EMCa
energy market consulting associates

Ausgrid Revenue Proposal 2019-24

Review of aspects of Ausgrid's forecast capital expenditure

Report to

Australian Energy Regulator

from

Energy Market Consulting associates

August 2018

This report has been prepared to assist the Australian Energy Regulator (AER) with its determination of the appropriate revenues to be applied to the prescribed distribution services of Ausgrid from 1st July 2019 to 30th June 2024. The AER's determination is conducted in accordance with its responsibilities under the National Electricity Rules (NER). This report covers a particular and limited scope as defined by the AER and should not be read as a comprehensive assessment of proposed expenditure that has been conducted making use of all available assessment methods.

This report relies on information provided to EMCa by Ausgrid. EMCa disclaims liability for any errors or omissions, for the validity of information provided to EMCa by other parties, for the use of any information in this report by any party other than the AER and for the use of this report for any purpose other than the intended purpose.

In particular, this report is not intended to be used to support business cases or business investment decisions nor is this report intended to be read as an interpretation of the application of the NER or other legal instruments. EMCa's opinions in this report include considerations of materiality to the requirements of the AER and opinions stated or inferred in this report should be read in relation to this over-arching purpose.

Except where specifically noted, this report was prepared based on information provided by AER staff prior to 29th June 2018 (9th July 2018 for non-network capex) and any information provided subsequent to this time may not have been taken into account.

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About EMCa

Energy Market Consulting associates (EMCa) is a niche firm, established in 2002 and specialising in the policy, strategy, implementation and operation of energy markets and related network management, access and regulatory arrangements. EMCa combines senior energy economic and regulatory management consulting experience with the experience of senior managers with engineering/technical backgrounds in the electricity and gas sectors.

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Executive Summary

Purpose of this report

1. This report provides our assessment and findings from our review of Ausgrid's proposed repex and non-network expenditure requirements for the next Regulatory Control Period (RCP) 2019 to 2024.

2. We have undertaken our review primarily based on Ausgrid's Regulatory Proposal (RP) and the documents that Ausgrid provided in support of its RP, and we have considered these documents to definitively provide its proposal and supporting rationale. To augment these sources, we sought and were provided with a range of additional documents[1], and we met with Ausgrid for a series of onsite meetings at which we provided Ausgrid with the opportunity to provide clarifications and additional information on its proposed expenditure requirements and their basis.

Review approach

3. Our review approach comprises reviews of:

   - Ausgrid's framework for expenditure governance and management of its expenditure, and in particular its governance and management framework for its RP forecast expenditure;
   - The forecasting methodologies that Ausgrid states that it has employed in developing its repex and non-network capex forecasts;
   - Its repex forecast, which we have reviewed at a category level consistent with the way in which Ausgrid has presented it; and
   - Its non-network capex forecast, which comprises its forecasts for ICT/OTI, fleet and plant, and property.

4. We have assessed Ausgrid's governance and management framework and its forecasting methodologies for the extent to which we consider that they would be

[1] As at the current date of this report, some Information Requests remain outstanding. Some of our Information Requests were not fully answered, and Ausgrid provided some responses after a cut-off for our assessment that was notified to Ausgrid. We have sought to take account of all information provided, but we disclaim responsibility for full consideration or acknowledgment in this report, of information that was provided after the information cut-off for completion of our assessment.

likely to provide the means for Ausgrid to forecast requirements that meet National Electricity Rules (NER) objectives and criteria. For Ausgrid's repex and non-network capex forecasts, we have assessed a significant sample of project and program-based information to identify any systemic issues that we consider have led Ausgrid to over-estimate its forecast requirements.

Ausgrid's proposal

5. Ausgrid has forecast repex and non-network capex for the next RCP of $1,673.1m and $548.0m respectively. Ausgrid's proposed repex is similar to its current RCP estimated spend, noting that this comparison is appreciably affected by Ausgrid's estimated increases in the final two years of the current RCP. Its proposed non-network forecast is somewhat higher than in the current RCP.

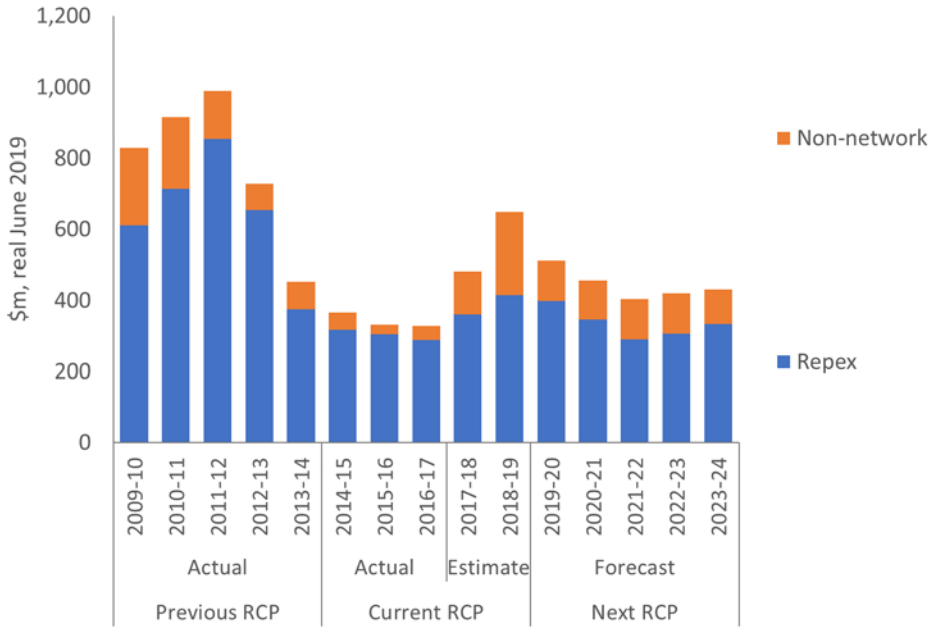
Table 1: Forecast repex and non-network capex for the next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Category	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Repex	398.8	345.3	290.0	306.1	332.9	1,673.1
Non-Network	112.3	110.6	113.2	113.4	98.4	548.0
Total	**511.1**	**455.9**	**403.2**	**419.6**	**431.3**	**2,221.1**

Source: Ausgrid Reset RIN

6. The figure below shows Ausgrid's actual and forecast repex and non-network capex for the previous, current and next RCPs.

Figure 1: Actual, estimated and forecast repex and non-network capex for the previous, current and next RCPs ($m, real June 2019)



Source: Ausgrid Reset RIN

Our assessment of Ausgrid's expenditure governance and management framework

7. We consider that Ausgrid's governance and management framework reflects a focus on expenditure control. In regard to those elements of Ausgrid's framework that have

defined the process and accountabilities by which Ausgrid has produced its RP forecast, our findings are as follows:

- The criteria used in Ausgrid's top-down portfolio challenge process are unclear, with no clear link back to achievement of defined corporate or investment objectives, including defined performance outcomes or risk outcomes which reflect its risk appetite. It is therefore unclear how Ausgrid has determined that its proposed forecast represents an appropriate balance between cost and intended outcomes;
- The incremental nature of Ausgrid's rolling ten-year plans, absent strong portfolio-level linkage to decision criteria such as those defined in the finding above, lends itself to an insufficient level of challenge which over time is likely to lead to an over-estimate of requirements and may also lead to a degree of unwarranted expenditure;
- While Ausgrid claims that its investment decision-making is entirely needs driven and internally determined, there are indications in its expenditure governance and management documentation that it may ultimately determine its actual work program based on allowances which the Australian Energy Regulator (AER) adopts for the purpose of its price determinations;
- Through the involvement of the Regulatory Reset Executive Committee (RREC) in establishing the RP forecast, it is unclear whether Ausgrid's RP forecast has been determined entirely under its BAU expenditure governance framework. There are indications that the involvement of the RREC may have introduced considerations, such as tariff outcomes, that do not accord with Ausgrid's defined framework; and
- Ausgrid's process by which its forecast is based on a defined set of projects and programs, as represented in its Portfolio Investment Plan (PIP) / master project list, and which underpins Ausgrid's RP forecast, is likely to overstate its eventual requirements by not accounting for future refinements and rationalisations that will occur as projects and programs progress through Gates 2 and 3.

Our assessment of Ausgrid's expenditure forecasting methods

8. Ausgrid appears to have developed its repex forecast essentially from a bottom-up build of proposed projects. While it claims to have challenged the resulting plan, there is little evidence of portfolio-level forecasting methods having been applied to effect in this process.

9. In the bottom-up build of the projects and programs included in its forecast, we find:

- considerable and significant inconsistencies between Ausgrid's proposed expenditure for each of the RIN asset categories, and forecast expenditure in the information that is intended to support those forecasts;
- there are also some inconsistencies between the proposed projects in the forecast, and in the supporting documents. Collectively, these inconsistencies reduce confidence in the forecast, pose a challenge to our assessment of the forecast as presented and we expect would have similarly detracted from Ausgrid's internal challenge processes;
- while Ausgrid claims to have adopted an evidence-based approach, this is not evident. Supporting documentation tends to lack information that we would expect, such as on asset condition, failure rates, defect rates, or service-related measures;

- contrary to Ausgrid's claims, we observe only limited application of risk analysis or options analysis in project-level and program-level documentation; and
- we also observe only limited application of cost benefit analysis and limited information on Ausgrid's application of predictive modelling.

10. The portfolio-level forecasting methods that Ausgrid has applied do not explain its justification for the level or mix of its repex forecast. Our key concerns are:
    - Ausgrid's descriptions in its RP and associated documents do not appear to be based on or to explicitly take account of Ausgrid's stated corporate objectives, or to reflect a defined risk appetite;
    - Ausgrid claims that its plan has been risk-prioritised, but the information Ausgrid has provided does not show how this has been done;
    - we consider that the Capital Allocation Selection Hierarchy (CASH) prioritisation tool that Ausgrid states it uses for this would not produce risk prioritisation that represents current good industry practice; and
    - Ausgrid claims that modelling using the AER's Repex model verifies its proposed repex program. However, to the extent that this modelling is considered valid, it does not in our view support Ausgrid's contention, in that the Repex model indicates a lower required level of repex overall and a somewhat different mix of projects and programs from what Ausgrid has proposed.

11. Ausgrid has not explained why it considers the repex amount that it has proposed to be at an appropriate level. Its proposed figure has not been justified against NER criteria or against Ausgrid's stated corporate objectives. Ausgrid has not provided evidence of how it determined that the risk levels or other outcome metrics resulting from its proposed program are preferred over those that could have resulted from an alternative program.

Our assessment of Ausgrid's proposed repex requirements

12. We find that Ausgrid has not fully justified its repex forecast for the next RCP, for reasons including that Ausgrid:
    - has not provided adequate supporting justification for the projects and programs included in the proposed forecast expenditure, with examples of programs not documented in the supporting justification;
    - presents a low level of alignment between the expenditure forecast and the submitted RIN data as part of its RP. We sought an explanation from Ausgrid for these discrepancies, however it was not provided, and this significantly hindered our assessment;
    - has not adequately supported its modelled outcomes by sufficient supporting information, including explanation of the basis of input assumptions;
    - with the exception of complex assets,[2] has not demonstrated that it has undertaken an assessment of the trends in asset risk, health or failures rates, or other relevant performance measures to determine if the current levels of replacement are appropriate and if the proposed expenditure will result in a stable, improving or declining trend in risk;

[2] Sub-transmission fluid filled cable, and 11kV and 33kV switchboards.

- provided insufficient correlation between the objectives and outcomes developed by Ausgrid to the expenditure levels to draw any meaningful conclusions;
- provided insufficient analysis of risk and options to determine the most efficient risk treatment option; and
- has not justified the expenditure classification applied in some areas where we consider the expenditure should be reviewed as a part of an alternate expenditure classification.

13. We have not been asked to specifically assess evidence of efficient costs employed by Ausgrid in the development of its forecast. However, we have made observations within our review of the asset categories that suggest to us that further consideration of cost efficiency would likely place downward pressure on the forecast expenditure.

Our assessment of Ausgrid's proposed ICT/OTI requirements

14. We find that Ausgrid has not fully justified its ICT/OTI capex forecast for the next RCP, for reasons including that Ausgrid:

- has not fully justified its strategy to move all Line of Business applications to the cloud within a short timeframe, and has not included a project to similarly close the data centres and decommission its on-premise infrastructure;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified through rigorous options analysis;
- has not justified the timing of its projects through risk-based cost-benefit analysis;
- has not justified proposed expenditure that would deliver additional functionality through benefits quantification;
- has not factored into its forecast the likely investment deferrals through life extension of applications;
- has not factored into its forecast the likely savings and investment deferrals possible through the consolidation of applications due for upgrade;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the Investment Governance Framework (IGF) gate review process;
- has not demonstrated how it will efficiently and effectively implement three large transformation programs including cyber security, cloud migration, and the introduction of the ADMS, given the nearly 850% increase in estimated program expenditure over just the final years of the current RCP; and
- has not demonstrated why its Network Innovation program should be funded by customers rather than be self-funded.

Our assessment of Ausgrid's proposed Fleet and Plant requirements

15. We find that Ausgrid has not fully justified its Fleet and Plant capex forecast for the next RCP, for reasons including that Ausgrid:

- has not factored into its forecast the likely savings and investment deferrals due to Ausgrid's practice of fleet life extension based on the condition,

reliability, and operating costs of each individual vehicle, including Elevated Work Platforms (EWP);

- has not factored reduced fleet requirements into its forecast due to further staff reductions delivered by Ausgrid's transformation program;
- has not factored into its forecast further efficiencies delivered by its telematics investment;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process; and
- has not justified the nearly tripling of its forecast for Plant capex.

Our assessment of Ausgrid's proposed Buildings and Property requirements

16. We find that Ausgrid has not fully justified its Buildings and Property capex forecast for the next RCP, for reasons including that Ausgrid:
    - has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified through rigorous options analysis;
    - has not factored into its forecast investment deferrals due to project delays and business reprioritisation, including from further accommodation rationalisation;
    - has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process; and
    - has not justified the General Depot Refurb capex forecast, including how this money will be spent efficiently.

Implications

17. On the basis of the findings above, we consider that Ausgrid's RP capex forecast for the categories that we have reviewed, is not a reasonable forecast of its prudent and efficient expenditure requirements and overstates those requirements. In Sections 5, 6, 7 and 8 we describe the extent to which we consider Ausgrid's forecasts overstate requirements that would be consistent with the NER expenditure criteria. Further, for ICT/OTI (Section 6) and property (Section 8) we provide adjustment estimates that we consider would reflect forecasts consistent with the NER requirements.

1 Introduction

1.1 Purpose and scope of requested work

1.1.1 Purpose

18. The purpose of this report is to provide the Australian Energy Regulator (AER) with our findings from a review of defined elements of Ausgrid's proposed capital expenditure (capex) forecast for the 2019-24 Regulatory Control Period (next RCP).

19. The assessment contained in this report is intended to assist the AER in its own analysis of the capex forecast as an input to its Draft Decision on Ausgrid's revenue requirements.

1.1.2 Scope

20. The scope of this review covers Ausgrid's proposed:

    (i) replacement capex (repex) forecast; and

    (ii) non-network capex.[3]

1.2 Our approach

21. In undertaking our review, we:

- completed a desktop review of the information provided to us by the AER, which included Ausgrid's Regulatory Proposal (RP) and associated supporting documents;
- prepared requests for specific additional information to be provided by Ausgrid;

[3] As agreed with the AER by teleconference on 28th May 2018 and confirmed in subsequent email on 29th May 2018.

- undertook onsite review meetings over four days with Ausgrid[4] to ensure we correctly understood the methodology and assumptions being applied as the basis for its forecast expenditure requirements;
- undertook an assessment of Ausgrid's expenditure forecast, which included reviewing Ausgrid's expenditure governance, management and forecasting framework, Ausgrid's top-down portfolio challenge process and Ausgrid's application of its expenditure justification and forecasting approach to a sample of projects and programs; and
- documented our findings in the current report.

22. We also provided feedback to AER staff on our preliminary findings, while drafting the current report.

23. The limited nature of our review does not extend to advising on all options and alternatives that may be reasonably considered by Ausgrid, or on all parts of the capex forecast.[5] We have included additional observations in some areas that we trust may assist the AER with its own assessment.

1.3 Structure of this report

24. Our main findings are summarised in the Executive Summary at the beginning of this report.

25. In Section 2, we present a context overview of the capex elements relevant to our review. This overview includes consideration of the expenditure trends and past forecasting performance of repex and non-network capex.

26. In the subsequent six sections, we present the assessment that supports our findings:

- in Section 3, we describe our assessment of the governance and management framework that Ausgrid uses to plan and approve its repex and non-network capex projects and programs, together with the implications of any identified issues on its forecast expenditure;
- in Section 4, we describe our assessment of the expenditure forecasting methodology and assumptions that Ausgrid has used to determine its proposed repex forecast[6], together with the implications of any identified issues on the forecast expenditure;
- in Section 5, we consider Ausgrid's proposed repex forecast by asset category and describe any issues that we identified with the proposed expenditure, including Ausgrid's application of its expenditure governance and management framework, and its expenditure forecasting methodology; and

[4] The onsite review meetings took place on 18th June 2018 (for governance & management, forecasting, and repex), 19th June 2018 (repex), 25th June 2018 (non-network Property & Fleet), and 26th June 2018 (ICT/OTI).

[5] For example, our review does not include unit costs or supporting models, although we have included some observations where relevant.

[6] We describe the forecasting methodology for non-network together with our assessments of each non-network category, in Sections 6, 7 and 8.

- in Sections 6, 7 and 8, we consider Ausgrid's proposed non-network capex forecast and describe any issues that we identified with the proposed expenditure, including the application of its expenditure governance and management framework, and its expenditure forecasting methodology. Non-network capex comprises Ausgrid's proposed expenditure which we review for ICT/OTI (Section 6), Fleet and plant (Section 7), and Property (Section 8).

1.4 Other

1.4.1 Information sources

27. We have examined relevant documents from Ausgrid's RP, information supplied at the on-site meetings, and further documents provided in response to our information requests. These documents are referenced directly where they are relevant to our findings.

28. Our assessment is based on our observations from the onsite meetings, together with information supplied prior to, at, and following the onsite meeting pursuant to EMCa information requests. In our consideration of Ausgrid's responses, and at the request of the AER, we have included additional information supporting our assessment of aspects of the capex forecast we have been asked to review.

29. To enable us to complete our draft report by the date requested by the AER, we agreed a cut-off date of 29th June 2018 for Ausgrid to respond to all information requests except those relating to non-network capex for which a cut-off date of 9th July 2018 applied. As at the time of finalising the drafting this report (25th July 2018) Ausgrid has not responded to all Information Requests. Ausgrid provided some information responses after our assessment cut-off and, while we have not been able to make full use of this delayed information, we have satisfied ourselves that it would not lead us to materially change our findings.

30. Please refer to Appendix A for a list of our information requests, whether responses were received to these requests, and whether responses were received in time to be taken into account in our assessment.

31. Where available, we sourced expenditure data for analysis from Ausgrid's Reset RIN.[7] Any other data relied upon for analysis is referenced in our report.

1.4.2 Rounding of numbers and real conversion

32. Numerical totals in tables may not present as being equivalent to the sum of the individual numbers due to the effects of rounding. Also, some numbers in this report may differ from those shown in Ausgrid's regulatory submission or other documents due to rounding.

33. This report refers to costs in real June 2019 dollars unless denoted otherwise.

[7] We have relied on the expenditure data provided in Ausgrid's Reset RIN received 8th June 2018, as an updated version to that provided in the RP. All references to Ausgrid's Reset RIN are to the version received on 8th June 2018.

2 Background

2.1 Introduction

34. In this section, we provide background context to the assessments which follow.

35. We first provide an overview of Ausgrid's total proposed capex for the next RCP, breakdown the components of non-network capex and we include observations of Ausgrid's actual and forecast capex for the current RCP. We next outline the categories of capex that we have been asked to review, and for which our assessment has been based in the remainder of this report. Finally, we summarise the National Electricity Rules (NER) capital expenditure criteria and capital expenditure objectives that have guided our assessment.

2.2 Overview of proposed capex

2.2.1 Overview of total capex

36. Ausgrid has forecast total capex for the next RCP of $3,083.6m. The table below sets out Ausgrid's proposed capex for each capex category for each year of the next RCP.

Table 2: Proposed capex by capex category for the next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Category	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Repex	398.8	345.3	290.0	306.1	332.9	1,673.1
Connections	10.6	12.5	10.6	10.0	8.5	52.2
Augex	27.0	51.7	46.6	29.8	34.1	189.1
Non-Network	112.3	110.6	113.2	113.4	98.4	548.0
Capitalised Network Overheads	133.4	121.5	114.4	111.9	114.1	595.3
Capitalised Corporate Overheads	5.7	5.4	5.2	5.0	4.6	25.9
Total	**687.8**	**647.0**	**580.0**	**576.2**	**592.6**	**3,083.6**

Source: Ausgrid Reset RIN

37. The following table show Ausgrid's capex for each capex category for each year of the current RCP.

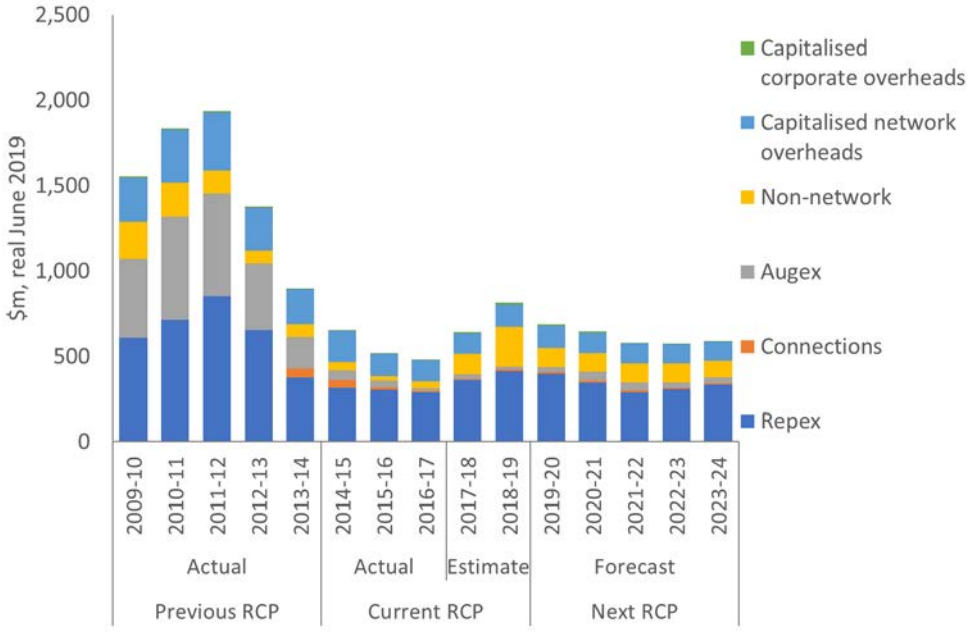
Table 3: Actual/Estimated total capex by capex category for the current RCP ($m, real June 2019)

$m, real June 2019	Current RCP					
Category	Actual 2014-15	Actual 2015-16	Actual 2016-17	Estimate 2017-18	Estimate 2018-19	Total 2015-19
Repex	316.2	304.7	288.2	359.9	414.6	1,683.6
Connections	43.3	15.4	8.5	8.5	8.6	84.3
Augex	56.6	35.4	16.5	25.2	16.5	150.1
Non-Network	50.4	27.5	40.1	121.4	233.7	473.2
Capitalised Network Overheads	183.2	132.5	124.1	122.0	128.7	690.5
Capitalised Corporate Overheads	6.9	3.4	3.8	5.1	11.7	30.9
Total	**656.6**	**518.9**	**481.1**	**642.1**	**813.8**	**3,112.6**

Source: Ausgrid Reset RIN

38. The figure below shows Ausgrid's proposed capex for each capex category for each year of the 2009-14 RCP (previous RCP), 2014-19 RCP (current RCP), and next RCP.

Figure 2: Capex by capex category for the previous, current, and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

39. Ausgrid's total annual capex peaked in 2011/12 and has then markedly declined up to 2016/17. Reduced augex is the largest contributing factor to the overall reduction in capex. From a low of $481m in 2016/17, Ausgrid forecasts that its capex will increase to above $800m by the last year of the current RCP (2018/19), before falling back to an average of just over $600m per year over the next RCP.

40. Ausgrid's forecast of $234m non-network capex in 2018/19, up from $40m in 2016/17, is the main reason for the increase in total capex in the final year of the current RCP although its forecast increase in repex is also significant. While Ausgrid's forecast capex in the next RCP is less than for the current RCP, this is largely because of the high expenditure that Ausgrid has forecast for the final two years of the current RCP. Its actual expenditure for the three years of the current RCP reported to date averages $552m, whereas its forecast for the seven years from 2017/18 averages just under $650m per year.

2.2.2 Overview of non-network capex

41. Ausgrid has proposed a non-network capex forecast of $548.0m for the next RCP compared to the actual/estimated expenditure in the current RCP of $473.2m as shown in the tables below, representing an increase of 15.8% (or $74.8m).

Table 4: Proposed non-network capex by asset type for next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Asset type	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
IT & Communications	50.2	45.4	40.8	40.0	39.2	215.5
Motor Vehicles	18.3	15.2	19.8	23.0	17.7	94.0
Buildings and Property	38.3	43.6	46.2	44.1	36.2	208.4
Other	5.4	6.4	6.4	6.4	5.4	30.0
Total	**112.3**	**110.6**	**113.2**	**113.4**	**98.4**	**548.0**

Source: Ausgrid Reset RIN

Table 5: Actual/Estimated non-network capex by asset type for current RCP ($m, real June 2019)

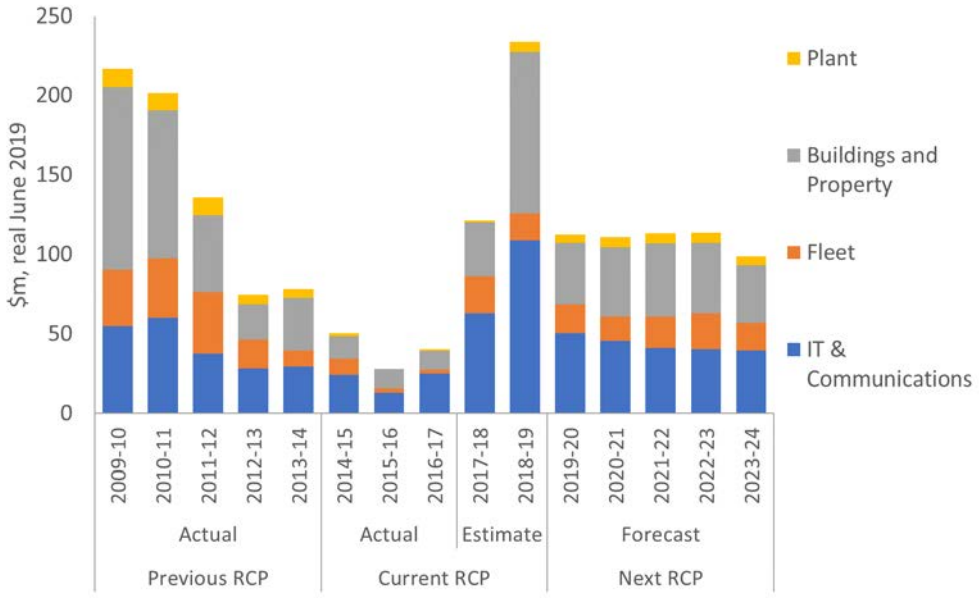
$m, real June 2019	Current RCP					
	Actual	Actual	Actual	Estimate	Estimate	Total
Asset type	2014-15	2015-16	2016-17	2017-18	2018-19	2015-19
IT & Communications	23.7	12.8	24.8	62.9	108.6	232.9
Motor Vehicles	10.1	3.1	2.2	23.2	17.1	55.7
Buildings and Property	14.3	11.6	11.7	33.9	101.6	173.1
Other	2.3	0.0	1.4	1.4	6.4	11.5
Total	**50.4**	**27.5**	**40.1**	**121.4**	**233.7**	**473.2**

Source: Ausgrid Reset RIN

42. The 'Other' category represents Ausgrid's expenditure for plant, and the 'Motor Vehicles' category represents Ausgrid's expenditure for fleet. The 'IT & Communications' category represents Ausgrid's expenditure for Information and Communications Technology (ICT), and includes $58.5m for Operational Technology & Innovation (OTI).[8]

43. The figure below shows non-network capex over the previous, current and next RCP. Actual non-network capex fell to a low of $27.5m in 2015/16 and is forecast to climb to $233.7m in 2018/19, an increase of around 850% over three years. Non-network expenditure is forecast to be mostly stable over the next RCP.

Figure 3: Non-network capex by asset type for the previous, current and next RCP ($m, real June 2019)



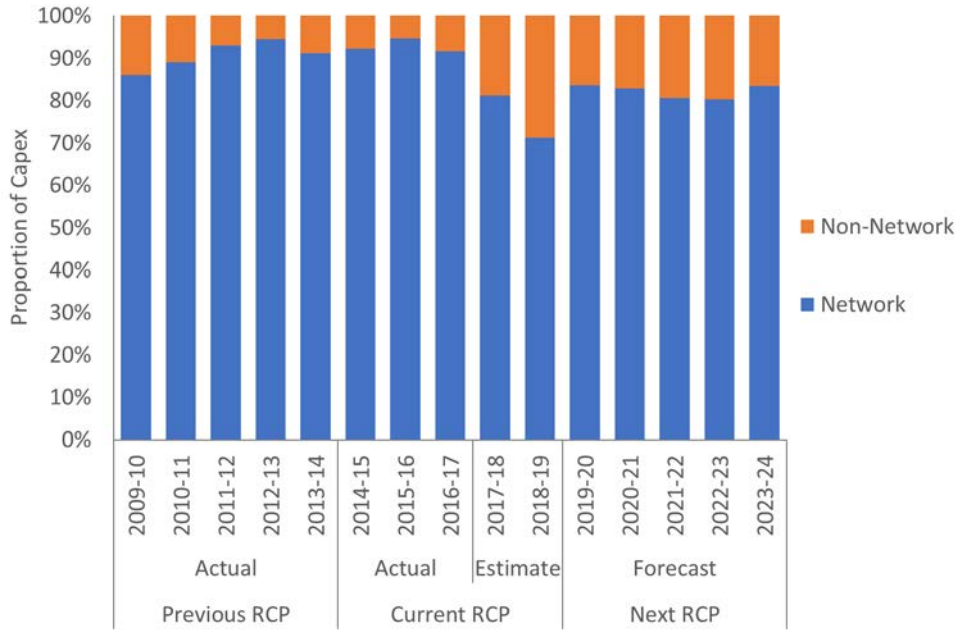
Source: Ausgrid Reset RIN

44. Ausgrid explained at the onsite meetings that the lower expenditure in the first three years of the current RCP was due to capex constraints during the lease transaction process and also as a result of Ausgrid's transformation project to improve efficiency. Ausgrid further explained that the increased expenditure in the last two years of the current RCP is in part to address the backlog of projects following finalisation of the lease transaction.

[8] As discussed further below in this section, Ausgrid has also included $43.6m in OTI capex under repex.

45. The figure below shows the split between network and non-network capex in relative terms. The figure shows the proportion of non-network capex growing towards the end of the current RCP and remaining high for the next RCP compared to the previous RCP and the first three years of the current RCP. Conclusions regarding the prudency and efficiency of non-network capex cannot be drawn from this figure in isolation, but this observation supports the case for a closer assessment of Ausgrid's proposed non-network capex as undertaken in Sections 6,7 and 8.

Figure 4: Split between non-network and network capex for the previous, current and next RCPs ($m, real June 2019)



Source: Ausgrid Reset RIN

2.2.3 EMCa observations on prior RCP trends and performance

46. Ausgrid is forecasting to underspend its capex allowance in the current RCP by $403m as shown in the table below. Ausgrid underspent its capex allowance in the first three years of the current RCP and is estimating expenditure approximately equal to its allowance in 2017/18 and expenditure significantly higher than its capex allowance in the final year of the current RCP. A rapid increase in expenditure such as this raises questions regarding efficiency of expenditure and deliverability.

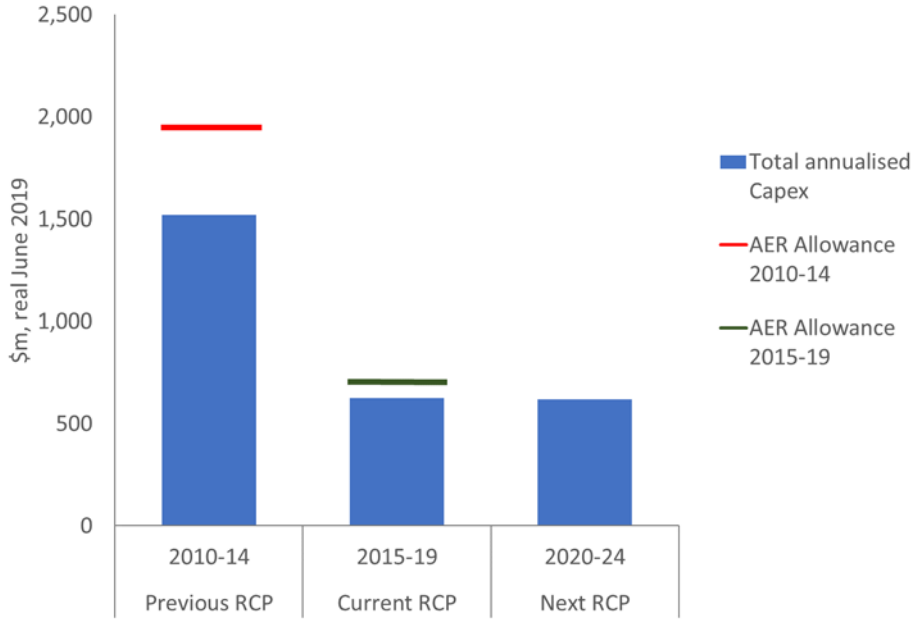
Table 6: Actual/estimated capex versus allowance in the current RCP ($m, real June 2019)

$m, real June 2019	Actual 2014-15	Actual 2015-16	Actual 2016-17	Estimate 2017-18	Estimate 2018-19	Total 2015-19
AER Allowance	729.3	778.6	749.3	660.9	597.4	3,515.7
Actual/Estimated Capex	656.6	518.9	481.1	642.1	813.8	3,112.6
Variance	**-72.7**	**-259.7**	**-268.2**	**-18.8**	**216.4**	**-403.0**

Source: Ausgrid Reset RIN, and AER Final Decision April 2015.

47. The figure below shows that Ausgrid has underspent its capex allowance in both the current and previous RCPs, indicating a possible over forecasting bias.

Figure 5: Annualised actual/forecast capex versus annualised allowance for previous, current and next RCP ($m, real June 2019)



Source: Ausgrid reset RIN, and AER Final Decision April 2015.

48. The majority of the underspend in the current RCP occurred during the first three years. Ausgrid explained at the onsite meeting that capex reduced during this period in response to its internal business transformation project, and also capex constraints during the lease transaction. Ausgrid's underspend in the previous RCP is also in part explained by Ausgrid's transformation project. Ausgrid further explained that following finalisation of the lease transaction in 2017, its capex is forecast to increase in 2017/18 and 2018/19 to what it describes as a more sustainable level.

2.2.4 Aspects of capex relevant to our review

49. We have been asked to review repex and non-network capex for the next RCP.

50. Ausgrid has forecast repex and non-network capex for the next RCP of $1,673.1m and $548.0m respectively. The tables below set out Ausgrid's actual and estimated repex and non-network capex for each year in the current RCP, and also Ausgrid's forecast repex and non-network capex for each year in the next RCP.

Table 7: Actual/estimated repex and non-network capex for current RCP ($m, real June 2019)

$m, real June 2019	Current RCP					
Category	Actual 2014-15	Actual 2015-16	Actual 2016-17	Estimate 2017-18	Estimate 2018-19	Total 2015-19
Repex	316.2	304.7	288.2	359.9	414.6	1,683.6
Non-Network	50.4	27.5	40.1	121.4	233.7	473.2
Total	**366.6**	**332.3**	**328.3**	**481.3**	**648.3**	**2,156.8**

Source: Ausgrid Reset RIN

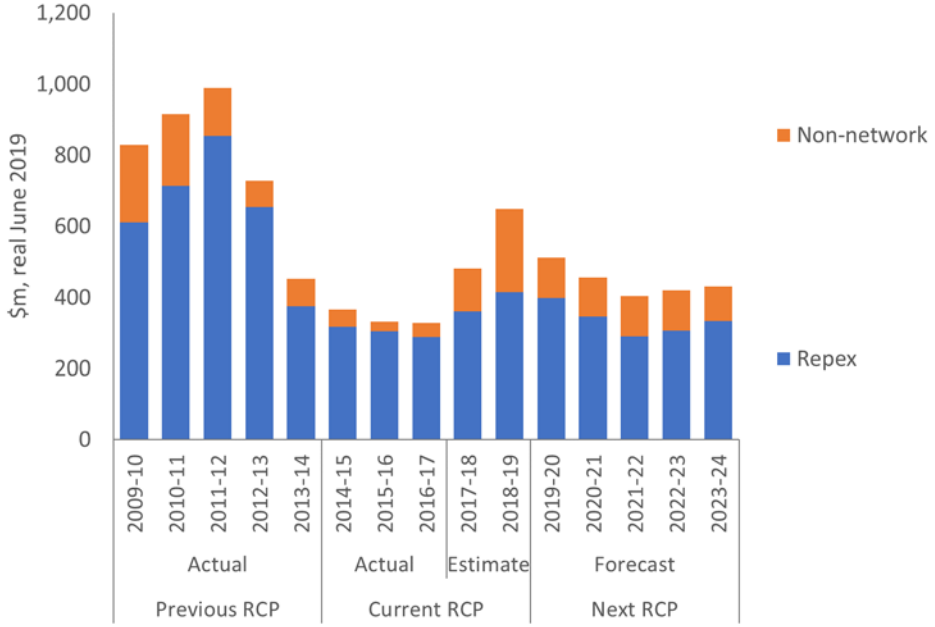
Table 8: Proposed repex and non-network capex for next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Category	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Repex	398.8	345.3	290.0	306.1	332.9	1,673.1
Non-Network	112.3	110.6	113.2	113.4	98.4	548.0
Total	511.1	455.9	403.2	419.6	431.3	2,221.1

Source: Ausgrid Reset RIN

51. The figure below shows Ausgrid's actual and forecast repex and non-network capex for the previous, current and next RCPs.

