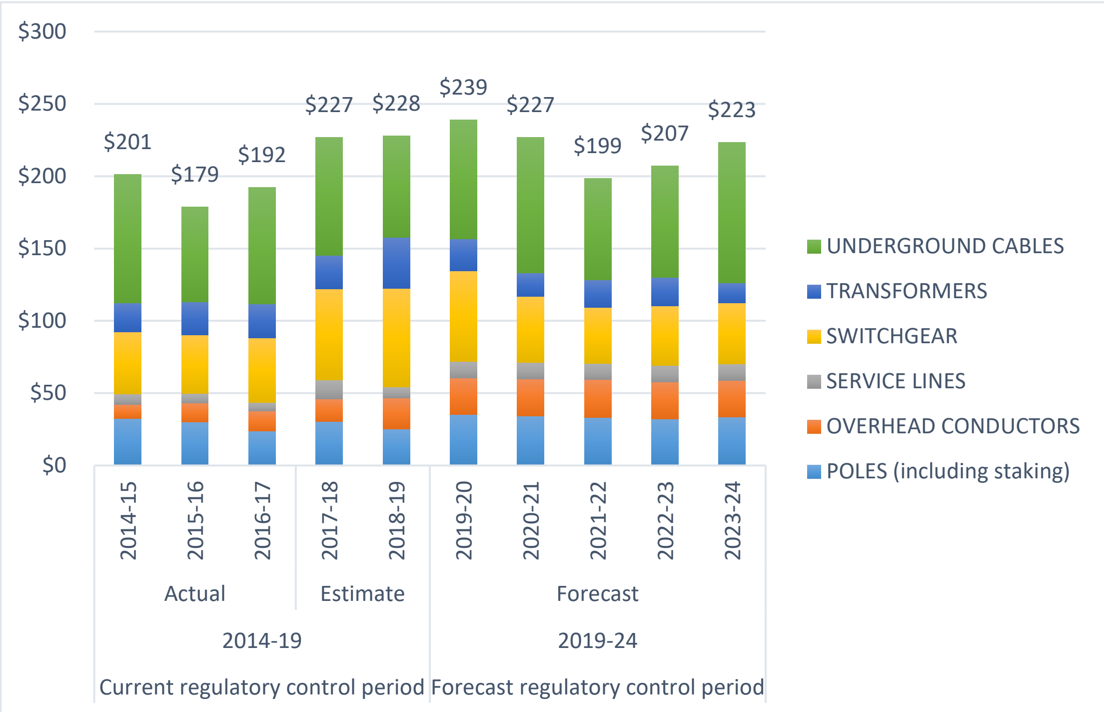
143 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 85.

144 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 85.

Trend analysis

Figure B.4.2 highlights a similar trend to the total historical and forecast repex trend outlined in figure B.4.1. Ausgrid's actual modelled repex in the first three years of the current period is moderately lower than its estimate for the last two years of the current period and the 2019–24 forecast period. Ausgrid is forecasting increases in all asset groups except service lines and transformers. Overhead conductors, switchgear, underground cables and poles were therefore key focuses of our bottom-up assessment, which is discussed below.

Figure B.4.2 Ausgrid's historical vs forecast modelled repex (by asset group) ($2018–19, million)



Source: AER analysis

Repex modelling

We are able to use our repex model to forecast replacement volumes and expenditure for the pole, overhead conductor, service line, switchgear, transformer and underground cable asset groups. We do not use the repex model for the pole top structure, SCADA and other asset groups. Appendix D provides more information regarding our repex modelling approach.

Overall, we are able to model $930 million or 56 per cent of Ausgrid's repex forecast. We applied the repex model to Ausgrid's asset categories that can be modelled and compared its repex forecast against the following four scenarios:

- historical scenario – historical unit costs and calibrated expected replacement lives
- cost scenario – comparative unit costs and calibrated expected replacement lives

- lives scenario – historical unit costs and comparative expected replacement lives
- combined scenario – comparative unit costs and comparative expected replacement lives.

Comparative unit costs are the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM. Comparative replacement lives are the maximum of a distributor's calibrated replacement life and the median replacement life across the NEM.

Previous distribution determinations where we have used the repex model have primarily focused on the 'historical scenario'. This scenario forecasts a distributor's expected repex and replacement volumes based on its historical unit costs and asset replacement practices (which are used to derive expected replacement lives).

Our refined comparative analysis repex modelling approach builds on this previous analysis and now introduces the historical performances of other distributors in the NEM into the forecast period. The 'cost, lives and combined' scenarios rely on a comparative analysis technique that compares the performance of all distributors in the NEM. The technique analyses the two variable repex model inputs – unit costs and expected asset replacement lives.

The 'cost scenario' analyses the level of repex a distributor could achieve if its historical unit costs were improved to comparative unit costs. The 'lives scenario' analyses the level of repex a distributor could achieve if its calibrated expected replacement lives were improved to comparative expected replacement lives.

Our 'repex model threshold' is defined taking these results and other relevant factors into consideration. For the 2019–24 determinations, our approach is to set the repex model threshold equal to the highest result out of the 'cost scenario' and the 'lives scenario'.[145] This approach considers the inherent interrelationship between the unit cost and expected replacement life of network assets.

For example, a distributor may have higher unit costs than other distributors for particular assets, but these assets may in turn have longer expected replacement lives. In contrast, a distributor may have lower unit costs than other distributors for particular assets, but these assets may have shorter expected replacement lives.

As noted in section 5.4, if a distributor's forecast exceeds our modelling results, we do not necessarily reject the forecast deterministically. We use our modelling results to target a more detailed bottom-up assessment. If the proposed repex is sufficiently justified and shown to be prudent and efficient, we will accept it. If sufficient justification has not been provided, we can use our modelling results to arrive at a substitute estimate.

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145 Our modelling approach means the 'historical scenario' will always be higher than the 'cost scenario' and the 'lives scenario', and the 'combined scenario' will always be lower than the 'cost scenario' and the 'lives scenario'.

We presented our new repex modelling approach, including preliminary modelling results, to Ausgrid during our capex deep dive session in Melbourne on 22 March 2018. These results used adjusted[146] mean unit costs and expected asset replacement lives for comparative analysis purposes.

In June 2018, we provided Ausgrid with updated modelling results, which incorporated updates to Ausgrid's underlying input data and minor changes to modelling assumptions. We advised that, after further research, we had adopted a median approach for our comparative analysis, rather than relying on the adjusted mean for unit costs and expected asset replacement lives. We consider that the median approach is the most effective and robust way of accounting for any outliers in the resulting data sets.

We have used this approach in our 2019–24 draft decisions for TasNetworks, Power and Water, and Evoenergy, as published in September 2018. In addition, the United Kingdom's Office of Gas and Electricity Markets (Ofgem) uses a median approach for comparison purposes.[147] More information is outlined in appendix D.

We initially did not receive any feedback from Ausgrid regarding the June 2018 modelling results. However, in late August 2018, Ausgrid sought clarification regarding the differences in modelling results between March 2018 and June 2018. We responded on 29 August 2018 to outline these key differences, which are summarised below:

- the March 2018 results were based on Ausgrid's historical category analysis RIN data, while the June 2018 results were based on Ausgrid's recast category analysis RIN data that was submitted as part of its proposal on 30 April 2018;
- the March 2018 proposal comparison data was based on a draft reset RIN that was provided during the pre-proposal stage on 7 March 2018, while the June 2018 comparison data was based on Ausgrid's formal reset RIN that was submitted on 30 April 2018;
- as noted above, the March 2018 results used an adjusted mean comparative analysis approach for unit costs and expected asset replacement lives, while the June 2018 results used a median comparative analysis approach; and
- the March 2018 results considered several asset categories[148] as modelled repex, while the June 2018 results reclassified these categories as unmodelled repex, which is also consistent with our 2019–24 draft decisions for TasNetworks, Power and Water, and Evoenergy.

[146] These adjustments removed outliers.

[147] Ofgem, *Strategy decisions for the RIIO-ED1 electricity distribution price control – tools for cost assessment,* March 2013.

[148] ‘Switchgear – other’, ‘transformers – other’ and ‘underground cables – other’.

Calibration period

In coming to our position on the years to apply for our calibration period, we reviewed Ausgrid's actual and forecast repex trend. For Ausgrid and the other two NSW distributors, Endeavour and Essential, we used the first three years of the current regulatory period (2014–15 to 2016–17) to calculate historical unit costs and to calibrate each distributor's expected asset replacement lives.

We consider that the spending pattern in the first three years of the current regulatory period is likely to be the best forecast for the 2019–24 regulatory control period. We did not rely on historical data from the previous regulatory period due to an amendment to the licence conditions for NSW distributors that came into effect on 1 July 2014.[149] This amendment removed the deterministic design planning requirements.

Throughout our engagement, Ausgrid stated that the first three years of the current regulatory period are not likely to be representative of its repex requirements over the 2019–24 regulatory control period, stating that it had reduced its repex due to the lease transaction. However, as noted above, we could not rely on historical data from the previous regulatory period due to the licence condition change, and Ausgrid's audited 2017–18 category analysis RIN will not be available until late October 2018. During our capex deep dive sessions and our ongoing engagement, we outlined to Ausgrid that our preferred approach was to use the fourth year of data from the current period when it becomes available.

In its submission, Ausgrid provided advice from Nuttall Consulting on the application of the repex model and the appropriate calibration period.[150] Nuttall Consulting stated:

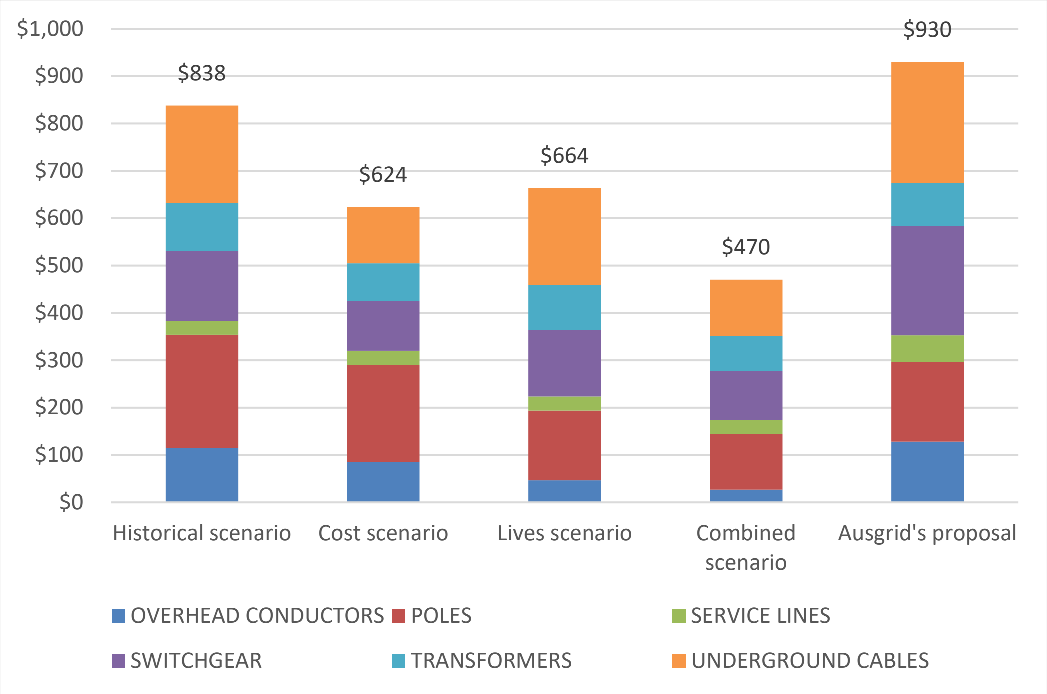
> "In Ausgrid’s circumstance, it has gone through a recent sale and repex has reduced significantly from the levels at the start of such a 5-year period. As such, I can appreciate why the AER may prefer to use a shorter 3-year period for Ausgrid – I most likely would have done the same had I been in its position."[151]

149 For more information, refer to https://www.ipart.nsw.gov.au/files/sharedassets/website/trimholdingbay/electricity_-_regulatory_instruments_-_dnsp_conditions_14_-_19_-_july_2014.pdf.

150 Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018.

151 Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 4.

Figure B.4.3 Four modelled scenarios vs Ausgrid's modelled repex forecast ($2018–19, million)



Source: AER analysis

Note: the 'historical scenario' uses historical unit costs and calibrated expected asset replacement lives, the 'cost scenario' uses comparative unit costs[152] and calibrated expected asset replacement lives the 'lives scenario' uses historical unit costs and comparative expected asset replacement lives[153] the 'combined scenario' uses comparative unit costs and comparative expected asset replacement lives

Figure B.4.3 outlines Ausgrid's proposed modelled repex compared with our four scenarios. The 'repex model threshold' is the 'lives scenario'. Ausgrid's proposal is $266 million (40 per cent) greater than the repex model threshold. Nuttall Consulting compared Ausgrid's repex forecast with repex model outcomes using previous assessment approaches. It revealed that Ausgrid's forecast was likely to be 7 per cent above a possible alternative based on the repex model.[154] However, this analysis relied on outdated analysis techniques and input information. Our results, based on more recent unit cost and asset replacement data, therefore differ significantly from the results outlined in Nuttall Consulting's advice.

Ausgrid also asked Nuttall Consulting to provide opinions on our refined repex modelling approach,[155] which is outlined in detailed in appendix D. Nuttall Consulting stated:

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152 Minimum of historical, forecast and NEM median unit costs.

153 Maximum of calibrated and NEM median expected asset replacement lives.

154 Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 3.

155 Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 3.

> "It may be appropriate to extend the calibration period to four years once the data is available. This should provide a more robust data set for calibration, and in turn, a more reliable assessment result".[156]

As noted above, we agree with this statement and outlined that this was our preferred approach to Ausgrid during our capex deep dive sessions. Ausgrid's 2017–18 category analysis RIN data will be available for use in our final decision. Nuttall Consulting also stated "I do not consider that benchmark (expected asset replacement) lives should not be used by the AER".[157] Nuttall Consulting listed several factors that are important to consider when analysing expected asset replacement lives, which we have had regard to in our assessment approach.

Figure B.4.3 highlights that Ausgrid's proposal for modelled repex is significantly higher than our results for overhead conductors, service lines, switchgear and underground cables. Ausgrid's forecast for poles is only slightly higher than our modelled results, while its forecast for transformers falls slightly below the modelled threshold. We have used these results to identify asset groups and categories to examine in greater detail, and to help inform our bottom-up assessment.

Bottom-up assessment and technical and engineering review

Our trend analysis and repex modelling results enabled us to focus on specific programs and projects in Ausgrid's modelled repex forecast and filter out others that did not raise as many concerns. For example, trend analysis indicated that transformer repex is expected to decline over the 2019–24 regulatory control period and our repex modelling results provided a threshold amount ($95 million) that was slightly above Ausgrid's proposal ($91 million). We therefore did not focus our bottom-up assessment on these assets as much as other asset groups.

For key programs and projects in other asset groups, Ausgrid had provided limited justification in its proposal. We therefore asked Ausgrid for underlying cost-benefit analysis for these programs and projects in an information request to assess whether the proposed repex was prudent and efficient. Ausgrid did not provide this analysis in its response. In addition, a subsequent information request response indicated that only 23 per cent of its repex forecast had been based on cost-benefit analysis that included risk quantification.[158] ECA also noted in its submission that "there is no cost-benefit analysis done for (safety-driven) programs or projects and the decision making appears to be quite subjective".[159] This is once again indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1.

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[156] Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 4.

[157] Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p.5.

[158] Ausgrid, *Response to information request 016, Question EMCaAUS066 repex CBA,* July 2018, p.1.

[159] Energy Consumers Australia, *Ausgrid regulatory proposal 2019–24: Submission to the AER issues paper,* August 2018, p. 20.

EMCa also noted that Ausgrid's application of the cost-benefit analysis method was limited to major projects for sub-transmission cables and 11kV and 33kV switchboard replacements.[160] We reviewed this method for one case study that Ausgrid provided, which was the Concord 11kV switchgear replacement project.[161] While we broadly commend Ausgrid's modelling approach, Ausgrid has applied conservative mean time to repair input assumptions that are significantly longer than industry average. As a result, its unserved energy and quantified benefit calculations are likely to be overstated. CCP10 made a similar observation in its submission, noting "we believe that Ausgrid is taking a relatively conservative view to the risk of plant failure leading to the interruption of supply or an immediate safety risk".[162]

In addition, Ausgrid applied a disproportionality factor of 10 in its Concord 11kV switchgear replacement project. We discuss the implications of this assumption below in table B.4.2. Overall, these assumptions bring the optimal asset replacement timing forward by between two and three years. We therefore consider that it is likely to be prudent to defer some projects in the 11kV switchgear asset category until the 2024–29 period.

There is an interrelationship between Ausgrid's repex forecast for the 11kV switchgear asset category and its opex forecast (attachment 6). Ausgrid has proposed demand management in its opex proposal to defer repex across six projects. Our opex position, which is outlined in further detail in attachment 6, is to accept three of these six demand management options. While Ausgrid did not provide information for us to base our substitute estimate on a project-based bottom-up build, we have had regard to the capex-opex interrelationship in our assessment of this asset category.

Key programs and projects in the overhead conductor, pole, service line and underground cable asset groups were not based on risk-based cost-benefit analysis. CCP10 also stated in its submission, "we believe that a risk-based approach can be reconsidered in the treatment of service lines…to the benefit of reducing the expenditure requirement".[163]

We conveyed this feedback to Ausgrid throughout our ongoing engagement. In response, Ausgrid provided cost-benefit analysis spreadsheets for six of its main repex programs in August 2018.[164] As noted above, we typically expect distributors to provide this information and supporting justification during the pre-engagement stage or when proposals are submitted. Nevertheless, we reviewed the information that was provided to us and our general findings are outlined in Table B.4.2 below.

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[160] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 34.

[161] Ausgrid, *Response to information request 016, Question EMCaAUS080 Concord case study,* June 2018.

[162] CCP10, *Response to AER issues paper and revenue proposals for NSW electricity distribution businesses 2019–24,* August 2018, p. 5.

[163] CCP10, *Response to AER issues paper and revenue proposals for NSW electricity distribution businesses 2019–24,* August 2018, p. 66.

[164] Ausgrid, *Further information related to cost-benefit analysis for replacement programs,* August 2018.

Table B.4.2 Summary of Ausgrid's August 2018 cost-benefit analysis

Parameter	Finding	Effect
Probability of failure	For several programs, Ausgrid applied a Weibull distribution function to model asset failure rates. However, these Weibull functions were not used to forecast failure rates over the forecast period and historical failure data was used instead. Ausgrid's analysis does not consider that the expected probability of failure may change over time due to changes in asset age and the effect of the proposed repex programs.	For several programs, Ausgrid's analysis is likely to overstate the probability of asset failure. This subsequently overstates the expected risk and associated benefit of the replacement program.
Probability of consequence	For several programs, Ausgrid's expected probability of consequence appears to have been based on a qualitative assessment that has not been verified against historical data. For example, the dedicated LV circuit reconfiguration program forecasts 347 asset failures over the forecast period. Using Ausgrid's probability of consequence (10%) produces 35 consequence events. Ausgrid's submission only references one historical consequence event relating to these assets.	Ausgrid's underlying input assumptions significantly overstate the probability of consequence for several programs. This subsequently overstates the expected risk and associated benefit of the replacement program.
Cost of consequence	For several programs, Ausgrid estimated the cost of consequence for safety, fire and reliability risks. Ausgrid has selected the worst possible quantified consequence, rather than considering the range of all possible consequences. For example, Ausgrid assumed the safety consequence of a pole failure would be a single fatality. This ignores other less severe safety consequences such as injuries. Ausgrid's cost of consequence assumptions are not supported by analysis or historic incident records.	Ausgrid's input assumptions significantly overstate the cost of consequence for several programs. This subsequently overstates the expected risk and associated benefit of the replacement programs.
Disproportionality factor	Ausgrid applied a disproportionality factor of 10 to the value of statistical life in each of its six cost-benefit analysis spreadsheets. This analysis is typically used where a distributor has a legislative requirement to eliminate or reduce safety risks so far as is reasonably practicable.[165] The disproportionality factor applied is at least twice as large as common industry practice.	Using a disproportionality factor of 10 significantly overstates the total cost of consequence in Ausgrid's six programs. This subsequently overstates the expected risk and associated benefit of the replacement program.

165 Safe Work Australia, *Model work health and safety bill,* March 2016, p. 14.

Parameter	Finding	Effect
Cost and benefit assessment	Ausgrid's cost-benefit analysis compared total expected annual risk for each program with the total expected annual cost. This assumes that the annual investment would totally remove the inherent risk, which is an incorrect assumption. The analysis should instead compare the annual risk reduction, which represents the program benefit, with the annualised program cost. Ausgrid's annual risk cost calculations also ignore the improvement effect from implementing the program in proceeding years.	Ausgrid's analysis significantly overstates the net benefit of each proposed repex program, as the total risks faced, rather than the annual risk reduction, are compared against total program costs.

