Technical Review of Regulatory Proposals

Review of Proposed Network Augmentation and Replacement Capital Expenditure in Energex's Regulatory Proposal 2015 - 2020

Report to

Australian Energy Regulator

from

Energy Market Consulting associates

Strata Energy Consulting

APRIL 2015

This report has been prepared to assist the Australian Energy Regulator (AER) with its determination of the appropriate revenues to be applied to the prescribed distribution services of Energex Limited (Energex) from 1st July 2015 to 30th June 2020. The AER's determination is conducted in accordance with its responsibilities under the National Electricity Rules (NER). This report covers a particular and limited scope as defined by the AER and should not be read as a comprehensive assessment of proposed expenditure that has been conducted making use of all available assessment methods.

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

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

Except where specifically noted, this report was prepared based on information provided by Energex and the AER prior to February 13th, 2015 and any information provided subsequent to this time may not have been taken into account.

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About EMCa

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

About Strata

Strata Energy Consulting Limited specialises in providing services relating to the energy industry and energy utilisation. The Company, which was established in 2003, provides advice to clients through its own resources and through a network of Associate organisations. Strata Energy Consulting has completed work on a wide range of topics for clients in the energy sector both in New Zealand and overseas.

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Findings

Overarching findings and observation of systemic issues

1. Energex has proposed a significant reduction in augex and a step increase in repex for the 2015/20 Regulatory Control Period (RCP). We consider that, whilst the reduction in growth-related augex is supported by revised (lower) demand forecasts, the evidence provided by Energex does not support the proposed level of non-growth-related augex or the proposed step increase in some repex programs.

2. We observed the dominance of a CPI price outcome objective in the top-down challenge of Energex's forecast. Given the head-room afforded by a low WACC, the reduction in augex including the considerable under-spend on augex in the current RCP (relative to the regulatory allowance for this period), and the movement of expenditure into Alternative Control Services (ACS) from Standard Control Services (SCS), we consider that a CPI price outcome objective does not provide a meaningful discipline that would lead Energex to a prudent and efficient capex level, consistent with the NER expenditure criteria.

3. Energex claims that its proposed augex and repex levels are consistent with the AER's augex and repex models, respectively. Whilst Energex's augex modelling does appear to indicate that its proposed expenditure is within scale, its repex modelling presents alternative outcomes that are so wide as to be of little merit. It is difficult to see how these outputs provide any meaningful opportunity for top-down calibration of the proposed expenditure levels.

4. We consider that Energex's application of its risk assessment framework to its proposed augex and repex programs does not provide sufficient justification of risk-based prioritisation. This was evidenced by the inclusion of an inappropriately high number of projects with 'Low' and 'Very low' risk ratings in Energex's capital expenditure forecasts. In our view, this arises from an inadequate top-down challenge, coupled with Energex's application of the CPI price outcome objective as a primary constraint. Accordingly, the overall capex program is not optimised in relation to risk and economic outcomes and Energex's capital expenditure forecast is above that which would reasonably be considered to be prudent and efficient.

Findings specific to augex

5. We consider that the credibility of Energex's augex forecasting methodology is undermined by the following issues:

   i. a significant discrepancy between the top-down and bottom-up forecasts which Energex has not adequately reconciled;

   ii. inadequate description of the forecasting methodology, drivers and prioritisation process for non-growth (compliance) augex projects;

   iii. inclusion of a significant number of projects with low-risk ratings coupled with use of a CPI price objective as the primary top-down challenge constraint; and

   iv. insufficient consideration of net deferrals from targeted demand management and more detailed options analysis.

6. We consider that these issues are systemic and contribute to an over-estimation bias regarding Energex's forecast augmentation expenditure. Specifically, we find that the proposed level of augmentation capex for the next RCP:

   i. has not been adequately linked to a prudent, needs-driven analysis, including efficient timing of expenditure;

   ii. has not been adequately supported by cost-benefit analysis, appropriately-applied risk assessment and effective top-down challenge; and

   iii. is unlikely to reflect a prudent and efficient level of expenditure.

