# **E**MC<sup>a</sup>

energy market consulting associates

Energex 2025/26 to 2029/30 Regulatory Proposal

# REVIEW OF ASPECTS OF EX ANTE AUGEX

**Public Version** 

Report prepared for: AUSTRALIAN ENERGY REGULATOR August 2024

## Preface

This report has been prepared to assist the Australian Energy Regulator (AER) with its determination of the appropriate revenues to be allowed for the prescribed distribution services of Energex Energy from 1st July 2025 to 30th June 2030. 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 nor all available inputs to the regulatory determination process. This report relies on information provided to EMCa by Energex Energy. 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 overarching purpose.

Except where specifically noted, this report was prepared based on information provided to us prior to 21 June 2024 and any information provided subsequent to this time may not have been taken into account. Some numbers in this report may differ from those shown in Energex Energy's regulatory submission or other documents due to rounding.

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# **ABBREVIATIONS**

Term	Definition
ADMS	Advanced Distribution Management System
AMP	Asset Management Plan
BAU	Business As Usual
СВА	Cost Benefit Analysis
СТБ	Conductors to Ground
current RCP	2020-25 Regulatory Control Period
DA	Distribution Authority
DER	Distributed Energy Resources
DMS	Distribution Management System
Ergon	Ergon Energy
EQ	Energy Queensland
EQL	Energy Queensland Limited
GIS	Geospatial Information System
GSL	Guaranteed Service Level
LV	Low Voltage
MPL	Multiprotocol Label Switching
MSS	Minimum Service Standards
NEM	National Electricity Market
NER	National Electricity Rules
next RCP	2025-30 Regulatory Control Period
NRF	Network Risk Framework
NSP	Network Service Provider
от	Operational Technology
OTE	Operational Technology Environment
PoF	Probability of Failure
QA	Quality Assurance
RAS	Risk Appetite Statements
RCP	Regulatory Control Period
RP	Regulatory Proposal
RRG	Reset Reference Group
UGIS	Unified GIS

# **EXECUTIVE SUMMARY**

## Introduction and context

- 1. The AER has engaged EMCa to undertake a technical review of aspects of the expenditure that Energex has proposed in its regulatory proposal (RP) for the 2025-30 Regulatory Control Period (next RCP). The scope of our review comprises aspects of its proposed augex, for conductor clearance and grid communications, protection and control. We are also requested to advise on the governance, management and forecasting methods applied by Energex, where they may impact the prudency and efficiency of expenditure that we have been asked to review.
- 2. The assessment contained in this report is intended to assist the AER in its own analysis of the proposed capex allowance as an input to its draft determination on Energex's revenue requirements for the next RCP.

## Proposed augex for next RCP

- 3. Energex has proposed \$610.3 million for augex in the next RCP. Our scope of review includes the conductor clearance program and the grid communications, protection and control categories of augex, totalling \$160.7 million for the next RCP.
- 4. For its conductor clearance program, Energex has forecast capex of \$58.5 million to remediate 3,995 defects, being an increase from \$49.3 million that Energex expects to incur in the current RCP. Energex proposes to remediate outstanding and forecast level 1-5 defects within its remediation timeframes while monitoring and opportunistically rectifying the lowest priority level 5 defects, phased over the 5-year period.
- 5. For its grid communications, protection and control category Energex has forecast capex of \$102.2 million, being an increase from \$63.7 million that Energex expects to incur in the current RCP. To assist our review, we have assigned individual projects with a similar project title in Energex's capex model into project groupings, and which we understood from our discussions with Energex at our onsite meeting were as Energex had organised its capex proposal for this category of augex.
- 6. Energex has included \$13.8 million for cyber security in its proposed grid communications, protection and control category augex, and we consider this as a part of the broader cyber security program in a separate confidential report to the AER.

## Our assessment and findings

## Governance, management and forecasting methods

Energex's governance, management and forecasting methods are not adequate to demonstrate that its proposed augex is a reasonable forecast

- 7. We observe that the governance arrangements and processes in place for Energex reflect a standard approach across Energy Queensland (EQ). We observe from our review of the arrangements and processes for Ergon, that this generally reflects an adoption of processes and standards in place at Energex and which continue into the next RCP.
- 8. The focus for our review includes aspects of the proposed augex for Energex, and therefore our review is limited to the influence of the governance and forecasting methods on that expenditure. To that end, we found issues across EQ, and which are detailed in our review

of the in-scope components of Energex's expenditure and which we consider have led to an overstatement of these expenditure requirements for the next RCP.

# Energex does not appear to have addressed some critical feedback provided in the last AER decision

9. In its RP, Energex has provided evidence of its risk-cost modelling, however at times we found this difficult to interrogate. We were not provided with the basis of the inputs and assumptions that Energex has applied in forming its projects and programs and which we consider reflects feedback provided by the AER to Energex previously, but which has not been sufficiently addressed.

### Insufficient evidence that the projects and programs had been optimised

- 10. Energex has, in places, claimed that its risk modelling has assisted with its prioritisation of its project and programs. However, we did not find sufficient evidence that the portfolio had been optimised in the aspects of expenditure that we have reviewed. In fact, we found instances where the scope and timing of some projects and programs were subject to multiple dependencies in the grid communications, protection and control augex, and the resultant delivery risks would likely result in a lower program of expenditure being incurred by Energex.
- 11. In many instances the basis for consideration of the project is clear, however Energex has not adequately demonstrated that the augex forecast that it has proposed for the next RCP (for the aspects we were asked to review) would form part of a total capex forecast that reasonably reflects the capex criteria.

## Conductor clearance program

Energex has overstated both its forecast of future defects requiring rectification and the cost of solutions to address such defects

- 12. We accept that Energex has a need to address sites that present an immediate safety risk of inadequate clearance to the ground or structure, following verification that a defect exists. Energex relied on the outcome of flights of its network using LIDAR for the identification of defects for its historical program.
- 13. For the next RCP, Energex has forecast the number of defects based on two assumptions that we do not consider have a reasonable basis, being (i) that despite the identification and rectification of clearance issues currently being addressed, future flights will continue to identify a material number of new defects, and (ii) Energex has not sufficiently taken account of the interaction with other programs that will assist resolve issues with conductor clearance. We consider that the extent of conductor clearance rectification will be materially less than Energex has proposed.
- 14. We found evidence that the rectification program that Energex commenced in the current RCP had been initially forecast to be substantially complete by the end of the current RCP, and which undermines the basis for estimating the extent of defects for the next RCP that Energex has included.
- 15. Whilst the volume of future defects requiring remediation is likely overstated, we are also not convinced that the solutions that Energex will deploy are reflected in the assumed unit rate, and which is limited by the last 12 months of data. We consider that greater analysis of the solutions, costs and proportion of solutions deployed are likely to identify solutions that in aggregate will incur a lower unit cost.

## Grid communications, protection and control

Absent an overarching strategy, Energex's proposed expenditure represents a relatively immature program that does not adequately demonstrate need or the likelihood of lower cost options

- 16. For the grid communications, protection and control category we do not observe an overarching strategy that applies a framework for the proposed expenditure, and as a result the need for some of the elements of the expenditure has not been adequately demonstrated. Whilst we consider some of the projects are likely to be reasonable for inclusion into the forecast, and reflect ongoing programs, there is insufficient analysis undertaken for other projects. Specifically, to demonstrate the need for the project or that lower cost alternatives could not be undertaken, such that a lower forecast expenditure would be prudent.
- 17. The proposed Energex projects are similar to those proposed by Ergon, particularly where shared systems / platforms are involved such as for the Operational Technology environment, and which underpins the requirement for an overarching strategy and application to each of the Ergon and Energex's instances.
- 18. Many of the projects and programs that Energex has proposed for the next RCP are continuing from similar projects and programs that Energex has in place, and which are targeted at identified risks to the grid communications, protection and control assets, and provide benefits to the reliability, security and capacity of the associated assets and systems. To this end, many projects are likely to be prudent to be included in the forecast augex for the next RCP. However, in other cases Energex has not provided sufficient analysis that the project is required to be undertaken or that lower cost alternatives could not be undertaken, such that a lower forecast expenditure would be prudent.

# The proposed projects are back-ended and for several reasons, including deliverability, we consider it more likely that Energex will undertake a smaller program in the next RCP

- 19. Energex's proposed increase in expenditure relative to the current RCP is driven by a small number of projects, where the timing of expenditure is back-ended in the next RCP, and we do not consider that these have been sufficiently reviewed from a deliverability perspective. In other cases, the expenditure profile reflects early planning, where implementation for the project has not yet been considered, and which casts doubt on whether it would be completed within the next RCP.
- 20. Overall, we find that the projects and programs that form the grid communications, protection and control category were not subject to sufficient internal review to determine the optimal portfolio, with respect to risk or other service outcomes, nor were we provided evidence that the level of proposed work in this category is required to maintain risk or service levels. We found evidence of projects in the Intelligent Grid grouping that are of a research and development nature. If such a review had taken place, we expect that Energex would identify a smaller program of work that would require a lower level of augex.

## Implications of our findings

- 21. Overall, we consider that Energex's proposed augex of \$160.7 million for the two categories of 'conductor clearance' and 'grid communications, protection and control' is not a reasonable forecast of its requirements for the next RCP.
- 22. We consider that the need for some elements of its proposed expenditure has not been adequately demonstrated and that the forecasts for Energex's proposed expenditure for conductor clearance and grid communications, protection and control categories are considerably overstated.

# **1** INTRODUCTION

The AER has asked us to review and provide advice on Energex's proposed allowances over the 2025-30 Regulatory Control Period (next RCP) relating to aspects of ex ante augex. Our review is based on information that Energex provided and on aspects of the National Electricity Rules (NER) relevant to assessment of expenditure allowances.

## 1.1 Purpose of this report

- 23. The purpose of this report is to provide the AER with a technical review of aspects of the expenditure that Energex has proposed in its regulatory proposal (RP) for the next RCP.
- 24. The assessment contained in this report is intended to assist the AER in its own analysis of the proposed capex allowance as an input to its draft determination on Energex's revenue requirements for the next RCP.

## 1.2 Scope of requested work

25. Our scope of work, covered by this report, is as defined by the AER. Relevant aspects of this are as summarised in Figure 1.1.

Figure 1.1: Scope of work covered by this report

Scope of work covered by this report.

The scope of this review, as requested by the AER, covers the following.

Capex (ex ante)

Augex ('conductor clearance' and 'grid communications, protection and control')

## 1.3 Our review approach

## 1.3.1 Approach overview

- 26. In conducting this review, we first reviewed the RP documents that Energex has submitted to the AER. This includes a range of appendices and attachments to Energex's RP and certain Excel models which are relevant to our scope.
- 27. We next collated several information requests. The AER combined these with information request topics from its own review and sent these to Energex.
- 28. In conjunction with AER staff, our review team met with Energex at its offices on 13-15 May 2024. Energex presented to our team on the scoped topics, and we had the opportunity to engage with Energex to consolidate our understanding of its proposal.
- 29. Energex provided the AER with responses to information requests and, where they added relevant information, these responses are referenced within this review.
- 30. We have subjected the findings presented in this report to our peer review and Quality Assurance (QA) processes and we presented summaries of our findings to the AER prior to finalising this report.

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

## 1.3.2 Technical review

- 32. Our assessments comprise a technical review. While we are aware of stakeholder inputs on aspects of what Energex has proposed, our technical assessment framework is based on engineering considerations and economics.
- 33. We have sought to assess Energex's expenditure proposal based on Energex's analysis and Energex's own assessment of technical requirements and economics and the analysis that it has provided to support its proposal. Our findings are therefore based on this supporting information and, to the extent that Energex may subsequently provide additional information or a varied proposal, our assessment may differ from the findings presented in the current report.
- 34. We have been provided with a range of reports, internal documents, responses to information requests and modelling in support of what Energex has proposed and our assessment takes account of this range of information provided. To the extent that we found discrepancies in this information, our default position is to revert to Energex's regulatory submission documents as provided on its submission date, as the 'source of record' in respect of what we have assessed.