Source: AER analysis

We acknowledge that Ausgrid attempted to demonstrate the prudency and efficiency of these six repex programs in the cost-benefit analysis spreadsheets provided in August 2018. However, based on the date of this analysis, it is clear that this analysis did not help to inform its total repex forecast in the lead up to and at the time of its proposal. In addition, while we acknowledge the need for some replacement programs during the 2019–24 regulatory control period, the analysis provided in August 2018 for the six programs does not demonstrate that Ausgrid's proposed repex for each program is prudent and efficient. We encourage Ausgrid to provide additional supporting justification for its modelled repex forecast, including revised cost-benefit analysis, in its revised proposal.

Given we only received a sample of bottom-up cost-benefit analysis spreadsheets, we are unable to form our substitute estimate of this repex component using reasonable input assumptions and more accurate modelling comparisons. In the absence of robust risk-based cost-benefit analysis, we have relied on our repex modelling results to determine our substitute estimate of modelled repex. The repex model input data we relied on is based on the historical performance of other distributors in the NEM. For asset categories where Ausgrid is forecasting high unit costs or low expected asset replacement lives, we apply the industry median result to determine what level of repex a typical distributor could achieve. Based on the available information, we are satisfied that our repex modelling results would form part of a total forecast capex that reasonably reflects the capex criteria.

132kV underground cables

Ausgrid’s proposal includes $165 million for 132kV underground cables. Ausgrid has not established that this forecast would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $93 million in our substitute estimate. Our reasons for this position are discussed below.

In previous decisions, including Ausgrid’s 2014–19 draft and final decisions, 132kV underground cables were considered modelled repex. However, our refined repex modelling approach relies on comparative analysis and no other distributors in the

NEM have these subtransmission cables. In addition, Ausgrid is forecasting a significant level of repex for this high-value low-volume asset category. We therefore undertook a detailed bottom-up review of this asset category.

To support its proposed repex for this asset category, Ausgrid submitted:

> "Subtransmission feeders comprising fluid-filled cables (FFC) operating at voltages between 33kV and 132kV have been used extensively in Ausgrid's network from the early 1960s to the mid-1980s, when this technology was superseded. They form the backbone of Sydney's Inner Metropolitan Subtransmission network and their operation is essential to provide our customers with reliable electricity supply.
>
> Over the last 20 years, increasing numbers of these cables have been affected by a fault that causes leaks to develop, allowing insulating fluid that is under pressure to escape from the cable into the surrounding environment. Such leaks pose a danger to the environment as they enter the water table, and to the integrity of the cables, which depend on the fluid to prevent a catastrophic internal flashover. Consequently, a leaking cable must be repaired.
>
> Leaking cables are also subject to oversight by the NSW Environment Protection Authority (EPA) under the Protection of the Environment Operations Act (NSW) 1997. Ausgrid has given the EPA an undertaking to reduce the environmental risk of leaking cables by at least 50% in each regulatory period and to replace all fluid cables with known leaks by 2034".[166]

In forming our position on Ausgrid's 132kV underground cable replacement proposal, we relied on a bottom-up assessment, technical and engineering review, and stakeholder submissions including from the EPA and CCP10.

Bottom-up assessment

Ausgrid's 132kV underground cable replacement program comprises 20 individual projects. Two of these projects relate to Transgrid's Powering Sydney's Future (PSF) project, where Ausgrid is proposing to decommission six cables as part of PSF. An additional three projects are already committed from the 2014–19 period and are expected to carry over into the 2019–24 regulatory control period. We therefore consider that these five projects would form part of a total capex forecast that reasonably reflects the capex criteria. Table B.4.3 provides further details of the remaining 15 132kV underground cable replacement projects.

[166] Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018, p. 9.

Table B.4.3 Ausgrid's remaining 15 132kV underground cable replacement projects ($2018–19, million)

Project number	Locations	Feeders	Proposed repex	Optimal replacement timing
1	Beaconsfield to Zetland	260/1, 261/1	$34.0*	2027/2028
2	Castle Cove to Mosman	9Y9/2, 9Y7/2, 9P7	$35.3	2018/2019
3	Beaconsfield to Campbell St & Belmore Park	9SA, 92P	$21.0	2026/2027
4	Sydney South to Revesby	282/1, 283/1	$18.5	2022/2023
5	Zetland to Clovelly	260/2, 261/2	$18.7	2025/2026
6	Bunnerong to Maroubra	265	$17.1	2025/2026
7	Beaconsfield to Millpond	91M/3	$15.0	2027/2028
8	Mason Park to Burwood	923/2, 924/2	$8.9	2023/2024
9	Beaconsfield to Green Square	9SE	$6.5	2033/2034
10	Beaconsfield to Kingsford	264	$3.1	2030/2031
11	Double Bay to Clovelly	262	$1.0	Post 2034
12	Kingsford to Maroubra	270	$0.7	Post 2034
13	Mason Park to Homebush	90A, 90L	$5.7	2018/2019
14	Mason Park to Drummoyne to Rozelle	202, 203, 204	$0.3	Post 2034
15	Beaconsfield to St Peters	91A/1, 91B/1	$0.0	–

Source: AER analysis.

Note: *Includes Zetland zone substation replacement cost

Table B.4.3 and Ausgrid's submission indicate that only four of these 15 projects (2, 4, 8 and 13) have an optimal replacement time, i.e. where the benefits of replacement exceed the costs, in the forecast period.[167] Ausgrid provided a worked case study example, including risk-based cost-benefit analysis with clear input assumptions, for project 2 in response to an information request from EMCa.[168]

Ausgrid's analysis accounted for joint asset failure probabilities and calculated the expected unserved energy based on a range of different failure scenarios. Its modelling demonstrated that the optimal replacement timing, i.e. when the total risk cost exceeded the annualised project deferral benefit, was expected to be during the

[167] Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018.

[168] Ausgrid, *Response to information request 016, Question EMCaAUS082, Case study – Willoughby to Mosman,* June 2018.

forecast period. Ausgrid's submission demonstrated that the optimal investment timing for projects 4, 8 and 13 was also during the 2019–24 regulatory control period.[169]

We commend Ausgrid for its detailed modelling of these projects and encourage it to apply a similar level of rigorous analysis to other programs and projects in its repex forecast. Overall, Ausgrid has sufficiently demonstrated that the proposed repex for projects 2, 4, 8 and 13 is prudent, and we have therefore included these four projects in our substitute estimate for this repex component.

Project 7 has been planned in conjunction with the Mascot zone substation replacement project, which is forecast to cost $18.4 million. This project has been deferred from the 2014–19 period and is expected to be further deferred to the end of the 2019–24 regulatory control period due to the application of a demand management solution.[170] The forecast repex for the Mascot zone substation replacement project primarily falls into the 'modelled repex' component.

EMCa noted “while the quantification of the availability of a demand management non-network solution is in its early stages, its inclusion by Ausgrid supports the prudency and efficiency of the proposed expenditure”.[171] Ausgrid has therefore sufficiently demonstrated that the Mascot zone substation replacement project forecast is prudent and efficient, and we have included the associated underground cable replacement project (project 7) in our substitute estimate for this repex component.

For the remaining 10 projects, Ausgrid's submission and analysis indicate that the optimal replacement timing occurs after the forecast period.[172] Table B.4.3 outlines the optimal economic replacement timing for most of these projects is in the 2024–29 period, while the optimal economic replacement timing for some projects is the 2029–34 period or later. Ausgrid has therefore not demonstrated that it is prudent to undertake these 10 projects. It submitted that the primary replacement driver for these projects is to reduce its environmental risk in accordance with its undertaking with the EPA.[173]

Ausgrid stated that in accordance with this undertaking, it is seeking to reduce the environmental risk of leaking cables by at least 50 per cent in the next regulatory period, and it has a commitment to replace all of the 132kV underground cables by 2034.[174] We acknowledge that Ausgrid's 132kV underground cables pose risks to the environment. However, throughout our ongoing engagement, Ausgrid did not provide any evidence or documentation of a specific compliance obligation that requires it to remove a certain number of these underground cables or reduce its environmental risk by a certain amount each regulatory control period. The EPA confirmed that Ausgrid is

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169 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018.

170 NER, cl. 6.5.7(e)(10).

171 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 74.

172 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018.

173 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018, p. 9.

174 Ausgrid, *Attachment 5.14.2 – Project justification for subtransmission cable replacements,* April 2018, p. 9.

not subject to a specific environmental risk reduction obligation during our discussion on 27 September[175] and then via email on 29 October[176].

In a submission, the EPA noted its "support for Ausgrid's continuation" of its environmental management strategy.[177] We consider and Ausgrid's analysis indicates that our position of including 10 out of Ausgrid's 20 proposed 132kV underground cable replacement projects in our substitute estimate will minimise a large degree of the inherent environmental risk that these cables pose and help Ausgrid to improve its environmental performance. We conveyed this position to the EPA during a meeting on 27 September 2018[178] and via email on 16 October 2018[179]. In this discussion, we acknowledged environmental risk as the replacement driver for these cables, but that the prudent replacement volume would be assessed using a risk-based cost-benefit analytical framework, consistent with our role as an economic regulator. The EPA's email from 29 October[180] confirms this discussion.

Finally, we outlined our initial position to Ausgrid during our ongoing engagement and it responded by providing updated cost-benefit analysis for five of these 10 projects.[181] The updated analysis related to the five largest projects in terms of total forecast repex for the 2019–24 regulatory control period. Ausgrid stated that the five lowest cost projects would be "reviewed for its 2024–29 submission".[182]

Ausgrid's updated cost-benefit analysis applied a disproportionality factor of 10 to the quantified environmental risk cost in its modelling.[183] This analysis increased the expected environmental risk in Ausgrid's cable failure modelling and brought the optimal investment timing into the 2019–24 regulatory control period for four of the five projects. However, this disproportionality factor analysis is typically used for safety risks, where a distributor has a legislative requirement to:

- eliminate risks to health and safety, so far as is reasonably practicable; and
- if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks so far as is reasonably practicable.[184]

Therefore, Ausgrid has not sufficiently demonstrated that it is prudent to undertake these 5 projects in the 2019–24 regulatory control period and it submitted it would review the remaining 5 projects in its 2024–29 submission.[185] CCP10 also stated “there

175 Meeting between the AER and EPA to discuss Ausgrid's 132kV underground cables, September 2018.

176 EPA, *Email to AER – Ausgrid's 2019–24 regulatory proposal,* October 2018.

177 EPA, *Replacement of fluid-filled underground transmission cables,* September 2018, p. 1.

178 Meeting between the AER and EPA to discuss Ausgrid's 132kV underground cables, September 2018.

179 AER, *Email to EPA – Ausgrid's 2019–24 regulatory proposal,* October 2018.

180 EPA, *Email to AER – Ausgrid's 2019–24 regulatory proposal,* October 2018.

181 Ausgrid, *Response to AER questions during meeting 23 August 2018,* August 2018.

182 Ausgrid, *Cost-benefit analysis (132kV subtransmission feeders),* August 2018, p. 2.

183 Ausgrid, *Response to AER questions during meeting 23 August 2018,* August 2018.

184 Safe Work Australia, *Model work health and safety bill,* March 2016, p. 14.

185 Ausgrid, *Cost-benefit analysis (132kV subtransmission feeders),* August 2018, p. 2.

are opportunities to further consider reductions in the investment in replacing fluid-filled cables".[186] Our position is consistent with this view.

Overall, the information available to us does not demonstrate that Ausgrid's proposed forecast for its 132kV underground cable program would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $93 million in our substitute estimate, which represents 10 of Ausgrid's 20 proposed projects that we consider are likely to be undertaken during the forecast period. As noted above, we are satisfied that our substitute estimate is prudent and efficient, because Ausgrid has sufficiently demonstrated that these 10 projects are likely to form part of a total capex forecast that reasonably reflects the capex criteria.

Unmodelled repex

Table B.4.1 outlines that Ausgrid has proposed $578 million in repex that cannot be modelled using our repex model. However, the proposed $578 million includes $74 million that we have recategorised into different capex drivers:

- Advanced Distribution Management System (ADMS) – $41 million proposed
    - Ausgrid has proposed the ADMS as repex, but we have assessed the ADMS as non-network capex. Our position and the reasons for this position are outlined in section B.5.
- Strategic property acquisition – $36 million proposed as repex, $33 million recategorised as augex
    - Ausgrid submitted that its strategic property acquisition was replacement-driven, but we assessed that the majority was growth-driven and has therefore been assessed as augex. Our position and the reasons are outlined in section B.2.

The remainder of this unmodelled repex analysis relates to the remaining $504 million in Ausgrid's proposal. To assess Ausgrid's unmodelled repex, we relied on trend analysis, bottom-up assessment, and technical and engineering review.

Trend analysis

Figure B.4.4 highlights that Ausgrid's actual unmodelled repex in the first four years of the current period is significantly lower than its estimate for the last year of the current period and lower than its forecast for the forecast period. In its proposal, Ausgrid has not demonstrated the need for this increased repex in its unmodelled asset categories.

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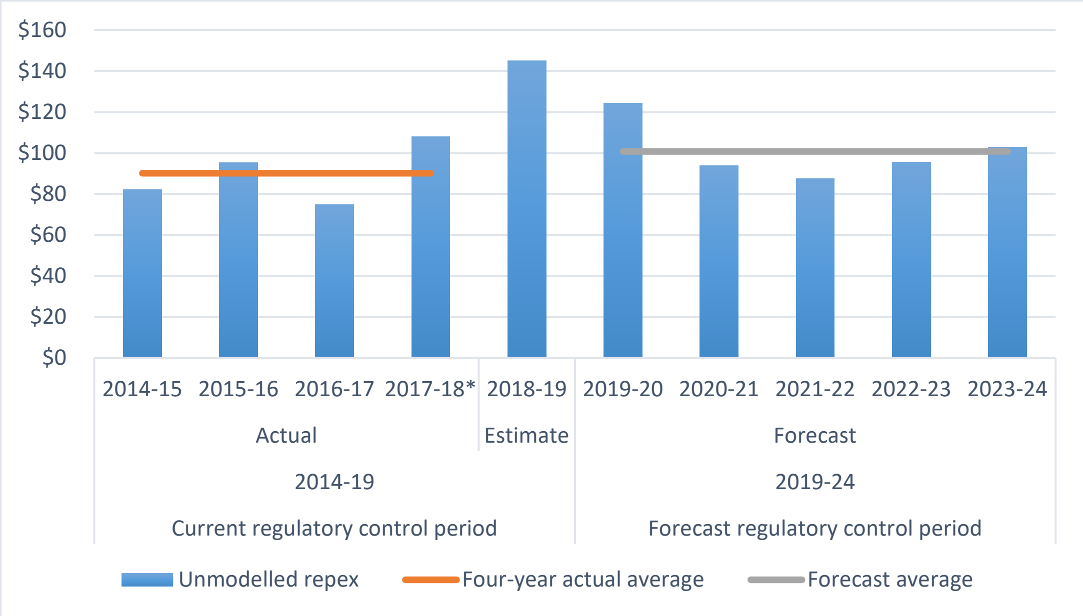
[186] CCP10, *Response to AER issues paper and revenue proposals for NSW electricity distribution businesses 2019–24,* August 2018, p. 5.

Figure B.4.4 Ausgrid's historical vs forecast unmodelled repex ($2018–19, million)



Source: AER analysis.

Note: *2017–18 based on draft actuals provided by Ausgrid

We initially considered the first three years of actual data from the current period (2014–15 to 2016–17) to assess unmodelled repex. However, throughout our ongoing engagement with Ausgrid, it indicated that these three years were not representative of its forecast requirements, primarily due to the lease transaction that occurred at the beginning of the current period. As a result, we asked Ausgrid to provide disaggregated actual data for 2017–18. The information Ausgrid provided indicated that it had broadly spent the amount it originally estimated during 2017–18.[187]

Bottom-up assessment and technical and engineering review

Ausgrid's significant forecast increase in unmodelled repex prompted us to review a sample of programs and projects from a bottom-up perspective. This analysis and EMCa's review of these unmodelled repex programs and projects are summarised in table B.4.4 below.

[187] Ausgrid, *Response to AER questions during meeting 23 August 2018,* August 2018.

Table B.4.4 Ausgrid's unmodelled repex program and project analysis ($2018–19, million)

Program/ project	EMCa's analysis	Proposed repex	Cost-benefit analysis provided
Oil containment	"In the absence of adequate risk analysis, it is not possible to conclude that Ausgrid has sufficiently explored risk mitigation options...to determine that the proposed activity is reflective of a prudent and efficient level of expenditure".[188]	$28.2	No
Tower painting and refurbishment	"We have not been provided with evidence of the condition information or condition assessments relied upon by Ausgrid in developing the proposed refurbishment forecast or the basis of its assumption that 20% of inspected towers will require full refurbishment".[189]	$16.6	No
Pole crossarms	"Information has not been provided to justify the proposed replacement volumes or forecast expenditure".[190]	$15.8	No
SCADA equipment	"Ausgrid claims that 2.9% of the SCADA equipment population is planned to be replaced each year, but it provides no analysis for how this figure was derived or whether this represents good asset management practice".[191]	$18.8	No
Modem replacement	"We consider that it is more likely than not that a proportion of this program will be deferred beyond the end of the forecast period".[192]	$18.2	No
Electromechanical and non-electromechanical relay replacement	"We are not able to find any justification for inclusion of these programs in the forecast".[193]	$85.8	No

Source: AER analysis.

188 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 84.
189 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 50.
190 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 52.
191 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 80.
192 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 80.
193 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 85.

For each of these programs and projects, Ausgrid is forecasting significant increases in repex over the forecast period. The replacement volumes are also expected to increase for several of these programs and projects. In instances where total repex is forecast to increase and total replacement volumes are forecast to remain flat or decline, such as the tower painting and refurbishment program, Ausgrid has not justified the expected increase in its unit costs. For the SCADA replacement program, CCP10 noted:

> “We also believe that a risk-based approach can be reconsidered in the treatment of…control and protection (assets) to the benefit of reducing the expenditure requirement”.[194]

Similar to several modelled programs and projects, we asked Ausgrid for the underlying cost-benefit analysis for these unmodelled programs and projects in an information request.[195] This was to ensure that the expected benefits of the program met or exceeded the expected costs. As noted above, Ausgrid did not provide this analysis in its response and a subsequent information request response indicated that only 23 per cent of its repex forecast had been based on cost-benefit analysis that included risk quantification.[196] Once again, this is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1.

Taking into account our trend analysis and bottom-up assessment and technical and engineering review, Ausgrid has not established that its unmodelled repex forecast would form part of a total capex forecast that reasonably reflects the capex criteria. In these circumstances, we have extrapolated Ausgrid's actual spend in the first four years of the current period to a five-year period (on a pro-rata basis),[197] resulting in $450 million for unmodelled repex. This is 11 per cent below Ausgrid’s proposed forecast of $504 million.

Notably, applying Ausgrid's actual spend in these circumstances is reasonable given Ausgrid's network reliability has remained fairly stable over the first three years of the current period, as highlighted below in our network health indicator assessment in figure B.4.5. Based on the information available, we are satisfied that $450 million for unmodelled repex would form part of a total forecast capex that reasonably reflects the capex criteria.

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194 CCP10, *Response to AER issues paper and revenue proposals for NSW electricity distribution businesses 2019–24,* August 2018, p. 66.

195 AER, *Information request 005, EMCaAus024,* May 2018.

196 Ausgrid, *Response to information request 016, Question EMCaAUS066 repex CBA,* July 2018, p.1.

197 NER, cl. 6.5.7(e).

Network health indicator assessment

Network health measures inform us about the overall condition of a distributor's assets that are currently in commission. When assessing a distributor's proposed repex over the forecast period, we have regard to the following network health measures to assess the network's health and whether an increase in repex is required:

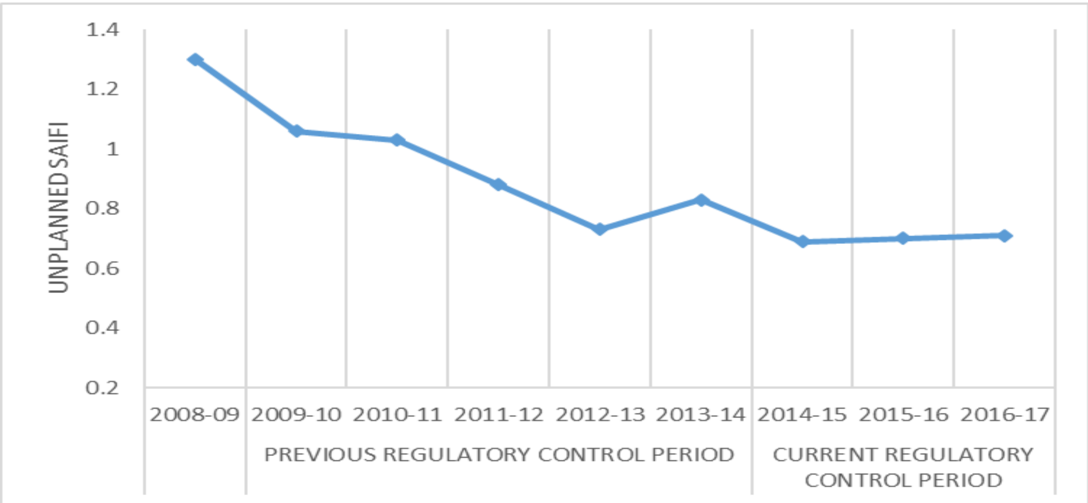
- reliability measures on Ausgrid's network;
- the age profile of assets in Ausgrid's network, and where possible, comparable networks; and
- utilisation of Ausgrid's network (where spare capacity should be correlated to asset condition), which provides an indication as to whether Ausgrid's assets are likely to deteriorate more or less than would be expected given the age of its assets.