Figure 6: Repex and non-network capex for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

52. The profile for repex and non-network capex is similar to Ausgrid's overall capex profile, with capex peaking in 2011/12 and declining significantly through to 2016/17, before increasing in the final two years of the current RCP. We discuss Ausgrid's actual and forecast repex and non-network capex further in Sections 5 (for repex) and Sections 6, 7 and 8 (for respective components of non-network capex).

2.3 NER Capex Objectives and Criteria

53. In undertaking our review, we have been cognisant of the relevant aspects of the NER under which the AER is required to make its determination. The most relevant aspects of the NER in this regard are the 'capital expenditure criteria' and the 'capital expenditure objectives'. Specifically, the AER must accept Ausgrid's capex proposal if it is satisfied that the capex proposal reasonably reflects the capital expenditure criteria, and these in turn reference the capital expenditure objectives.

54. We have taken particular note of the following aspects of the capex criteria and objectives:

- Drawing on the wording of the first and second capex criteria, our findings refer to efficient and prudent expenditure. We interpret this as encompassing the extent to which the need for a project or program has been prudently established and the extent to which the proposed solution can be considered to be an appropriately justified and efficient means for meeting that need;
- The capex criteria require that the forecast '*reasonably reflects'* the expenditure criteria and in the third criterion, we note the wording of a '*realistic expectation*'. In our review we have sought to allow for a margin as to what is considered reasonable and realistic, and we have formulated negative findings where we consider that a particular aspect is outside of those bounds;
- We note the wording '*meet or manage'* in the first capex objective, encompassing the need for the DNSP to show that it has properly considered demand management and non-network options;
- We tend towards a strict interpretation of compliance (under the second capex objective), with the onus on the DNSP to evidence specific compliance requirements rather than to infer them, and
- We note the word '*maintain'* in capex objectives 3 and 4 and, accordingly, we have sought evidence that the DNSP has demonstrated that it has properly assessed the proposed expenditure as being required to reasonably maintain, as opposed to enhancing or diminishing, the aspects referred to in those objectives

55. The capex criteria and capex objectives are reproduced in the figures below and on the next page.

Figure 7: NER capital expenditure criteria

> *(c) The AER must:*
>
> *(1) subject to subparagraph (c)(2), accept the forecast of required capital expenditure of a Distribution Network Service Provider that is included in a building block proposal if the AER is satisfied that the total of the forecast capital expenditure for the regulatory control period reasonably reflects each of the following (the capital expenditure criteria):*
>
> *(i) the efficient costs of achieving the capital expenditure objectives;*
>
> *(ii) the costs that a prudent operator would require to achieve the capital expenditure objectives; and*
>
> *(iii) a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives.*

Source: NER 6.5.7(c) Forecast capital expenditure, v111

Figure 8: NER capital expenditure objectives

(a) A building block proposal must include the total forecast capital expenditure for the relevant regulatory control period which the Distribution Network Service Provider considers is required in order to achieve each of the following (the capital expenditure objectives):

(1) meet or manage the expected demand for standard control services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;

(3) to the extent that there is no applicable regulatory obligation or requirement in relation to:

(i) the quality, reliability or security of supply of standard control services; or

(ii) the reliability or security of the distribution system through the supply of standard control services,

to the relevant extent:

(iii) maintain the quality, reliability and security of supply of standard control services; and

(iv) maintain the reliability and security of the distribution system through the supply of standard control services; and

(4) maintain the safety of the distribution system through the supply of standard control services.

Source: NER 6.5.7(a) Forecast capital expenditure, v111

3 Assessment of governance and management framework

3.1 Introduction

56. A premise of our review process is that application of a sound expenditure governance and management framework is necessary to support prudent and efficient expenditure and to support a reasonable forecast of such requirements.

57. In this section, we provide an overview of Ausgrid's expenditure governance and management framework, and we assess the extent to which expenditure forecasts developed under this framework are likely to be prudent and efficient. The extent to which Ausgrid's forecast requirements meet NER requirements also depends on how the framework has been applied, and which we cover in subsequent sections.

3.2 Ausgrid's capital expenditure governance framework

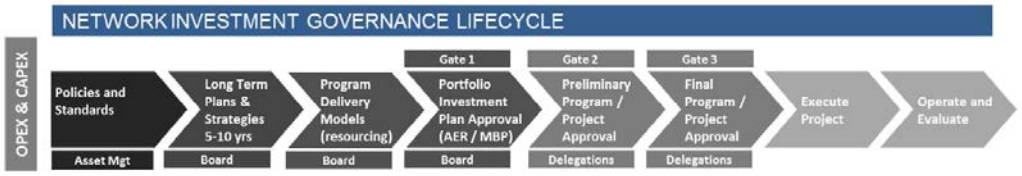
3.2.1 Investment Governance Framework

58. Ausgrid maintains an Investment Governance Framework (IGF) to provide guidance and accountability in respect of the development, determination and approval of investments.[9] The IGF includes a gated process with a number of key stages with assigned governance responsibilities at each stage.

[9] RP Attachment 5.05 Investment Governance Framework. April 2018. Section 1.1.

59. Ausgrid's network investment governance process involves three investment decision approval gates, as shown in the following figure.[10]

Figure 9: Ausgrid's network investment governance process



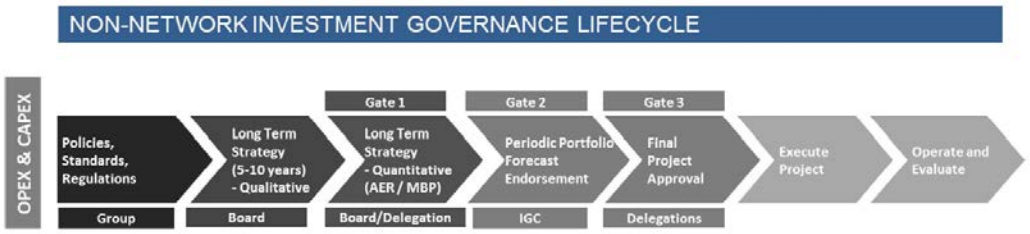
Source: RP Attachment 5.05 Ausgrid Investment Governance Framework.April 2018. Figure 1.

60. Ausgrid's non-system investment governance process involves a similar process, also with three investment decision approval gates and associated approvals. Differences include that:

- whereas a five to ten-year Portfolio Investment Plan (PIP)[11] is approved at Gate 1, the equivalent Gate 1 approval for non-network is described as a 'strategy';
- whereas for the network process, Gate 2 is described as preliminary approval of a program or project, in the non-network process this is described as 'endorsement'; and
- the non-network process does not include separate Board approval of Program Delivery Models.

61. We also note that in the network process, at Gate 1, there is reference to 'approval' of the plan by the AER.

Figure 10: Ausgrid's Non-Systems investment governance process



Source: RP Attachment 5.05 Ausgrid Investment Governance Framework. April 2018. Figure 2.

62. Ausgrid's network investment governance process includes annual development by the business of a risk-prioritised PIP, which is approved at Gate 1 by a combination of Board and Executive Management delegations. Ausgrid advises that risk-based prioritisation enables management to make an informed decision based on its risk appetite with an understanding of the risk versus expenditure position[12].

63. Gate 2 provides what is described as preliminary individual project approval, outlining the need and the options to address it. Approval is by delegated authority. Under Ausgrid's process, projects with a total estimated investment above $2.5m are subject to independent and peer review as part of the governance process. Ausgrid

[10] RP Attachment 5.05 - Investment Governance Framework. April 20187. Section 1.1.

[11] Ausgrid variously refers to this as its Portfolio Investment Plan and its Prioritised Investment Plan. See RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018.

[12] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.2.

states that the scope of these reviews includes testing the need for the investment and assessment of the proposed options.

64. Ausgrid states that its investment processes are designed to promote:[13]

- efficient and prudent investments consistent with its stated investment objectives;
- timely identification of the business's capital and resource requirements;
- investment decisions that are informed by a full understanding of the costs, benefits and regulatory requirements and are authorised in accordance with the business's internal delegation policy;
- compliance with statutory and regulatory obligations to the Board, stakeholders, shareholders, broader community, regulators and appointed auditors;
- co-ordination with related organisations, including other network service providers and utilities;
- investment opportunities being prioritised to best meet the objectives of the corporation and reviewed at Board level; and
- a sustainable investment profile over the long term, to minimise peaks and troughs that can lead to resourcing issues and instability in electricity prices.

65. Ausgrid states that its approach to governance and approval of capital investment is aligned to its system planning, budgeting and regulatory approvals.[14]

3.2.2 Capital planning process

66. Ausgrid states that the objective of its capital planning process is to identify investments that provide the most benefit to customers in terms of affordability, reliability and safety.[15]

67. Each year Ausgrid prepares a rolling 10-year forecast of the capital program.[16] Ausgrid's first step in this process is to identify the capex drivers and to review a range of strategies, such as network development strategies and asset class strategies, to guide the development of programs and projects for similar groups of assets.

68. Ausgrid states that it applies a needs-based approach to identifying required projects, responding to defined investment drivers, as shown in the figure below. Ausgrid's framework then involves subjecting its consolidated bottom-up project list to top-down sense checks, a prioritisation process, and a deliverability check. Its ten-year capex portfolio of projects and programs is the outcome from this process.

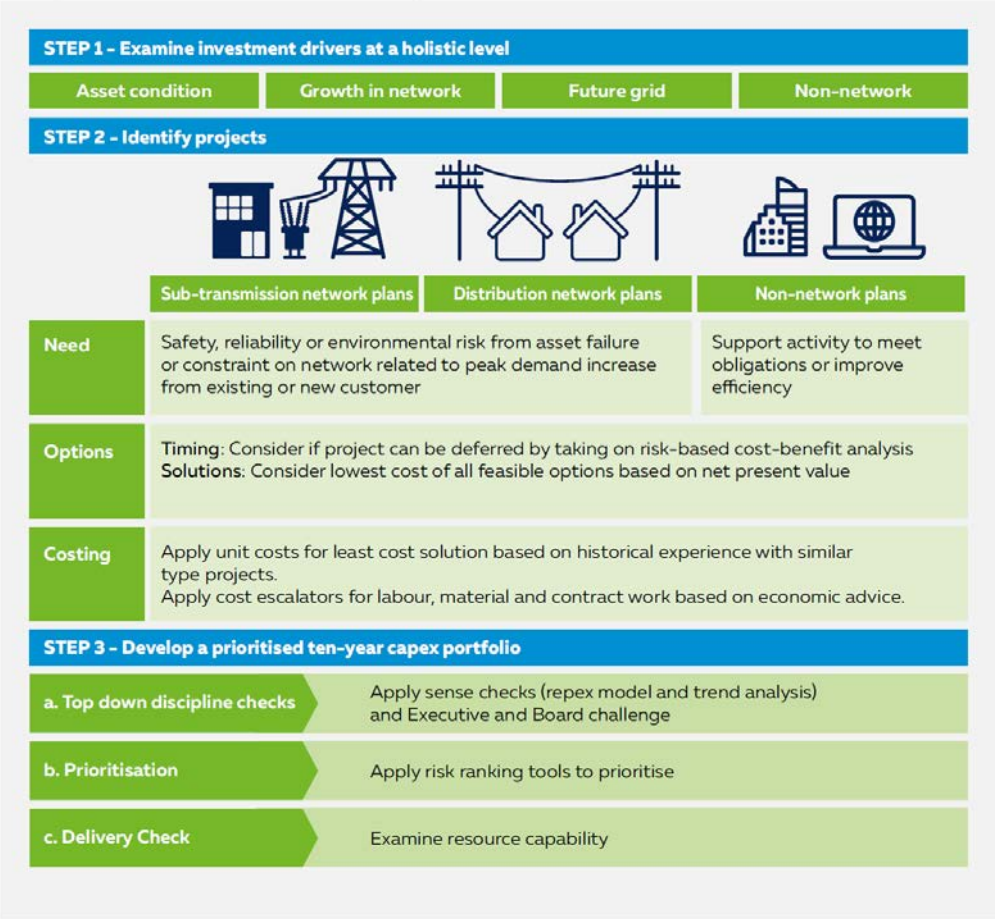
[13] Ausgrid Distribution and Transmission Annual Planning Report 2017. Section 2.4.1.

[14] RP Attachment 5.05 - Investment Governance Framework. April 2018. Section 1.1.

[15] RP. April 2018. Section 5.3.1.

[16] RP Attachment 5.01 - Proposed capex. April 2018. Section 2.5.

Figure 11: Ausgrid's capital planning process



Source: RP Ausgrid's approach to forecasting capex. Page 78.

69. Ausgrid states that the objective of its prioritisation process is to identify prudent opportunities to defer or avoid capex based on an assessment of relative risk such that the requirement for investment funding could be minimised and better meet the goal of customer affordability.[17] The key elements of its prioritisation process are that:

- at several points in the development of the expenditure plans, Ausgrid identifies a full suite of projects and programs that could comprise the proposed expenditure portfolio;
- each project or program is assigned a risk ranking, based on Ausgrid's methodology for assessing risk. The resulting risk score is used to rank projects; and
- through a process of feedback and iteration, Ausgrid refines the plans and risk assessments as the expenditure forecasts are refined with multiple passes through the risk prioritisation tool.

70. A further step in the process is a delivery capability check and Ausgrid states that it considers delivery risks and constraints and, where required, incorporates these into

[17] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.3.

the plan.[18] In some cases, the weighted risk scores arising from the CASH process are over-ridden by management in the subsequent prioritisation of the portfolio.[19]

71. The resulting PIP is a risk prioritised list of all network capital projects/programs currently in progress or proposed to be undertaken.[20]

3.2.3 Investment governance bodies and their roles

72. Ausgrid has three key governance bodies in place to review and endorse investment decisions prior to approval, as follows:[21]

    (i) Investment Evaluation Unit (IEU);

    (ii) Network Steering Committee (NSC); and

    (iii) Investment Governance Committee (IGC).

73. Ausgrid's investment governance committees are intended to review the portfolios produced by the capital planning process and to provide top-down challenge.[22] Ausgrid states that they test the projects and programs, both for consistency of risk prioritisation and for deferral risk.[23]

74. The IGC is chaired by the Chief Financial Officer and includes an external independent engineering expert.[24] This Committee is tasked with providing independent review and challenge to programs and projects prior to approval decisions.

75. The IEU reviews all proposed investments prior to their consideration by the IGC.

76. Ausgrid has a formal change control process in place to provide governance and transparency for any changes to the Gate 1 approved portfolio and risk position.[25]

77. Ausgrid has a Capital Portfolio Management Office (PMO) for network project-based governance and reporting.[26] The Capital PMO is responsible for:

    - defining and improving how projects / programs are developed and executed to align with network requirements; and
    - providing certainty that project / program requirements are satisfied at each of the key decision milestones.

78. The Capital PMO resides in the Integrated Works Management Office (IWMO) within the Asset Management & Operations division, which also contains Asset Investment,

[18] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

[19] RP Attachment 5.05 - Investment Governance Framework. April 2018. Section 2.1.

[20] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

[21] RP Attachment 5.05 - Investment Governance Framework. April 2018. Section 1.2.

[22] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Section 2.8.

[23] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

[24] RP. April 2018. Section 5.3.1.

[25] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

[26] RP Attachment 5.12 - Resource and Delivery Strategy. April 2018. Section 3.3.1.

the function that defines the network investment portfolio and manages approvals at IGF stage gates.

3.2.4 Strategic goals and objectives

79. Ausgrid defines its purpose as to 'connect communities and empower lives with a focus of reliability, affordability and sustainability'.[27] Ausgrid states that its aim is 'to continually provide the functionality required to meet our specified performance and compliance requirements in a sustainable manner'.[28] It defines its strategic objectives as follows:

- keep the network safe for the public, customers and workers;
- maintain current levels of network reliability and security;
- maintain affordability for customers; and
- sustainable capital expenditure.

80. Ausgrid has developed the following capital planning strategies which are intended to achieve its strategic objectives.[29]

Figure 12: Ausgrid's capital planning strategies

Organisational objective	Capital planning strategy
Keep the network safe for the public, customers and workers	Conduct risk assessments on the potential exposure from network assets or activities by incorporating leading and lagging information into the decision making process.
Maintain current levels of network reliability and security	Assess the impacts from loss of supply and consider system and non-system solutions. The benefit to customers in terms of reliability should outweigh the cost of mitigating any issue with an asset.
Maintain affordability for customers	Undertake whole-of-life cost analysis, assessment of risks and project costs for different options, including accepting the risks of a "do nothing" approach where appropriate.
Sustainable capital expenditure	Apply a risk-based approach to assessing the need for and prioritising investments. Target the highest risk assets first.

Source: RP Attachment 5.01 Ausgrid's proposed capital expenditure. April 2018. Table 3.

81. Ausgrid has also defined 'investment objectives',[30] which are intended to align with its strategic objectives. Ausgrid defines these as follows:

(i) operating a safe, reliable and sustainable network;

(ii) operating efficiently;

(iii) maximising the value of the company to shareholders; and

(iv) balancing commercial, social, environmental and customer expectations.

[27] Ausgrid Distribution and Transmission Annual Planning Report 2017. Section 2.1.1.

[28] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Section 2.2.

[29] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Section 2.2.

[30] Ausgrid Distribution and Transmission Annual Planning Report 2017. Section 2.1.3.

3.2.5 Changes to governance and management practices during the current RCP

82. Ausgrid highlights the following changes that it has made in response to the AER's 2014-19 determination and to stakeholder feedback:[31]

- managing risk to defer the timing of major projects by using cost benefit analysis when planning major projects. Ausgrid states that it defers the timing of major projects where the value of customer reliability is lower than the cost of the project. Ausgrid also takes into account reductions in peak demand associated with PV and battery storage;
- more rigorous options assessment by examining alternative options to mitigate risk with low cost solutions. Ausgrid claims to manage to avoid 'like for like' replacement of major infrastructure by utilising spare capacity on the network. Ausgrid states that it has integrated demand management into its planning process when assessing options;
- more emphasis on scope and costs by incorporating cost efficiencies from the efficiency transformations into its forecast methods. Ausgrid claims that the more exacting controls now in place on governance and procurement have led to significant changes in scope, design and delivery costs, which are embedded in its expenditure forecasts; and
- incorporating AER techniques to test capex forecasts. Ausgrid states that it has used the AER's Repex model to test its level of expenditure on replacement for the next RCP, together with other tools such as trend analysis.

83. Ausgrid has established a new Business Planning and Consolidation (BPC) process with a supporting tool-set (Enterprise SAP module) to assist with developing its capex forecast.[32] It consolidates all capital projects and programs across the network and non-network portfolios and manages them in this central repository. The claimed benefits of the BPC application include:[33]

- allowing good integration of budgeting, forecasting, and actuals;
- providing consistent regulatory reporting;
- improving transparency and justification of forecasts;
- a repeatable process;
- audit trail of changes to assumptions and key parameters; and
- providing better investment and scenario analysis functionality.

3.2.6 Ausgrid's transformation program

84. Ausgrid became a new company on 1 December 2016, with a new CEO and a new ownership structure. Ausgrid has undergone a significant transformation process during the current period and which it claims to have positioned the organisation for improved performance and to re-shape and re-focus the business, to:[34]

[31] Ausgrid - Expenditure Forecasting Methodology 2019-24. June 2017. Section 3.1.

[32] RP. April 2018. Section 5.3.1.

[33] RP Attachment 5.03 - Business Planning Consolidation. April 2018. Section 4.0.

[34] RP Attachment 5.12 - Resource and Delivery Strategy. April 2018. Section 3.5.

- improve efficiencies in delivery processes and execution of work;
- maintain current levels of reliability, quality and security of electricity supply at a price which is affordable to customers;
- readily adapt and respond to future changes in the operating environment; and
- embed a culture of continual improvement, constantly seeking new and innovative ways to improve processes to deliver better value to customers.

85. Ausgrid claims that these improvements and efficiency gains are now embedded in the business and are fully reflected in its capex forecasts for the next RCP.[35]

3.2.7 Risk framework

86. Ausgrid's risk framework is described in a Board Policy.[36] The policy requires an annually approved Risk Appetite Statement, defines a Risk Management Governance structure and defines elements of a Risk Management Culture.

87. The Policy defines risk categories, comprising safety, network performance, environment, reputation, finance, compliance, customers and 'program/portfolio'.[37] The framework prescribes that risks are to be assessed using the risk matrix shown in the figure below, which is accompanied by a table to assist with defining 'consequence'.

Figure 13: Ausgrid's risk matrix

		CONSEQUENCE (See next page)				
LIKELIHOOD		Insignificant	Minor	Moderate	Major	Severe
Has happened in the company in the past year and may occur more than 5 times a year For programs or portfolios, it is certain to occur, based on occurrence on similar programs or portfolios.	Almost Certain	Medium	Medium	High	Extreme	Extreme
Has happened in the company in the past 10 years and may occur more than once a year but no more than 5 times a year For programs or portfolios, it is likely to occur, based on occurrence in the majority of similar programs or portfolios	Likely	Low	Medium	High	High	Extreme
Has happened in the industry and may occur more than once in 10 years but no more than once a year For programs or portfolios, it may occur, based on occurrence in a minority of similar programs or portfolios.	Possible	Low	Medium	Medium	High	High
Has happened in industry and may occur more than once in 25 years but no more than once in 10 years For programs or portfolios, it has potential to arise during the programs or portfolios but not expected.	Unlikely	Low	Low	Medium	Medium	High
Never heard of in the industry, but may occur in exceptional circumstances, no more than once every 25 years. For programs or portfolios it is conceivable, but is not known to have occurred in any previous programs or portfolios.	Rare	Low	Low	Low	Medium	High

Source: Ausgrid Board Policy – Risk Management GV000-Y0014. Annexure A - Risk Matrix

88. In response to our information request, Ausgrid provided a draft document (dated June 2018) on the application of its risk framework to asset management decision making. We refer to this document in our assessment of Ausgrid's forecasting methodologies related to repex, in Section 4.3.

[35] RP. April 2018. Section 5.11.

[36] Board Policy – Risk Management GV000-Y0014. Approved 15/05/2018.

[37] *Ibid*. Page 5.

89. We sought information on Ausgrid's risk appetite, and the way that Ausgrid has applied this in determining a prudent and efficient level of expenditure[38]. Ausgrid's response refers to various obligations that it has but claims that the results of its risk considerations are confidential. Ausgrid did not provide its Risk Appetite Statement.

3.2.8 Ausgrid's governance and management framework for its RP forecast

90. Ausgrid states that its RP forecast has been developed under its BAU governance and management framework. Specifically, the PIP presented to the IGC for the RP was developed using essentially the same process as Ausgrid uses to produce its rolling annual ten-year PIP.

91. While Ausgrid appears to have used what are essentially its BAU planning processes in developing its RP capex forecast, it appears that a different governance body was involved. Specifically, Ausgrid states that since the lease transaction in 2016 Ausgrid has held regular Regulatory Reset Executive Committee (RREC) meetings, which have been the main forum for challenging and debating the investment and planning decisions being proposed by the business for the next RCP.[39]

3.3 Our assessment

Portfolio does not appear to have been tested against aggregate performance outcomes

92. Ausgrid has not provided evidence demonstrating that it has tested the aggregate performance of the set of portfolios that it has considered back to its stated corporate objectives. It is also not clear that Ausgrid monitors the performance of portfolios, individually or in aggregate, and which would assist in determining if the investments are prudent.

93. In summary, Ausgrid's capital planning process does not include top-down guidance sufficient to link its assessment of a reasonable and prudent level of investment to its intended service levels. Such linkages would also enable the executive to meaningfully interact with the portfolio investment plans presented at Gate 1 for approval each year.

Risk based investment prioritisation does not appear to reflect a defined risk appetite

94. Ausgrid's expenditure forecast is constructed and progressively refined with an iterative process[40] with the expenditure forecasts passing multiple times through the risk prioritisation tool.[41] Ausgrid's documentation does not indicate how its risk appetite is defined in terms that would allow its CASH model to be used to determine a justified 'cut-off' point for its prioritised portfolio. Absent this guidance, it is not clear

[38] Ausgrid's response to information request IR016, EMCaAUS061.

[39] RP. April 2018. Section 5.3.1.

[40] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

[41] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.3.

if or how Ausgrid established that the plan that it has proposed as the basis for its forecast expenditure, would address risk to a level consistent with its risk appetite. While Ausgrid has indicated that it undertook multiple review and challenge cycles, it has not explained the criteria by which the iterations of its plans were rejected and then modified, and the implications of those changes by reference to risk.

95. It is not clear whether the challenge and re-ranking of a portfolio sufficiently challenges the original need for an investment, which would assist in optimising the overall program, or how the executive determines that a particular portfolio is 'risk-optimised'.

Incremental nature of the planning process is likely to have led to over-estimation bias and a degree of inefficiency in actual spend

96. Ausgrid's approach to portfolio management is to maintain a ranked list of programs/projects and, each year, to update this list.

97. We consider that a zero-based approach to this annual exercise, or an incremental approach with better-defined challenge criteria, would result in stronger top-down challenge. Ausgrid's process is likely to have led to an over-estimate of project and program requirements. Further, there is a risk that each category manager may be prone to maintaining spending to the levels of funding implied by inclusion in a Gate 1 plan rather than dynamically reassessing what's needed as circumstances change or new information comes available.

Basis for top-down challenge has not been explained

98. Ausgrid states that its forecasting approach combines bottom-up analysis with top-down reviews by senior executives to ensure that the proposed expenditure is prudent and efficient.[42] We observe steps in the governance and management framework that involve rationalising and prioritising individual projects and programs, in producing Ausgrid's plan (PIP), including prioritisation based on Ausgrid's assessment of risk scores.

99. We have been provided with bottom-up assessment information on many of the projects and programs that Ausgrid has included in its plan, and which we assess in Sections 5, 6, 7 and 8. We understand that the process by which it has identified these projects is as described in Ausgrid's forecast capex method,[43] which is discussed in Section 4.

100. Portfolio management involves constructing an appropriate mix of investments that in combination are intended to optimally achieve a set of portfolio level objectives, linked to the corporate strategy. For an electricity network, a strong element of this is managing a range of risks within defined risk parameters. However, Ausgrid has not provided information that shows how the IGC performed the top-down challenge and specifically, how it determined that the proposed forecast represents an appropriate balance of cost against intended outcomes, and what trade-offs were made in arriving at this conclusion.

[42] RP. April 2018. Section 5.3.1.

[43] Ausgrid - Expenditure Forecasting Methodology 2019-24. June 2017. Pages 12-15.

Ausgrid's documentation includes indications that its work program is not entirely 'needs driven'

101. Ausgrid states that its RP forecast is needs-driven. However, in describing its portfolio-level prioritisation process, Ausgrid states that '*if [it] is allowed 100% of its proposed expenditure, it will undertake all of the activities on the PIP project list*'.[44] This suggests to us a lack of internal confidence that Ausgrid's proposed expenditure reflects a considered assessment of need, that Ausgrid has justified by consideration of metrics that reflect its stated corporate and investment objectives.

102. Ausgrid's justification for its proposed expenditure should support the capex allowance that is included in the AER's eventual regulatory determination of its tariffs. While issues raised in the AER's assessment process may lead Ausgrid to reconsider or refine aspects of its planned works program, it is an unwarranted reversal of this process for Ausgrid to determine the extent of its investment program based on that allowance. Such a reversal also potentially undermines Ausgrid own governance process.

Whilst BAU governance bodies and their roles are largely fit for purpose, it's unclear whether the RREC operated entirely under the BAU framework

103. Ausgrid's BAU expenditure governance bodies and their roles appear to be largely fit for purpose, with the peak body being the IGC.

104. We observe that Ausgrid's RREC appears to have been the peak governance body for Ausgrid's RP forecast. It is unclear whether this Committee has absorbed the role of the IGC in approving projects for the latest BAU five- to ten-year PIP, or whether it has produced a different PIP for the next RCP specifically for the RP process. It is also unclear whether its terms of reference, processes and considerations are the same as the IGC.

105. To the extent that Ausgrid's RREC has operated under corporate objectives, investment objectives, policies or decision criteria that differ from Ausgrid's BAU governance framework, conclusions that we draw based on our assessment of Ausgrid's BAU governance framework may not apply to its forecast. From discussions at our onsite meeting it appears that the RREC introduced other considerations into the planning process, including tariff outcomes. This introduces the possibility that the proposed plan may include projects that would not have been included based on need, or the exclusion of projects that otherwise do meet criteria for inclusion.

106. Ausgrid's governance and management framework appears to be designed primarily as an expenditure control framework, through a relatively standard gated decision process for individual projects and programs.

Forecast does not appear to allow for future refinements

107. Ausgrid's RP capex forecast is almost entirely comprised of projects at Gate 1 level. Ausgrid describes how projects and programs are rationalised and refined at Gates 2 and 3. Whilst, at the individual project and program level, it is not possible to wind the clock forward and prejudge these refinements, it is possible to do this by

[44] RP Attachment 5.04 - Prioritisation Investment Plan (PIP) process. April 2018. Section 1.4.

considering the effect at an aggregate level that Gate 2 and Gate 3 processes are likely to have.

108. Ausgrid has proposed an RP forecast comprised almost entirely of its Gate 1 plan. On balance, it is likely that some projects may be subsequently rationalised, found not to be justified or displaced by alternative lower cost network or non-network options at Gates 2 or 3.

3.4 Summary and implications for proposed capex forecast

3.4.1 Findings

109. We consider that Ausgrid's governance and management framework reflects a focus on expenditure control. In regard to those elements of Ausgrid's framework that have defined the process and accountabilities by which Ausgrid has produced its RP forecast, our findings are as follows:

- The criteria used in Ausgrid's top-down portfolio challenge process are unclear, with no clear link back to achievement of defined corporate or investment objectives, including defined performance outcomes or risk outcomes which reflect its risk appetite. It is therefore unclear how Ausgrid has determined that its proposed forecast represents an appropriate balance between cost and intended outcomes;
- The incremental nature of Ausgrid's rolling ten-year plans, absent strong portfolio-level linkage to decision criteria such as those defined in the finding above, lends itself to an insufficient level of challenge which over time is likely to lead to an over-estimate of requirements and may also lead to a degree of unwarranted expenditure;
- While Ausgrid claims that its investment decision-making is entirely needs driven and internally determined, there are indications in its expenditure governance and management documentation that it may ultimately determine its actual work program based on allowances which the AER adopts for the purpose of its price determinations;
- Through the involvement of the RREC in establishing the RP forecast, it is unclear whether Ausgrid's RP forecast has been determined entirely under its BAU expenditure governance framework. There are indications that the involvement of the RREC may have introduced considerations, such as tariff outcomes, that do not accord with Ausgrid's defined framework; and
- Ausgrid's process by which its forecast is based on a defined set of projects and programs, as represented in its PIP / master project list, and which underpins Ausgrid's RP forecast, is likely to overstate its eventual requirements by not accounting for future refinements and rationalisations that will occur as projects and programs progress through Gates 2 and 3.

3.4.2 Implications

110. We consider that the systemic issues we have observed with Ausgrid's expenditure governance and management process detract from its capacity to on balance make prudent and efficient expenditure decisions and we consider that it is likely that an

RP forecast produced through this governance process is not a reasonable forecast of Ausgrid's prudent and efficient requirements.

4 Assessment of forecasting methods

4.1 Introduction

111. In this section, we describe and assess the methods by which Ausgrid has developed its capex forecast.

112. While some aspects of its methods may apply across all components of its proposed capex, the focus of our assessment is on the methods that Ausgrid has used to forecast the two expenditure categories that we have been asked to review, namely, repex and non-network.[45] In this section we have focused on assessment of Ausgrid's repex forecasting methods. Assessment of forecasting methods specific to non-network expenditure are covered in Sections 6, 7 and 8.

113. Because of its significance, we have described and assessed Ausgrid's approach to forecasting its expenditure requirements at the aggregate portfolio level and at the individual project / program level in separate sub-sections. We also describe here certain 'tools' that Ausgrid states that it has used to develop or to verify its forecast.

4.2 Overview of Ausgrid's stated capex forecasting process

114. Ausgrid has used its BAU capital planning process, as described in Section 3, to develop its RP forecast. As described in Section 3, this is a three-step process involving:

- Step 1: Examining investment drivers
- Step 2: Identifying projects and programs, and
- Step 3: Developing a prioritised ten-year plan.

[45] Non-network comprises proposed capex for fleet and plant, property, ICT and OTI.

115. This same process is applied both to network and non-network project requirements. We understand that Ausgrid's RP forecast is the first five years of this ten-year plan.

116. The forecasting process that Ausgrid describes can be characterised as a 'bottom-up' method, with claimed top-down checks and a prioritisation process. Consistent with Ausgrid's forecasting process, we first describe and assess how Ausgrid identifies and justifies repex project and program needs (in Section 4.3). In Section 4.4 we describe the methodologies that Ausgrid has applied at a portfolio level, by way of claimed 'checks' and to prioritise the repex programs and projects.

4.3 Repex forecasting – individual project and program level justification

4.3.1 Ausgrid's approach

Asset management plans and strategies

117. As discussed in Section 3, Ausgrid has an Asset Management Policy and a draft Network Management Strategy (NMS), as its version of a Strategic Asset Management Plan.

118. Ausgrid explains[46] that it is continuing to develop the NMS and the overarching Asset Management System (AMS) framework following the significant transformative events in the business over the past four years, and they remain in draft. From our review of these documents, it is not clear to us what if any material changes have occurred that have had a material impact on development of the asset management drivers and objectives for the next RCP.

119. We requested that Ausgrid describes any material changes to its asset management approach that have been included in the forecast period when compared with the current period. In its response, Ausgrid outlined six areas of change:[47]

- probabilistic planning, in contrast to deterministic (compliance rule based), was introduced in 2016;
- a greater emphasis has been placed on demand management to defer larger replacement projects;
- enhanced asset management initiatives for gathering and processing additional network information for incorporation into models of asset risk;
- consideration of new or changed stakeholder requirements;
- consideration of new or changed asset condition; and
- increased focus on secondary system assets after previous period focused more heavily on primary assets and their related support assets.

120. The draft NMS refers to segmentation of Ausgrid's assets into a number of asset classes, and development of delivery of holistic strategies, referred to as asset class strategies. Ausgrid advised that the specific asset class summaries identified in its draft NMS are '*currently under development as part of improvements in asset*

[46] Response to information request IR005 EMCaAUS021 - Asset Mgt Approach.

[47] Response to information request IR005 EMCaAUS022 - Changes in AM approach.

management documentation to support our ISO55001 certification process as required by the NSW Licence Conditions. These Asset Class Strategy documents will replace the previous strategies for replacement decision making captured in Attachment 5.13.0 (including 5.13.A to 5.13.L) provided with our substantive proposal.'[48]

121. Prior to developing its NMS, Ausgrid stated that '*asset strategies have been captured in "Asset Investigation & Assessment reports" (from 2004 to 2010), Asset Condition & Planning Summary documents (ACAPS) in 2013 and Strategic Asset Prioritisation documents (SAP's) for transmission cables and 11kV switchgear*.'[49]

122. We have relied on the information that Ausgrid provided to support its expenditure forecast. For the repex forecast, this has been primarily included in Attachment 5.13, Attachment 5.14 and in responses to our information requests. Ausgrid has also provided overview documents for twenty-seven of its programs/categories, in its Attachment 5.13.A through to Attachment 5.13.J.[50]

123. Ausgrid has described its process for deciding the scope and timing for asset replacements at an asset level in its *Decision Making & Risk Management Strategy*[51] and capex overview documents.[52] This includes three key principles:

- economic life assessment – through understanding the long-term customer needs of assets appropriate decisions can be made about the economic life of the asset over which to manage;
- lifecycle risk management – through applying risk management techniques across the asset life cycle to provide an appropriate balance of risk, cost and performance that meets the needs of our customers and stakeholders; and
- evidence based decision making – whereby accurate and timely data is to be used in conjunction with risk methodologies and assessment techniques to inform asset management related decisions.

Replacement drivers

124. The replacement programs that Ausgrid proposes are developed to target and treat risks where '*the benefits of ameliorating the risks outweigh the costs. Our approach to risk management is embedded in our asset management decision making process and applied across all asset classes.*'[53]

125. The key replacement drivers include:[54] (i) functional failure – triggered by either asset condition or an extraneous event; (ii) conditional failure – asset is assessed based on inspection and analysis to be 'at risk' of functional failure; and (iii)

[48] Ausgrid's response to information request IR016 EMCaAUS069 - Repex overview AS GR MR2 PG.

[49] *Ibid.*

[50] Ausgrid's response to information request IR016 EMCaAUS069 - Program overview briefs.

[51] Ausgrid's response to information request IR005 EMCaAUS017 - Draft Decision Making and Risk Management.

[52] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018 and RP Attachment 5.13.0 Project justification for replacement and duty of care programs – Introduction. April 2018.

[53] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 26.

[54] *Ibid.*

compliance – asset is assessed as non-compliant and creates an unacceptable level of risk.

