# FINAL DECISION
# Ausgrid
# Distribution determination

# 2019 to 2024

# Attachment 5
# Capital expenditure

April 2019

AUSTRALIAN ENERGY REGULATOR

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# Note

This attachment forms part of the AER's final decision on the distribution determination that will apply to Ausgrid for the 2019–2024 regulatory control period. It should be read with all other parts of the final decision, which includes the following documents.

As a number of issues were settled at the draft decision stage or required only minor updates, we have not prepared all attachments. The attachments have been numbered consistently with the equivalent attachments to our longer draft decision. In these circumstances, our draft decision reasons form part of this final decision.

The final decision includes the following attachments:

Overview

Attachment 1 – Annual revenue requirement

Attachment 2 – Regulatory asset base

Attachment 4 – Regulatory depreciation

Attachment 5 – Capital expenditure

Attachment 7 – Corporate income tax

Attachment 9 – Capital expenditure sharing scheme

Attachment 10 – Service target performance incentive scheme

Attachment 12 – Classification of services

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Attachment 15 – Alternative control services

Attachment 18 – Tariff structure statement

Attachment A – Negotiating framework

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# Shortened forms

| Shortened form | Extended form |
|---|---|
| ADMS | advanced distribution management system |
| AEMC | Australian Energy Market Commission |
| AEMO | Australian Energy Market Operator |
| AER | Australian Energy Regulator |
| augex | augmentation expenditure |
| capex | capital expenditure |
| CCP10 | Consumer Challenge Panel (sub-panel 10) |
| CESS | Capital expenditure sharing scheme |
| DER | distributed energy resources |
| DSO | Distribution System Operator |
| EBSS | Efficiency benefit sharing scheme |
| FPSC | fixed price service charge |
| ICT | Information and Communications Technology |
| MEFM | Monash Electricity Forecast Model |
| NEL | National Electricity Law |
| NEM | National Electricity Market |
| NEO | National Electricity Objective |
| NER | National Electricity Rules |
| NPV | Net present value |
| NSP | Network Service Provider |
| RAB | Regulatory asset base |
| repex | replacement expenditure |
| SAIDI | System average interruption duration index |
| SAIFI | System average interruption frequency index |
| SCADA | Supervisory Control and Data Acquisition |
| STPIS | Service Target Performance Incentive Scheme |

# 5 Capital expenditure

Capital expenditure (capex) refers to the investment made in the network to provide standard control services. This investment generally 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 final decision on Ausgrid's revised total capex forecast. Further detailed analysis is provided in the following appendices:

- Appendix A – Assessment techniques
- Appendix B – Assessment of capex drivers
- Appendix C – Repex modelling approach
- Appendix D – Engagement process
- Appendix E – Forecast demand

## 5.1 Final decision

In assessing forecast capex, we are guided by the National Electricity Objective (NEO) and underpinning capex criteria and objectives set out in the 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]

These criteria outline 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]

Where a distributor is unable to demonstrate that its proposal complies with the capex criteria and objectives, the NER requires 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]

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1 NER, cl. 6.4.3(a).7
2 NER, NER, cl. 6.5.7(c).
3 NER, cl. 6.5.7(c)(1).
4 NER, cl. 6.5.7(a).
5 NER, cl. 6.12.1(3)(ii).

We accept Ausgrid's revised total net capex forecast of $2,638.4 million ($2018–19) for the 2019–24 regulatory control period. We are satisfied that Ausgrid's revised total net capex forecast reasonably reflects the capex criteria and is consistent with the efficient costs that a prudent operator would incur in the 2019–24 regulatory control period. Table 5.1 outlines Ausgrid's revised total capex forecast and our final decision.

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

| | 2019–20 | 2020–21 | 2021–22 | 2022–23 | 2023–24 | Total |
|---|---|---|---|---|---|---|
| Ausgrid's revised proposal and AER final decision | 630.5 | 556.9 | 484.1 | 491.8 | 475.2 | 2,638.4 |

Source: Ausgrid PTRMs.

Notes: Numbers may not add due to rounding.

The above figures do not include equity raising costs. For our assessment of equity raising costs, see the overview of our Final Decision.

Notwithstanding these concerns, Ausgrid's total capex forecast reasonably reflects the capex criteria, taking into account the capex factors and the revenue and pricing principles. As set out in Appendix B, we are satisfied that Ausgrid's total capex forecast forms part of an overall distribution determination that will contribute to achieving the NEO to the greatest degree.

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

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. As discussed in Appendix B, we have concerns with some aspects of Ausgrid's revised proposal, particularly some of the evidence used to support components of the non-network capex forecast.

Notwithstanding these concerns, Ausgrid's total capex forecast reasonably reflects the capex criteria, taking into account the capex factors and the revenue and pricing principles.[6] As set out in Appendix B, we are satisfied that Ausgrid's total capex forecast forms part of an overall distribution determination that will contribute to achieving the NEO to the greatest degree.

### Table 5.2 – Summary of AER findings and reasons

| Issue | Reasons and findings |
|---|---|
| Total capex forecast | Ausgrid proposed a total capex forecast of $2,638.4 million ($2018–19) in its revised proposal. Ausgrid has justified that its revised proposal reasonably reflects the capex criteria. The reasons for our decision are summarised in this table and detailed in the |

[6] NER, cl. 6.5.7(c) and (d); NEL s. 7A.

| | |
|---|---|
| | remainder of this attachment. |
| Forecasting methodology, key assumptions and past capex performance | Ausgrid's key assumptions and forecasting methodology are generally reasonable. Although our assessment of Ausgrid's capex drivers has revealed some minor issues, we consider these issues are not significant and Ausgrid's approach results in an overall capex forecast that reasonably reflects the capex criteria. |
| Augmentation capex | We are satisfied Ausgrid's forecast augex of $182.3 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this view, we have assessed updated project documentation accompanying Ausgrid's revised proposal and additional information provided in information request responses. We have focused our assessment on the two main differences between our draft decision and Ausgrid's revised proposal. |
| Customer connections capex | Ausgrid has demonstrated that its revised net customer connections capex forecast of $32.8 million ($2018–19) reasonably reflects the capex criteria. Compared with our draft decision, Ausgrid has made adjustments to its net connections capex and capital contributions forecasts to reflect changes in the timing and costing of major connections projects, and to amend a calculation error that was included in its initial proposal. Ausgrid has provided sufficient material to satisfy us that the additional connections expenditure requirements are justified. |
| Replacement capex (repex) | Ausgrid has established that its revised repex forecast of $1,342.3 million ($2018–19)[7] reasonably reflects the capex criteria. In our draft decision, we stated that Ausgrid had not adequately justified that its initial repex forecast of $1,631.7 million ($2018–19) reasonably reflected the capex criteria. In response to our draft decision, Ausgrid significantly revised its repex forecasts for many programs and projects, and accepted our draft decision on its 132kV underground cable and unmodelled repex forecasts.<br><br>In addition, Ausgrid provided information and analysis, including risk quantification and cost-benefit analysis, to support several key programs and projects that were assessed as 'modelled repex'. Ausgrid also engaged proactively and constructively with our repex modelling approach and results, and this engagement has helped inform our updated repex modelling results. |
| Non-network capex | Ausgrid has demonstrated that its revised non-network capex forecast of $405.4 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. In our draft decision, we stated that Ausgrid had not adequately justified its initial non-network capex forecast of $489.5 million ($2018–19). In response to our draft decision, Ausgrid revised its forecasts for many aspects of its non-network capex proposal, and largely accepted our draft decision on its fleet and plant capex forecasts.<br><br>In addition, Ausgrid provided additional information and analysis, revised business cases and models, and also provided benefit quantification and cost-benefit analysis to support the information and communications technology (ICT) capex proposal. Ausgrid also engaged proactively and constructively with us in preparation for submitting its revised proposal and this engagement has helped inform the revised proposal. |
| Operational technology and innovation (OTI) capex | Ausgrid has established that its revised OTI capex forecast of $136.8 million ($2018–19)[8] would form part of a total capex forecast that reasonably reflects the capex criteria. In our draft decision, we stated that Ausgrid had not adequately justified its initial OTI capex forecast of $99.8 million ($2018–19). In response to our draft decision, Ausgrid provided significantly more information, including detailed business cases and cost-benefit analysis spreadsheets to support these programs. |
| Capitalised overheads | Ausgrid has demonstrated that its revised capitalised overheads forecast of $590.5 million ($2018–19) reasonably reflects the capex criteria. Its revised forecast is based on our draft decision for capitalised overheads, with an adjustment to reflect the higher direct capex that it has proposed compared with our draft decision on total |

7 This amount excludes the proposed ADMS upgrade project, which has been assessed under the OTI category.

8 This amount includes the proposed ADMS upgrade project.

capex.

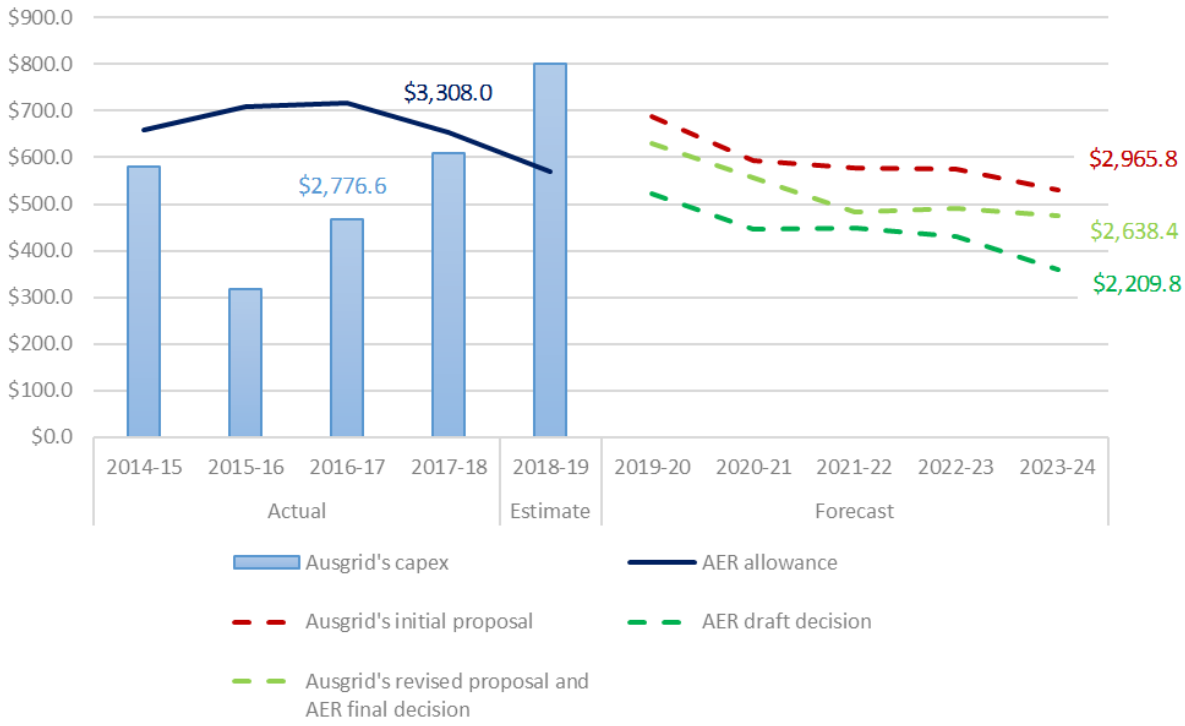
Source: AER analysis.

## 5.2 Ausgrid's revised proposal

In its revised proposal, Ausgrid proposed a total net capex forecast of $2,638.4 million ($2018–19). This forecast is $138.1 million (5 per cent) lower than its actual and estimated net capex over the 2014–19 regulatory control period.

Ausgrid's revised total net capex forecast is $327.3 million (11 per cent) lower than its initial total net capex forecast of $2,965.8 million ($2018–19). Figure 5.1 below outlines Ausgrid's historical capex trend, its initial and revised forecasts for the 2019–24 regulatory control period, and our draft and final decisions.

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




Source: AER analysis.

The key drivers of Ausgrid's revised capex proposal are:

- Augmentation – $182.3 million (7 per cent)
- Net customer connections – $32.8 million (1 per cent)
- Replacement – $1,342.3 million (50 per cent)
- Non-network capex – $405.4 million (15 per cent)

- OTI capex – $136.8 million (5 per cent)
- Capitalised overheads – $590.5 million (22 per cent)

The reasons for our final decision, including a summary of these capex drivers, are outlined in section 5.4. More detailed analysis of each of these drivers is outlined in Appendix B.

## 5.3 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.

More broadly, we also take into account the revenue and pricing principles set out in the NEL.[9] 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:

- providing direct control network services; and
- complying with its regulatory obligations and requirements.[10]

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.[11]
- Past expenditure was sufficient for the distributor to manage and operate its network in previous periods, in a manner that achieved the capex objectives.[12]

### 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 revised capex forecast. In summary, some of these assessment techniques focus on total capex, while others focus on high-level, 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. Our approach is based on approving an overall ex-ante revenue requirement that includes

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

10 NEL, s. 7A.

11 AER, *Better regulation: Expenditure forecast assessment guideline for electricity distribution*, November 2013, pp. 8–9.

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

an assessment of what we find to be a prudent and efficient total capex forecast.[13] 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 may also not need to complete some of the programs or projects it proposed during the forecast regulatory control period if circumstances 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, we use a combination of bottom-up and top-down assessment techniques when reviewing a capex forecast. Bottom-up assessments are an informative way to establish whether 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.[14] 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 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 weigh the results of these techniques case-by-case, in light of all the relevant information available to us.

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

14 See AER, *Draft decision: Ergon Energy determination 2015−16 to 2019−20: Attachment 6 − Capital expenditure*, October 2015, p. 21; AER, *Draft decision: SA Power Networks determination 2015−16 to 2019−20: Attachment 6 − Capital expenditure*, October 2015, pp. 20–21.

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

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 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 their 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.

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 final 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 10. 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 final decision will allow Ausgrid to maintain the safety, service quality and reliability of its network, consistent with its legislative obligations.

### 5.3.3 Interrelationships

In coming to a position on Ausgrid's revised capex proposal, we have taken into account the various interrelationships between the total capex forecast and other constituent components of the determination, such as forecast opex and STPIS interactions.[17] For some elements, such as capitalised overheads, we will consider the proposed capex in the context of total expenditure. For other elements, such as

[16] NER, r. 6.6.

[17] NEL, s. 16(1)(c).

capability growth, we may consider any opex-capex trade-offs to determine whether the capex will result in a net benefit to electricity customers.