Overall, the consistent improvement in Ausgrid's SAIFI over time indicates that its current replacement practices are providing a consistent level of reliability on its network. Compared with other distributors, the average age of Ausgrid's network assets is above the distributor-wide average. Despite this, its asset utilisation has been fairly stable between 2013–14 and 2017–18, suggesting the assets should not be degrading from high use.

Reliability trends (SAIFI)

We observe that Ausgrid's SAIFI has improved from 2008–2017. A network that is in poor health is likely to experience more interruptions, which would correlate with a higher SAIFI. The improvement seen in Figure B.4.5 suggests that Ausgrid's network is likely to be in good health.

Figure B.4.5 Ausgrid Energy whole of network unplanned SAIFI[198]



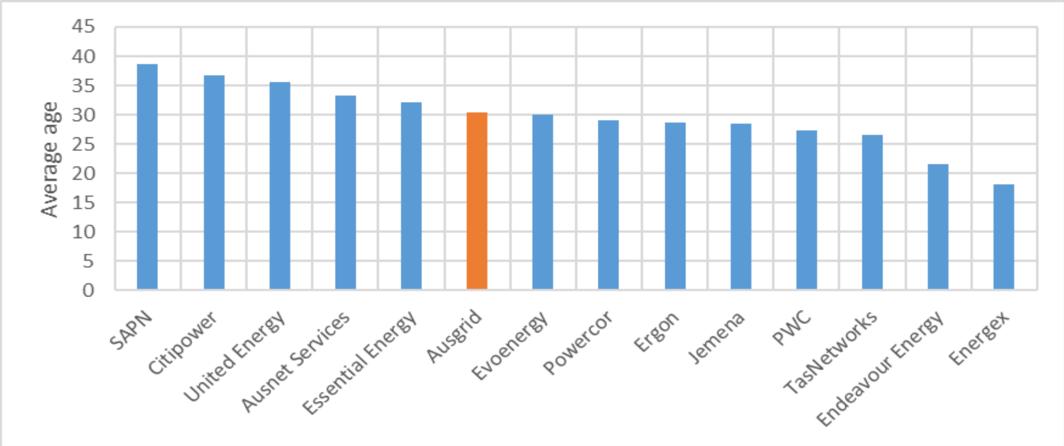
Source: Ausgrid, Economic benchmarking RIN – 3.6 Quality of service.

[198] System wide SAIFI excluding MEDs and excluded outages.

Average asset age

We considered the average age of all of Ausgrid's assets compared with other distributors in the NEM. Figure B.4.6 below outlines that compared with other distributors in the NEM, Ausgrid has a relatively old network, with an average asset age that is slightly above the industry average.

Figure B.4.6 Electricity distributor network average asset age (excluding public lighting)



Source: AER analysis, 2016–17 CA RINs – 5.2 Asset Age Profile.

Asset utilisation

We consider the degree of asset utilisation can affect the condition of certain network assets. The relationship between asset utilisation and condition can vary across asset types. The relationship between asset utilisation and condition is not necessarily a linear one and the condition of an asset may be difficult to determine. Early-life asset failures may be due to utilisation or a combination of factors.

Figure B.2.2 in section B.2 highlights that the number of zone substations that have asset utilisation above 50 per cent has been marginally stable between two comparison years of 2013–14 and 2017–18. This indicates that Ausgrid's assets have not suffered material degradation and are generally in reasonable health.

B.5 Forecast non-network capex

The proposed non-network capex for Ausgrid includes expenditure on information and communications technology (ICT), buildings and property, motor vehicles, and tools and equipment. We have also assessed Ausgrid's proposed ADMS program, which Ausgrid proposed as a repex program, under this capex category.

B.5.1 Ausgrid's proposal

Ausgrid has proposed $548 million for non-network capex for the 2019–24 regulatory control period. This is $78 million, or 17 per cent higher than total forecast non-network capex of $470 million of the current regulatory control period. The largest components of Ausgrid's forecast are ICT and innovation ($216 million, or 39 per cent) and buildings and property ($208 million, or 38 per cent).[199]

B.5.2 Position

Ausgrid has not demonstrated that its proposed $548 million ($2018–19) for non-network capex would form part of a total capex forecast that reasonably reflects the capex criteria. We have included an amount of $345 million ($2018–19) in our substitute estimate, a 37 per cent reduction to Ausgrid's forecast. Table B.5.1 summarises Ausgrid's proposal and our substitute estimate for non-network capex.

Table B.5.1 Draft decision on Ausgrid's total forecast non-network capex ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Ausgrid's proposal	112.3	110.6	113.3	113.5	98.5	548.0
Draft decision	77.9	74.5	66.8	69.9	56.3	345.4
Total adjustment	-34.4	-36.1	-46.4	-43.5	-42.1	-202.6
Total adjustment (%)	-31%	-33%	-41%	-38%	-43%	**-37%**

Source: Ausgrid, Attachment 5.01 – Ausgrid's proposed capital expenditure, April 2018; AER analysis.

Note: Numbers may not add up due to rounding.

B.5.3 Reasons for our position

We have had regard to the following information and applied several assessment techniques to assess Ausgrid's proposed non-network capex forecast, including:

- trend analysis;[200]
- consideration of stakeholder submissions;[201]
- category specific analysis of individual components of non-network expenditure;
- review of the project documentation accompanying Ausgrid's proposal;
- assessment of Ausgrid's overall expenditure forecast to assess the extent to which capital investments are offset by reductions to Ausgrid's overall expenditure proposal; and

199 Ausgrid, *Regulatory proposal – executive summary (overview paper)*, April 2018, p. 23.

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

201 We received submissions from CCP10, PIAC and ECA that made reference to Ausgrid's non-network capex forecast.

- EMCa's technical review of Ausgrid's proposal.

When weighing up all the above techniques, Ausgrid's forecast non-network capex is likely to be overstated. Trend analysis has identified that Ausgrid's forecast represents a significant increase compared with recent historical levels of expenditure. Given that Ausgrid's forecast is higher than historical expenditure for this capex category, we have assessed the need for, and timing of, the proposed expenditure, to inform our view as to whether the increase relative to past expenditure is justifiable.[202]

Ausgrid has not justified its forecast for each category of non-network expenditure. For example, there was insufficient options analysis and cost-benefit assessment accompanying the ICT/OTI and buildings and property forecasts. Stakeholders noted that there was a lack of clear explanation from Ausgrid as to the incorporation of the ex-ante benefits of the program into the overall expenditure proposal. Our review has found no evidence that this has been undertaken in developing its forecast.

In forming our position for non-network capex, we have also considered EMCa's advice. The lack of sufficient cost-benefit analysis is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1.

EMCa was engaged to provide an independent assessment of, and propose quantified adjustments to, Ausgrid's proposed ICT/OTI and buildings and property forecast if required. In coming to our position for fleet and plant capex, we have had regard to the fleet and plant capex model provided and Ausgrid's historical fleet replacement practices. Our key finding is that, among other issues, Ausgrid has not demonstrated the prudency of its proposed change in policy to replace Elevated Work Platforms (EWPs) at a 10-year life. We have therefore adjusted Ausgrid's fleet and plant capex model to reflect Ausgrid's historical replacement practices.

Our substitute estimate does not include Ausgrid's proposed $41 million for its ADMS program (proposed as repex). While we consider that the information provided demonstrates there may be a need, Ausgrid did not provide sufficient information to justify that its chosen option would form part of a total capex forecast that reasonably reflects the capex criteria. Given the absence of a base-case option considered in the analysis provided to us, we have made no allowance for this program in our substitute estimate.

B.5.3.1 Trend analysis

Trend analysis allows us to draw general observations about how a business is performing. In addition, we must have regard to the actual and expected capital expenditure during any preceding regulatory control period.[203]

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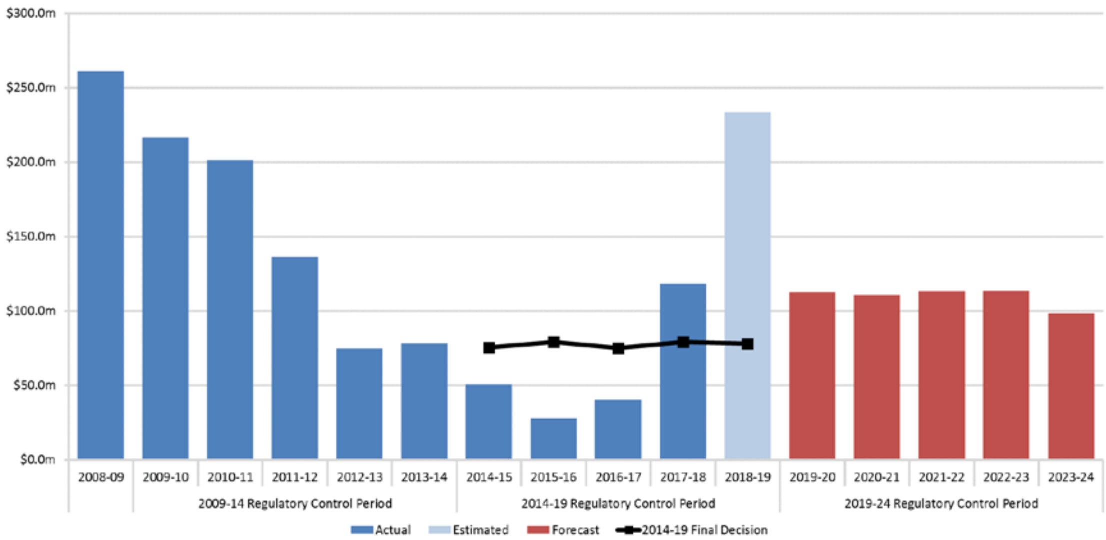
[202] NER, cl. 6.5.7(e)(5).

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

Figure B.5.1 shows Ausgrid's actual and estimated non-network capex for the period from 2008–09 to 2018–19, and proposed forecast capex for the 2019–24 regulatory control period. It also shows our final decision for capex relating to non-network expenditure for the current period. Until 2017–18, non-network capex has followed an overall decreasing trend since 2008–09. Ausgrid is forecasting non-network capex to remain relatively constant over the forecast period.

Figure B.5.1 Ausgrid's non-network capex ($2018–19, million)



Source: Ausgrid, RIN Responses; Ausgrid, Response to information request 035, 09 August 2018; AER, Final Decision Ausgrid distribution determination – Ausgrid 2015 – Capex Model; April 2015.

Ausgrid has indicated that for the purposes of trend analysis, 2014–15 to 2016–17 expenditure is not representative of its ongoing capital expenditure requirements, primarily due to the lease transaction that was finalised in 2016–17. Ausgrid has submitted that a more reasonable historical range for comparison would be average expenditure of the last three regulatory control periods (2004–05 to 2018–19). Ausgrid noted that its forecast is lower than average expenditure over this period, and considered that this reflected that Ausgrid's forecast "represents a low capex proposal".[204]

While we understand Ausgrid's circumstances in the early years of the current period, using this wider historical range does not account for relevant factors such as:

- efficiencies Ausgrid has achieved over recent years that would not be reflected in a longer historical counterfactual, e.g. the recent reductions to staff numbers and rationalisation of fleet and property that were cited as reasons for reductions to expenditure over the current period;

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[204] Ausgrid, *Time period analysis of capex*, August 2018, p. 1.

- recent changes in the regulatory requirements Ausgrid has faced over time, e.g. changes to reliability standards during the 2009–14 regulatory control period; and
- the introduction of the CESS incentive mechanism in the 2014–19 regulatory control period, which provides greater incentives for Ausgrid to pursue capex efficiencies and would not be captured in expenditure from the previous regulatory control periods.

Ausgrid's analysis includes 2018–19 estimated data for the purposes of trend analysis. Ausgrid's forecast for this year is almost 300 per cent higher than average actual non-network capex for the first four years of the current period (representing approximately 50 per cent of Ausgrid's total forecast non-network capex for the current period). EMCa expressed concerns regarding deliverability of this expenditure and considered that non-network expenditure in this year, in particular ICT, may not represent prudent and efficient costs for the purpose of trend analysis.[205] We therefore have not included 2018–19 forecast expenditure in our trend analysis.

On 6 August 2018, we requested Ausgrid provide unaudited actual non-network capex data for 2017–18 and an updated forecast for 2018–19. Ausgrid advised that with the exception of buildings and property capex, it expects that 2017–18 actual expenditure for each category of non-network capex will not be materially different from the estimates provided in April 2018.[206] We have used the unaudited 2017–18 actual figure for the purposes of trend analysis. Ausgrid submitted that the 2018–19 forecast remains unchanged.

Our analysis of longer term trends in non-network capex has identified that Ausgrid's proposal, as well as being higher than forecast current period expenditure, is:

- 74 per cent higher than average actual non-network capex of the previous five years (2013–14 to 2017–18);
- 5 per cent higher than average actual non-network capex of the previous two regulatory control periods (2009–10 to 2017–18).

We cannot conclude that trend analysis supports Ausgrid's non-network capex proposal. We have therefore undertaken a review of the information provided by Ausgrid in support of its non-network capex proposal to inform our view as to whether the increase relative to past expenditure is justifiable.[207]

B.5.3.2 Category analysis

We have undertaken trend analysis across each non-network capex category. This category analysis has been used to inform our view of whether forecast non-network

205 EMCA, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 91.

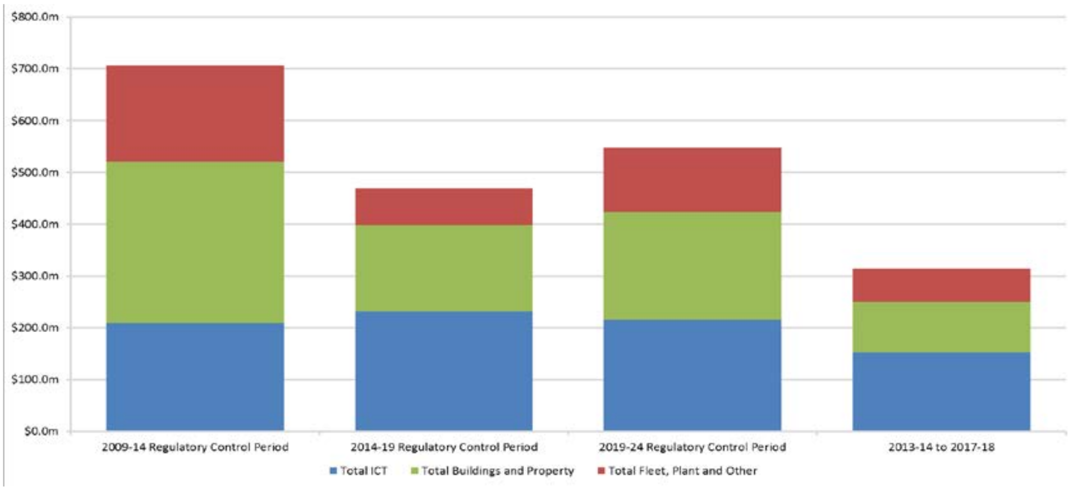
206 Ausgrid, *Response to AER information request 035*, August 2018.

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

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.[208]

Figure B.5.2 shows Ausgrid's actual/estimated and forecast non-network capex by category for each regulatory control period. Figure B.5.2 also shows total actual non-network capex for the previous five years of actual data (2013–14 to 2017–18). As shown, Ausgrid's total non-network capex forecast falls approximately between the expenditure levels of the 2009–14 and 2014–19 regulatory control periods, while it is significantly higher than actual non-network capex of the most recent five years.

Figure B.5.2 Ausgrid non-network capex by category ($2018–19, million)



Source: Ausgrid, RIN Responses; Ausgrid, Response to information request 035, August 2018.

At the category level, with the exception of ICT, Ausgrid's forecast capex is higher than current regulatory control period capex. We have also considered longer historical trends in each category of non-network capex. Ausgrid's forecast capex for each category is largely in line with average actual expenditure of the current and previous regulatory control period (2009–10 to 2017–18).

The comparison of Ausgrid's forecast to the previous five years of actual expenditure (2013–14 to 2017–18) has found that Ausgrid's forecast represents an increase across each respective category, ranging from 42 per cent (ICT) to 118 per cent (buildings and property). Given our top-down assessment of historical trends, we have conducted a review on all categories of non-network capex. Our conclusions for each category of non-network capex are summarised below.

B.5.4 Information and communications technology capex

Ausgrid has proposed capex of $216 million ($2018–19) for non-network ICT for the 2019–24 regulatory control period.[209] This comprises of $157 million for ICT and $58

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

million for Operational Technology and Innovation (OTI) projects. It is $16 million, or 7 per cent less, than total forecast ICT capex for the current regulatory control period. Ausgrid has submitted that the key drivers of its ICT capex forecast include maintaining safe, reliable and affordable customer service and business operations; security of the network; compliance with laws and obligations; and adapting Ausgrid's capabilities to improve its data driven decisions.[210]

Ausgrid provided business cases for each ICT program.[211] Ausgrid did not provide us with formal business cases for the OTI programs (network innovation, planning and technology data usage, and control system core refresh). Ausgrid did not include quantitative cost-benefit assessment for any ICT or OTI projects in its proposal. When we requested this, Ausgrid submitted "analysis has focused on the quantifiable risks as opposed to benefits."[212] This is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1. Ausgrid therefore has not shown that its proposed non-network ICT forecast was prudent and efficient.

We provided this feedback to Ausgrid throughout our ongoing engagement. In response, Ausgrid provided a risk-cost model for its cyber-security program on 13 July 2018. Ausgrid provided cost-benefit assessment for its network innovation program on 13 September 2018, which it submitted would be independently reviewed and refined and included as part of its revised submission.[213] Ausgrid also provided a submission to outline the strategy and benefits underpinning its information management and digital transformation programs on 14 September 2018.

B.5.4.1 Assessment approach

We have assessed forecast ICT capex by each sub-category of non-network ICT capex. This sub-category analysis has been used to inform our view of whether forecast non-network capex is reasonable relative to historical rates of expenditure in each sub-category, and to identify trends in the different sub-category forecasts, which may warrant further review.[214] Ausgrid has allocated its historical and forecast non-network ICT capex into the following sub-categories:[215]

- Asset replacement
    - The replacement of an existing ICT asset with its modern equivalent where the asset has reached the end of its economic life.

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209 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 98.

210 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 99.

211 Ausgrid, *Response to AER information request 013*, July 2018.

212 Ausgrid, *Response to AER information request 020*, July 2018.

213 Ausgrid, *Network innovation program summary*, September 2018, p. 2.

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

215 Ausgrid, *RIN responses – table 2.6.4*, April 2018.

- Asset remediation
    - The correction or optimisation of the performance of existing ICT assets that are not performing to the required service performance requirement.
- Asset extensions
    - The extension of existing ICT assets to broaden their functionality.
- Capability growth
    - The acquisition, development and implementation of new ICT assets to meet a business purpose or capacity requirement.

In assessing Ausgrid's proposed recurrent ICT expenditure (replacement and remediation), we placed significant weight on Ausgrid's historical expenditure trends. Applying the CESS[216] to capex places a strong incentive on distributors to pursue efficiencies in its recurrent expenditure practices. As such, a distributor's actual expenditure while subject to this mechanism is a good indicator of the efficient expenditure the distributor requires in the future. In particular, where past expenditure was sufficient to achieve the capex objectives, this can be a reasonable indicator of whether an amount of forecast capex would form part of a total capex forecast that we are satisfied reasonably reflects the capex criteria.[217]

In assessing Ausgrid's non-recurrent ICT expenditure (asset extension and capability growth), for each program we have reviewed the available individual business case assessments, benefit quantifications and NPV analysis. For programs that are efficiency-benefit driven (i.e. capex programs to improve productivity), we sought information from Ausgrid to understand how it had incorporated these benefits into their overall proposal, such that we could be satisfied that any investment would result in lower total costs. We outline this within our expenditure forecast assessment guideline:[218]

> "We expect distributors to submit regulatory proposals that include … explanations of trade-offs between capex and opex expenditure that show that the choices chosen (for example to undertake a capex IT program to reduce opex) are prudent and efficient. Firms will also need to demonstrate these choices are fully accounted for in capex and opex forecasts."

In the absence of this information, we would not consider that the requirement for the recovery of capital funding for these programs has been justified. For any prudent investment, where the benefits outweigh the costs, the distributor will recover sufficient funding through realising efficiencies (savings) and having them returned to the distributor under the incentive frameworks in place (EBSS, CESS and STPIS).[219] The

216 AER, *Capital expenditure incentive guideline*, November 2013.

217 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, pp. 7–9.