## 1.4 This report

## 1.4.1 Report structure

- 35. This report covers our ex ante review of aspects of proposed augex for the next RCP.
- 36. In each section, we have presented:
  - an overview of the proposed expenditure, and a summary of Energex's justification for that expenditure;
  - our observations on Energex's application of its governance framework and forecasting methodology to the expenditure category, along with the derived forecasting inputs;
  - our assessment of individual expenditure categories and/or projects, and
  - our findings for each expenditure category and the implications of these findings for the expenditure allowances determined by the AER in its draft regulatory determination.
- 37. We have taken as read the considerable volume of material and analysis that Energex provided, and we have not sought to replicate this in our report except where we consider it to be directly relevant to our findings.

## 1.4.2 Information sources

- 38. We have examined relevant documents that Energex has published and/or provided to the AER in support of the areas of focus and projects that the AER has designated for review. This included further information at onsite meetings and further documents in response to our information requests. These documents are referenced directly where they are relevant to our findings.
- 39. Except where specifically noted, this report was prepared based on information provided by AER staff prior to 21 June 2024 and any information provided subsequent to this time may not have been taken into account.
- 40. Unless otherwise stated, documents that we reference in this report are Energex documents comprising its RP and including the various appendices and annexures to the RP.

41. We also reference information responses, using the format IRXX being the reference numbering applied by AER. Noting the wider scope of AER's determination, AER has provided us with IR documents that it considered to be relevant to our review.

## 1.4.3 Presentation of expenditure amounts

- 42. Expenditure is presented in this report in \$FY25 real terms, unless stated otherwise. In some cases, we have converted to this basis from information provided by the business in other terms.
- 43. While we have endeavoured to reconcile expenditure amounts presented in this report to source information, in some cases there may be discrepancies in source information provided to us and minor differences due to rounding. Any such discrepancies do not affect our findings.

# 2 REVIEW OF GOVERNANCE, MANAGEMENT AND FORECASTING METHODS

The governance arrangements and processes in place for Energex reflect a standard approach across Energy Queensland (EQ). We observe from our review of the arrangements and processes for Ergon, that this generally reflects an adoption of processes and standards in place at Energex.

The focus for our review includes aspects of the proposed augex, and therefore our review is limited to the influence of the governance and forecasting methods on that expenditure. To that end, we find issues across EQ, which are detailed in our review of Energex's expenditure and which we consider have led to an overstatement of its requirements for the next RCP.

Specifically, we find an absence of sufficient demonstration that Energex's portfolio of work has been optimised or that the compliance risk that Energex has proposed is reasonable and prudent.

## 2.1 Introduction

- 44. In this section, we provide an overview of Energex's expenditure governance and management framework as it pertains to the focus of our review of augex only. We subsequently assess the extent to which expenditure forecasts developed under this framework, and that are within our scope of review, are likely to be prudent and efficient.
- 45. The extent to which Energex's forecast requirements meet National Electricity Rules (NER) requirements is, in part, dependent on how the governance and management framework has been applied.

## **2.2** Assessment of governance arrangements

## 2.2.1 Governance framework

### Governance arrangements continue to be aligned with a common EQ approach

- 46. EQL has an overarching Investment Management Standard for Energy Queensland Group (EQL), which EQL describe as setting the governance approach across EQL.<sup>1</sup>
- 47. In our discussion at the onsite meeting, EQ described a four-tier governance process, which includes:
  - Asset Management Strategy & Policy
  - Grid Investment Plan
  - Program/Portfolio of Work (PoW) performance reporting
  - Project and program approvals.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup> Response provided by Ergon to IR022, in relation to EQL. Question 1.

<sup>&</sup>lt;sup>2</sup> EMCa\_AER Presentation - 13 to 15 May 2024 (Day 2).

### Development of investment governance process remains ongoing

48. We had understood from information that Energex presented to its Reset Reference Group (RRG)<sup>3</sup> that it had undertaken an investment governance review of EQL. We requested a copy of the review findings to understand what, if any, changes had been made by EQL. We were advised that there was no formal report generated, rather that the:

Investment Management Refresh Project, is a process EQ is undertaking across both its regulated and unregulated business. This initial focus has been on forming a new dedicated board sub-committee including the associated charters and workplans.<sup>4</sup>

## 2.2.2 Risk management framework

- 49. EQ's Network Risk Framework (NRF) includes Risk Appetite Statements (RAS) that describe the risk appetite of the EQ Board for each of the risk consequence areas. For example, Energex states that it applies its Network Risk Framework and its embedded Network Risk Evaluation Matrices to conduct risk assessments of:
  - All new investment proposals (business cases and project approval reports)
  - Investments detailed in the Program of Work
  - Asset assessments within forecasting tools (e.g. Copperleaf, P6)
  - New operational risks identified in the field that are likely to require investment. <sup>5</sup>

#### The network risk framework has continued to evolve

- 50. For the 2025-30 RP, Energex has further developed the NRF and introduced a new Risk Quantification Guideline, that we understand supports the risk quantification tools that it has employed and a cost benefit analysis (CBA) framework. The guideline provides guidance on the selection of consequence values and use of disproportionality factors for quantification of risk costs.
- 51. We looked for evidence of how this guidance has been applied in the development of the augex forecast.

### Change in expression of risk position makes direct comparison problematic

52. EQ's risk appetite establishes the amount of risk EQ is willing to pursue or accept in order to achieve its objectives. We compared the positions of the Risk Appetite Statement (RAS), included as a central tenet of the risk management framework, to understand whether we could discern a change in risk position, and whether that position may lead to an increase in expenditure. In Table 2.1 we note a change in expression of the risk appetite statements which renders direct comparison problematic, and introduction of other risks in the RAS.

<sup>&</sup>lt;sup>3</sup> Reset Reference Group (RRG) deep dive. March 2024.

<sup>&</sup>lt;sup>4</sup> Response provided by Ergon to IR022, in relation to EQL. Question 2.

<sup>&</sup>lt;sup>5</sup> Energex 5.2.06 - Network Risk Framework – January 2024. Page 14.

Table 2.1: Comparison of risk appetite staten
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	2018 version	2023 version
Risk	Distribution	Network Asset Safety & Reliability
Risk appetite statement	EQ has a medium appetite for operating the network effectively and will invest prudently in the network, including systems and automation to balance network risk, cost, customer expectations and performance standards. EQ has a low appetite for any disruption to supply as a result of the network performance of our critical assets.	<ul> <li>EQ will design, build, and maintain a safe and reliable electricity network.</li> <li>EQ will apply:</li> <li>a Conservative appetite to the safe design and operation of its assets. This means EQ will focus and prioritise investment that improves safety outcomes.</li> <li>a Balanced appetite to meeting customer and stakeholder supply expectations, ensuring network performance is in line with required standards while maintaining a competitive cost structure and acknowledging the commitment to safety as a priority.</li> <li>a Balanced appetite to new technology initiatives that support asset safety and reliability</li> </ul>

Source: EMCa analysis of risk appetite statements provided to the AER in support of 2020-25 RP and 2025-30 RP

- 53. A 'conservative' appetite is described by EQ as 'will only take safe options that are very low risk with high degree of certainty, unwilling to accept even a limited amount of risk in most situations'. 'Balanced' is described as 'will consider all potential options and choose the one most likely to result in successful delivery through applying a manageable control program'.
- 54. We recognise that risks and risk positions change over time and are not intended to remain static. We also recognise that it is the role of management to determine how the range of risks are balanced to achieve its objective. In that context, we looked for evidence of how the various risks positions were applied in the development of the proposed capex forecast and particularly the risk that the portfolio would address, including measure of ALARP.
- 55. Whilst less overt in the risk appetite statement, we observe a greater focus on compliance as evident in the increased expenditure directed towards pole failure and conductor clearance activities. Statements of compliance are peppered through many of the justification statements that Energex has provided in support of its proposed expenditure, and which has had the effect of driving an increase in the expenditure that Energex has and proposes to incur.

## 2.3 Assessment of expenditure forecasting methods

## 2.3.1 Augex activity forecasting

- 56. Augex is typically forecast using bottom-up methods, as Energex has done, and responds to specific drivers which may vary from one RCP to another.
- 57. As discussed in Section 3, the 2010-15 RCP included a large investment in augex. Following subsequent revision of the jurisdictional planning standards, augex was significantly reduced in subsequent periods. The absence of growth (or the ability of the network to meet the growth without further augmentation) is observed in the 2015-20 RCP, and then increases are apparent in 2020-25 and 2025-30 RCPs.
- 58. Energex describes the increases as being in response to demand growth coupled with exhausting the available capacity in the network. The most significant increases are in the distribution growth and sub-transmission growth categories. There are also other increases evident in the SCADA, protection and control, resilience, and clearance categories, following Energex's decision to reclassify this expenditure from repex to augex.

### No material changes to Energex's planning framework

- 59. The AER has asked that we include observations in relation to changes to Energex's planning and investment framework that we consider may have led to an increase in augex relative to historical expenditure.
- 60. We asked EQ to nominate any changes to its planning framework that may result in an increase to its augex. EQ referred changes to its ratings methodology, which primarily impact Energex. To avoid creating new network constraints, and associate projects to address the constraints, Energex has maintained existing feeders and transformers ratings, and will apply the new ratings methodology on new work when feeders are modified/constructed or when transformers are replaced.
- 61. We have not identified any material differences in the planning framework that have contributed to a step increase in augex for Energex.

## Reclassification of conductor clearance from repex to augex

- 62. Whilst we have not been requested to review the capex incurred by Energex during the current RCP, or the ex-post period, we have assumed that Energex like Ergon has reclassified its CTG/CTS program from repex to augex during the current RCP.
- 63. In its presentation to the RRG, this statement was made however whilst branded Ergon and Energex, the numbers included in the presentation referred to Ergon only.

## 2.3.2 Brisbane 2032 Olympic and Paralympic Games

64. In its RP, Energex states that it has assessed the capability, reliability, and security of supply of its network in locations that are critical to the upcoming games. Specifically, that:

we are anticipating that there will be an infrastructure pause enforced in the lead-up to Brisbane 2032 and therefore required augmentation in the 2030-35 regulatory control period will need to be brought forward to ensure we complete this work prior to these forecast network constraints. Consequently, we have identified two areas of expenditure that would have been required in the 2030-35 regulatory control period that we have brought forward by two to three years to the 2025-30 period<sup>6</sup>

65. The projects referred are a new 110kV feeder from Ann St to McLachlan St zone substation, and a new 33kV feeder from Nudgee bulk supply to Nundah zone substation. The two projects are beyond the scope of our augex review.

## 2.3.3 Expenditure assessment and justification

### Energex has applied a cost benefit framework to its proposed expenditure

- 66. Energex has undertaken an economic assessment of its business case expenditure that it claims demonstrates that proposed projects are economically viable, and which justify selection of its preferred option (where more than one option is considered). The analysis typically compares the incremental costs and incremental benefits of the proposed option with a stated BAU counterfactual.
- 67. Energex has included a cost benefit framework with its RP that describes the methods that it has undertaken.
- 68. The limited scope of our review did not allow us to test the application of its economic assessment approach across all parts of its proposed expenditure. For the aspects of augex that we were asked to review, and were based on economic assessment, were limited. In these instances, we found a general lack of justification for the input assumptions that had been relied upon and evidence to confirm the reasonable and prudent timing of the proposed expenditure.

<sup>&</sup>lt;sup>6</sup> Energex 2025-30 Regulatory proposal – January 2024. Page 102-103

### Options analysis is biased to supporting the preferred option for some capex categories

- 69. In its final decision for the current RCP, the AER found that Energex had developed quantified cost-benefit analysis for a large number of its major projects, in response to feedback in its Draft decision. However, the AER had some residual concerns that some elements of Energex's risk cost analysis led to risks that were overstated, and Energex had not adequately considered credible options.<sup>7</sup>
- 70. We looked for evidence that Energex has improved its options analysis in the expenditure areas that we were asked to review, specifically the extent to which Energex has considered and made provision for efficient and prudent options in its assessment. For augex, the AER's feedback extended to evidence gaps in Energex's network communications augex program.<sup>8</sup> As evident in our assessment of aspects of the proposed expenditure in Section 3, we consider that Energex has not sufficiently addressed this feedback.