## 5.4 Reasons for final decision

We accept Ausgrid's revised total net capex forecast of $2,638.4 million ($2018–19) for the 2019–24 regulatory control period. Ausgrid has demonstrated that its revised total net capex forecast reasonably reflects the capex criteria and is consistent with the efficient costs that a prudent operator would incur in the 2019–24 regulatory control period. Several stakeholder submissions noted that Ausgrid's revised capex forecast is a significant improvement from its initial proposal:

- CCP10 stated "we view the capital investment proposal as reflecting a determined and genuine attempt to take a progressive and informed approach to meeting their licence obligations and responsibility to their customers. CCP10 commends the Ausgrid revised capital plan as being reasonable and supportable."[18]
- EUAA highlighted Ausgrid's commitments in its revised proposal engagement, particularly "the final capex forecast of $2.69 billion compared with $3.08 billion in the initial proposal and a much more robust internal analysis process for assessing capital projects."[19]
- PIAC stated that it "strongly supports the direction of the revision – clearly, $2.69 billion in capex is more affordable for Ausgrid's consumers than $3.1 billion."[20]

We applied the assessment approach set out in section 5.3 and Appendix A to Ausgrid. Table 5.3 below sets out the capex amounts by driver that Ausgrid has demonstrated would reasonably reflect the capex criteria. Our findings and reasons for each capex driver are summarised below.

### Table 5.3 – Assessment of required capex by driver for the 2019–24 regulatory control period ($2018–19, million)

| Driver | 2019–20 | 2020–21 | 2021–22 | 2022–23 | 2023–24 | Total |
|---|---|---|---|---|---|---|
| Augmentation | 33.1 | 49.2 | 54.0 | 19.8 | 26.1 | 182.3 |
| Net connections | 10.2 | 7.3 | 6.0 | 5.2 | 3.9 | 32.8 |
| Replacement | 331.5 | 265.5 | 240.7 | 248.3 | 256.3 | 1,342.3 |
| Non-network | 89.0 | 83.4 | 83.5 | 84.3 | 65.3 | 405.4 |
| OTI | 33.0 | 31.8 | 30.0 | 27.8 | 14.1 | 136.8 |
| Capitalised overheads | 133.8 | 123.0 | 115.0 | 107.8 | 110.9 | 590.5 |
| Gross capex | 767.1 | 678.1 | 668.3 | 625.8 | 584.9 | 3,324.2 |

[18] CCP10, *Response to Ausgrid's revised regulatory proposal 2019–24 and AER draft determination,* January 2019, p. 34.

[19] EUAA, *NSW DNSPs 2019–24 revenue reset,* January 2019, p. 5.

[20] PIAC, *Submission to the AER's draft determinations and the NSW DNSPs' 2019–24 revised proposals,* February 2019, p. 9.

| | | | | | | |
|---|---|---|---|---|---|---|
| Less capital contributions | 136.5 | 117.9 | 139.0 | 132.7 | 108.2 | 634.3 |
| Less disposals | 0.1 | 3.4 | 45.3 | 1.3 | 1.4 | 51.5 |
| **Net capex** | **630.5** | **556.9** | **484.1** | **491.8** | **475.2** | **2,638.4** |

Source: Ausgrid attachment 5.02.2, revised PTRMs and AER analysis.

Notes: Numbers may not add due to rounding.

Net capex = gross capex less capcons less disposals.

**Augmentation:**

- Ausgrid has justified that its revised augmentation capex forecast of $182.3 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
- In coming to this view, we have assessed updated project documentation accompanying Ausgrid's revised proposal and additional information provided in information request responses.
- We have focused our assessment on the two main differences between our draft decision and Ausgrid's revised proposal. Our findings are that:
    - The additional information provided to support Ausgrid's 11kV network reinforcement program shows that the benefits of the project outweigh the costs.
    - We are satisfied with Ausgrid's updates to its conditional projects. Although we have residual concerns with the demand forecasts supporting the new Beresfield zone substation project, we do not consider these concerns are significant in the context of the overall capex allowance.

**Customer connections capex:**

- Ausgrid has established that its revised net customer connections capex forecast of $32.8 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
    - This is $3.6 million higher than our draft decision and is due to the deferral of stage 2 of the WestConnex project and small adjustments following updated construction activity forecasts.
- Ausgrid has justified that its revised capital contributions forecast of $634.3 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
    - This is $55.6 million (10 per cent) higher than our draft decision and is due to the deferral of projects from the current period and the correction of a mathematical error in its initial forecasting methodology.

**Repex:**

- Ausgrid has adequately demonstrated that its revised repex forecast of $1,342.3 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.

- In our draft decision, we highlighted that Ausgrid's forecast for modelled repex was significantly higher than our repex model threshold. In addition, our bottom-up review of Ausgrid's 132kV underground cables highlighted that several proposed projects were not prudent and efficient. Ausgrid's unmodelled repex forecast was also 12 per cent higher than its historical unmodelled repex and our draft decision noted that Ausgrid had not adequately supported this increase.
- In its revised proposal, Ausgrid reduced its repex forecast from $1,631.7 million ($2018–19) to $1,342.3 million ($2018–19) (18 per cent). Ausgrid accepted our draft decision positions on its 132kV underground cable and unmodelled repex forecasts.
- In addition, Ausgrid reduced its modelled repex forecast from $930.1 million to $761.4 million. It has provided additional information, including risk-based cost-benefit analysis spreadsheets and documents, to support many of the programs in its modelled repex forecast. We commend Ausgrid for responding to our engagement and draft decision by providing cost-benefit analysis with risk quantification in support of its revised repex forecast.

**Non-network capex:**

- Ausgrid has reasonably demonstrated that its revised non-network capex forecast of $405.4 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
- In our draft decision, we highlighted numerous issues with Ausgrid's initial proposal. The issues we found included the lack of cost-benefit analysis in support of the ICT capex proposal, insufficient options analysis and a lack of evidence to support the buildings and property capex proposal, lack of evidence in support of unit cost escalation and replacement age assumptions for the fleet and plant capex forecast, and a lack of information to support the minor asset capex forecast.
- In its revised proposal, Ausgrid reduced its non-network capex forecast from $489.5 million ($2018–19) to $405.4 million ($2018–19) (17 per cent). Notably, in response to our draft decision position, Ausgrid reduced its buildings and property capex forecast by 27 per cent, from $208.4 million ($2018–19) to $151.8 million ($2018–19). In addition, Ausgrid reduced its fleet and plant capex forecast from $98.6 million ($2018–19) to $86.7 million ($2018–19) (12 per cent).
- In support of its revised ICT and minor asset capex forecasts, Ausgrid provided significantly more information, which included cost-benefit analysis in support of ICT capex forecast and a consultant report in support of the minor asset capex forecast. We commend Ausgrid for responding to our engagement and draft decision by providing this information in support of its revised non-network capex forecast.

**Operational technology and innovation (OTI) capex:**

- Ausgrid has established that its revised non-network capex forecast of $136.8 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
- In our draft decision, we noted that the majority of these projects were aimed at improving service through the benefits that they would generate. Our bottom-up

review highlighted the lack of supporting documentation and cost-benefit analysis in support of these projects. We concluded that Ausgrid had not demonstrated that these projects were required to meet the capex objectives.

- In its revised proposal, Ausgrid increased its OTI capex forecast from $99.8 million ($2018–19) to $136.8 million ($2018–19). Ausgrid reproposed all initially proposed OTI projects and also included an additional $19.8 million for additional cyber security capex.
- In support of its revised proposal, Ausgrid provided significantly more information, including detailed business cases and cost-benefit analysis spreadsheets to support these programs. We commend Ausgrid for responding to our engagement and draft decision by providing this information in support of its revised OTI capex forecast.

**Capitalised overheads:**

- Ausgrid has demonstrated that its revised capitalised overheads forecast of $590.5 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria.
- Ausgrid's forecast is based on our draft decision on capitalised overheads, and adjusted to reflect the increase in its revised direct capex forecast compared with our draft decision. We are satisfied that this proportional adjustment is reasonable.

**Modelling assumptions:**

- Consistent with our standard assessment approach, we reviewed the underlying modelling assumptions that underpin Ausgrid's revised capex model.[21] Specifically, we reviewed the inflation and labour price escalation assumptions in Ausgrid's revised capex forecast. Overall, in the context of Ausgrid's total net capex forecast, we consider that these assumptions are reasonable and we have therefore not made any adjustments.

[21] Ausgrid, *Response to information request 060 and subsequent meetings,* 21 February 2019.

# 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 set out in greater detail the extent to which we relied on each of these assessment techniques.

The assessment 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 expenditure that we are assessing. We therefore use some assessment techniques in our capex assessment that are not suitable for assessing opex and vice versa. We outline this in the Expenditure Forecasting Assessment Guideline (the Guideline).[22] Below we outline the assessment techniques we used to assess Ausgrid's revised capex forecast.

## A.1 Trend analysis

We consider past trends in actual and forecast capex as this is one of the capex factors under the NER.[23] 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 for these differences. We also assess whether the historical levels of expenditure are indicative of the required expenditure moving forward. In doing so, we consider the reasons the distributor provides in its 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.[24] 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 amount of 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, to the extent that actual demand differs from forecast demand, a distributor should reassess project needs. Growth in a distributor's network will also drive connections-related capex. For these reasons, it is important to consider

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

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

24 NER, cl. 6.5.7(a).

how capex trends, particularly for augex and connections, compare with trends in demand and customer numbers.

For service standards, there is generally a lag between when capex is undertaken (or not) and when the service improves (or declines). This is important when considering the expected effect of an increase or decrease in capex on service levels. It is also relevant to consider when service standards have changed and how this has affected the distributor's capex requirements. We analysed capex trends across a range of levels including at the total capex level and the category level (e.g. augex, connections, repex and non-network). 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 replacement lives across a range of repex asset categories.

Using standardised reporting templates, we collect data on augex, repex, connections, non-network capex, overheads and forecast 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 model that forecasts asset replacement capex (repex) for various asset categories based on their condition (using age as a proxy) and unit costs. We use the repex model to only 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. The repex model is only used to forecast modelled repex for electricity distributors.

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 define a substitute estimate if necessary. We can also use the

model to compare a distributor against other distributors in the NEM.[25] In coming to our position, we also had regard to feedback from distributors on some of the underlying assumptions and modelling techniques.

## 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. In contrast to previous determinations, the current approach considers intra-industry comparative analysis for unit costs and expected asset replacement lives, rather than only analysing inter-company historical performance. 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; and
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 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 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.

## 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

[25] This includes Power and Water Corporation.

model threshold equal to the highest result out of the 'cost scenario' and the 'lives scenario'.[26]

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 C.

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

In assessing whether Ausgrid's revised 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 justify 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 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[27], which relates to asset replacement planning, aims to assist network businesses with this bottom-up forecast. 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 challenge 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.

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[26] 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'.

[27] This Application Note does not replace published guidelines. Rather, it supplements the guidelines by outlining principles and approaches that accord with good asset management and risk management practices.

## A.5 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report.[28] The NER requires us to have regard to the annual benchmarking report, as it is one of the capex factors.[29] 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.[30]

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.[31] The AEMC stated:

> "Benchmarking is a critical exercise in assessing the efficiency of an NSP."[32]

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 affects its ability to convert inputs into outputs. 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 revised total capex forecast. These factors include:

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

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28 AER, *Annual benchmarking report: Electricity distribution network service providers*, November 2018.

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

30 AER, *Better regulation: Expenditure forecast assessment guidelines for electricity distribution – explanatory statement*, November 2013, p. 78.

31 NER, cl. 6.5.7(c).

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

# B Assessment of capex drivers

This appendix outlines our detailed analysis of the categories of Ausgrid's revised capex forecast for the 2019–24 regulatory control period. These categories are augmentation capex (augex), customer connections capex, replacement capex (repex), non-network capex, operational technology and innovation (OTI) capex, and capitalised overheads.

As we have discussed earlier in this attachment, Ausgrid has demonstrated that its revised total capex forecast reasonably reflects the capex criteria. In this appendix, we set out further analysis in support of this view and the different assessment techniques we relied on to form this view. The structure of this appendix is:

- Section B.1 – forecast augex;
- Section B.2 – forecast customer connections capex;
- Section B.3 – forecast repex;
- Section B.4 – forecast non-network capex;
- Section B.5 – forecast operational technology and innovation capex; and
- Section B.6 – forecast capitalised overheads.

## B.1 Augmentation capex (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.1.1 Ausgrid's revised proposal

Ausgrid's revised proposal includes $182.3 million for augex. This is $15.7 million higher than our draft decision and $6.8 million lower than its initial proposal. Ausgrid generally accepted our draft decision with the following amendments:

- it reproposed its 11kV network reinforcement program with additional supporting information; and
- it updated the following conditional probability projects:
    - Macquarie Park subtransmission station likelihood increased from 75 per cent to 100 per cent following the completion of a RIT-D; and
    - added a conditional project at Beresfield with a 50 per cent probability of proceeding. [33]

[33] Ausgrid, *Revised proposal 2019–2024,* January 2019, pp. 49–50.

Ausgrid also did not propose some projects we classified as 'other augmentation' that we included in our draft decision. These are relatively small projects such as the load transfer between Darling Harbour and Camperdown zone substations.

### B.1.2 Final decision position

Ausgrid has established that its forecast augex of $182.3 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this view, we have assessed updated project documentation accompanying Ausgrid's revised proposal and additional information provided in information request responses. We have focused our assessment on the two main differences between our draft decision and Ausgrid's revised proposal. Our findings are that:

- The additional information provided to support Ausgrid's 11kV network reinforcement program shows that the benefits of the project outweigh the costs.
- We are satisfied with Ausgrid's updates to its conditional projects. Although we have residual concerns with the demand forecasts supporting the new Beresfield zone substation project, we do not consider these concerns are significant in the context of the overall capex allowance.

### B.1.3 Reasons for our position

#### 11kV network reinforcement

We are satisfied with the updated information Ausgrid provided in its revised proposal to support its 11kV network reinforcement program. In our draft decision, we considered this program was not supported by the information provided. In particular, we considered Ausgrid's diversity factor of 1.1 appeared to be overstating feeder loads.[34]

In response to our draft decision, Ausgrid provided additional information on actual feeder diversity factors.[35] We have also reviewed the assumptions around Ausgrid's NPV analysis including discount rates and the potential impact of distributed energy resources. We have found that adjusting for these assumptions results in the benefits of the project exceeding the costs.