126. Ausgrid states that most of its repex arises from the risk of asset failure. The optimal timing is determined '*when the likelihood of failure reaches a point where the risk is unacceptable*.'[55]

Categorisation of replacement plans

127. Ausgrid has categorised its replacement programs into three main treatment methods:[56]

(i) planned programs – the product of assessment of the inherent asset risk including a thorough assessment of the asset condition for a group or population of assets, such that the replacement requirements for that population are known up front and can be prioritised based on risk;

(ii) condition-based programs – where the condition of the asset can be reliably monitored, and where the asset is deemed to no longer meet minimum standards, asset retirement or replacement is triggered. These programs required a deep understanding of asset risk and condition; and

(iii) reactive replacement – involves replacement or life extension to address risks that arise and not covered by proactive programs. (reactive replacement - functional failure).

128. In its program justification documents, Ausgrid considers the appropriateness of each method to the asset type and recommends a preferred method as being the basis of the replacement activity.

129. In Attachment 5.01, Ausgrid claims that it apportions Substation and Reactive asset category counts and associated costs across the standard RIN asset categories, and therefore the expenditure will be reflected in the respective asset categories.

130. Ausgrid describes a change in its forecasting approach for its reactive replacement programs for the next RCP, moving to a pooled approach based on historical trends in expenditure.[57] For the current RCP, Ausgrid claims it undertook a bottom-up build resulting in 141 individual program that led to a higher aggregate forecast than was actually incurred.

131. For the next RCP, Ausgrid has applied the average actual expenditure from 2015-17 to forecast future expenditure requirements. Ausgrid claims that[58] '*given the targeted risk based approach to proactive programs informed by strong asset condition information, it is not expected that the increases in age and failure rate will require an increase reactive investment over the period*.'

[55] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 26.

[56] *Ibid*. Page 28.

[57] RP Attachment 5.13.K - Reactive replacement programs. April 2018. Pages 4-5.

[58] RP Attachment 5.13.K - Reactive replacement programs. April 2018. Page 6.

Asset information

132. Ausgrid states[59] that asset condition data for its programs is captured in a number of corporate systems, namely: Asset Management System (SAP), Geographical Information System (GIS), Outage Management System (OMS), and Portfolio Investment Plan. The asset data in SAP, GIS and OMS is claimed to be correlated when developing programs that capture aspects of each of them.

Replacement programs

133. Ausgrid nominates two primary options for its replacement needs:[60]

- Replacement Programs – applied to assets that do not meet the criteria for continued service as identified above may be added to a replacement program; and
- Area Plans[61] – at sub-transmission sites, where there is the potential for multiple capex requirements, a holistic review of the area is conducted. An area plan may identify the need for a major project. This is also where demand management is considered, forecasting of failures, cost benefit analysis and sensitivity analysis is undertaken.

Predictive failure models

134. In its response to a request for information, Ausgrid has advised that it has relied on three predictive failure models for its repex forecast:[62]

- major Transformer Weibull model;
- 11kV Switchboard Weibull model; and
- the Sub-transmission Cable failure probability model (based on the CROW-AMSAA methodology).

135. Ausgrid has commissioned an external assessment of the transformer and sub-transmission cable models and has provided references to the reviews. In summary:

- for transformers, the model was assessed as reasonable and based on sound underlying methods and principles; and
- for sub-transmission fluid-filled cables (FFCs), the modelling approach was 'reasonable' for predicting the failure rate of FFC's (the population and individual FFC's) and unavailability of individual FFC's.

136. The 11kV switchboard failure probability model was developed during 2016 and 2017, based on the same Weibull modelling approach as is applied for major transformers.

[59] Ausgrid's response to information request IR016 EMCaAUS069 - Repex overview AS GR MR2 PG.

[60] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 30.

[61] Major assets included in Area Plan strategies are limited to sub-transmission cables, major transformers, 11kV switchgear.

[62] Ausgrid's response to information request IR016 EMCaAUS071 Model validation.

Project and program justification

137. For the most part, we have not been provided with business case level justification for the included programs and projects. We understand from discussions with Ausgrid that consistent with its application of its BAU investment planning framework[63], it has not developed business cases for the projects and programs in the next RCP as part of the RP development process.

138. We therefore sought evidence of justification of the proposed expenditure, consistent with the normal requirements of a business case-like document, from the information we were provided.

139. In describing its replacement programs, Ausgrid referred to three treatment options (repair, refurbish or replace) and three treatment methods (reactive, conditional or planned) that have been considered for each program. In most cases for replacement programs included into the forecast for the next RCP, Ausgrid has concluded that replacement and planned treatment are its preferred options.

140. In documentation we have reviewed, Ausgrid often refers to the basis for the selection of replacement volumes by '*balancing the costs of continuing ongoing maintenance against the cost of replacement'* and uses this as a basis to conclude that a planned treatment should be undertaken to manage the identified risk, and which at times coincides with an asset age-basis.

Cost-benefit analysis

141. Ausgrid has documented a cost benefit analysis methodology (CBA).[64] This has been applied to 132kV fluid filled cable replacements, and 11kV and 33kV switchboard replacements only. We discuss the modelling methodology for these asset categories in Section 5.

4.3.2 Our assessment

Expenditure mapping to RIN is not complete and internally inconsistent

142. We received mapping of the replacement program and project forecast expenditure to the RIN asset categories from the AER, as provided from Ausgrid to assist with reconciling the expenditure forecast with the supporting information. We found that the:

- mapping of programs does not exactly align to the repex asset categories. For example, service wires expenditure is $55.9m in the RIN but only $52.5m according to project/program mapping. This suggests another program may be contributing to the RIN total and has not been included;
- mapping of programs does not align to the repex sub-categories. The variations across sub-categories of RIN are at times significant (i.e. > $10m), and at times also change the mapping of projects across categories when compared with the RIN (i.e. SCADA/Other, Switchgear/Other); and
- unders and overs within and across asset categories (as described above) appear to balance out at the aggregate level, such that the major projects

[63] As described in Section 3

[64] RP Attachment 5.09 - Cost Benefit Analysis for Planning. April 2018.

represent the balance of the RIN forecast of $434.7m. We have not been provided with mapping of the major project expenditure to the RIN asset categories.

143. The variances described above are summarised in the table below.

Table 9: Summary of RIN mapping ($m, real June 2019)

$m, real June 2019	Total 2020-24			
Repex	RIN	Master project list	Percentage mapped	Variance
Poles	168.3	161.4	96%	6.9
Pole Top Structures	26.3	26.3	100%	0.0
Overhead Conductors	129.0	120.4	93%	8.6
Underground Cables	440.3	201.6	46%	238.7
Service Lines	55.9	52.5	94%	3.5
Transformers	108.7	62.9	58%	45.9
Switchgear	230.8	155.0	67%	75.8
SCADA, Network Control & Protection System	106.1	128.9	122%	-22.8
Other	407.7	329.5	81%	78.2
Total	**1,673.1**	**1,238.4**	**74%**	**434.7**

Source: EMCA analysis.

Expenditure forecast information varies between documents

144. As a further complicating factor, the expenditure forecast information was not consistent between the RIN, Ausgrid's master project list[65] and the supporting documentation. There were numerous examples where the documents provided by Ausgrid as justifying the expenditure contained forecast expenditure for the next RCP that was not consistent with the RIN or Ausgrid's master project list. We identify examples in our review of the repex forecast in Section 5.

Supporting information is incomplete

145. We identified a number of programs included in the expenditure forecast that were not included in the supporting information provided in Attachments 5.13 and 5.14 to justify the repex forecast. For example, Ausgrid has included line items for electromechanical relay replacement and non-electromechanical relay replacement in its RIN totalling $85.8m. We were not able to find any justification for inclusion of these programs into the forecast in the supporting information.

146. We also found that the justification for the reactive components of programs was aggregated across seven asset groups in Attachment 5.13.K *Project justifications for reactive replacement programs,* and not visible in the information provided in Attachments 5.13.A to 5.13.J to justify the expenditure forecast. Instead the use of a historical trend was applied. In the absence of additional supporting information to confirm the reasonableness of this forecasting approach or that provision is not already included in other programs, insufficient information is available to conclude the proposed expenditure is prudent.

[65] RP Attachment 5.02 - Master list of forecast capex portfolio.

147. Furthermore, the single largest reactive program REP_04.04.02 *11/5kV underground mains* is included in the forecast expenditure at $32.1m over the next RCP, and 46% of the DMUG asset group (also referred to as *RND_04.02.99 - Replace Distribution Mains Underground Reactive* program). Ausgrid states[66] that it has introduced an aggregated pooled approach to forecasting reactive replacement programs based on the assessment of historical trends in actual expenditure, to replace its previous bottom-up program level approach. However, Ausgrid includes 11 programs in the DMUG asset group, none of which appear to have supporting information at the program level.

Insufficient evidence provided to support the proposed replacement volumes

148. Whilst we except that there are often limitations on assessing asset condition for some assets, we did not see sufficient analysis of available condition information, defect rates, failures rates or other data that would assist in supporting or otherwise assessing the proposed replacement volumes.

149. We found that the justification information provided by Ausgrid did not tend to include sufficient detail of the assessment of the selected option, or any attempt to quantify the costs or benefits.

150. We expected to see evidence of analysis of asset performance (condition, health, defects, failures) at an asset class level, assessment of risk (qualitative and quantitative) for the asset and asset class, assessment of changes in risk over time including pre and post expenditure, and any impact to service measures and network risk performance (where appropriate). This appears not to exist.

151. Of the principles included in the *Decision Making & Risk Management Strategy*[67] we observe that the three elements of: (i) economic life assessment; (ii) lifecycle management; and (iii) evidence-based decision making, are present in the assessment of the major projects, including application of Ausgrid's CBA method. However, we saw limited evidence of these principles applied in the high-level information we were provided in support of the replacement program expenditure.

152. As is described by Ausgrid[68], evidence-based decision making is a fundamental element of good asset management practice. Accordingly, an assessment of a prudent and efficient level of expenditure should draw from the information relied upon and the method applied by the NSP to produce its forecast expenditure requirements, and to meet the requirements of the NER.

Limited application of risk and options analysis

153. Ausgrid's statement of objectives in its decision making and risk management approach[69] appear incongruent with the documentation we have reviewed. Ausgrid's application of risk analysis to programs is limited and is unlikely to facilitate a

[66] RP Attachment 5.13.K - Project justification for reactive replacement programs. April 2018. Page 5

[67] Ausgrid's response to information request IR005 EMCaAUS017 - Draft Decision Making and Risk Management.

[68] *Ibid.*

[69] Ausgrid's response to information request IR005 EMCaAUS017 - Draft Decision Making and Risk Management.

consistent approach to comparing and prioritising risks across the business as Ausgrid has claimed.

154. Of the projects and programs we reviewed, we consider that the identified replacement activities are generally consistent with treatment of high risk assets, as set out in Ausgrid's draft NMS to target these. However, we do not see sufficient evidence to ascertain how Ausgrid's assessments were undertaken, and any trade-offs made by Ausgrid in selecting the projects and programs into the forecast over others.

155. We sought evidence of Ausgrid's application of risk analysis to the project and program documents we reviewed. We found evidence that:

- for major projects for sub-transmission cables, and switchboard replacements, Ausgrid has undertaken a quantitative risk assessment, including application of its CBA model to determine the economic timing of projects; and
- for its replacement programs, the risk assessment consisted of a high-level qualitative table-based assessment that considers consequences of loss of function and key failure modes.

Adoption of a predictive modelling approach is limited in scope and without evidence of data quality

156. As described by Ausgrid, its predictive modelling approaches should, if applied with appropriate input assumptions and accurate condition data, lead to a forecast of replacement activity that is more likely to be reflective of a prudent level.

157. Whilst Ausgrid has provided descriptions and reports on its approach to predictive modelling for sub-transmission cables and for switchgear, it is not clear how it has applied the approach in practice for other asset categories. Ausgrid has not provided the specific models that would demonstrate the application of its methodology as a part of its submission, or in response to our information requests for supporting information.

158. We haven't seen evidence that Ausgrid has undertaken adequate quality assurance of the data it has relied upon in its modelling. Whilst it may obtain good data from inspections immediately prior to undertaking work, it is essential that Ausgrid can provide assurance on the reliability of the current data to support its plans and forecasts.

159. Accordingly, we have not been able to assess the quality of Ausgrid's application of its predictive modelling.

Application of cost benefit analysis is limited

160. We observe that Ausgrid's application of its CBA method is limited to major projects for sub-transmission cables, and 11kV and 33kV switchboard replacements, as described in Attachment 5.14. We understand that Ausgrid may have also applied modelling to its Major Transformers, however we did not see evidence of its application of CBA in the information provided to justify the forecast expenditure.

161. Whilst we have not undertaken a detailed analysis of the input assumptions used in the supplied modelling, we make observations on the reasonableness of the parameters and approach to quantification of risk, and how this is applied in its

economic models in our review (in Section 5) of the relevant parts of the repex forecast.

162. We do not see evidence of sufficient options analysis or economic analysis as applied to the replacement programs, or consideration of scenarios to generate alternate risk outcomes and expenditure forecasts as part of Ausgrid's options consideration. The justification information provided is high-level in nature, and in most cases is insufficient evidence to justify the need and timing of repex that Ausgrid claims.

4.4 Repex forecasting - portfolio level justification

4.4.1 Ausgrid's approach

Derivation of Ausgrid's proposed forecast repex requirement

163. As described in Sections 4.2 and 4.3, Ausgrid has developed its repex forecast of $1,673m in the first instance from a bottom-up build of proposed projects and programs expenditure. In this process, Ausgrid states that it has sought to remove potential overlaps and applied certain top-down checks, such as trend considerations, prioritisation and Repex model comparison.

164. In this section we describe and assess the top-down checks and prioritisation processes that are integral to Ausgrid's stated repex forecasting methodology[70].

Application of risk-based prioritisation method and methods used for top-down challenge

165. As described by Ausgrid, it first checks that the bottom-up portfolio of projects does not include overlaps between projects and programs, removing projects from the consolidated list as necessary.[71]

166. Ausgrid's process then requires '*a top-down assessment of the [*repex forecast*] outcome'* using the AER's Repex model[72]. As described by Ausgrid it also uses '*historical trending as a "check" on our forecast capex requirements'.* [73] Where there is a material difference between its bottom-up forecast and results from applying the AER's models and techniques, it seeks to understand the drivers of the difference. Ausgrid's description of its process does not explicitly state the decision-making process for modifying its expenditure forecast (i.e. are adjustments made at a category level or at a portfolio level?). Nevertheless, given its claims we consider its Repex model comparisons in our assessment in Section 4.4.2.

[70] As noted in Section 4.1, Ausgrid's forecasting methodologies for the non-network expenditures that we have reviewed, tend to be bespoke to those expenditure categories, and are reviewed in Sections 6, 7 and 8.

[71] Ausgrid - Expenditure Forecasting Methodology 2019-24. June 2017. Page 15.

[72] RP, Page 86

[73] Ausgrid - Expenditure Forecasting Methodology 2019-24. June 2017. Page 15.

167. Once it has completed its top-down checks, Ausgrid states that it uses 'risk ranking tools', specifically the CASH model, to prioritise projects[74] which it then maintains in its PIP. Ausgrid makes frequent reference to its use of risk-based methodologies to determine its expenditure requirements. For example, in determining its capital planning strategies, Ausgrid claims to '*conduct risk assessments'*, '*undertake… assessment of risks and project costs for different options*', '*apply a risk-based approach to assessing the need for and prioritising investment*' and to '*target the highest risk assets first*'.[75] We review this process in Section 4.4.2 below.

Consideration of link between capital expenditure objectives and outcome measures

168. In describing its capital planning process, Ausgrid lists a number of 'capital planning measures' which are effectively measures that could capture intended capital expenditure outcomes. These include safety incident performance, safety risk assessment (ALARP, SFAIRP), asset failure trends, reliability performance (SAIDI, SAIFI), value of unserved energy, peer benchmarks and system risk performance.

Deliverability

169. Ausgrid has provided evidence of having assessed delivery capability through a *Resource and Delivery Strategy*, supported by a Workforce Strategy and Delivery Model. Ausgrid also describes improvements that it has made to its delivery processes through its 'One Plan' initiative and creation of a Program Delivery Division.

4.4.2 Assessment

Top-down assessment of aggregate repex requirement

170. In Section 4.2 of its proposed capital expenditure supporting document[76], Ausgrid has sought to compare its proposed repex forecast, which it has developed from a bottom-up build of project and program costs, with outputs that Ausgrid has determined by running the AER's Repex model. Ausgrid has undertaken a partial comparison because not all of the components of its proposed expenditure are included in its AER repex modelling and Ausgrid has run the model using its own assumptions.

171. Taking its 'modelled' components only (comprising $1,107m), Ausgrid has compared this with Repex model runs which produce repex forecasts for these categories of between $1,027m and $1,283m.

172. While assessment of Ausgrid's Repex model runs and associated assumptions are not within EMCa's scope, we note that Ausgrid has provided a letter from Nuttall Consulting which reports (in part) on '*an assessment of Ausgrid's repex forecast, through the AER repex model, using the approach the AER has applied in its most recent set of decisions*.'[77] In an overview of analysis, that letter states that '*…the*

[74] RP. Pages 78 - 79.

[75] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 8.

[76] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018.

[77] RP Attachment 5.15 - Nuttall review of repex. April 2018.

AER's recent assessment approach….supports a large portion of the Ausgrid forecast ….with only 7% of the Ausgrid covered forecast above the alternative estimate.' We interpret this to mean that Ausgrid's forecast is approximately 7% higher than it obtains from its run of the Repex model.[78]

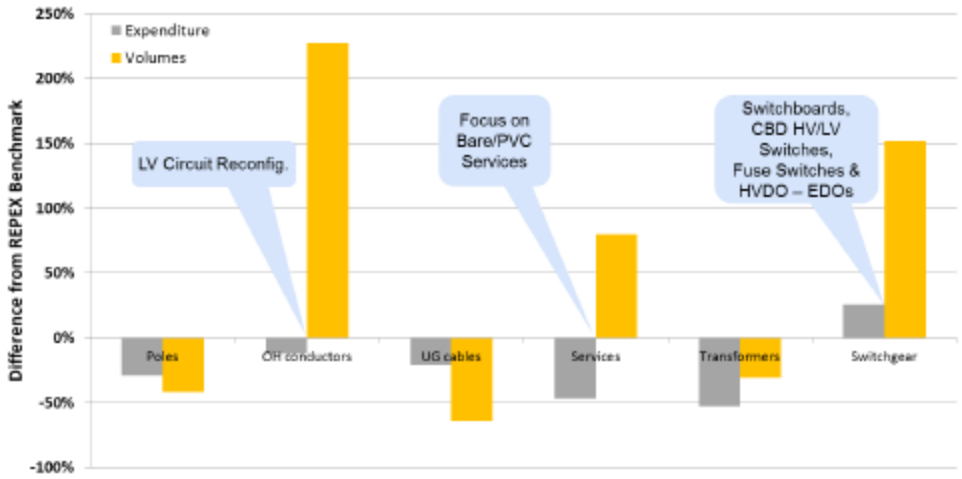
173. We have not seen evidence that Ausgrid modified its bottom-up plans by reference to Repex model outputs. Ausgrid claims that its repex modelling '…*supports the reasonableness of [*its*] proposal'*.[79] From a process point of view, we observe that Ausgrid has made the top-down comparison. However, the validity of its claim that it demonstrates that its forecast is reasonable relies on a view on the validity of its repex modelling and on whether a 7% higher forecast requirement relative to this is considered reasonable. While it is not within our scope to assess Ausgrid's repex modelling, we make the observation that different input assumptions can lead to considerably different Repex model outputs.

174. While Ausgrid states that it has considered trending, Ausgrid has not described how or if top-down trend considerations led it to moderate its forecast or led it to conclusions as to the reasonableness of its forecast. Ausgrid has however provided information that indicates that it did rationalise its first-pass portfolio through assessments which include the removal of project and program overlaps.[80]

Top-down assessment of category-level repex

175. Ausgrid has compared its proposed repex by category, with category-level outputs from its modelling using the AER's Repex model. The results of its analysis are shown in the figure below.

Figure 14: Ausgrid's proposed repex – difference from the Repex model



Source: RP Attachment 5.13.0 Project justification for replacement and duty of care programs. April 2018. Page 12.

176. Ausgrid claims that, having developed its bottom-up forecast of replacement needs, its repex modelling is undertaken '*considering trends of assets over their standard lives… to verify that these bottom-up forecasts are reasonable and in line with*

[78] The Nuttall letter implies that the AER Repex model is 7% below Ausgrid's proposal, which corresponds to Ausgrid's proposal being 7.5% higher than the Repex model.

[79] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 25.

[80] Ausgrid's response to information request EMCaAUS059 provides this information. This was received after our close-off for full consideration in our assessment.

historic levels'.[81] However, its analysis above shows considerable variation at the asset category level. We consider that this is cause for concern, since the basis of repex modelling is that it provides a top-down check that is intended to be read at the asset category level.

177. We have not seen evidence that Ausgrid reconsidered or modified its expenditure forecast either in aggregate or at the category level by taking repex modelling outputs into consideration. Further, a considerable portion of Ausgrid's proposed repex is 'unmodelled' and therefore, by definition, it is unable to cross-check these components against AER Repex model outputs.

178. In our view, any category-level justification necessarily therefore relies on consideration of Ausgrid's bottom-up project and program justifications, which we describe and review in Section 5.

Ausgrid's claimed risk-based prioritisation based on its CASH model

179. We are concerned by the claims throughout Ausgrid's RP documentation, including in the RP itself, in its Capex Proposal,[82] in its Expenditure Forecasting Methodology,[83] and in its description of its PIP[84] that its capex forecast is based on a risk-based prioritisation of required projects and programs. Ausgrid describes this as being based on its CASH prioritisation process. For example, in its Prioritisation Investment Plan document, Ausgrid states that '*…the [CASH] methodology is used to assist in the selection of the projects and programs which best meet the business objectives*'; and that '*the CASH methodology is used to assess and prioritise projects and programs according to the level of associated risk…*'[85] Ausgrid also states that '*the methodology Ausgrid uses for prioritisation has been developed to be consistent, efficient and transparent in order to articulate the risk outcome associated with a particular investment scenario*.'[86]

180. Ausgrid further describes in its PIP overview document how it *'…identifies a full suite of projects and programs…at a granular level involving between 500 and 600 individual line items….*' and how, after assigning a risk ranking to each, *'...refines the plans and risk assessments …*' and the associated expenditure forecasts '*… with multiple passes through the risk prioritisation tool.*'[87]

181. Our first concern with this is that Ausgrid has not provided evidence of the application of CASH-based prioritisation of its projects and programs either by reference to its business objectives, as claimed, or by reference to its risk appetite. Ausgrid has not articulated the risk outcomes of particular investment scenarios in its RP or associated documents, and therefore this process is not transparent to parties seeking to form a view on the prudency or efficiency of its proposed expenditure. As reviewers, we are provided only with Ausgrid's assertion that it has undertaken such a process and that this process has in some way resulted in an expenditure portfolio

[81] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018. Page 12.

[82] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018.

[83] Ausgrid's Expenditure Forecasting Methodology 2019-24. June 2017.

[84] RP Attachment 5.04 - Prioritisation (sic) Investment Process (referred to within that document as the Portfolio Investment Plan). April 2018

[85] Ibid. Page 3.

[86] Ibid. Page 3.

[87] Ibid. Page 4.

that better meets its objectives and risk appetite than some original portfolio. Furthermore, at our onsite meeting, Ausgrid personnel stated that the CASH model was not used to set a justified level of expenditure. The explanation provided was that the CASH model was used solely to show the ranked risk scores of projects that had been included in its PIP. If correct, this would not be consistent with the process that Ausgrid describes in its documentation.

182. Our second concern is that, if Ausgrid did use its CASH model in some way to establish its proposed portfolio, this is a poorly conceived tool for risk-based prioritisation.

183. Ausgrid's CASH model is a tool which assigns scores to each project based on a user questionnaire. The questionnaire involves a range of 'topics' which include asset condition, public safety, environment or regulatory impact, network-initiated fire, network reliability, community impact (reputation), employee WH&S, and network capacity. These topics are weighted equally (with a value of 10). Scores within each topic (and which are rated 1 to 10) are assigned based on a 'look up' depending on the user's answers to questions within these topic areas.

184. These answers are then further weighted according to whether the project is committed / considered a 'short term need', 'medium-term' (and prior to project approval), or long term (including projects at planning stage). Projects are assigned overarching weightings of 15, 10 and 5 respectively according to these judgments.[88]

185. The project and program scores are the product of the factor results above.

186. Our chief concerns are that:

- the CASH model 'topics' comprise a mix of service outcome-related risks, and an 'input' related issue (i.e. asset condition) that is not in itself a risk;
- there is considerable scope for overlap and double-up by a user providing input to the questionnaire – for example network-related fires, public safety and employee safety would all be considered to also have a community reputational impact and so would be expected to attract risk scores in each 'topic';
- while the model qualitatively considers various factors that in some cases are related to risk, it does not address the significant risk-related differences in consequence that result, for example, between a risk with potential for a fatality, compared with risk of a loss of supply, compared with property damage;
- the resulting scores appear to represent the 'current' risk that a project seeks to address. This may be quite different from the risk reduction that results from a particular project (and which does not necessarily reduce risk to zero); and
- the user-assigned weightings as to whether a project is short-term, medium-term or long-term seem in themselves to require a judgment of risk and which, given the three-times multiple between the lowest and highest such rating, would in all likelihood swamp the more granular 'topic' ratings.

[88] This information is drawn from Ausgrid's RP Attachment 5.04 - Prioritisation Investment Plan. The explanation appears to be the same as Ausgrid has provided for its instance of the same model, hence our assessment is also the same.

187. While decision support tools such as CASH may improve decision-making beyond subjective judgment, this model falls a long way short of current good industry practice for the assessment of projects based on their risk mitigation outcomes. It has no clear or obvious links to Ausgrid's stated risk framework,[89] nor to the risk-based approach described (for example) in its document *Project Justification for replacement and duty of care projects*,[90] nor to its organisational objectives and capital planning objectives.[91] It does not embody current industry good practice of defining risk-cost taking account of consequences and their likelihood, and it does not have any clear or obvious reference back to Ausgrid's risk appetite. We consider that any use of this model in its current form would not support Ausgrid's claim that its portfolio plan represents a '*risk-prioritised network capital investment portfolio*'.[92]

Meeting stated objectives

188. While Ausgrid claims that its proposed expenditure is required to meet a range of stated objectives, Ausgrid has not provided evidence that its portfolio has been assessed against those objectives. As we note in Section 4.4.1, Ausgrid has listed a range of 'capital planning measures' against each objective but has not provided evidence that its proposal represents a portfolio of work that has been prudently determined to meet those objectives.

189. For example, one of Ausgrid's stated objectives is to '*maintain current levels of reliability and security*'.[93] Ausgrid has not provided evidence of having assessed that the proposed portfolio of work will meet that objective, or of having assessed whether a lesser program of work may also meet that objective, or of having assessed whether a different mix of projects may more prudently and efficiently meet that objective.

190. In its RP,[94] Ausgrid lists the claimed key outcomes from its capex program as: '*affordable; reliable; sustainable; safe; secure; needs-based investment; future network; and digital strategy*.' While Ausgrid has qualitatively indicated the outcomes (as 'benefits') of each of its proposed repex programs, these are not quantified and do not evidence if or how Ausgrid has determined the appropriateness of the proposed levels of work in each program or the trade-offs between different programs in terms of their ability to meet those outcomes.

191. In later sections of this report, we consider the extent to which Ausgrid has sought to justify specific projects and programs against these outcomes. However, at the portfolio level, we do not observe use of forecasting tools that are designed with these outcomes in mind, or metrics that evidence the outcomes that Ausgrid has assessed will result from the proposed portfolio.

[89] Ausgrid's risk framework is described in Company Procedure – Risk Management 20180615, which was provided in response to EMCa's Information Request EMCaAUS017.

[90] RP Attachment 5.13.0. See for example page 5.

[91] As described in RP Attachment 5.01 - Ausgrid's proposed capital expenditure. Table 2 and Table 3.

[92] RP Attachment 5.04 - Prioritised Investment Plan Process. April 2018. Page 3.

[93] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April 2018.

[94] RP. April 2018. Page 68.

Deliverability

192. We have reviewed Ausgrid's RP *Attachment 5.12 Resource and Delivery Strategy* and we consider that Ausgrid has adequately considered the deliverability of its proposed program. Moreover, Ausgrid's proposed repex program is not dissimilar to its current RCP program in aggregate, on the basis that Ausgrid is able to deliver on its actual/estimated repex for the final two years.

193. While pockets of delivery challenge may arise, and on the assumption that Ausgrid can deliver the repex program in the current period, we do not expect that deliverability is likely to be an impediment to Ausgrid being able to undertake a program of work of the nature and scale that it has proposed for the next RCP.

4.5 Findings and implications for Ausgrid's proposed repex forecast

4.5.1 Findings

194. Ausgrid appears to have developed its repex forecast essentially from a bottom-up build of proposed projects. While it claims to have challenged the resulting plan, there is little evidence of portfolio-level forecasting methods having been applied to effect in this process.

195. In the bottom-up build of the projects and programs included in its forecast, we find:

- considerable and significant inconsistencies between Ausgrid's proposed expenditure for each of the RIN asset categories, and forecast expenditure in the information that is intended to support those forecasts;
- there are also some inconsistencies between the proposed projects in the forecast, and in the supporting documents. Collectively, these inconsistencies reduce confidence in the forecast, pose a challenge to our assessment of the forecast as presented and we expect would have similarly detracted from Ausgrid's internal challenge processes;
- while Ausgrid claims to have adopted an evidence-based approach, this is not evident. Supporting documentation tends to lack information that we would expect, such as on asset condition, failure rates, defect rates, or service-related measures;
- contrary to Ausgrid's claims, we observe only limited application of risk analysis or options analysis in project-level and program-level documentation; and
- we also observe only limited application of cost benefit analysis and limited information on Ausgrid's application of predictive modelling.

196. The portfolio-level forecasting methods that Ausgrid has applied do not explain its justification for the level or mix of its repex forecast. Our key concerns are:

- Ausgrid's descriptions in its RP and associated documents do not appear to be based on or to explicitly take account of Ausgrid's stated corporate objectives, or to reflect a defined risk appetite;
- Ausgrid claims that its plan has been risk-prioritised, but the information Ausgrid has provided does not show how this has been done;

- We consider that the CASH prioritisation tool that Ausgrid states it uses for this would not produce risk prioritisation that represents current good industry practice; and
- Ausgrid claims that modelling using the AER's Repex model verifies its proposed repex program. However, to the extent that this modelling is considered valid, it does not in our view support Ausgrid's contention, in that the Repex model indicates a lower required level of repex overall and a somewhat different mix of projects and programs from what Ausgrid has proposed.

197. Ausgrid has not explained why it considers the repex amount that it has proposed to be at an appropriate level. Its proposed figure has not been justified against NER criteria or against Ausgrid's stated corporate objectives. Ausgrid has not provided evidence of how it determined that the risk levels or other outcome metrics resulting from its proposed program are preferred over those that could have resulted from an alternative program.

4.5.2 Implications

198. We consider that Ausgrid's portfolio-level forecasting methodologies do little to support its proposed repex requirement, and we consider that it is likely that an RP forecast produced through application of these forecasting methods is not a reasonable forecast of Ausgrid's prudent and efficient requirements. Our assessment therefore relies to a greater extent on Ausgrid's project and program-level justifications.

5 Assessment of proposed repex

5.1 Introduction

199. In this section we provide our assessment of Ausgrid's repex forecast. We first summarise Ausgrid's proposed repex, before providing our review of Ausgrid's forecast for each repex category. Finally, we present the findings from our assessment, and we indicate the implications that these findings have for determining a reasonable forecast of Ausgrid's prudent and efficient expenditure requirements.

5.2 Summary of proposed expenditure

5.2.1 Overview

200. Ausgrid has proposed a repex forecast of $1,673m for the next RCP compared to its actual/estimated expenditure in the current RCP of $1,684m, as shown in the tables below.

Table 10: Forecast total repex by asset category for next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Category	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Poles	35.2	34.1	33.3	32.3	33.5	168.3
Pole Top Structures	5.3	5.3	5.3	5.2	5.2	26.3
Overhead Conductors	25.5	25.9	26.2	25.7	25.6	129.0
Underground Cables	86.0	97.8	74.5	80.9	101.0	440.3
Service Lines	11.3	11.2	11.2	11.1	11.1	55.9
Transformers	25.3	19.1	21.7	23.6	19.1	108.7
Switchgear	62.7	45.7	38.7	41.3	42.4	230.8
SCADA, Network Control & Protection System	41.5	18.3	15.0	15.3	16.0	106.1
Other	106.1	87.9	64.1	70.6	79.0	407.7
Total	**398.8**	**345.3**	**290.0**	**306.1**	**332.9**	**1,673.1**

Source: Ausgrid Reset RIN.

Table 11: Actual/estimated total repex by asset category for current RCP ($m, real June 2019)

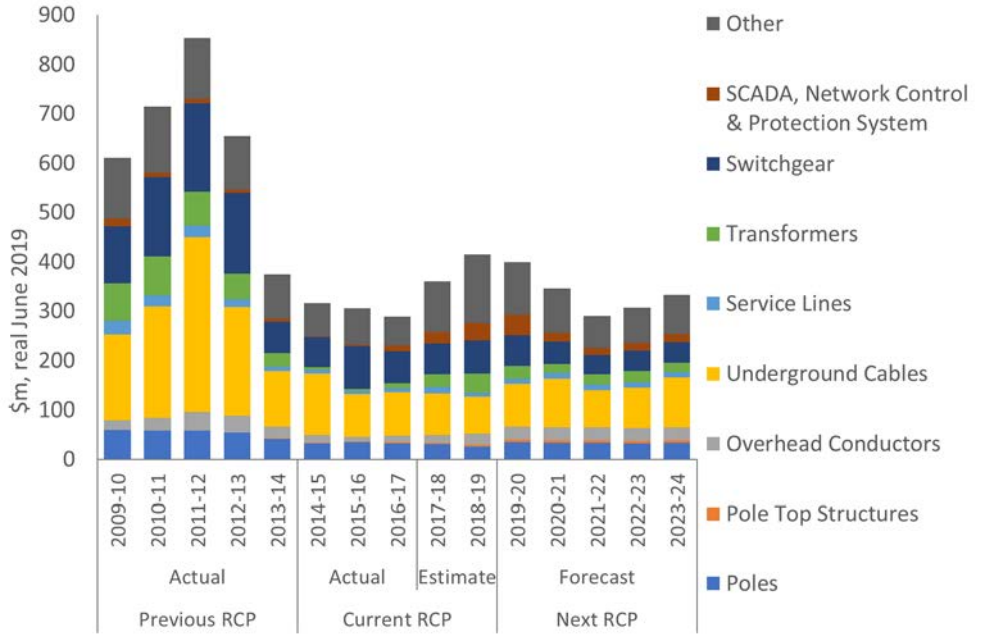
$m, real June 2019	Current RCP					
Category	Actual 2014-15	Actual 2015-16	Actual 2016-17	Estimate 2017-18	Estimate 2018-19	Total 2015-19
Poles	32.6	34.9	31.7	30.4	25.2	154.7
Pole Top Structures	0.4	0.8	3.1	2.6	4.9	11.8
Overhead Conductors	16.7	9.2	13.2	15.6	21.7	76.4
Underground Cables	123.5	86.4	87.8	84.3	74.9	456.8
Service Lines	7.5	7.1	6.8	13.2	7.5	42.1
Transformers	5.5	3.6	10.7	25.4	38.7	83.8
Switchgear	61.9	87.9	65.7	62.7	68.1	346.3
SCADA, Network Control & Protection System	1.6	1.9	11.4	23.8	35.3	74.0
Other	66.6	73.0	57.7	101.8	138.5	437.6
Total	**316.2**	**304.7**	**288.2**	**359.9**	**414.6**	**1,683.6**

Source: Ausgrid Reset RIN

201. Most asset categories have increased in expenditure level by an average of $25m per category, which is offset by reductions in Switchgear ($116m) and Other ($30m) asset categories.

202. In the figure below, the profile of repex is seen to increase at the end of the current RCP, which continues into the start of the next RCP. This profile appears evident in the next RCP also.

Figure 15: Repex by asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN.

203. Ausgrid states[95] that '*the replacement capex declines in 2021/22 and 2022/23 due to fewer major projects in these years. The higher capex in 2020/21 and 2021/22 relates to a number of concluding major projects and $41.3 million of expenditure associated with the replacement of our legacy distribution management system with an Advanced Distribution Management System (ADMS) that commenced in the final years of the 2014-2019 regulatory period*.'

204. The reference to higher capex in 2020/21 and 2021/22 is more likely referring to 2019/20 and 2020/21, where the higher expenditure reflects projects commenced in the current RCP. We review the impact of these projects in the subsequent sections.

5.2.2 Modelled versus unmodelled repex

205. Ausgrid states[96] that the asset categories relevant for consideration in its runs of the Repex model account for 68% or $1,107m of the proposed repex.[97] Ausgrid does not provide a breakdown of its forecast by asset category as modelled in the Repex model. Ausgrid also states that the remaining 32% (or $566m) was not assessed by its repex modelling and can therefore be considered as unmodelled repex.

206. Consistent with advice from its consultant, Ausgrid has not modelled the RIN asset categories of Pole top structures, SCADA, network control and protection systems, and Other using the Repex model.

207. When we total Ausgrid's expenditure forecast for each of the modelled and unmodelled categories, we arrive at modelled repex of $1,133m and not $1,107m,

[95] RP Attachment 5.01 - Ausgrid proposed capital expenditure. April 2018. Page 22.

[96] *Ibid*. Pages 24-25.