## 2.3.4 Cost estimation approach

### Cost estimation framework is reasonable

- 71. In response to our questions, Energex provided a copy of the EQ Estimation Methodology and Framework 2020<sup>9</sup> that defines the underlying principles, as well as the business rules and associated estimation system linkages used for network project cost estimation in EQ.
- 72. EQ categorises estimates by degree of project scope definition, which typically aligns with the project phase in its lifecycle.
- 73. To maintain currency, compatible units and standard estimate reviews are initiated based on a range of triggers that include:
  - Ad hoc reviews by request
  - Periodic reviews such as annually or quarterly, including related to changes in trends associated with unit rate types of work
  - Changes driven by work practices, contract or materials impacts.
- 74. During the onsite we asked if Energex had undertaken any external reviews of its estimate accuracy, to which the response was no, they had not.<sup>10</sup>
- 75. Energex also provided a presentation titled 'IWP program build Program Estimate overview 2024',<sup>11</sup> which provided a high-level summary of the milestones associated for review of unit rates and some improvement actions that have been undertaken.

### Energex's unit rate analysis is flawed

- 76. Based on our review of the historical averaging method that Ergon has applied, and similar information provided for Energex,<sup>12</sup> we conclude that the issues we have identified in Ergon's analysis are similarly represented in Energex.
- 77. Whilst we have not specifically reviewed the proposed repex forecast, we found evidence of the same issues with Energex's approach, namely:
  - The averaging method applied by Energex draws from what appears to be expenditure expressed in nominal terms, then determines an average which is used to develop a forecast expenditure. This forecast expenditure appears to reconcile with the input to the capex model which is expressed in real 2023 dollars.

AER. Final decision - Energex distribution determination 2020-25 - Attachment 5 - Capital expenditure - June 2020. Page 5-13

<sup>&</sup>lt;sup>8</sup> AER. Final decision - Energex distribution determination 2020-25 - Attachment 5 - Capital expenditure - June 2020. Page 5-15

<sup>&</sup>lt;sup>9</sup> Energex's response to IR031. Question 5.

<sup>&</sup>lt;sup>10</sup> Energex's response to IR031. Question 5.

<sup>&</sup>lt;sup>11</sup> Energex's response to IR031. Question 5.

<sup>&</sup>lt;sup>12</sup> Energex's response to IR031. Question 4.

- Whilst we see provision for escalation in the model, this does not appear to have been applied to determine the average unit rates, which appear to have been relied upon in developing the forecast.
- The escalation rates included in the model differ from those provided to us by Energex as the basis of its assumptions, and would appear to come from the opex model, and not its capex modelling assumptions.
- Energex does not account for outlier expenditure or volumes in its determination of unit rates, which results in a biased unit rate. There are clear examples of large movements in expenditure and/or volumes, which result in a unit rate that is an outlier to the trend or may be zero. Without explanation and correction, these outlier values result in a bias to the unit rates relied upon for determination of the forecast expenditure.

### Application of unit rates to conductor clearance may not reflect efficient level of cost

78. As discussed in our review of the cost inputs for the conductor clearance program in Section 3, we do not consider that the unit rate method applied by Energex (and Ergon) is reflective of the revealed cost that Energex has incurred, or necessarily representative of the efficient level of cost that Energex will incur for the next RCP.

## 2.3.5 Capex portfolio deliverability

79. Energex has provided an assessment of deliverability for its proposed capex and taken together with the discussions during the onsite, we consider that Energex has put in place reasonable processes that should result in deliverability of its program. However, at the project and program level, we have identified the potential for constraints of key resources based on a step increase in activity for SCADA, protection and control category works, which we consider will impact the ability to deliver those programs. We discuss this further in Section 3.

# 2.4 Our findings and implications for our review of governance, management and forecasting methods

## 2.4.1 Summary of findings

Energex does not appear to have addressed some critical feedback provided in the last AER decision

- 80. In its final decision for the current RCP, the AER had some residual concerns that some elements of Energex's risk costs analysis led to risks that were overstated, and Energex had not adequately considered credible options.<sup>13</sup>
- 81. In its RP, Energex has provided evidence of its risk-cost modelling, however at times we found this difficult to interrogate. We were not provided with the basis of the inputs and assumptions that Energex has applied in forming its projects and programs and which we consider reflects feedback provided by the AER to Energex previously, that has not been sufficiently addressed.

### Augex forecasting methods based on a bottom-up build of requirements

82. Ergon's forecast for the aspect of augex we have been asked to review is based on a bottom-up forecast, which is reasonable for this type of work. Ergon describes general increases in augex as being driven by now exhausting available capacity in the network,

<sup>&</sup>lt;sup>13</sup> Final decision - Energex distribution determination 2020-25 - Attachment 5 - Capital expenditure - June 2020. AER. Page 5-13.

which are most relevant to the distribution growth and sub-transmission growth categories, and which also require increases to the SCADA, protection and control category.

- 83. We have not identified any material differences in the planning framework that Energex has applied to developing its forecast capex requirement, that has contributed to a step increase in augex.
- 84. Energex has reclassified its CTG/CTS program from repex to augex, which is included as a new defect driven forecast, to which Energex describes the driver as compliance. We typically see this classified by NSPs as repex and we discuss our assessment of this program further in Section 3.

# A greater focus on compliance is evident in Energex's proposal, however the analysis of compliance risk does not support the level of expenditure that Energex has proposed

- 85. We have observed a greater focus on compliance evident in the increased expenditure directed towards compliance activities. Statements of compliance are peppered through many of the justification statements that Energex has provided in support of its proposed expenditure, and which has had the effect of driving an increase in the expenditure that Energex has and proposes to incur. Accordingly, we looked for demonstrable evidence of the risk and breach of its compliance requirements, or whether new compliance requirements may be resulting in an increase in the required expenditure.
- 86. As presented in our assessment of the proposed expenditure in Section 3, we did not find sufficient analysis of compliance risk to support the proposed expenditure as reasonable and prudent, nor the emergence of new compliance obligations that could have driven an increase in expenditure.

#### Insufficient evidence that the projects and programs had been optimised

- 87. Energex has, in places, claimed that its risk modelling has assisted with its prioritisation of its project and programs. However, we did not find sufficient evidence that the portfolio had been optimised in the aspects of expenditure that we have reviewed. In fact, we found instances where the scope and timing of some projects and programs were subject to multiple dependencies in the grid communications, protection and control augex, and the resultant delivery risks would likely result in a lower program of expenditure being incurred by Energex.
- 88. In many instances the basis for consideration of the project is clear, however Energex has not adequately demonstrated that the augex forecast that it has proposed for the next RCP (for the aspects we were asked to review) would form part of a total capex forecast that reasonably reflects the capex criteria.

# 3 REVIEW OF ASPECTS OF FORECAST AUGEX

We consider that Energex's proposed augex of \$160.7 million for the two categories of 'conductor clearance' and 'grid communications, protection and control' is not a reasonable forecast of its requirements for the next RCP.

We consider that the need for some elements of its proposed expenditure has not been adequately demonstrated and that the forecast for Energex's proposed expenditure for the aggregate of conductor clearance and grid communications, protection and control categories is considerably overstated.

## 3.1 Introduction

- 89. In this section, we present our assessment of the forecast augex that Energex has proposed for the two categories of 'conductor clearance' and 'grid communications, protection and control' in the next RCP.
- 90. We reviewed the information provided by Energex to support its proposed augex forecast, including a sample of projects and programs contained within these categories where relevant.
- 91. We sought to establish the strategic basis for, and the reasonableness of, Energex's proposed augex for each of the identified categories of expenditure. Forecast expenditure in the next RCP is reflective of a step increase from the historical expenditure that Energex has incurred and is expected to incur in the remainder of the current RCP.

## 3.2 Overview of Energex's augex forecast

## 3.2.1 Overview

92. Energex has proposed \$610.3 million for augex in the next RCP as shown in Table 3.1. Our scope of review comprises the conductor clearance and grid communications, protection and control categories of augex, totalling \$160.7 million for the next RCP, and which we have highlighted in blue in the table.

	FY26	FY27	FY28	FY29	FY30	Total
Sub-transmission Growth	52.3	38.6	32.2	33.7	60.1	216.9
Distribution Growth	26.9	27.2	28.5	30.1	31.5	144.2
Clearance Programs	11.6	11.6	11.7	11.8	11.8	58.5
Reliability	5.6	5.5	5.5	5.6	5.6	27.8
Resilience	12.3	12	10.6	7.1	8.1	50.1
Grid communications, protection and control	17.1	23.5	24.9	19.2	17.5	102.2
Cyber security	2.1	2.1	2.1	2.1	2.2	10.6
Total	127.9	120.6	115.6	109.5	136.8	610.3

Table 3.1: Augex by category (\$m, FY25)

Source: Energex Regulatory proposal, Table 35

93. Energex included \$13.8 million in its Operational Technology Cyber Security Replacement project (project ID 34) within the grid communications, protection and control augex, in addition to the \$10.6 million Operational Technology New Cyber Security Capability project (project ID 39) shown in the augex summary in Table 3.1. We consider the cyber security projects, as a part of the broader cyber security program in a separate report to the AER.<sup>14</sup>

## 3.2.2 Augex trend

94. In Figure 3.1: Energex augex trend (\$m, FY25)Figure 3.1 we show the augex trend compared with the augex component included in the AER capex allowance. All expenditure has been inflated to real FY25 dollars, and for the purposes of allowing comparison to the historical data also includes Energex's proposed real cost escalation.

*Figure 3.1: Energex augex trend (\$m, FY25)* 



Source: EMCa analysis of Energex Regulatory proposal, Table 33 and Table 34

- 95. Due to the drivers of augex, the capex profile tends to be lumpy in nature, varying both year on year and RCP to RCP. Whilst a trend is instructive in terms of looking for changes in the drivers of augex between RCPs, historical revealed costs are less helpful in aggregate.
- 96. What is clear is that the 2010-15 RCP included a large investment in augex, which followed review of the jurisdictional planning standards and which was significantly reduced in subsequent periods. The absence of growth (or ability of the network to meet the growth without further augmentation) is observed in the 2015-20 RCP, and then increases are apparent in 2020-25 and (as proposed) for 2025-30.
- 97. At a category or program level, the revealed costs can be helpful for those programs that span multiple years or RCPs. For the components of augex we have been asked to review, we provide a summary and trend in the relevant assessment sections.

<sup>&</sup>lt;sup>14</sup> The total proposed augex for two cyber security projects for the next RCP is \$24.4 million.

## 3.3 Assessment of forecast augex for conductor clearance

## 3.3.1 Energex's proposed capex

98. Energex has forecast capex of \$58.5 million for conductor clearance for the next RCP to remediate 3,995 defects. Annual capex is shown in Table 3.2 as included in the business case.

Project/program title	FY26	FY27	FY28	FY29	FY30	Total
Clearance to Ground (CTG)						
Number of defects	631	631	631	631	631	3,155
Unit costs (\$,000)	12.4	12.4	12.4	12.4	12.4	n/a
Clearance to Structure (CTS)						
Number of defects	168	168	168	168	168	840
Unit costs (\$,000)	14.1	14.1	14.1	14.1	14.1	n/a
Total (\$m, Dec 2022)	10.2	10.3	10.2	10.2	10.2	50.8
Total (\$m, FY25)	11.6	11.6	11.7	11.8	11.8	58.5

 Table 3.2:
 Summary of Clearance to Ground & Structure program for next RCP

Source: Energex 5.5.01 Business case Clearance to Gound & Structure program – January 2024, Table 4 and Energex's SCS capex model

- 99. In its SCS capex model, Energex has split the Clearance to Ground & Structure program across two separate line items, totalling \$58.5 million (project ID 23 and 32).
- 100. Energex proposes to remediate outstanding and forecast level 1-5 defects within its remediation timeframes while monitoring and opportunistically rectifying the lowest priority level 5 defects. Energex proposes to phase the program in the context of deliverability of the overall program of work for delivery and which leads to small differences in each year.