#### Conditional projects

Overall, we are satisfied with Ausgrid's revised conditional projects. We have applied the same assessment approach to assessing the updated conditional projects as we have in our draft decision. Due to the uncertainty of these projects proceeding at the time of the initial proposal, we consider it is reasonable to update the probability of these projects proceeding using the latest data available.

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[34] AER, *Ausgrid 2019–24 draft decision,* November 2018, p. 39.

[35] Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 51.

In our draft decision, we noted our assessment of conditional projects was consistent with our review of other augmentation projects. We considered Ausgrid did not fully support projects such as the White Bay Zone substation and Pyrmont subtransmission substation.[36]

In its revised proposal, Ausgrid accepted our draft decision. However, Ausgrid adjusted the probability of its Macquarie Park zone substation from 75 per cent to 100 per cent and proposed a new conditional project for Beresfield zone substation.[37] For Ausgrid's Macquarie Park project, we previously noted, in our draft decision, that demand forecasts and options analysis was sound. Consistent with our draft decision, we are satisfied with Ausgrid's adjustment to its Macquarie Park conditional project.

For Ausgrid's Beresfield zone substation, we had concerns that it had not adequately considered the cost and benefits of each investment option and did not include sufficient information to support its demand forecasts. In response to our information requests, Ausgrid provided more information on its options analysis and demand forecasts. Ausgrid also identified how it derived its 50 per cent value of the project proceeding.[38]

We have assessed the additional information and we consider Ausgrid, using demand management, could potentially defer its investment by two years. This could result in lower costs to consumers. This indicates that Ausgrid may not have selected the most efficient option to address the increase in demand.

However, the benefits to consumers may not be material as it is likely, given expected increases in demand, Ausgrid may need to invest in its network option in the future. Taking this into account and the fact that Ausgrid has included 50 per cent of the total cost of the project to reflect uncertainty, we do not consider an adjustment for deferral will have a material impact on augex.

## B.2 Connections capex

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 (NSW) allows customers to choose their own Accredited Service Provider (ASP) and negotiate efficient prices for connection services. Given the competition between service providers, we do not regulate the majority of connection services in NSW. 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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36 AER, *Ausgrid 2019–24 draft decision,* November 2018 p. 42.

37 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 49.

38 Ausgrid, *Response to information request 058,* 20 February 2019.

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.2.1 Ausgrid's revised proposal

Ausgrid forecast $667.1 million ($2018–19) for connections capex in its revised proposal for the 2019–24 regulatory control period. This is $59.3 million (10 per cent) higher than its initial proposal and our draft decision.

Ausgrid's forecast connections capex includes:

- Net expenditure (costs incurred by Ausgrid) of $32.8 million. This is $3.6 million (12 per cent) higher than our draft decision.
- Capital contributions of $634.3 million. This is $55.6 million (10 per cent) higher than our draft decision.[39]

The increase compared with Ausgrid's initial proposal is due to the deferral of projects from the current period—notably WestConnex stage 2—and correction of a mathematical error in its initial capital contributions forecasting methodology. Ausgrid's revised proposal for net connections capex for the 2019–24 regulatory control period is 61 per cent lower than actual expenditure of $83.7 million in 2014–19. Only net connections capex is rolled into the regulatory asset base.

### B.2.2 Final decision position

We are satisfied that Ausgrid's proposed connections capex of $667.1 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. Table B.2.1 summarises Ausgrid's proposed connections capex for 2019–24.

**Table B.2.1 – Ausgrid's proposed connections capex for 2019–24 ($2018–19, million)**

| | 2019–20 | 2020–21 | 2021–22 | 2022–23 | 2023–24 | Total |
|---|---|---|---|---|---|---|
| Net connections capex | 10.2 | 7.3 | 6.0 | 5.2 | 3.9 | 32.8 |
| Capital contributions | 136.5 | 117.9 | 139.0 | 132.7 | 108.2 | 634.3 |
| Total | 146.7 | 125.2 | 145.0 | 138.0 | 112.2 | 667.1 |

Source: Ausgrid, *Attachment 4.02 – PTRM for distribution* and *Attachment 5.02.2 – Master list of capex projects and programs*, January 2019.

Note: Numbers may not add due to rounding.

[39] Ausgrid, *Attachment 4.02 – PTRM for distribution* and *Attachment 5.02.2 – Master list of capex projects and programs*, January 2019.

### B.2.3 Reasons for our position

In coming to our position, we have taken our draft decision as a starting point. We asked Ausgrid for further information and justification for its connections capex requirements additional to our draft decision.

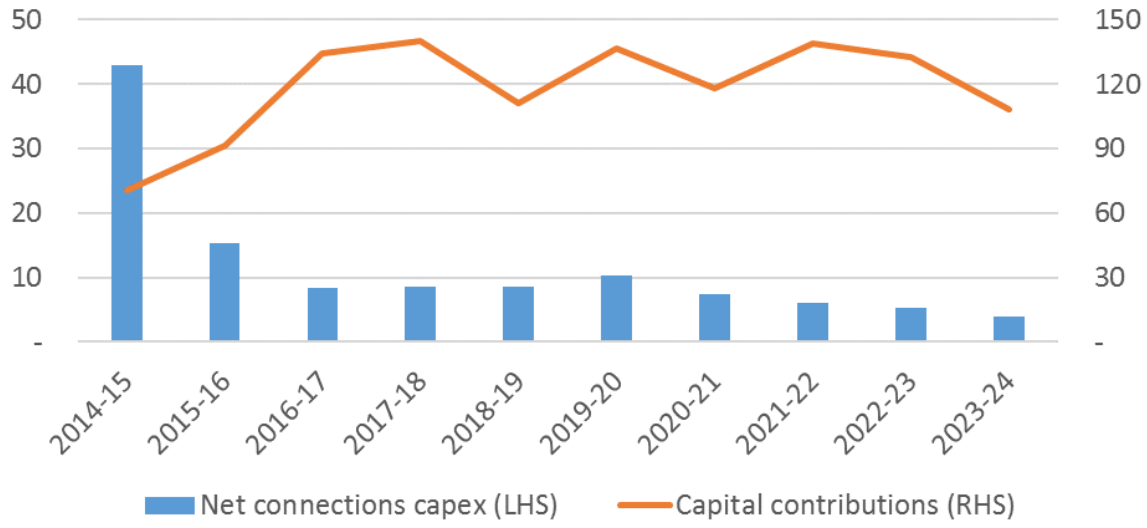
#### Forecast connections capex compared with current period

Figure B.2.2 shows Ausgrid's 2019–24 forecast net connections capex and capital contributions with actual and 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 61 per cent lower;
- forecast capital contributions is 16 per cent higher; and
- gross connections capex is 6 per cent higher.

**Figure B.2.2 – Annual net connections capex, 2014–15 to 2023–24 ($2018–19, million)**




Source: AER analysis based on data from 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.

#### Our assessment of forecast net connections capex

Ausgrid's revised proposal includes $32.8 million for net connections capex. Ausgrid stated that it accepted our draft decision of $29.2 million, but it has made adjustments based on project timing and new information including updated construction activity

forecasts.[40] 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 subtransmission connections, will connect to its network in 2019–24.[41]

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 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.

### LV and HV connections

LV and HV connections make up the majority of new connections volumes 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).[42]

For its revised proposal, Ausgrid updated its forecast using the most recent ACIF forecasts of construction activity. The update resulted in a slight (<$0.1 million) increase in its forecast to $16.0 million for 2019–24.[43] We are satisfied that this is a reasonable 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.

### Major connections

Ausgrid's revised forecast includes $16.8 million for major connection projects. This is $3.6 million higher than our draft decision. Ausgrid submitted that the increase is due to stage 2 of the WestConnex project being deferred from the current regulatory period to the 2019–24 regulatory period.[44]

In response to our information request, Ausgrid provided updated information regarding major connections forecasts and timings, including information about WestConnex stage 2.[45] We consider that Ausgrid has provided sufficient support for its additional capex requirements compared with our draft decision.

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40 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 46.

41 Ausgrid, *Attachment 5.01 Ausgrid's initial proposal,* April 2018, p. 37.

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

43 Ausgrid, *Attachment 5.02.2 – Master list of capex projects and programs*, January 2019, and response to AER information request 055.

44 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 46.

45 Ausgrid, *Response to AER information request 055,* February 2019 – Comparison of original and revised contributions forecast. This information focused on capital contributions, but identified the deferral and costings of the WestConnex stage 2 project.

## Our assessment of capital contributions

Ausgrid's revised proposal for capital contributions is $634.3 million. This is $55.6 million (10 per cent) higher than our draft decision of $578.7 million. The forecast is based on actual contributions received in 2016–17. Ausgrid noted that its previous connection policy impacted capital contributions received in previous years, but did not affect that year's capital contributions.[46] We accepted this approach in our draft decision. The increase in capital contributions compared with the initial proposal is due to the deferral of projects from the current period and correction of a mathematical error in its initial capital contributions forecasting methodology.

### Deferred projects

Ausgrid submits that a number of deferrals of major projects has "resulted in $32.6 million in gifted assets moving from the 2014–19 regulatory control period into the 2019–24 period due to customer-driven delays in the timing of significant major projects, primarily involving subtransmission connections."[47]

Ausgrid provided details of its major projects capital contributions forecasts, which included information about timing and costing changes between the initial and revised proposals.[48] We are satisfied that Ausgrid has demonstrated that its higher capital contribution requirements compared with its initial proposal are justified.

### Correction of error in initial proposal

Ausgrid submitted that its initial proposal for capital contributions was in error due to an "indexation error that was identified when developing the revised proposal. In the original proposal, forecast distribution contributions were reported as being in Real 2019 dollars when in fact they were in constant dollars (Dec 2016). This accounted for a $24M (4.6 per cent) under-reporting of forecast distribution contributions in the original proposal which has been corrected."[49]

We inspected Ausgrid's forecast models for capital contributions that it submitted in response to our information request. We are satisfied that Ausgrid did not escalate its forecast from constant dollars (Dec 2016) in its initial proposal. We also note that a similar error was identified—and corrected—for net connections capex ahead of our draft decision.[50]

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

47 Ausgrid, *Response to information request 055,* February 2019.

48 Ausgrid, *Response to AER information request 055,* February 2019 – Comparison of original and revised contributions forecast.

49 Ausgrid, *Response to AER information request 055*, February 2019.

50 Correspondence between the AER and Ausgrid, September 2018.

## B.3 Replacement capex (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[51];
- 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.

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 capex.

### B.3.1 Ausgrid's revised proposal

Ausgrid has proposed a repex forecast of $1,342.3 million ($2018–19) in its revised proposal. Its revised forecast is $289.5 million (18 per cent) lower than its initial forecast of $1,631.7 million ($2018–19).[52] Ausgrid's revised repex forecast is $324.2 million (19 per cent) lower than actual and estimated repex over the 2019–24 regulatory control period.

In our draft decision, we highlighted that Ausgrid's forecast for modelled repex was significantly higher than our repex model threshold. In addition, our bottom-up review of Ausgrid's 132kV underground cables highlighted that several proposed projects were not prudent and efficient. Ausgrid's unmodelled repex forecast was also 12 per cent higher than its historical unmodelled repex and our draft decision noted that Ausgrid had not adequately justified this increase.

In its revised proposal, Ausgrid accepted our draft decision positions on its 132kV underground cable and unmodelled repex forecasts. Regarding its 132kV underground cable forecast, Ausgrid stated:

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[51] 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.

[52] These figures exclude Ausgrid's ADMS proposal, which has been assessed below in section B.4 as non-network capex.

> "In light of feedback from the AER and in the interests of affordability, we have decided to manage the risk of the 132kV cable replacement projects within the allowance provided by the AER."[53]

Regarding its unmodelled repex forecast, Ausgrid stated:

> "We reviewed our programs in light of feedback from the AER with consideration of refined needs and historical performance. Our review led us to reprioritise our programs, including staging some programs over two future regulatory periods."[54]

In addition, Ausgrid reduced its modelled repex forecast from $930.1 million to $761.4 million. It has provided additional information, including risk-based cost-benefit analysis spreadsheets and documents, to support many of the programs in its modelled repex forecast. As a result, our revised proposal assessment focuses on Ausgrid's revised modelled repex forecast.

We commend Ausgrid for responding to our engagement and draft decision by providing cost-benefit analysis with risk quantification in support of its revised repex forecast. Origin Energy submitted that "robust risk-based asset management techniques" are vital parts of good governance and management processes.[55]

### B.3.2 Final decision position

We are satisfied Ausgrid's revised repex forecast of $1,342.3 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria. Table B.3.1 below summarises Ausgrid's revised repex forecast for the 2019–24 period. CCP10 submitted:

> "We are satisfied with the revised replacement expenditure forecast and the way it has been presented to stakeholders. Overall, CCP10 is supportive of the approach to asset replacement proposed by Ausgrid, subject to the satisfaction of the AER that Ausgrid has provided adequate assurances as to the quality and intent of the many detailed Asset Management Plans that have been developed."[56]

**Table B.3.1 – Ausgrid's revised repex proposal and AER final decision ($2018–19, million)**

| | 2019–20 | 2020–21 | 2021–22 | 2022–23 | 2023–24 | Total |
|---|---|---|---|---|---|---|
| Replacement | 331.5 | 265.5 | 240.7 | 248.3 | 256.3 | 1,342.3 |

Source: Ausgrid attachment 5.02.2.

Notes: Numbers may not add due to rounding.

53 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 22.

54 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 22.