7. An absence of documentation has, in some cases, hindered assessment of the augmentation capex proposal. Since the onus is on the business to provide the regulator with evidence to justify its proposal, this lack of documentation, where it exists, raises further concern as to the prudency of the forecast.

8. Based on our assessment of a sample of augex projects and programs, we estimate the aggregate impact of these biases on Energex's proposed direct augmentation capital expenditure to be in the order of 15% to 25%. This is based on the following findings:

   i. **for growth and compliance augex** - we consider that: (a) the proposed sub-transmission expenditure is heavily front-loaded and dependent on the timing of large block loads with uncertain timing; (b) a proportion of the proposed C2060 distribution expenditure reflects low-risk projects that are candidates for deferral; and (c) a proportion of the proposed C2565 distribution expenditure is not adequately supported;

   ii. **for power quality augex** - we consider that: (a) the proposed expenditure is above the level of power quality monitoring present at most network operators; and (b) the proposed PV remediation is not supported by robust analysis; and

   iii. **for reliability augex** - we consider that the case for increasing expenditure for further reliability improvements is unproven given Energex's current reliability performance and own consumer research. We also consider there to be opportunity for review of the reliability augex program, with a view to reducing its scope, within the requirements of the Distribution Authority.

Findings specific to repex

9. We consider that Energex has developed a bottom-up repex program that is generally based on substantiated focus areas. However, it is seeking to include significantly increased levels of repex in some of its programs, and for this we found insufficient justification.

10. We find that the proposed replacement expenditure was not subject to a sufficiently rigorous top-down challenge. Specifically, we did not find evidence that a top-down challenge process was applied to test the tolerable boundaries of risk and cost.

11. We find that prudency and efficiency of the repex forecast is undermined by the following systemic issues in a large number of repex programs:

    i. insufficient project and program analysis to support the timing and volume of activity, coupled with replacement targets that appear to coincide with regulatory end points;

    ii. risk assessment that has been undertaken at too high a level to assist meaningful decision making both within and across the program;

    iii. aggregate repex modelling presents alternative outcomes that are so wide as to be of little merit for use in a top-down challenge to validate the proposed expenditure levels; and

    iv. inadequate justification of the proposed significant step increases in expenditure.

12. We have not been requested to assess the aggregate impact of these systemic issues on Energex's proposed direct replacement capital expenditure. We consider that the issues described above contribute to an over-estimation bias.

Other findings

13. On sourcing, procurement, deliverability and efficiency we found no material issues that would require an adjustment to proposed capex. We consider that Energex has the resources and capability to deliver the proposed program.

14. Whilst outside the scope of this review, we observe that the allocation of overheads (i.e., 42% indirect cost) to direct capex costs is significant and appears to have been at this level during the current RCP. We consider that the review and planned reduction of overheads is an issue worthy of consideration by the Technical Advisory Group (TAG).

Addressing TAG observations

15. We summarise the AER TAG's initial observations on Energex's proposed network capex allowance in section 2.5. Having completed our review, we respond to the TAG's initial observations as follows.

Preliminary assessment matters

16. We consider that we have addressed the preliminary findings identified by the TAG for the AER, as summarised below:

- A small number of large growth-related sub-transmission projects that dominate the forecast are biased to the front of the RCP period. We reviewed a sample of augex growth projects and included the impact of systemic issues in the summary of implications to the augex forecast;

- AEMO recently reduced the planning value of VCR. We asked Energex what effect this would have, and were informed that it would likely be small. We accept this conclusion; and

- We find that the absence of cost benefit analysis, and inconsistency of data, raises concerns regarding the robustness of the forecast for PV remediation. Further, the step change evident in the RCP is not adequately supported.