### **Consolidation of program**

- 101. During the current RCP, Energex (like Ergon) classified the clearance program as repex up until FY22, and from FY23 recorded the program expenditure as augex.
- 102. In Table 3.3 we provide a summary of the clearance program in aggregate as advised to us by Energex in its response to an information request. From this same data we provide a time series in Figure 3.2.

#### Table 3.3: Summary of Clearance to Ground & Structure program (\$m FY25)

	Current RCP	Next RCP
Clearance to Ground & Structure program	49.3	58.5

Source: EMCa analysis of Energex response to IR31, Question 1

#### *Figure 3.2: Clearance program time series (\$m FY25)*



Source: EMCa analysis of Energex response to IR31, Question 1

103. We observe a large spike associated with the program in FY19, that Energex associated with rectification following the initial survey of its network. The Energex network was first flown in 2018 parallel with Ergon's Cycle 6. In response to our information request,<sup>15</sup> the first cycle of Energex's flights captured most historical clearance defects. Subsequent reduction in defects for the next cycle (Cycle 7) is a reflection on the initial flights effectively 'sweeping up' remaining defects.

## 3.3.2 Our assessment of capex forecast for conductor clearance program

### Conductor clearance program is an ongoing program of compliance

- 104. Energex has a legislative obligation including 'Queensland Electrical Safety Regulation 2013, Schedule 4' to maintain minimum electrical clearances of its overhead conductors to ground (CTG) and conductors to structure (CTS) to ensure public safety, in accordance with its obligations. Energex also provides regular status updates on its program to the ESO.
- 105. Energex states that prior to 2013, electrical clearance issues across the network were identified by visual inspections and assessments performed in its cycle of inspections. In 2015, Ergon engaged a LiDAR provider to survey its distribution network to detect clearance breaches. In 2018, this was expanded to include Energex's network.

### Awareness of breaches of compliance creates an obligation to act

- 106. Ergon's LIDAR program has identified many defects where breaches have been recorded against conductor clearance requirements. It is assumed that the lines to which the identified defects relate were built to the standard of the day, and that the breaches have been determined against that assumption. Ergon provided information that supported this assertion. These methods have now been applied to the Energex network, commencing in 2018.
- 107. EQ has established a prioritisation method for rectification of defects, and the timeliness of rectification is monitored by ESO, for both Ergon and Energex.

Detailed advice is provided to the AER as part of a review of Ergon's clearance program commencing in FY19, and which have a bearing on Energex's practice

108. We were requested to undertake a review of the ex post period expenditure by Ergon, and which includes the conductor clearance program as a driver of capex that exceeded the capex allowance for that period. At Ergon, the capex was initially classified as repex during

<sup>&</sup>lt;sup>15</sup> Energex's response to IR018. Question 5.

the period FY19 to FY21 of the ex post review period, and then in the final two years of the ex post review period as augex.

- 109. We identified a range of issues that included:
  - Ergon has included agricultural land as high risk which is likely contributing to a higher number of defects. Based on Energex's primarily urban network, we are not convinced this is a material matter for Energex.
  - ESO notices highlight gaps in adherence with Ergon standards.<sup>16</sup> Whilst the same standards are in place for Energex, we were not alerted to ESO notices that applied to Energex relating to matters of conductor clearance.
  - Delivered solutions are claimed to be based on the lowest cost option. These are captured in the common EQ standard.
  - Evidence of adherence to field verification step has not been provided. This issue is likely to apply to Energex as it does for Ergon, primarily that whilst some steps are in place to validate defects, further verification steps help ensure that the process does not materially over or under identify defects for remediation. We did not have the same data for Energex to undertake an analysis of the number of defects that are within the accuracy tolerance of the LiDAR results to determine whether the bias to upgrade the Ergon network, similarly existed in the data for the Energex network.
  - Analysis of the root cause has not been presented to ascertain whether the lowest cost mitigation has been applied in developing the forecast. Given the longer history available to Ergon in managing clearance defects, we consider that it is more likely than not that Energex (like Ergon) has also not properly analysed the likely root causes of its conductor clearance issues, to inform its risk mitigation strategies.
- 110. We acknowledge the legislative requirement to meet and maintain safe clearance of its overhead conductor, and whilst clearance standards may have changed since the original construction of some lines,<sup>17</sup> changes to the design of a line require that the design complies to the standards in place at the time, including clearance. Moreover, there is likely to be a public safety benefit of doing so. However, Energex (and Ergon) has claimed a single driver of compliance and has not detailed where the solution triggers a new design and therefore a more stringent design (and clearance requirement) or where the solution provides a public safety risk/benefit.

# Review of the current RCP performance suggests that the majority of defects have or will be addressed with the current program

- 111. We have not been asked to review Energex's expenditure over the ex post period as we have done for Ergon. However, we note that expenditures in FY18 and FY19 spiked due to the backlog of remediation issues arising from the Cycle 1 LiDAR review conducted in 2016 for Energex, and which presents a similar expenditure profile for Ergon.<sup>18</sup>
- 112. We reviewed the submission by Energex for the current RCP, where we noted that Energex expected to substantially address its clearance defects in that period:

The present LiDAR approach is a point-in-time geospatial solution – clearance issues are identified based upon simple calculation of overhead asset to ground or structure clearance. Energex's recent clearance remediation effort is based upon the system-wide LiDAR scan made in 2016, with work expected to be substantially completed by 2020.<sup>19</sup>

<sup>&</sup>lt;sup>16</sup> In accordance with the Standard of conductor clearance prioritisation and remediation which we understand is common to Ergon and Energex.

<sup>&</sup>lt;sup>17</sup> Clauses referred to as 'grandfather clauses' also exist that accept that existing lines will comply with clearance standards if they continue to comply with the regulatory standards in place at the time of construction.

<sup>&</sup>lt;sup>18</sup> Energex Justification statement CTG CTS January 2019.

<sup>&</sup>lt;sup>19</sup> Energex Justification statement CTG CTS January 2019. Page 1.

113. However, Energex also added a comment that it considers the program will extend beyond 2025, albeit at lower levels, being the result of greater precision arising from the identification and remediation of clearance issues:

The experience reported by Ergon Energy post the initial survey and remediation indicates an ongoing number of clearance issues being identified annually. Energex expects a similar trend. There are multiple reasons for this, notably pole movement in the ground, changes in land use, ongoing community and building construction, and basic conductor temperature and tension physics impacting line sag at different points in time.<sup>20</sup>

- 114. Over the current RCP, Energex estimated that it would require \$36.5 million (\$FY19). In its business case at that time, Energex tested this estimate against a lower estimate of \$16.5 million (or \$3.3 million p.a.) which it considered presented an unacceptable ongoing risk, and an upper estimate of \$60 million (or \$12 million p.a.) to raise all spans to achieve current design standards using ABC construction.
- 115. As shown in Table 3.3, Energex expects to incur \$49.3 million in the current RCP, which compares to its forecast of \$45.4 million<sup>21</sup>, being \$3.9 million above its forecast at that time. Based on Energex's own statements, this would imply that most defects should have been rectified, and the basis for estimating an increase in the clearance program to \$58.5 million for the next RCP is not substantiated.

Information provided to explain historical defects indicates a smaller program than Energex has proposed for the next RCP

- 116. Energex provided the data in Table 3.4 which shows that the number of defects identified at Cycle 7 was 6,622 for CTG and CTS, and which we understand is the total amount identified in the network. Energex adds a further 1,508 for temperature correction, increasing the total outstanding defects to 8,130.
- 117. As Energex has found, we would expect a lower level of defects being identified in the network requiring mitigation in each cycle, as a result of the defect remediation program in place.

Cycle	СТС	СТС ТС	стѕ	Total
1 (Feb 2018)	22,638		3,367	26,005
7 (Jul 2020)	5,149	1,508	1,473	8,130

Table 3.4: Number of identified defects by flight cycle, CTG and CTS

Source: Energex's response to IR018, Question 5

## Forecast of conductor clearance program based on an estimate of historical surveyed defects

118. During our onsite meeting, we asked Energex to provide justification for the estimated number of defects in each year of the next RCP and for the forecast unit costs included in the business case that we already had a copy of. We were seeking to understand firstly why future defects had been included, and the basis of the ratios that Energex had applied. This information was not forthcoming. We were provided with a spreadsheet that included the same information provided in the business case as shown in in Table 3.5.

<sup>&</sup>lt;sup>20</sup> Energex Justification statement CTG CTS January 2019. Page 1-2.

<sup>&</sup>lt;sup>21</sup> The amount is escalated from \$36.5 million in real FY2019, using escalation index provided by Energex in IR031.

Project/program title	No. of defects	2020-25	2025-30	2030-35	Monitor and complete with other work
Cycle 1 <sup>22</sup>	26,005	5	-	-	<i>a</i> 1
Cycle 7	8,130	4,765	1,311	-	2,065
Cycle 8 (estimated)	2,425	224	2,201	-	-
Cycle 9 (estimated)	2,425		483	1,942	19 19
Total	38,985	4,994	3,995	1,942	2,065

#### Table 3.5: Basis of forecast defects by regulatory period

Source: Energex - 5.5.01 - Business Case Clearance to Ground & Structure Program and response to IR29

- 119. We note that Energex's Cycle 1 commenced in 2018, in parallel with Cycle 6 for Ergon, and then aligned with the naming convention adopted for Ergon from Cycle 7 in 2020. Energex's Cycle 8 is expected to commence in February 2024.
- 120. Compared with Cycle 1, the lower number of defects raised in Cycle 7 was due to: (i) approximately 9,239 defects in Cycle 6 being identified as 'no defect found,'; and (ii) the remaining defects after mitigation of those identified in Cycle 1 (over the intervening period). It follows that the work to resolve the defects in Cycle 7 would span the 2020-25 and 2025-30 RCPs due to staggered completion dates, as shown in Table 3.5.
- 121. Whilst Energex estimates that the remaining defects identified in Cycle 8 are lower than Cycle 7, the basis for including a forecast of defects from future cycles of LiDAR surveys remains unclear. We observe that these estimates do not form part of the total defects included in reports to the ESO for Energex (or Ergon) and are not currently known defects by either business.

### We found inconsistencies in the data provided by Energex

- 122. Firstly, the total defects for Cycle 7 in Table 3.5 is 8,141 and not 8,130. Whilst not a material difference, we looked further at the data provided by Energex in response to our information request.<sup>23</sup> We observed:
  - a lower total of defects of 7,310, referred to by Energex as the total with 'Cancelled WO's removed'; and
  - a higher number of 'Monitor only, no action' defects at 2,342 (compared with 2,065 in Table 3.5).
- 123. The estimated defects arising from Cycle 8 were based on the total of 7,310 and not the higher number of 8,130 in the business case. However, the proposed number of outstanding defects of 1,311 included for the next RCP, relies on the total 'Monitor only' defects of 2,065. The values relied upon by Energex are not sourced from the same data set.
- 124. However, the actual surveyed defects, minus the temperature correction amount, was actually much lower at 6,622 as indicated in Table 3.4. We would expect that the data relied upon by Energex should be internally consistent, and the unexplained discrepancies that we have highlighted indicate a potential issue with Energex's quality review process.

Forecast number of new clearance defects in next RCP are based on a percentage of historical clearance defects

125. The forecasting approach adopted by Energex identifies a rate of new defects, based on historical find rates. Specifically, that:

The forecast volumes for Cycle 8 are based on a 30% reduction in CTG and a 50% reduction in CTS defects from Cycle 7. The percentage of L1 - L5 defects for Cycle 8 is based on Cycle 7 actual percentages. As the volume of defects decrease over time, a

<sup>&</sup>lt;sup>22</sup> From the 26,005 clearance defects identified in Cycle 1, 9,239 defects were assessed as 'No Defect Found'.