55 Origin Energy, *AER draft decision for NSW electricity distributors 2019–24,* February 2019, p. 3.

56 CCP10, *Response to Ausgrid's revised regulatory proposal 2019–24 and AER draft determination,* January 2019, p. 39.

### B.3.3 Reasons for our position

Similar to our draft decision, we have applied several assessment techniques to assess Ausgrid's revised repex forecast against the capex criteria, as well as considering stakeholder submissions. These techniques include:

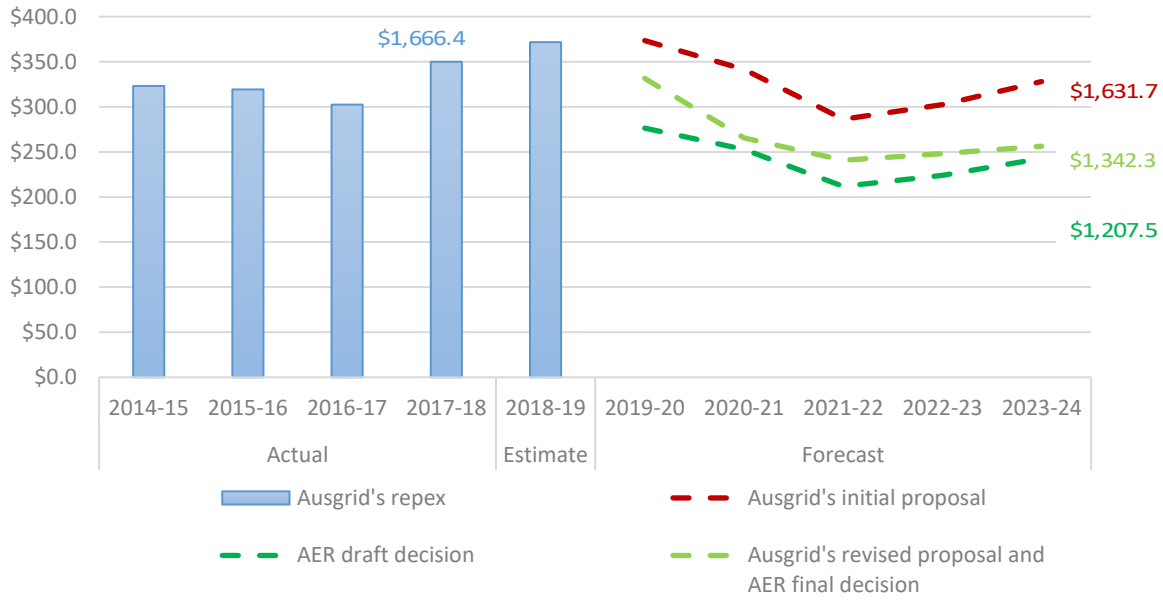
- trend analysis;
- repex modelling; and
- bottom-up technical and engineering assessment.

#### Trend analysis

Trend analysis of a distributor's past expenditure allows us to make general observations about how a distributor is performing, as well as to provide a check against our predictive modelling results. This is consistent with the capex factor that requires us to have regard to the actual and expected capex during any preceding regulatory control period.[57] In forming our position, we had regard to the following trends:

- Ausgrid's revised repex forecast for the 2019–24 regulatory control period relative to its actual spend in the current regulatory control period and its initial repex forecast (Figure B.3.1); and
- historical vs forecast repex and replacement volume trends at both the asset group and asset category level.

**Figure B.3.1 – Ausgrid's historical vs forecast repex snapshot ($2018–19, million)**




Source: AER analysis.

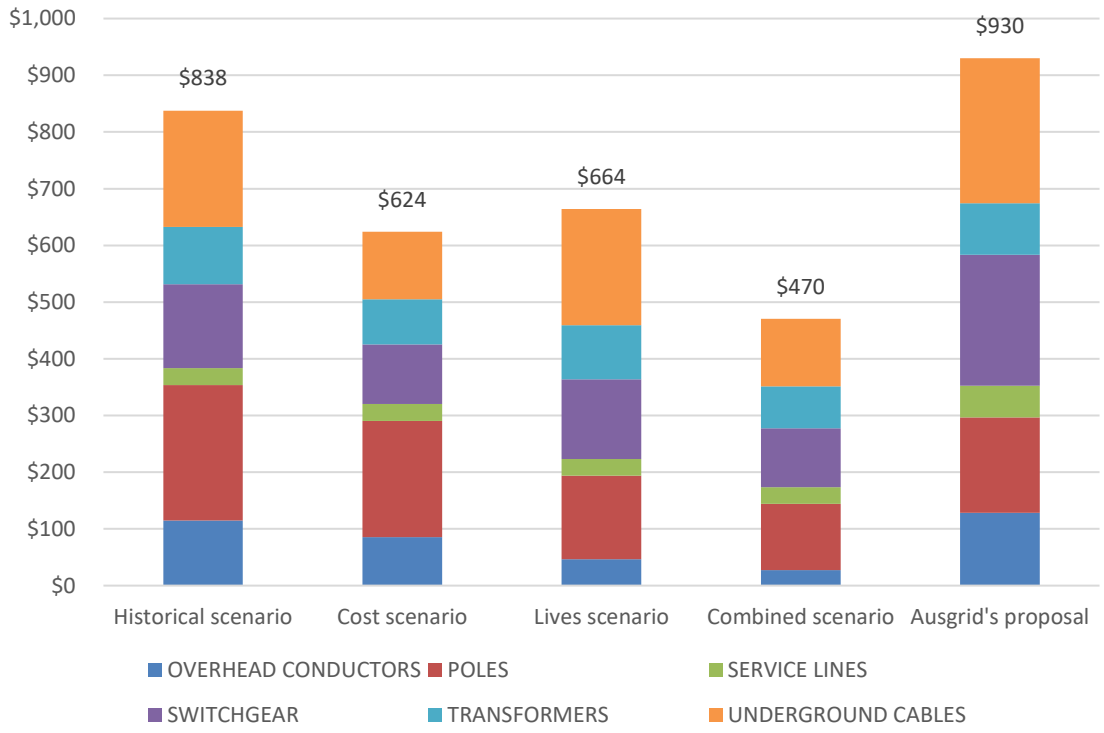
[57] NER, cl. 6.5.7(e)(5).

Figure B.3.1 highlights that Ausgrid has significantly reduced its repex forecast from its initial proposal to its revised proposal. Total repex is forecast to decrease from $1,666.4 million over the 2014–19 period ($333.3 million per annum) to $1,342.3 million over the 2019–24 regulatory control period ($268.5 million per annum). We assess and consider specific aspects of Ausgrid's repex forecast below under repex modelling and bottom-up technical and engineering assessment.

## Repex modelling

In our draft decision, we presented our initial repex modelling results against Ausgrid's initial modelled repex forecast. These initial results are outlined below under Figure B.3.2.

### Figure B.3.2 – Initial repex modelling results ($2018–19, million)




Source: AER analysis.

Our draft decision stated, and Figure B.3.2 highlights, that Ausgrid's initial modelled repex proposal was $265.9 million (40 per cent) greater than the repex model threshold. Figure B.3.2 highlights that Ausgrid's initial proposal for modelled repex was significantly higher than our results for overhead conductors, service lines, switchgear and underground cables.

Ausgrid's forecast for poles was slightly higher than our modelled results, while its forecast for transformers fell slightly below the modelled threshold. As we stated in our

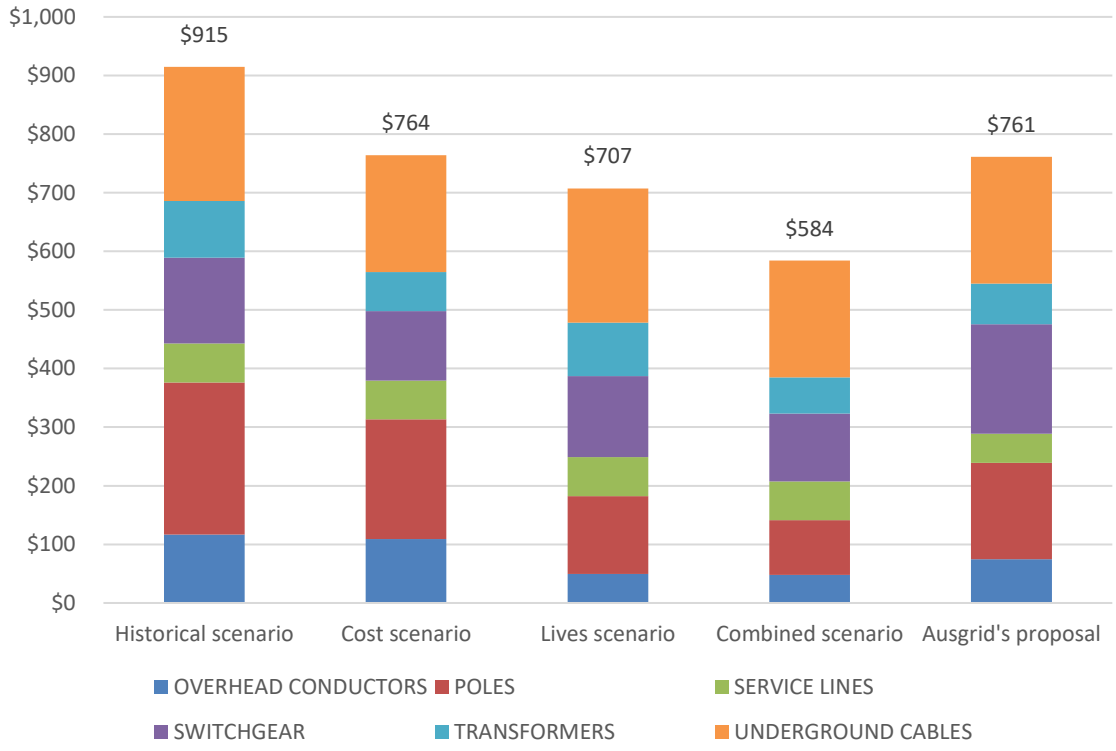
draft decision, we used these results to identify asset groups and categories to examine in greater detail, and to help inform our bottom-up assessment.

We also noted in our draft decision that Ausgrid initially asked Nuttall Consulting to provide opinions on our refined repex modelling approach.[58] Nuttall Consulting stated:

> "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."[59]

We agreed with this statement in our draft decision and outlined that this was our preferred approach to Ausgrid during our capex deep dive sessions. Our updated repex modelling results, using the additional year of category analysis RIN data for nine distributors, compared with Ausgrid's revised modelled repex forecast are presented below under Figure B.3.3.

### Figure B.3.3 – Revised repex modelling results ($2018–19, million)




Source: AER analysis.

Figure B.3.3 highlights that Ausgrid reduced its modelled repex forecast from $930.1 million to $761.4 million. It also provided additional information, including risk-based cost-benefit analysis spreadsheets and documents, to support many of the

[58] Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 3.
[59] Ausgrid and Nuttall Consulting, *Attachment 5.15 – Nuttall review of repex,* April 2018, p. 4.

programs in its modelled repex forecast. This information is discussed below in our bottom-up technical and engineering assessment.

Figure B.3.3 highlights that Ausgrid's revised modelled repex forecast is much closer to our updated repex modelling threshold than its initial forecast, which is shown in Figure B.3.2. For its revised proposal, Ausgrid re-engaged Nuttall Consulting to better understand our repex modelling approach and results. In its revised proposal, Ausgrid stated:

> "We have engaged further with the AER and our revised repex forecasts have been assessed against the AER's updated approach."[60]

Following this engagement, Ausgrid provided additional analysis and evidence that indicates the underlying repex model inputs used for several asset categories in our draft decision repex modelling results are not representative of its requirements for the 2019–24 regulatory control period.

For example, Ausgrid identified its dedicated low-voltage mains program that has not historically been required in its network and therefore cannot be assessed using the repex model. We have excluded this program from our modelled repex assessment and have instead assessed Ausgrid's risk-based cost-benefit analysis model. CCP10 submitted that:

> "We are also pleased to see how Ausgrid has worked with the AER on the operation and development of the refined repex modelling. This has resulted in a general reduction 'across the board' of Ausgrid's replacement capital requirements."[61]

Figures B.3.2 and B.3.3 indicate that our repex model results have changed between Ausgrid's initial proposal and revised proposal. This is primarily due to two main factors that are outlined below:

- Consistent with our final decision for other distributors, our updated repex model results use an additional year of category analysis RIN data for nine distributors (as noted above).
- Following its engagement on our refined repex modelling approach, Ausgrid and Nuttall Consulting provided additional analysis and evidence that indicates the underlying repex model inputs used for several asset categories in our draft decision repex modelling results are not representative of its requirements for the 2019–24 regulatory control period. Nuttall Consulting's views on six potentially non-representative asset categories are discussed below.

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60 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 22.

61 CCP10, *Response to Ausgrid's revised regulatory proposal 2019–24 and AER draft determination,* January 2019, p. 39.

### Nuttall Consulting's supplementary repex review

In its revised proposal, Ausgrid and Nuttall Consulting highlighted a selection of replacement programs that "may need to be modelled or assessed differently within the model or excluded from the repex component assessed through the model."[62]

These programs relate to six of Ausgrid's asset categories:

- low-voltage overhead conductors;
- low-voltage underground cables;
- 11kV switches;
- 11kV fuses;
- 11kV circuit breakers; and
- 22kV 600kVA multiphase ground-mounted transformers.

Nuttall Consulting stated:

> "The AER would need to reconsider the comparative unit costs it is using in its assessment method, as these are unlikely to reflect Ausgrid's circumstances."[63]

Below we outline our response to Ausgrid's revised proposal and Nuttall Consulting, and our assessment of these asset categories. We have made adjustments to the inputs for some asset categories only where sufficient justification has been provided.

#### Low-voltage overhead conductors

For Ausgrid's low-voltage overhead conductors, Nuttall Consulting stated:

> "The major component of the forecast in this asset category relates to a planned new program, which will reconfigure and then decommission an existing dedicated LV overhead network that is used to supply public lighting…
>
> The unit cost for this program is much lower than historical unit costs because it is largely decommissioning work, which can be planned as a bulk retirement package of work. As such, the low unit cost is more reflective of this type of program and the volume of work, and is not reflective of typical replacement costs for LV overhead conductor."[64]

Following our additional assessment of Ausgrid's dedicated low-voltage mains reconfiguration program, we agree that this program should be excluded from our repex modelling assessment. This program has not been historically required in Ausgrid's network and therefore is not captured in our calibration period. In addition, as Nuttall Consulting noted, including this program for the modelled low-voltage overhead conductor asset category produces an artificially lower unit cost for the forecast period.

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62 Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 1.
63 Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 1.
64 Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 4.

We have excluded this program from the unit cost calculation in the cost and combined scenarios in Figure B.3.3. As a result, the unit cost for this asset category has increased from $24,163 per unit in our draft decision (based on forecast costs) to $45,901 per unit in our final decision (based on historical unit costs). In addition, we have excluded the forecast for this program ($43.0 million) from Ausgrid's proposal comparison in Figure B.3.3.

**Low-voltage underground cables**

For Ausgrid's low-voltage underground cables, Nuttall Consulting stated:

> "A significant component of the forecast in this asset category relates to the replacement of Consac and HDPE cable types. The unit cost for replacing the Consac and HDPE cables are typically significantly higher (almost double) than for the reactive or ancillary replacement of conventional LV cable…
>
> Although I consider that this asset category and the underlying programs should still be allowed for in the modelling, further testing of the model/scenario results are likely to be required to investigate the appropriate parameters and possible adjustments. This is likely to require some form of detailed review of the programs in this category and Ausgrid's claims."[65]

Following our additional assessment of Ausgrid's low-voltage underground cable programs, we agree that the unit cost input used in our draft decision may not be representative of Ausgrid's requirements for the 2019–24 period. This is because Ausgrid's CONSAC and HDPE replacement programs, which are higher cost programs, dominate this asset category.