Systemic issue hypotheses

17. In regard to the TAG's hypotheses regarding possible systemic issues, we find as follows:

- '**That the business's forecast is reasonable and unbiased**': We observed the dominance of a CPI price outcome objective in the governance of Energex's expenditure forecast that does not reflect a meaningful discipline to ensure the forecast is optimised to achieve prudent and efficient outcomes. We find that Energex's proposed forecast is not reasonable and exhibits a degree of upwards bias.

- '**That the business's costs and work practices are prudent and efficient**': Based on our review of Energex's cost estimation, sourcing and procurement processes and on the network programs that we reviewed, we find that Energex's costs and work practices are prudent and efficient, within the bounds of reasonableness as referred to in the NER.

- "**That the business's risk management is prudent and efficient**": We consider that Energex's risk management framework has elements that reflect a bias towards over-estimation of risk and which contribute to an exaggeration of its forecast for required repex activity.

1 Introduction

1.1 Purpose of this report

18. The purpose of this report is to provide the AER with technical advice on the network augmentation expenditure (augex) and replacement expenditure (repex) that Energex has proposed as part of its 2015 – 2020 Regulatory Proposal. The assessment contained in this report is intended to assist the AER in establishing an appropriate capital expenditure (capex) allowance as an input to its Draft Decision on Energex's revenue requirements.

19. Our assessment is based on a limited scope review[1] in accordance with the terms of reference. It does not take into account all factors or all reasonable methods for determining an expenditure allowance in accordance with the National Electricity Rules (NER). We understand that the AER will establish a capital expenditure allowance for Energex based on assessments undertaken by its own staff.

1.2 Scope and approach

20. The AER issued a Scope of Work to EMCa in January 2015, requesting assistance in identifying any systemic issues that may be resulting in forecasting biases in Energex's replacement and augmentation network-related capital expenditure. The requested assistance was: (1) "*to identify whether Energex's business' processes, systems, behaviours and/or cultures are leading to any biases in the capex forecasts*"; and (2) "*to identify whether these biases mean that the capex forecast does not meet the capex criteria*".

21. The AER noted three areas in which it considered there may be systemic issues:

- Whether Energex's forecast is reasonable and unbiased;

[1] The capex scope agreed was confined to replacement ("repex") and augmentation ("augex") network capital expenditure (including compliance and reliability-related expenditure). The scope for our review excluded consideration of contingent projects, connections and customer initiated works.

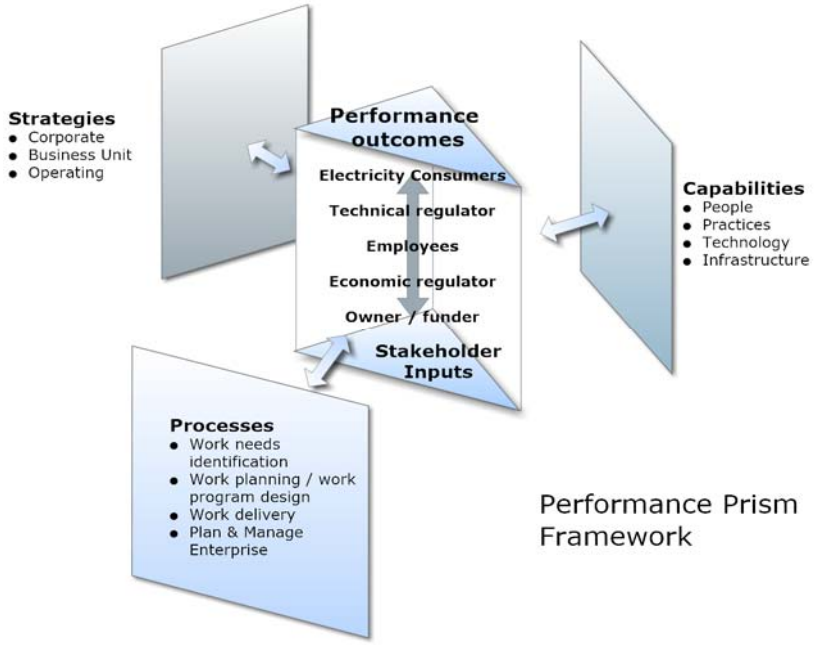
- Whether Energex's costs and work practices are prudent and efficient; and
- Whether Energex's risk management is prudent and efficient.