<sup>&</sup>lt;sup>23</sup> Energex forecast clearance volumes provided with Energex's response to IR029 Question 10.

natural frequency of defects is expected to emerge. This natural frequency is expected to represent the Cycle 8 volumes and carried forward to Cycle 9 at 2,426 defects.<sup>24</sup>

- 126. Firstly, we note that the reduction in CTG defects by Energex is 30%, whereas for Ergon this reduction is 35%. The basis of these assumptions, and why they differ between each business has not been sufficiently justified, however we find that the underlying principle that defects will continue to emerge as a proportion of the historical find rate is not sufficiently supported.
- 127. Energex refers to its estimate of future defects as the emergence of a 'natural frequency' of defects, which implies that Energex expects an ongoing number of lines / bays to breach the clearance requirements under the regulations. We do not consider that this claim has been sufficiently justified, nor has Energex justified its claims that the levels of new defects that it expects to identify are a reasonable estimate.
- 128. Overhead lines are designed to meet clearance requirements operating under a range of environmental conditions, and so the cause of breaches of clearance requirements are most likely changes by third parties or to the surrounding environment (change in soil levels, subsidence leading to foundation failure and encroachment of structures) and whilst possible, but less likely, deterioration of the asset between inspections. Energex has not demonstrated that the find rate of defects is strongly correlated with the age and condition of the line.
- 129. It follows that if Energex has processes in place to manage actions of third parties and has inspection and review processes to identify potential for breaches of clearance for activities in proximity to the overhead lines, the incidence of new unknown defects should be small. Defects would otherwise be expected to be identified as a result of ground inspection methods and prioritised for action on a risk basis.
- 130. If the number of defects identified in Cycle 7 are required to be mitigated as suggested by Energex, and on the basis that a LiDAR cycle surveys the entire network as we understand it, then the forecast should be based on those that will be completed in the next RCP. Inclusion into the forecast of new defects that have not been identified by previous cycles of LiDAR, and which will be required to be rectified, has not been sufficiently justified.

### Temperature correction should further reduce captured defects using LiDAR

- 131. Introduction of temperature correction will also lessen the likelihood that new defects are captured under different flying conditions, as a result of changes to ambient conditions from the last cycle. Energex introduced temperature correction to Cycle 7.<sup>25</sup>
- 132. The reduction factors applied by Energex to estimate its defects for Cycle 8 of 35% in CTG and 50% in CTS defects are based on its Cycle 7 defects, and which include temperature correction, and not the raw results from surveys. Energex does not appear to take account of the impact of temperature correction in lowering the number of future identified defects from its survey processes, having addressed a higher number of defects than was identified during previous cycles of its survey processes.

## Future defects are likely to be much lower than Energex has forecast

- 133. As the LiDAR flight cycle time has moved to three years (across Ergon and Energex), the highest risk items would be expected to be resolved in the three-year period with other lower priority defects extending beyond that time. The subsequent cycles planned by Energex (Cycle 8 and 9) would likely pick up any change of priority in defect from earlier cycles and apply temperature correction for others. Furthermore, any defects not already being addressed, would be prioritised and likely span the 2025-30 and 2030-35 RCPs.<sup>26</sup>
- 134. However, as we have introduced, Energex has not adequately demonstrated that its estimate of future defects is reasonable. There are a number of factors which lead us to

<sup>&</sup>lt;sup>24</sup> Energex - 5.5.01 - Business Case Clearance to Ground & Structure Program. Page 10.

<sup>&</sup>lt;sup>25</sup> Energex's response to IR018. Question 4.

<sup>&</sup>lt;sup>26</sup> Energex 5.5.01 Business case clearance to Ground & Structure program. Page 8.

conclude that the defects that Energex may identify are likely to be much lower than Energex's estimate.

#### Ergon applies an average cost per physical defect approach

- 135. EQ has determined the estimated cost for its clearance programs based on an average cost per physical defect, using unit rates from the most recent 12-months of data. However, unit rates are more commonly applied to repeatable scopes of work, e.g. replace a pole, whereas the resolution of defects can require a wide array of solutions from re-tensioning of the conductor to replacement of a pole and associated pole top equipment. This can result in a wide range of costs per defect.
- 136. EQ acknowledges that unit costs are most effective for like-for-like scopes of work, and that clearance program solutions can be quite different. However, EQ does not offer an alternative costing method.

#### Assumed unit rates are higher than the revealed cost

137. According to Energex (and for Ergon):

Unit rates are based on a dataset that totals the financial costs and the actual units/physicals recorded (based on its Unit of Measure) for the rolling 12 months prior, captured by Standard Job and/or NAMP. The Clearance programs are deemed Physical Programs so this data is then analysed using an 'average cost per physical' lens to produce a preliminary unit rate.<sup>27</sup>

- 138. The unit rates applied by Energex are \$12.4 (\$k, Dec 2022) for CTG and \$14.1 (\$k, Dec 2022) for CTS as shown in Table 3.2. This results in an average blended unit rate of \$14,643 (\$FY25).<sup>28</sup> The rate closely aligns with the average blended unit rate assumed by Ergon of \$14,760.
- 139. We did not have sufficient historical data for the number of closed defect work orders to test the assumptions made by Energex in determining its historical unit cost. However, we consider that the observations made for Ergon are likely to also present for Energex. Specifically, given that the unit cost assumption is similar to that assumed by Ergon, the unit cost for the forecast is likely to be higher than the recent revealed cost. We base this on:
  - For Ergon, the average blended rate is similar to the bundled pole replacement unit rate developed by Ergon in its review of unit rates,<sup>29</sup> which indicates that on average a new pole is required. In similar analysis for Energex,<sup>30</sup> the average blended rate is higher, indicating that on average, works in addition to a new pole are included in the unit cost.
  - For Ergon, the unit rate for the most recent 12-months, the 12-months prior and the 3year average are all lower than the rate Ergon has assumed.
- 140. It is difficult to make broad assumptions as to the nature of mitigation solutions that may be made for Energex compared to Ergon, due to the difference in network design and nature of specific defects. However, we would expect that the solutions would tend to reduce in cost over time as the higher risk and more complex defects are resolved such that new poles are not required as often to address defects. Adopting a higher unit cost is likely to overstate the efficient level of capex that Energex will require.

# Unit rates are a coarse costing methodology, which may not be reflective of the efficient cost

141. We would suggest that a more detailed unit rate analysis for such a large program is required, particularly given the maturity of the program, and that the highest risk defects are likely to have been addressed assuming also that the highest risks may have resulted in

<sup>&</sup>lt;sup>27</sup> Energex's response to IR029. Question 11.

<sup>&</sup>lt;sup>28</sup> Calculated by dividing the total expenditure by the total volume.

<sup>&</sup>lt;sup>29</sup> Ergon - 5.2.08 - Cost Comparison of Ergon RIN Unit Costs to the NEM - December 2023.

<sup>&</sup>lt;sup>30</sup> Energex - 5.2.08 - Cost Comparison of Energex RIN Unit Costs to the NEM - January 2024.

more costly designed solutions. Whilst all of these assumptions may not remain valid, the unit costs of the solutions to be undertaken within this program vary, and an improved forecasting method may be to consider the proportions of solutions that may be applied, or other means to provide greater confidence in the forecast.

## 3.3.3 Our findings of proposed augex for conductor clearance

- 142. We consider that Energex's proposed expenditure for its conductor clearance program is overstated.
- 143. Energex has identified a compliance issue with conductors not meeting the clearance requirements as nominated in its overarching regulations, and which consistent with good industry practice is required to manage the associated risk including remediation once identified.
- 144. The program commenced in the current RCP, and leveraged the process and methodology applied for the Ergon network.
- 145. For the next RCP, the number of defects is based on two assumptions that we do not consider have a reasonable basis, being (i) that despite the identification and rectification of clearance issues currently being addressed, future flights will continue to identify a material number of new defects, and (ii) Energex has not sufficiently taken account of the interaction with other programs that will assist to resolve issues with conductor clearance. We consider that the extent of conductor clearance rectification will be materially less than Energex has proposed.
- 146. We found evidence that the rectification program that Energex commenced in the current RCP had been initially forecast to be substantially complete by the end of the current RCP, and which undermines the basis for estimating the extent of defects for the next RCP that Energex has included.
- 147. We are also not convinced that the solutions that Energex will deploy are reflected in the assumed unit rate, limited by the last 12 months of data. We consider that greater analysis of the solutions, costs and proportion of solutions deployed are likely to identify solutions that in aggregate will incur a lower unit cost.

## 3.4 Assessment of forecast augex for grid communications, protection and control

## 3.4.1 Energex's proposed capex

148. Energex has forecast capex of \$102.2 million for grid communications, protection and control for the next RCP. Annual capex is show in Table 3.6.

 Table 3.6:
 Grid communications, protection and control capex forecast for next RCP (\$m, FY25)

	FY26	FY27	FY28	FY29	FY30	Total
Grid communications, protection and control	17.1	23.5	24.9	19.2	17.5	102.2

Source: Energex's SCS capex model

149. In Table 3.7 we provide a summary of the grid communications, protection and control in aggregate as advised to us by Energex in its response to an information request. From this same data we provide a time series in Figure 3.3.



	Current RCP	Next RCP
Grid communications, protection and control	63.7	102.2

Source: Energex's response to IR018, Question 1





Source: Energex's response to IR018, Question 1

- 150. In its response to information request IR018, Energex states that whilst it has provided historical data, it considers that the accuracy and therefore any reliance placed on the historical data is low. What is most relevant is that the forecast expenditure for the next RCP is a step increase on the historical expenditure.
- 151. In our review, we note that Energex also uses the term Grid Technology when referring to the expenditure under this category, and we may use this interchangeably when referring to Energex's proposal in this report.

## 3.4.2 Program groupings

152. To assist our review, we assigned individual projects with a similar project title in Energex's capex model into project groupings, and which we understood from our discussions with Energex at our onsite meeting were as Energex had organised its capex proposal. We also referred to a response from Energex that assigned projects to the SCADA and protection category. The project groupings are shown in Table 3.8 and Figure 3.4.

	FY26	FY27	FY28	FY29	FY30	Total
Protection	2.3	8.4	11.9	7.4	6.3	36.4
Grid Control	7.3	6.4	4.3	3.9	4.0	25.9
Grid comms	0.8	2.3	2.3	1.8	1.8	8.8
OTE	1.8	1.8	1.0	0.7	0.6	5.9
Intelligent grid	2.2	2.0	2.6	2.6	2.0	11.4
OTE cyber	2.7	2.7	2.8	2.8	2.8	13.8
Total	17.1	23.5	24.9	19.2	17.5	102.2

Table 3.8: Grid communications, protection and control category - with EMCa groupings (\$m, FY25)

Source: EMCa analysis of Energex SCS capex model



*Figure 3.4: Grid communications, protection and control category - with EMCa groupings (\$m, FY25)* 

Source: EMCa analysis of Energex SCS capex model and response to IR031, Question 2

- 153. We observe that grid comms is the largest project grouping, with the capex for the protection project grouping peaking in the middle of the next RCP. We also note a line item for Operational Technology Cyber Security Replacement project as part of the grid communications, protection and control category at a cost of \$13.8 million.
- 154. To confirm our allocations, we asked Energex to provide a list of projects that comprised the grid communications, protection and control category. Energex's response<sup>31</sup> included a list of projects that totalled to \$102.2 million, and which aligned with our own project grouping.
- 155. Energex has included \$13.8 million for cyber security in its proposed grid communications, protection and control category augex, and we consider this as a part of the broader cyber security program in a separate report to the AER.
- 156. Energex did not provide a project grouping that we could apply. We therefore present our assessment against the project groupings we have assumed by considering a sample of projects assigned to each project grouping.

## 3.4.3 Protection project grouping

### Protection grouping is dominated by two key projects, which drive the expenditure profile

157. As shown in Table 3.9, we identified \$36.4 million on protection projects during the next RCP. The proposed expenditure is dominated by the DC and Bus overcurrent protection duplication program (\$19.8 million) which contains 29 individual projects, and the upgrade 110kV feeder from Abermain Bulk Supply to Lockrose bulk supply project (\$12.6 million).