[97] Any additional repex modelling undertaken by Ausgrid subsequent to the RP submission may not have been taken into account.

and unmodelled repex of $540m (not $566m), contrary to the aggregate values as stated by Ausgrid[98] for the next RCP. The total repex is however the same. Ausgrid has not identified or explained this variance.

Table 12: Modelled and Unmodelled repex for current and next RCP ($m, real June 2019)

$m, real June 2019	2014-19 Current RCP	2020-24 Next RCP
Modelled repex		
Pole replacements	154.7	168.3
Overheard conductors	76.4	129.0
Underground cables	456.8	440.3
Service lines	42.1	55.9
Transformers	83.8	108.7
Switchgear	346.3	230.8
Total modelled ($m)	1,160.2	1,133.1
Total modelled (percentage of total)	68.9%	67.7%
Unmodelled repex		
Pole top structures	11.8	26.3
SCADA, network control & protection	74.0	106.1
Other	437.6	407.7
Total unmodelled ($m)	523.5	540.0
Total unmodelled (percentage of total)	31.1%	32.3%
Total repex	1,683.6	1,673.1

Source: Ausgrid Reset RIN.

208. We also note that the expenditure profile as described in Section 2 for the current RCP, has been influenced by corporate events. This is likely to impact the calibration of Repex model outcomes given the historical replacement volumes undertaken in this period are unlikely to be reflective of a sustainable level of replacement. Further calibration and/or adjustment of the Repex model may be required to compare the Repex model outcomes with the proposed repex forecast by Ausgrid.

209. EMCa has not been asked to review the application of the AER's Repex model by Ausgrid or to review Ausgrid's input assumptions. We also note that the AER may elect to classify asset category expenditure differently to that proposed by Ausgrid in its repex modelling. We have not commented on the asset category classification. We have, however, included discussion of the Repex model outputs and classification of expenditure against the asset categories in the Repex model as proposed by Ausgrid to assist review of the proposed forecast expenditure.

5.2.3 Repex forecast data

210. For the purposes of this report, we have used RIN data to establish the relative magnitude of proposed project and program expenditure trends. The RIN data was the only available source of disaggregated historical and forecast repex time series information.

211. In the absence of clear identification of the relationship of the individual projects and programs in the repex forecast to the RIN, we necessarily relied upon the RIN repex

[98] The value of $1,107.3m was also referred to by Ausgrid's consultant, RP Attachment 5.15 – Nuttall review of repex.

data as the most serviceable presentation of Ausgrid's actual and proposed repex. Ausgrid has provided a spreadsheet[99] that maps its proposed repex programs and projects included in the master list of Ausgrid's forecast capex portfolio[100] ("Capex portfolio") to the Reset RIN asset categories. Whilst the Capex portfolio reconciles with the Reset RIN at the total repex level, we have identified material variances within and across asset categories when comparing this data with the data Ausgrid provided in its Reset RIN. For example, expenditure totalling $434.7m associated with major projects for feeder cable and switchboard replacements are not included in the provided mapping.

212. We have assumed that the RIN data contains all direct costs for replacement programs as required by the AER and we have relied on this for our trend assessment at the category level. In our review of the sample projects and programs, we have relied on the values provided in the Capex portfolio, as the only available disaggregated view of the repex forecast at a project / program level.

5.3 Our assessment of proposed expenditure by asset categories

213. Our review has focussed on the major drivers of expenditure included in Ausgrid's repex forecast. We note that:

- two asset categories – Underground cables and Other – comprise approximately 51% of the total repex forecast;
- the AER has provided EMCa with a summary of its preliminary modelling results using the AER's Repex model.[101] This identifies variances between its modelling and Ausgrid's repex forecast, the largest being associated with the asset categories of Overhead conductors and Switchgear; and
- the AER also flagged concerns to us with Ausgrid's large expenditure forecast associated with unmodelled repex, and Underground cables.

214. Through our review of Ausgrid's proposed programs and projects we have sought to establish the strategic basis for, and the reasonableness of, the proposed repex for each of the identified asset categories. We have undertaken this by reviewing programs and a sample of projects to ascertain the extent to which the issues identified in the preceding sections are evident at the activity level, and the forecast expenditure reflects the NER.

[99] Ausgrid Repex Mapping - 20 June 2018.

[100] Ausgrid's response to information request IR007, Attachment 5.02.2 - Master list of Ausgrid forecast capex which was updated following the RP submission of Attachment 5.02.2 - Master list of Ausgrid forecast capex portfolio (Excel), April 2018.

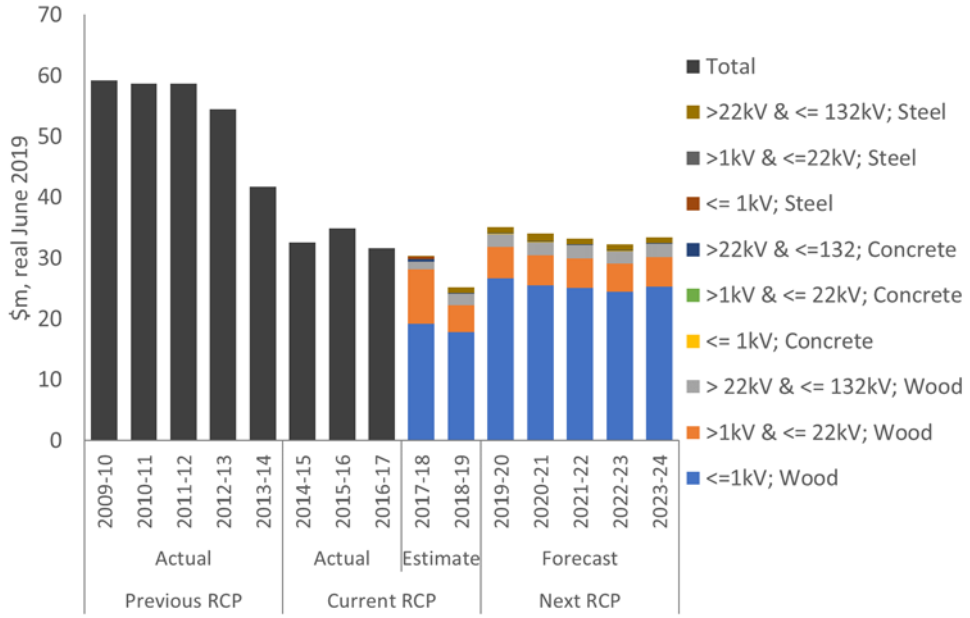
[101] EMCa has not been asked to review the AER Repex model as applied by Ausgrid or the AER, or consider the reasonableness or otherwise of the forecast produced by the AER Repex model.

5.3.1 Poles

Ausgrid's forecast

215. Ausgrid has proposed $168.3m for the Poles asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Poles is shown in the figure below.

Figure 16: Repex for the Poles asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

216. We observe a 9% increase in expenditure proposed for Poles for the next RCP (or an average increase of $2.7m per year) when compared with the actuals and estimates for the current RCP. This appears primarily driven by increases in replacement of un-staked LV poles.

217. Ausgrid has included a description of its proposed pole and tower replacement programs in Attachment 5.13.A of its RP.

Summary of expenditure mapping

218. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the poles asset category, totals $161.4m[102]. This is $6.9m lower than the RIN total of $168.3m. Ausgrid has not explained this variance.

Our assessment

Pole reinforcement and replacement programs

219. Ausgrid has proposed to replace approximately 18,200 poles and to reinforce a further 5,500 poles, at a cost of $144m (transmission and distribution).[103] This is

[102] Ausgrid Repex Mapping - 20 June 2018.

[103] Ausgrid RP Attachment 5.13A - Pole replacement program. April 2018. Pages 4-5.

made up of a distribution pole replacement program ($130.3m), distribution pole reinforcement program ($6.0m) and transmission pole replacement program ($9.2m).

220. Ausgrid claims[104] that approximately 60% of poles that were assessed as 'conditionally failed' due to below ground defects have been able to be reinforced and have applied this to the forecast. Whilst a high reinforcement rate can be an effective risk mitigation strategy, the rate claimed by Ausgrid is higher than we would expect to see, so we sought to understand how this value was derived by Ausgrid through an information request.

221. Ausgrid has developed a predictive model *'to estimate the future condition of the bases of wood poles and, from this estimate, forecasts annual reinforcement and replacement volumes for wood poles*.'[105] As the model only relates to treatment of below-ground defects, Ausgrid also applies trend analysis to annual quantities associated with other failure modes including above ground defects, and due to residual strength reductions from destructive testing (drilling) associated with small diameter poles. Based upon a claimed 60% reinforcement rate, and a pole reinforcement volume of 5,500, there are approximately 9,167 pole replacements in the next RCP. The balance of 9,033 pole replacements to add to 18,200, whilst not clearly explained by Ausgrid, is likely to be made up of other failure modes at an average rate of 1,807 per year. Ausgrid claims[106] that the average number of poles replaced due to above ground defects is 1,300 per year, and the remaining 507 per year for small diameter pole replacement is likely to be reasonable.

222. Ausgrid has incurred a low level of unassisted pole failures, which it claims supports its current condition-based program. Ausgrid claims it seeks to manage the risks associated with its pole population by undertaking an assessment of each pole to determine its condition against its criteria and then to prioritise its treatment. Ausgrid's own repex modelling for poles has '*suggested that the proposed expenditure was below long term sustainable levels (based on the age of the pole population and our forecast expenditure / unit cost) obtained from the Repex model*.'[107]

223. Ausgrid appears to be treating poles based on condition assessment in line with good practice and below a level indicated by an age-only replacement program. However, the justification for an uplift in proposed volume of replacement[108] in the next RCP, and which we would expect to have included scenario analysis around alternate risk outcomes, has not been adequately demonstrated in the information we have reviewed.

Tower reinforcement and replacement

224. Refurbishment of 153 towers and replacement of 16 towers is included in the next RCP to address structural integrity issues associated with tower degradation or their

[104] Ausgrid RP Attachment 5.13A - Pole replacement program. April 2018. Pages 4-5.

[105] *Ibid. P*age 11.

[106] Ausgrid's response to information request IR016 EMCaAUS075-Pole volumes. Page 1.

[107] *Ibid*. Page 3.

[108] Including the uplift in the Black spot pole replacement from 40 to 50 poles for the next RCP.

inherent design at a total cost of $21.7m[109]. Ausgrid has only included the replacement of towers ($5.1m) in the Poles asset category. It has included the refurbishment of towers in the 'Other' asset category of repex.

225. Ausgrid states[110] that these programs are developed based on condition issues identified through tower inspections and that they reflect a continuation of existing programs which commenced in the current RCP.

226. We have not been provided with evidence of the condition information or condition assessments relied upon by Ausgrid in developing the proposed refurbishment and replacement forecast, or the basis of its assumption that 20% of inspected towers in the next RCP will require full refurbishment.

227. Ausgrid states[111] that the forecast has '*been based off the previous risk assessments undertaken by Ausgrid to maintain a sustainable tower asset base*', and that following inspections '*a small number of towers will require replacement based on insufficient structural strength under conductor failure situations due to their inherent design and lower peak wind loads used at the time of design.*'

228. Ausgrid has not provided the risk assessments, or other information it has relied upon to sufficiently justify the proposed replacement of 16 towers in the next RCP as reflecting a prudent and efficient level of expenditure.

5.3.2 Pole-top structures

Ausgrid's forecast

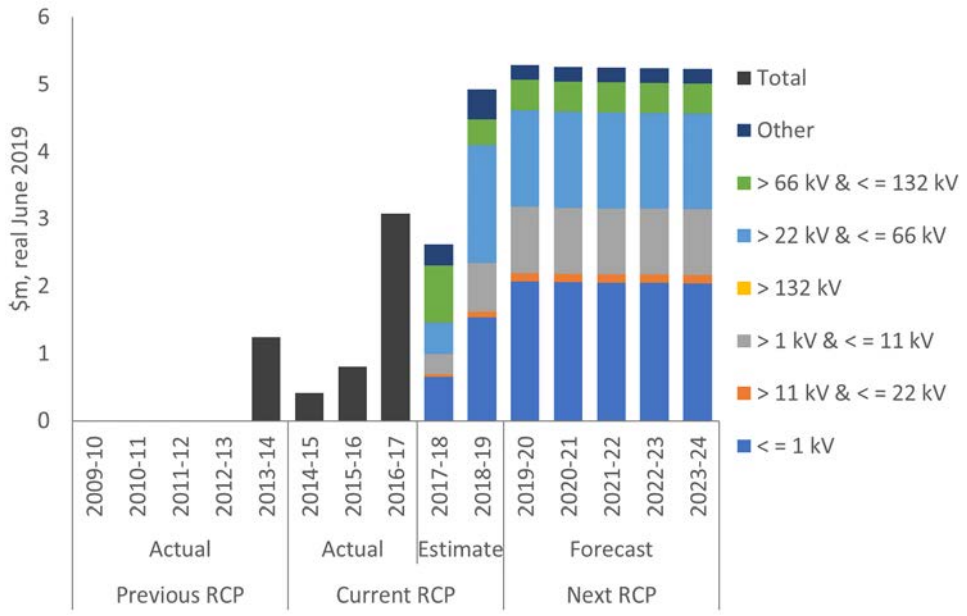
229. Ausgrid has proposed $26.3m for the Pole top structures asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for pole-top structures is shown in the figure below.

[109] RP Attachment 5.13A - Pole replacement program. April 2018. Page 18

[110] RP Attachment 5.13A - Pole replacement program. April 2018. Page 18.

[111] *Ibid*. Page 22.

Figure 17: Repex for the Pole top structures asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

230. There is a 122% increase in expenditure proposed for Pole top structures for the next RCP (an average increase of $2.9m per year) compared to the actual and estimated expenditure for the current RCP. The increase in expenditure commences in the last year of the current RCP and continues at a similar level throughout the next RCP.

231. Ausgrid has included a description of its proposed Pole top replacement programs in Attachment 5.13.B of its RP.

Summary of expenditure mapping

232. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the Pole top structures asset category, totals $26.3m[112]. This is consistent with the RIN total of $26.3m.

Our assessment

233. For the distribution cross-arm replacement program, Ausgrid proposes to replace 10,000 distribution pole top structures at LV and 11kV. Ausgrid states that for the development of its expenditure forecast[113] '*the forecast conditional replacement volumes reflect an expectation that approximately 0.5% of the population of pole top structures operating at these voltages will require replacement per year.*' Based on the stated volume of poles being 440,000, a replacement rate of 0.5% equates to 2,000 cross-arms per year, as Ausgrid has included in the forecast.

234. For higher voltages, Ausgrid has based the expenditure forecast for the refurbishment programs on historical identification of conditional failures, asset

[112] Ausgrid Repex Mapping - 20 June 2018.

[113] RP Attachment 5.13.B - Pole top structures replacement programs. Page 10.

population and condition information, as well as local knowledge of feeder condition issues and feeder location issues.[114]

235. Ausgrid has not provided asset condition information to support the proposed rate of replacement and refurbishment. Given the step increase in volume and expenditure observed in the figure above, we asked Ausgrid to explain the rationale for the increase in forecast expenditure for pole top structures. Ausgrid has advised that the increase corresponds with commencement of ground-based LiDAR and other asset digitisation inspections during 2018/19 of poles not previously inspected in this way. Specifically,[115] '*[i]t is expected that there will also be an uplift in defects identified when these additional areas are inspected using this technology, particularly for distribution poles (i.e. LV to 11kV) - this rationale has resulted in the increased expenditure forecast provided in the Reset RIN.'*

236. Ausgrid claims to have reviewed the outcomes of the original LiDAR audits and local knowledge in developing its forecast replacement volumes. The additional and more detailed asset information that may be obtained from the new surveys is not in of itself sufficient to lead to a material change in the risk of failure posed by these assets. Accordingly, we would have expected a greater level of analysis and risk assessment to have been provided to justify the proposed expenditure. Ausgrid has provided insufficient evidence to demonstrate that the dramatically increased volumes are reasonable.

237. In addition to the above programs, Ausgrid has included four programs for insulator replacement into the Pole top structures forecast for 33kV, 66kV, 132kV wood poles and 132kV tower lines at a total of $2.5m[116] in the next RCP. Information has not been provided to justify the proposed replacement volumes or forecast expenditure.

5.3.3 Overhead conductors

Ausgrid's forecast

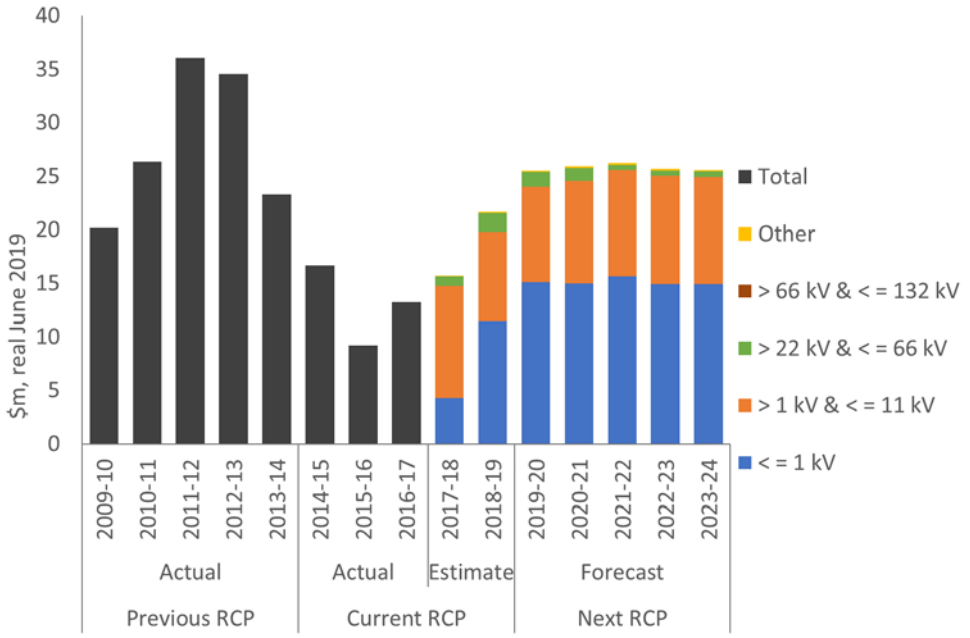
238. Ausgrid has proposed $129.0m for the Overhead conductors asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Overhead conductors is shown in the figure below.

[114] RP Attachment 5.13.B - Pole top structures replacement programs. *P*age 10.

[115] Ausgrid's response to information request IR016 EMCaAUS074 - Pole top structures. Page 1.

[116] Comprising programs REP_05.02.23, REP_05.02.25, REP_05.02.05-1 and REP_05.02.05-2.

Figure 18: Repex for the Overhead conductors asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

239. There is a 69% increase in expenditure proposed for Overhead conductors for the next RCP (an average increase of $10.5m per year) compared to the actual and estimated expenditure for the current RCP. The increase in expenditure is evident from 2016/17, driven by increasing low voltage conductor replacement, with a further increase in the first year of the next RCP.

240. Ausgrid has included a description of its overhead conductor programs in Attachment 5.13.C of its RP.

Summary of expenditure mapping

241. The aggregate expenditure for the program and major projects in Ausgrid's Capex portfolio that maps to the overhead conductors asset category total $120.4m[117]. This is $8.6m lower than the RIN total of $129.0m. Ausgrid has not explained this variance.

Our assessment

Dedicated LV Circuit Reconfiguration program

242. The program DOC_11.03.73 proposes a reconfiguration of the assets Ausgrid uses to provide a street lighting service to councils as an Alternative Control Service (ACS). Currently there are 6,100km of overhead conductors used on dedicated circuits which supply street lights and just over 5,000km are greater than 50 years old. Previously, Ausgrid was removing dedicated street light circuits and connecting new, internally switched street light luminaires to its LV circuits on an ad-hoc basis.

243. Ausgrid has included $43.0m in its repex forecast that will result in the removal of 2,900km of the dedicated circuits during the next RCP. The primary need for the

[117] Ausgrid Repex Mapping - 20 June 2018.

investment is identified by Ausgrid as being due to the '*reasonably foreseeable public safety risks and average age of these assets*.'[118] During the current RCP, Ausgrid will be negotiating with councils to replace approximately 100,000 older luminaires (or 34.5 luminaires per km) with internally switched modern technology.

244. Given the identified safety risks and the age of the dedicated streetlight control circuits we consider, based on our experience, that the removal program is necessary. At approximately 60% of the conductors over 50-years old, the forecast circuit length to be removed during the next RCP is reasonable.

245. Ausgrid notes[119] that this program is still in its infancy and that the program unit rate and delivery are still to be established. Ausgrid also notes that '*efficiencies can be gained by undertaking circuit reconfiguration in conjunction with the upgrading of street lighting services.'*[120] The potential benefits of replacing old luminaires with new low energy, low maintenance options may be considerable and could be used to at least offset a portion of the cost of the dedicated circuit reconfiguration. Given the links between the ACS related service and the Standard Control Service (SCS) repex, justification for the forecast should have included an explanation of how the costs and benefits had been allocated. Ausgrid has not provided this analysis.

246. We questioned whether Ausgrid's allocation of the decommissioning costs of existing assets used to deliver ACS related services to SCS repex, is appropriate. Ausgrid provided the following response: '*[t]he LV dedicated circuits are part of the low voltage network, owned by Ausgrid and classified according to the AER classification as a Standard Control Service. While Ausgrid are aligning this work with the upgrading of streetlights where possible, the costs are appropriately split between Councils for streetlight upgrade works and Standard Control for the reconfiguration.'*[121]

247. In our opinion, removal of the dedicated street lighting conductor is not replacement or refurbishment of an asset and is therefore inappropriately classified. The new configuration of the street lighting connections will utilise existing LV conductor assets and will not require replacement or refurbishment of the existing assets. We expect the costs of new street lighting luminaires and their installation will be included in Ausgrid's public lighting plan[122] and we consider that Ausgrid has provided insufficient explanation for this item to be included as SCS rather than ACS-related expenditure.

Steel mains, 33kV feeder Overhead conductor and HV mains replacement programs

248. The overhead conductor program includes proposed replacements of steel mains ($22.3m), the refurbishment of 33kV overhead feeders ($7.5m) and HV overhead mains (ACSR/Quince) ($1.8m). Replacement is triggered by the risks associated

[118] RP Attachment 5.13.C - Project justification for overhead conductors replacement programs. April 2018.

[119] *Ibid*. Page 18.

[120] *Ibid*. Page 18.

[121] Ausgrid's response to information request IR015 Capex Dedicated LV circuit reconfiguration program & network protectors.

[122] RP Attachment 8.11 - Public Lighting Investment Plan. April 2018.

with identified failure modes and inherent design issues, compounded by the ageing asset population (average age over 40 years).

249. Ausgrid identified that from 1/7/2013 to 30/6/2017, 7.6% of steel mains and ACSR failures were attributable to functional failures with additional failures being caused by falling vegetation or third-party damage. Ausgrid notes that '*the low level of functional failures compared to conditional failure reflects the robust inspection process for overhead conductors to assess their condition and to then repair or replace them prior to functional failure*.'[123] Ausgrid advises that it has based its forecast of the quantity of steel mains and ACSR replacements on its historical identification of conditional failures as well as the size and age of the remaining asset population. For 33kV feeder overhead conductors, Ausgrid has determined replacement requirements through condition assessments from asset inspections.

250. In our opinion the forecast volume of steel mains and ACSR to be replaced should have considered the trend in conditional failures. Given Ausgrid's observations on the impact made by its inspection and repair maintenance regime, and historical replacements, we would expect that failure rates would have reduced from historical levels. We have not seen evidence of the extent that historical opex/capex trade-off decisions have been considered when Ausgrid formed its forecast for these assets.

251. Ausgrid expects its forecast will sustainably manage the risks through replacement in a prioritised order. We have concluded that replacement of the overhead conductor fleet based primarily on condition treatment (i.e. rather than on reactive or planned treatment) is appropriate and likely to result in efficient and prudent expenditure. In our opinion, in the absence of accurate and reliable asset health data, using the historical conditional failure rates along with age profiles is an appropriate way to forecast replacement volumes. However, the impact on reliability due to historical replacements, refurbishments and life extending maintenance must also be considered. We have seen insufficient evidence on the extent to which Ausgrid has done this.

252. Whilst we accept the need for continuing investment in this activity, it is not possible to conclude that the proposed expenditure is prudent and efficient as there is an absence of information on how the proposed volumes have been derived

Overhead wiring community concerns program

253. Ausgrid proposes to initiate a new program called 'overhead community wiring concerns' in 2019 and includes $18.7m in the repex forecast for program REP_04.02.49. Ausgrid proposes to redesign the overhead network in accordance with its strategic vegetation management objectives rather than on a like-for-like replacement. Ausgrid identifies that the investment will assist mitigate safety[124] and reliability risks due primarily to vegetation contact with existing LV mains in urban areas. The benefits claimed are improved outcomes for Ausgrid and the community.

254. Ausgrid claims[125] that risk mitigation will be achieved through a combination of replacing:

[123] RP Attachment 5.13.C - Project justification for overhead conductors replacement programs. April 2018. Page 9.

[124] RP Attachment 5.13.C - Project justification for overhead conductors replacement programs. April 2018. Page 20.

[125] RP Attachment 5.13.C - Project justification for overhead conductors replacement programs. April 2018. Page 23.

(i) existing bare LV mains with LV aerial bundled conductor (LV ABC);

(ii) existing LV and/or 11kV mains with underground assets in association with council 'precinct plan' works; and

(iii) inappropriate tree species under LV or 11kV mains with appropriate species.

255. Volumes have been based on what Ausgrid has determined as adequate for the expected quantity of initiatives to be jointly funded with stakeholders. We have not seen any explanation of how Ausgrid has established its view on adequacy. Under the co-funding scheme,[126] some functions (e.g. reinstatement of footpaths) may be undertaken by councils where it is more efficient. Ausgrid has not provided details on the quantity of shared costs, the expected benefits, or who will receive them. Due to the lack of detail, we have been unable to conclude that the proposed repex for the 'overhead wiring community concerns program' is prudent and efficient to meet the stated purpose.

256. We also consider that planting appropriate tree species should be included as part of Ausgrid's vegetation management expenditure and not as asset repex.

Low Voltage (LV) Overhead Mains - Bare Wire program

257. Ausgrid expects that it will address 680 overhead conductor clearance risks during the next RCP and includes $5.6m in the repex forecast for program REP_04.04.01. This is the equivalent of replacing 0.1% of its overhead conductor fleet (all voltages). Inspection and condition assessments and LiDAR is used to identify conductors that have a low clearance to ground, roads, buildings or other infrastructure. Ausgrid states that in recent years, detection of low mains clearance issues in bushfire prone areas has been decreasing as legacy issues are removed.

258. Whilst we accept the need for continuing investment in this activity, it is not possible to conclude that the proposed expenditure is prudent and efficient as there is an absence of information on how the proposed volumes have been derived.

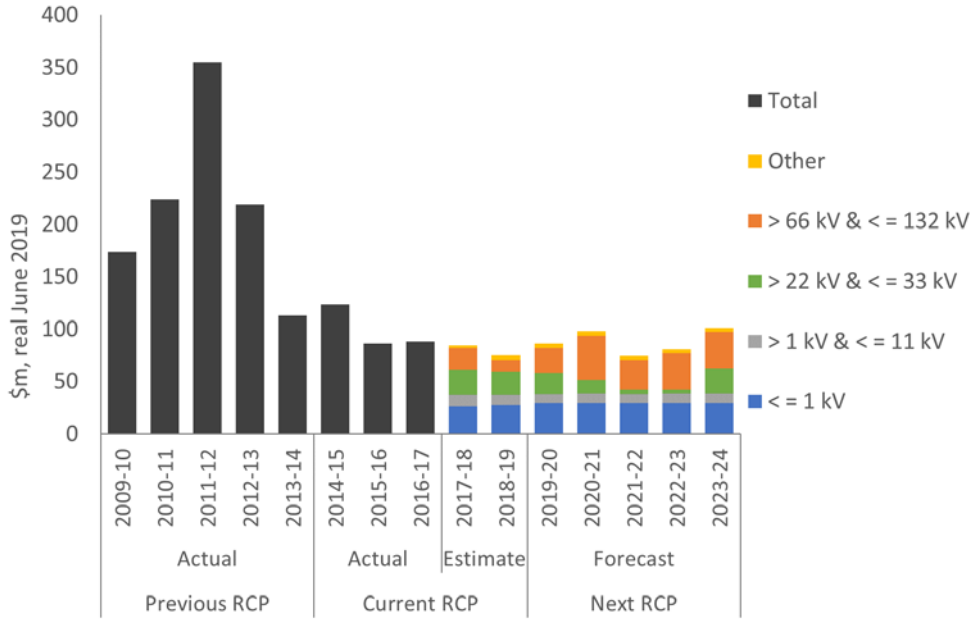
5.3.4 Underground cables

Ausgrid's forecast

259. Ausgrid has proposed $440.3m for the Underground cables asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Underground cables is shown in the figure below.

[126] Ausgrid is expecting to make arrangements with councils to co-fund some of the costs of the reconfiguration program, see Ausgrid RP Attachment 5.13.C - Project justification for overhead conductors replacement programs. April 2018. Page 23.

Figure 19: Repex for the Underground cables asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

260. There is a 4% reduction in expenditure proposed for Underground cables for the next RCP (or an average reduction of $3.3m per year) when compared with the actual and estimated expenditure for the current RCP.

261. Ausgrid has included a description of its Underground cables programs in Attachment 5.13.D of its RP. In addition, Ausgrid has included a number of major projects for the Underground cables asset category as described in Attachment 5.14.2 - *Project justification for sub-transmission cable replacements* in its RP.

Summary of expenditure mapping

262. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the Underground cables asset category, totals $201.6m[127]. We have identified a further $215.1m of sub-transmission cable related major projects in Ausgrid's Capex portfolio, increasing the aggregate forecast to $416.7m. This is $23.6m lower than the RIN total of $440.3m. Ausgrid has not explained this variance.

Our assessment of program expenditure

LV cable replacement programs

263. Ausgrid's LV cable replacement programs have two primary components: (i) low voltage cable replacement ($104.2m) [128]; and (ii) underground equipment replacement and modification ($12.4m).[129]

[127] Ausgrid Repex Mapping - 20 June 2018.

[128] This excludes additional reactive component of $6.5m.

[129] RP Attachment 5.13.D - Project justification for underground cables replacement programs. April 2018. Page 4.

264. The programs include planned replacement of 76km of CONSAC cable and 25km of high density polyethylene insulated (HDPE) cable. The program commenced in the current RCP. Ausgrid has identified the primary need based on risk to the public through loss of neutral connectivity due to sheath corrosion. Risks are determined through a high-level qualitative table-based assessment that considers consequences of loss of function and key failure modes. Failure rates are higher for CONSAC and HDPE, than other cable types. Ausgrid has provided information showing that in recent years the COSAC and HDPE failures have trended upwards.[130]

265. The total populations of CONSAC and HDPE cables have been identified for replacement as a planned program that will take over 40 years. The forecast for the next RCP will result in replacement of 12%[131] of the population of CONSAC and HDPE cable fleets. Ausgrid has revised its approach to cable replacement delivery resulting in half of the volume of cable replacement work being outsourced under 'design and construct' arrangements and outsourced contractors continuing to be used for cable laying on projects managed by Ausgrid. The expected result is an increase in the utilisation of external resources from 70% to 85% of the forecast project costs. The extended use of outsourcing should apply market pressure to project costs and provide additional assurance that the delivery is efficient.

266. We consider that the:

- need for replacement of the CONSAC and HDPE cable fleets has been established and that this program will continue beyond the next RCP;
- replacement of 12% of the CONSAC and HDPE cables during the next RCP does not appear to be excessive given the installed volume and age profile; and
- the planned replacement strategy addresses risks with these specific types of cables, whilst adopting a reactive replacement strategy for other, lower risk types.

267. We consider that Ausgrid's claim that the proposed volume of replacements is sustainable, is not sufficiently supported in the justification and explanations that Ausgrid provided. For example, the data provided by Ausgrid[132] shows an increasing trend in failures yet the planned replacement volumes are virtually identical for each year of the forecast. We would have expected some front loading of forecasts to address the trend and associated increased risk. Ausgrid provided no explanation on how the risk profile of these cables has been considered when forming its forecasts.

268. Whilst we accept the need for continuing investment in this activity, it is not possible to conclude that the proposed expenditure is prudent and efficient as there is an absence of information on how the proposed volumes have been derived.

[130] *Ibid.* Figure 3.

[131] Based on 76km of CONSAC cable and 25km of HDPE cable of a population of 845km. RP Attachment 5.13.D - Project justification for underground cables replacement programs. April 2018. Sections 2.1 and 2.2. Page 5.

[132] RP Attachment 5.13.D - Project justification for underground cables replacement programs. April 2018. Figure 3.

Underground equipment

269. Underground equipment covers the functioning of cables and the connection between overhead and underground sections of the network. Ausgrid has proposed $12.4m for the next RP that includes replacement of Cable pressure alarms, 11kV Underground to overhead terminations, 33kV Underground to overhead termination and the modification of a specific type of LV pillars.[133]

270. Ausgrid explains that the program is generally age based with risk prioritisation applied. Ausgrid considers that the forecast replacement for the next RP will '*sustainably manage the risks associated with an ageing asset population and in a prioritised order so those of highest risk are completed first.'*[134]

271. Due to risks associated with failure of the equipment Ausgrid has adopted a planned replacement strategy to modify the old and obsolete equipment with modern equivalents. The forecast is a continuation of an existing replacement program.

272. We consider that the:

- information on age and failure rates supports the risk prioritised replacement program; and
- replacement of equipment with modern equivalents is an appropriate approach as it addresses obsolescence and adds modern day functionality.

273. Ausgrid considers that its forecast level of replacement is *'sufficient to sustainably manage the risks associated with an ageing asset population.'*[135] The forecast proportions of the equipment to be replaced do not appear to be excessive given the age profile. However, Ausgrid has not provided details on how it has determined that the proposed replacement program has been optimised to sustainably manage the identified risks.

Our assessment of major project expenditure

274. Ausgrid is planning to undertake 18 sub-transmission cable replacement projects during the next RCP.[136] These projects are included in the project justification information provided by Ausgrid and relied upon for our review. In addition, Ausgrid will decommission seven 132kV cables as a part of the Powering Sydney's Future project.[137] The cost of these additional works is not included in the repex forecast, as we would expect.

Ausgrid's methodology for selecting projects

275. Ausgrid has established a long-term replacement strategy for its fleet of sub-transmission fluid filled cables. The methodology for ranking cables for retirement is '*based on separate consideration of the avoided network risk valuation (reduced cost of unserved energy) and the reduced environmental risk of each cable, or pair*

[133] Comprising programs REP_05.02.12, REP_04.02.11, REP_05.02.30, and DOC_11.03.74.

[134] *Ibid*. Page 19.

[135] *Ibid.*

[136] RP Attachment 5.14.2 - Project justification for sub-transmission cable replacements. April 2018. Table 2.

[137] RP Attachment 5.14.2 - Project justification for sub-transmission cable replacements. April 2018. Table 3.

of cables, per dollar of the required replacement expenditure. The aim is to address both impacts, by selecting the portfolio of projects that offers the most efficient reduction in unserved energy and environmental risk per dollar of expenditure. Environmental risk for each cable is quantified based on historical cable fluid leak volume records and knowledge of environmental sensitivity along the cable route.'[138]

Ausgrid's avoided network risk valuation methodology

276. Ausgrid identifies the economic benefit of cable replacement-related projects it has selected for inclusion in the program for the next RCP, on a risk cost basis. A positive economic benefit is determined if the NPV of the avoided risk cost is greater than the NPV of the cable replacement cost. Ausgrid assumes the economic timing of the cable replacement is when the cost of annual Expected Unserved Energy (EUE) is expected to be greater than the annualised cable replacement cost.

277. The avoided risk is cable failure and the avoided cost (or benefit) is the aggregate of (i) the cost of unserved energy (valued at VCR), (ii) the avoided environmental damage (e.g. oil spillage), and (iii) the avoided repair and maintenance costs. Each of these is calculated from input assumptions.

278. Ausgrid has developed an Excel based EUE model that incorporates the results of a power system simulation engineering tool to determine the resulting EUE for CBA analysis. For this project the EUE is calculated for N-2 and switched N-3 events for the peak summer season. To determine probability of failure Ausgrid has used a modelled method using its failure analysis tools. Ausgrid commissioned an independent study of its modelling tools using international experts in the relevant fields.[139] The review concluded that Ausgrid's use of combined modelling principles was '*at the leading edge of model developments in the way it combines serving cable condition data to modify the outcomes from age modelling to predict cable failures*'.[140] Given the independent assurance reviews and the alignment of the CBA approach with Total Asset Lifecycle Management techniques, we consider the method and tools that Ausgrid has applied are appropriate to establish failure probabilities and EUE.

279. Ausgrid calculated values for avoided environmental impact cost and repair cost by multiplying standard cost assumptions for oil filled cables by the respective failure rates of the feeders. The values used by Ausgrid are:

- environmental impact cost of $6,000 for M2 (Corrective), $55,000 for M3 (Breakdown) and $58,133 (Third party); and
- repair cost of $20,000 for M2 (corrective); and $700,000 each for M3 (Breakdown) and M5 (Third party).

280. We consider that the methodology through which Ausgrid develops CBA is aligned with its *Decision Making & Risk Management Strategy* (as discussed in Section 4) and should provide reliable project prioritisation and timing. However, both the prioritisation and timing are sensitive to the assumptions used to calculate EUE and the values used to establish the environmental impact costs and repair costs.

[138] *Ibid*. Page 9.

[139] Ausgrid's response to information request IR016, EMCaAUS081-CMPJ0041 Ausgrid cable failure model validation Report-Final 2016.

[140] *Ibid.*

281. Ausgrid's CBA indicates that projects are generally sensitive to the following:

- volume of unserved energy (USE), and VCR of $40,036/MWh;
- environmental cost of oil leakage; and
- expected annual cost of future repair and maintenance.