We have therefore excluded the NEM median comparison point from our revised repex model analysis. Although we maintain that Ausgrid's forecast unit cost for this asset category ($900,000 per unit) is very high compared with other distributors, we consider it is appropriate to apply Ausgrid's historical unit cost ($475,000 per unit) for this asset category.

**11kV switches**

For Ausgrid's 11kV switch asset category, Nuttall Consulting stated:

> "This asset category captures a broad range of asset types, covering lower cost air break switches ($11k) and higher cost ring main Isolators and fuse switches ($45k) contained within underground and chamber substations…
>
> …this asset category, as described, may not be treated appropriately through the AER's methodology and further consideration should be given to the unit costs in Ausgrid's circumstances."[66]

Following our additional assessment of Ausgrid's programs that map to the 11kV switch asset category, we agree that the unit cost input used in our draft decision may

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65 Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 7.

66 Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 9.

not be representative of Ausgrid's requirements for the 2019–24 period. As Ausgrid and Nuttall Consulting outlined, this asset category encompasses a range of different asset and technology types, and Ausgrid's network primarily has higher cost 11kV switches in underground and chamber substations. We have therefore excluded the NEM median comparison point from our revised repex model analysis and applied Ausgrid's historical 11kV switch unit cost ($18,642 per unit).

**11kV fuses**

The historical, NEM median and Ausgrid's forecast unit costs for the 11kV fuse category are broadly similar for Ausgrid's 11kV fuse asset category. In addition, in our revised repex model results, Ausgrid's forecast unit cost is the input that is applied in the cost scenario. The NEM median unit cost is therefore not applicable for this asset category, unlike the 11kV switch category. As a result, we have not made any adjustments to the inputs for this asset category.

**11kV circuit breakers**

For Ausgrid's 11kV circuit breaker asset category, Nuttall Consulting stated:

> "This asset category captures a range of asset types and replacement types, noting it captures circuit breakers within distribution substations, outdoor zone substations and indoor zone substations. It considers that the median replacement unit cost set by Essential Energy is likely to be reflective of switchgear replacement in distribution substations (typically 1-2 breakers per location) or outdoor circuit breakers only, which it considers is relatively consistent with its own costs for this type of circuit breaker."[67]

As noted above, we agree that different asset and technology types are more likely to affect the results of asset categories in the switchgear asset group. However, our revised repex model results use Ausgrid's historical unit cost as the underlying input. Therefore, similar to the 11kV fuse category, the NEM median unit cost is not applicable for this asset category. The historical, NEM median and Ausgrid's forecast unit costs for the 11kV circuit breaker category are also broadly similar for the 11kV circuit breaker category. As a result, we have not made any adjustments to the inputs for this asset category.

**22kV 600kVA multiphase ground-mounted transformers**

For Ausgrid's 22kV 600kVA multiphase ground-mounted transformer category, Nuttall Consulting stated:

> "Ausgrid's key concern is that the forecast unit cost is not directly comparable with any of its peers and should be determined by means other than standard peer comparison…Although I consider that this asset category and the underlying programs should still be allowed for in the modelling, further testing

[67] Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 10.

> of the model/scenario results are likely to be required to investigate the appropriate parameters and possible adjustments."[68]

Our additional assessment of this asset category revealed that our revised repex model results now use Ausgrid's historical unit cost as the input, rather than the NEM median unit cost. Therefore, we have not made any adjustments to the inputs for this asset category.

## Bottom-up technical and engineering assessment

As highlighted in section B.3.1, Ausgrid reduced its modelled repex forecast from $930.1 million to $761.4 million in its revised proposal. It has provided additional information, including risk-based cost-benefit analysis spreadsheets and documents, to support 20 of the repex programs and projects in its revised proposal. Consistent with our standard assessment approach, we have assessed a sample of these cost-benefit analysis models and targeted our assessment at specific programs and projects where we outlined particular concerns in our draft decision.

### Overview of Ausgrid's cost-benefit analysis framework

During our engagement with Ausgrid following our draft decision and in its revised proposal, Ausgrid outlined the overarching cost-benefit analysis framework that it was seeking to implement in response to our draft decision. A summary of this engagement is provided in Appendix D. CCP10 noted this engagement in its submission, stating:

> "Ausgrid renewed engagement with the AER on issues of replacement capital, with at least two workshops to better integrate their work with that of the modelling and analysis being done by the AER specialist teams."[69]

In its revised proposal, Ausgrid submitted:

> "Ausgrid has developed a series of models to support risk based decision making and inform replacement program requirements and prioritisation. The models have two main objectives:
>
> 1. the establishment of a Health Index for the Ausgrid asset base to monitor asset risks and support risk based decision making; and
>
> 2. support funding requirements as part of the 2019–2024 regulatory submission."[70]

Ausgrid also submitted that the method used to determine and evaluate risk is based on the principles of ISO31000: Risk Management, which considers risk in terms of likelihood and consequence. The quantified risk associated with each program and project is calculated using the formula outlined below under Figure B.3.4.

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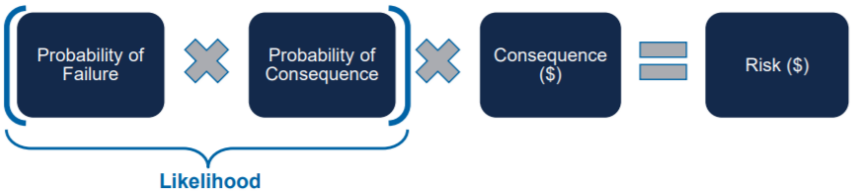
[68] Ausgrid and Nuttall Consulting, *Attachment 5.15.1 – Nuttall supplementary review of repex,* January 2019, p. 13.

[69] CCP10, *Response to Ausgrid's revised regulatory proposal 2019–24 and AER draft determination,* January 2019, p. 33.

[70] Ausgrid, *Attachment 5.13.M.0 – Repex program CBA modelling methodology,* January 2019, p. 3.

## Figure B.3.4 – Risk quantification formula




Source: Ausgrid, *Attachment 5.13.M.0 – Repex program CBA modelling methodology,* January 2019, p. 3.

To determine the probability of failure for different assets across a range of programs and projects, Ausgrid considers key factors that affect the probability of asset failure, such as age, condition, configuration, technology and utilisation. The probability of failure is then determined by establishing the relationship between historical failures and age or an alternative key factor using data correlation.

The probability of failure is further refined by adjusting for individual assets within an asset class based on other key factors and by applying a statistical adjustment method.[71] To calculate a forecast probability of failure, Ausgrid used two correlation analysis methods:

- Weibull analysis for discrete assets (such as poles, switches); and
- a modified CROW-AMSA analysis for linear assets (such as overhead mains and underground cables).[72]

Ausgrid's methodology uses a similar statistical method to the probability of failure calculations to determine the probability of consequence. For the avoidance of doubt, this calculation is the probability of an electricity asset causing a consequence event due to asset failure. An expected cost is then applied to the assumed consequence or consequences to calculate the total inherent risk associated with an asset or group of assets.

The consequence categories Ausgrid broadly considered are public and worker safety, environmental fines and remediation, fire-related consequences such as public safety and property damage, loss of supply (unserved energy), and financial costs such as maintenance and property damage.[73] Consequences are also allocated a level of severity – insignificant, minor, moderate, major and severe. Ausgrid's attachment 5.13.M.0 lists the expected monetised value of each of these severity levels for each of the different types of consequence outlined above.

Overall, we consider that Ausgrid's overarching cost-benefit analysis framework provides a solid basis to forecast the expected costs and benefits of required repex programs and projects. Its modelling also provides information to help target programs and projects, and to identify assets with the highest level of risk. However, like with any

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71 Ausgrid, *Attachment 5.13.M.0 – Repex program CBA modelling methodology,* January 2019, p. 3.
72 Ausgrid, *Attachment 5.13.M.0 – Repex program CBA modelling methodology,* January 2019, p. 6.
73 Ausgrid, *Attachment 5.13.M.0 – Repex program CBA modelling methodology,* January 2019, p. 11.

model, the underlying inputs, assumptions and parameters are crucial to determine the prudency and efficiency of repex forecasts.

Following our assessment of Ausgrid's broad cost-benefit analysis framework, we assessed a small sample of cost-benefit analysis models. As noted above, Ausgrid identified that its dedicated low-voltage mains program has not historically been required in its network and therefore cannot be assessed using the repex model. We therefore excluded this program from our modelled repex assessment and have instead assessed Ausgrid's risk-based cost-benefit analysis model. We discuss our assessment of this program below.

**Dedicated low-voltage mains reconfiguration**

Our assessment of Ausgrid's dedicated low-voltage mains reconfiguration program primarily relied on attachments 5.13.M.6 and 5.13.M.6A. Ausgrid's cost-benefit analysis model used the broad framework outlined above to calculate the expected level of risk inherent in its low-voltage mains assets over the 2019–24 regulatory control period if no assets are replaced (base case). Ausgrid's modelling outlines that safety risk is the primary concern relating to its dedicated low-voltage mains.

Ausgrid's analysis indicates that its preferred replacement option is likely to deliver marginal benefits to consumers. Although we have minor concerns relating to the underlying input parameters used for this program, overall we consider that this issue is likely to be insignificant in the context of Ausgrid's revised repex and total capex forecasts.

## B.4 Non-network capex

The non-network capex category for Ausgrid includes expenditure on information technology and communications (ICT), buildings and property, fleet and plant, and tools and equipment (minor assets).

In our draft decision, we also assessed Ausgrid's proposed Advanced Distribution Management System (ADMS) upgrade project and operational technology and innovation programs under the non-network category. To align with the presentation of Ausgrid's revised proposal, our assessment of these programs is detailed separately in section B.5.

### B.4.1 Ausgrid's revised proposal

Ausgrid's revised proposal includes forecast non-network capex of $405.4 million ($2018–19). This is a reduction of $84.1 million from Ausgrid's initial proposal of $489.5 million and an increase of $63.4 million from our draft decision of $342.0 million. Table  outlines Ausgrid's revised non-network capex proposal by component and compares this with Ausgrid's initial proposal and our draft decision.

### Table B.4.1 – Revised non-network capex proposal ($2018–19, million)

| | Initial proposal | Draft decision | Revised proposal |
|---|---|---|---|
| ICT | 157.0 | 133.8 | 144.2 |
| Property | 208.4 | 135.5 | 151.8 |
| Fleet and plant | 98.6 | 72.7 | 86.7 |
| Minor assets | 25.4 | 0.0 | 22.7 |
| **Total non-network** | **489.5** | **342.0** | **405.4** |

Source: AER analysis.

## B.4.2 Final decision position

We are satisfied that Ausgrid's forecast non-network capex of $405.4 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this view, we have assessed the project documentation accompanying Ausgrid's revised proposal and any further information provided by Ausgrid. In reviewing the information provided in support of the forecast, we have identified elements of Ausgrid's non-network capex that we consider Ausgrid has not sufficiently justified. However, we do not consider these issues are significant in the context of the overall capex forecast.

## B.4.3 Reasons for our position

We have assessed Ausgrid's revised non-network capex forecast by category. Our assessment of each category is outlined below.

### Information and communications technology

Ausgrid's revised proposal includes an ICT capex forecast of $144 million. This is a decrease of $13 million from Ausgrid's initial proposal and an increase of $10 million from our draft decision. Ausgrid has submitted that its revised proposal accepts our draft decision on ICT capex with the exception of our position on the Adapt program, which we did not consider was justified. Ausgrid has reproposed the Adapt program, but at a lower cost of $10 million. In response to our draft decision, Ausgrid provided a revised project justification report and cost-benefit analysis in support.

We received submissions from PIAC, EUAA and CCP10 that concerned Ausgrid's revised ICT capex proposal. Most submissions requested that we require Ausgrid to clearly define measurable consumer benefits from the ICT investment.

We reviewed the information provided by Ausgrid in support of the revised Adapt program. We do not consider that Ausgrid has adequately demonstrated benefit of this investment. However, this does not change our position on Ausgrid's capex forecast overall as we do not consider this has a material effect on the capex forecast. Our findings are as follows:

- In response to our draft decision that noted that the program lacked benefit quantification in support, Ausgrid has provided further analysis. However, Ausgrid did not demonstrate that these assumptions were reasonable.
- In our draft decision, we stated that Ausgrid had provided no evidence in support of its claim that this program would offset expected opex increases, which were not included in the opex forecast. Ausgrid has provided no further evidence in support of this claim.
- Ausgrid has also not addressed our concern that its submission that the Adapt program would offset expected opex increases is inconsistent with its submission that its transformation program will enable sustainable reductions in opex.[74] In the main Revised Regulatory Proposal document Ausgrid submits that its opex forecast does reflect ongoing savings, which contrasts the supporting documentation provided for the Adapt program:[75]

> "Our [opex] forecasts embed the significant cost decreases we have achieved through our transformation program, delivering ongoing savings of $100 million per year."

Nonetheless, we do not consider this issue is material in the context of Ausgrid's overall capex proposal.

### Property

Ausgrid's revised proposal includes $152 million for property capex. This is $57 million lower than Ausgrid's initial proposal and is $16 million higher than our draft decision. In response to our draft decision, Ausgrid provided revised NPC analyses, a Napier Blakely review of construction costs and a project deliverability assessment by Colliers. Some important aspects of Ausgrid's revised proposal include the following:

- Ausgrid submitted that it unintentionally overstated its property forecast when it intended to propose $188 million (SCS only).[76] Ausgrid submitted that its initial proposal of $208 million represented the entire property forecast, which is allocated in its cost allocation methodology (CAM) as 90% to Standard Control Services (SCS), 10% Alternative Control Services (ACS) and unregulated asset services.
- Ausgrid has submitted revised project timings and costs. Most notably, Ausgrid has deferred $15.6 million for the Wallsend office-building project into the subsequent regulatory control period and has lowered the scope of the Oatley depot replacement project by $11.3 million.[77]

We have reviewed the information provided by Ausgrid in support of its revised buildings and property forecast. While Ausgrid has come some way to address the concerns outlined in our draft decision, we do not consider that Ausgrid has provided sufficient information to demonstrate that its program as a whole is prudent and

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74 Ausgrid, *Regulatory proposal 2019–2024*, April 2018, p. 122.
75 Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 108.
76 Ausgrid, *Attachment 5.20 – Non-network property 2019–2024*, January 2019, p. 7.
77 Ausgrid, *Attachment 5.20 – Non-network property 2019–2024*, January 2019, p. 10.

efficient. However, we do not consider these issues are significant in the context of Ausgrid's overall proposal. Our findings are outlined below.