218 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 18; NER cll. 6.5.7(e)(6), (7), (8).

219 See AER, *Better regulation factsheet – expenditure incentives guideline*, November 2013.

assessment of regulatory obligation based non-recurrent expenditure is outlined within our expenditure forecast assessment guideline.[220]

B.5.4.2 AER findings

Recurrent ICT capex

Ausgrid has proposed $117 million in capex for ICT replacement and remediation for the 2019–24 regulatory control period. [221] This includes programs relating to its SAP system, end-of-life based infrastructure, application upgrades and regulatory-compliance related expenditure. Ausgrid's forecast is $76 million, or 40 per cent lower, than total forecast recurrent ICT capex for the current period.

Our trend analysis has found that there has historically been an overall decreasing trend in ICT replacement and remediation capex. This suggests that Ausgrid has become more efficient in managing its ICT portfolio over time.

Ausgrid's forecast is 10 per cent lower than average actual recurrent ICT capex of the current regulatory control period (2014–15 to 2017–18), during which Ausgrid was subject to the CESS. We also note Ausgrid's submission that "critical ICT investment decisions were delayed until after the finalisation of the NSW Government's long-term lease transaction process"[222] over this period. In our view, this suggests that Ausgrid's forecast for this category of ICT capex is reasonable in regard to historical expenditure for this category.[223]

Non-recurrent ICT capex

Ausgrid's non-recurrent ICT capex forecast of $98 million is comprised of the following programs:

- network innovation;
- adapt program (digital transformation and information management);
- planning and technology; and
- cyber-security program.

These programs appear aimed at improving services and safety and reducing cost, and are opportunities to improve service at lower cost. We appreciate that Ausgrid has identified opportunities to improve service and in particular, ways it can become more efficient and deliver service at a lower cost. We note that the NER require distributors

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220 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013, p. 10.

221 For the purpose of this analysis, we have considered expenditure relating to SAP and 'Mandatory Patches and Releases' as ICT replacement and remediation expenditures, respectively. We have also considered Ausgrid's proposed cyber-security program as ICT asset extension.

222 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 98.

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

to maintain the quality, reliability and security of supply of services.[224] Where investment is justified by efficiency improvements it would be reasonable for those investment costs to be recovered from cost savings (through the incentive framework), rather than funded by consumers. Our review of these programs found:

Insufficient economic analysis

The business cases provided revealed that Ausgrid has based its options ranking on a qualitative assessment of outcomes and not a quantitative cost-benefit assessment. Without a cost-benefit assessment, Ausgrid has not evidenced:

- that these investments represent the most economic options available;
- whether there are likely to be net benefits of this expenditure; and therefore
- whether the proposed expenditure reasonably reflects prudent and efficient costs.

It follows that Ausgrid has not demonstrated that its ICT non-network capex forecast is prudent and efficient. Similarly, EMCa found that Ausgrid "has not justified proposed expenditure that would deliver additional functionality through benefits quantification."[225]

Lack of evidence of benefit incorporation into overall forecast

Many stakeholders submitted that it was unclear how Ausgrid had incorporated any efficiencies from its ICT program into its overall expenditure forecast. We asked Ausgrid to detail how forecast benefits of its ICT capex forecast were incorporated into its overall proposal, but it provided no evidence that a complete and accurate cost-benefit analysis was undertaken in developing its forecast. In the absence of these identified trade-offs, we cannot conclude that Ausgrid's proposed forecast non-network ICT capex is prudent and efficient. As such, we consider that for projects where the forecast efficiency gain would exceed the costs, these projects would be 'self-funding'.

Program assessments

1. Network innovation program

Ausgrid states that:[226]

> "The key objective of the Network Innovation Program is to identify innovative technologies capable of providing a better core service to customers at lower cost and more safely than existing methods, or new services that our customers want but that we currently cannot deliver with our existing assets."

Ausgrid included 11 projects within this program. Ausgrid submitted that business cases for these projects are still in development.[227] Ausgrid also submitted that "by

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

225 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 108.

226 Ausgrid, *Project justifications for operating technology and innovation programs*, April 2018, p. 9.

227 Ausgrid, *Response to information request 048*, September 2018, p. 19.

their nature, the majority of these technologies are not at the level of maturity that enables accurate and detailed determination of unit costs and overall project costs at early project stages."[228] We asked Ausgrid to provide detailed cost breakdowns for each project. Ausgrid submitted that it would provide this as part of the revised proposal.[229] Ausgrid has therefore not shown that this program is prudent and efficient.

As noted above, Ausgrid did not initially provide cost-benefit assessment for these programs. On 13 September 2018, Ausgrid provided preliminary cost-benefit analysis for these programs, which would be independently reviewed and refined for its revised submission.[230] We will therefore consider this as part of Ausgrid's revised proposal.

We also note that the new material provided assumes capex and opex benefits from each program. Ausgrid has not demonstrated how it has incorporated these benefits into its forecast. As such, it is likely that aspects of this program will be able to be funded through the incentive framework, rather than by consumers. In coming to this view, we note the EMCa's findings that:[231]

> "Ausgrid has not demonstrated why its Network Innovation program should be funded by customers rather than be self-funded."

While we have not been provided with sufficient information to demonstrate the prudency and efficiency of these initiatives, it appears that some of these projects have the potential to deliver a net economic benefit. For example, the high-voltage micro-grid trial project ($17.5 million) has the potential to achieve better economic outcomes at locations where grid supply is costly and uneconomic. It may deliver net benefit to consumers in the long term, particularly in avoided network capital and operating costs. However, Ausgrid has not provided any business cases in support, including in respect of project scope, intended outcomes and anticipated benefits. Although there may be net economic benefits, Ausgrid has not established that this project would form part of a total forecast capex that reasonably reflects the capex criteria.

Ausgrid's dynamic load control program also appears reasonable. This is part of Ausgrid's ongoing effort to expand its load control capability beyond hot water systems to include other types of controllable load, and to explore more flexible and advanced load control technologies. Ausgrid is currently migrating existing load control circuitry to smart metering. We consider that load control still plays an important and effective role to reduce demand and avoid network expenditure. Given its demand management nature, we consider that this project could be funded from the demand management innovation allowance.

Ausgrid has also proposed a grid battery pilot program to assess the potential of battery storage in network support services, including trialling a novel business model called 'virtual partitions'. There have been multiple trials conducted by other parties

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[228] Ausgrid, *Project justifications for operating technology and innovation programs*, April 2018, p. 9.

[229] Ausgrid, *Response to information request 048*, September 2018, p. 19.

[230] Ausgrid, *Network innovation program summary,* September 2018, p. 2.

[231] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 96.

such as non-network service providers in this space. From a review of the information available, we consider that Ausgrid could gain insight from those trials rather than repeating it themselves.

Ausgrid has also proposed two programs related to its ADMS program (o*n-line asset condition monitoring* and a*dvanced line fault indicator trials and deployment*). Given that Ausgrid has not demonstrated the prudency and efficiency of its ADMS program (discussed in section B.5.7), we have not included these programs within our substitute estimate. We also consider that these trials would be more prudent to conduct after the ADMS has been fully implemented, which would mean undertaking these programs as part of the 2024–29 regulatory control period.

2. Adapt program

Ausgrid has identified two programs under the adapt program stream:

- Digital transformation:

> "Digitisation is changing the way organisations do business. Customers are demanding increased information and speed of processing when interacting with Ausgrid. Through a Digital Readiness program, Ausgrid would improve the way it does business internally, with the ability to automate existing manual processes and use the advances in data analytics to improve maintenance, safety, reliability, and efficiency of the distribution network."[232]

- Information management:

> "Ausgrid is on a journey of continuous improvement and is committed to deliver safe, reliable, and future ready services that represent good value for money. It has been identified that Ausgrid needs to enhance its information management in order to operate efficiently and deliver services that meet customer expectations both now and in the future."[233]

The business cases for these programs identified various benefits, including reducing operational overheads,[234] increasing productivity[235] and improving safety and customer experience. However, these were not modelled quantitatively. On 14 September 2018, Ausgrid provided further information about this program. Ausgrid submitted that the adapt program would enable Ausgrid to sustain the efficiency savings achieved by its transformation program:[236]

> "In the current regulatory period, Ausgrid removed $100 million in base year operating expenses to pass the benefits to customers. This was achieved at such speed that it did not allow the business to adapt its processes. Without adapting our processes this operating cost reduction is unsustainable in the long term. The productivity benefits anticipated from the delivery of the Adapt program will help ensure a sustained reduction."

232 Ausgrid, *Digital transformation business case*, June 2018, p. 3.

233 Ausgrid, *Information management business case*, June 2018, p. 3.

234 Ausgrid, *Information management business case*, June 2018, p. 15.

235 Ausgrid, *Digital transformation business case*, June 2018, p. 15.

236 Ausgrid, *ICT adapt program summary*, September 2018, p. 1.

This statement appears to be inconsistent with Ausgrid's submission in its regulatory proposal that its transformation program will enable sustainable reductions in opex while ensuring it continues to deliver safe and reliable electricity services:[237]

> "Phase 1 of the transformation program was launched in 2015 and focused on laying the foundations for our future success. This was achieved through a series of initiatives to 'right-size' our workforce and increase efficiency and productivity in the field, in order to deliver sustainable reductions in our cost base without compromising safety or reliability.
>
> We introduced phase 2 of our transformation program in 2017 to drive further efficiency and operational effectiveness and to help us meet the AER's opex forecast in order to provide a stable and sound cost base for the future. We implemented additional transformation initiatives to further reduce the size of our workforce, improve the efficiency of our capital investments, improve labour productivity, increase blended delivery, drive efficient network support costs, and streamline back-office operations. We also negotiated a new competitive enterprise agreement, implemented a new management structure and invested in our key capabilities to ensure that the significant cost reductions we have achieved are sustainably embedded within our cost base moving forward.'"

Ausgrid also submitted that various ICT opex increases were estimated for the forthcoming period, but these have not been included in its opex submission due to the productivity benefits that would be delivered by the adapt program. However, Ausgrid provided no evidence in support of these claims. As such, Ausgrid has not shown that these programs will deliver net economic benefit to consumers or that Ausgrid's overall non-network capex forecast is prudent and efficient.

3. Planning and technology usage

Ausgrid has included two projects within this category and has submitted that the objective is to "drive enhancements of asset data and systems to safely and effectively optimise usage of network assets".[238]

In relation to the network digitisation project, Ausgrid has been collecting asset spatial data of its overhead network since 2012. This project would continue to collect spatial and image data of network assets using LiDAR and photography technologies. Ausgrid intends to capture significantly more asset data of its overhead network. Ausgrid anticipated that the project would "increase capital delivery efficiency by understanding exact configuration of assets and improving risk prioritisation methods for effective capital delivery."[239] Collecting and using spatial data has the potential to deliver operational efficiency in some parts of the network, and may lead to better investment decisions. However, this would also incur additional ongoing data collection and maintenance costs.

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[237] Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p.122.

[238] Ausgrid, *Project justifications for operating technology and innovation programs*, April 2018, p 17.

[239] Ausgrid, *Project justifications for operating technology and innovation programs*, April 2018, p 18.

However, this project is not a trial of new technology, but a continuation of the use of existing technologies over the past six years. We would have expected Ausgrid to have conducted a cost-benefit assessment of the proposed expenditure and prepared a business case, which it has not.[240] As such, Ausgrid has not justified that proposed expenditure for this project would form part of a total forecast capex that reasonably reflects the capex criteria.

We also consider that a portion of investment cost would likely be self-funded from opex savings that it would generate.[241] For example, data collected from LiDAR would be used to identify high-risk assets so that corrective actions can be taken in with priority. This would reduce both risks of asset failure, and damages and cost as a result of asset failure.

Ausgrid has also proposed to invest in a web-based system to provide information on electric vehicle (EV) and embedded generation connection for the connection for the competitive market. While we consider it is likely to benefit the market and increase the uptake of distributed energy resources (DER) at a low cost, Ausgrid has provided no supporting information to demonstrate the benefit.

4. Cyber-security program

Ausgrid proposes to invest in a three-year cyber-security program, for which it has identified that two years fall in the 2019–24 regulatory control period. Ausgrid has commenced this program as part of the current period (commenced in 2018). Ausgrid has submitted that historically it has invested approximately 1 per cent of its technology budget on cyber security, but referenced KPMG benchmark data that found most companies spend approximately 4–6 per cent of their budget on ICT and physical security.

This program resulted from Ausgrid engaging Ernst and Young (EY) to complete a cyber-security strategy for Ausgrid in August 2017. The report presented Ausgrid's current level of cyber control maturity against C2M2 Control Maturity Framework.[242] EY presented a three-year program with a road map for individual outcomes to reach an identified desired state.[243] EY provided cost forecasts for this program, which Ausgrid has proposed for the 2019–24 regulatory control period. EMCa noted:[244]

> "While we do not doubt the need to maintain and enhance cyber security levels, we would have expected to see Ausgrid describe the outcomes it will see as a result of its cyber security investment."

Ausgrid provided us with their 'cyber-risk model' that outlined the 34 cyber-attack scenarios outlined by EY. We found Ausgrid's model is likely to have overstated the risks because it assumed the worst consequences for risk events. However, we share

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240 Ausgrid, *Project justifications for operating technology and innovation programs*, April 2018, p 18.

241 NER, cll. 6.5.7(e)(6), (7).

242 EY, *IREMCaAUS035 – Cyber Strategy Report*, August 2018, p. 20.

243 Ausgrid, *Response to information request 020 – Ausgrid memo – Cyber risk model*, July 2018.

244 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure*, September 2018, p. 94.

the EMCa's views that we acknowledge the importance of Ausgrid ensuring the safety of its network[245] and consider that Ausgrid has presented a need to improve its cyber security.

Considering the information before us, we consider that Ausgrid's proposed program is prudent and efficient. In coming to this view, we also note that Ausgrid engaged Hakluyt Cyber, an independent strategic intelligence and advisory firm, to review EY's recommended program. We note Hakluyt provided advice that concurred with EY's threat assessment and provided five recommendations, finding the program to be "sound overall".[246] We also note that Ausgrid has consulted with the Federal Government.[247]

B.5.4.3 Conclusion

Ausgrid has not shown its proposed forecast of $216 million for non-network ICT capex would form part of a total forecast capex that reasonably reflects the capex criteria. Instead, we consider $137 million would form part of a total forecast capex that reasonably reflects the capex criteria and have included this amount in our substitute estimate. In coming to this position we have had regard to the capex factors set out in the NER,[248] and more specifically:

Ausgrid's historical ICT expenditure trends

We have compared Ausgrid's forecast recurrent ICT capex to current period expenditure. We note that over this period, Ausgrid operated under the CESS mechanism. Importantly, given that Ausgrid has been subject to the CESS, it has had an incentive to minimise capex over the current regulatory control period. This gives us some confidence that Ausgrid's actual recurrent ICT capex in the 2014–19 regulatory period may be appropriate in determining our substitute estimate. We have found that Ausgrid's forecast is lower than current period actual expenditure for this category. We have included Ausgrid's forecast for this category of non-network ICT capex within our substitute estimate.

Individual project assessment

With the exception of the cyber-security program, Ausgrid has not justified that its proposed increases to ICT functionality are prudent and efficient. We have therefore not included programs these within our substitute estimate. We note that through our engagement with Ausgrid, it is aware of the issues with its proposal and will provide further information as part of its revised proposal.

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245 NER, cl. 6.5.7(a)(4).

246 Hakluyt, *Response to EMCaAus036, Hakluyt review of cyber-security strategy – Confidential,* October 2017.

247 Ausgrid, *Response to EMCaAUS037, Federal Government acknowledgement of cyber strategy – Confidential,* November 2017.

248 NER, cl. 6.5.7(e).

Technical review provided by EMCa

We have also considered EMCa's views, who stated:[249]

> "We consider that Ausgrid's ICT/OTI capex forecast is significantly above the level that a prudent and efficient distributor would require."

EMCa considered that based on their assessment, a forecast of prudent and efficient non-network ICT capex represents a reduction to Ausgrid's forecast in the range of 25 to 35 per cent.[250] This supports our view that an estimate of the prudent and efficient non-network ICT capex that Ausgrid requires for the 2019–24 regulatory control period is significantly lower than Ausgrid's proposal.

Our substitute estimate is close to EMCa's recommended range for non-network ICT capex. We consider that based on the significance of the issues identified with Ausgrid's proposal, in particular the absence of evidence of benefit incorporation into its overall expenditure proposal, we have included $137 million for non-network ICT capex within our substitute estimate of total forecast capex.

B.5.5 Buildings and property capex

Ausgrid has proposed capex of $208 million ($2018–19) for buildings and property. Ausgrid's proposal is $42 million, or 25 per cent higher, than total actual/estimated buildings and property capex of the current period.

Ausgrid submitted:

> "Capex is required for the consolidation and renewal of depots, and development of offices and specialist supply sites in the right locations that assist in reducing response times in the event of an outage or emergency. The portfolio is ageing with a number of properties not meeting mandatory compliance or environmental requirements."[251]

Ausgrid's forecast is comprised of eight components:

- A general depot refurbishment and 'future workplace' program;
- Completion of its Zetland depot replacement project;
- Four depot replacement projects (Wallsend, Homebush, Hornsby and Oatley); and
- Wallsend office building replacement.

Ausgrid provided a business case for each project and net present cost (NPC) analysis for three programs, but did not provide benefit quantification for any project. When we requested this quantification, Ausgrid submitted that it was not feasible to conduct quantitative assessment of the operational benefits.[252] Ausgrid therefore had not

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[249] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure*, September 2018, p. 97

[250] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure*, September 2018, p. 97.

[251] Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 101.

[252] Ausgrid, *Response to information request 021*, July 2018, p. 7.

adequately demonstrated that its proposed non-network buildings and property forecast was prudent and efficient.

We provided this feedback to Ausgrid throughout our ongoing engagement. On 10 September 2018, Ausgrid provided us with further information concerning the scope, timing and cost of its proposed non-network buildings and property program. Ausgrid submitted that it engaged JLL Consultancy (JLL) to undertake an independent assessment of its proposed buildings and property program. Based on this work, Ausgrid has submitted it is has reduced its proposal for the 2019–24 regulatory control period from $208.4 million to $205.8 million.

Ausgrid submitted that this analysis supports the redevelopment options originally selected for each major project, but changes have been made to the assumed timing and cost for the major project.[253] Accompanying this were feasibility analysis reports undertaken by JLL for each project. Ausgrid also provided NPC analysis spreadsheets for the five major programs.[254] We outline our assessment of this new information below in section B.5.5.3.

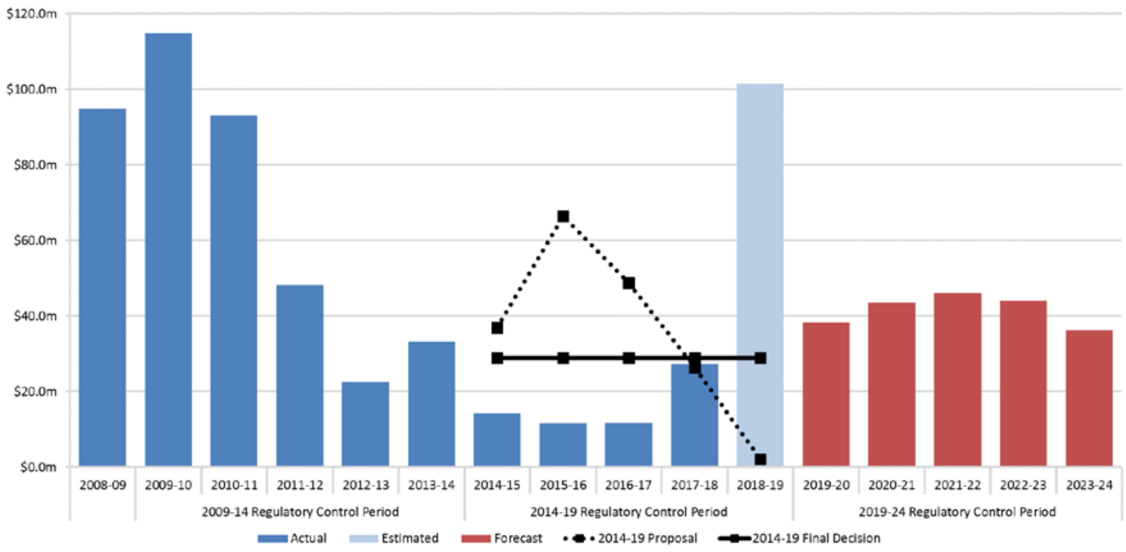
B.5.5.1 Trend analysis

Figure B.5.3 shows Ausgrid's forecast buildings and property capex for each year of the 2019–24 regulatory control period. It also shows Ausgrid's actual and estimated buildings and property capex from 2008–09 to 2018–19, as well as Ausgrid's proposed and allowed buildings and property capex for the 2014–19 regulatory control period.