282. The values used for the above assumptions are applied consistently to CBA assessments in all projects. The USE is calculated using a load factor relevant to the specific cable. For example, in the Mosman feeder replacement project CBA workbook,[141] USE is calculated by multiplying the post transfer load (MW), the load factor, hours in a year and the N-2 and N-3 State Probabilities.

283. Mean time to repair (MTTR) is considered by inclusion of 'unavailability' in the determination of the probability. MTTR for cables is an important consideration when determining USE and Ausgrid uses a +/- 10% range[142] to determine sensitivity of the project trigger time to MTTR.

284. The input value for VCR uses CPI adjusted 2014 AEMO VCR for NSW values. Other inputs such as failure rates and MTTR, are obtained from Ausgrid's network and asset management data. The accuracy and validity of the modelled outputs will therefore be dependent on the quality and reliability of the input data.

285. The potential for load switching and demand management is included in the CBA for each project we have reviewed. Demand management and load switching benefits reduce USE, but do not reduce the risk of oil contamination nor repair and maintenance costs.

286. We consider that, if applied consistently, Ausgrid's avoided network risk valuation methodology will have produced a reasonable risk-based prioritisation of its fluid filled cable replacement program.

Ausgrid's environmental risk methodology

287. A significant driver of the replacement strategy is meeting with Ausgrid's undertaking to the EPA to reduce the environmental risk of leaking cables by at least 50% in each RCP and to replace all fluid cables with known leaks by 2034.[143]

288. Ausgrid has advised that it has been in discussions with the EPA over several years, and as a result of the working relationship reviewed its environmental management strategy EMS300 to reflect its commitments. Whilst the EPA was not required to accept or decline Ausgrid's strategy,[144] for the purposes of our review we have assumed the strategy lodged with the EPA is binding on Ausgrid. We note that Ausgrid has taken steps to prudently manage the social and economic impact of the

[141] Ausgrid's response to information request IR016, EMCaAUS082 Feeder CBA Tool_V2.0_Mosman feeders-20180628, tab 12. Total EUE_(N-2 EUE+N-3 EUE).

[142] Ausgrid's response to information request IR016, EMCaAUS082-Worked example-Castle Cove_Mosman feeders_v1.0-20180628. Page 12.

[143] *Ibid.*

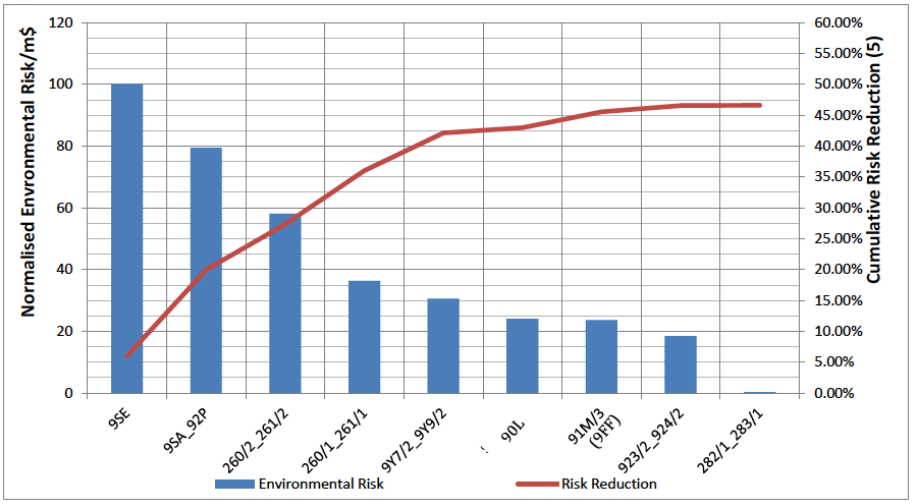
[144] RP Attachment 5.14.2 - Project justification for sub-transmission cable replacements. April 2018. Section 3.3. Page 13.

cable replacements, which has resulted in re-negotiating the time period for completion of the replacement of all oil-filled cables program from 2030[145] to 2039[146].

289. Ausgrid has developed an environmental risk model to quantify the environmental risks based on: (i) historical cable fluid leak volume records, and (ii) knowledge of environmental sensitivity along the cable route for each cable (such as proximity to waterways). The cables are then ranked in decreasing order of risk.[147] This is a relatively simple model,[148] which we consider is adequate for the purposes of ranking the potential risk to the environment of oil leaks for each cable, for those that remain in service.

290. We have reproduced the environmental risk reduction contribution from the cables proposed for replacement by Ausgrid in the next RCP in the figure below.

Figure 20: Environmental risk reduction ranking of oil filled cables



Source: Ausgrid RP Attachment 5.14.2 –Subtransmission Cable Replacement. April 2018. Figure 11.

291. We have not been able to reconcile the environmental risk reduction developed from the environmental risk model with the cables identified for replacement in the next RCP, specifically the information from the following sources:

- list of projects identified in Figure 11 of Attachment 5.14.2 (as reproduced above) – which denotes 9 projects, with the highest environmental risk reduction contribution being cable 9SE;
- list of projects included in Table 2 of Attachment 5.14.2 that Ausgrid has planned for replacement and decommission in the next RCP – which lists 12 projects, of which 8 are replacement projects, with the highest environmental risk reduction contribution being 9SA & 92P;

[145] Ausgrid's response to information request IR016, EMCaAUS083-9 Ausgrid EMS300 EPA submission, 2012.

[146] Cables with no known leaks are targeted for replacement in the 2034/39 RCP. Ausgrid's response to information request IR016, EMCaAUS083-1 Strategy document EMS300 Underground Transmission Cables. October 2017.

[147] Ausgrid's response to information request IR011, EMCaAUS049 - FFC Environmental Risk Assessment. October 2017.

[148] The model normalises the risk from one period to another, such that the highest risk cable in one period (once removed) is considered to be equivalent to the highest risk cable in the next. Accordingly, this is only useful for ranking the cables that remain in service, and is not suitable to quantify the environmental risk

- list of projects included in Table 3 of Attachment 5.14.2 that Ausgrid has scheduled for decommissioning as part of the Powering Sydney's Future project – which lists a further 7 projects in addition to those in Table 2 for the next RCP;
- list of cable replacement projects included in Part B Attachment 5.14.2 – denoted as Project 1 though Project 15;[149]
- list of cable replacement and decommissioning projects included in the master project list; and
- cables identified for treatment in the next RCP in the environmental risk model, to meet Ausgrid's undertaking to the EPA.

292. We expected to see, and did not see:

- clear presentation of the cable projects that Ausgrid has proposed to achieve the environment risk reduction target and their contribution towards that target;
- evidence of the basis for inclusion of each of the cable projects in the proposed repex forecast (where a capex project has been proposed); and
- clear links evident between these two lists of projects, including reconciliation of the expenditure forecast and environmental risk reduction.

293. In the absence of this information, we are unable to determine if the proposed program is consistent with Ausgrid's claims of meeting its obligations to the EPA, or that Ausgrid has exhausted options to defer some projects beyond the next RCP.

Major project: Beaconsfield to Zetland

294. The project involves retiring the Beaconsfield to Zetland 132kV oil-filled cable circuits to mitigate the risks associated with failure of the cable sheathing causing oil leaks. The 260/1 and 261/1 132kV feeders supply the Zetland and Clovelly zone substations from the Beaconsfield bulk supply point. The preferred option includes decommissioning the existing Zetland zone substation and establishing a new Alexandria North zone substation at a total cost of $39.4m[150] in the next RCP. The bulk of the expenditure is for the new substation, with $0.6m attributable to cable decommissioning of the 132KV Feeders 260/1 & 261/1.

295. The project justification document demonstrates how resolution of the cable issues can drive a broader suite of interconnected projects that will deliver additional benefits, for example, increasing capacity to meet future load growth. The need to replace ageing and leaking fluid filled cables advances the replacement of the Zetland zone substation and provides the opportunity to increase network capacity.

296. The CBA indicates that the optimal project timing was beyond the next RCP. However, Ausgrid determined that the replacement of feeders 260/1 and 261/1 during the next RCP provided a substantial cost-effective contribution towards achieving its environmental risk reduction target with the EPA. The cables rank

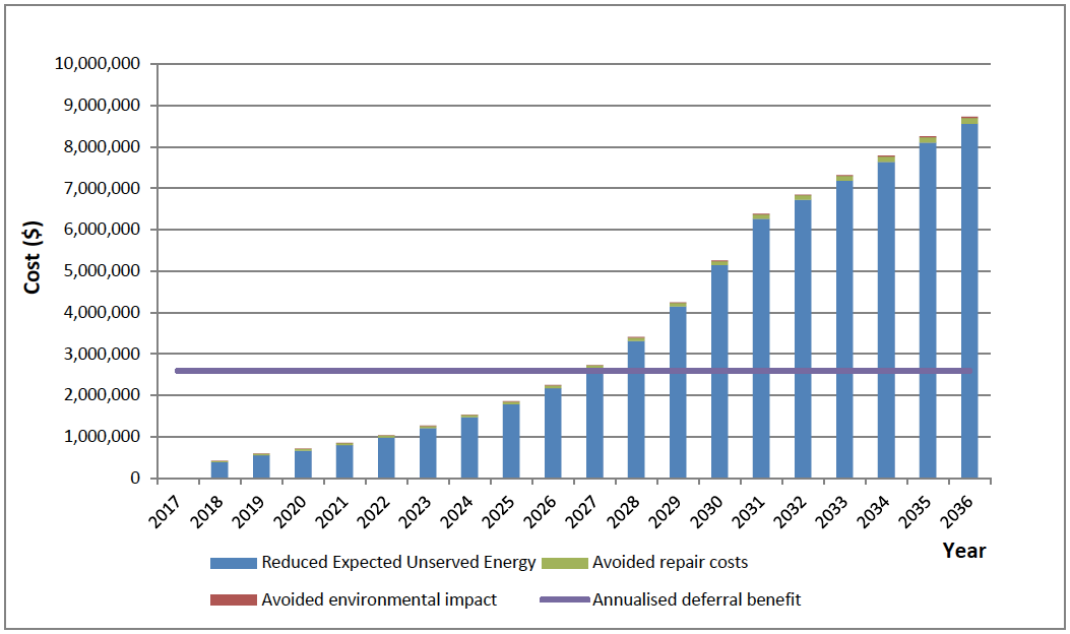
[149] Excluding 33kV cable replacement projects.

[150] Based on Attachment 5.14.2. Total of $34.0m included in master project list for projects ARA_03.1C.006 and ARA_03.1C.0030.

highly[151] on Ausgrid's calculation of environmental risk reduction contributions as shown below. Because of its relatively high ranking on environmental risk, Ausgrid's plan is to advance the commencement of the project to fall within the next RCP.

297. The timing for the project, and therefore the expenditure in the next RCP, is dependent on the application of Ausgrid's *Environmental Management Strategy*.[152] Despite these feeders ranking highly on the environmental risk reduction priority, the risk cost analysis in the CBA of this project (see figure below) does not indicate a high avoided environmental impact cost. This suggests to us that the environmental risk ranking is not formed on an economic basis. Notwithstanding Ausgrid's commitment to the EPA, Ausgrid's assessment does not unequivocally lead to a conclusion that it is prudent to undertake the project in the next RCP.

Figure 21: Beaconsfield to Zetland CBA Risk Cost assessment



Source: Ausgrid RP Attachment 5.14.2 –Subtransmission Cable Replacement. April 2018. Figure 14.

Major project: Castle Cove to Mosman

298. Ausgrid provided a worked example for its Castle Cove to Mosman feeder replacement project.[153] Ausgrid proposes expenditure of $36.4m on this project during the next RCP out of a total of $37.5m total project cost.[154] The scope for the project is the replacement of two 132kV oil filled cables connecting Castle Cove and Mosman zone substations. Two new XLPE 132kV cables will be installed between Willoughby sub-transmission substation and Mosman zone substation.

299. The primary drivers identified for this project are:

[151] Ranked 9th overall on FFC Environmental Risk Assessment 4 Oct 2017, including projects identified for current RCP. Ranked 3rd on projects identified for replacement in next RCP. RP Attachment 5.14.2 – Subtransmission Cable Replacement. Figure 11.

[152] Ausgrid's response to information request IR016, EMCaAUS083 Strategy Document EMS300 Underground Transmission Cables. October 2017.

[153] Ausgrid's response to information request IR016, EMCaAUS082-Worked example-Castle Cove_Mosman feeders_v1.0.

[154] Based on Attachment 5.14.2. Total of $34.7m included in master project list for project ARA_05.1.10014.

- EUE related costs that would arise from coincident failures of the cables (260/1 and 261/); and
- avoided costs of repairs and maintenance.

300. The project will also contribute towards environmental risk reduction targets.

301. At the current stage of project development, demand management options have not been quantified. Ausgrid advises that it will consider these in the future as part of the RIT-D for the project.

302. Ausgrid has provided a description of the method it applied to derive the EUE and avoided costs of repairs and maintenance.[155] An Excel workbook was also provided to demonstrate how the derived costs have been applied in the project CBA.[156]

Projects with timing advanced ahead of the risk cost curve

303. Ausgrid has included five projects[157] where the timing has been advanced from what Ausgrid's CBA has determined to be the economic timing by the commitment to reduce environmental risk. The aggregate estimate for these five projects is $62.6m[158], however $60.3m is included in the repex forecast in the next RCP.

304. Other projects, that would otherwise have been undertaken after the next RCP, have had their timing advanced due to the dependency of other, more urgent projects on their completion. These are:

- 132kV oil filled cable replacements at Double Bay to Clovelly (Project 11), Kingsford to Maroubra (Project 12), Mason Park to Drummoyne and Drummoyne to Rozelle (Project 14)[159]; and
- Surry Hills to Paddington retirement of three gas pressure 33kV cables[160].

Summary

305. Ausgrid's project summaries demonstrate that individual fluid filled 132kV and 33kV cable replacements are components of a strategic program to address the environmental impact of oil leakage. A significant proportion of the cable replacement strategy and cable replacement projects is driven by commitments made by Ausgrid in its EMS300. Ausgrid's repex forecast for this asset category is therefore sensitive to any flexibility that may be available in delivering the commitments.

306. If there is no flexibility in Ausgrid's commitments in EMS300, we consider that Ausgrid's prioritisation generally supports the identification of projects triggered by

[155] Ausgrid's response to information request IR016, EMCaAUS082-Case Study-Willoughby to Mosman feeders (PSSE App).

[156] Ausgrid's response to information request IR016, EMCaAUS082 Feeder CBA Tool_V2.0_Mosman feeders.

[157] Project 05 Zetland to Clovelley; Project 06 Bunnerong to Maroubra; Project 07 Beaconsfield to Millpond; Project 09 Beaconsfield to Green Square; and Project 10 Beaconsfield to Kingsford. A sixth project, Project 15 Haymarket to Pyrmont at $17m is not included in the repex forecast.

[158] Based on RP Attachment 5.14.2. Table 1.

[159] Aggregate of $1.9m included in the repex forecast for projects ARA_03.1C.0028, ARA_03.1C.0041A, and ARA_031.1.0129.

[160] Estimated at $7.4m, and $6.8m included in the repex forecast for project ARA_03.1A.0018.

environmental risk to achieve its risk reduction targets. However, we were unable to confirm Ausgrid's application of its prioritisation framework, including the contribution to this commitment by decommissioned cables (including those as part of the OPSF project).

307. Furthermore, whilst other projects appear to be generally triggered by avoided EUE related costs, and included on the basis of the CBA, we found evidence of a projects being included in the next RCP in advance of the economic timing. When considered at a portfolio level, there are likely to be projects that can be deferred beyond the next RCP.

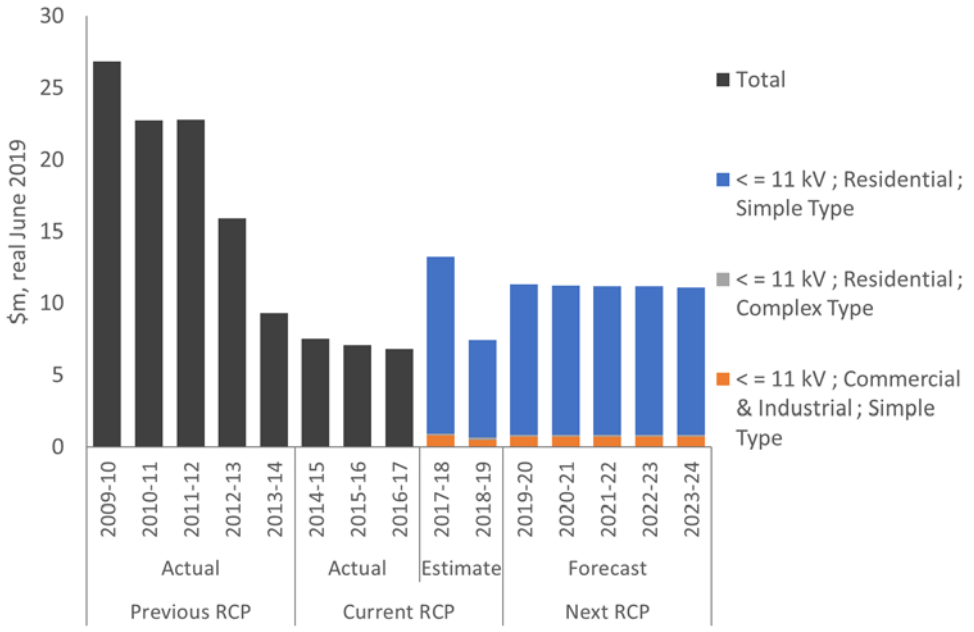
308. Ausgrid has not demonstrated that at a portfolio level, the proposed program is prudent.

5.3.5 Service lines

Ausgrid's forecast

309. Ausgrid has proposed $55.9m for the Service lines asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Service wires as shown in the figure below.

Figure 22: Repex for the Service lines asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

310. There is a 33% increase in expenditure proposed for the Service lines asset category for the next RCP (an average increase of $2.8m per year) compared with the actual and estimated expenditure for the current RCP. The increase in expenditure is evident from 2017/18 and maintained at a level similar to the average of 2017/18 and 2018/19 levels in the next RCP.

311. Ausgrid has included a description of its service wire replacement programs in Attachment 5.13.E of its RP.

Summary of expenditure mapping

312. The aggregate expenditure for the program and major projects in Ausgrid's Capex portfolio that maps to the service lines, totals $52.5m[161]. This is $3.5m lower than the RIN total of $55.9m. Ausgrid has not explained this variance.

Our assessment

313. In support of its planned replacement program, Ausgrid states[162] that it '*intends to mitigate the risks associated with bare and PVC insulated OH service lines by the end of 2023/24, resulting in a higher volume of OH service line replacement work*.' After this time, the replacement volume is expected to reduce from 25,000 per year (total of 125,000 for the next RCP) to approximately 16,000 per year.[163]

314. Ausgrid states that over 300,000[164] overhead service lines are above 30 years old. It further states[165] that '[a]*ssets greater than 25 years old are presumed to be either bare or PVC insulated OH service lines as Ausgrid did not install XLPE prior to this time.*' We therefore conclude that at the current replacement rate using the data provided by Ausgrid, it is unlikely that Ausgrid will replace all non-XLPE services in the next RCP.

315. Ausgrid states[166] that it '*undertakes inspections, condition assessments and location based risk assessment of OH service lines to determine the appropriate treatment options for each service line.*' However, Ausgrid states that the forecast is based on three factors: (i) age; (ii) remaining quantity of bare and PVC insulated service lines; and (iii) failure trend. The proposed program appears to be more closely aligned with an age-based forecast of replacement quantities, rather than a condition-based program as claimed Ausgrid. Therefore, we would expect that actual replacements will be lower through a degree of condition-based deferral.

316. Ausgrid has not demonstrated that Network Standard (*NS435 Section 5.4 Assessing asset risk*) has been applied when determining the forecast. Service line replacements will be required to replace bare and PVC technology which have known failure modes and which are likely to present an elevated safety risk if not treated. However, the proposed forecast is not adequately supported by evidence of increasing safety risk, or reflective of a prioritised approach to mitigate the highest risk assets as Ausgrid has suggested.

317. Whilst Ausgrid claims[167] that the proposed program provides a balance between cost, risk and performance, it has not provided sufficient evidence to support how this assessment has been undertaken to justify (i) the increase in forecast expenditure of 33% above the current RCP; (ii) that the proposed level of activity is reasonable; and (iii) that forecast expenditure for service lines is prudent and efficient.

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[161] Ausgrid Repex Mapping - 20 June 2018.

[162] RP Attachment 5.13.E - Project justification for service lines replacement programs April 2018. Page 4.

[163] Ausgrid refer to ultimately aligning with the standard technical life of XLPE insulated services.

[164] RP Attachment 5.13.E - Project justification for service lines replacement programs April 2018, based on data from Table 1.

[165] *Ibid*. Page 6.

[166] *Ibid*. Page 3.

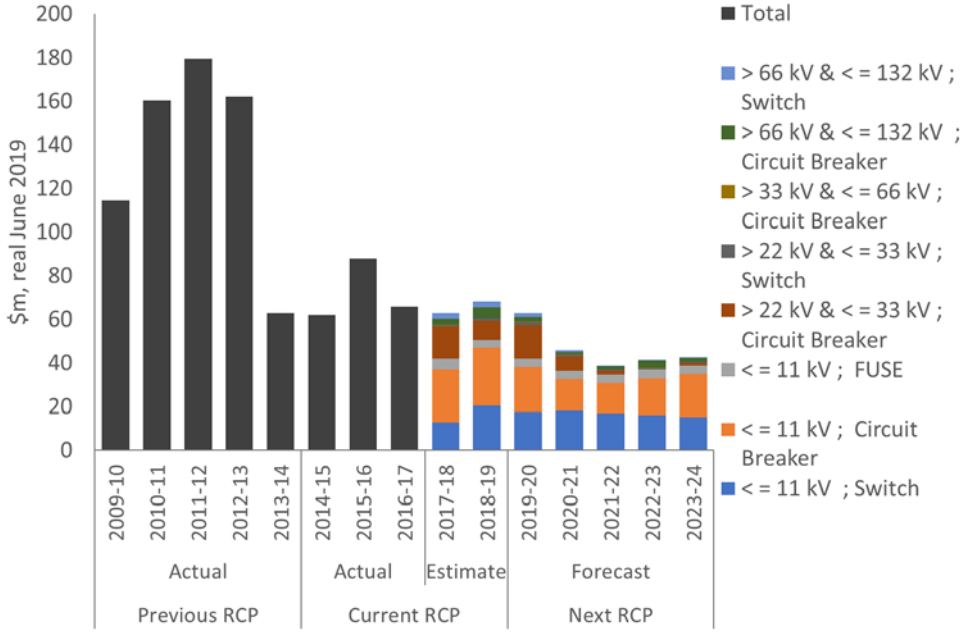
[167] *Ibid*. Page 11.

5.3.6 Switchgear

Ausgrid's forecast

318. Ausgrid has proposed $230.8m for the Switchgear asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Switchgear as shown in the figure below.

Figure 23: Repex for the Switchgear asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

319. There is a 33% reduction in expenditure proposed for Switchgear for the next RCP (an average decrease of $23.1m per year) when compared with the actual and estimated expenditure for the current RCP. The decrease appears to be driven by decreasing 33kV circuit breaker replacement in the next RCP.

320. Ausgrid has included a description of its Switchgear programs in Attachment 5.13.G of its RP. In addition, Ausgrid has included a number of major projects for the Switchgear asset category as described in Attachment 5.14.1 - *Project justification for 11kV switchgear replacements* and in Attachment 5.14.3 - *Project justification for 33kV switchgear replacements* in its RP.

Summary of expenditure mapping

321. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the switchgear asset category, totals $155.0m[168]. We have identified a further $157.0m of switchgear related major projects in Ausgrid's Capex portfolio, increasing the aggregate forecast to $312.0m. This is $81.2m higher than the RIN total of $230.8m. Ausgrid has not explained this variance.

[168] Ausgrid Repex Mapping - 20 June 2018.

Our assessment

11kV overhead switchgear replacement programs

322. For each program, Ausgrid establishes the need for replacement on the basis of type (e.g. manufacture), failure rates, age and condition, ongoing maintenance and repair opex, operating safety risks and hazards to the public.

323. Ausgrid states[169] that switch replacements are generally based on analysis of:

- avoided cost of maintaining the asset;
- minimising the cost of reactive failures;
- avoided cost of potential injury, fire and damage to the equipment; and
- additional safety outcomes gained through the installation of a modern switch with improved insulator materials.

324. As discussed in Section 4, the risk assessment consists of a high-level qualitative table-based assessment that considers consequences of loss of function and key failure modes. Whilst Ausgrid has undertaken and documented how it has determined failure rates for its 11kV switchgear, for example through probabilistic modelling, we found that the justification information that Ausgrid provided did not include sufficient detail on how the forecasts had been derived from the modelled outputs.

325. Ausgrid applies a planned treatment approach to the 11kV overhead switchgear replacements and considers that it has a good level of knowledge of the age and condition and failure histories of these assets. Given Ausgrid's assurance that it has good knowledge of asset condition, we consider that a condition/risk based planned replacement is appropriate for expenditure forecasting. However, the information that Ausgrid has provided for its programs is not clear on how this has been achieved.

326. Ausgrid has established the replacement volumes at a level that it considers is needed to '*sustainably manage the risks associated with the deteriorating asset population in a prioritised order so those of highest risk are completed first*.'[170] Ausgrid's documentation describes its application of a planned approach to identifying prioritisation of the highest risk switch types.[171] We consider that Ausgrid's method for setting its priorities is appropriate and note that it applies a replace-on-failure reactive replacement strategy for non-prioritised switchgear.

327. On the basis of the age profile of these assets, the inclusion of a replacement program in the forecast appears reasonable. However, whilst Ausgrid provides details of its condition-based[172] and risk-based[173] selection of assets for inclusion

[169] RP Attachment 5.13.G - Project justification for switchgear replacement programs. Pages 28-29.

[170] *Ibid*. Page 10.

[171] Ausgrid's response to information request IR011, EMCaAUS048 - 11kV Switchboard Risk for Planning 20171218.

[172] Ausgrid's response to information request IR011, EMCaAUS047 - Strategic Asset Prioritisation 11kV Switchgear – 20180608.

[173] Ausgrid's response to information request IR005, EMCaAUS024-Asset Risk Report-11kV Switchgear-20180711.

into the program, there are no details on how Ausgrid has determined that the replacement volumes have been set at a reasonable level. For example, we do not see pre- and post-replacement risk assessments that demonstrate the resulting program meets its risk policy requirements. In the absence of this information, we are unable to conclude that the proposed expenditure is prudent and efficient.

11kV ground mounted switchgear

328. Ausgrid's 11kV ground mounted switchgear assets are generally installed in distribution substations. Ausgrid identifies the primary driver for the replacement program as safety risks to the public, customers and workers.[174] Ausgrid's forecast expenditure on replacement of these assets in the next RCP is $60.5m. Assets identified for replacement include fuse switches, ring main units, isolation and earth switches.

329. Ausgrid states that a high number of 11kV ground switches are '*beyond the standard technical life, are leaking, and have known condition issues with tank corrosion.'*[175] A planned treatment approach to replace the assets at 45-50 years has been adopted. In taking this approach Ausgrid notes that due to cost, oil replacement in oil filled fuse switches had been undertaken every 25-30 years rather than the manufacturer's recommendation of every 10 years. This implies that past 'poor' asset management practice has forced Ausgrid to undertake a planned replacement earlier than would otherwise have been necessary.

330. Ausgrid provided no information or analysis on the economic efficiency of the approach that it took or on the extent to which the approach has brought forward the need for the replacement volumes proposed. Such analysis would be useful to inform future maintenance strategies on opex/capex trade-offs, and better assist the prudency assessment of this program.

331. Ausgrid advises[176] that the replacement volumes for the next RCP are based on:

- its conclusion that planned treatment at 45-50 years is appropriate to reduce the risk of catastrophic failures and the higher operating costs associated with oil filled units over gas filled units;
- balancing the costs of continuing ongoing maintenance against the cost of replacement; and
- aligning volumes with its new strategy to remove the oil risk and reduce the need for additional maintenance expenditure as these assets age.

332. Replacement volumes for 11kV ground mounted oil switches is aligned with Ausgrid's strategy to remove the oil risk associated with these assets and reduce the need for additional maintenance expenditure due to aging assets. Ausgrid intends to replace 9% of these assets during the next RCP.

333. The approach Ausgrid has taken to determine the need and prioritisation of outdoor oil switchgear replacements seems appropriate and the forecast replacement numbers seem reasonable. Ausgrid's justification document demonstrates the need for the replacement program. However, the justification does not provide a cost benefit analysis for the proposed program that, for example, would consider potential

[174] RP Attachment 5.13.G - Project justification for switchgear replacement programs. Page 18.

[175] *Ibid*. Page 22.

[176] *Ibid*. Page 22.

capex/opex trade-offs and demonstrate the balance between cost and risk. We consider that the addition of economic analysis would further strengthen the justification of the proposed program.

415V switchgear

334. Ausgrid has two programs related to the replacement of 415V switchgear; (i) network protector replacement (REP_01.03.06); and (ii) LV air circuit breakers (REP_01.03.02). These programs have been included in the repex forecast to mitigate loss of supply and safety risks by addressing asset deterioration, totalling $24.4m for next RCP comprising the replacement of 258 units.

335. There are plans to replace all of the remaining network protectors over the next RCP. The network protectors have been identified, assessed as conditionally failed, and placed on a priority list for replacement. Ausgrid's preference is to replace network protectors with modern equivalent air circuit breakers.

336. Ausgrid is proposing a two-year period of planned replacement of two specific types of LV air circuit breaker assets and to manage the remainder based on a conditional treatment approach. Ausgrid's reasons for taking this approach are to provide time to secure parts for a conditional replacement approach for the remaining population. This approach is sensible as it takes into consideration the risks, lifecycle costs and practical constraints of managing the aging assets.

337. Ausgrid has not provided details on how it has derived the replacement volumes. On balance however, given the steps already in place to address the identified risks, the proposed expenditure for this targeted program is likely to be reasonable.

11kV circuit breakers

338. The scope of this program is to replace degraded and obsolete circuit breakers installed in distribution and zone substations. There are three planned programs to replace (i) oil circuit breakers; (ii) single circuit breaker switchgear; and (iii) air insulated switchboards (vacuum circuit breakers)[177]. Ausgrid has included $20.4m in the repex forecast for the next RCP.

339. Ausgrid considers that the information collected during maintenance and testing of these assets has given it a good understanding of the internal condition of the equipment. Ausgrid has concluded[178] that the replacements are needed because:

- the condition of circuit breakers is deteriorating, and spare components are becoming difficult to source;
- single circuit breaker substations form an obsolete substation and switchgear design; and
- Ausgrid has a strategy to progressively remove oil filled equipment, including switchgear, from substations to reduce fire risk.

340. Ausgrid's records show that between 2012/13 and 2016/17 there was an annual average of 185 conditional and functional failures. However, Ausgrid's analysis shows a decreasing trend attributed to the positive affect of Ausgrid's previous

[177] Programs REP_01.02.43, REP_01.03.04, REP_02.02.01 per RP Attachment 5.13.G - Project justification for switchgear replacement programs. Page 25.

[178] *Ibid*. Page 26.

replacement programs. Despite this, Ausgrid claims that it has a backlog of poor performing circuit breakers and obsolete equipment; and because of this, it intends to implement a planned treatment approach until the backlog has been cleared.

341. Whilst Ausgrid has shown the need for a level of replacement for 11kV circuit breakers, it has not provided details or analysis on how it determined the volume of replacement. In addition, Ausgrid has not provided an explanation for the factors that have contributed to the historical backlog, the relationship between the backlog and forecast trend in defects or risk levels, or the steps Ausgrid has taken to prevent a backlog occurring again in the next RCP. Whilst we accept the need for continuing investment in this activity, it is not possible to conclude that the proposed expenditure is prudent and efficient as there is an absence of information on how the proposed volumes have been derived.

Sub-transmission circuit breakers

342. The scope of this program is the replacement of sub-transmission circuit breakers in zone and sub-transmission substations. The forecast repex for the next RCP is $5.6m, made up of two programs (REP_03.04.03 and REP_02.03.01).[179]

343. During the next RCP Ausgrid proposes to:

- replace all obsolete 33kV air blast circuit breaker technology used at one substation location (during 2019-20); and
- install motorised operation to the remaining quantity of 132kV outdoor circuit breakers that are approaching end of life.

344. Ausgrid states that the remainder of the sub-transmission circuit breaker assets will '*follow a reactive or conditional treatment approach and will be initially managed within the maintenance program'*.[180]

345. We would expect justification of the forecast to include analysis of the safety risk, reliability risk (cost of USE) and avoided reactive measures needed to address probable failures. However, Ausgrid did not provide any such analysis to support the planned program. On balance, given the age profile, obsolescence risks and targeted nature of this program, the proposed expenditure is likely to be reasonable.

Sub-transmission isolating switches

346. Ausgrid has proposed four programs[181] to address risks associated with sub-transmission switch assets that are in poor condition to mitigate identified safety risks for workers and to improve reliability of supply to customers. To achieve these objectives Ausgrid has included $6.9m in its repex forecast in the next RCP on two types of 33kV isolate and earth switches (programs REP_02.02.35 and REP_02.02.38) and two types of 132kV motorised I & E switch programs (programs REP_02.03.02 and REP_03.03.02).

347. Ausgrid states that it intends to replace the isolating switches of units experiencing condition issues and presenting immediate safety concerns.

[179] RP Attachment 5.13.G - Project justification for switchgear replacement programs. Page 31.

[180] *Ibid*. Page 34.

[181] *Ibid*. Page 36.

348. Given the apparent safety issues and the age and condition of these assets, we consider the need for the replacement of the 33kV isolate and earth switches and the refurbishment of the 132kV I & E switch programs is likely to be required. Whilst we have not seen detail on how the replacement volumes have been derived, we consider that Ausgrid's targeting of assets with significant risk is prudent. Further detail on the specific development of the justification for the volume of the overarching program would have been useful for us to understand if the 3.5% replacement level over the next RCP is reasonable.

Assessment of Switchgear replacement major projects

349. Ausgrid has included a number of major switchboard replacement projects where the forecast for each project and its timing has been justified on a risk cost basis. The annual probabilistic cost for USE, safety risk, environmental risks, and major repairs are calculated in accordance with the methodology described for sub-transmission cables.

350. Ausgrid's CBA indicates that whilst the VCR risk cost is the primary underlying driver of replacement, the timing triggers are quite variable across projects. Several switchgear replacement projects are linked to the timing of related fluid filled cable and zone substation replacements. Because of this, the timing of switchgear replacements can also be influenced by the environmental commitments made by Ausgrid in relation to mitigation of oil cable leaks.

351. The potential for load switching and demand management are considered and assessed by Ausgrid for each project we have reviewed. Demand management and load switching benefits are seen in the reduction of VCR related risk cost which delays the project commencement date.

Replacement of Mascot zone substation

352. This project covers replacement of the existing Mascot 33/11kV zone substation with a new 132/11kV substation that will be located on a nearby greenfield site. The new substation will take its primary supply at 132kV. Ausgrid's estimate of the total replacement cost is $21.9m in the next RCP, and a total of $51.2m[182] for the preferred option),[183] however $18.4m is included in the repex forecast for project ARA_03.1B.0017.

353. The primary driver of the zone substation replacement is the condition of the existing 11kV switchgear, including the compound and air insulated switchgear, and oil-filled circuit breakers that are all nearing the end of life.[184]

354. Ausgrid's CBA analysis indicates that the VCR and safety risk cost are the key determinates of the project timing. Ausgrid has developed a load transfer option that has deferred the project commencement from 2018 to 2021. A demand management option is also included in the preferred option, and this allows $29m of the forecast (provided for the network option) to be deferred beyond the next RCP.

[182] Ausgrid states the total project cost is $51.1m of which $45.5m is attributable to switchgear and $5.6m to replacement of cables. As the optimal solution is a new 132/11kV substation on a greenfields site, the expenditure breakdown is likely to include other major assets such as buildings and civil works, transformers etc.

[183] RP Attachment 5.14.1 - Project justification for 11kV switchgear replacements. April 2018. Page 12.

[184] For example, the oldest switchboards are compound insulated and will be over 70 years old in 2019, well beyond their typical technical life; the air insulated switchboards are over 50 years old.

355. Ausgrid has demonstrated the need for the project and that the preferred option is reasonable. The project also demonstrates the impact that demand management can make on deferral of the project expenditure.

356. The proposed timing of expenditure includes $18m of the estimated $21.9m falling in the last year (2023/24) of the next RCP. This means that the forecast is sensitive to Ausgrid's assumptions on the quantity of available demand management. Whilst the quantification of the availability of a demand management non-network solution is in its early stages, its inclusion by Ausgrid supports the prudency and efficiency of the proposed expenditure.

Peakhurst sub-transmission substation

357. This project covers replacement of 33kV switchgear at Peakhurst 132/33kV sub-transmission substation. The expected completion date of the new switchroom and load transfers is 2021, with decommissioning of the replaced assets scheduled in the following year. The substation was commissioned in 1964 and age and condition of the switchgear and SCADA assets have triggered the need for replacement. A total of $19.4m[185] is estimated out of a total project cost of $22.1m to be spent in the next RCP, however $15.6 is included in the repex forecast for project ARA_04.1.0029.

358. Ausgrid has assessed brownfield and greenfield options and concluded that the greenfield option for the new switchroom is preferred because it has the lowest Net Present Cost and delivers the lowest risk. Ausgrid's CBA shows that safety risk is a significant driver and, on the basis of this risk cost alone, the optimal timing of replacement appears to be in the past. [redacted] Because of the safety issues driving this project, demand management has not been considered as a deferral option. We concur with the approach for this project.