**Options analysis**

We expressed in our draft decision that Ausgrid had not explored other viable options such as targeted refurbishment options to address specific risks and inefficiencies. The revised NPC analysis remains binary (build now or defer for five years). Ausgrid's options analysis therefore remains insufficient.

**NPC analysis**

The revised JLL reports provided show immaterial NPC difference for the Homebush, Oatley and Wallsend depot projects. The difference is less than 5% and well below the margin of error in cost estimate. This demonstrates that Ausgrid has not identified a clear and material benefit to proceed with these projects within the next regulatory period.

We stated in our draft decision that Ausgrid had not supported its assumptions that opex costs and 'ongoing capital works costs' would halve under the build now option. Ausgrid has stated that it considers the opex assumption was reasonable as this was based on the advice received from JLL. However, Ausgrid has provided no further information to support its 50 per cent 'ongoing capital works costs' reduction. We note that Ausgrid would have its own historical data from which it could validate these assumptions. For example, Ausgrid could provide evidence of similar reductions achieved from previous projects.

We also note that Ausgrid has forecast opex reductions to occur in the final year of the regulatory control period.[78] Ausgrid has not proposed a corresponding step-change in its opex forecast. This is evidence that a portion of the investment cost should not be funded by consumers as Ausgrid will receive pay-back on the investment through the EBSS.

**Construction costs**

Ausgrid submitted that following engagement with ECA in preparation for submitting its revised proposal, it engaged Napier & Blakeley to review its construction cost assumptions. Ausgrid submitted that this review found that the assumed unit rates were reasonable. However, we note:

- Napier Blakeley stated in its report that "it must be noted that these feasibilities and the development program/cash flow as prepared by Ausgrid/JLL are not based on any actual concept design development or a thorough site investigation of conditions and efficiencies and consequently a broad number of costing assumptions have had to be made and which would require much more detailed input in due course to validate and prove up."[79] We consider that concept design is a necessary part of preliminary planning work to define the scope of work and

[78] Ausgrid, *Attachment 5.20 – Non-network property 2019–2024*, January 2019, p. 12.

[79] Ausgrid, *Attachment 5.20.8 – Napier Blakeley review of construction costs*, January 2019, p. 2.

provide a foundation for the planning cost estimate. Ausgrid's cost estimates lack this foundation support.

- Napier Blakeley reviewed most of Ausgrid's cost components where information was available. It states that the unit costs for some major components such as office, training and warehouse "is in our view conservative".
- Ausgrid's forecasts include contingency costs. These are a project management instrument to manage cost overrun risks. However, the actual cost of a project may either go above or below the original cost estimate. As such, we do not consider that these added costs meet the capex criteria.
- Ausgrid applies professional fees on all cost components. We note that some of the costs such as demolition cost and contractor margin do not incur professional fees.

**General refurbishment and future workplace**

In our draft decision, we made note of EMCa's view that Ausgrid had not justified the scope of the general refurbishment program given the significant investment in depots and buildings in the current regulatory control period.[80] We also stated that Ausgrid had not provided any detail of the efficiency outcomes that it expects to achieve from the Future Workplace program. We concluded that Ausgrid had therefore not demonstrated that these programs would form part of a capex forecast that reasonably reflects the capex criteria.[81]

In response to our draft decision, Ausgrid has subsequently reduced the scope of the two programs.[82] However, no further information has been provided to support the future workplace program. Ausgrid has therefore not demonstrated the expected benefits of this program.

### Fleet and plant

Ausgrid's revised proposal includes $87 million for fleet and plant capex. This is $12 million lower than Ausgrid's initial proposal and is $14 million higher than our draft decision. Ausgrid's revised proposal:

- is based on an updated fleet model and data set;
- accepts our draft decision on unit cost escalation[83] and EWP replacement lifecycle assumptions;[84]
- proposes a change in replacement criteria for crane borers; and
- applies a 30 per cent reduction to the yearly rate of replacement of light vehicles, 15 per cent reduction to heavy vehicles and 15 per cent reduction to EWPs.[85]

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

81 AER, *Ausgrid 2019–24 draft decision,* November 2018, pp. 5–103.

82 Ausgrid, *Attachment 5.20 – Non-network property 2019–2024*, January 2019, January 2019, p. 14.

83 Ausgrid, *Attachment 5.24.1 – Motor vehicle plant and minor assets capex*, January 2019, p. 8.

84 Ausgrid, *Attachment 5.24.1 – Motor vehicle plant and minor assets capex*, January 2019, p. 9.

85 Ausgrid, *Attachment 5.24.1 – Motor vehicle plant and minor assets capex*, January 2019, p. 9.

We are satisfied that Ausgrid's forecast $87 million for fleet and plant capex forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this position, we have reviewed the new fleet model provided by Ausgrid. We commend Ausgrid's strong engagement with us in preparation for submitting its revised fleet forecast.

**Crane borer replacement assumptions**

Ausgrid has proposed to change its replacement criteria for crane borers to a 10-year life from its current policy of a 15-year life[86]. Ausgrid has submitted that it undertook lifecycle analysis of both options and found that a 10 year replacement assumption achieved the lowest NPC.

Ausgrid in assessing the lifecycle costs of crane borers assessed the relative costs of each option over 20 years. We asked Ausgrid to undertake its analysis over 30 years given that lifecycle analysis over 20 years would ignore the remaining useful life of the 15-year vehicle.

Ausgrid's revised analysis[87] found that a 15-year replacement cycle, Ausgrid's current policy, yielded the lowest cumulative cost. Ausgrid has therefore not provided strong economic evidence in support of its proposed change in replacement criteria.

**Assumed reductions to fleet size**

Ausgrid submitted:[88]

> "We have embedded in our revised forecast a 30% reduction to our replacement rate for light vehicles and 15% for all other asset categories. This, in our view, responds to the CCP's submission that we should consider a rationalisation of our motor vehicle and plant equipment in the 2019–24 period in anticipation of further transformation initiatives."

We commend Ausgrid for its engagement on this issue in preparation for submitting its revised proposal. We asked Ausgrid to explain how it arrived at these assumed reduction rates. Ausgrid submitted that:[89]

> "Assumed replacement rates were decided in consultation with key stakeholders and business SMEs based on current and future benchmarking, previous success with fleet reduction programs and a forward view of both the works program and the future transformation of the organisation. This was then proposed and subsequently endorsed by our IGC."

Ausgrid has not evidenced these claims. We note that Ausgrid has shown that it has benchmarked its current fleet size against other DNSPs.[90] However, Ausgrid's transformation process is ongoing. Ausgrid has provided no evidence that it has benchmarked its fleet size against its likely future staffing requirements.

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86 Ausgrid, *Response to AER information Request 053*, 18 January 2019, p. 7.

87 Ausgrid, *Response to AER Information Request 053*, 6 February 2019.

88 Ausgrid, *Attachment 5.24.1 – Motor vehicle plant and minor assets capex*, January 2019, p. 9.

89 Ausgrid, *Response to AER information Request 053*, 18 January 2019, p. 8.

90 Ausgrid, *Revised proposal 2019–2024*, January 2019, pp. 94–95.

Ausgrid has also not provided any evidence that these reductions have been reviewed and endorsed by its Investment Governance Committee (IGC). We also note that this gradual five-year fleet reduction strategy may be unnecessarily long and a much shorter time may be sufficient.

### Minor assets

Ausgrid classifies minor assets as tools with an individual or group value below $1000 as well as other miscellaneous items such as furniture. We note that this was presented within the fleet and plant capex forecast as part of the initial proposal.

Ausgrid's revised proposal includes $22.3 million for minor assets capex. This is 11 per cent lower than its initial proposal of $25.4 million. In response to our draft decision, Ausgrid submitted that it engaged PWC to review this category of expenditure, in particular to provide clarification for historical expenditure on this item. Historical expenditure was then trended forward to develop the forecast. Ausgrid has demonstrated that its proposed capex for minor assets forms part of a capex forecast that reasonably reflects the capex criteria.

Ausgrid submits:[91]

> "In developing our base level of minor asset capex, we have adopted an average of the last 7 years' worth of expenditure. We took an average of 7-years given that it would adjust for the annual variability in investment requirements from year-to-year. A longer-term view also smooths out historically-low investment in recent years which has arisen from the disruptions caused to our business by the lease transaction issue."

We note that Ausgrid has significantly reduced minor asset capex over the past seven years. For the reasons outlined in our draft decision,[92] we do not consider that longer term levels of historical expenditure is likely to be reflective of the prudent and efficient costs of the forthcoming regulatory control period. However, we do understand Ausgrid's unique circumstances of the current regulatory control period.

We note the most recent year of actual audited data has revealed that Ausgrid has incurred $4.7 million on minor asset capex. Ausgrid has therefore demonstrated that, while operating under the CESS mechanism, that it can incur minor asset capex levels similar to that of which has been proposed by Ausgrid. We also note that for the two years preceding the lease transaction process (FY13 and FY14), while not operating under the CESS mechanism, Ausgrid incurred similar levels to its forecast. On this basis, we accept Ausgrid's revised minor assets capex forecast as being a reasonable estimate of the likely costs required for the 2019–24 regulatory control period.

## B.5 Operational technology and innovation

The operation technology and innovation (OTI) category of expenditure for Ausgrid includes the following programs:

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91 Ausgrid, *Attachment 5.24.1 – Motor vehicle plant and minor assets capex*, January 2019, p. 16.

92 AER, *Ausgrid 2019–24 draft decision*, November 2018, pp. 85–86.

- network innovation;
- planning and technology data usage;
- core system refresh; and
- additional cyber security.

We have also included Ausgrid's proposed ADMS upgrade project under this category.

### B.5.1 Ausgrid's revised proposal

Ausgrid's revised proposal includes forecast capex of $136.8 million for OTI projects over the 2019–24 regulatory control period. This is an increase of $37.0 million from Ausgrid's initial proposal of $99.8 million and an increase of $133.4 million from our draft decision. Table B.4.4 outlines Ausgrid's revised OTI capex proposal and compares this with Ausgrid's initial proposal and our draft decision.

**Table B.4.4 – Revised OTI capex proposal ($2018–19, million)**

| | Initial proposal | Draft decision | Revised proposal |
|---|---|---|---|
| ADMS upgrade | 41.4 | 0.0 | 59.8 |
| Network innovation | 42.7 | 0.0 | 42.0 |
| Planning and technology data usage | 12.3 | 0.0 | 11.9 |
| Core system refresh | 3.4 | 3.4 | 3.4 |
| Additional cyber security | - | - | 19.6 |
| **Total non-network** | **99.8** | **3.4** | **136.8** |

Source: AER analysis.

### B.5.2 Final decision position

We are satisfied that Ausgrid's forecast OTI capex of $136.8 million ($2018–19) forms part of a total capex forecast that reasonably reflects the capex criteria. In coming to this view, we have assessed the project documentation accompanying Ausgrid's revised proposal and any further information provided by Ausgrid.

In reviewing the information provided in support of the forecast, we have identified elements of Ausgrid's OTI capex that have not been adequately supported. However, this does not change our position on Ausgrid's forecast capex overall.

### B.5.3 Reasons for our position

For our final decision, we focused on the incremental differences between our draft decision and Ausgrid's revised proposal. These incremental differences are:

- ADMS upgrade;
- network innovation;
- planning and technology data usage; and

- additional cyber security.

We discuss these four areas in the sections below.

### ADMS upgrade

Ausgrid's revised proposal includes $59.9 million for the ADMS upgrade project. This is an increase of $18.5 million from its revised proposal. In response to our draft decision, Ausgrid provided a revised business case and cost-benefit analysis in support. In regards to the increased cost, Ausgrid submits:[93]

> "Following the submission of our Initial Proposal, further planning and design workshops were held with vendors and the relevant Commonwealth authorities, resulting in a change to the scope of the ADMS requirements. This changed scope included introducing a staged implementation approach to de-risk the implementation and address the requirement to onshore all Ausgrid data during implementation.
>
> The increased scope of requirements changed the project cost from $41.3m to $59.9m during FY20-24. This approach was validated by reference site visits and calls and aligned schedules for staged implementation and cutover. The revised approach also includes strengthened governance and additional compliance requirements to meet Ausgrid's Critical Infrastructure Licence Conditions."

We also note that Ausgrid has proposed to establish a Network Innovation Advisory Committee (NIAC) to provide advice on certain projects. Ausgrid has committed that if it does not spend any capex overseen by the NIAC in the regulatory period, it will not receive a benefit under the Capital Expenditure Sharing Scheme (CESS).[94] Ausgrid has proposed that this project is overseen by NIAC, and will be excluded from the capex allowance for CESS purposes.[95] CCP10 submitted that they supported this project on that basis.[96]

We have undertaken a review of the supporting business case and cost-benefit analysis. We consider that while Ausgrid has demonstrated that the project represents a prudent investment, there are aspects of Ausgrid's cost forecast that have not been supported. However, this does not change our position on Ausgrid's forecast capex overall. Our findings are outlined below.

#### Options analysis

Ausgrid has identified and assessed the following six options:

- continue with current Distribution Network Management System (DNMS);
- contemporising the DNMS;
- like-for-like replacement;

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93 Ausgrid, *Attachment 5.13.N – ADMS Project Justification*, January 2019, pp. 3–4.

94 Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 80.

95 Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 150.

96 CCP10, *Response to Ausgrid's revised regulatory proposal 2019–24 and AER draft determination*, January 2019, p. 39.

- DMS (ADMS phase 1 only);
- part ADMS (ADMS phase 1 and 2 only); and
- full ADMS (ADMS phases 1, 2 and 3).

Ausgrid's options development has vastly improved from its initial proposal. We now consider that the range of options that Ausgrid has identified and assessed is reasonably complete for the purpose of assessing the investment. In response to our draft decision, Ausgrid has constructed a base case for this study, being to continue with the current DNMS. Ausgrid has also adequately considered various scopes of the system, from making minimum change to adopting a full scale ADMS.

We note that Ausgrid has not specifically investigated the optimal timing of the investment. However, its cost model provided data for us to ascertain the total costs should its preferred option be deferred. It showed that the annual operating cost of the existing DNMS would exceed the annual deferral benefit. This suggests that it is reasonable for Ausgrid to start its ADMS implementation now.