[253] Ausgrid, *FY20–24 property capex summary,* September 2018, p. 1.

[254] Ausgrid, *Response to information request,* September 2018.

Figure B.5.3 Ausgrid's total actual/estimated and forecast buildings and property capex ($2018–19, million)



Source: Ausgrid, RIN responses; AER, Draft decision distribution determination – Ausgrid 2014 – Consolidated capex forecast, November 2014; AER, Final decision distribution determination – Ausgrid 2015 – capex model; April 2015.

Figure B.5.3 indicates that Ausgrid has significantly reduced buildings and property capex from 2008–09 to 2011–12 levels. Over the subsequent six years (2012–13 to 2017–18), Ausgrid has incurred on average $20 million per year on buildings and property capex. Ausgrid has submitted that this reflects a "period of rationalisation, with limited capital expenditure and the disposal of a number of sites."[255]

As shown, Ausgrid is forecasting an uplift in buildings and property capex over the following six years with forecasts, on average, 157 per cent higher than actual buildings and property expenditure of the previous six years. Ausgrid has submitted this reflects the clearing of some of the backlog of projects and to refurbish key depots to ensure safe and efficient operations in the long term.[256]

B.5.5.2 AER findings

History of project deferrals

As shown in figure B.5.3, Ausgrid has significantly underspent relative to proposed and allowed capex over the first four years of the current period. In determining our final decision for the current period, we concluded that "based on an observed historical pattern of project deferrals and re-scoping, we consider it likely that a proportion of projects proposed by Ausgrid for the 2014–19 period will again be re-scoped, deferred

[255] Ausgrid, *FY20–24 property capex summary,* September 2018, p. 2.

[256] Ausgrid, *FY20–24 property capex summary,* September 2018, p. 2.

or not completed within the period."[257] We subsequently made a 20 per cent reduction to account for observed 12–15 month delays in the schedule of major projects.

We asked Ausgrid to detail the status of the projects included within the proposal for the 2014–19 regulatory control period. Ausgrid submitted that only two of these projects have been completed and a further three were temporarily deferred (due for completion by 2018–19).[258] Ausgrid submitted that it has fully deferred three projects (Homebush, Oatley and Wallsend) into the forthcoming period[259] and that the Zetland depot (Alexandria) is underway for completion in 2019–20.

Ausgrid has therefore demonstrated over the previous two regulatory control periods that it can (and does) defer buildings and property programs. Based on this historical pattern, it is likely that over the forthcoming period, projects will be further re-scoped, deferred or not completed within the period. Our view is also informed by the fact that Ausgrid has not provided evidence to justify that it must complete these projects within the next regulatory control period, or it is economically optimal to do so. This will likely result in Ausgrid spending less than forecast. EMCa also notes that:[260]

> "It seems more likely than not that Ausgrid will find opportunities and reasons to defer or perhaps stage some of what it has proposed during the next RCP. On balance, therefore, we would expect deferrals and reconsiderations at subsequent Gates of its IGF, to result in Ausgrid spending less than it has currently forecast."

Insufficient options analysis and cost-benefit assessment

We have reviewed the supporting documentation initially provided for each project. The options analysis and cost-benefit assessment outlined within the business cases provided is insufficient. In its options assessment for each project, Ausgrid described benefits such as operating cost reductions, improvements to safety and compliance benefits. However, Ausgrid assessed these on a binary scale (either 1 or 5). Ausgrid also only provided least-cost analysis (cost only assessment) for three of its projects, and did not quantify the claimed benefits.

Ausgrid's options analysis for each project scope was essentially "all or nothing". We would consider that between a full rebuild and 'do nothing' options, there is a range of options to address individual risks identified in Ausgrid's analysis. These options could potentially be lesser in scope and cost relatively less. However, there is no evidence that Ausgrid has considered these options. For example, Homebush's main risks are fire safety, air conditioning, electrical system, lighting, disable access, cracks in walls. Ausgrid did not present and assess options to address these individual risks. We would consider that it is necessary and beneficial, as these projects enter that planning stage, that these lower cost options would be identified and assessed. As such, we consider

[257] AER, *Final decision Ausgrid determination – Attachment 6 – Capital expenditure*, April 2015, pp. 6-85.

[258] Ausgrid, *Response to information request 021*, July 2018.

[259] Ausgrid, *Attachment 5.20 – Non-network property plan 2019–24*, April 2018, p. 13.

[260] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure*, September 2018, p. 108.

there are likely opportunities for Ausgrid to lower its buildings and property capex forecast through the identification of these lower cost options.

Conversely, we were not provided with any evidence that the timing of these projects was optimised or such that major action at these sites are necessary. For example, we were not provided with evidence that the reduction of ongoing maintenance costs or safety risk were driving these projects. Temporary deferral was also not considered as an option within the analysis. If Ausgrid were to consider these options in its analysis, from review of the information available, we consider it would be likely that Ausgrid would be able to identify projects it can prudently defer. In coming to this view, we also note EMCa's view that:[261]

> "Ausgrid has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified through rigorous options analysis."

We also asked Ausgrid for further clarification regarding projects that it deferred from the current regulatory period. For example, Ausgrid's response in regards to Homebush was that:[262]

> "Deferred due to business priority transformation initiatives, staff reductions and a current strategy review of accommodation needs. Project now essential due to end of life, hazardous materials, accommodation and storage deficiency issues."

However, with the exception of Building Code of Australia reports, Ausgrid provided no evidence in support of these claims or evidence of the severity of these issues. Ausgrid has stated for the Homebush upgrade that it needs to accommodate additional staff moved from other depots. However, Ausgrid did not provide an estimate of shortage of staff accommodation.

Ausgrid also submitted that it is currently undertaking a 'project refresh' to rectify already identified compliance and safety issues across its portfolio as a consequence of the BCA audit.[263] It would therefore appear that the current safety and compliance issues may not be sufficient or relevant to the need to undertake the major projects identified for the regulatory submission.

As well as safety and compliance improvements, Ausgrid cited efficiency benefits arising from its buildings and property program, such as:[264]

- increased proximity of depots to key Ausgrid assets and customers, enabling faster response times in the event of outages and emergencies;

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[261] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure*, September 2018, p. 122.

[262] Ausgrid, *Response to information request 021,* July 2018.

[263] Ausgrid, *Response to information request 037*, August 2018, p. 2.

[264] Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 103.

- co-location of offices and depots to bring staff together, enabling greater information sharing between staff, and more collaboration and innovation within the organisation; and
- improved staff morale and wellbeing, leading to productivity increases.

However, Ausgrid submitted that these have not been modelled financially, submitting that it was not feasible to conduct quantitative assessment of the operational benefits.[265] However, we consider that these benefits can be quantified. For example, faster response to an outage event would reduce outage duration and subsequently unserved energy. In cost-benefit assessment provided by Ausgrid for other projects, Ausgrid was able to quantify this benefit.

Stakeholders (CCP10 and PIAC) encouraged us to review Ausgrid's forecast in the context of reduced staff numbers and the previous investment in property. Over the current period, staff numbers reduced (cited as a reason for deferral of property projects) and Ausgrid closed nine depots and upgraded ten existing depots.[266] Ausgrid is also currently undertaking four major projects for completion by either 2018–19 of 2019–20. We would therefore consider that any efficiency improvement achieved as part of current period buildings and property expenditure would also be included as part of the proposal for the forthcoming period. EMCa noted that from the reductions in the number and age of Ausgrid's buildings over the forthcoming regulatory control period, it would expect to see a reduction in forecast opex reflecting reduced maintenance expenses.[267]

We note that Ausgrid is forecasting buildings and property opex to increase over the forthcoming period (from $51 million ($2018–19) in 2016–17 to $67 million in 2023–24). This would appear to be inconsistent with Ausgrid's strategy of property rationalisation. We therefore cannot conclude that an assumed trade-off between buildings and property capex/opex is incorporated into Ausgrid’s forecast.[268] As such, Ausgrid has not demonstrated that it has proposed an efficient expenditure forecast.

Relevantly, we have concerns with the economic justification provided for the general refurbishment and future workplace programs. In relation to the general depot refurbishment program, EMCa noted that:[269]

> "Ausgrid has not justified the General Depot Refurb forecast expenditure of $12.5m. With the significant investment in new depots and office buildings planned, we would have expected this cost to reduce in the next RCP compared to the current RCP. Ausgrid’s business case for General Depot Refurb has not demonstrated a process to spend this money efficiently, including through the prioritisation of rectification works."

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265 Ausgrid, *Response to information request 021,* July 2018.

266 Ausgrid, *Attachment 5.20 – Non-network property plan 2019–24*, April 2018, p. 10.

267 EMCA, *Review of aspects of Ausgrid’s forecast capital expenditure,* September 2018, p. 103.

268 NER, cl.6.5.7(e)(7).

269 EMCa, *Review of aspects of Ausgrid’s forecast capital expenditure,* September 2018, pp. 106–7.

We also note that the specific purpose of the future workplace is to "support the cultural transformation by providing a collaborative work environment that sponsors productivity, growth and creativity". [270] Ausgrid has not undertaken this program historically. Given that this is a new program, we would have expected that Ausgrid's analysis would identify the forecast deliverables of this program. Ausgrid has not provided any detail of the efficiency outcomes that it expects to deliver from the program. Ausgrid has therefore not demonstrated that the program forms part of a capex forecast that reasonably reflects the capex criteria.

B.5.5.3 New information

On 10 September 2018, Ausgrid provided further information concerning the scope, timing and cost of Ausgrid's proposed non-network buildings and property program. Ausgrid maintained its initial proposal for the future workplace and general depot refurbishment program as well as its Zetland depot upgrade. Ausgrid provided feasibility analysis reports undertaken by JLL for each project. Ausgrid also provided NPV analysis spreadsheets for the five major programs.[271] For the reasons we outline below, we do not consider that this new information supports Ausgrid's proposal.

Insufficient options analysis

The JLL reports provided generally focused on two options:

- build/rebuild now; and
- defer the rebuild by five years.

For the Hornsby depot project, it also assessed an option to build at an alternative site. For the Wallsend office project, it compared continuing operation in the current facility against building at an alternative site.

The JLL reports did not provide any options analysis, but rather only assessed full-scale rebuild options. It has not explored other options such as targeted refurbishment options to address specific risks and inefficiencies. Ausgrid's option analysis therefore remains inadequate.

Lack of cost-benefit assessment

We have reviewed the NPC analysis provided. These models only take into account capital work costs and operational costs. The JLL models show that the two options generally produce near identical NPC. If building depreciation costs are included, then project deferrals appear to have better NPC results. This suggests that Ausgrid has not established clear merit why these projects need to be implemented in the forecast regulatory control period.

270 Ausgrid, *Non-network property strategy plan*, April 2018, p. 22.

271 Ausgrid*, Response to information request,* September 2018.

Neither Ausgrid nor JLL have conducted benefit quantification. As a result, Ausgrid has not demonstrated that its preferred solutions would deliver the best economic outcomes. For example, Ausgrid stated that the Homebush depot project would reduce travel times to and from projects, among other benefits. However, none of these benefits were quantified to demonstrate that the preferred solutions are the best options. We consider that without benefit quantification, Ausgrid has not demonstrated that its preferred options and timing would deliver the best economic outcomes for consumers.

Ausgrid has also not provided any information to demonstrate that the assumptions adopted in its analysis are reasonable. For example, Ausgrid's analysis assumes that 'ongoing capital works costs' in the years before planned construction would double by deferring the project by five years. Ausgrid submitted that:[272]

> "The 50% assumption provided by JLL, being an estimate only, acknowledges the likely scenario that less ongoing capital works will be undertaken in the years prior to a construction of a new facility."

Ausgrid provided no information in support of this assumption. If this assumption was removed for all projects, deferral by five years would be the highest NPC option. As such, Ausgrid has not demonstrated the realism of the results of the NPC analysis.

We also note that an assumption adopted within the NPC calculations provided would be that opex costs would halve upon the completion of each project. No supporting information was provided in support of this assumption. Ausgrid has not submitted a revised opex forecast reflecting this. Ausgrid submitted that it "does not intend to resubmit our total forecast opex for standard control services or any component of that forecast, including building and property."[273] We therefore consider that Ausgrid has not accounted for efficiencies within its overall expenditure forecast.[274]

<u>Insufficient justification for timing of proposed buildings and property expenditure</u>

Ausgrid submitted that it revised the timing of each major project “to allow sufficient time for planning and council development application approvals.”[275] We appreciate Ausgrid responding to our concerns and identifying that it could, at least temporarily, delay projects. However, Ausgrid has not this new schedule is prudent and efficient. Table B.5.2 shows Ausgrid's initial and adjusted forecast for buildings and property capex.

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272 Ausgrid, *Response to information request 048*, September 2018, p. 13.

273 Ausgrid, *Response to information request 047*, September 2018, p. 1.

274 NER, cl. 6.5.7(e)(7).

275 Ausgrid*, FY20–24 property capex summary*, September 2018, p. 1.

Table B.5.2 Adjusted buildings and property forecast ($2018–19, million)

	2019–20	2020–21	2021–22	2022–23	2023–24	Total
Initial proposal	38.3	43.6	46.2	44.1	36.2	208.4
Adjusted forecast	19.4	3.0	54.9	88.8	39.8	205.8
Difference	-18.9	-40.6	+8.7	+44.7	+3.6	-2.6

Source: Ausgrid, RIN responses; Ausgrid, FY20–24 Property capex summary, September 2018, p. 1; AER analysis.

Note: Numbers may not add up due to rounding.

As shown in table B.5.2, Ausgrid is still forecasting to complete the entire program within the forecast regulatory control period, but in a shorter timeframe. For example, the Homebush depot upgrade project has been compressed from a four-year to a two-year schedule. We consider that Ausgrid's need in property and accommodation is a function of ongoing business operations. It is unlikely that the optimal timings of all major projects would align with regulatory reset periods.

We also note that shortening the construction time of these projects would likely increase deliverability risks and would likely result in further project deferrals. We would consider that when all five major property projects were implemented in parallel, it would put unusually high strain on Ausgrid's internal project delivery capability. We conclude that, based on the information available, it would appear that Ausgrid's adjusted proposal is intentionally back-loaded and is unlikely to be achieved in practice.

Ausgrid was able to identify that it could defer these projects at least temporarily, at no added cost. However, Ausgrid provided no further information as to why this new timing is now optimal. It would appear from the information provided that the timeframe was not chosen through economic analysis but rather, Ausgrid is justifying its chosen timing by comparing it to a five-year deferral.

ECA submitted that it considered it was not apparent that Ausgrid's proposal could not be spread over two regulatory periods and made specific comment on the Homebush depot upgrade project.[276] Based on the information available, we consider that it is still likely that Ausgrid will be able to identify ways to prudently lower its forecast for the forthcoming period. For example, the NPC analysis provided for the Homebush depot upgrade project found that the higher NPC option is to defer by five years. We note that Ausgrid is forecasting to undertake this project over the final two years of the regulatory period. Given that essentially a two-year deferral would enable Ausgrid to

276 Energy Consumers Australia, *Ausgrid regulatory proposal 2019–24: Submission to the AER issues paper,* August 2018, p. 15.

defer this project into the following regulatory control period, this presents Ausgrid an opportunity to prudently lower its forecast through the deferral of this project.

Ausgrid also provided no evidence that this revised buildings and property project had been subject to the investment governance framework (IGF) process.[277] As such, we do not consider Ausgrid has addressed the EMCa's concerns that Ausgrid had not taken into account the likely deferral and re-scoping of projects once the project is subject to the IGF process.

B.5.5.4 Conclusion

Ausgrid has not demonstrated that its total forecast buildings and property capex forecast would form part of a total forecast capex that reasonably reflects the capex criteria. While Ausgrid has not provided sufficient justification for each buildings and property project, we agree with EMCa that:[278]

> "Given the age and condition of Ausgrid's non-network buildings, we consider it is likely that Ausgrid will proceed with some building upgrades and replacements in the next RCP."

In determining our substitute estimate of non-network buildings and property capex, we have not sought to determine which of the proposed projects Ausgrid should pursue in the 2019–24 regulatory control period. Our substitute estimate is based on the advice we have received from EMCa. EMCa has considered a forecast of prudent and efficient buildings and property capex represents a reduction between 15 and 35 per cent to Ausgrid's proposal.

Given the lack of sufficient options analysis and cost-benefit assessment accompanying Ausgrid's proposal, we have reduced Ausgrid's proposed buildings and property capex forecast by 35 per cent. We consider this reduction is warranted given the extent of our findings. We consider that it is likely that, consistent with past practice, Ausgrid will be able to spend lower than forecast through re-scoping, deferring or not completing the projects included within the proposal.

Ausgrid has also submitted that the proposed buildings and property program is expected to deliver significant reductions in operating costs through operating efficiencies. However, Ausgrid failed to provide evidence that Ausgrid has factored in these likely savings into its overall forecast. We consider that capex of $135 million for non-network buildings and property is sufficient for Ausgrid to continue to invest in a range of prudent construction, refurbishment and maintenance projects.

B.5.6 Fleet, plant and other capex

Ausgrid has proposed capex of $124 million ($2018–19) with respect to this category. Ausgrid submitted that this expenditure comprises of $94 million for fleet and $30

[277] Ausgrid, *Response to information request 048*, September 2018, p. 10.

[278] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 107.

million for plant.[279] Ausgrid's proposal is $53 million, or 74 per cent higher, than total actual/estimated fleet and plant capex during the current period.

Ausgrid has submitted that at the beginning of the 2014–19 regulatory control period, its fleet was larger than required, and focused on reducing fleet to improve fleet utilisation following the reduction in the capex program.[280] Ausgrid has submitted that the focus of its fleet capex forecast is replacement to reduce opex and optimise life cycle costs.[281] Ausgrid has submitted that it forecast its fleet and plant by estimating age-based retirements of existing assets and these were then adjusted for changes in maximum acceptable asset ages and refurbishment plans.[282]

We asked Ausgrid to provide its fleet and plant capex model to outline the methodology and input assumptions Ausgrid undertook in forecasting its fleet and plant capex requirements for the forthcoming period. [283] This was provided on 9 July 2018.

B.5.6.1 AER findings

Reconciliation of fleet model to proposed expenditure

Ausgrid's fleet and plant capex model reported a total expenditure forecast of $98.5 million ($2018–19), less than the $124 million identified in the regulatory proposal. We asked Ausgrid to clarify whether the fleet and plant capex model provided by Ausgrid represented the complete forecast or if this forecast excluded plant expenditure. Ausgrid submitted that the model relates to total fleet and "fleet-related plant".[284] Ausgrid submitted that the remaining $25.4 million relates to 'minor asset' expenditure (plant/equipment/tools), which was forecast by rolling forward its current spend on minor plant and tools.[285]

Ausgrid's historical RIN data indicates that forecast capex for plant capex has increased in the order of 300 per cent of the entire spend during the 2014–19 regulatory control period. EMCa also stated:[286]

> "Ausgrid’s forecast for Plant capex has nearly tripled compared to the current RCP, increasing from $10.5m to $30m. Ausgrid has not provided justification for this increase."

We asked Ausgrid to provide a detailed bottom-up forecast model for this expenditure and asked for clarification regarding historical expenditure for 'minor assets'.[287] Ausgrid has not yet responded to this request for information. Ausgrid has therefore not shown

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279 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 104.

280 Ausgrid, *Regulatory proposal 2019–2024,* April 2018, p. 104.

281 Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure*, April 2018, p. 60.

282 Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure*, April 2018, p. 62.

283 AER, *Information request 018*, June 2018.

284 AER, *Information request 018 further questions,* July 2018.

285 Ausgrid, *Response to information request 018*, August 2018.

286 EMCa, *Review of aspects of Ausgrid’s forecast capital expenditure,* September 2018, p. 103.

287 AER, *AER information request*, August 2018.

that its proposal for $25.4 million for minor asset capex would form part of a total capex forecast that would satisfy the capex criteria.

Unit cost escalation

Ausgrid submitted that its historical replacement and refurbishment costs (in nominal terms) were used to develop its forecast of $98.5 million for fleet and fleet related plant. Ausgrid submitted that:[288]

> "This is given that these costs have been arrived at by procuring vehicles and plant equipment from vendors which operate in contestable markets. They have therefore been calculated using a market based mechanism, in which the efficient unit cost of a vehicle is revealed by competitive tension between vendors."

To account for movements in vehicle and plant costs from year-to-year, Ausgrid applied a 15 per cent escalation factor to average historical acquisition costs for fleet assets. This escalation factor was applied uniformly across all fleet classes to adjust for movements in the price of these assets since the date of their acquisition. Ausgrid submitted that it applied a uniform value across all types of vehicle and plant equipment to simplify its forecasting approach.[289]

In response to concerns we raised regarding this approach, Ausgrid provided a resubmitted fleet and plant capex model on 29 August 2018,[290] which adopted an updated escalation approach "which differ depending on historical movements in the price of each fleet class "[291]. Ausgrid submitted that with respect to its original proposal, "we accept that our modelling could have adopted a more granular method of escalation."[292] Ausgrid submitted that these updated escalators were based on a dataset provided by a fleet market intelligence firm, Glass Advisory. Ausgrid also provided replacement costs obtained from SG Fleet.