<sup>&</sup>lt;sup>31</sup> Energex's response to IR 031. Question 2.

Table 3.9:	Protection	project	grouping	(\$m,	FY25)	
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Project name	FY26	FY27	FY28	FY29	FY30	Total
DC and Bus Overcurrent Protection Duplication (29 projects)	0.3	2.2	4.9	6.1	6.2	19.8
Upgrade 110kV Feeder from Abermain Bulk Supply to Lockrose Bulk Supply	0.5	4.0	6.9	1.2	-	12.6
Tamborine Village Zone Substation Establish New Earthing Point	0.1	0.7	0.0	Ð	₽	0.9
Gamboorian Zone Substation Establish New Earth Switch	0.1	0.7	0.0	-	-	0.8
Wamuran Zone Substation Establish New Earth Switch	0.1	0.5	-	-	-	0.7
New 33kV Feeder from Pimpama East Zone Substation to Stapleton Zone Substation	0.7		-	-	-	0.7
Establish Protection Relay Fleet Management Capability	0.1	0.1	0.1	0.1	0.1	0.5
Improve Backup Protection Reach for Bald Hills Zone Substation	0.3	0.0			÷.	0.3
Total	2.3	8.4	11.9	7.4	6.3	36.4

Source: EMCa project grouping based on Energex's SCS capex model

### DC and Bus Overcurrent protection duplication program

# Energex proposes a program to duplicate DC supply and bus systems to ensure operation of its protection systems

- 158. The program commenced in the current RCP for prioritised substations and according to Energex is likely to continue beyond the next RCP. The projects for the next RCP are weighted towards the last three years of the next RCP, increasing from a low base in the first year.
- 159. This profile suggests that there will be a sequence of tasks required to develop, plan, coordinate, execute, and commission the programs. This indicates that deliverability of the overall program may be challenging and/or that the proposed work could rollover into the following RCP.
- 160. During FY29, 27 of the 29 projects are included in the work program for that year, and work on all 29 projects is scheduled in FY30. This is significantly more than Energex has indicated its capability to be. We discuss the implications of the proposed work program later in this section.

#### We found insufficient evidence of an overarching strategy

161. EQ's Future Grid Roadmap identifies that two directional flows will be a feature of the future grid but does not provide strategic guidance on the issues and opportunities that this will create for the existing network. The roadmap also notes that:

This transition won't be easy. It will require cultural change, transition of skills, and constant focus on addressing barriers in order to innovate.<sup>32</sup>

162. The Future Grid Roadmap does not identify specific technical issues that will need to be overcome to support the grid of the future. We did not locate any other documents providing strategic guidance on the specific transition issue that these programs are targeted at managing.

Review of aspects of ex ante augex

<sup>&</sup>lt;sup>32</sup> Energex's response to information request IR020-Q10\_EQL's Future Grid Roadmap.

Energex has appropriately identified the drivers but has not always provided convincing evidence of the justification or reason for its selected option

- 163. Energex's project justification statements identify that limitations in the existing protection system are not acceptable in its current operating environment. Specifically, under certain conditions faults occurring on some high voltage distribution lines may not be isolated by the existing protection system. Thereby creating an elevated risk to safety of the public and its workforce.
- 164. Our assessment of the identified drivers for the proposed projects are provided below:
  - Changing network use and increased bi-directional flow it is unclear to us how the proposed solution addresses this issue, the change in current flows and general desensitisation effect from additional HV and LV DER will persist. However, we accept that the solution provides greater local protection, avoiding the need for upstream protection to operate in the event that local substation DC supply systems are inoperative.
  - **Changing customer expectations** EQ has not provided evidence to support its claim that outages attributable to DC supply or bus protection failures are a material driver of declining reliability performance, or that a change in reliability performance is economic.
  - **Compliance with the NER** the core issue appears to be the requirement for protection systems to operate within specified fault clearance times. To achieve this, an N-1 standard is applied to protection systems. This means that when one protection system fails to operate an upstream protection system identifies the fault and isolates the network. Whilst there is time discrimination between the operation of the protection systems, they must isolate the faulted network within the specified clearance times.

Because DC supply system faults can occur and cause the associated protection system to be inoperable, duplication of this component is often used as a solution to reduce the associated risk. In these cases, care is taken to avoid the use of common components within the DC supply systems to prevent common failure modes occurring.

Other options such as protection tripping on loss of the DC supply system are also considered, and according to EQ deployed when required. However, EQ considers that DC supply duplication is the only option.

• **Safety risks** – there are clear safety risks associated with the failure of protection devices to operate. Absent the compliance issue, the program would need to be supported by a robust net benefit assessment, which in our view Energex has not provided. However, EQ has not provided information on how it determined its PoF values used in its NPV model. This information is important to establish a risk-based priority for the proposed program.

### Energex claims it does not comply with the NER and industry practice

165. Energex considers that the current configuration of its protection schemes has not been meeting the NER or industry standard practice for N-1 on high voltage protection schemes. Energex refers to two clauses in the NER:

The National Electricity Rules (S5.1.9(c)) directs a network service provider to provide sufficient primary protection systems and backup protection systems to ensure that a fault anywhere on its transmission system or distribution system automatically disconnects<sup>33</sup>

The National Electricity Rules (section S5.1a.8) prescribes clearing times, require duplicate local main and backup protection schemes to meet industry standard practices of reliability and fault discrimination.<sup>34</sup>

<sup>&</sup>lt;sup>33</sup> Energex's response to information request IR020-Q10\_EQL's Future Grid Roadmap.

<sup>&</sup>lt;sup>34</sup> Individual project justification statements.

#### 166. NER clause S5.1.9 (c) states:

Subject to clauses S5.1.9(k) and S5.1.9(l), a Network Service Provider must provide sufficient primary protection systems and back-up protection systems (including breaker fail protection systems) to ensure that a fault of any fault type anywhere on its transmission system or distribution system is automatically disconnected in accordance with clause S5.1.9(e) or clause S5.1.9(f).<sup>35</sup>

- 167. Our understanding is that NER clause S5.1.9 (c) places a responsibility on an electricity distributor to ensure that its protection systems are *sufficient* to ensure that automatic disconnection of faults occurs within the specified fault clearance times.
- 168. Clauses S5.1.9(e) and clause S5.1.9(f) concern the fault clearance times for protection systems.

### Demonstration of pre and post compliance outcomes has not been provided

- 169. For Energex to conclude that it is non-compliant with NER clause S5.1.9 (c), it would need to have determined that its existing protection systems would not isolate faults within the required fault clearance times. It would also need to identify if this issue is related to its primary or back-up (including breaker fail protection systems). Specifically, Energex would need to ensure that its proposed solution to correct the identified issue would bring it into compliance with NER clause S5.1.9 (c), that is, that its protection system would clear faults within the required fault clearance times.
- 170. We note that the desktop study that Energex has relied upon did not consider factors such as the current health of the existing DC supply assets, the failure rate history and SAIDI (which relates to the duration of outages experienced by customers). The proposed program appears to have been formed on a deterministic rather than probabilistic basis.
- 171. Whilst projected solar PV levels have been used to indicate ongoing implications for protection systems, we have not been provided with an integrated study that accounts for other DER connections such as energy storage, electric vehicle charging and commercial/industrial electrification, that are likely to impact on the way that protection systems will need to operate in the future.
- 172. In addition, Energex has not provided evidence that it has undertaken onsite assessments of the existing protection systems to determine if the existing protection schemes are failing to provide cover for a DC supply failure.
- 173. It would not be sufficient to conclude that, on its own, installation of duplication of the DC supply and bus systems, would bring Energex's protection systems within compliance. Determining both pre and post treatment compliance levels requires detailed technical analysis of the protection systems.
- 174. Assuming that the need can be demonstrated, Energex has not demonstrated that its selected projects address the highest risk items, or are otherwise optimised for service outcomes, benefits or deliverability.

### Claims of public and personnel safety concerns are not substantiated

- 175. Energex has identified that the components of its current protection systems are inadequate to protect workers and the public from risks from faults on several sections of its network. This is a serious safety issue. Whilst the operation of its protection system has been adversely affected by bidirectional energy flows attributable to increased Distributed Energy Resources (DER), the underlying issue appears to have been an inherent design issue.
- 176. Energex would need to have demonstrated how its proposed solution will ensure that it meets its safety obligations in the future but has not done so.

<sup>&</sup>lt;sup>35</sup> NER - v210 – Full. Page 947.

### Energex's proposed program was determined through a desktop study

- 177. Out of its 270 substations, Energex has focused on substations that rely on a single DC supply system or single sub-transmission bus protection scheme and are within a 15km radius of the Brisbane CBD. This resulted in the identification of 31 substations that have only one DC supply system and 35 that have only one sub-transmission bus protection scheme.
- 178. In addition, Energex identified seven meshed substations with voltages >100kV that take supply directly from the Energex 110kV network and have single DC supply and sub-transmission bus protection schemes. Energex's study recommended augmentation to duplicate local DC supply systems and sub-transmission bus protection schemes to 38 of its highest priority locations. We consider that assuming the need is demonstrated, the prioritisation criteria applied by Energex are reasonable.
- 179. However, we found no explanation on how Energex had formed its proposed program being a reduction to the recommended number of sites to be treated during the next RCP to 29.

#### There is no evidence of portfolio level optimisation

- 180. The documents provided by Energex indicate that portfolio level assessments have not been undertaken. For example, there is no evidence that Energex has considered the implications for programs concurrently being undertaken across Ergon and Energex. In addition, we have not seen evidence that consideration has been given to similar proposed repex projects running concurrently with the proposed augex portfolio.
- 181. Many of the resources will be drawn from EQ resources. As Ergon has proposed similar work for its protection systems, resource constraints could emerge.

#### Energex is likely to deliver a smaller program than it has proposed

- 182. Based on Energex's historical delivery of similar protection upgrade projects (being four projects per annum over five years) and its revised design method, Energex considers that up to eight projects could be delivered per year, or up to 40 in the next RCP. <sup>36</sup> Energex's proposed program reflects an increase on its historical delivery of projects, primarily incurred over the final three years of the next RCP.
- 183. Whilst Energex notes that it is confident that it will continue to maintain delivery performance through its robust systems and processes and the targeted strategies, it recognises that:

undertaking augmentation works to establish a duplicated DC supply system or subtransmission bus protection scheme on too many substations within the 2025 to 2030 period will put significant additional load on the work groups within Energex and would be impractical to deliver.<sup>37</sup>

184. We have not seen evidence that targeted strategies for delivering the DC and Bus Overcurrent Upgrade program have been formed and applied when establishing its proposed program, and as a result we consider that Energex would likely deliver a smaller program of works than it has proposed.

#### Upgrade 110kV feeder from Abermain BSP to Lockrose BSP

- 185. Energex has proposed to reconductor approximately 35kms 110kV feeder F7259 between SST136 and SST78 to ensure supply in the area around Lockrose and Gatton area remains compliant with Safety Net requirements, which is a regulatory obligation as outlined in the Distribution Authority.<sup>38</sup>
- 186. It is unclear why Energex has classified this project as a part of its grid communications, protection and control category augex as the solution includes reconductoring of the 110kV feeder only. We suspect this has been classified incorrectly, and this project should be

<sup>&</sup>lt;sup>36</sup> Energex Justification Statements e.g. GT AER Justification Statement SSCMV – Energex. Page 21.

<sup>&</sup>lt;sup>37</sup> Energex - 5.2.07 - Network Deliverability Strategy - January 2024 – Public. Page 18.

<sup>&</sup>lt;sup>38</sup> Upgrade 110kV feeder F7259 from Abermain Bulk Supply to Lockrose Business case.

considered alongside the AER's assessment of Energex's sub-transmission augex category, and the category total reduced accordingly.