**Cost-benefit assessment**

We have reviewed in depth the assumptions of Ausgrid's CBA assessment. We consider that Ausgrid's analysis is reasonably detailed and credible. We note that:

- the cost model appears to have included all capital and operating costs of continuing the operation of the existing DNMS while the ADMS is being implemented, as well as the cost of new system;
- given that Ausgrid's cost components are common across all options, and contractor's cost components are the outcome of competitive sourcing, we have reasonable ground to believe that the cost assumptions are adequate;
- Ausgrid's cost estimate for the base case includes capital costs to address limitations of the existing DNMS. We consider that if the life of DNMS is only to be extended for a short period, then some of the capex could be reduced, in particular the DNMS enhancements. However, we note the total annual cost is still higher than the saving from a one year deferral of ADMS. While this inadequacy of Ausgrid's model would alter the cost assessment outcome, it does not change the relative merits of the options;
- in response to our criticism of lack of assessment of ADMS benefits, Ausgrid's cost model has provided a detailed breakdown of benefit components and has quantified each benefit. The benefit is estimated based on a set of assumptions developed by Ausgrid's consultant DGA. These assumptions are estimated based on DGA's experience and the current Ausgrid operational figures. While most of the assumptions appear reasonable, some may be overly optimistic. For example, the model assumes that time saving for writing and checking switching instructions under the new ADMS is 25%. We consider the work load reduction estimate is sound, however the reduction of this work load cannot be fully translated to cost savings because of the minimum operator staffing levels that must be maintained in network operation centres.

Overall, we consider the benefit assumptions and benefit estimates are within a reasonable range, or represent the best estimates under the current circumstance. We anticipate Ausgrid will document closely the benefits of this investment and incorporate them in future regulatory proposals. Having the project overseen by the NIAC provides a valuable opportunity for this to occur.

**Contingency costs included in forecast**

Ausgrid's ADMS cost includes a contingency allocation. We note this was included "to account for scope/execution challenges".[97] We consider that contingency costs are a project management tool, not a definite cost that requires consumers to fund.

### Network innovation

Ausgrid's revised proposal includes $42 million for network innovation, comprised of the same 11 projects as the initial forecast.[98] In response to our draft decision, Ausgrid provided updated cost-benefit analysis for each project and an independent review of the program by GHD Consulting.

Similarly to the ADMS upgrade project, Ausgrid has proposed that this program is overseen by the NIAC and therefore will not contribute to the capex allowance for CESS calculation.[99] This initiative and the program itself was supported strongly in the submissions we received. For example, PIAC submitted:[100]

> "PIAC considers that the establishment of the Network Innovation Advisory Committee provides a useful mechanism to help ensure consumer benefits are, indeed, realised by the fund. As such, we support Ausgrid's proposed Network Innovation Fund."

CCP10 and EUAA also expressed support of the proposed investment.

We have undertaken an assessment of the new information provided in support of the program. While we recognise the strong consumer support for the Network Innovation portfolio, we do not consider that Ausgrid has sufficiently justified the program. In our view, Ausgrid's innovation programs better fit as ordinary network augmentation programs. As such, these need to be subject to normal business case review and cost-benefit assessment in accordance with capital expenditure criteria. GHD's report echoed our view in its assessment of many the projects.

While we do not accept or approve certain projects, we note that if Ausgrid decides to undertake this program in the forthcoming period, it is our expectation that Ausgrid documents closely the benefits arising from this expenditure. We expect detailed ex-post reviews and regular performance reporting for all projects to demonstrate the

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97 Ausgrid, *Attachment 5.13.N.2 – EY ADMS business case independent review*, January 2019, p. 1.

98 Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 80.

99 Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 80.

100 PIAC, *Submission to the AER's draft determinations and the NSW DNSPs' 2019–24 revised proposals,* February 2019, p. 10.

prudency and efficiency of these projects. It is also important to note that, as GHD states:[101]

> "86% of Ausgrid's proposed Network Innovation Program costs are incurred between 2020 and 2024 whilst 73% of the forecast benefits will occur from 2025-29. Where benefits are realised, there should be appropriate adjustments made to forecasts in future periods. The implementation of the Network Innovation Advisory Committee provides an opportunity for more detailed and transparent examination of costs and benefits throughout the regulatory period."

We concur with GHD. We consider it an expectation that these adjustments are accounted for as part of future regulatory proposals. Our findings are outlined below.

**Insufficient information in support of individual projects**

In response to our draft decision, Ausgrid has provided quantitative cost-benefit analysis for each projects. However, Ausgrid has still not provided detailed business cases or cost-breakdowns for any projects. Ausgrid has therefore not provided sufficient information about the scope and options considered for each project.

**Insufficient evidence benefits have been accounted for in overall proposal**

Ausgrid's cost-benefit analysis calculates an assumed forecast cost reduction benefit of $8.5 million over the 2019–24 regulatory period. Ausgrid has provided no evidence that these benefits are accounted for in its revised expenditure proposal. As such, we remain of the view that a portion of this capex should not be funded by consumers.

**Alternative funding arrangements not considered**

In our draft decision we suggested that the Dynamic Load Control Program, given its demand management nature, could be funded through the DMIA.[102] Ausgrid in making its revised proposal has simply reproposed the project for the capex allowance.

As GHD also states, the Australian Renewable Energy Agency can fund projects that increase the uptake of renewable energy onto the grid. The Service Target Performance Incentive Scheme (STPIS) also provides networks with incentives for maintaining and improving network performance.

In short, Ausgrid has provided no evidence that it has considered alternative funding for these projects. As such, we question, further to the concerns outlined below, that the forecast capital expenditures for these projects is required over the 2019–24 regulatory control period.

**Lack of 'innovation'**

We note that many of these programs, such as Network Insights, Portable All-In-One Off-Grid Supply Units, Dynamic Load Control, On-Line Asset Condition Monitoring,

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101 Ausgrid, *Attachment 5.13.L.1 – GHD independent review of the network innovation portfolio*, January 2019, pp. 55–56.

102 AER, *Ausgrid 2019–24 draft decision,* November 2018, p. 5–92.

Self-Healing Network and Line Fault Indicators are not innovations. These are deployment of mature technologies and in many cases, a continuation of Ausgrid's current work. GHD states this to Ausgrid in their advice on individual programs.

Further, some programs, such as Micro-Grid, EV Charging and Advanced Voltage Regulation, are repeating trials conducted by others. The incremental benefit of repeating these trials has not been demonstrated. GHD also made this point in its advice to Ausgrid.

**Cost-benefit analysis**

We have reviewed Ausgrid's cost benefit model. In short, we have found assumptions that have not been demonstrated to be reasonable. We therefore consider that the model has not presented a credible assessment of CBA outcomes of these investments. We provide a high-level discussion of the issues we found below.

- Ausgrid's cost model used assumptions that frequently are not supported by evidence and analysis. For example, for the high voltage micro-grid program, it assumed that the customers would have 20 outages per year. This is well outside what is considered normal performance range. For the portable power supply program, Ausgrid has assumed that each battery will be used for 12 hours a week for each week of the year. We do not consider that this would be true, because these would only be needed in peak demand (i.e. winter or summer periods);
- Ausgrid's cost model has misaligned cost and benefits. For example, for On-Line Asset Condition Monitoring, it compared the cost of implementing on-line monitoring technology on a single feeder, with the benefit from implementing the technologies on all feeders that would otherwise require augmentation work;
- Ausgrid's model has overstated program benefits. For example, for Network Insights and Dynamic Load Control programs, Ausgrid assumed the investment would yield capex deferral benefit for up to 10 years.

### Planning and technology data usage

Ausgrid's revised proposal includes $11.9 million for the Planning and Technology Data Usage project. In response to our draft decision, Ausgrid provided a detailed business case in support of the project, cost-benefit analysis and an independent review of the project by GHD consulting.

We have reviewed the business case and cost-benefit analysis provided by Ausgrid in support of the investment. We consider that the project has been demonstrated to be prudent and efficient. However, we consider that a portion of this project's cost should be self-funded as opposed to be recovered through the capex allowance. Nonetheless, this does not change our position on Ausgrid's capex forecast overall as we do not consider this issue is material. Our findings are outlined below.

**Options analysis**

Ausgrid assessed the outcomes of three options:

1. complete asset capture of all remaining network assets near roadways and ongoing LiDAR and high-resolution imagery on a three-yearly cycle;

2. complete asset capture of all remaining network assets near roadways with no new recurring program; and
3. manual asset capture (where possible for the remaining network assets during the five-yearly pole and line inspections). No additional investment in LiDAR or high-resolution photography programs.

Ausgrid submits that Option 3 represents the base case as it represents not performing any additional LiDAR and high-resolution photography beyond its current program. We consider that Ausgrid's options analysis is sufficient as it considers and quantifies a 'business-as-usual' option, as well as considering options of variant scope.

**Cost-benefit assessment**

Ausgrid has identified benefits from Complete Asset Capture in four categories: vegetation encroachment related benefit, LV spreader related benefit, capital efficiency related benefit and unregulated services related benefit. We have reviewed Ausgrid's calculation of each benefit. We consider that Ausgrid's cost benefit analysis provides a reasonable estimate of the likely costs and benefits of the Complete Asset Capture. As such, we consider that Ausgrid has demonstrated that there are likely to be net positive benefits from this added expenditure. However, we note the following:

- Ausgrid's modelling assumes that $6.5 million of capex/opex benefit will be achieved within the 2019–24 regulatory control period. Ausgrid has not identified how these benefits have been incorporated into its respective capex and opex forecasts. On this basis, it would result in a potential double-recovery of these benefits if we were to allow for these benefits to be included in the forecast revenues.
- Ausgrid's modelling forecasts that it will get an additional $19.7 million of unregulated revenue in 2019-20 to 2033-34. We would consider that at least as a principle, the cost of this program should be proportionally recovered through unregulated revenue rather than recovered completely from consumers.

As such, we consider that a prudent operator would reduce the project's cost accordingly.

### Additional cyber security

Ausgrid's revised proposal includes an additional $19.6 million to enhance and achieve best practice OT security as required by its Licence conditions.[103] Ausgrid submits:[104]

> "Since lodging or Initial Proposal in April 2018, we have sought external review of our cyber investment and preparedness. That review has recommended that we expand our cyber security investment in the next regulatory period. While this program will continue to be refined in line with industry developments, Ausgrid will be required to increase its proposed cyber security in the 2019–24 regulatory period. This program represents an additional $20 million of OTI capex."

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[103] Ausgrid, *Attachment 5.13.L.1 – GHD independent review of the network innovation portfolio,* January 2019, p. 18.

[104] Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 78.

Ausgrid has proposed this investment be overseen by its Technology Review Committee. Under this proposal, this investment will be excluded from its allowance for the purposes of the CESS for the 2019–24. The submissions we have received, generally supported Ausgrid's proposed investment on the basis that it will be subject to review by the Technology Review Committee.

We have reviewed the information provided by Ausgrid in support of this additional cyber security expenditure. Ausgrid has not demonstrated its additional cyber security capex program against the capex criteria. However this does not change our position on Ausgrid's capex forecast overall as we do not consider this program has a material effect on the overall capex forecast.

We note that the cyber security landscape is one of continuing complexity and increased risk. Ausgrid is required under the NER to comply with all relevant regulatory obligations and requirements[105] as well as maintain the security of supply of standard control services.[106] Ausgrid's Licence requires "best industry practice" in relation to ensuring that its network cannot be controlled or operated by persons outside of Australia.

Ausgrid engaged Ernst and Young (EY) to undertake a cyber-security investment review.[107] Ausgrid's planned investment over the forthcoming regulatory control period has been driven by the timeframes and projects as identified by EY to meet required levels of cyber maturity. Ausgrid's proposed program delivers investments which will deliver:[108]

- additional capability to increase level of maturity and meet industry practice; and
- uplift, enhancement or refresh of existing capability.

From review of the information provided, we accept that in principle, a need has been demonstrated by Ausgrid. However, we wish to highlight the lack of evidence provided by Ausgrid to demonstrate the consumer benefit of this expenditure. In particular, we note that no additional risk assessment has been provided to assess this new expenditure. We also note that "best industry practice" is a somewhat abstract and ever evolving expectation. In the case where EY's expectation of best industry practice in the future exceeds what is realistically required, Ausgrid's forecast will represent costs that will be above prudent and efficient costs. In consideration of the information available, and the capex factors, we consider that any issue is likely to be immaterial in the context of Ausgrid's overall proposal.

## B.6 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

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105 NER, cl. 6.5.7(a)(2).

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

107 Ausgrid, *Attachment 5.19.1 – Justification for OTI programs*, January 2019, p. 18.

108 Ausgrid, *Attachment 5.19.1 – Justification for OTI programs*, January 2019, p. 19.

Australian Accounting Standards and the distributor's cost allocation methodology (CAM).

### B.6.1 Ausgrid's revised proposal

Ausgrid has forecast $590.5 million ($2018–19) for capitalised overheads in its revised proposal for the 2019–24 regulatory control period.[109] This is $13.4 million—or 2 per cent—higher than our draft decision, and $30.8 million—or 5 per cent—lower than its initial proposal. Ausgrid submits that the increase in forecast capitalised overheads compared with our draft decision reflects the higher proposed direct capex in its revised proposal.[110]

### B.6.2 Final decision position

We are satisfied that Ausgrid's proposed capitalised overheads of $590.5 million ($2018–19) would form part of a total capex forecast that reasonably reflects the capex criteria. We have therefore included this amount in our final decision.

### B.6.3 Reasons for our position

In coming to our position, we had regard to our assessment of Ausgrid's forecast capitalised overheads in our draft decision, Ausgrid's reasons for its revised forecast and its revised forecast for direct capex, and stakeholder submissions.

In our draft decision we examined Ausgrid's forecasting methodology for its proposed indirect capital program support costs and direct network planning costs. We found that Ausgrid's methodology was robust and provided a forecast that reasonably reflects the capex criteria.

However, we considered that 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 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 applied a proportional cut using the same methodology that we applied in the 2016 Victorian determinations; that is, a 1 per cent change to our substitute estimate of capitalised overheads for each 4 per cent difference between Ausgrid's initial 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

[109] Ausgrid, *Attachment 5.02.2 – Master list of capex projects and programs*, January 2019.

[110] Ausgrid, *Revised proposal 2019–2024*, January 2019, p. 102.

methodology resulted in our draft decision for capitalised overheads of $577.1 million. This was $44.1 million, or 7 per cent, lower than Ausgrid's proposal of $621.3 million.