Ausgrid submitted that this updated approach produced a lower fleet and plant capex forecast than the initial forecast of $98.5 million. Using Ausgrid's updated escalation approach, Ausgrid arrived at a revised forecast of $93.6 million ($2018–19) for fleet and fleet-related plant. Ausgrid submitted that it did not consider that this was grounds to adjust its forecast, as its initial forecast was a lower forecast than if it used data from SG Fleet. Ausgrid concluded that it considered that the application of a uniform 15 per cent escalation was reasonable on this basis. Ausgrid provided no information as to why the use of the provided revised escalation approach was not reasonable.

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288 Ausgrid, *Response to information request*, September 2018, p. 1.

289 Ausgrid, *Response to information request 018*, July 2018, p. 1.

290 Ausgrid, *Additional information on Ausgrid's fleet model*, August 2018.

291 Ausgrid, *Response to information request*, September 2018, p. 2.

292 Ausgrid, *Response to information request*, September 2018, p. 8.

Assumed replacement and rebuild assumption

Ausgrid provided several spreadsheets that modelled fleet forecast expenditure data. In part, the data about Ausgrid's internal fleet management system provided detailed insight at a vehicle level of date of purchase, refurbishment, date of disposal and numerous other characteristics of individual fleet components. Over 90 per cent of the data related to vehicles and plant acquired and/or disposed between January 2000 and November 2017.

Clear patterns of use, rebuild and disposal were established across the different vehicle categories based on historical Ausgrid practices. When compared with the forecast capital expenditure model, differences between forecast replacement assumptions and actual practice emerged for elevated work platforms (EWPs) and heavy commercial vehicles (HCVs). For example, it was observed historically that Ausgrid would often extend the life of EWPs to 15 years, through the choice to refurbish at 10 years. Ausgrid's forecast assumed that EWPs and HCVs would be replaced after 10-year lives.

We sought clarification from Ausgrid concerning this assumption. Ausgrid responded that its forecast reflects analysis it undertook to show that a replacement age of 10 years is optimal for a EWP for the 2019–24 regulatory control period.[293] Ausgrid submitted that:[294]

> "Our current policy is to replace EWPs at 15 years. In developing our 2019–24 proposal, we investigated whether we should maintain that policy. The initial drivers of this investigation were qualitative in nature – in particular, the safety, technology, and environmental benefits which would be realised by shortening our EWP asset refresh.
>
> Our investigation, though initially driven by qualitative factors, resolved to only move to a shorter replacement cycle if it was supported by economic analysis. We provided this analysis in 'Ausgrid – EWP lifecycle cost – NPV analysis – 20180829 – Public'. It shows that a 10 year lifespan in the 2019–24 regulatory period delivers the lowest lifecycle costs. In our view, this analysis provides a strong economic basis on which to change our policy."

We reviewed Ausgrid's analysis. Ausgrid's conclusion that a 10-year life cycle yields lower costs was based on an incorrectly truncated assessment period. Ausgrid's analysis shows the NPC of EWP replacement at 15 years is lower than a 10-year replacement cycle over a 30-year period. As such, Ausgrid has not adequately demonstrated the prudency and efficiency of this change in policy. We also note that Ausgrid submitted that "this does not mean that all EWPs will be deterministically replaced after this assumed asset life."[295] Furthermore, Ausgrid submitted that it:

> "has processes in place to optimise decisions to either replace or refurbish EWPs. These processes underpin Ausgrid's approach to ensuring we can

[293] Ausgrid, *FY20–24 fleet expenditure summary*, September 2018, p. 3.

[294] Ausgrid, *Response to information request*, September 2018, p. 5.

[295] Ausgrid, *FY20–24 fleet expenditure summary*, September 2018, p. 3

deliver safe, efficient and cost effective fleet management outcomes to both our customers and our field workers."[296]

Our review has found that Ausgrid has not adequately accounted for the savings from the likely extension of EWP and HCV life beyond 10 years. We consider it is likely that, as Ausgrid has demonstrated in the past, that it will and does extend the life of EWPs and HCVs beyond the 10-year life. We therefore consider that it is therefore likely that Ausgrid will spend less than forecast as a result. This view is also supported by EMCa, who found that Ausgrid:[297]

- "has not factored into its forecast the likely savings and investment deferrals due to Ausgrid's practice of fleet life extension based on the condition, reliability, and operating costs of each individual vehicle, including EWPs;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process."

B.5.6.2 Conclusion

Ausgrid has not justified that its forecast of $124 million for fleet and plant capex would form part of a total forecast capex that reasonably reflects the capex criteria. We have included $73 million ($2018–19) for fleet and plant capex, which is 41 per cent less than its proposal. This substitute estimate reflects the following:

- the revised unit rates provided by Ausgrid that account for individual variation in prices across vehicles;
- historical rates of the refurbishment and replacement of EWPs and HCVs; and
- we have made no allocation for 'minor asset' expenditure in the absence of information in regards to historical expenditure for this aspect of Ausgrid's forecast.

We consider that this reduction is warranted given the materiality of our findings. Similarly, EMCa found that Ausgrid:[298]

> "has not factored reduced fleet requirements into its forecast due to further staff reductions delivered by Ausgrid's transformation program."

This was a concern raised in the submissions received from PIAC.[299] We consider this supports our view that a prudent and efficient forecast of fleet and plant capex should be lower than Ausgrid's forecast.

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296 Ausgrid, *FY20–24 fleet expenditure summary*, September 2018, p. 3.

297 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 103.

298 EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018, p. 101.

299 Public Interest Advocacy Centre, *Submission in response to the NSW DNSPs 2019–24 regulatory proposals and AER issues paper – Attachment B,* August 2018, p. 10.

B.5.7 ADMS

Ausgrid has proposed $41 million for the 2019–24 regulatory control period to upgrade its Distribution Network Management System (DNMS) to a modern-day Advanced Distribution Management System (ADMS). Ausgrid provided a draft business case for this program on 6 July 2018 and published a Final Project Assessment Report for this project on 13 July 2018[300] with plans to commence the program in the final year of the current regulatory control period (2018–19). The majority ($25 million) of the $41 million proposal is forecast for the first year of the 2019–24 regulatory control period.

Ausgrid submitted it has been operating on a DNMS platform since the 1990s. It was a bespoke vendor/Ausgrid hybrid, which it expected to become a widely used industry product. However, it remains the only user of the system. Ausgrid stated that some major weaknesses have emerged in vendor support, functionality, safety and Outage Management System (OMS) integration. Ausgrid noted that the vendor (CGI) has advised that current support arrangements will expire in 2020, but there is possibility for extension of the contract until 2022.[301]

Ausgrid submitted that the ADMS business case provided was prepared before entering into an initial solution design phase with the preferred vendor. Ausgrid is currently revising its final pre-contract business case following a series of initial solution design workshops with the vendor. This business case will reflect new timeliness and associated activities to those in the business case we have been provided and will be available for Ausgrid's revised proposal.[302]

EMCa undertook a technical review of the preliminary business case and found:[303]

- Ausgrid's approach appears to be consistent with the industry;
- Ausgrid did not present evidence of having specifically assessed the justification for the 'advanced' modules or whether it had considered providing such capabilities on a staged basis; and
- the decision to defer the implementation of any ADMS modules would likely not have a material impact on ADMS capex for the 2019–24 regulatory control period.

After reviewing the information provided, we consider that Ausgrid has identified a need, but we have concerns with the economic justification provided in support of this investment. ECA's submission considered that the justification for this project was "an unsatisfactory qualitative assessment of three options."[304] This is indicative of the concerns that EMCa raised throughout its detailed review of Ausgrid's governance

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300 Refer to “Modernising Ausgrid’s Operational Control System”, https://www.Ausgrid.com.au/Industry/Regulation/Network-planning/Regulatory-investment-test-projects

301 Ausgrid, *Draft technology plan business case – DNMS and SCADA replacement*, June 2018, p. 9.

302 Ausgrid, *Response to information request 043*, September 2018, p. 1.

303 EMCa, *Review of aspects of Ausgrid’s forecast capital expenditure*, September 2018, p. 94.

304 Energy Consumers Australia, *Ausgrid regulatory proposal 2019–24: Submission to the AER issues paper,* August 2018, p. 15.

framework, risk management processes and expenditure forecasting methodologies, which are discussed in detail in sections 5.4 and B.1.

We raised concerns that Ausgrid did not define and assess its base case option in the business case. In Ausgrid's response, it stated that has considered 'do nothing' and contemporising DNMS options.[305] This is despite its business case not addressing a 'do nothing' option.

Ausgrid also stated that it cannot defer the ADMS because DNMS is reaching a hard capacity limit, citing it cannot add new monitoring devices into this system. We asked for evidence of this claim. Ausgrid presented a CGI report that identified the incidences observed with the current system. CGI recommended a solution to address major issues identified by modifying the database schema. Ausgrid dismissed this solution stating that:[306]

> "Making non-traceable code changes is not consistent with licence condition requirements to manage cyber security threats, and Ausgrid's past experience is that making changes to the system increases the instability of the system which is inconsistent with the Licence Condition requirement for delivering SCADA capability required to safely and reliably operate the NSW distribution system."

Ausgrid did not explain how software code changes would violate its licence conditions and did not provide any evidence to support this argument. Ausgrid did not raise system capacity limit issue in its business case, and the primary factor for its ADMS timing was the anticipated DNMS vendor support contract ending date.

EMCa noted that Ausgrid had not provided evidence of having specifically assessed the justification for the 'advanced' modules or whether it had considered providing such capabilities on a staged basis. Ausgrid has not provided mapping between the proposed ADMS functions and its business needs to demonstrate whether it would meet or exceed its business needs. It has not identified the costs to deliver functions for meeting individual needs. It has not identified nor quantified benefit of the individual ADMS components either. Therefore, we do not have adequate information to assess whether Ausgrid's proposed expenditure on advanced models is prudent and efficient.

Ausgrid provided a project input cost breakdown.[307] We consider that cost-benefit analysis requires that Ausgrid assess the individual cost components against the benefits that the component would deliver such that the optimal scope of investment can be determined. For example, an assessment of the cost for implementing 'switching management' package against operational benefit from this package would inform Ausgrid on the net benefit of having this component. Ausgrid has not made connection between cost of components and benefits of those cost components. Therefore, it is unclear if the scope of ADMS is economically optimal.

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305 Ausgrid, *Response to information request 043*, September 2018.

306 Ausgrid, *Response to information request 048*, September 2018, p. 18.

307 Ausgrid, *Response to information request 048*, September 2018, p. 18.

We also have concerns with the NPV of the investment presented within the business case. Ausgrid stated that DNMS and other supporting control system suite of applications are mission critical to Ausgrid, and the proposed ADMS is the lowest NVP option. We consider that this is not a justification for a negative (-$58m) NPV outcome. This shows either ADMS expenditure is not good value for consumers, or Ausgrid has not adequately assessed the benefit and cost.

Based on the information provided, Ausgrid has failed to demonstrate that the forecast capex for the ADMS project would form part of a capex proposal that reasonably reflects the prudent and efficient costs of achieving the capex objectives.[308]

Our substitute estimate of total forecast capex included within our draft decision for the 2019–24 regulatory control period does not include capex associated with this program. In the absence of a 'do nothing' option considered in the business case, we are unable to form a substitute estimate of capex required to maintain the system over the forthcoming period. Ausgrid has indicated that it will provide updated information for this program as part of its revised proposal.

B.6 Forecast capitalised overheads

Overhead costs are business support costs not directly incurred in producing output, or costs that are shared across the business and cannot be attributed to a particular business activity or cost centre. The allocation of overheads is determined by the Australian Accounting Standards and the distributor's cost allocation methodology (CAM).

B.6.1 Ausgrid's proposal

Ausgrid forecast $621.3 million ($2018–19) for capitalised overheads for 2019–24. This is $70.6 million, or 10 per cent, lower than its expected expenditure in 2014–19 of $691.9 million in the 2014–19 regulatory control period.[309]

Ausgrid explained that the decrease in forecast capitalised overheads is the result of improved productivity under its Transformation Program:[310]

> "Decreases across operating and capital expenditure programs reduced the total cost pool of our network, resulting in lower indirect support costs allocated to capital."

Ausgrid's forecast capitalised overheads include:

- Indirect capital program support costs, which are indirect overhead costs that are allocated to capex in accordance with Ausgrid's CAM.

308 NER, cl. 6.5.7(c).

309 Ausgrid, *Regulatory information notices and response to information request 032,* April 2018.

310 Ausgrid, Attachment 5.01 – Ausgrid's proposed capital expenditure, April 2018, p. 64.

- o Ausgrid forecast $498 million for indirect capital program support in 2019–24.
- Direct network planning costs, which are overhead costs that directly relate to network planning for the capital program.
  - o Ausgrid forecast $122 million for direct network planning in 2019–24.

B.6.2 Position

Ausgrid has not established that its proposed capitalised overheads forecast of $621.3 million would form part of a total capex forecast that reasonably reflects the capex criteria. We have included $577.1 million ($2018–19) for capitalised overheads, which is $44.1 million (7 per cent) lower than Ausgrid's forecast, in our substitute estimate. This includes an adjustment to reflect the lower support requirements of direct capex for our substitute estimate.

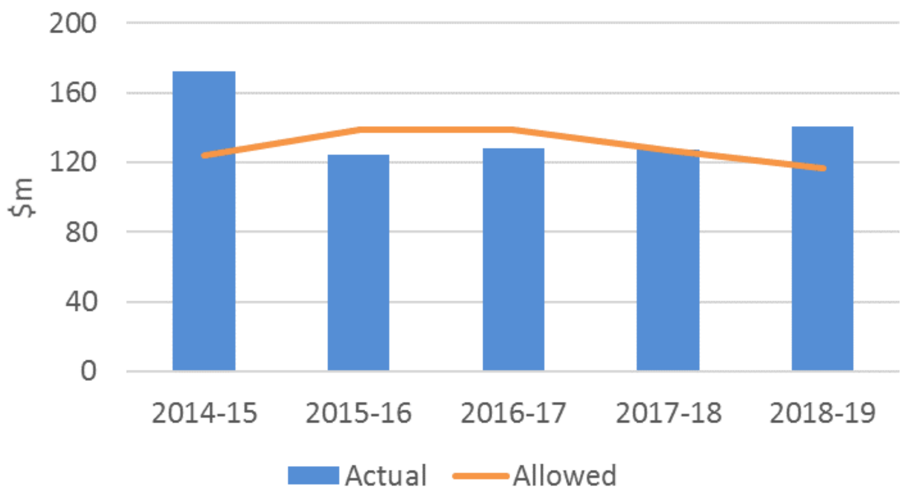
B.6.3 Reasons for our position

In coming to our position, we have assessed Ausgrid’s methodology, historical costs and trends, and total overheads across Ausgrid’s opex and capex functions.

Capitalised overheads in 2014–19

Figure B.6.1 compares Ausgrid's 2014–19 actual/estimated capitalised overheads with our allowance. Ausgrid estimates capitalised overheads of $691.9 million in 2014–19, 7 per cent higher than our allowance of $645.0 million ($2018–19). The increase in capitalised overheads in 2017–18 and 2018–19 reflect higher direct capex compared with the previous two years. Increases in direct capex as a proportion of total direct costs attract a higher share of indirect overheads, in accordance with Ausgrid’s CAM.

Figure B.6.1 Annual capitalised overheads, actual expenditure compared with allowance, 2014–19 ($2018–19, million)

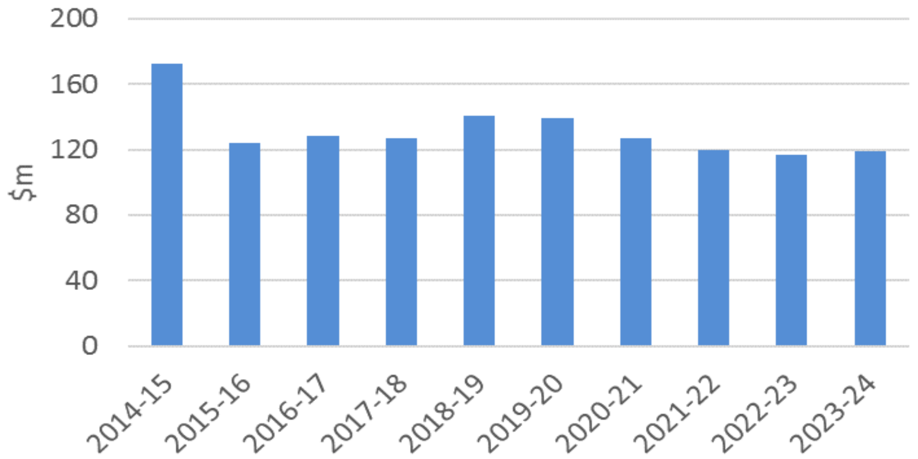


Source: Ausgrid and AER.

Forecast capitalised overheads compared with current period

Figure B.6.2 compares Ausgrid's 2019–24 forecast capitalised overheads with actual/estimated expenditure in 2014–19. Capitalised overheads are forecast to decrease each year over the 2019–24 regulatory control period. This reflects the forecast decrease in direct capex over the same period. Capitalised overheads are forecast to be 10 per cent lower in 2019–24 compared with the current regulatory control period, while direct capex is forecast to be only 1 per cent lower.

Figure B.6.2 Annual capitalised overheads, 2014–15 to 2023–24 ($2018–19, million)



Source: Ausgrid.

Our assessment of forecast capitalised overheads

To estimate its forecast for capitalised overheads Ausgrid calculates:

- indirect capital program support costs, which are indirect overheads that are allocated to capex in accordance with Ausgrid's CAM; and
- direct network planning costs, which relate only to the capex program.

Assessment of indirect capital program support costs

Indirect capital program support costs (capital support) are costs related to functions and services that support capital programs, but which cannot be directly attributed to a specific capital project. They encompass network divisional management and business support functions, certain corporate support functions, fleet, logistics and procurement and ICT. Ausgrid's CAM defines capitalised overheads as a multiple of direct labour costs.[311]

[311] Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure, April 2018,* pp. 65–66.

Ausgrid forecast capital support at a rate of 63.5 per cent of forecast direct capex labour (overhead rate) for each year of the 2019–24 regulatory control period. This overhead rate is derived from the proportion of capital support to direct capex labour estimated to be incurred in 2017–18. This percentage was calculated using the 2017–18 budget and further confirmed to still align with this assumption using actuals to December 2017.[312]

Ausgrid submitted that capital support has reduced as a proportion of direct capex labour over the previous and current regulatory control period. It submits that in the 2009–14 regulatory control period, the proportion was on average 74 per cent. The proportion has decreased over the current regulatory control period as a result of efficiencies achieved under Ausgrid's Transformation Program.[313]

We consider that this approach is reasonable, because Ausgrid has forecast its capital support with reference to the historical relationship between overheads and capex labour costs. Furthermore, Ausgrid has selected an overhead rate that is historically low and so represents a relative peak in labour efficiency for Ausgrid for the last two regulatory periods. While the overhead rate for 2017–18 ostensibly reflects the productivity improvements achieved under its Transformation Program, we had some concerns that by carrying this overhead rate forward, Ausgrid has not embedded ongoing improvements to productivity into its forecast. We expressed our concerns to Ausgrid and it responded that:[314]

> "Since 2012 we have transitioned our business to a more sustainable level through an ambitious program of transformation designed to 'right-size' our workforce and improve our efficiency.
>
> We introduced phase 2 of our transformation program in 2017 and implemented additional transformation initiatives to further reduce the size of our workforce, improve the efficiency of our capital investments, improve labour productivity, increase blended delivery, drive efficient network support costs, and streamline back-office operations. We also negotiated a new competitive enterprise agreement, implemented a new management structure and invested in our key capabilities to ensure that the significant cost reductions we have achieved are sustainably embedded within our cost base moving forward. We believe the 64 per cent reflects this sustainable level with respect to capitalised overheads.
>
> In addition, we have already embedded an average 5% labour productivity factor in our proposed direct capex labour. As the majority of the overheads are driven by direct capex labour, the productivity factor is also inherent in the capitalised overheads forecast within the total capital program."

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312 Ausgrid, *Response to information request 012,* June 2018.

313 Ausgrid, *Attachment 5.01 – Ausgrid's proposed capital expenditure, April 2018,* p. 64.

314 Ausgrid, *Response to information request 012,* June 2018.

Further, we consider that:

- using direct labour as the non-causal allocator for allocating indirect overheads to capex is consistent with Ausgrid's CAM;
- Ausgrid's forecast for direct labour includes a productivity component, which is therefore reflected in the forecast for capital support; and
- Ausgrid's forecast decrease in capital support of 16 per cent compares favourably with its forecast decrease of only 1 per cent in direct capex.

For these reasons, we are satisfied that Ausgrid's forecasting methodology results in a prudent and efficient estimate of capital support for 2019–24.