## 3.4.4 Grid control project grouping

### Forecast is dominated by a small number of large projects

187. We identified \$25.9 million proposed for grid control augex during the next RCP for 18 projects. Five projects account for 84% of the capex for the Grid Control grouping as shown in Table 3.10.

Table 3.10: Grid control project grouping (\$m, FY25)

Project name	FY26	FY27	FY28	FY29	FY30	Total
Grid Control - Distribution Management System Advanced Functions	1.3	1.4	1.4	1.4	1.4	6.8
Grid Control Operational LV Model	1.2	1.2	1.2	1.2	1.2	6.1
Grid Control - Distribution Management System Version Upgrade	0.9	1.2	1.3	0.9	0.9	5.1
Grid Control Distribution Management System Continuous Improvement	0.5	0.4	0.4	0.4	0.4	2.2
Grid Control Operational LV Model	-	1.5	-	-	-	1.5
Grid Control Distribution Management System Staging Environment Upgrades	0.4	0.4	-	-	-	0.9
Grid Control IEC61850 Non Protection Device Capability	0.4	-	-	12	-	0.4
Grid Control Field Device Log Rotation	0.4	-	-	-	-	0.4
Grid Control RTU Configuration Management	0.4	-		-	-	0.4
Grid Control Operator Training Simulations	0.3	171	57.9		-	0.3
Grid Control Low Trust FEP	0.3	-	-	i <del>C</del>	-	0.3
Grid Control Automated Distribution Management Systems Testing	0.3	-	-	-	-	0.3
GC CSD Upgrade 25-26	0.3	-	-	-	-	0.3
GC CSD Upgrade 26-27	-	0.3	57.1	1.7	202	0.3
Grid Control Distribution Management System Version Upgrade	0.3	-	-	~	-	0.3
Grid Control Underfrequency Load Shedding Distribution Management System Smart Applications	0.1	-	-	05	-	0.1
GC SACS MDC LCS Breakout	0.0	-	-	07	-	0.0
GC FCAS AEMO Data Concentrator	0.0	-	-	-	-	0.0
Total	7.3	6.4	4.3	3.9	4.0	25.9

Source: EMCa project grouping based on Energex's SCS capex model

- 188. In Table 3.10 there are two separate Operational LV Model items as listed by Energex in its capex model.
- 189. Energex explained during our onsite meeting that the above projects are focused on version maintenance of the Advanced Distribution Management System (ADMS), associated systems, and implementing new advanced capability in the ADMS.
- 190. The capex for the remaining 13 projects is proposed for the first 1 or 2 years, which is indicative of projects rolled over from the previous RCP and/or front-loading of the forecast capex, whereby the delivery may be different to that proposed. Collectively, these projects comprised around 16% of the forecast capex.

191. Energex explained that the balance of the proposed capex is focussed on building its support capability and providing multiple small business enhancements within grid control systems.

### Inclusion of the DMS Version Upgrade project is reasonable

192. The project anticipates the timing of upgrades to EQ's ADMS and Mobility systems. The periodic updates are required by vendors to ensure ongoing support. Energex emphasises the importance of ensuring the upgrades are maintained in the following paragraph:

Energy Queensland Limited (EQL) implementation of the

is a state-wide, highly nd network outage

complex mission-critical system for power network control and network outage management.<sup>39</sup>

193. Whilst the sequencing of the various components of the upgrade are currently uncertain, Energex's assumed trajectory is reasonable. The allocation of the \$6.8 million in costs are spread relatively evenly across the five years. No information is provided to explain the reason for this.

## Inclusion of the Operational LV model project is reasonable

- 194. Under EQ's Unified GIS project (UGIS) Energex's legacy Geospatial Information System (GIS) will migrate to the ESRI GIS platform.<sup>40</sup> As part of this transition the LV network will be mastered in the GIS, with LV switches and sites replicated to the DMS. Energex describes this as an opportunity for full connectivity of the LV network model to be built into the DMS enabling visualisation in a geographic layout.<sup>41</sup>
- 195. EQ expects that the importation of the LV Connectivity Model into the DMS for switching capability will open significant opportunities to decrease LV safety risks, improve LV switching operational awareness, and decrease overall GSL and NECF breaches.
- 196. EQ has identified that the data cleansing effort required to bring Ergon's LV connectivity model into the DMS may be significant. The project Justification Statement did not provide any information on how Ergon is planning to manage the risk and associated costs if this eventuated.
- 197. The options analysis is limited to a do nothing counterfactual. This appears reasonable as there is not a logical alternative to the migration of GIS data to the DMS.
- 198. The capex attributable to the project is spread evenly across the five years of the next RCP. Whilst this is probably not what will happen in practice it is a reasonable assumption given that it is being integrated into a larger existing project. The cost estimate also includes a small component for opex.
- 199. The tangible benefits included in the NPV calculation include workflow efficiencies in switching sheet writing (\$90k/year), 50% reduction in GSL and NECF compliance breaches (\$158k/year), and fewer switching incidents resulting from a 25% reduction in LV switching safety risk (both fatality and injury). Net benefits are calculated to be approximately \$8.7 million. We have not been provided information on how these benefits have been determined, or the assumed degree to which the identified benefits can be realised from the data in the existing system.
- 200. Taking action to build in improved visibility of the LV network when unifying systems is good practice. The benefits expected to be realised appear logical and improving safety for field workers and consumers, whilst at the same time achieving ongoing opex savings are desirable outcomes. We note that project delivery is dependent on the completion of four other related DMS projects.

<sup>&</sup>lt;sup>39</sup> WR7789390 GC DMS Version Upgrade SE. Page 4.

<sup>&</sup>lt;sup>40</sup> Energex state that the existing Energex GIS is modelled in Network Facilities Management (NFM).

<sup>&</sup>lt;sup>41</sup> Energex's response to information request IR018. Question 7. WR7789394 GC Operational LV Model SE.

### Inclusion of a second Operational LV model project with the same name is not justified

201. We observed two projects included with the same name. The first at \$6.1 million appears to relate to the supporting documents we were provided. However, we have found no explanation for the additional \$1.5 million augex identified by a second LV Operational Model project, and which appears to be a duplicate of the first.

Absence of a robust delivery and benefits plan to address delivery risks, suggests the broader DMS program will experience delay

- 202. Energex identifies that the ADMS platform in use at EQL has the capability to perform '*smart grid technology and capability around smart self-healing power networks, distribution network state estimation, and distribution power flow studies.*<sup>' 42</sup> The objective of this project is to realise this functionality through implementing the advanced DMS features that provide FLISR (self-healing network), automatic switching sheet writing and power analysis tools on the as-switched network.
- 203. Energex considers that this project may initially be implemented as a pilot project, using the advanced functions on a selected region prior to rolling out over the entire network. The same claim is provided for the Ergon project.
- 204. The implementation of advanced functions option is compared with the 'do nothing' base case. The difference between the base case and upgrade options reveals the expected disbenefits if the added functionality is not gained:
  - Ever-growing control room staff numbers to cope with the growing network, and everincreasing switching sheet numbers.
  - Growing complexity of switching sheets, as the network becomes more complex.
  - Increased focus on public safety and driving need to patrol feeders following a fault leading in increasing restoration times, outage minutes and unserved energy.
  - Risk of reconfiguration of the network to an unprotected situation due to undetectable fault levels.
  - Limited visibility of power flows on the network, particularly reverse flows.
- 205. The net NPV for the project is calculated to be \$47.3 million realised benefits from:<sup>43</sup>
  - Reduced effort required to manually write switching sheets (\$4.3 million per year).
  - Reduced time to locate fault (\$1.8 million per year).
  - Automated fault isolation and restoration resulting in customer minute savings 480MWh per year.
- 206. Energex has also included a DMS Continuous Improvement project to address deferred DMS improvements due to migration of its EMS into the Unified DMS project.<sup>44</sup> Energex considers that the delays have led to issues that are now approaching critical levels where modifications must be made to the system. Energex has included additional financial and reliability benefits from this project and has calculated the net benefits from completing the upgrades to be \$8.1 million, in the business case.
- 207. The collective benefits from these two DMS projects exceed \$55 million in NPV terms, and when added to other DMS projects are much higher. We note that the basis of input assumptions that underpin the estimate of benefits vary across Ergon and Energex, without explanation.
- 208. We have not seen evidence of a roadmap, or benefits realisation plan associated with its DMS projects, or when viewed across EQ. We would expect EQ to put in place rigorous project management monitoring and reporting to track the achievement of these significant benefits.

<sup>&</sup>lt;sup>42</sup> Energex's response to information request IR018. WR7780609 GC DMS Advanced Functions SE. Page 4.

<sup>&</sup>lt;sup>43</sup> WR7780609 GC DMS Advanced Functions SE. Pages 9-10.

<sup>&</sup>lt;sup>44</sup> WR7789392 GC DMS Continuous Improvement SE. Page 3.

- 209. The expenditure profile for both of these projects is allocated evenly over the 5 years of the next RCP. It seems unlikely that this will be the case if the project is implemented, and each project recognises delivery risks due to the dependencies of completing other DMS projects. As a result, when considering the portfolio of improvement projects that Ergon is undertaking, we consider that it is more likely than not that parts of its program will experience delay, and as a result, the expenditure profile will extend into the next RCP.
- 210. As these key upgrade projects are common to both Ergon and to Energex, we would have expected to see an overarching strategy and delivery plan, to assist support the business case for proceeding with these projects, and we did not.

## 3.4.5 Grid communications project grouping

### Proposed capex is allocated across four projects

211. We identified \$8.8 million of capex in the grid communications project grouping for the next RCP as shown in Table 3.11. The proposed expenditure is allocated to four projects with 82% of the forecast contributed by the top two projects which we consider below.

Project name	FY26	FY27	FY28	FY29	FY30	Total
Grid Comms Reliability Core	-	1.1	1.1	0.8	0.8	3.8
Grid Comms - Digital Enablement	0.5	0.8	0.8	0.7	0.5	3.3
Grid Comms Operational Enhancements	0.2	0.2	0.3	0.3	0.5	1.5
Grid Comms - U5078 to Wellington Road Substation Fibre	0.1	0.1	5-2	-	2	0.1
Total	0.8	2.3	2.3	1.8	1.8	8.8

Table 3.11: Grid communications project grouping (\$m, FY25)

Source: EMCa project grouping based on Energex's SCS capex model

### Energex provided Justification Statements at the project and program level

- 212. Energex states that the drivers of the portfolio of augex projects are to improve the availability, reliability, performance, coverage and capacity of telecommunications services. Moreover, that Energex is targeting a number of deficiencies identified in key technology areas to be addressed in individual projects for the next RCP.<sup>45</sup>
- 213. Like Ergon, Energex presents a grid comms investment program comprising replacement and augmentation. The proposed augex totals \$4.99 million (\$Dec 2022) at a NPV of \$0.9 million<sup>46</sup> across three projects. Compared to the proposed repex, the augex is targeted to address known issues with reliability, capacity and coverage.
- 214. We tested the application of the drivers to classify the projects as augex when reviewing a sample of projects, and whilst the program appears small (compared with Ergon's proposal) we did find some issues that lead us to conclude the program is slightly higher than a prudent level.

<sup>&</sup>lt;sup>45</sup> IR018 - Energex - GRID COMMS Investment Program.

<sup>&</sup>lt;sup>48</sup> IR018 - Energex - GRID COMMS Investment Program. Page 28. A value of \$2.32 million is also included in this document, which we consider is in error, being pasted from the similar Ergon document.

# Energex has not adequately demonstrated the need for the scope of reliability improvement projects that it has proposed

- 215. Energex proposes to extend its fibre optic and IP/MPLS network to additional sites and migrate legacy services to IP/MPLS.<sup>47</sup> Through this investment it expects to deploy highcapacity telecommunications connectivity to sites that are currently limited to using third party 3/4G, ADSL or NBN to provide telecommunications services such as SCADA and site security.
- 216. Whilst Energex has described an issue that could well be worthy of addressing during the next RCP, it has not provided convincing evidence and analysis that the proposed timing and scope of the proposed program has been optimised, the criteria applied for selection of the proposed projects or whether the projects form part of a larger strategy across multiple RCPs. Progressing work on the highest risk sections of its telecommunications networks and developing experience and understanding of the timing of the developing issues may result in a lower level of expenditure.