359. Whilst we accept the need for this project, it is not possible to conclude that the proposed expenditure is prudent and efficient due to the absence of information on Ausgrid's input assumptions that have been relied on in its analysis.

Concord zone substation 11kV switchgear replacement project

360. This project covers the proposed 11kV switchgear replacements together with control and protection equipment in a new building located within the existing Concord zone substation. Total estimated project cost is $22.4m[186] with $20.8m to be spent during the next RCP, however $16.2m is included in the repex forecast for project ARA_04.4.B.0002. The zone substation was commissioned in 1955.

361. Whilst the risk cost associated with USE is the primary driver of the timing of the project, safety risk is also a factor. Many switchgear components at this zone substation have been replaced and the remaining 11kV OCBs and compound insulated switchboard present an ongoing fire risk.

362. Ausgrid has considered the opportunity for demand management and has included a three-year deferral of the expenditure in its forecast. By reducing the load served by this zone substation, the demand management option reduces the likely USE cost in

[185] Based on forecast provided in RP Attachment 5.14.1.

[186] Based on forecast provided in RP Attachment 5.14.1.

Ausgrid's risk cost analysis. However, the fire risk will remain throughout the current RCP.

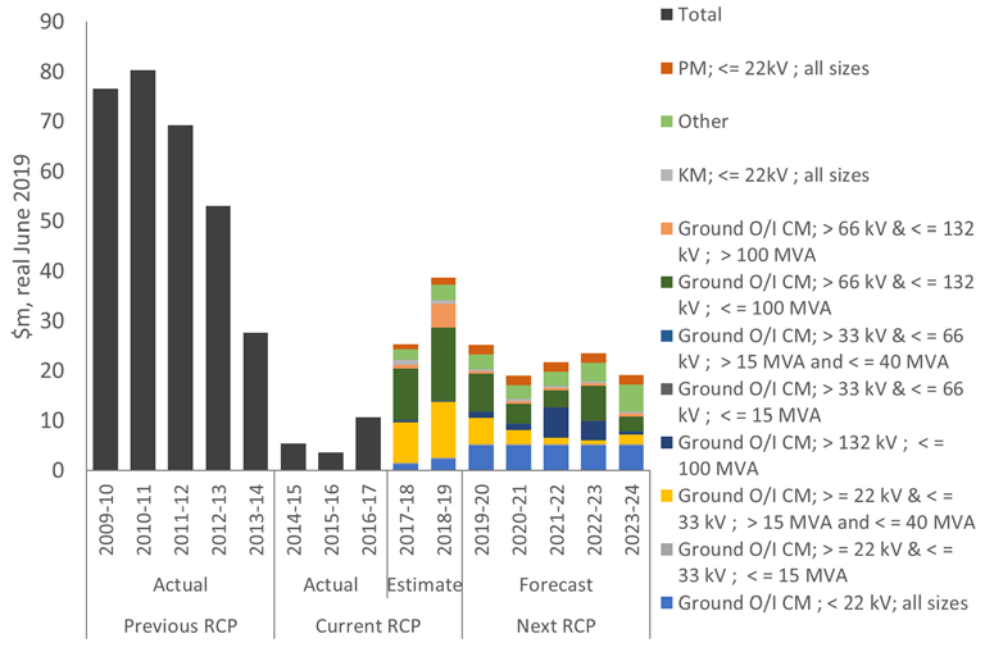
363. From our review of Ausgrid's documentation, it is reasonable to include this replacement project in the forecast, and we consider that Ausgrid's preferred option has been selected through an appropriate method. The inclusion of the benefits of the demand management option demonstrates that Ausgrid is seeking opportunities to defer expenditure. We consider that the process established and followed by Ausgrid, is likely to reflect a proposed level of activity that is reasonable. However, it is not possible to conclude that the proposed expenditure is prudent and efficient due to the absence of information on Ausgrid's input assumptions that have been relied on in its analysis.

5.3.7 Transformers

Ausgrid's forecast

364. Ausgrid has proposed $108.7m for the Transformers asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for Transformers is as shown in the figure below.

Figure 24: Repex for the Transformers asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

365. There is a 30% increase in expenditure proposed for Transformers for the next RCP (an average increase of $5.0m per year) when compared with the actual and estimated expenditure for the current RCP. The increase in expenditure is evident from 2017/18, driven by increasing zone substation transformer replacements at 33kV and 132kV in the next RCP.

366. Ausgrid has included a description of its transformer programs in Attachment 5.13.F *Transformers* and Attachment 5.13.H *Distribution substations* of its RP.

Summary of expenditure mapping

367. The aggregate expenditure for the program and major projects in Ausgrid's Capex portfolio that maps to the transformers asset category total $62.9m[187]. This is $45.9m lower than the RIN total of $108.7m. Ausgrid has not explained this variance.

Our assessment

Distribution transformers

368. Ausgrid states that the majority of its distribution transformers are treated reactively.[188] A planned replacement program has been included for the 400kVA Sydney CBD Conservator Type due to functional failures and oil leaks associated with end of life.

369. Ausgrid states that the program continues from the current RCP and will extend beyond the next RCP due to the volume of assets and access issues. During the onsite, Ausgrid advised that the current program was delayed as a result of difficulties sourcing replacement units to meet their specific technical characteristics, which also affects switchgear installed in the same CBD substation locations.

370. Ausgrid describes[189] that a spares management process (referred to as a 'rotables process') is also in place where transformers are selectively removed from service for repair and placed into inventory stock for future projects. Ausgrid has proposed a replacement volume that accounts for approximately 13%[190] of CBD transformers. Whilst Ausgrid has nominated planned treatment of all transformers, at their technical standard life of 45 years, the average age is already 53.6 years. Assets are incurring an increasing failure rate and as such are already considered to be conditionally failed. Whilst a managed replacement program appears reasonable for this asset, we have not been provided with the analysis to support the proposed replacement levels. On balance however, given the delays to this program and proposed replacement volume and spares management strategy already in place, the proposed expenditure for this targeted program is likely to be reasonable.

Distribution substation replacement programs

371. For distribution substations, Ausgrid is continuing its program to replace a small group of obsolete substations of early era kiosk and outdoor enclosure designs and to replace pole top substations when the associated pole or the transformer itself has conditionally failed. This includes:

- Ausgrid expects to replace 20 outdoor enclosure substations[191] per year, based on an assessment that replacement of 20% of the outdoor enclosures

[187] Ausgrid Repex Mapping - 20 June 2018.

[188] RP Attachment 5.13.F - Transformer replacement programs. Page 3.

[189] *Ibid.*

[190] 33 replacements per year, totalling 165 over the next RCP of a population of 1,300.

[191] There were 523 outdoor enclosure substations of varying type, age, configuration and condition as of June 2017.

across Ausgrid's network during the next RCP is required to maintain the number of outdoor enclosure substations operating over their technical life;[192]

- Forecasting the number of pole top substations[193] to be replaced is based on the average of long term historical trends[194] and compared with the pole condition predictive model. A similar process is applied for refurbishment of pole top substations, electing to complete the refurbishment program within the next RCP; and
- Planned replacement of 40 kiosk substations[195] considered obsolete and at end of life, using an asset condition assessment process.

372. In general, Ausgrid has proposed a volume of replacement for its distribution substations fleet that is primarily based on historical trends and age of the identified assets, albeit the final sites are based on an asset condition assessment. Whilst an allowance is also provided within the reactive replacement programs, as is the case for most programs to account for unforeseen failures based on historical trend, Ausgrid's current practices suggest that it is likely to target the higher risk sites.

373. In our experience, bottom-up, age-based forecasts are biased towards overestimating the actual expenditure requirements. Whilst Ausgrid refers to some evidence of conditional failures of these types of units, this information has been provided in aggregate, and does not identify the level of defects, safety risk, or condition / health assessment of the fleet of assets that we would normally expect to see to support the proposed replacement levels. Accordingly, whilst a managed program appears reasonable, Ausgrid has not provided sufficient information to justify that a program in the order of $45m is prudent and efficient.

Power transformers

374. Ausgrid has included four programs for power transformers to manage spares holdings and to replenish power transformers replaced at end of life totalling $12.3m over the next RCP. Ausgrid expects to replace 20 transformers in the next RCP as part of reactive replacement programs.[196] Ausgrid has also included a forecast replacement rate of 5 power transformers per year,[197] which would total 25 over the next RCP.

375. Ausgrid claims to have a probability of failure model[198] and an economic model[199] to assess transformer options for its transformer fleet, and if applied, we would expect this would provide a reasonable estimate of transformer replacements, costs and

[192] RP Attachment 5.13.H - Distribution substations replacement programs. Page 8.

[193] There are over 16,000 pole top substations are installed on the network and these assets are predominantly located on the 11kV distribution network.

[194] RP Attachment 5.13.H - Distribution substations replacement programs. Page 13.

[195] Population of 12,800 kiosk substations as at 1 July 2017.

[196] RP Attachment 5.13.F - Transformer replacement programs. Page 9.

[197] *Ibid*. Page 14.

[198] *Ibid*. Page 11.

[199] *Ibid*. Page 12.

benefits. However, neither model has been provided to support its expenditure forecast.[200]

376. Whilst we accept the need for continuing investment in this activity, it is not possible to conclude that the proposed expenditure is prudent and efficient as there is an absence of information on how the proposed volumes have been derived.

Instrument transformers

377. Ausgrid has included four programs relating to replacement of instrument transformers at $10.3m in the next RCP.

378. The proposed volumes are based on predicted conditional failures.[201] A consistent volume of instrument transformer replacement work is proposed throughout the next RCP comprising planned replacement of legacy units and conditional replacement based on historical levels. Based on a replacement volume estimated at 1% of the population annually, and targeting known and identified condition issues, the proposed the proposed expenditure for this targeted program is likely to be reasonable.

Reactive plant

379. Ausgrid has included two programs to replace reactive plant at $5.8m in the next RCP, relating to replacement of neutral earthing resistors and refurbishment of air core reactors.

380. The proposed volumes of replacement and refurbishment activity are based on emerging condition issues, where Ausgrid claims there has not been sufficient expenditure in the past.[202] Whilst we accept the need for investment in this type of activity, Ausgrid has not provided sufficient information on the emerging condition issues that Ausgrid has identified that require an uplift in expenditure from current levels. On that basis, it is not possible to conclude that the proposed expenditure is prudent and efficient.

5.3.8 SCADA, Network Control and Protection System

Ausgrid's forecast

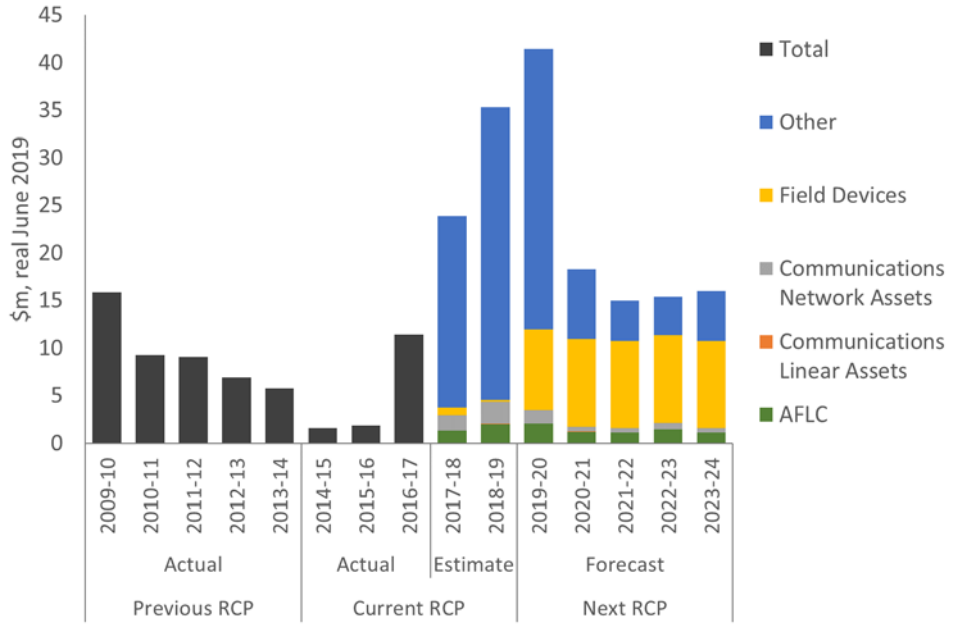
381. Ausgrid has proposed $106.1m for the SCADA, network control and protection system asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for SCADA, network control and protection system is shown in the figure below.

[200] Ausgrid provided a copy of a report by PB associates, Review of Investment Decision Models - Transformer repair or replace, 2006 in response to a request for information pertaining to evidence of quality assessments undertaken on Ausgrid's application of Wiebel distribution curves when determining the probability of asset failure. The relevance of this report, published in 2006 for Energy Australia, to the forecast expenditure for transformers in the next RCP was not explained by Ausgrid.

[201] RP Attachment 5.13.F - Transformer replacement programs. Page 18.

[202] RP Attachment 5.13.F - Transformer replacement programs. Page 22.

Figure 25: Repex for the SCADA, network control and protection system asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

382. There is a 43% increase in expenditure proposed for the SCADA, network control and protection system asset category for the next RCP (an average increase of $6.4m per year) when compared with the actual and estimated expenditure for the current RCP. The increase in expenditure is evident from 2017/18, driven by increases in the Other category (primarily associated with the ADMS replacement) and field devices in the next RCP. Once the ADMS expenditure of $41.4m is removed from the forecast, the remainder of the proposed expenditure is $64.7m.

383. Ausgrid has included a description of its SCADA, network control and protection system programs in Attachment 5.13.I of its RP.

Summary of expenditure mapping

384. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the SCADA network control and protection system asset category total $128.9m[203]. This is $22.8m higher than the RIN total of $106.1m. Ausgrid has not explained this variance.

Our assessment

Advanced Distribution Management System

385. The most significant project within the SCADA, network control and protection system asset category is the replacement of its ADMS, at $41.4m in the next RCP. We provide our observations on this project in Section 6 (ICT/OTI).

SCADA equipment

386. In addition to the ADMS project, Ausgrid is proposing a collection of SCADA equipment projects comprising $18.8m due to obsolescence and end of life. The

[203] Ausgrid Repex Mapping – 20 June 2018.

relationship between the ADMS implementation and the additional SCADA related projects is not clear to us. Whilst the emphasis appears to be on the remote equipment (i.e. substation-based SCADA equipment) it is not clear what if any dependency exists with the large-scale deployment of a new ADMS, the degree to which these projects are already included or whether Ausgrid has sufficient capacity to undertake further SCADA equipment projects at the same time.

387. Ausgrid claims that 2.9% of the SCADA equipment population is planned to be replaced each year, however it provides no analysis for how this figure was derived, or whether this represents good asset management practice.

Protection relay replacement program

388. Ausgrid has proposed nine protection relay replacement programs at $33.0m in the next RCP. Ausgrid states that the replacement volume is based on planned replacement of the identified assets. However, no analysis is provided for the protection relay asset class in terms of asset profile by relay type, failure modes, defect analysis and failure rates to provide the justification for the proposed replacement option and corresponding replacement volume. Ausgrid states[204] that approximately 0.1% of the relay population is to be replaced as part of replacement programs each year due to the risks and average age of these assets. Applying this to a population of 72,000 relays, equates to a replacement rate of approximately 72 relays per year. Ausgrid's planned replacement of 347 relays over the RCP is an average of 69 per year being slightly lower, and likely to be reasonable.

389. Ausgrid has included additional protection relay projects in the Other asset category and these also form part of other projects. The corresponding replacement volume has not been assessed as a part of this program and we assume these also do not form part of the replacement rate quoted by Ausgrid.

Modem replacement

390. Two programs have been included to replace modems, totalling $18.2m, due to the retirement of Telstra's third generation (3G) mobile network. According to information Telstra has provided to Ausgrid,[205] the availability of the 3G network drops from '*likely to be available in 2022*' to '*50% likely to be available in 2025*'. Ausgrid has proposed to undertake a full replacement program of its fleet of 6600 modems to be completed within the next RCP '*ahead of the proposed start of the 3G disconnection [*which*] ensures availability of critical services'.*[206]

391. Ausgrid provides a reference to an investor-day presentation in 2016 as its sole source of the requirement to replace this technology within the next RCP. We would have expected to see more evidence to support Telstra's plans given the significance of the decision to infrastructure services across the country impacting many services,[207] and an assessment of risk and contingency planning undertaken by Ausgrid in its options analysis. In the absence of this analysis, we consider that it is more likely than not that a proportion of this program will be deferred beyond the end of the next RCP.

[204] *Ibid. P*age 10.

[205] RP Attachment 5.13.I - Project justification for SCADA control protection replacement programs. Table 10.

[206] *Ibid*. Page 19.

[207] Including other network service providers, and other utility providers.

Other programs

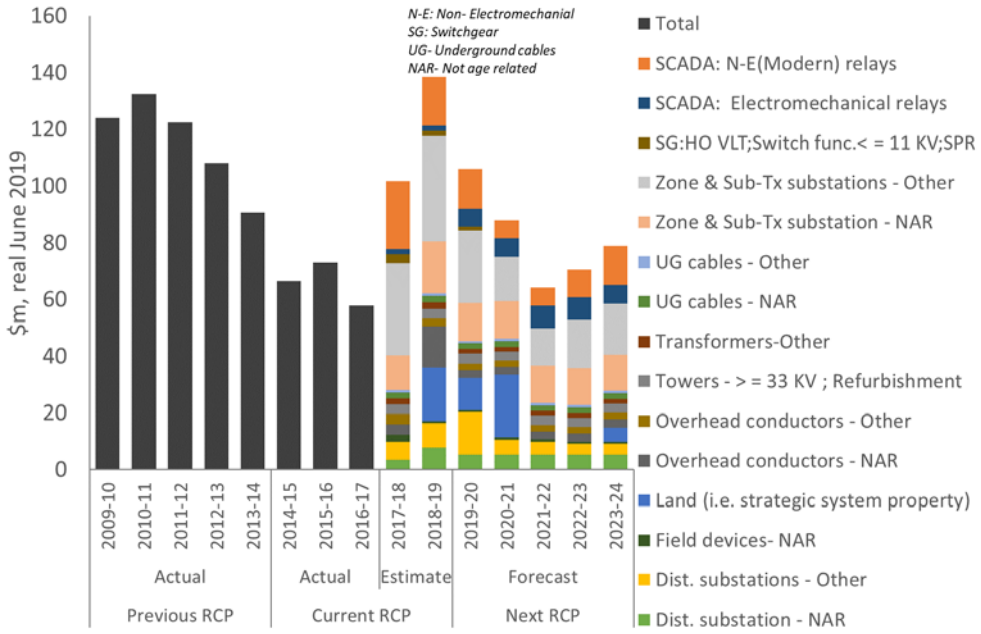
392. The information provided for the remaining range of other programs is insufficient to conclude that the programs reflect a prudent and efficient level of expenditure.

5.3.9 Other

Ausgrid's forecast

393. Ausgrid has proposed $407.7m for its 'Other' asset category in its repex forecast for the next RCP. The expenditure profile for the previous, current and next RCP for the Other asset category is shown in the figure below.

Figure 26: Repex for the Other repex asset category for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

394. There is a 7% decrease in expenditure proposed for the Other category for the next RCP (an average decrease of $6.0m per year) when compared with the actual and estimated expenditure for the current RCP. The decrease in expenditure is evident from 2015/16, driven by decreasing land purchases, tower refurbishment and zone substation (other) over the next RCP. The trend is influenced by higher estimated expenditure in the last 2 years of the current RCP.

395. Ausgrid has included a description of its Other repex programs in Attachment 5.13.G of its RP.

Summary of expenditure mapping

396. The aggregate expenditure for the programs and major projects in Ausgrid's Capex portfolio that maps to the Other asset category, totals $329.5m[208]. This is $78.2m lower than the RIN total of $407.7m. Ausgrid has not explained this variance.

[208] Ausgrid Repex Mapping - 20 June 2018.

397. In the Reset RIN, Ausgrid categorises the forecast expenditure in the 'Other' asset category as follows:

- $155.2m attributed to zone and sub-transmission substations (not age related and Other);
- $89.5m for SCADA, network control and protection, including $35.5m for electromechanical relay replacement and $50.3m for non-electromechanical (modern) relay replacement;
- $59.1m attributed to distribution substations (not age related and Other);
- $38.2m attributed to strategic property;
- $25.8m for conductors;
- $16.6m for towers; and
- $23.1m for cables, transformers and switchgear.

398. Ausgrid has not identified the relationship between these groupings and the projects and programs provided in its Capex portfolio. In the absence of better information, we have reviewed a number of programs identified in Ausgrid's Capex portfolio in the subsequent sections. As noted in Section 4 and in this section, we have found inconsistencies in the presentation of the expenditure forecast for programs and projects between Ausgrid's Capex portfolio and the justification documents provided.

Our assessment

Support related programs

399. Ausgrid has not provided justification of the inclusion of Switching and Control and GIS Data capture related costs as repex or detailed the composition of the expenditure forecast.

400. Ausgrid has also separately identified a number of support costs required to deliver its capital program as Capital program costs in its RP[209] on the basis that the associated costs cannot be allocated to individual projects so are bundled together as overheads. It is not clear to us why the Switching and Control and GIS Data capture programs have been added as repex, and are not presented within 'Capitalised Network Overheads', similar to other costs related to the management and supervision of capital projects and programs, scheduling jobs, admin support and safety briefings.

401. The costs associated with switching and control of the operational network and updating of GIS records form part of the core role of an NSP. Whilst these costs are predominantly related to opex activities, a component is also related to capex activities. Ausgrid has not demonstrated how this component of the proposed expenditure is related to capex activities, and specifically how this should be categorised as repex, or separate from expenditure proposed as capital program support costs.

402. On balance we consider the costs are more closely aligned with activities treated as capital program support costs and suggest that the proposed expenditure is assessed separately as part of the assessment of these support costs. Assessment

[209] RP. April 2018. Page 106.

of Ausgrid's proposed capital program support/overhead costs is not within our scope of review.

Strategic property acquisition

403. In an onsite meeting presentation, Ausgrid has proposed expenditure for acquisition of four sites[210] consistent with its *2017 Network Property Plan*[211]:

- White bay zone substation – new load centre in response to urban growth;
- Liddell 33kV switching station – [redacted]
- New substation (Sydney) – in response to infrastructure and area re-development; and
- New substation (Hunter) – in response to infrastructure and area re-development.

404. In our view, the identified properties are being acquired for the purposes of augmenting the transmission and distribution network, and therefore do not meet the classification of repex. We suggest that the assessment of this expenditure is undertaken as a part of the AER's assessment of Ausgrid's network growth planning, and specifically augex.

Substation-related programs

405. In Attachment 5.13.J[212] Ausgrid identifies nine program groupings totalling $124.6m[213]. The largest of these are related to substation security ($41.4m), buildings and civil infrastructure[214] ($39.8m) and oil containment ($28.2m).

406. The substation security grouping comprises seven programs '*to continue with a similar volume to the current regulatory period to mitigate the risks*.'[215] The substation lock upgrades program is continuing from the current RCP and concludes in 2019/20, at a cost of $10.5m within the next RCP. Ausgrid has not provided any justification for the proposed volumes for the remaining programs.

407. Buildings and civil component comprises twelve sub-programs. Ausgrid has a number of substation sites in excess of 50 years of age. Ausgrid states that the infrastructure at these sites are generally in original condition and therefore the age of the substation is a good indication of the age of the associated infrastructure.

408. In describing the individual refurbishment and replacement programs, Ausgrid claims that each site is assessed on a case by case basis to determine the most cost-effective option between refurbishment or replacement of the substation infrastructure. We understand that Ausgrid's program is likely to span several RCPs, however an overarching strategy has not been provided that provides the level of

[210] Response to information request IR005, EMCaAUS024-SUPP_44.01.01-Strategic Property Slides.

[211] Ausgrid, Network Property Plan, December 2017 (D17/1144071).

[212] RP Attachment 5.13.J - Project justification for other replacement programs.

[213] Includes planned, conditional and reactive components from Ausgrid master project list.

[214] Comprising expenditure for buildings and roofs, perimeter fences, fire services, and fire doors.

[215] RP Attachment 5.13.J - Project justification for other replacement programs. Page 11

evidence that we would normally expect to see to justify such an extensive and expensive program.

409. Oil containment in zone substations is a single program to modernise or install missing oil containment systems at 50 zone substations. Ausgrid has elected a planned upgrade as its treatment option due to risk of non-compliance with the NSW *Protection of the Environment Operation Act 1997*. Ausgrid states that it has adopted a risk-based approach for the oil containment programs at substation sites. We have not seen the risk-based approach, and on review of the material provided, consider this is likely to be prioritisation of the nominated 10 sites per year rather than an assessment of risk to inform treatment options.

410. With the exception of the oil containment program, we understand from Ausgrid that, in general, the substation-related programs are continuing at a similar volume when compared with the current RCP, and that the overall program is expected to continue for several RCPs. Whilst we have not seen evidence of the risk assessment and risk-ranking that Ausgrid has undertaken, we consider that Ausgrid is likely to direct expenditure to the highest risk assets first. Notwithstanding that Ausgrid claims that it has proposed a similar level of replacement activity to the current period, we would have expected to see a longer-term strategy developed for the substation-related assets, including evidence of the assessment of asset condition and associated risks, to justify the proposed level of replacement activity.

411. For the oil containment program, in the absence of adequate risk analysis, it is not possible to conclude that Ausgrid has sufficiently explored risk mitigation options (including alternate oil/water separation systems, barrier systems, etc.) to determine that the proposed activity is reflective of a prudent and efficient level of expenditure.

Distribution-related programs

412. Ausgrid has not provided any specific justification of distribution-related programs. The Reset RIN does nominate expenditure for Capital Works - Natural Disasters, Storms and Bushfires at $12.5m.

413. Ausgrid has not identified the drivers of this expenditure, historical evidence of significant events, impact to Ausgrid's ability to deliver its repex program or consideration of alternate risk treatments such as insurance. We expected to see, and have not been provided with, evidence of how natural disasters, storms and bushfires had adversely impacted the level of risk on the network and ability for Ausgrid to undertake it repex program. In the absence of this information, we consider that Ausgrid has not demonstrated that the forecast expenditure is prudent.

Protection systems

414. Ausgrid has included line items for electromechanical relay replacement and non-electromechanical relay replacement in the Other asset category totalling $85.8m. Based on the RIN, approximately $45m is also estimated for the final two years of the current RCP. We have not identified any justification for inclusion of these programs into the forecast. We would expect that justification for these programs would be included in the supporting information, and given the proposed expenditure requirements, detailed information pertaining to the asset condition and associated risks detailed for inclusion of these programs into the forecast. This information has not been provided.

5.4 Findings and Implications for proposed repex forecast

5.4.1 Findings

415. We find that Ausgrid has not fully justified its repex forecast for the next RCP, for reasons including that Ausgrid:

- has not provided adequate supporting justification for the projects and programs included in the proposed forecast expenditure, with examples of programs not documented in the supporting justification;
- presents a low level of alignment between the expenditure forecast and the submitted RIN data as part of its RP. We sought an explanation from Ausgrid for these discrepancies, however it was not provided, and this significantly hindered our assessment;
- has not adequately supported its modelled outcomes by sufficient supporting information, including explanation of the basis of input assumptions;
- with the exception of complex assets,[216] has not demonstrated that it has undertaken an assessment of the trends in asset risk, health or failures rates, or other relevant performance measures to determine if the current levels of replacement are appropriate and if the proposed expenditure will result in a stable, improving or declining trend in risk;
- provided insufficient correlation between the objectives and outcomes developed by Ausgrid to the expenditure levels to draw any meaningful conclusions;
- provided insufficient analysis of risk and options to determine the most efficient risk treatment option; and
- has not justified the expenditure classification applied in some areas where we consider the expenditure should be reviewed as a part of an alternate expenditure classification.

416. Accordingly, we find that Ausgrid's repex forecast in its RP is not efficient, prudent and reasonable and therefore does not meet the NER expenditure criteria.

417. We have not been asked to specifically assess evidence of efficient costs employed by Ausgrid in the development of its forecast. However, we have made observations within our review of the asset categories that suggests to us that further consideration of cost efficiency would likely place downward pressure on the forecast expenditure.

5.4.2 Implications

418. We consider that the repex forecast as proposed by Ausgrid is significantly overstated. In part this is because of what we consider to be Ausgrid's misallocation of some expenditure to repex that should more properly have been presented as part of other capital expenditure categories.

[216] Sub-transmission fluid filled cable, and 11kV and 33kV switchboards.

419. Considering the proposed expenditure that we judge clearly to be 'repex', we have then considered the implications of our findings based on the projects and programs we reviewed. From this evidence, we consider that both the modelled and un-modelled components of Ausgrid's proposed repex forecast are in aggregate moderately above a reasonable prudent and efficient level.

Assessed Adjustment

420. We were not asked to provide an assessed adjustment for Ausgrid's repex forecast.

6 Assessment of proposed ICT/OTI capex

6.1 Introduction

422. In this section we provide our assessment of Ausgrid's ICT/OTI capex forecast, which is a component of its 'non-network' forecast. We first summarise Ausgrid's proposed ICT/OTI capex, we then outline the forecasting process that Ausgrid claims to have followed in preparing its forecast, before providing our assessment of Ausgrid's forecast for ICT/OTI capex. In Section 6.4, we summarise the findings from our assessment, and we indicate the implications that these findings have for determining a reasonable forecast of Ausgrid's prudent and efficient expenditure requirements for ICT/OTI.

6.2 What Ausgrid has proposed

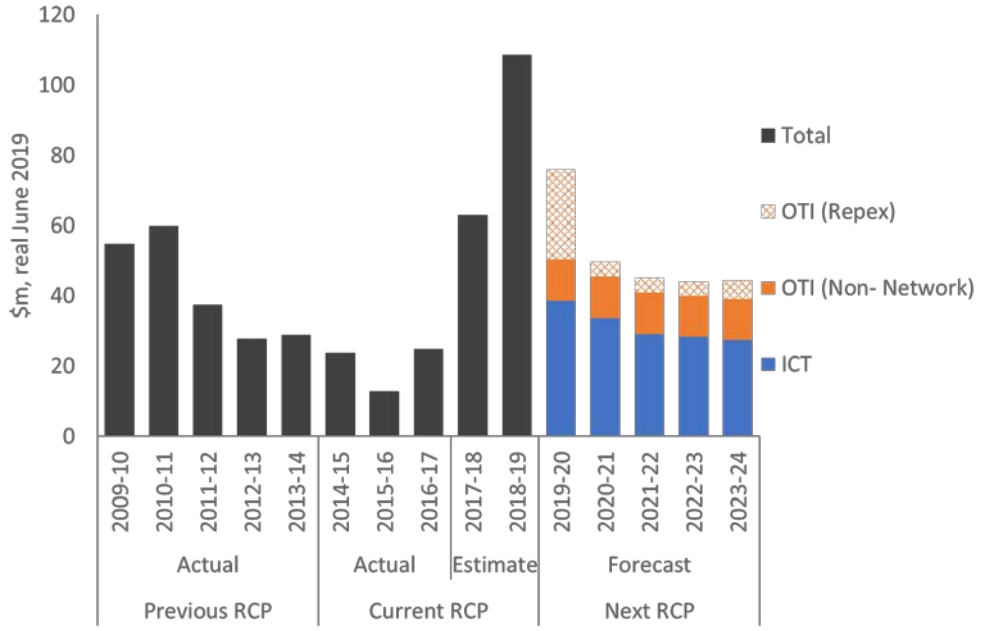
6.2.1 Summary of proposed expenditure

423. Within its non-network expenditure forecast, Ausgrid has forecast ICT/OTI capex of $215.5m for the next RCP compared to actual/estimated capex in the current RCP of $232.9m. This represents an apparent decrease of 7.5% (or $17.4m) although, in large part, this is because Ausgrid plans a very large increase in expenditure in the final two years of the current RCP. Ausgrid's forecast for the next RCP is comprised of $157.0m for ICT projects and $58.5m for OTI projects.

424. Ausgrid has presented a further $43.6m for OTI projects in its repex forecast (included in the figure below) and which we review as part of ICT/OTI forecast capex in the current section. Once this is taken into account, the total forecast for ICT/OTI increases to $259.1m for the next RCP.

425. The profile for ICT/ OTI capex is consistent with the profile for total non-network capex, and driven by similar reasons, as explained in Section 2.

Figure 27: ICT/ OTI capex for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN.
Note: We have included OTI capex which Ausgrid has classified as repex for the next RCP in this figure. We do not know what, if any, OTI is classfied as repex in the current period.

426. Ausgrid's plan comprises six ICT programs for the next RCP as set out in the table below.

Table 13: ICT capex by program for next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
ICT Capex cost by program	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Regulatory & Compliance Systems	1.2	1.2	1.3	1.3	1.3	6.2
Cyber Security	7.2	2.7	2.3	4.3	3.3	19.8
Application Maintenance	13.7	19.6	16.8	13.7	16.7	80.5
Infrastructure & Telco Mtce	10.8	4.6	2.0	3.3	1.9	22.6
Workplace Technology	0.6	0.7	1.0	1.3	1.0	4.6
Data & Digital Enablement	4.9	4.8	5.7	4.6	3.3	23.3
Total	**38.4**	**33.7**	**29.1**	**28.4**	**27.5**	**157.0**

Source: Ausgrid's response to information request IR013. Question 2.

427. Ausgrid is planning five OTI programs for the next RCP. These programs are divided between the non-network and repex categories as shown in the tables below. Ausgrid is proposing $102.1m in total for OTI (including both non-network OTI and OTI that it has categorised as repex).

Table 14: OTI capex (non-network) programs for next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Program	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Network Innovation	8.5	8.5	8.5	8.6	8.6	42.7
Planning & Technology	2.4	2.5	2.4	2.5	2.5	12.3
Operational Technology Security	0.4	0.4	0.4	0.4	0.4	2.2
Control System Refresh	0.5	0.3	0.3	0.0	0.0	1.2
Total	**11.9**	**11.7**	**11.8**	**11.5**	**11.6**	**58.5**

Source: Ausgrid RP Attachment 5.13.L. April 2018.

Table 15: OTI capex (repex) programs next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Program	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
ADMS	25.2	3.9	3.7	3.6	4.9	41.4
Core Systems Refresh	0.4	0.4	0.4	0.4	0.4	2.2
Total	**25.7**	**4.3**	**4.2**	**4.1**	**5.4**	**43.6**

Source: Ausgrid RP Attachment 5.13.L. April 2018.

6.2.2 Ausgrid's expenditure forecasting and governance process

428. Ausgrid has broadly followed its three-step capex forecasting method for ICT as discussed in Section 3.2.2 of this report.

429. In relation to Step 1 of its capex forecasting method, Ausgrid outlined ICT strategies[217] in the areas of cloud transformation, cyber security, and digital enablement, and also detailed four investment drivers in its *ICT Technology Plan*.[218] Ausgrid summarised these drivers at the onsite meeting as follows:[219]

- '*Comply with licence conditions, laws and regulatory obligations;*
- *Protect the electricity network, our staff and customer information;*
- *Maintain safe, reliable and affordable customer service and business operations; [and]*
- *Adapt Ausgrid systems and capabilities to form data driven customer centric decisions.*'

430. In relation to Step 2 of its capex forecasting method, Ausgrid identified project needs which it grouped under the following six programs:[220]

- Regulatory & Compliance Systems;
- Cyber Security;
- Application Maintenance;
- Infrastructure & Telco Maintenance;
- Workplace Technology; and

[217] Ausgrid onsite meeting. Non-network ICT Capex Presentation. 26 June 2018. Slides 15 - 20.

[218] RP Attachment 5.18 - ICT Technology Plan. April 2018. Section 4.

[219] Ausgrid onsite meeting. Non-network ICT Capex Presentation. 26 June 2018. Slide 8.

[220] RP Attachment 5.01 - Ausgrid's Proposed Capital Expenditure. April 2018. Page 45.

- Digital & Workplace Enablement.

431. Ausgrid advised that it developed business cases for each of its programs. Ausgrid advised at the onsite meeting that it undertakes options analysis and where relevant the options cover derivations of 'do nothing', 'maintain', 'extend', and 'replace'.

432. Ausgrid further advised at the onsite meeting that it undertakes '[b]*ottom up costing using standardised benchmarked unit costs, prior project costs and project profiles to phase the costs based on previous projects*.'[221]

433. In relation to Step 3 of its capex forecasting method, Ausgrid advised at the onsite meeting that its ICT capex is subjected to top-down challenge through its IGF as described in Section 3.2.1 of this report.

434. Ausgrid did not describe its forecasting methodology for OTI other than to describe how its forecast is comprised of the aggregate estimated costs for the projects that it has deemed to require, according to steps 1 and 2 above. At the onsite meeting, Ausgrid advised that it has established a governance framework specifically for its Network Innovation program.

6.3 Assessment

6.3.1 Assessment of Ausgrid's forecasting process

Strategies, plan and investment drivers

435. The strategic decision to move all Line of Business (LOB) applications to the cloud has been made in the current RCP and this decision is the foundation for a significant proportion of Ausgrid's ICT/OTI capex forecast for the next RCP. At the onsite meeting, Ausgrid described a wholesale shift of all LOB applications to the cloud by the end of the next RCP, and a move to an 'As A Service' model. Ausgrid stated that it reviewed each LOB application to determine which 'As A Service' approach to take.

436. From our experience, it is unusual for a utility to undertake such a wholesale shift to the cloud, decommissioning all on-premise applications and exiting all data centres in such a short period of time. We would have expected to see a transition period starting with applications that demonstrate characteristics best supported by the cloud and which can demonstrate payback, followed by other applications over time. For example, this could reasonably occur as an application is due for upgrade, or when a business initiative needs to introduce a step change in functionality. The transition period would also allow Ausgrid to better manage risk and to minimise business disruption such as by isolating any changes to business-critical applications when migrating the ERP. However, with the move now in progress, we focused our review on ensuring that Ausgrid's forecast reflects this platform shift and the benefits that should flow from it.