Assessment of direct network planning costs

Direct network planning costs (network planning) relate to activities that support the development of Ausgrid's capital investment programs and major projects, seeking related planning approvals and implementing Ausgrid's capital governance processes.

Ausgrid's 2019–24 forecast for network planning includes:

- direct costs: direct labour and non-labour costs of $76.2 million; and
- indirect costs: network planning overheads of $45.9 million.

Ausgrid's forecast for network planning of $122.1 million is 24 per cent higher than its expected expenditure in 2014–19. The increase is due to considerably higher network planning overheads compared with the current regulatory control period.

Ausgrid submitted that forecast network planning is materially the same as actual/estimated costs for the 2014–19 regulatory control period.[315] However, while this is correct for direct costs, indirect costs are forecast to be 112 per cent higher than for the 2019–24 regulatory control period.

We asked Ausgrid to explain why this component is forecast to increase. It submitted that:[316]

> "Although Network Planning itself is an overhead cost, its direct labour component also attracts 63.5% overhead allocation. This is the basis of the $46m.
>
> The application of a universal 63.5% overhead adjustment in our forecast for 2019–24 is reflective of the efficient level of indirect costs which we will require to support the safe and reliable delivery of all network and non-network services.

315 Ausgrid, *Response to information request 012,* June 2018.

316 Ausgrid, *Response to information request 032,* August 2018.

> This, however, does not mean that our actual reported capitalised overheads for every function of our business will be equal to 63.5%. Some functions may attract higher overheads while others will attract a smaller allocation. For this reason, our actual reported overheads for Network Planning, at $27 million, is lower than the universal 63.5% adjustment applied in our 2019–24 proposal."

Ausgrid further submitted "…it would be inappropriate to apply a different percentage adjustment to an isolated business function such as network planning. Such a change would undermine the integrity of our overall overhead forecast…"[317] However, we remain concerned with Ausgrid's forecast for indirect network planning costs, and that the forecast increase in network planning reflects a possible misapplication of Ausgrid's forecasting methodology and not any real expectation of higher indirect costs in the 2019–24 regulatory control period.

We sought further information from Ausgrid to support its forecast. Ausgrid explained that when calculating the overhead rate of 63.5 per cent to forecast program support, this included indirect network planning costs. Ausgrid submitted that:[318]

> "…we recognise that this makes the comparison between historic and forecast network planning costs problematic, given the historic results are based on a capitalised overhead outcome for the network planning function specifically, whereas the forecast utilises an average capitalised overhead percentage for the entire capital program, including the network planning function as a subset."

However, further information provided by Ausgrid on 20 September 2018 demonstrated that if network planning is excluded, the overhead rate used to calculate capital support would increase from 63.5 to 65.6 per cent. This is shown in table B.6.1.

Table B.6.1 Calculation of Ausgrid's overhead rate, including and excluding network planning

	Total capex	Network planning	Capex excl. network planning
Direct capex labour ($m)	179.9	12.6	167.3
Indirect capitalised overheads ($m)	114.2	4.4	109.8
Overhead rate (%)	**63.5**	**34.9**	**65.6**

Source: Ausgrid.

Based on the available information, we consider that any over-forecasting of indirect network support costs is fully offset by an equal decrease in capital support costs. For this reason, we are satisfied that, as a whole, Ausgrid's methodology for forecasting capitalised overheads overall reasonably estimates prudent and efficient expenditure over the 2019–24 regulatory control period.

317 Ausgrid, *Response to information request 032,* August 2018.

318 Ausgrid, *Response to information request 046,* September 2018.

Adjustment to overheads

Distributors generally consider that overheads are largely fixed and recurrent costs that do not vary from one year to the next to the extent that direct costs do. However, capitalised overheads should and do vary, in part, with changes in direct capex because:

- reducing the scope of the capital program should reduce support requirements; and
- a lower proportion of direct capex to total expenditure (totex) results in a lower proportion of overheads being allocated to capex, in line with distributor's CAMs.

For these reasons, we have adjusted Ausgrid’s forecast capitalised overheads to reflect that our substitute estimate for direct capex is 29 per cent lower than Ausgrid’s proposed direct capex. We did so by applying Ausgrid’s forecasting methodology to our substitute estimate for direct capex, assuming that direct capex labour decreased proportionally with total direct capex. This reduced Ausgrid’s forecast capitalised overheads by around $145 million, or 23 per cent.

This reduction is substantially larger than if we had applied the methodology we used in our Victorian determinations.[319] We put our position to Ausgrid, who submitted:[320]

> "Though we consider over the long-term capitalised overheads may have a level of variability with changes in our direct labour capex, Ausgrid considers that in the medium term (five year regulatory period) these costs are largely fixed. We are accordingly of the strong view that the AER should revisit its present position. At this stage, it appears that the AER has made high level assumptions about our indirect network support costs which neither aligns with the nature of our capitalised overheads nor the AER’s established approach in recent distribution determinations."

Ausgrid also highlighted that “a reduction in direct capex labour leads to a significant ‘flow back’ of overheads from capex to opex. This flow back leads to the level of overheads allocated to opex rising (where a) reduction to direct labour capex is made.”[321] This is due to Ausgrid’s assertion that overheads are largely fixed, so as a result a reduction in direct capex labour leads to an increase to opex in accordance with Ausgrid’s CAM.

Ausgrid submitted that this flow back of costs “must be taken into account when the AER undertakes its assessment of our proposed capitalised overheads". Clause 6.5.6(e)(7) of the NER requires the AER to have regard to the interrelationships, or

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[319] For the 2016 Victorian determinations, we considered that capitalised overheads have a component that is fixed and a component that varies with changes in direct capex. We took the variable component to be 25 per cent; that is, a 4 per cent change in direct capex gives a 1 per cent change in support costs (i.e. capitalised overheads).

[320] Ausgrid, *Response to information request 046,* September 2018.

[321] Ausgrid, *Response to information request 046,* September 2018.

‘substitution possibilities’, between capex and opex when assessing an expenditure proposal.”[322]

Based on the available information, our position is that applying Ausgrid’s methodology to our substitute estimate for direct capex will not provide Ausgrid with a reasonable opportunity to recover at least efficient costs.[323]

Instead, we have applied a proportional cut using the same methodology that we applied in the 2016 Victorian determinations. This includes applying a 1 per cent change to our substitute estimate of capitalised overheads for each 4 per cent difference between Ausgrid's proposal and our substitute estimate for direct capex.

This methodology reflects our established position that, while largely fixed, capitalised overheads should and do vary, in part, with changes in direct capex. Applying this methodology results in capitalised overheads of $577.1 million, which we have included in our substitute estimate. This is $44.1 million, or 7 per cent, lower than Ausgrid’s proposal of $621.3 million.

322 Ausgrid, *Response to information request 046,* September 2018.

323 NEL, s. 7A.2.

C Engagement and information-gathering process

Initial proposal

Ausgrid lodged its proposal on 30 April 2018. Prior to lodgement, Ausgrid requested an extension to the submission date from 31 January 2018 to 30 April 2018.[324] Ausgrid submitted that the extension would provide additional time for further engagement and consultation with stakeholders.[325] Ausgrid committed to a stakeholder engagement plan that included a series of 'deep dives' on specific capex topics, including repex, augex, non-network capex and demand forecasts.

We considered Ausgrid's letter and agreed to the extension.[326] Ausgrid lodged its capex forecast as part of its proposal on 30 April 2018, which included the capital expenditure supporting documentation, high-level strategic asset management plans and regulatory information notices (RINs). However, Ausgrid did not provide us with detailed justification, including business cases or cost-benefit analysis, for many key capex programs and projects.

Information-gathering process

To gain a better understanding of Ausgrid's capex proposal, we requested further material through our request for information process. Between 3 May 2018 and 18 September 2018, we sent Ausgrid 35 information requests related to its total capex forecast, which includes information requests that were prepared by our consultant, EMCa. Ausgrid responded to the majority of these information requests, but some responses were delayed by up to three weeks.

Engagement

We engaged with CCP10 and other consumer groups during the review process to understand and test their views on Ausgrid's proposal. We had regard to their public submissions and all other public submissions that related to Ausgrid's capex proposal. The specific interactions we have had with Ausgrid and other key stakeholders in the lead up to our draft decision are outlined below.

In the pre-proposal stage:

- We attended four capex 'deep dives', which enabled us to gain a greater understanding of Ausgrid's capex proposal.

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[324] Ausgrid, *Letter to AER – Extension of time for 2019–24 regulatory control period,* December 2017.

[325] Ausgrid, *Letter to AER – Extension of time for 2019–24 regulatory control period,* December 2017, p. 2.

[326] AER, *Letter to Ausgrid – Revised submission date for 2019–24 regulatory proposal,* December 2017.

- We met with Ausgrid to present our refined repex modelling approach on 22 March 2018. We provided Ausgrid with a copy of our preliminary modelling results, as we considered it would be an opportunity for Ausgrid to understand our repex modelling approach and underlying assumptions.

Following Ausgrid's submission, we supplemented our formal information requests with face-to-face discussions:

- We met with Ausgrid and EMCa to discuss Ausgrid's total capex forecast during on-site meetings across four days in Sydney in June 2018. We sought further detailed information on capex issues and tested our understanding of Ausgrid's repex and non-network capex proposals. EMCa's assessment of Ausgrid's capex forecast is based on its observations from the on-site meetings, together with the information supplied prior to, at and following the on-site discussions.[327]
- We provided Ausgrid with our updated repex modelling results in June 2018. Our preliminary results from March 2018 had changed over this period because Ausgrid submitted recast historical data as part of its proposal in April 2018, it submitted formal reset RIN data also in April 2018 and we continued to refine our repex modelling approach. We sought feedback on these results, but Ausgrid did not engage with us on this aspect of its proposal until later in the process.
- Consistent with our no-surprises policy, in August 2018 we provided feedback to Ausgrid on our preliminary position on the reasonableness of its total capex forecast. We were clear that our preliminary views were based on the information we had received. Ausgrid provided additional information to support its total capex forecast on 27 August 2018. As noted in appendix B, we typically expect distributors to provide this information and supporting justification during the pre-engagement stage or when proposals are submitted.
- In early October 2018, we met with Ausgrid to provide feedback on the additional cost-benefit analysis spreadsheets that it provided in late August 2018 to support its repex forecast. We also provided additional feedback regarding our position on its 132kV underground cable forecast. In addition, we discussed the cost-benefit modelling issues noted in attachment 5 and agreed to resolve these issues when Ausgrid submits its revised proposal.
- Finally, we outlined our final capex positions to Ausgrid during a teleconference on 16 October 2018. This included our positions on repex, augex and non-network capex.

[327] EMCa, *Review of aspects of Ausgrid's forecast capital expenditure,* September 2018.

D Repex modelling approach

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

- relevant background information;
- the data used to run the repex model;
- the key assumptions underpinning our repex modelling approach; and
- the repex model outcomes under different scenarios.

D.1 Background to predictive modelling

In 2012, the AEMC published changes to the National Electricity and National Gas Rules.[328] Following these rule changes, we undertook a "Better Regulation" work program, which included publishing a series of guidelines setting out our approach to regulation under the new rules.[329]

The expenditure forecast assessment Guideline (Guideline) describes our approach, assessment techniques and information requirements for setting efficient expenditure allowances for distributors.[330] It lists predictive modelling as one of the assessment techniques we may employ when assessing a distributor's repex. We first developed and used our repex model in our 2009–10 review of the Victorian electricity distributors' 2011–15 proposals and have also used it in subsequent electricity distribution decisions.

The technical underpinnings of the repex model are discussed in detail in the replacement expenditure model handbook.[331] At a basic level, our repex model is a statistical tool used to conduct a top-down assessment of a distributor's replacement expenditure forecast. Discrete asset categories within six broader asset groups are analysed using the repex model. These six asset groups are poles, overhead conductors, underground cables, service lines, transformers and switchgear.

The repex model forecasts the volume of assets in each category that a distributor would be expected to replace over a 20-year period. The model analyses the age of assets already in commission and the time at which, on average, these assets would be expected to be replaced, based on historical replacement practices. A total replacement expenditure forecast is derived by multiplying the forecast replacement volumes for each asset category by an indicative unit cost.

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

329 See AER *Better regulation reform program* web page at https://www.aer.gov.au/networks-pipelines/better-regulation.

330 AER, *Better regulation: Expenditure forecasting assessment guideline*, November 2013.

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

The repex model can be used to advise and inform us where to target a more detailed bottom-up review, and define a substitute repex forecast if necessary. The model can also be used to benchmark a distributor against other distributors in the NEM.

As detailed in the repex handbook, the repex model is most suitable for asset groups and categories where there is a moderate to large asset population of relatively homogenous assets. It is less suitable for assets with small populations or those that are relatively heterogeneous. For this reason, we exclude the SCADA and other asset groups from the modelling process and do not use predictive modelling to directly assess the asset categories within these groups.

Expenditure on and replacement of pole top structures is also excluded, as it is related to expenditure on overall pole replacements and modelling may result in double counting of replacement volumes. In addition, distributors do not provide asset age profile data for pole top structures in the annual category analysis RINs, so this asset group cannot be modelled using the repex model.

D.2 Data collection

The repex model requires the following input data:

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

This data is derived from distributors' annual regulatory information notice (RIN) responses, and from the outcomes of the unit cost and expected replacement life benchmarking across all distributors in the NEM. The RIN responses relied on are:

- annual category analysis RINs – issued to all distributors in the NEM; and
- reset RINs – distributors are required to submit this information with its proposal.

Category analysis RINs include historical asset data and reset RINs provide data corresponding to distributors' proposed forecast repex over the upcoming regulatory control period. The templates relevant to repex are sheets 2.2 and 5.2. Our current approach of adopting a standardised approach to network asset categories provides us with a dataset suitable for comparative analysis and better equips us to assess the relative prices of cost inputs as required by the capex criteria.[332]

D.3 Scenario analysis

In this section we set out the broad assumptions used to run a series of scenarios to test distributors' forecast modelled repex. The specific modelling assumptions applied for each distributor are outlined in each individual repex modelling workbook. The four scenarios analysed are:

[332] NER, cl 6.5.7(c).

1. historical unit costs and calibrated expected replacement lives
2. comparative unit costs and calibrated expected replacement lives
3. historical unit costs and comparative expected replacement lives
4. comparative unit costs and comparative expected replacement lives.

Comparative unit costs are the minimum of a distributor's historical unit costs, its forecast unit costs and the median unit costs across the NEM. Comparative replacement lives are the maximum of a distributor's calibrated expected replacement life and the median expected replacement life across the NEM.

D.4 Calibration

The calibration process estimates the average age at replacement for each asset category using a distributor's observed historical replacement practices. The length of the historical period analysed during this process is referred to as the 'calibration period'. The inputs required to complete the calibration process are:

- the age profile of network assets currently in commission; and
- historical replacement volume and expenditure data for each asset category.

The calibrated expected asset replacement lives as derived through the repex model differ from the replacement lives that distributors report. During the calibration process, we assume the following:

- the calibration period is a historical period where a distributor's replacement practices are largely representative of its expected future replacement needs[333];
- we do not estimate a calibrated replacement life where a distributor did not replace any assets during the calibration period, because the calibration process relies on actual replacement volumes to derive a mean and standard deviation; and
- where a calibrated replacement life is not available, we substitute the value of a similar asset category.

D.5 Comparative analysis approach

Previous distribution determinations where we have used on the repex model have primarily focused on the 'historical scenario'. This scenario forecasts a distributor's expected repex and replacement volumes based on its historical unit costs and asset replacement practices (which are used to derive expected asset replacement lives).

Our refined comparative analysis repex modelling approach builds on this previous analysis and introduces the historical performances of other distributors in the NEM into the forecast period. The 'cost, lives and combined' scenarios rely on a comparative

[333] Each distributor's specific repex modelling workbook outlines more detailed information on the calibration period chosen.

analysis technique that compares the performance of all distributors in the NEM. The technique analyses the two variable repex model inputs – unit costs and replacements lives.

The ‘cost scenario’ analyses the level of repex a distributor could achieve if its historical unit costs were improved to comparative unit costs. The ‘lives scenario’ analyses the level of repex a distributor could achieve if its calibrated expected replacement lives were improved to comparative expected replacement lives.

Unit costs

The comparative analysis technique compares a distributor’s historical unit costs, forecast unit costs and median unit costs across the NEM. Historical unit costs are derived from a distributor’s category analysis RIN and forecast unit costs are derived from a distributor’s reset RIN, which is submitted as part of its proposal.

The median unit costs across the NEM are based on each distributor’s historical unit cost for each asset category. The median unit cost is used for comparative analysis purposes because this approach effectively removes any outliers, either due to unique network characteristics or data reporting anomalies.

The United Kingdom's Office of Gas and Electricity Markets (Ofgem) has a similar approach to unit costs benchmarking, where Ofgem applies a unit cost reduction where the distributor's forecast unit cost was higher than industry median.[334] The unit cost input used in the ‘cost’ and ‘combined’ scenarios is the minimum of a distributor’s historical unit costs, its forecast unit costs and the median unit costs across the NEM.

Expected replacement lives

For expected replacement lives, the comparative analysis technique compares a distributor’s calibrated expected asset replacement lives (based on historical replacement practices) and the median expected asset replacement lives across the NEM. Median expected replacement lives are based on each distributor’s calibrated replacement lives for each asset category. Once again, using the median value effectively accounts for any outliers.

The expected replacement life input used in the ‘lives’ and ‘combined’ scenarios is the maximum of a distributor’s calibrated replacement life and the median replacement life across the NEM.

Repex model threshold

Our ‘repex model threshold’ is defined taking these results and other relevant factors into consideration. For the 2019–24 determinations, our approach is to set the repex model threshold equal to the highest result out of the ‘cost scenario’ and the ‘lives

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334 Ofgem, *Strategy decisions for the RIIO–ED1 electricity distribution price control – tools for cost assessment*, March 2013.

scenario'.[335] This approach considers the inherent interrelationship between the unit cost and expected replacement life of network assets.

For example, a distributor may have higher than average unit costs for particular assets, but these assets may in turn have longer expected replacement lives. In contrast, a distributor may have lower than average unit costs for particular assets, but these assets may have shorter expected replacement lives.

D.6 Non-like-for-like replacement – the treatment of staked wooden poles

The staking of a wooden pole is the practice of attaching a metal support structure (a stake or bracket) to reinforce an aged wooden pole.[336] The practice has been adopted by distributors as a low-cost option to extend the life of a wooden pole. These assets require special consideration in the repex model because, unlike most other asset types, they are not installed or replaced on a like-for-like basis.

Replacement expenditure is normally considered to be on a like-for-like basis. When an asset is identified for replacement, it is assumed that the asset will be replaced with its modern equivalent and not a different asset.[337] The repex model forecasts the volume of old assets that need to be replaced, not the volume of new assets that need to be installed. This is simple to deal with when an asset is replaced on a like-for-like basis – the old asset is simply replaced by its modern equivalent. Where like-for-like replacement is appropriate, it follows that the number of assets that need to be replaced matches the number of new assets that need to be installed.

However, where old assets are commonly replaced with a different asset, we cannot simply assume the cost of the new asset will match the cost of the old asset's modern equivalent. As the repex model forecasts the number of old assets that need to be replaced, it is necessary to make adjustments for the asset's unit cost and calibrated expected replacement life. For modelling purposes, the only category where this is significant is wooden poles.

Staked and unstaked wooden poles

Staked wooden poles are treated as different assets to unstaked poles in the repex model. This is because staked and unstaked poles have different expected replacement lives and different unit costs.

There are two asset replacements options and two associated unit costs that may be made by a distributor – a new pole could replace the old one or the old pole could be

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[335] Our modelling approach means the 'historical scenario' will always be higher than the 'cost scenario' and the 'lives scenario', and the 'combined scenario' will always be lower than the 'cost scenario' and the 'lives scenario'.

[336] The equivalent practice for stobie poles is known as "plating", which similarly provides a low-cost life extension. SA Power Networks carries out this process. For simplicity, this section only refers to the staking process.

[337] For example, conductor rated to carry low-voltage will be replaced with conductor of the same rating, not conductor rated for high-voltage purposes.

staked to extend its life.[338] In addition, there are circumstances where an in-commission staked pole needs to be replaced. Staking is a one-off process. When a staked pole needs to be replaced, a new pole must be installed in its place. The cost of replacing an in-commission staked pole is assumed to be the same as the cost of a new pole.

Unit cost blending

We use a process of unit cost blending to account for the non-like-for-like asset categories. For unstaked wooden poles that need to be replaced, there are two appropriate unit costs – the cost of installing a new pole and the cost of staking an old pole. We use a weighted average between the unit cost of staking and the unit cost of pole replacement to arrive at a blended unit cost.[339]

For staked wooden poles, we ask distributors for additional historical data on the proportion of staked wooden poles that are replaced. The unit cost of replacing a staked wooden pole is a weighted average based on the historical proportion of staked pole types that are replaced. Where historical data is not available, we use the asset age data to determine what proportion of the network each pole category represented and use this information to weight the unit costs.