### The cost of the digital enablement project is not well supported, and likely to be in error

- 217. Energex's Grid Comms Investment Program<sup>48</sup> and Digital Enhancement Business Case<sup>49</sup> include a cost estimate of \$0.5 million (\$Dec 2022), based on deployment of substation wi-fi capability to 4 strategic sites annually based on forecast staff presence and service requirement.
- 218. The costs for the counterfactual of \$0.2 million are not well described and at a marginal NPV, the basis for proceeding with the project is not well supported. Energex has included \$3.3 million included in its SCS capex model, and the basis for this much larger cost is not explained and likely to be in error.

## 3.4.6 Operational Technology (OT) project grouping

### Energex program is based on shared operating systems with Ergon

219. The program is the same as the program proposed by Ergon both in content and aggregate annual expenditure profile.<sup>50</sup> This is attributable to the shared operating systems and the development of unified platforms under EQ. The proposed capex comprises three projects as shown in Table 3.12.

Project name	FY26	FY27	FY28	FY29	FY30	Total
OT Program Augmentation	1.2	1.2	-		<b>7</b> .	2.4
OTE Continuous Improvement	0.5	0.5	0.5	0.5	0.5	2.6
OTE Infrastructure Augmentation	0.1	0.1	0.5	0.2	0.1	1.0
Total	1.8	1.8	1.0	0.7	0.6	5.9

Table 3.12: Operational technology grouping (\$m, FY25)

Source: EMCa project grouping based on Energex's SCS capex model

220. Ergon's overarching objective for its OT investments is to:

<sup>&</sup>lt;sup>47</sup> IR018 - Energex - GRID COMMS IP Network Reliability - Business Case.

<sup>&</sup>lt;sup>48</sup> IR018 - Energex - GRID COMMS Investment Program. Page 28.

<sup>&</sup>lt;sup>49</sup> IR018 - Energex - GRID COMMS Digital Enablement - Business Case.

<sup>&</sup>lt;sup>50</sup> Minor differences are present for year on year expenditure for the component projects between Ergon and Energex, and which are not explained.

enable Energy Qld to securely provide business solutions for the continued running of existing applications and adoption of next-generation technologies to improve customer choice and provide cost competitive alternatives to traditional network investment.<sup>51</sup>

221. Whilst development and maintenance of a secure operational environment is important, we do not consider that Energex has sufficiently justified the proposed options for its proposed OT projects, specifically provision for what appears to be multiple programs aimed at 'provisional' sums for unspecified improvement projects.

Multiple continuous improvement programs to manage OT infrastructure are not sufficiently justified

- 222. Energex has included multiple programs that it describes as continuous improvement, aimed at managing the asset lifecycle of its OT systems so that they are secure, reliable, efficient, and able to support new technologies and systems<sup>52</sup> and to ensures its technology infrastructure systems can support new and emerging features and technologies that support the operation of critical control systems.<sup>53</sup>
- 223. Energex considers that many of its existing OTE assets are now approaching or are past their design life. An objective of the proposed program is to ensure Energex complies with EQ's Digital Asset Management Guidelines to not extend operation of the assets beyond their useful life.
- 224. Energex has calculated an NPV for each of its programs. However, we were not provided details of the benefits were quantified, noting the NPV is only marginally positive.
- 225. Given the relatively low NPV for these programs, they have the potential to deliver a negative result. We have no information on a 'do nothing' counterfactual, and a general absence of information to support inclusion of the proposed expenditure. Whilst the aims of the proposed program listed above are important, Energex has not provided sufficient information to justify the inclusion of this project into the forecast, or that multiple programs with a similar purpose are required.

# Requirement for an improvement program when the system is proposed to be replaced is not demonstrated

- 226. Similar to Ergon's RP, Energex has included the OTE **second** replacement and continuous improvement project. We have not specifically reviewed the proposed **second** replacement of **second** is likely to be reasonable. We consider that a similar conclusion is likely to apply to Energex, based on the same rationale.
- 227. Energex considers that the platform is foundational in supporting seamless communications between the control room, field workers, and government agencies in providing the reliable and safe control of the network, and for restoration of critical services to the community in major events.<sup>54</sup> Ongoing maintenance and updating of a critical platform is good practice.
- 228. Energex lists<sup>55</sup> the features expected to be delivered through the update and continuous improvement investment as:
  - Ensure that the communications platform remains stable and secure.
  - Make it easier to communicate during major and severe weather events.
  - Meet its obligations associated with the restoration of power.
  - Facilitate increased communications for an anticipated 9% increase in field staff by 2026.

<sup>&</sup>lt;sup>51</sup> EMCa\_AER Presentation - 13 to 15 May 2024 (Day 1)\_provided to AER. Slide 93.

<sup>&</sup>lt;sup>52</sup> OTE AER Infrastructure Improvements Justification Statement – Energex. Page 4.

<sup>&</sup>lt;sup>53</sup> EMCa AER Presentation - 13 to 15 May 2024 (Day 1) provided to AER. Slide 93.

<sup>&</sup>lt;sup>54</sup> EMCa\_AER Presentation - 13 to 15 May 2024 (Day 1)\_provided to AER. Slide 94.

<sup>&</sup>lt;sup>55</sup> Business case Energex . Page 5.

- Enable control rooms to become more digitalised.
- Make it easier to adapt and integrate new communications technologies.
- 229. Energex has also proposed ongoing augmentation through an existing continuous improvement program. The objectives Energex has set for this program are:
  - Ensure that the platform is integrated with new and emerging communications technologies as they are adopted.
  - That critical calls through these technologies are prioritised appropriately.
  - The platform is foundational in supporting seamless communications between the control room, field workers, and government agencies in providing the reliable and safe control of the network, and for restoration of critical services to the community in major events.<sup>56</sup>
- 230. The additional benefits expected to be obtained through the addition of the continuous improvement component are limited. According to Energex, the additional benefits primarily relate to improved workforce capability and customer and community sentiment. The Business Case document does not provide an adequate explanation for why the proposed additional benefits of the continuous improvement project support the additional investment of \$2.2 million (\$Dec 2022) which is 51% of the cost of the repex for the replacement.
- 231. The proposed sequencing of the investment before and coincident with the planned replacement is also not explained. Based on the limited benefits identified for the additional cost of the continuous improvement project, and our doubt regarding the need for the continuous improvement project we consider that its inclusion in the OTE augex forecast is insufficiently supported.

## 3.4.7 Intelligent Grid Enablement project grouping

- 232. We identified \$11.4 million across five projects in its Intelligent Grid Enablement grouping. The purpose of the expenditure to provide 'operational software systems to support emerging customer needs and provide cost competitive alternatives to traditional network investment.'<sup>57</sup>
- 233. In Table 3.13, the grouping is dominated by two projects:
  - Underfrequency Load Shedding Capability Improvement (split across two projects) \$5.9 million.
  - Early Fault Detection, Research and Industry Enablement and Voltage Regulating Distribution Transformer Trial Programs \$4.1 million.
- 234. We also observed an LV Distributed Energy Resources Management System 'DERMS' project which we would typically associate with its DER integration program and associated DER capex.

<sup>&</sup>lt;sup>56</sup> Business case Energex Page 11.

<sup>&</sup>lt;sup>57</sup> EMCa\_AER Presentation - 13 to 15 May 2024 (Day 1)\_provided to AER. Slide 96.

Table 3.13: Intelligent grid project grouping (\$m, FY25)

Project name	FY26	FY27	FY28	FY29	FY30	Total
Early Fault Detection, Research and Industry Enablement and Voltage Regulating Distribution Transformer Trial Programs	0.8	0.8	0.8	0.8	0.8	4.1
Underfrequency Load Shedding Capability Improvement	1.2	1.2	1.2	-	-	3.5
Underfrequency Load Shedding Capability Improvement	: <del></del> .		. =	1.2	1.2	2.4
IGE Customer Connections Portal Implementation	- <u>-</u>	а <u>ш</u>	0.6	0.6	2	1.1
LV DERMS - DER Integration Business Case	0.3	2 <b>-</b>	-	-	-	0.3
Total	2.2	2.0	2.6	2.6	2.0	11.4

Source: EMCa analysis of Energex's SCS capex model

- 235. Energex has provided justification statements for each of the above listed components. We have considered each of the justification documents and formed the following views:
  - The projects are for research and field trials on various issues relating to identified network issues.
  - The costs of some projects appeared high. We did not identify project cost breakdowns in the documentation provided.
  - There was no identification and quantification of the benefits provided other than the NPV outcomes.
- 236. The supporting documentation and the presentation made by Energex during the onsite meeting have not demonstrated that the initiatives selected for investment are optimal or that the quantification of costs and benefits are reasonable. In addition, we have not been provided sufficient information that demonstrates that provision is not already included in other parts of Energex's submission (including DER capex), and/or opex forecast to continue its collaboration with industry on similar research and development projects.
- 237. In summary, we understand and accept the need for research and pilot programs to assist Energex to stay ahead of emerging issues and risks to provision of reliable electricity distribution services on its network. We consider that these initiatives are so important that they should be given deep consideration in terms of scope and expected outcomes. The standard CBA approach to valuing projects may not be suitable for research projects that may not in the end lead to quantifiable benefits but will none the less have been valuable in some way.

# 3.4.8 Our findings of proposed augex for grid communications, protection and control

- 238. We consider that Ergon's proposed expenditure of \$102.2 million for its grid communications, protection and control category is overstated.
- 239. We do not observe an overarching strategy that applies a framework for the proposed expenditure, and as a result the need for, and relationship between, some of the elements of the expenditure is not sufficiently demonstrated. In general, the level of justification provided was insufficient, and where CBA models were available, we did not have information on the input assumptions that Ergon had used to determine its benefits.
- 240. The projects are similar to those proposed by Ergon, particularly where shared systems / platforms are involved such as for the Operational Technology environment, and which underpins the requirement for an overarching strategy and application to each of the Ergon and Energex's instances.

- 241. Many of the projects and programs that Ergon has proposed for the next RCP are continuing from similar projects and programs that Energex has in place, and which based on representations from Energex, are targeted at identified risks to the grid communications, protections and control assets, and provide benefits to the reliability, security and capacity of the associated assets and systems. To this end, many projects are likely to be prudent to be included in the forecast augex for the next RCP. However, in other cases Energex has not provided sufficient analysis that the project is required to be undertaken or that lower cost alternatives could not be undertaken, such that a lower forecast expenditure would be prudent.
- 242. Energex's proposed increase in expenditure relative to the current RCP is driven by a small number of projects, where the timing of expenditure is back-ended in the next RCP, and we do not consider that these have been sufficiently reviewed from a deliverability perspective. In other cases, the expenditure profile reflects early planning, where the implementation for the project has not yet been considered, and which casts doubt on whether it would be completed within the next RCP.
- 243. Energex has referred to cyber security risks in some of its proposed expenditure for its DMS and broader OT infrastructure and which is separate to its proposed cyber security project included in its proposed augex. We have considered Energex's cyber security program, including \$13.8 million in its grid communications, protection and control category augex, in separate advice to the AER.<sup>58</sup>
- 244. Overall, we find that the projects and programs that form the grid communications, protection and control category were not subject to sufficient review to determine the optimal portfolio, with respect to risk or other service outcomes, nor were we provided evidence that the level of proposed work in this category was required to maintain risk or service levels. In fact, we found evidence of projects in the Intelligent Grid grouping that were of a research and development nature. If such a review had taken place, we expect that Energex would identify a smaller program of work that would require a lower level of augex.

## 3.5 Implications for proposed augex

245. For the reasons stated in sections 3.3.3 and 3.4.8, we consider that the forecasts for Energex's proposed expenditure for conductor clearance and grid communications, protection and control categories are considerably overstated.

<sup>&</sup>lt;sup>58</sup> Total proposed augex for two cyber security projects in the next RCP is \$24.4 million.