437. We also would have expected to see a clear cost benefit analysis demonstrating why moving all applications to the cloud in the next RCP is the right thing to do within a short timeframe. From our experience, it is rare to see a positive return on investment from moving all on-premise applications to the cloud, especially given

[221] Ausgrid onsite meeting. Non-network ICT Capex Presentation. 26 June 2018. Slide 24.

Ausgrid will still incur the cost of operating data centres and on-premise infrastructure for OTI and as such the incremental cost of retaining other applications on-premise is potentially low.

438. Ausgrid has not included a project in the next RCP describing the close of the data centres and the decommission of all on-premise infrastructure. Ausgrid advised at the onsite meeting that it will complete its transition to the cloud early in the next RCP and decommissioning of existing infrastructure is required to realise some of the benefit of moving to the cloud.

Identified project and program needs

439. Ausgrid has identified programs consistent with its ICT strategies, technology plan and investment drivers. Ausgrid has developed business cases for its programs, however as outlined below, we consider these business cases have some short-comings.

440. Ausgrid has not provided evidence of options analysis that is consistent with good industry practice. The options analysis in Ausgrid's business cases is high level only, does not include quantitative assessment of options, including of costs and benefits, and the option descriptions do not appear to fully explore options of life extension and application consolidation. Although it is reasonable for Ausgrid not to invest in detailed business cases this far ahead of when projects are required, we would have expected Ausgrid to acknowledge in the RP that the options analysis is preliminary only, and to have included an adjustment in its ICT/OTI capex forecast to account for the likelihood that lower cost options will be identified closer to the time of investment.

441. Ausgrid has not undertaken risk-based cost-benefit analysis (as claimed in its capex forecasting method that we have discussed in Section 3) for any of its proposed programs. Consistent with good industry practice, and Ausgrid's own capital planning process, we consider that risk-based cost-benefit analysis would have assisted Ausgrid in justifying its assessment of options and justifying the timing of its programs.

442. Ausgrid's business cases did not quantify the identified benefits for any of its programs. We consider benefits quantification to be especially important for justifying expenditure that will deliver additional functionality such as that which would deliver improved service to customers or that which would improve productivity in other areas of Ausgrid's business.

443. Ausgrid also did not provide evidence of benefits realisation tracking and reporting for programs implemented in the current RCP, and which would have been consistent with its *Technology Projects Benefits Framework 2017*.[222] We consider that this is an indicator of substandard investment governance for ICT programs and suggests that the proposed benefits of these programs may not be being realised to the benefit of Ausgrid's customers.

444. Ausgrid's ICT/OTI capex forecast includes the replacement of many applications at the end of the standard warranty period specified by application vendors. Whilst application vendors encourage clients to upgrade to the latest versions of their products, in practice, most vendors offer extended warranty for periods longer than they initially advise. Our experience suggests that an application life of 3-5 years as

[222] Ausgrid's response to information request IR005, EMCaAUS029.

claimed by Ausgrid appears conservative, and we would expect some enterprise applications with upgrades to perform adequately for 7-10 years. We would expect, if not now, then at the time replacement is due, that Ausgrid would undertake a cost benefit assessment of deferring application replacement. Ausgrid has not provided evidence that its forecast allows for some application lives to be lengthened through the negotiation of extended warranties from application vendors, and/or accepting higher risk or higher opex based on the outcome from risk-based cost-benefit analysis.

Top-down challenge

445. Ausgrid did not provide evidence of project prioritisation or other top-down processes or consideration of metrics that might have supported or led to challenge of the proposed program of work. Ausgrid advised that the ICT forecast was reviewed by the IGC, but that no changes were made.

446. At the onsite meeting, Ausgrid explained that its initial ICT forecast based on a bottom-up process was $187m, which was reduced by $30m through internal ICT review and challenge. However, the basis for this reduction was explained as resulting from the removal of infrastructure expenditure from the initial forecast, and which was effectively made redundant by the strategic migration to the cloud. Apart from removal of this initial apparent 'double-up', Ausgrid did not provide evidence of challenge that would have considered and potentially adjusted the need, timing and/or scale of the proposed portfolio of projects.

447. We also note that the process used to develop the ICT/OTI forecast for the RP does not incorporate BAU processes which we understand include a more rigorous top-down review and challenge process at subsequent approval gates of the IGF. We would expect improvements to the eventual work undertaken, to arise from such later and more rigorous processes.

448. Ausgrid was able to significantly reduce its ICT/OTI capex in the current RCP in response to capex constraints imposed during the lease transaction. At the onsite meeting, Ausgrid explained that it achieved this capex reduction through investment deferral. Ausgrid did not provide evidence demonstrating that this investment deferral created additional risks or resulted in any deterioration in performance or increase in costs. This investment deferral demonstrates that Ausgrid was able to defer some investment without significant impacts to business operations and, as a minimum, that it should assess this option carefully in considering future needs.

6.3.2 Assessment of ICT/OTI capex trend

449. Ausgrid's ICT/OTI capex fell to a low of $12.8m in 2015/16 before increasing by nearly 850% to its estimated spend of $108.6m in 2018/19. The 2018/19 estimated expenditure would be higher if the estimated OTI expenditure classified as repex (including ADMS) was included in the non-network expenditure category. Whilst we are not assessing the efficiency and prudency of expenditure in the current RCP, we do note that ramping up expenditure this rapidly risks introducing inefficiency into ICT/OTI capex. As such, expenditure in 2017/18 and 2018/19 may not represent prudent and efficient expenditure for the purposes of trend analysis. Although definitive assessment of unit rates is not within our scope, we observe that this possible inefficiency may also be reflected in the forecast for the next RCP. In addition, the massive increase that Ausgrid has planned raises concerns with its ability to deliver its proposed capex in 2018/19, which could call into doubt Ausgrid's claim that its capex forecast for next RCP is lower than that for the current RCP.

450. Ausgrid's classification of a significant OTI project (the ADMS) as repex also has the effect of reducing the 'headline' ICT/OTI forecast that Ausgrid has presented as non-network capex, and further calls into question its claim that its ICT/OTI forecast is less than its current RCP spend. We consider that Ausgrid's claimed lower ICT/OTI capex for the next RCP does not necessarily demonstrate prudency and efficiency. Rather, we interpret this trend as resulting largely from Ausgrid's classification of some OTI as repex and from the significant increase in expenditure that Ausgrid has estimated in 2018/19 and which Ausgrid has not justified.

6.3.3 Sample program reviews

451. We make the following observations relating to ICT/OTI programs presented at the onsite meeting.

ICT - Application Maintenance

452. Ausgrid has forecast capex of $80.5m for application maintenance for the next RCP, with around $38m to migrate to SAP's cloud solution.

453. As part of such a significant investment, we would expect Ausgrid to take the opportunity to further streamline activities, so we would expect to see business benefits quantified for this program.

454. SAP has set a deadline of 2025 for when customers need to move to their cloud platform. In our experience vendors tend to impose such milestones, but generally with provisions to extend (at a cost). It would be reasonable for Ausgrid to split the transition over two RCPs to spread the costs and reduce risk. By starting later Ausgrid would benefit from other SAP customers completing the transformation.

455. Ausgrid has not provided sufficient evidence to justify the expenditure required for this upgrade, which at nearly 25% of Ausgrid's total forecast ICT capex forecast, represents a potential area for Ausgrid to reduce costs.

456. The remaining $42m for Application Maintenance is for end of life maintenance and mandatory patch and release management. Its forecast seems to be based essentially on assumed 'like-for-like replacement and Ausgrid has not demonstrated if or how it is using this investment as an opportunity to consolidate applications and reduce costs, and its forecast.

457. Ausgrid has also not demonstrated that it has assessed the risk profile of placing applications under extended support to defer upgrades. Applications that are stable and have few functional changes per year are good candidates to operate even without the guarantee of mainstream support. While aspirational, it is unusual to keep all LOB applications at the current or previous version. Risk based upgrade deferral provides a significant source of potential reductions in Ausgrid's Application Maintenance forecast activity and expenditure.

ICT - Cyber Security

458. For the $20m Cyber Security program, we have some concerns with Ausgrid's ability to effectively implement so much change, especially during the same time it is proposing two transformation projects in their migration of its SAP suite of applications to the cloud, as well as the introduction of an ADMS.

459. Cyber Security initiatives add most value when business change is part of the scope. For example, Identity & Access Management (IDAM) solutions rely on the definition and maintenance of all roles in the organisation, describing what systems and data each role should have access to. Once that is done, it requires every line manager to ensure they maintain their records (e.g. who belongs to which role). Based on our experience, IDAM projects alone, at an enterprise level such as this one, typically take 2-3 years to implement. Ausgrid has not provided evidence of its ability to effectively deliver the technologies to enable Ausgrid's risk profile to be lowered by the full extent possible with the technology.

460. While we do not doubt the need to maintain and enhance cyber security levels, we would have expected to see Ausgrid describe the outcomes it will see as a result of its cyber security investment. A significant commitment from the whole business is required for cyber security programs to be most successful.

461. Given the licence obligations relating to cyber security provisions, we would expect cyber security investment to be prioritised above other ICT investment, possibly contributing to the deferral of other programs.

OTI - Advanced Distribution Management System

462. One of the two most significant OTI projects is Ausgrid's replacement of its ADMS, at $41.4m in the next RCP. Ausgrid has commenced this project in the current RCP, and its approach appears to be consistent with industry.

463. Despite the project having already commenced, Ausgrid was only able to provide us with a draft business case. We would have expected the business case to include a quantitative assessment of the benefits of the new functionality to justify the decision to fully implement the ADMS in the next RCP. In particular, Ausgrid did not present evidence of having specifically assessed the justification for the 'advanced' modules, or whether it had considered providing such advanced capabilities on a staged case-by-case basis as they are individually justified, rather than building a suite of such capabilities into the system specification at this stage.

464. We note, however that the majority of the expenditure for the ADMS is in the first year of the next RCP so a decision to defer the implementation of any ADMS modules would likely only have a minor (if any) impact on ADMS capex next RCP.

OTI - Network Innovation

465. Ausgrid forecasts capex of $42.7m for its Network Innovation program in the next RCP, which includes 25 separate projects, most of which are pilots and research projects.

466. Ausgrid advised at the onsite meeting that it is collaborating with technology partners, but it does not appear to be collaborating with other networks businesses which could provide the opportunity to both improve the quality of its research and significantly reduce its capex by sharing costs.

467. Ausgrid has undertaken Australia's largest electricity utility research program in the part government funded Smart Grid Smart City program. Analysis of the customer benefits realised from that program would have aided the justification for the Network Innovation program, however in material Ausgrid provided to us, the links back to this program were absent or hardly recognised.

468. Directionally, we consider that network businesses need to research and pilot innovation opportunities. This is driven both by rapidly changing use of distribution networks and also by technologies and shifts in consumers' perceptions and capabilities to interact with the network, to mutual benefit. However, an innovation program of the size that Ausgrid has proposed requires justification that goes beyond reference to the industry generically. This should comprise a range of target outcomes and a clear delineation between benefits that customers will realise and those that may in the first instance benefit the network through the operation of expenditure and performance related incentive schemes. Ausgrid has not provided such justification.

469. Whilst we have not undertaken a regulatory-legal assessment, to the extent that proposed expenditure may be 'self-funding', then there is a need to consider whether it meets the NER objectives and criteria for capitalisation into the RAB.

6.3.4 Efficiency benefits

470. To assist the AER in its overall assessment of ICT/OTI (capex and opex), we have classified Ausgrid's ICT/OTI expenditure as either recurrent, non-recurrent compliance driven, or non-recurrent non-compliance driven. Whilst most programs span at least two of these categories, where possible we have identified the category most applicable to each program. This analysis is provided to assist the AER identify the programs where we would expect to see efficiency benefits. Ausgrid did not provide quantified benefits for each of its projects and did not provide a cost break-down for each project that aligned with its RP.

Table 16: ICT/OTI capex classification

Program	Classification
ICT Program 1 – Regulatory and Compliance Systems	**Non-recurrent compliance driven** This program is primarily driven by new regulatory obligations and compliance with software licencing agreements.
ICT Program 2 – Cyber Security	**Non-recurrent compliance driven** This program is primarily driven by the need to respond to global security events and more stringent licence conditions.
ICT Program 3 – Application Maintenance	**Recurrent** This program is primarily driven by end of life upgrades (including the SAP upgrade to the cloud), and patch and release management. End of life upgrades will rarely deliver like for like replacement and will generally provide additional functionality that would be expected to enable efficiency benefits.
ICT Program 4 – Infrastructure and Telecommunications Maintenance	**Recurrent / Non-recurrent compliance driven** This program is primary driven by end of life upgrade of telecommunications infrastructure, and the business case for migration to the cloud. Whilst the telecommunications infrastructure update is an end of life upgrade, it will deliver additional capability which will enable the benefits delivered by other projects such as the ADMS. The business case for the cloud migration identifies efficiency savings for this program.
ICT Program 5 – Workplace Technology	**Recurrent** This is primarily driven by end of life upgrade of workplace technology. Whilst end of life is the primary driver, we would expect the newer technologies to deliver some efficiency benefits.
ICT Program 6 – Data and Digital Enablement	**Non-recurrent non-compliance driven / Non-recurrent compliance driven** This is primarily benefits driven by enabling efficiency benefits and improved service and safety. A component of the program is responding to changed compliance obligations relating to information management.
OTI Program 1 – Advanced Distribution Management System	**Recurrent** This is primarily driven by end of life upgrades. Whilst end of life is the primary driver, we would expect the new ADMS to deliver some efficiency benefits.
OTI Program 2 – Network Innovation	**Non-recurrent non-compliance driven** This is primarily driven by the prospect of efficiency benefits in the future.
OTI Program 3 – Planning & Technology Data Usage	**Non-recurrent non-compliance driven** This is primarily benefits driven by improving network data integrity and the systems that utilise this data which Ausgrid claims will improve capital delivery efficiency.
OTI Program 4 – Operational Technology Security	**Non-recurrent compliance driven** This is primarily driven by additional licence conditions.
OTI Program 5 – Control System Core refresh	**Recurrent** This is primarily driven by end of life upgrades.

Source: EMCa analysis

6.4 Findings and implications for proposed ICT/OTI forecast

6.4.1 Findings

471. We find that Ausgrid has not fully justified its ICT/OTI capex forecast for the next RCP, for reasons including that Ausgrid:

- has not fully justified its strategy to move all LOB applications to the cloud within a short timeframe, and has not included a project to similarly close the data centres and decommission its on-premise infrastructure;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified through rigorous options analysis;
- has not justified the timing of its projects through risk-based cost-benefit analysis;
- has not justified proposed expenditure that would deliver additional functionality through benefits quantification;
- has not factored into its forecast the likely investment deferrals through life extension of applications;
- has not factored into its forecast the likely savings and investment deferrals possible through the consolidation of applications due for upgrade;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process;
- has not demonstrated how it will efficiently and effectively implement three large transformation programs including cyber security, cloud migration, and the introduction of the ADMS, given the nearly 850% increase in estimated program expenditure over just the final years of the current RCP; and
- has not demonstrated why its Network Innovation program should be funded by customers rather than be self-funded.

6.4.2 Implications

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

Assessed Adjustment

473. We consider that an adjustment to Ausgrid's ICT/OTI capex forecast of between minus 25% and minus 35% would more reasonably meet the requirements of the NER. Our assessment is based on consideration of information that Ausgrid provided as part of its RP and supporting documents, information provided at our onsite meeting and Ausgrid's responses to our Information Requests. Further information from Ausgrid and, in particular, information that assists us in resolving issues that we have identified in our findings on Ausgrid's proposal, may lead us to a different assessment.

474. Our assessed adjustment allows for:

- the likelihood that savings and project deferrals will be identified during the next RCP through more rigorous options analysis, risk-based cost-benefit analysis, and rigorous review and challenge as Ausgrid progresses its projects through its IGF gate review process;
- deferral of some SAP core management systems expenditure to the subsequent RCP on our opinion that Ausgrid is likely to find it more prudent not to fully migrate these systems to the cloud over a single RCP;
- savings resulting from application consolidation as part of the cloud migration program; and
- a reduction to proposed expenditure on discretionary projects including Digital & Data Enablement, Network Innovation, and Planning & Technology, on the basis that Ausgrid has not demonstrated the benefits of these programs. In the absence of information on any such benefits, including opex savings, our working assumption is that 50% of the proposed expenditure will be found to provide benefits that will flow to customers and we have adjusted Ausgrid's proposed capex accordingly.

7 Assessment of proposed Fleet & Plant capex

7.1 Introduction

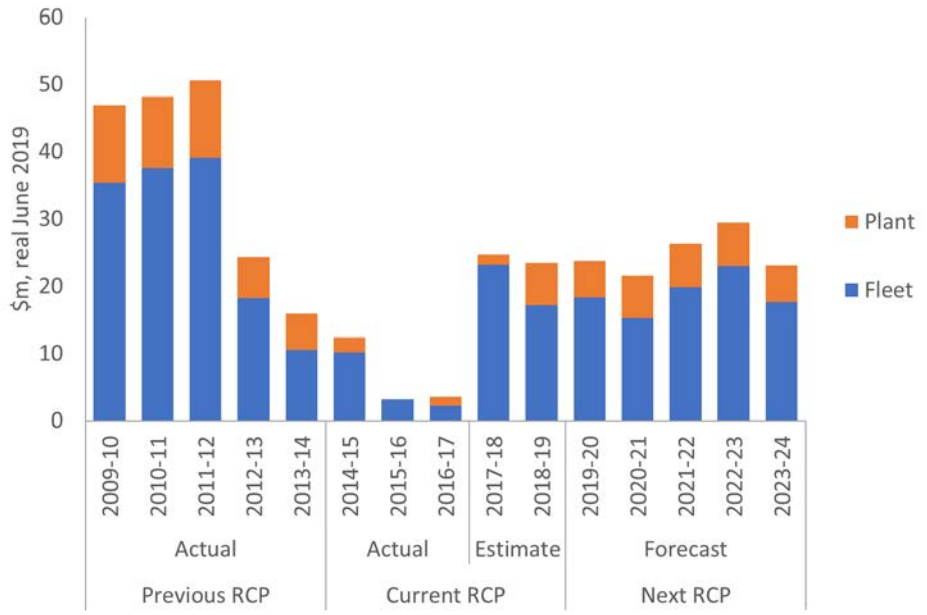
475. In this section we provide our assessment of Ausgrid's Fleet and Plant capex forecast, which is a component of its 'non-network' capex forecast. We first summarise Ausgrid's proposed Fleet and Plant capex, we then outline the forecasting process that Ausgrid claims to have followed in preparing its forecast, before providing our assessment of Ausgrid's forecast for Fleet and Plant capex. In Section 7.4, we summarise the findings from our assessment, and we indicate the implications that these findings have for determining a reasonable forecast of Ausgrid's prudent and efficient expenditure requirements for Fleet and Plant.

7.2 What Ausgrid has proposed

7.2.1 Summary of proposed expenditure

476. Ausgrid has forecast Fleet and Plant capex of $124.3m for the next RCP compared to actual/estimated capex in the current RCP of $67.2m, representing an increase of 84.7% (or $56.9m).

Figure 28: Fleet & Plant capex for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN

477. In the previous RCP Ausgrid recognised that its volume of fleet and plant was higher than it required and commenced a process to reduce fleet and plant volumes. The reduction was also in response to Ausgrid's overall transformation project which includes a significant reduction in the number of staff and thus requirements for fleet and plant. Ausgrid advised at the onsite meeting that it achieved this reduction by not replacing fleet and plant at end of life, which is evident in the years 2015/16 and 2016/17.

478. Ausgrid's forecast capex for each year of the next RCP is set out in the table below for each Fleet and Plant asset type.

Table 17: Fleet and plant capex by asset type for the next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Asset type	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Car	1.1	0.0	0.0	3.2	3.0	7.3
Light commercial vehicle	9.6	7.7	1.6	2.5	1.6	23.0
Elevated work platform (LCV)	1.4	1.6	15.4	15.0	11.5	44.9
Elevated work platform (HCV)	0.9	0.6	1.9	1.3	1.3	6.0
Heavy commvercial vehicle	5.4	5.4	0.9	1.1	0.3	13.1
Plant	5.4	6.4	6.4	6.4	5.4	30.0
Total	**23.8**	**21.7**	**26.2**	**29.5**	**23.1**	**124.3**

Source: Ausgrid Reset RIN

7.2.2 Ausgrid's forecasting process

479. Ausgrid has broadly followed its three-step capex forecasting method for Fleet and Plant as discussed in Section 3.2.2 of this report.

480. In relation to Step 1 of its capex forecasting method, Ausgrid outlined its fleet strategic plan at the onsite meeting, with objectives relating to safety, reliability, customer expectations for an efficient service, workforce productivity, capital

requirements, and life cycle costs.[223] Ausgrid advised that the key drivers for fleet and plant investment are:[224]

- increasing employee safety;
- reducing maintenance and leasing costs;
- standardising fleet; and
- optimising life cycle costs.

481. In relation to Step 2, Ausgrid advised that its '*fleet replacement plan has been developed using analysis of age profiles across our different vehicle and plant types*'[225] and further explained that '[o]*ur Replacement Guidelines then drive the timing of replacement in order to maximise fleet safety and reliability*'.[226]

482. In relation to Step 3, Ausgrid advised at the onsite meeting that its Fleet and Plant capex forecast was subjected to top-down challenge through its IGF as described in Section 3.2.1[227] of this report. Ausgrid also outlined its vehicle procurement process which for each purchase requires branch manager approval, Chief Operating Officer approval for non-standard purchases, and project budget governance approval.

7.3 Assessment

7.3.1 Assessment of Ausgrid's forecasting process

Strategies, plan and investment drivers

483. Whilst Ausgrid discussed its fleet strategy at the onsite meeting, we were not provided with Ausgrid's Fleet Strategy document to review. An overarching Fleet Strategy document would have assisted Ausgrid demonstrate the efficiency and prudency of its forecasts, and we would have expected to see considerations such as:

- performance against strategic objectives and other KPIs;
- challenges, such as age, condition, technology, service costs, and safety;
- opportunities to reduce costs, including:
  - optimising fleet size;
  - rationalising vehicle specifications (i.e. more standardisation);
  - procurement;
  - lease versus own;
  - fuel management; and
  - risk-based whole of life cost-benefit analysis.

[223] Ausgrid onsite meeting. Fleet and Plant Presentation. 25 June 2018. Slide 12.

[224] *Ibid*. Slide 10.

[225] *Ibid*. Slide 5.

[226] *Ibid*. Slide 5.

[227] *Ibid*. Slide 7.

Identified project and program needs

484. At the onsite meeting, Ausgrid explained that in practice it takes factors specific to each vehicle, such as condition, reliability, and operating costs, into account when making a decision to replace a vehicle. This allows Ausgrid to defer fleet and plant capex. However, Ausgrid's explanations of its forecasting processes suggest that it has not provided for life extension for individual vehicles and items of plant and which will arise from factors not considered by the end of life replacement model. We consider that will have led it to over-forecast its eventual requirements.

485. Ausgrid's transformation project is ongoing with further reduction to staff numbers expected. This will further reduce the requirement for fleet and plant, the quantum of which will depend on what percentage of the further staff reductions use Ausgrid vehicles. Ausgrid provided one page from a Boston Consulting Group report[228] that looks to be a review of Ausgrid's Fleet strategy, but without the remainder of the report as context we are unable to form an opinion. Ausgrid's explanations of its forecasting processes suggest that it has not factored into its forecast further reductions to fleet and plant requirements due to reduced staff numbers.

486. At the onsite meeting, Ausgrid explained that it is installing telematics across its fleet, which will help Ausgrid to operate its fleet more efficiently.[229] Ausgrid's explanations of its forecasting processes suggest that it has not factored into its forecast further efficiencies delivered by its telematics investment. We expect that the business case for the telematics program would have quantified the expected benefits, however the business case was not provided to us.

Top-down challenge

487. At the onsite meeting, Ausgrid claimed that its Fleet and Plant forecast was subjected to rigorous top-down review and challenge, resulting in 17 revisions to the forecast. However, Ausgrid has not provided evidence of this process and did not demonstrate the outcomes and how those outcomes were achieved.

7.3.2 Sample project reviews

Possible bias to Elevated Work Platform forecast

488. Ausgrid is forecasting to spend $50.7m in the next RCP on replacing Elevated Work Platforms (EWP). Consistent with the overall fleet and plant forecast, this forecast is based on an age-based schedule to replace EWPs at 15 years old. Ausgrid has not provided evidence to demonstrate that 15 years is the optimal age to replace EWPs, and why EWP lives cannot, at least on a case by case basis, be extended based on condition or refurbishment where it is safe to do so. Ausgrid has also not provided evidence of top-down challenge to the forecast and has not demonstrated that the forecast includes fleet size reduction through fleet optimisation and efficiencies delivered by Ausgrid's transformation project.

[228] Boston Consulting Group Fleet Advice. 9 July 2018.

[229] Typically, such benefits include savings from better route and scheduling management, reduced safety costs, and lower vehicle operating costs.

No justification for plant forecast increase

489. Ausgrid's forecast for Plant capex has nearly tripled compared to the current RCP, increasing from $10.5m to $30m. Ausgrid has not provided justification for this increase.

7.4 Findings and implications for proposed Fleet and plant forecast

7.4.1 Findings

490. We find that Ausgrid has not fully justified its Fleet and Plant capex forecast for the next RCP, for reasons including that Ausgrid:

- has not factored into its forecast the likely savings and investment deferrals due to Ausgrid's practice of fleet life extension based on the condition, reliability, and operating costs of each individual vehicle, including EWPs;
- has not factored reduced fleet requirements into its forecast due to further staff reductions delivered by Ausgrid's transformation program;
- has not factored into its forecast further efficiencies delivered by its telematics investment;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process; and
- has not justified the nearly tripling of its forecast for Plant capex.

7.4.2 Implications

491. We consider that Ausgrid's Fleet and Plant capex forecast is moderately above the level that a prudent and efficient distributor would require.

Assessed Adjustment

492. We were not asked to provide an assessed adjustment for Ausgrid's Fleet and Plant capex forecast.

8 Assessment of proposed Buildings and Property capex

8.1 Introduction

493. In this section we provide our assessment of Ausgrid's Buildings and Property capex forecast, which is a component of its 'non-network' forecast. We first summarise Ausgrid's proposed Buildings and Property capex, we then outline the forecasting process that Ausgrid claims to have followed in preparing its forecast, before providing our assessment of Ausgrid's forecast for Buildings and Property capex. In Section 8.4, we summarise the findings that we have found from our assessment, and we indicate the implications that these findings have for determining a reasonable forecast of Ausgrid's prudent and efficient expenditure requirements for Buildings and Property.

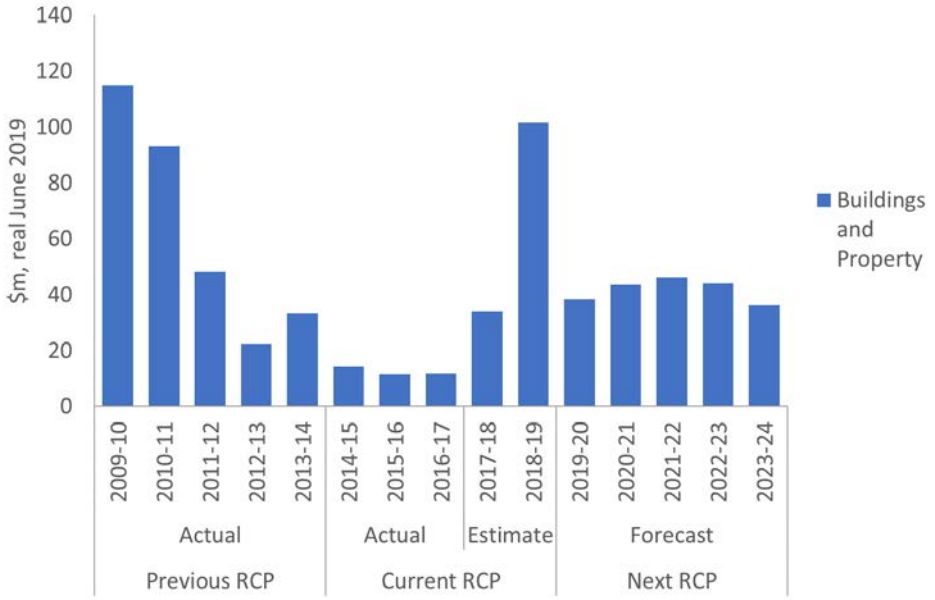
8.2 What Ausgrid has proposed

8.2.1 Summary of proposed expenditure

494. Ausgrid has forecast Buildings and Property capex of $208.4m[230] for the next RCP compared to actual/estimated capex in the current RCP of $173.1m, representing an increase of 20.4% (or $35.3m).

[230] Note this is different to Table 18 because this figure is sourced from the RIN, whereas Table 18 data has been sourced from Ausgrid's RP.

Figure 29: Buildings and Property capex for the previous, current and next RCP ($m, real June 2019)



Source: Ausgrid Reset RIN.

495. Ausgrid reduced its Buildings and Property capex in the first three years of the current RCP in response to capex constraints during Ausgrid's lease transaction. Its Buildings and Property capex estimate ramps up towards the end of the current RCP with two major depot replacements contributing to the estimate for 2018/19.

496. Ausgrid advised that its estimate for 2018/19 is based on signed contracts for the two new depots under construction.

497. Forecast Buildings and Property capex for each year of the next RCP is set out in the table below for each major program.

Table 18: Buildings and Property capex by major program for the next RCP ($m, real June 2019)

$m, real June 2019	Next RCP					
Programs	Forecast 2019-20	Forecast 2020-21	Forecast 2021-22	Forecast 2022-23	Forecast 2023-24	Total 2020-24
Wallsend office/depot						
Future workplace program						
Zetland depot replacement						
General depot refurbishment						
Homebush depot upgrade						
Hornsby depot replacement						
Oatley depot replacement						
Wallsend depot upgrade						
Total	41.8	44.0	45.0	43.0	34.2	208.0

Source: Ausgrid RP Attachment 5.01 Ausgrid's proposed capital expenditure. April 2018.

8.2.2 Ausgrid's forecasting process

498. Ausgrid has broadly followed its three-step capex forecasting for Fleet and Plant that is discussed in Section 3.2.2 of this report.

499. In relation to Step 1 of its capex forecasting method, Ausgrid outlined its Property Strategic Plan at the onsite meeting and listed the primary drivers of investment as '*the consolidation and modernisation of our portfolio of property assets'*.[231] Ausgrid updates its *Property Strategy Plan* on an annual basis to ensure it remains aligned with Ausgrid's Corporate Plan.[232]

500. In relation to Step 2 of its capex forecasting method, Ausgrid has used a needs-based bottom-up approach to developing its Buildings and Property capex forecast for the next RCP. Ausgrid identifies needs such as replacement of aging depot & office buildings, addressing non-compliance issues, and building consolidation. Ausgrid states that it *'…. conducts annual reviews to assess the state of the property portfolio and how changes in the underlying business environment or external circumstances are likely to drive requirements of the portfolio*.' [233] The figure below lists Ausgrid's investment drivers.

Figure 30: Ausgrid's property investment drivers

Investment Driver	Description
Mandatory	Shareholder, compliance or regulatory driven
Risk Based	Safety or essential upgrade to avoid asset failure
Strategic	Initiative which aligns with key corporate objectives
Business Improvement	Improvement to operational efficiency and effectiveness

Source: RP Attachment 5.20 - Non-network Property Strategy Plan. April 2018. Page 16.

501. In its *Property Strategy Plan*, Ausgrid states that it undertakes options analysis to find '*the least-cost life-cycle solution to address the issues across the portfolio. [It] look[s] at a range of feasible options, including 'do nothing', replacement, refurbish-in-situ and construction of new facilities*.'[234]

502. Ausgrid forecasts costs using a mix of bottom-up individual estimates and historical prices, vendor prices, and average historical costs.

503. In relation to Step 3, Ausgrid advised at the onsite meeting that its Buildings and Property capex forecast was subjected to top-down challenge through its IGF as described in Section 3.2.1[235] of this report.

8.3 Assessment

Identified project and program needs

504. At the onsite meeting, Ausgrid explained that its depots are designed to be in use for 40 years, but currently 17 out of 23 depots[236] are over 40 years old. Ausgrid provided the graph below to illustrate the age profile of its buildings.

[231] RP Attachment 5.20 - Non-network Property Strategy Plan. April 2018. Page 3.

[232] RP Attachment 5.20 - Non-network Property Strategy Plan. April 2018. Page 5.

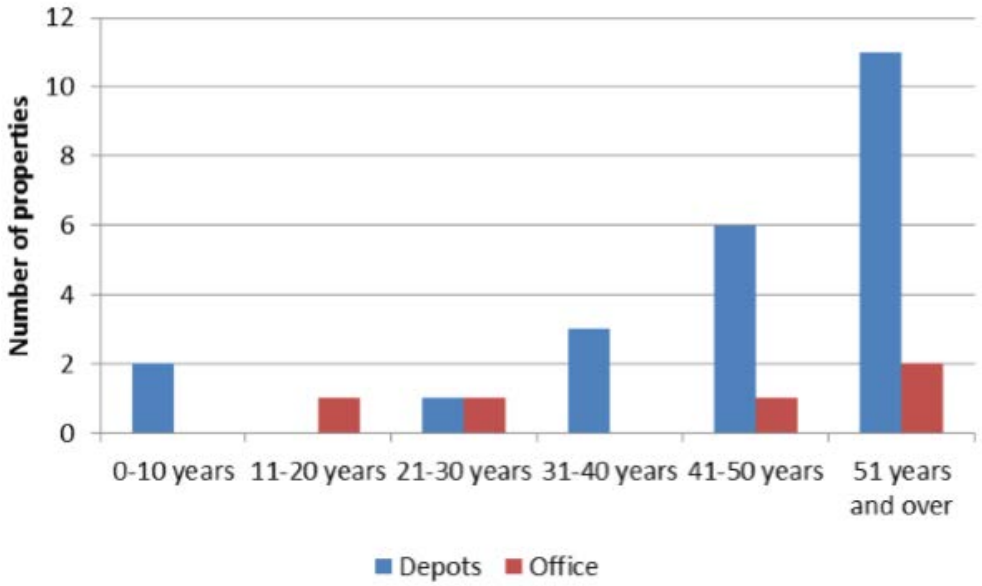
[233] RP Attachment 5.01 - Ausgrid's proposed capital expenditure. April. Page 57.

[234] RP Attachment 5.20 - Non-network Property Strategy Plan. April 2018. Page 17.

[235] Ausgrid onsite meeting. Non-network property presentation. 25 June 2018. Slide 8.

[236] This depot count includes both major and minor depot buildings co-located at substations.

Figure 31: Property age profile



Source: Ausgrid onsite meeting, Non-network Property Presentation. 25 June 2018. Slide 7.

505. Ausgrid provided Building Code of Australia audit reports for its office and depot buildings, which outlined a significant number of compliance issues with its buildings.

506. Accommodation consolidation is also a driver for Ausgrid's Buildings and the Property capex is intended to enable Ausgrid to reduce costs by reducing the number of buildings it owns and maintains. Ausgrid advised that in the current RCP, it is closing nine depots, and opening just one new depot (as well as upgrading three existing deports).[237]

507. Given the age and condition of Ausgrid's non-network buildings, we consider it is likely that Ausgrid will proceed with some building upgrades and replacements in the next RCP. However, for the reasons outlined below, we have some concerns regarding the lack of evidence provided by Ausgrid to demonstrate that its total Buildings and Property capex forecast is prudent and efficient.

Option analysis

508. Ausgrid has not demonstrated that it has undertaken sound options analysis in developing its forecast. A high-level qualitative options analysis is included in the business case for each project. The assessment criteria[238] do not appear to relate to the objectives for Ausgrid's Buildings and Property program (Ausgrid described objectives such as reducing operating costs, compliance, and safety), the scoring is binary (either 1 or 5), and Ausgrid has only undertaken Cost Benefit Analysis (a simple model that looks to have assessed costs only) for three of its projects.

509. Whilst we do not always expect thorough options analysis for projects not due to commence for several years, in the absence of such analysis we expect to see an adjustment to the capex forecast to account for likely savings and investment deferrals identified through rigorous options analysis as individual projects progress through the subsequent IGF gate review process. Ausgrid has not included such an adjustment to its Buildings and Property capex forecast.

[237] RP Attachment 5.20 - Non-network Property Plan 2019-24. April 2018. Page 10.

[238] RP Attachment 5.20 - Non-network Property Plan 2019-24. April 2018. Page 17.

Project deferrals

510. Ausgrid deferred a number of projects in the current RCP, including the Alexandria Depot, Chatswood Depot, Homebush Depot, Oatley Depot, and Wallsend Depot.[239]

511. It is appropriate that businesses change their plans in response to changes in circumstances. In the case of the Chatswood Depot rebuild, Transport for NSW compulsorily acquired the land, and Ausgrid developed a new depot in Artarmon instead.[240] Others were deferred due to changed business priorities (such as staff relocations) and Ausgrid explained that other delays were caused by protracted local authority planning approval processes.

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

513. Some Buildings and Property projects deferred from the current RCP are included in the forecast for the next RCP at a higher cost. Ausgrid explains that this is due to scope increases due to consolidation[241], however Ausgrid did not provide evidence to support this claim.

Project Risks

514. Ausgrid listed the delay risks for depot and office building projects in its onsite presentation.[242] Ausgrid listed external delays such as achieving development consent, satisfying council conditions, and trade shortages. Ausgrid also listed internal delays such as obtaining IGF gate approvals, procurement, and contract negotiation.