Calibrating staked wooden poles

Special consideration also has to be given to staked wooden poles when determining their calibrated replacement lives. This is because historical replacement volumes are used in the calibration process. The RIN responses provide us with information on the volume of new assets installed over the calibration period. However, the repex model forecasts the volume of old assets being replaced. Since the replacement of staked poles is not on a like-for-like basis, we make an adjustment for the calibration process to function correctly.

We need to know the number of staked poles that reach the end of their economic life and are replaced over the calibration period, so an expected replacement life can be calibrated. The category analysis RINs currently only provide us with information on how many poles were staked each year, rather than how many staked poles were actually replaced. This additional information is provided by each of the distributors. Where this information is not available, we estimate the number of staked wooden poles replaced over the calibration period based on the data we have available.

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[338] When a wooden pole needs to be replaced, it will either be staked or replaced with a new pole. The decision on which replacement type will be carried out is made by determining whether the stake will be effective in extending the pole's life and is usually based on the condition of the pole base. If the wood at the base has deteriorated significantly, staking will not be effective and the pole will need to be replaced. If there is enough sound wood to hold the stake, the life of the pole can be extended and the pole can be staked, which is a more economically efficient outcome.

[339] For example, if a distributor replaces a category of pole with a new pole 50 per cent of the time and stakes this category of the pole the other 50 per cent of the time, the blended unit cost would be a straight average of the two unit costs. If the mix was 60:40, the unit cost would be weighted accordingly.

E Demand

Maximum demand forecasts are fundamental to a distributor's forecast capex and opex and to our assessment. This is because we must determine whether the capex and opex forecasts reasonably reflect a realistic expectation of demand forecasts and cost inputs required to achieve the capex objectives.[340] Accurate demand forecasts are therefore important inputs to ensure efficient levels of network investment network.

This appendix sets out our decision on Ausgrid's forecast network maximum demand for the 2019–24 regulatory control period. We consider Ausgrid's demand forecasts at the system level and the local level.

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

Localised demand growth (spatial demand) drives the requirement for specific growth projects or programs. Spatial demand growth is not uniform across the entire network. For example, future demand trends would differ between established suburbs and new residential developments. In our consideration of Ausgrid's demand forecasts, we have had regard to:

- Ausgrid's proposal;
- AEMO's independent forecasts;
- submissions from stakeholders including PIAC and CCP10; and
- other relevant public information.

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

E.1 AER determination

We consider Ausgrid's approach to forecasting demand to be reasonable, but we have identified a number of issues that we consider should be addressed in the revised proposal. Our assessment of Ausgrid's proposal shows that:

- Ausgrid forecasts that over the period of 2017–18 to 2023–24, summer peak demand will grow at 1.2 per cent per annum. This is in contrast to AEMO's forecast of annual growth over the same period of 0.1 per cent.

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[340] NER, cll. 6.5.6(c)(3), 6.5.7(c)(1)(iii).

- Ausgrid's forecast methodology uses a historic trend to project the short-term demand up to 2018–19 and econometric modelling to project over the longer term (2021–22 to 2023–24). The longer term projection incorporates post-modelling adjustments for energy efficiency, embedded generation, emerging technologies, and block loads and load transfers. A weighted sum of the short and long-term forecasts is used to construct a smooth transition in the intervening period.
- Ausgrid's approach to forecasting block loads departs substantially from the approach taken by AEMO and contributes to Ausgrid's higher growth rates.
- A detailed examination of the forecast block loads, including demand from road tunnels, data centres and rail projects indicates that Ausgrid's projections for these customers may be overstated, or not adequately tested. We consider that these issues should be addressed as part of Ausgrid's revised proposal.

These points are discussed in greater detail below.

Comparison between AEMO forecasts and Ausgrid forecasts

We compared AEMO's and Ausgrid's coincident summer peak demand for the Ausgrid network region below in Figure E.1.1. It shows that Ausgrid reached summer system peak demand of 5,631MW in 2016–17, which corresponds to a temperature-corrected peak demand (at POE50%) of 5,353MW.[341] Ausgrid forecasts coincident summer peak demand (at POE50%) to rise from 5,521MW in 2017–18 to 5,938MW in 2023–24.

AEMO’s summer system peak demand for Ausgrid is 5,601MW in 2016–17. The weather-corrected peak demand (at POE50%) in 2016–17 is 5,075MW. AEMO forecasts peak demand to fall from 5,309MW in 2017–18 to 5,241MW in 2020–21 before increasing to 5,335MW in 2023–24.

While both forecasts are coincident system-level summer peak demand for the Ausgrid network, they are measured differently.[342] These differences between the measures such as network coverage, level of aggregation, and system peaking time, mean they are not directly comparable, but they are likely to be influenced by the same set of demand drivers. Therefore, when comparing Ausgrid and AEMO's forecasts, it is important to compare the forecasting methodologies in terms of demand drivers and their effects on the forecast growth rates.

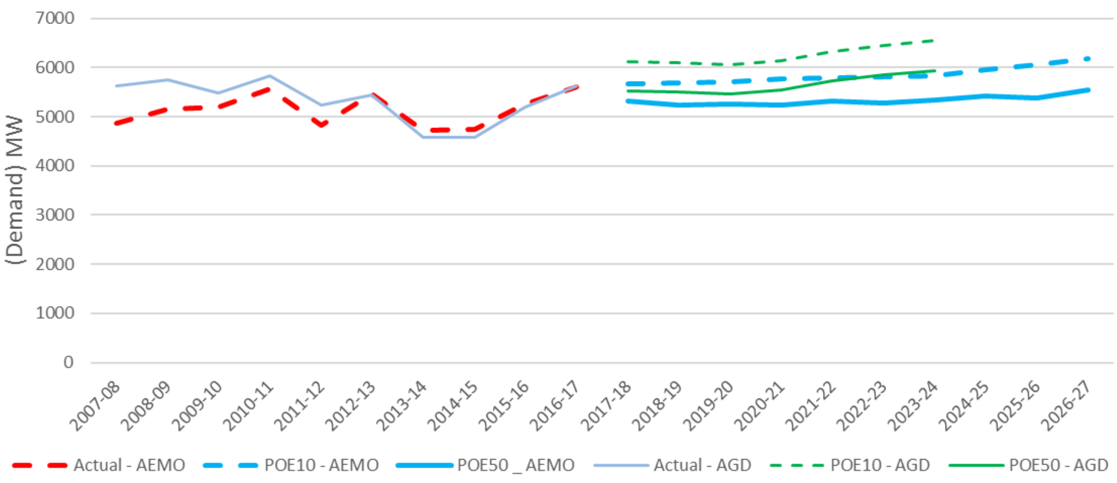
As shown in Figure E.1.1, Ausgrid forecasts its summer system peak demand to grow at a higher rate than the AEMO forecasts. Both AEMO and Ausgrid forecast some significant increases in summer peak demand (POE50%) in 2017–18 (4.6% versus

[341] POE 10 is the demand that is forecast to be exceeded with 10 per cent likelihood, POE 50 is the demand forecast to be exceeded with 50 per cent likelihood.

[342] Ausgrid measures the aggregated demand at the zone substations and sub-transmission substations and High Voltage Customers connected the 132kV network at the time of Ausgrid's network peak. AEMO measures the aggregated demand at its two transmission connection points in the Ausgrid network (i.e., the Sydney region serving 121 zone substations, and the Hunter region serving 60 zone substations), at the time of the NSW/ACT wide network peak.

3.1%). However, from 2017–18 until 2023–24, Ausgrid forecasts an average annual growth of 1.2 per cent compared with 0.1 per cent from AEMO. Similarly, PIAC noted the difference between Ausgrid's and AEMO's long-term load growth forecasts in the Sydney local government area, are 1.5 per cent and 0.9 per cent per annum, respectively.[343] PIAC suggested that we assess the reasonableness of Ausgrid's demand forecast.

Figure E.1.1 Comparison of coincident summer peak demand forecasts by AEMO and Ausgrid



Source: AEMO, 2017 NSW–ACT dynamic interface; Ausgrid, EB RIN 3.4 (table 3.4.3.2) for historic data and reset RIN 3.4 (table 3.4.3.2) for forecast data.[344]

Ausgrid's forecast growth rates are heavily influenced by the projected large number of new large customer connections. Table E.1.1 compares the projected annual growth rates for Ausgrid's four major regions, with and without large customer connections included. In Sydney South and Sydney North particularly, excluding new large customer connections results in a negative growth rate for both summer and winter peaks. This is indicative of the significant role that new large customers have in driving Ausgrid's strong growth forecasts for its network. We note CCP10's submission that a possible underestimation of the opportunities for energy efficiency in block developments may lead to growth forecasts being overstated.[345] For these reasons, we have examined the large customer forecasts in detail below.

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343 Public Interest Advocacy Centre, *Submission in response to the NSW DNSPs 2019–24 regulatory proposals and AER issues paper,* August 2018, p. 20.

344 For this analysis, we assume the coincident annul peak demand figures reported in EBRIN and Reset RIN are summer coincident peak.

345 CCP10, *Response to AER issues paper and revenue proposals for NSW electricity distribution businesses 2019–24,* August 2018, p. 62.

Table E.1.1 Ausgrid coincident system maximum demand forecasts, with and without large customer connections – Annual growth rate

Region	Summer maximum demand (summer maximum demand excluding large customer connections)[346]	Winter maximum demand – (winter maximum demand – excluding large customer connections)[347]
Sydney South	2.2 % (-0.5 %)	2.1 % (-0.9 %)
Sydney North	1.5 % (-0.5 %)	1.4 % (-0.8 %)
Central Coast	1.2 % (1.0 %)	-0.2 % (-0.7 %)
Hunter	-0.2 % (-0.2 %)	-0.4 % (-0.5 %)

Source: Ausgrid, 2017 electricity demand forecasts report, attachment 5.07, pp. 6–30.

Review of Ausgrid's peak demand forecasting methodology

Ausgrid's forecast growth rates for maximum peak demand differ somewhat from AEMO. To further understand the discrepancies, we have reviewed Ausgrid's peak demand forecasting methodology.

Comparison of forecasting method

AEMO uses a combination of a bottom-up approach to forecast peak demand at the transmission connection point (TCP) level and a top-down approach to forecast state-based system-level peak demand. The bottom-up TCP forecasts are reconciled to state-based system level forecasts by applying individual diversity factors[348] and allocating remaining differences with the top-down forecasts to growth connection points on a proportional basis.

Ausgrid has undertaken its own bottom-up approach to forecasting peak demand at the zone substation and sub-transmission substation levels for the short term (2017–18 and 2018–19), and used a top-down approach to forecasting system-wide demand growth for the longer term (2021–22 and 2023–24). For the intervening years, a smoothed combination of the two sets of forecasts is used.

The short-term forecasts are based on estimated underlying trend growth, and adjustments have been made to historical and forecast step changes in embedded generations, load transfer and block loads. The long-term forecasts account for the effect of price and income elasticities via econometric modelling, and makes post-modelling adjustments for out-of-trend changes in relation to energy efficiency, rooftop PV generation, battery storage, electric vehicles, new residential customer growth and

346 Annualised average growth rates from 2016–17 to 2023–24.

347 Annualised average growth rates from 2016 to 2023.

348 Diversity factor is the ratio of the demand at a location at the time of system peak demand to the maximum demand occurring at that location (whenever that maximum may occur).

air conditioner penetration. The resulting system-level demand forecast is then allocated to zone substations using a range of allocation techniques, primarily based on the share of residential and non-residential demand for each zone substation.

The Ausgrid approach differs from the AEMO approach in two key aspects: the smaller size threshold being applied to block loads,[349] and different assumptions made to the uptake of solar PVs and battery storage and EV charging time. Each of these contributes to Ausgrid's forecasts being higher than AEMO's forecast. For example:

- Ausgrid forecast major block loads of about 400MW up to 2023–24 and 11kV connection block loads of over 300MW in 2017–18 and 2018–19. These forecast new connections are much higher than those observed in the historical data and are not included in the AEMO block load adjustments due to the size threshold difference.[350]
- Ausgrid considered that the penetration of solar and batteries in its network area is modest compared with other networks in Australia. It argued that many apartments and commercial sites in the Sydney region within its network are not suitable for installing solar technology. Unlike AEMO, Ausgrid assumes no uptake of non-residential battery energy storage and 0.3kV per vehicle peak demand effect for electric vehicles. These result in smaller post-modelling adjustments made by Ausgrid to dampen underlying long-term demand growth.

New large customer demand

As discussed above, a further key driver for Ausgrid's forecast of increasing demand over 2018–19 to 2023–24 is new customers forecast to be connected to the network. For 11kV connections, the majority of the new loads is forecast to fall within 2017–18. For major customer connections, typically 33kV and above, significant demand growth (above the trend) is projected for State Government developments in road tunnels, rail networks and data centres.

We have therefore undertaken a more detailed review of each of these three categories. The details of the forecasts for these categories have been identified by Ausgrid as confidential, and therefore they are discussed in confidential appendix G. Broadly, we consider that:

- Ausgrid's forecast for new data centre loads appear to be largely based on the load forecasts submitted in the connection applications already received by Ausgrid at the time of producing the 2017 demand forecasts. It is not clear to us whether the requested loads have been adequately tested by Ausgrid. However, there is also

349 Block load is defined as an identified step change in demand due to a new large customer connection or disconnection.

350 AEMO has applied a 5 per cent threshold to screen out block loads, resulting in thresholds of over 200MW and 50MW for the Sydney region and the Hunter region respectively. The block load size thresholds adopted by Ausgrid are relatively small at 50 amps for 11kV connections and all connections at 33kV and above. The 50 amp threshold is equivalent to load of less than 1MW or about 3 per cent of the load on a zone substation with a load of 30MW (the average Ausgrid zone substation load).

evidence indicating there are data centre projects of substantial size that are not covered in the 2017 demand forecast. Ausgrid should account for the latest information available to it for its revised forecast of data centre load.

- Ausgrid has not provided sufficient information to explain the factors behind the requested loads for the road tunnel projects included in its proposal. The expected loads proposed by Ausgrid appear to be much higher than the loads observed for similar existing road tunnels such as Lane Cove tunnel, and may fail to appropriately account for energy efficient tunnel ventilation system that meet air-quality requirements while minimising energy uses. In its revised proposal, Ausgrid needs to sufficiently justify the forecast loads for road tunnel projects.
- Ausgrid is has not provided sufficient information to explain the forecast new loads related to rail projects. We have been unable to reconcile the loads proposed by Ausgrid to publically available information related to the power requirements for these projects. Furthermore, it is not clear to what extent energy efficient design and initiatives have been accounted for in these demand forecasts. However, as the forecast load from rail projects is to be supplied from existing infrastructure, our concerns are noted for Ausgrid's information only and does not have an effect on the capex decision.

Ausgrid has already indicated some of our concerns have been rectified in its 2018 maximum demand forecast.[351] We will review the revised forecast with respect to any revised block loads in the final decision.

Other potential issues

One issue to note is the potential double counting in relation to modelling residential air-conditioning effects. For forecasting residential demand, econometric modelling is applied to residential demand per customer rather than total consumption as per non-residential demand modelling. In projecting forward, Ausgrid appears to separate the effect of residential air-conditioner effect from the population growth effect, both contributing to the growing peak demand over time. Specifically, Ausgrid assumes that air-conditioner penetration will continue, but reach saturation at 65 per cent by 2021. Accordingly, it allows changing composition of customers with and without air-conditioners in forecasting customer numbers growth that drives peak demand.

However, this assumed air-conditioner penetration path has not been consistently applied in forecasting the per-customer residential demand. As econometric modelling is applied to residential demand per customer, the increase in air-conditioning penetration over the relevant historical period (at an annual rate of 1 per cent over the years 2005 to 2016) results in per-customer demand increasing at a higher rate or declining at a lower rate than otherwise. As the econometric modelling does not adjust data or explicitly account for increasing air-conditioner penetration in the modelling, its effect is likely to be captured to some extent by other correlated variables such as income (i.e. omitted variable problem). As a result, when projected forward for

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351 Ausgrid, *Response to information request 045 – demand forecast,* September 2018, p. 2.

increasing income over time, the forecast income effect may capture some continuing air-conditioner penetration effect, which appears to be at odds with the assumed saturation by 2021.

Another minor issue to note is the error in the application of the coincidence factor for mixed residential and commercial development. Our review shows a coincidence factor of one has been applied. Ausgrid indicates that the correct coincidence factor is 0.91, and this will be corrected in the 2018 maximum demand forecast.[352] The correction will reduce the load forecasts for the three commercial/residential projects (under post-modelling adjustments) by about 3MW.

Conclusions

We consider that Ausgrid's approach to forecasting is broadly acceptable, but we have some specific concerns that Ausgrid should address in its revised proposal. Specifically, we hold concerns relating to Ausgrid's forecast spot loads for road tunnels, data centres and rail projects that are to be completed in the 2019–24 regulatory control period. We note that Ausgrid expenditure programs and projects are often driven by these spot load growth forecasts rather than the general trend load growth across the network.

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[352] Ausgrid, *Response to information request 045 – demand forecast,* September 2018, p. 2.

F Ex-post prudency and efficiency review

We are required to provide a statement on whether the roll forward of the regulatory asset base from the previous period contributes to the achievement of the capital expenditure incentive objective.[353] The capital expenditure incentive objective is to ensure that, where the regulatory asset base is subject to adjustment in accordance with the NER, only expenditure that reasonably reflects the capex criteria is included in any increase in the value of the regulatory asset base.[354]

The NER require that the last two years of the current regulatory control period (2017–18 and 2018–19) are excluded from past capex ex-post assessment. The NER state that the review period does not include the regulatory year where the first Capital Expenditure Incentive Guideline was published (2013–14) or any prior regulatory year.[355] In addition, under the transitional rules, the review of past capex does not apply to Ausgrid prior to 1 July 2015.[356] Accordingly, our ex-post assessment only applies to the 2015–16 and 2016–17 regulatory years. We may exclude capex from being rolled into the RAB in three circumstances:

1. where the distributor has spent more than its capex allowance;
2. where the distributor has incurred capex that represents a margin paid by the distributor, where the margin refers to arrangements that do not reflect arm's length terms; or
3. where the distributor's capex includes expenditure that should have been classified as opex as part of a distributor's capitalisation policy.[357]

F.1 Position

We are satisfied that Ausgrid's capital expenditure in the 2015–16 and 2016–17 regulatory years should be rolled into the RAB.

F.2 AER approach

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

- stage one – initial consideration of actual capex performance; and
- stage two – detailed assessment of drivers of capex and management and planning tools and practices.[358]

[353] NER, cl. 6.12.2(b).
[354] NER, cl. 6.4A(a).
[355] NER, cl.11.60.5.
[356] NER, cl.11.56.5(a).
[357] NER, cl. S6.2.2A(b).

The first stage considers a distributor's past capex performance and whether it has overspent against its allowance. In accordance with our Guideline, we would only proceed to a more detailed assessment (stage two) if:

- a distributor had overspent against its allowance;
- the overspend was significant; or
- capex in the period of our ex-post assessment suggests that levels of capex may not be efficient or do not compare favourably to other distributors.

F.3 AER assessment

We have reviewed Ausgrid's capex performance for the 2015–16 and 2016–17 regulatory years. This assessment has considered Ausgrid's actual capex relative to the regulatory allowance given and the incentive properties of the regulatory regime for a distributor to minimise costs. Ausgrid incurred total capex below its forecast regulatory allowance in 2015–16 and 2016–17. Therefore, the overspending requirement for an efficiency review of past capex has not been satisfied.[359] We also consider that the 'margin' and 'capitalisation' RAB adjustments are not satisfied.

We have also had regard to some measures of input cost efficiency as published in our latest annual benchmarking report.[360] We recognise that there is no perfect benchmarking model, but we consider that our benchmarking models are robust measures of economic efficiency and we can use this measure to assess and compare a distributor's efficiency.

The results from our most recent benchmarking report suggest that Ausgrid's overall efficiency has remained largely steady from 2013–14 to 2015–16. However, Ausgrid is ranked last out of thirteen distributors on our multilateral total factor productivity score.[361] While this provides relevant context, we have not used our benchmarking results in a determinative way for this capex draft decision, including in relation to this ex-post prudency and efficiency review.

In assessing the prudency and efficiency of Ausgrid's capex in the ex-post review period, we may only take into account information and analysis that Ausgrid could reasonably be expected to have considered at the time that it undertook the relevant capex.[362] We have therefore not taken into account the information and analysis relied on in other areas of this draft decision, such as EMCa's analysis and advice on aspects of Ausgrid's capex forecast, for this ex-post prudency and efficiency review. For the reasons set out above, we are satisfied that the entirety of Ausgrid's capital expenditure in the 2015–16 and 2016–17 regulatory years should be rolled into the RAB.

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358 AER, *Capital expenditure incentive guideline*, November 2013, pp. 19–22.

359 NER, cl. S6.2.2A(c).

360 AER, *Annual benchmarking report: Electricity distribution network service providers*, November 2017.

361 AER, *Annual benchmarking report: Electricity distribution network service providers*, November 2017, p. 8.

362 NER, cl. S6.2.2A(h)(2).