### Stakeholder submissions

In its response to the AER draft decision for NSW electricity distributors 2019–24 Origin Energy submitted that:[111]

> "We understand that there is not a proportionate relationship between movements in capex and overheads, however, we would expect a ratio of movement greater than a 1 to 4 ratio as applied in the Ausgrid assessment. Furthermore, we believe it would be insightful for the AER to directly compare the direct and indirect overheads for both capex and opex of each of the networks as a percentage of direct spend to allow for a comparison of the respective efficiencies in overhead allocation."

It is difficult to determine a consistent relationship between changes in direct capex and capitalised overheads with precision. We have adjusted capitalised overheads at a ratio of 1 to 4 to direct capex in a number of resets to date, when a more accurate forecasting methodology is not available. This approach is generally accepted by industry and stakeholders, and gives us the means to make meaningful adjustments to forecast capitalised overheads with the data available before us.

Furthermore, we agree in principle that benchmarking overheads across businesses may be useful. We operate an ongoing program to review and incrementally refine elements of the benchmarking methodology and data. One issue we will consider is the implication of changes in cost allocation and capitalisation approaches between DNSPs (e.g. corporate overheads) on our benchmarking results. We are currently reviewing our benchmarking development priorities for the next twelve months. We will consult with all stakeholders as part of our ongoing program.

### Ausgrid's revised proposal

Ausgrid's revised proposal is $13.4 million (2 per cent) higher than our draft decision. It submits that, "Our revised capex proposal includes more direct capex for network and non-network than the AER approved in its Draft Decision. As a result, our revised capital overhead support costs are higher than the AER Draft Decision."[112]

This approach is in line with the methodology we used in our draft decision to reduce Ausgrid's capitalised overheads proportionately with our reductions in direct capex. Importantly, Ausgrid has proposed a 2 per cent increase in its forecast capitalised overheads compared with our draft decision. This compares with a 20 per cent increase in its forecast direct capex. That is, the proportional increase in capitalised overheads (around 1 per cent per 9 per cent increase in direct capex) in its revised proposal is much smaller than the proportional decrease that we applied (1 per cent per 4 per cent decrease in direct capex) in our draft decision.

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111 Origin Energy, *AER draft decision for NSW electricity distributors 2019–24,* February 2019.

112 Ausgrid, *Attachment 5.01 Ausgrid's revised proposal,* January 2019, p. 46.

Given that Ausgrid's starting point for its revised forecast for capitalised overheads is our draft decision, and that we accept the reasonableness of its proportional adjustment, we are satisfied that its revised forecast reasonably reflects the capex criteria.

# C 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.

## C.1 Background to predictive modelling

In 2012, the AEMC published changes to the National Electricity and National Gas Rules.[113] Following these rule changes, the AER undertook a "Better Regulation" work program, which included publishing a series of guidelines setting out our approach to regulation under the new rules.

The Guideline describes our approach, assessment techniques and information requirements for setting efficient expenditure allowances for distribution network service providers (distributors).[114] 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 regulatory 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.[115] At a basic level, the AER's 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.

The repex model can be used to advise and inform us and our consultants where to target a more detailed bottom-up review, and define a substitute repex forecast if

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

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

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

necessary. The model can also be used to benchmark a distributor against other distributors in the NEM.[116]

As detailed in the AER's 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.

## C.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 distribution businesses in the NEM. The RIN responses relied on are:

- annual category analysis RINs that are issued to all distributors in the NEM; and
- reset RINs that distributors are required to submit with their regulatory 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. In both RINs, 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.[117]

## C.3 Scenario analysis

In this section we set out the broad assumptions used to run a series of scenarios to test distributors' modelled repex forecasts. The specific modelling assumptions applied for each distributor are outlined in each individual repex modelling workbook. The four scenarios analysed are:

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[116] This includes Power and Water Corporation.

[117] 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; and
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.

## C.4 Calibration

The calibration process estimates the average age at replacement for each asset category using the observed historical replacement practices of a distributor. 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 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[118];
- 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 historical 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.

## C.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 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

[118] Each distributors' specific repex modelling workbook outlines more detailed information on the calibration period chosen.

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 regulatory 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 cost benchmarking, where Ofgem applies a unit cost reduction where the distributor's forecast unit cost was higher than industry median.[119] 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 replacement lives (based on historical replacement practices) and the median expected 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

[119] Ofgem, *Strategy decisions for the RIIO-ED1 electricity distribution price control – Tools for cost assessment*, 4 March 2013.

scenario'.[120] This approach gives consideration to 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.

## C.6 Non-like-for-like replacement

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.[121] 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.[122] 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 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 staked to extend its life.[123]

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120 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'.

121 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.

122 For example, conductor rated to carry low-voltage will be replaced with conductor of the same rating, not conductor rated for high-voltage purposes.

123 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

There are also circumstances where an in-commission staked pole needs to be replaced. Staking is typically 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.[124]

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 during the calibration process.

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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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.

[124] 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.

# D Engagement process

## Information requests

Ausgrid submitted its revised proposal in January 2019. Throughout our assessment of Ausgrid's revised proposal, we requested further information via several information requests. We sent six information requests relating to Ausgrid's revised capex forecast. These questions aimed to test our understanding of the revised material provided and to clarify capex-related issues, particularly relating to data reconciliation and Ausgrid's cost-benefit analysis models.

## Engagement

We have engaged with Ausgrid and other key stakeholders on several occasions throughout our assessment of its revised proposal. These interactions are summarised below:

- 26 November 2018 – We met with Ausgrid to discuss Ausgrid's revised repex forecast. Ausgrid responded to issues we raised in our draft decision, and provided an initial presentation of its cost-benefit analysis methodology and gave us feedback on our draft decision repex model results. Ausgrid also outlined additional refinements to its unmodelled and reactive repex forecasts.
- 4 December 2018 – We met with Ausgrid, its consultants from Frontier Economics and CutlerMerz, and ECA's consultant John Howarth to run through Ausgrid's cost-benefit analysis methodology at a more detailed level. Ausgrid provided an update on its methodology, outlined key assumptions and provided an input and parameter overview. It also provided us several repex cost-benefit analysis models so we could begin a high-level assessment and provide initial feedback.
- 7 December 2018 – We met with Ausgrid via teleconference to discuss Ausgrid's revised non-network capex forecast. Ausgrid responded to the issues we raised in our draft decision and provided an initial presentation on the revised analysis it had undertaken in preparation for submitting its revised proposal.
- 10 December 2018 – We met with Ausgrid via teleconference to discuss Ausgrid's revised non-network OTI capex forecast. Ausgrid responded to the issues we raised in our draft decision and provided an initial presentation on the revised analysis it had undertaken in preparation for submitting its revised proposal.
- 12 December 2018 – We met with Ausgrid, ECA's consultant John Howarth and members of CCP10 to discuss Ausgrid's revised ADMS upgrade project. Ausgrid presented its revised business case and cost-benefit analysis it had undertaken in response to our draft decision.
- 12 December 2018 – We met with Ausgrid via teleconference to discuss the consultant report to be provided in support of the revised minor asset capex forecast.
- 14 December 2018 – We met with Ausgrid, its consultants from EY and ECA's consultant John Howarth via teleconference to discuss Ausgrid's revised fleet and

plant capex model. Ausgrid outlined its revised methodology, outlined key assumptions and provided an input and parameter overview.

- 14 December 2018 – We met with Ausgrid via a video conference to provide our preliminary views and feedback on Ausgrid's initial cost-benefit analysis models. We highlighted several modelling errors that Ausgrid had also identified and noted that it would rectify these issues in its revised proposal submission.
- 17 December 2018 – We met with Ausgrid and ECA's consultant John Howarth to discuss aspects of its buildings and property capex forecast. In particular, Ausgrid responded to issues raised by ECA in regards to the assumed costs of property projects.
- 15 January 2019 – We met with Ausgrid via teleconference to discuss its revised fleet and plant capex model and response to an information request. Ausgrid outlined the workings of the model and answered questions regarding how the model operated.
- 26 February 2019 – We met with Ausgrid via teleconference to discuss an information request relating to the underlying modelling assumptions in Ausgrid's capex model. Ausgrid explained how these assumptions are applied in its internal financial modelling system. As noted in section 5.4, in the context of Ausgrid's total net capex forecast, we consider that its inflation and labour price escalation assumptions are reasonable and we have therefore not made any adjustments.

# E Forecast 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.[125] Accurate demand forecasts are therefore important inputs to ensure efficient levels of network investment.

We are satisfied the system demand forecast in Ausgrid's revised regulatory proposal for the 2019–24 regulatory control period reasonably reflects a realistic expectation of demand. We acknowledge that demand forecasting is not a precise science and that Ausgrid's forecasts will inevitably contain errors.

In our draft decision, we considered Ausgrid's approach to forecasting demand to be reasonable, but had identified a number of issues for Ausgrid to address in the revised proposal. Our assessment showed that:

- Ausgrid forecasted that over the period of 2017–18 to 2023–24, summer peak demand would grow at 1.2 per cent per annum, in contrast to AEMO's forecast of annual growth over the same period of 0.1 per cent.
- Ausgrid's approach to forecasting block loads departed substantially from the approach taken by AEMO and contributed to Ausgrid's higher growth rates.
- Ausgrid's forecasts for block loads, including demand from road tunnels, data centres and rail projects were overstated, or not adequately tested.

In its revised proposal, Ausgrid revised its peak demand forecast to account for the latest 2018 economic information and new large customer connections. Ausgrid also sought external advice and updated its modelling to estimate the effect on demand of rooftop PV, battery storage and energy efficiency. The revised forecast projects system peak demand to increase by about 0.8 per cent per annum over the 2019–24 regulatory control period.[126] Demand is forecast to increase further in the short term, primarily due to price response, reflecting the update to AEMO's electricity price forecasts. However, in the longer term, the growth trajectory is flatter than previously forecasted. This is due to the effect of energy efficiency, rooftop PV and battery storage in countering higher demand.[127] According to Ausgrid, following the updates by both Ausgrid and AEMO, its demand forecasts are 'significantly more closely aligned' with each other.[128]

At the spatial level, around 54 per cent of zone substations in summer and 43 per cent of zone substations in winter are expected to experience growth in maximum demand over the period to 2024, down from 62 per cent of zones in summer and 60 per cent of zones in winter expected to experience growth in the 2017 forecast.

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125 NER, cll. 6.5.6(c)(3), 6.5.7(c)(1)(iii).

126 Ausgrid, *Revised proposal 2019–2024,* January 2019, pp. 73–75.

127 Ausgrid, *Attachment 5.07 – 2018 electricity demand forecasts report,* January 2019, p. 4.

128 Ausgrid, *Attachment 5.07 – 2018 electricity demand forecasts report,* January 2019, p. 7.

With regard to block loads, Ausgrid noted our comment that it was applying lower thresholds than AEMO for block load adjustments, leading it to 'step' up its forecast for specific zone substations that would otherwise be included within trend growth under the AEMO approach. It stated:[129]

> "…Ausgrid adopts a comprehensive assessment process of all large customer connections to more accurately assess the probable impact on local zone substation demand. This involves the tracking and analysis of several thousand customer connection applications for seven years of historical data and four forecast years so as to forecast block loads and organic growth independently.
>
> Essentially, this means that historic block loads are removed from the historic trend so that the underlying organic growth pattern in the data is discovered. Forecast block loads are then added to the calculated underlying trend in the same way the historic block loads are derived. This includes the application of scaling factors derived from the analysis of historical block loads. It is Ausgrid's view that this approach more accurately forecasts local substation demand.
>
> In a period when new large customer connections are increasing, this does lead to higher block load demand than that observed in the historical block load data. During the current significant customer activity, this is to be expected. If, in future, the rate of new large customer connections decline, Ausgrid's approach will result in a lower and more correct forecast demand than if we were to derive the trend from data that includes the cyclical development activity we are currently experiencing."

We are satisfied that Ausgrid's approach to forecasting block loads and organic growth independently is appropriate for the purpose of forecasting local substation demand. However, we consider that Ausgrid's treatment of block loads, by applying a size threshold of 1MW,[130] leads it to forecast a greater increase in forecast demand in the 2019–24 regulatory control period. This appears to differ from the AEMO approach of using the 5 per cent threshold, which Ausgrid claims to support and adopt in its forecasting methodology.[131] However, we recognise that Ausgrid's assessment of all large customer connections appears to be comprehensive.

In the revised proposal, Ausgrid has updated forecasts for block loads for road tunnels, rail and data centres to address our concerns. Using the latest information from customers, the scaling factors applied to each of the sectors are lowered. In comparison to the 2017 forecasts, demand forecasts for road tunnels and rail are revised down by 33 per cent and 36 per cent respectively, while new data centre demand forecasts rise by 59 per cent as new data centre connection requests continue to be a major source of new customer demand.[132]

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129 Ausgrid, *Attachment 5.07 – 2018 electricity demand forecasts report,* January 2019, pp. 10–11.

130 In percentage terms, 1MW is around 3.3 per cent of an average Ausgrid zone substation load, but varies substantially across zone substations with load ranging from 0.4MW to 128.8MW in summer 2017.

131 Ausgrid, *Attachment 5.07 – 2018 electricity demand forecasts report,* January 2019, p. 10.

132 Ausgrid, *Attachment 5.07 – 2018 electricity demand forecasts report,* January 2019, p. 13.

We received a submission in response to the draft decision and revised proposal, querying whether in the draft decision we had accounted for the effect of Ausgrid's proposed tariffs on forecast demand.[133] We queried Ausgrid on how it took into account the increased numbers of customers on cost-reflective tariffs into its regulatory proposal. Ausgrid explained that the number of customers on cost-reflective tariffs has grown steadily from close to zero in 2004 to the current 450,000, covering both residential and business customers.[134]

As Ausgrid bases its demand forecasts on the estimated baseline trend, the trend effectively incorporates demand response to the increased adoption of cost-reflective tariffs. Ausgrid considered that there is no need for further post-modelling adjustment as the projected growth in uptake of cost-reflective tariffs will be similar to historical growth. Ausgrid argued that its tariffs for 2019–24 regulatory control period are not significantly more or less cost reflective than its current seasonal time-of-use (TOU) tariff. It added that its policy has been to encourage transitioning the highest demand customers first, and hence the 450,000 current TOU customers represent a disproportionately high share of the maximum demand on its network.

We consider that Ausgrid's proposed forecast is the best available, and consider it appropriate for Ausgrid to continue to monitor the introduction of more cost reflective tariffs and develop its forecasting approach in the future as evidence of changes in customer behaviour becomes clearer.

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133 John Herbst, *Submission on the AER's draft decision for Ausgrid 2019-2024 and Ausgrid's revised regulatory proposal,* February 2019, p. 1.

134 Ausgrid, *Response to information request 022,* July 2018, pp. 3–4,