515. Whilst delay risks such as these are to be expected, it is unclear what actions Ausgrid is taking to mitigate these risks, and Ausgrid did not demonstrate how it has factored delay risks into its Buildings and Property capex forecast. Ausgrid has a risk register in its *Property Strategy Plan* that outlines mitigation strategies for some identified risks' however' notwithstanding such mitigation strategies, on balance we consider that some delays will eventuate and this will lead to reduced expenditure relative to Ausgrid's proposed forecast.

Other

516. Ausgrid advised at the onsite meeting that its accommodation rationalisation is well progressed but Ausgrid has not provided evidence that the savings from accommodation rationalisation has been factored into its Buildings and Property capex forecast.

517. Ausgrid has not justified the General Depot Refurb forecast expenditure of $12.5m. With the significant investment in new depots and office buildings planned, we would

[239] Ausgrid's response to information request IR020 EMCaAUS092.

[240] *Ibid*.

[241] Ausgrid's response to information request IR020 EMCaAUS092.

[242] Ausgrid onsite meeting, Non-network Property Presentation. 25 June 2018. Page 11

have expected this cost to reduce in the next RCP compared to the current RCP. Ausgrid's business case for General Depot Refurb has not demonstrated a process to spend this money efficiently, including through the prioritisation of rectification works.

518. Given the reduction in the number and age of Ausgrid's buildings over the next RCP, we would also expect to see a reduction in forecast opex reflecting reduced maintenance expenses.

Top-down challenge

519. At the onsite meeting, Ausgrid advised that its Buildings and Property capex was reviewed and approved by its Board and its Regulatory Reset Executive Committee but has not been subjected to its Non-Systems investment governance process. In its response to a request for information, Ausgrid explained that '*[t]he 2019-24 Non-network Property Plan and projects proposed in the Board endorsed Regulatory Proposal represents the first stage in decision-making. Further work will be undertaken to firm up each project before being submitted to the Investment Governance Committee (IGC) for consideration. The IGC includes the executive management team with representatives from the Network Division. At this stage, the priority of the program may be altered as a result of changes to current and / or future Network requirements*.'[243]

520. As discussed further in Section 3, Ausgrid's projects are reviewed by the Board, the IGC and the IEU before final approval is granted to proceed. Ausgrid states that the IGF ensures that '*investment decisions made are efficient, consistent and informed*.'[244] To ensure investment decisions are efficient, we would expect the IGF process to include rigorous review and challenge to ensure that firstly a project need is established and consistent with Ausgrid's broader objectives and strategies, and secondly that all options to reduce the cost of and to defer the investment have been considered.

521. Whilst Ausgrid claims that its Buildings and Property capex forecast was reviewed and approved by its Board and its Regulatory Reset Executive Committee, Ausgrid has not provided evidence in support of the rigour and outcomes of this process and has acknowledged that its plan has not yet been reviewed by its IGC. Ausgrid has also not provided evidence that its forecast has factored in the likely savings and investment deferrals that would be expected to be identified as individual projects progress through the IGF gate review process.

8.4 Findings and implications for proposed Buildings and Property forecast

8.4.1 Findings

522. We find that Ausgrid has not fully justified its Buildings and Property capex forecast for the next RCP, for reasons including that Ausgrid:

[243] Ausgrid's response to information request IR020 EMCaAUS091.

[244] Ausgrid onsite meeting, Non-network Property. 25 June 2018. Page 8.

- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified through rigorous options analysis;
- has not factored into its forecast investment deferrals due to project delays and business reprioritisation, including from further accommodation rationalisation;
- has not factored into its forecast the likely savings and investment deferrals that would be expected to be identified as individual projects are subjected to rigorous review and challenge through the IGF gate review process; and
- has not justified the General Depot Refurb capex forecast, including how this money will be spent efficiently.

8.4.2 Implications

523. We consider that Ausgrid's Buildings and Property capex forecast is moderately to significantly above the level that a prudent and efficient distributor would require.

Assessed Adjustment

524. We consider that an adjustment to Ausgrid's Buildings and Property capex forecast of between minus 15% and minus 35% would more reasonably meet the requirements of the NER. Our assessment is based on consideration of information that Ausgrid provided as part of its RP and supporting documents, information provided at our onsite meeting and Ausgrid's responses to our Information Requests. Further information from Ausgrid and, in particular, information that assists us in resolving issues that we have identified in our findings on Ausgrid's proposal, may lead us to a different assessment.

525. The basis for the assessed adjustment is that Ausgrid has not adequately demonstrated that the likely and reasonable scenario is that projects with expenditure proposed in the latter part of the next RCP will proceed according to Ausgrid's assumed timetable. From the information Ausgrid provided to us, we consider that it is more likely that these projects will be deferred or delayed by between 1 and 2 years, for the reasons outlined above in our findings in this section. This would shift proposed capex from 2023-24, and possibly 2022-23, into the following RCP, primarily affecting proposed expenditure for the Hornsby, Homebush, and Wallsend depot projects.

526. The assessed adjustment also includes a reduction for General Depot Refurbishment on the basis that this forecast, which was based on historical expenditure, has not taken account of the fact that 10 depots were closed and 9 refurbished over the current RCP and Ausgrid is in the process of rebuilding a further two which will be completed early in the next RCP. As such the general refurbishment requirement should be proportionately lower next RCP.

Appendix A - Record of Information Request Responses & RP Supporting Documents

Documents which EMCa has assessed to support its findings

Ausgrid regulatory proposal and Supporting Documents

Filename
• Ausgrid - 3.01 - Strategic Innovation Portfolio - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 2.01 - Extended Stakeholder Consultation Report - June 2018 - PUBLIC.compressed.pdf
• Ausgrid - Attachment 5.01 - Ausgrid's proposed capital expenditure - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.01 - Ausgrids proposed capital expenditure - April 2018 - CONFIDENTIAL.pdf
• Ausgrid - Attachment 5.02.1 - Master list of Ausgrid forecast capex portfolio - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.02.2 - Master list of Ausgrid forecast capex portfolio (Excel) - April 2018 - PUBLIC.xlsx
• Ausgrid - Attachment 5.03 - Business Planning Consolidation (BPC) description - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.04 - Prioritisation Investment Plan (PIP) process - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.05 - Investment Governance Framework - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.06 - Unit cost methodology - February 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.07 - 2017 Electricity Demand Forecasts Report - January 2018 - PUBLIC.PDF
• Ausgrid - Attachment 5.08 - GHD -Review of demand and customer forecasts - December 2017 - PUBLIC.pdf
• Ausgrid - Attachment 5.09 - Cost Benefit Analysis for Planning - APRIL 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.10 - GHD - GHD Review of cost benefit methodology - September 2017 - PUBLIC.pdf
• Ausgrid - Attachment 5.11 - Key assumptions and directors certification - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.12 - Resource and Delivery Strategy - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.15 - Nuttall Consulting - Nuttall review of repex - April 2018 - PUBLIC.pdf

Filename
• Ausgrid - Attachment 5.16 - Project justification for augmentation major projects - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.17 - Connections Policy - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.18 - ICT technology Plan - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.19 - ICT project justifications - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.20 - Non-network property plan 2019-24 - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.22 - Capitalisation Policy - March 2018 - PUBLIC.pdf
• Ausgrid - Attachment 6.01 - Ausgrids proposed operating expenditure - April 2018 - Public.pdf
• Ausgrid - Attachment 6.05 - Demand management cost benefit assessment - April 2018 - PUBLIC.xlsx
• Ausgrid - Expenditure Forecasting Methodology 2019-24 - June 2017.pdf
• Ausgrid - GHD - Attachment 5.08 - Review of demand and customer forecasts - December 2017 - PUBLIC.pdf
• Ausgrid - GHD - Attachment 5.10 - GHD Review of cost benefit methodology - September 2017 - PUBLIC.pdf
• Ausgrid - Nuttall Consulting - Attachment 5.15 - Nuttall review of repex - April 2018 - PUBLIC.pdf
• Ausgrid - Regulatory Proposal - April 2018 - PUBLIC.pdf
• Ausgrid - RIN01 - RIN Response - April 2018 - PUBLIC.pdf
• Ausgrid - RIN04 - PWC - Regulatory models review final report - January 2018 - PUBLIC.pdf
• Ausgrid - RIN05 - Repex model description - April 2018 - PUBLIC.pdf
• Ausgrid - RIN06 - Demand Management Standard NIS420 - March 2018 - PUBLIC.pdf
• Ausgrid - RIN07 - Demand side engagement document - December 2015 - PUBLIC.pdf
• Ausgrid - RIN11.3 - RIN Workbook 1 - Consolidated - April 2018 - PUBLIC.xlsm
• Ausgrid - Attachment 5.13.0 - Project justification for replacement and duty of care programs - Introduction - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.A - Project justification for pole replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.B - Project justification for pole top structures replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.C - Project justification for overhead conductors replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.D - Project justification for underground cables replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.E - Project justification for service lines replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.F - Project justification for transformer replacement programs - April 2018 - PUBLIC.pdf

Filename
• Ausgrid - Attachment 5.13.G - Project justification for switchgear replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.H - Project justification for distribution substations replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.I - Project justification for SCADA control protection replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.J - Project justification for other replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.K - Project justification for reactive replacement programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.13.L - Project Justifications for operational technology and innovation programs - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.14.1 - Project justification for 11kV switchgear replacements - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.14.2 - Project justification for sub-transmission cable replacements - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.14.3 - Project justification for 33kV switchgear replacements - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.21.1 - Business Case 1 Homebush Depot Upgrade - A....pdf
• Ausgrid - Attachment 5.21.2 - Business Case 2 Hornsby Depot Replacement ....pdf
• Ausgrid - Attachment 5.21.3 - Business Case 3 General Depot Refurbishment Program - April 2018 - PUBLIC.pdf
• Ausgrid - Attachment 5.21.4 - Business Case 4 Oatley Depot Upgrade - Apr....pdf
• Ausgrid - Attachment 5.21.5 - Business Case 5 Wallsend Depot Upgrade - A....pdf
• Ausgrid - Attachment 5.21.6 - Business Case 6 Wallsend Office Replacemen....pdf
• Ausgrid - Attachment 5.21.7 - Business Case 7 Zetland Depot Replacement ....pdf
• Ausgrid - Attachment 5.21.8 - Business Case 8 Future Workplace - April 2018 - PUBLIC.pdf

Ausgrid documents received before/on assessment cut-off date (29th June, and 9th July 2018 for non-network capex)

AER Ref#	EMCa Ref #	Date received	Filename
IR005	EMCaAUS	19/06/2018	• AUSGRID-IR005-EMCaAUS-2016 11 28_Steel Mains-20180618-Public
	EMCaAUS001	12/06/2018	• AUSGRID EMCaAUS001 Company Policy - Investment Governance Framework 20180607 Public
IR005	EMCaAUS002	11/06/2018	• AUSGRID IR005 EMCaAUS002 - Company Procedure - Network Investment Governance 20180608 Public
	EMCaAUS003	12/06/2018	• AUSGRID EMCaAUS003 - Company Procedure - Investment Evaluation 20180607 Public

AER Ref#	EMCa Ref #	Date received	Filename
IR005	EMCaAUS004	11/06/2018	• AUSGRID IR005 EMCaAUS004 -Company Procedure - Network Investment Governance Decision Pathways 20180608 Public
	EMCaAUS006	11/06/2018	• AUSGRID EMCaAUS006 - Company Procedure - Investment Evaluation 20180607 Public
IR005	EMCaAUS007	11/06/2018	• AUSGRID IR005 EMCaAUS007 - Executive Committee - Network Steering Committee Charter 20180608 Public
	EMCaAUS008	12/06/2018	• AUSGRID EMCaAUS008 - Executive Committee - Investment Governance Committee Charter 20180607 Public
IR005	EMCaAUS009	11/06/2018	• AUSGRID IR005 EMCaAUS009 - Company Procedure - Network Investment Governance - Network Delivery Plan 20180608 Public • AUSGRID EMCaAUS009 - Company Procedure - Network Investment Governance - Network Delivery Plan 20180607 Public
IR005	EMCaAUS010	11/06/2018	• AUSGRID IR005 EMCaAUS010 - Company Procedure - NIG Define Network Capital Maintenance Investment Portfolio 20180608 Public
	EMCaAUS011	6/06/2018	• AUSGRID EMCaAUS011 - Company Procedure - Network Investment Governance Monitor Portfolio Program and Project Performance 20180607 Public
	EMCaAUS012	12/06/2018	• AUSGRID EMCaAUS012 - Company Procedure - Network Investment Governance Change Control 20180607 Public
	EMCaAUS013	12/06/2018	• AUSGRID EMCaAUS013 - Company Procedure - Network Investment Governance Program Project Task Close 20180607 Public
IR005	EMCaAUS014	11/06/2018	• AUSGRID IR005 EMCaAUS014 Top down challenge 20180608 Public
	EMCaAUS015	12/06/2018	• AUSGRID EMCaAUS015 - Company Procedure - Non-System Investment Proposals to Ausgrid Committees 20180607 Public
IR005	EMCaAUS016	19/06/2018	• AUSGRID-IR005-EMCaAUS016-5.02.2-Master list PIP8.3 v9 - mark3.4 clean-20180619-Public • AUSGRID-IR005-EMCaAUS016-5.02.2-Master list PIP8.3 v9 - mark3.4 clean-20180619-Public • AUSGRID-IR005-EMCaAUS016-Fact Sheet - Defining the Portfolio Investment Plan & CASH Risk-20180618-Public • AUSGRID-IR005-EMCaAUS016-PROGRAM BRIEF - REL_33.01.01 Individual Feeder Reliability Program (Schedule 3)-20180619-Public • AUSGRID-IR005-EMCaAUS016-PROGRAM BRIEF-REL_33.01.06 High Community Impact Assets Reliability Program-20180619-Public
IR005	EMCaAUS017	18/06/2018	• AUSGRID-IR#005-EMCaAUS017-Company Procedure - Risk Management-20180615-Public • AUSGRID-IR#005-EMCaAUS017-Draft Decision Making and Risk Management-20180615-Public • AUSGRID-IR#005-EMCaAUS017-RM Framework response-20180615-Public

AER Ref#	EMCa Ref #	Date received	Filename
	EMCaAUS019	12/06/2018	• AUSGRID EMCaAUS019 - Company Policy - Asset Management 20180607 Public
	EMCaAUS020	12/06/2018	• AUSGRID EMCaAUS020 - Network Defect Prioritisation 20180607 Public
IR005	EMCaAUS021	18/06/2018	• AUSGRID-IR#005-EMCaAUS021-Asset Mgt Approach-20180615-Public • AUSGRID-IR#005-EMCaAUS021-Ausgrid MRA Process-20180615-Public • AUSGRID-IR#005-EMCaAUS021-Ausgrid MRA Process-20180615-Public • AUSGRID-IR#005-EMCaAUS021-Ausgrid Network Management Strategy DRAFT 20180614-CONFIDENTIAL • AUSGRID-IR#005-EMCaAUS021-GV000-Y0014 Risk Management-20180615-Public
IR005	EMCaAUS022	18/06/2018	• AUSGRID-IR#005-EMCaAUS022-Changes in AM approach-20180615-Public
IR015	EMCaAUS023	19/06/2018	• AUSGRID-IR00I5-EMCaAUS023-REPEX MODEL-20180619-PUBLIC
IR005	EMCaAUS024	26/06/2018	• AUSGRID-IR005-EMCaAUS024-OTI_03.15-DNMS and SCADA Replacement-20180606-CONFIDENTIAL DRAFT • AUSGRID-IR005-EMCaAUS024-ARA_01.1.0028A-RESPONSE-9SA-92P feeders - v2.0-20180626-PUBLIC • AUSGRID-IR005-EMcaAUS024-ARA_03.1C.0039A- Response_265_v2-20180626-PUBLIC • AUSGRID-IR005-EMCaAUS024-ARA_03_1b.0017- Mascot-20180626-PUBLIC • AUSGRID-IR005-EMcaAUS024-ARA_04.1.0029-Response_Peakhurst_v2-20180626-PUBLIC • AUSGRID-IR005-EMcaAUS024-ARA_04.4.B.002- Response_Concord-20180626-PUBLIC • AUSGRID-IR005-EMcaAUS024-ARA_05.1.0014-Response_Castle Cove-Mosman-20180626-PUBLIC • AUSGRID-IR005-EMCaAUS024-ARA_05.10014-DPAR - Ensuring reliability requirements in the Lower North Shore area-20180525-PUBLIC • AUSGRID-IR005-EMCaAUS024-SUPP_44.01.01-Network Property Plan-2017-20180626-PUBLIC • AUSGRID-IR005-EMCaAUS024-SUPP_44.01.01-Property process flowchart V03-disposal-PUBLIC • AUSGRID-IR005-EMCaAUS024-SUPP_44.01.01-property process flowchart-acquisition-PUBLIC • AUSGRID-IR005-EMcaAUS024-SUPP_44.01.01-Strategic Property Slides 19 June 2018 FINAL-PUBLIC
IR005	EMCaAUS025	18/06/2018	• AUSGRID-IR#005-EMCaAUS025-project references-20180615-Public
IR005	EMCaAUS026	11/06/2018	• AUSGRID IR005 EMCaAUS026 20180608 Public • AUSGRID IR005 EMCaAUS026 Ausgrid Demand Side Engagement Document December 2015 20180608 Public • AUSGRID IR005 EMCaAUS026 DTAPR 2017 20180608 Public

AER Ref#	EMCa Ref #	Date received	Filename
	EMCaAUS027	20/06/2018	• Ausgrid - IREMCaAUS027 - Technology and Data Strategy - 20180406
	EMCaAUS028	20/06/2018	• Ausgrid - IREMCaAUS028 - ICT Response - 20180606
	EMCaAUS029	20/06/2018	• Ausgrid - IREMCaAUS029 - ICT Project Benefits Framework - 20171031
	EMCaAUS030	20/06/2018	• Ausgrid - IREMCaAUS030 - ICT Response - 20180606
	EMCaAUS031	20/06/2018	• Ausgrid - IREMCaAUS031 - ICT program justifications - 20180430
	EMCaAUS031	20/06/2018	• EY - IREMCaAUS031 - Ausgrid Cloud Strategy - 20170526 - Confidential
IR005	EMCaAUS032	22/06/2018	• AUSGRID-IR005-EMCaAUS032 01. Regulatory Changes to Market & Enterprise Systems Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-02. Technology Licence Growth Business Case-20180621 • CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-03. Cyber Security Program Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-04. End of Life Application Maintenance Business Case-20180621 • CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-05. Mandatory Patch and Release Management Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-06. SAP Core Platform Transformation Business Case-20180621 • CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-07. Infrastructure & Capacity Upgrades Business Case 201806121-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-08. Workplace Technology Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-09. Telecommunications Platform Maintenance Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-19. Information Management Business Case-20180621-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS032-20. Digital Transformation Business Case-20180621-CONFIDENTIAL
	EMCaAUS033	20/06/2018	• Ausgrid - IREMCaAUS033 - EA Technology Reference Manual - 20171001 – Confidential • Ausgrid - IREMCaAUS033 - Enterprise Architecture ICT Landscape Overview - 20170901 – Confidential • Ausgrid - IREMCaAUS033 - Enterprise Architecture Practice – 20180605 • Ausgrid - IREMCaAUS033 - Enterprise Architecture Principles Master - 20170901
	EMCaAUS034	20/06/2018	• Ausgrid - IREMCaAUS034 - Technology and Data Strategy – 20180406 • Isobar - IREMCaAUS034 - Customer Digital Strategy - 20180131

AER Ref#	EMCa Ref #	Date received	Filename
	EMCaAUS035	20/06/2018	• EY - IREMCaAUS035 - Cyber Strategy Exec Summary - 20170817 – Confidential • EY - IREMCaAUS035 - Cyber Strategy Report - 20170821 - Confidential
	EMCaAUS036	20/06/2018	• Hakluyt - IREMCaAUS036 - Hakluyt Review of Cyber Security Strategy - 20171023 - Confidential
	EMCaAUS037	20/06/2018	• Ausgrid - IREMCaAUS037 - Federal Government Acknowledgement of Cyber Strategy & Roadmap - 20171103 - Confidential
	EMCaAUS038	20/06/2018	• Ausgrid - IREMCaAUS038 - AER 1924 Technology Plan Costing Methodology and Estimates - 20180406
IR005	EMCaAUS040	14/06/2018	• AUSGRID-IR005-EMCaAUS040-CONCISECERT- BCA - Access Audit Report Ausgrid Merriwa Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA Access Audit Report Ausgrid - Gore Hill Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA Access Audit Report Ausgrid Hornsby (re attach 5.21.2)-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA Access Audit Report Ausgrid Meadowbank Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA Access Audit Report Ausgrid Pymble Site Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report Ausgrid Salt Ash Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid - Homebush (re attach 5.21.1)-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Cessnock Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Menai Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Muswellbrook Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Newcastle-Wallsend Depot (re attach 5.21.5)-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Oatley Depot - Rev 02 (re attach 5.21.4-20180612) • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Audit Report - Ausgrid Somersby Depot-20180612

AER Ref#	EMCa Ref #	Date received	Filename
			• AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA - Access Report Ausgrid Maitland Depot-20180612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA -Access Audit Report - Ausgrid Singleton Depot-2018-0612 • AUSGRID-IR005-EMCaAUS040-CONCISECERT-BCA -Audit Report - Ausgrid - Wallsend office (re attach 5.21.6)-201800612
IR005	EMCaAUS041	14/06/2018	• AUSGRID-IR005-EMCaAUS041- 2017.12 Wallsend Depot-NPV options- 20180612-confidential • AUSGRID-IR005-EMCaAUS041-2017.12 Oatley Depot Replacement-NPV options - 20180612-Confidential • AUSGRID-IR005-EMCaAUS041-2017.12.06 Homebush Depot Upgrade - NPV options-20180612-confidential
IR005	EMCaAUS042 EMCaAUS043	11/06/2018	• AUSGRID IR005 EMCaAUS042 Fleet Replacement Guidelines 2017 20180608 Public • AUSGRID IR00I5 EMCaAUS042 and EMCaAUS43 Fleet and plant 20180608 Public
IR011	EMCaAUS044	11/06/2018	• Ausgrid - IR011 - EMCaAUS044 - Network Standard - NIS419 Area Planning - 20180608 - Public
IR011	EMCaAUS045	11/06/2018	• Ausgrid - IR011 - EMCaAUS045 - Network Standard - NIS439 Capacity Planning - 20180608 - Public
IR011	EMCaAUS046	11/06/2018	• Ausgrid - IR011 - EMCaAUS046 - Network Standard - NIS435 Replacement Planning -20180608 - Public
IR011	EMCaAUS047	11/06/2018	• Ausgrid - IR011 - EMCaAUS047 - 20180608 – Public • Ausgrid - IR011 - EMCaAUS047 - Strategic Asset Prioritisation 11kV Switchgear - 20180608 - Public
IR011	EMCaAUS048	11/06/2018	• Ausgrid - IR011 - EMCaAUS048 - 11kV Switchboard Risk for Planning 20171218 - 20180608 – Public • Ausgrid - IR011 - EMCaAUS048 - 20180608 - Public
IR011	EMCaAUS049	11/06/2018	• Ausgrid - IR011 - EMCaAUS049 - FFC Environmental Risk Assessment 4 Oct - 20180608 - Confidential
IR016	EMCaAUS060	29/06/2018	• AUSGRID-IR016-EMCaAUS060-Deferral Value-20180628-PUBLIC
IR016	EMCaAUS070	29/06/2018	• AUSGRID-IR016-EMCaAUS070-Other Hazards-20180628-PUBLIC
IR016	EMCaAUS071	29/06/2018	• AUSGRID-IR016-EMCaAUS071 Model validation-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS071-Cable failure model validation Report 2016-20180628-PUBLIC • EMCA-IR016-EMCaAUS071-EMCa Review of TransGrid Capex June 2017-20180628-PUBLIC • PB ASSOCIATES-IR016-EMCaAUS071-Review of Transformer Model 2006-PUBLIC
IR016	EMCaAUS073	28/06/2018	• AUSGRID-IR016-EMCaAUS073-Pole failure investigations-20180628-PUBLIC

AER Ref#	EMCa Ref #	Date received	Filename
IR016	EMCaAUS076	28/06/2018	• AUSGRID-IR016-EMCaAUS076 132kV Feeder 9E2 Incident Report 2008-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-1.Conductor failure investigations-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-132kV Conductor failure 2015-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS076-33kV-Insulator Failure Report 2017-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-66kV Feeder 826 OHEW Failure Report 2017-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-Report on bare copper mains breakdown-Campsie 2014-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-Safety Alert-Incorrect use of compression sleeves 2018-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-SIA 33 kV 2007-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-Telarah Zone Sub outage investigation 2013-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS076-Ungreased 33kV Conductor Assessment Report 2010-20180628-PUBLIC
IR016	EMCaAUS078	29/06/2018	• AUSGRID-IR016-EMCaAUS078 to 082-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS078-Mascot Combined POE50 HLM v1.0-20180628-PUBLIC
IR016	EMCaAUS080	29/06/2018	• AUSGRID-IR016-EMCaAUS080-Case Study-Concord 11kV SG (Database Tool)-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS080-Switchgear CBA Tool_V4.0_Concord-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS080-Worked example-Concord 11kV Switchegear_v1.0-20180628-PUBLIC
IR016	EMCaAUS081	29/06/2018	• AUSGRID-IR016-EMCaAUS081-Ausgrid Subtransmission Feeder unavailability-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS081-CMPJ0041 Ausgrid cable failure model validation Report-Final 2016-20180628-PUBLIC
IR016	EMCaAUS082	29/06/2018	• AUSGRID-IR016-EMCaAUS082 Feeder CBA Tool_V2.0_Mosman feeders-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS082-Case Study-Willoughby to Mosman feeders (PSSE App)-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS082-Worked example-Castle Cove_Mosman feeders_v1.0-20180628-PUBLIC

AER Ref#	EMCa Ref #	Date received	Filename
IR016	EMCaAUS083	28/06/2018	• AUSGRID-IR016-EMCaAUS083-1.Strategy Document-EMS300 Underground Transmission Cables Oct17-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-2.Merewether cable leak-EPA Official Caution-20171012-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-3.Ausgrid Fluid Filled Cable Management Strategy 2017 review 20171009-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-4. 15 11 30-Letter from Greg Sheehy, Acting Dir-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-5. 15 11 03-Letter from Greg Sheehy, Acting Dir-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-6. EPA interim letter re FFCs FINAL 20150824-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-7.Oil-filled cables-meeting with EPA-draft notes 20150806-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-9.Ausgrid EMS300 EPA submission 20121120-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-9a.Notes from DECC meeting 20080912-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083-9b.EPA Liaison mtg record final 20020722-20180628-CONFIDENTIAL • AUSGRID-IR016-EMCaAUS083.8.Willoughby Cable leak-EPA Formal Warning 20150203-20180628-CONFIDENTIAL
IR016	EMCaAUS084	28/06/2018	• AUSGRID-IR016-EMCaAUS084-33kV Cables Strategy-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS084-HSL Cable Risk For Planning-20180628-PUBLIC • AUSGRID-IR016-EMCaAUS084-Strategic Asset Prioritisation Sub-transmission Cables 2012-20180628-PUBLIC
IR016	EMCaAUS088	29/06/2018	• AUSGRID-IR016-EMCaAUS088-Service Wire Hazards-20180628-PUBLIC
IR020	EMCaAUS099	9/07/2018	• Ausgrid - IR020 - EMCaAUS099 - Project Cost by Business Case Bottom Up Build Detail - 20180706 – Confidential • Ausgrid - IR020 - EMCaAUS099 - Project Cost by Business Case Bottom Up Build Summary - 20180706 - Confidential
IR020	EMCaAUS104	9/07/2018	• Ausgrid – IR020 – EMCaAUS104 – Company Policy – Non-Network Standard – Information Security Controls for ICT Infrastructure – 20180706 – Public • Ausgrid - IR020 - EMCaAUS104 - Company Policy - Application Management - 20180706 - Public

AER Ref#	EMCa Ref #	Date received	Filename
IR020	EMCaAUS106	9/07/2018	• Ausgrid - IR020 - EMCaAUS106 - Draft Technology Business Case DNMS and SCADA Replacement - 20180607 - Confidential
IR020	EMCaAUS107	9/07/2018	• Ausgrid - IR020 - EMCaAUS107 - Castle Cove Automation Scheme Approval Paper 20180607 - Confidential
IR007		8/06/2018	• Ausgrid - IR007 - Attachment 5.02.2 - Master list - Updated 8 June 2018.xlsx
IR007		8/06/2018	• Ausgrid - IR007 - Attachment 5.02.2 - Master list of Ausgrid forecast ca....xlsx
IR007		8/06/2018	• Ausgrid - IR007 - Capex data reconciliation and cable replacement - 20180608 - Public.docx
IR007		8/06/2018	• Ausgrid - IR007 - Draft RFI for the provision of non-market meter data and services - 20180608 - Public.pdf
IR007		8/06/2018	• Ausgrid - IR007 - Attachment 5.02.2 - Master list - Updated 8 June 2018
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 01. Regulatory Changes to Market & Enterprise Systems Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 02. Technology Licence Growth Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 03. Cyber Security Program Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 04. End of Life Application Maintenance Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 05. Mandatory Patch and Release Management Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 06. SAP Core Platform Transformation Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 07. Infrastructure & Capacity Upgrades Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 08. Workplace Technology Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 09. Telecommunications Platform Maintenance Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 19. Information Management Business Case - 20180621
IR013		21/06/2018	• Ausgrid - AERIR013-04 - 20. Digital Transformation Business Case - 20180621
IR013		26/06/2018	• Ausgrid - IR013 - ICT information request response - 20180625 - Public
IR013		26/06/2018	• Ausgrid - IR013 - ICT Q1 - Reconciliation of Table 2.6.4 in Reset RIN - 20180625 - Public
IR013		26/06/2018	• Ausgrid - IR013 - ICT Question 2 response - 20180625 - Public
IR013		26/06/2018	• Ausgrid - IR013 - ICT Question 3 response - 20180625 - Public
IR013		26/06/2018	• Ausgrid - IR013 - ICT Question 3 response - Updated - 20180626 - Public
IR013		26/06/2018	• Ausgrid - IR013 - ICT Question 5 response - 20180625 - Public

AER Ref#	EMCa Ref #	Date received	Filename
IR015		3/07/2018	• Ausgrid - IR015 - Capex Dedicated LV circuit reconfiguration program & network protectors - 20180702
IR018		9/07/2018	• AER - IR018 - Fleet and plant percentage changes - 20180709 - Confidential
IR018		9/07/2018	• Ausgrid - IR018 - Fleet and plant capex - 20180709 - Public
IR018		9/07/2018	• Ausgrid - IR018 - Fleet and Plant Capex Model - 20180709 - Confidential
IR018		9/07/2018	• Ausgrid - IR018 - Fleet and Plant Capex Reset RIN Reconciliation - 20180709 - Public
IR020		9/07/2018	• Ausgrid - IR020 - Non-network capex program - Part 1 - 20180706 - Public
		9/07/2018	• Ausgrid - BCG Fleet Advice - 20180709 - Public
		8/06/2018	• Ausgrid Historical RIN data - for EMCa (updated 08062018).xlsx

Documents that did not form part of assessment

Ausgrid documents received after assessment cut-off date (29th June 2018, and 9th July 2018 for non-network capex)

AER Ref#	EMCa Ref #	Date received	Filename
IR005	EMCaAUS005	11/07/2018	• AUSGRID-IR005-EMCaAUS005-RREC CHARTER-20180710-PUBLIC
IR016	EMCaAUS020	5/07/2018	• AUSGRID-IR016-EMCaAUS020-Unit Rates of Replacement Programs FY20-24-20180705-PUBLIC
IR005	EMCaAUS024	12/07/2018	• AUSGRID-IR005-EMCaAUS024-CLOSE OUT-20180712-PUBLIC • AUSGRID-IR005-EMCaAUS024-Asset Risk Report-11kV Switchgear-20180711-PUBLIC • AUSGRID-IR005-EMCaAUS024-Asset Risk Report-Fluid Filled Cables-20180711-CONFIDENTIAL • AUSGRID-IR005-EMCaAUS024-Draft EMS350 for EPA consultation-20180711-CONFIDENTIAL
IR015		2/07/2018	• AUSGRID - IR015 - CAPEX DEDICATED LV circuit reconfiguration program & network protectors – 20180702
IR015		2/07/2018	• AUSGRID - IR015 - Vegetation Management Engagement and Feedback Summary Report - 20180702 - Public
IR016	EMCaAUS059	11/07/2018	• AUSGRID-IR016-EMCaAUS059-GOVERNANCE-20180710-PUBLIC • AUSGRID-IR016-EMCaAUS059-CAPEX GOVERNANCE TIMELINE-20180710-PUBLIC

AER Ref#	EMCa Ref #	Date received	Filename
IR016	EMCaAUS062	2/07/2018	• AUSGRID-IR016-EMCaAUS062-Repex Major Project and Programs Status-20180702-PUBLIC • AUSGRID-IR016-EMCaAUS062-Repex Major Project Status-20180702-PUBLIC
IR016	EMCaAUS063	5/07/2018	• AUSGRID-IR016-EMCaAUS063-Major Project Delivery Efficiencies-20180705-PUBLIC • AUSGRID-IR016-EMCaAUS063_EMCaAUS086-Delivery-20180705-PUBLIC
IR016	EMCaAUS064	5/07/2018	• AUSGRID-IR016-EMCaAUS064-UNIT RATES-20180705-PUBLIC
IR016	EMCaAUS066	4/07/2018	• AUSGRID-IR016-EMCaAUS066-Repex CBA-20180704-PUBLIC
IR016	EMCaAUS067	30/06/2018	• AUSGRID-IR016-EMCaAUS067-5.02.2-Master list PIP8.3 v9 mark3.4 clean-20180619-Public
IR016	EMCaAUS068	3/07/2018	• AUSGRID-IR016-EMCaAUS068 REPEX MODEL-20180703-PUBLIC
IR016	EMCaAUS069	7/07/2018	• AUSGRID - IR016 - EMCaAUS069 - Program Overviews & Briefs - 20180706 – Confidential • AUSGRID - IR016 - EMCaAUS069 Repex Overview draft AS GR MR2 PG - 20180706 - Confidential
IR016	EMCaAUS072	2/07/2018	• AUSGRID-IR016-EMCaAUS072-REPEX Current Reg Period-20180702-PUBLIC • AUSGRID-IR016-EMCaAUS072-Repex expenditure v1-20180702-PUBLIC
IR016	EMCaAUS074	30/06/2018	• AUSGRID-IR016-EMCaAU074-Pole Top Structures-20180629-PUBLIC
IR016	EMCaAUS075	30/06/2018	• AUSGRID-IR016-EMCaAUS075-Pole volumes-20180629-PUBLIC
IR016	EMCaAUS085	3/07/2018	• AUSGRID-IR016-EMCaAUS085-Consac supporting data for slide-20180703-PUBLIC
IR016	EMCaAUS087	30/06/2018	• AUSGRID-IR016-EMCaAUS087-Service wire expenditure-20180629-PUBLIC
IR020	EMCaAUS089	16/07/2018	• Ausgrid - IR020 Part 2 - Non-Network expenditure - 20180713 - Public
IR020	EMCaAUS098	16/07/2018	• Ausgrid - IR020 - Ausgrid Memo - Cyber Risk Model - Response to EMCaAU098 - 20180713 – Public • Ausgrid - IR020 - Cyber Risk Model - 20180713 - Public

Ausgrid is yet to respond to EMCa questions

EMCa Ref#	Description
EMCaAUS018	• Portfolio Investment Plan (PIP)
EMCaAUS039	• Ausgrid's Property Strategy Plan
EMCaAUS073	• Examples of post failure diagnostic investigations undertaken for pole failures

EMCa Ref#	Description
EMCaAUS077	• A copy of the strategy document & decision to retire/remove streetlight conductor as part of the LV Overhead Mains Circuit Configuration project
EMCaAUS079	• A copy of the switchgear model and methodology including explanation of the input parameters and assumptions for the risk-cost assessment
EMCaAUS086	• The delivery efficiencies achieved in the current RCP for consac cable replacement, and any projected savings
EMCaAUS090	• The governance process that the 'depot requirements' defined by Network Division is subjected to and how this fits in to Ausgrid's broader governance process
EMCaAUS091	• Provide FY18 YTD property capex
EMCaAUS092	• Reason for the projects were deferred, and what factors would allow these projects to be deferred again next RCP
EMCaAUS093	• Appears to be some duplication in the specification of works for the 2019-24 Hornsby replacement depot at Mount Ku-ring-gai, explain the separation between these two projects
EMCaAUS094	• Governance process (review and challenge) applied to the fleet and plant capex forecast in the RP
EMCaAUS095	• What options will be explored to extend the life of Elevated Work Platforms beyond 15 years, and to improve utilisation of Elevated Work Platforms
EMCaAUS096	• Figure 25 in RP Attachment 5.01, please explain why Ausgrid benchmarks poorly compared to non-rural distributors, and any actions planned to improve Ausgrid's performance on this benchmark
EMCaAUS097	• Evidence of the forecast for plant for 2019-24, which has increased considerably compared to 2014-19, is prudent and efficient
EMCaAUS097	• Where feasible within the timeframe, please provide risk cost analysis for ICT programs
EMCaAUS099	• Please quantify benefits for each program (e.g. costs savings, percentage increase in number of consumers using online services, percentage increase in customer satisfaction, reduction in cost to serve as more people use the online services instead of ringing the call centre, etc
EMCaAUS102	• Please provide evidence that the cost to migrate SAP to S4/Hana is efficient.
EMCaAUS104	• Please explain the 'whole of business' implementation program (i.e. roles, access to systems, etc.) to deliver the lower cyber security risk profile described from the cyber security capex program