22. The AER asked us to consider a number of specific matters as part of our assessment. These are summarised as follows:

- Are the forecasts, forecasting practices and assumptions of the business reasonable and unbiased?
- Do any observed differences between historical forecasts and actual expenditures stem from prudent and efficient responses to changes in the business circumstances?
- Are estimates of resources and unit-rates reasonable and unbiased?
- Is investment timing unbiased and reasonably optimal?
- Are the business' (implicit or explicit) identification, characterisation and evaluation of risk reasonable and unbiased?
- Are risk treatments reasonably optimal in terms of customer costs and benefits?

23. We undertook an approach based on assessing the "Performance Prism" in which the performance outcomes of the business are determined by its strategies, processes and capabilities, as shown in the following diagram.

Figure 1: Performance Prism Framework



Source: EMCa, adapted from Performance Prism concept[2]

24. We assessed for systemic issues through: (1) a desktop review of Energex's governance and management, planning, forecasting and budgeting process

2 Neely, A.D., Adams, C. and Kennerley, M. (2002), The Performance Prism: The Scorecard for Measuring and Managing Stakeholder Relationships, Financial Times/Prentice Hall, London

documentation; (2) consideration of Energex's planning and forecasting methodologies, tools and input assumptions; (3) assessment of Energex's proposed replacement and augmentation capital expenditure strategies and plans; and (4) through a two-day on-site meeting at which Energex executives described their use of this framework. To further evidence what the business does, we reviewed a sample of projects and programs.

25. The assessment in this report is based on the information provided to us through this process.

1.3 Structure of this report

26. Our principal findings are summarised at the beginning of this report.

27. In section 2, we provide a contextual overview of Energex's Regulatory Proposal and expenditure trends, along with the hypotheses and focus issues that the AER asked us to assess. This section includes consideration of past augex and repex trends, coupled with Energex's past forecasting performance.

28. In the subsequent five sections, we present the assessment that supports our findings. This assessment is structured as follows:

- In section 3, we describe our assessment of the governance and management processes that Energex uses to plan and approve its augex and repex projects and programs, and any systemic issues that we have found with these processes;
- In section 4, we describe our assessment of the sourcing, procurement, deliverability and efficiency of Energex's programs of work;
- In section 5, we summarise and assess the methodologies that Energex uses to forecast its augex and repex requirements. This is disaggregated into an assessment of augex activity forecasting, repex activity forecasting and the cost estimation methods used by Energex to prepare its expenditure forecasts;
- In section 6, we describe our assessment of the application of Energex's demand forecast and augex forecast by program category. We also identify and quantify our assessment of the prospective impact(s) of any systemic issues that we found in the outcomes of its augex forecasting process; and
- In section 7, we describe our assessment of the application of Energex's repex forecast by program category and identify any systemic issues that we found in the outcomes of its repex forecasting process.[3]

[3] We were not asked to quantify the impact of our assessment of systemic issues applying to Energex's proposed repex

2 Background

2.1 Introduction

29. This section is intended to provide background context to the expenditure assessments which follow. Reference data was primarily sourced from Energex's Regulatory Information Notices (RIN) and its 2015 – 2020 Regulatory Proposal (RP), including supporting documents. Some information is sourced from responses to information requests and material that Energex presented to us at the on-site meetings.

30. We first set out the capex allowances that Energex has proposed, and consider these relative to its historical capex allowances. We consider Energex's capex forecasting performance, as evidenced from variance analysis comparing its historical expenditure with the capex that it claimed to require at the previous revenue reset, and any explanations that Energex has provided for those variances.

31. Subsequently, we summarise the focus issues and hypotheses that the AER has already developed from its initial focus assessment and from its top-down assessments of proposed capex, using other techniques.

2.2 Augmentation expenditure

2.2.1 Summary of Energex's proposed augex

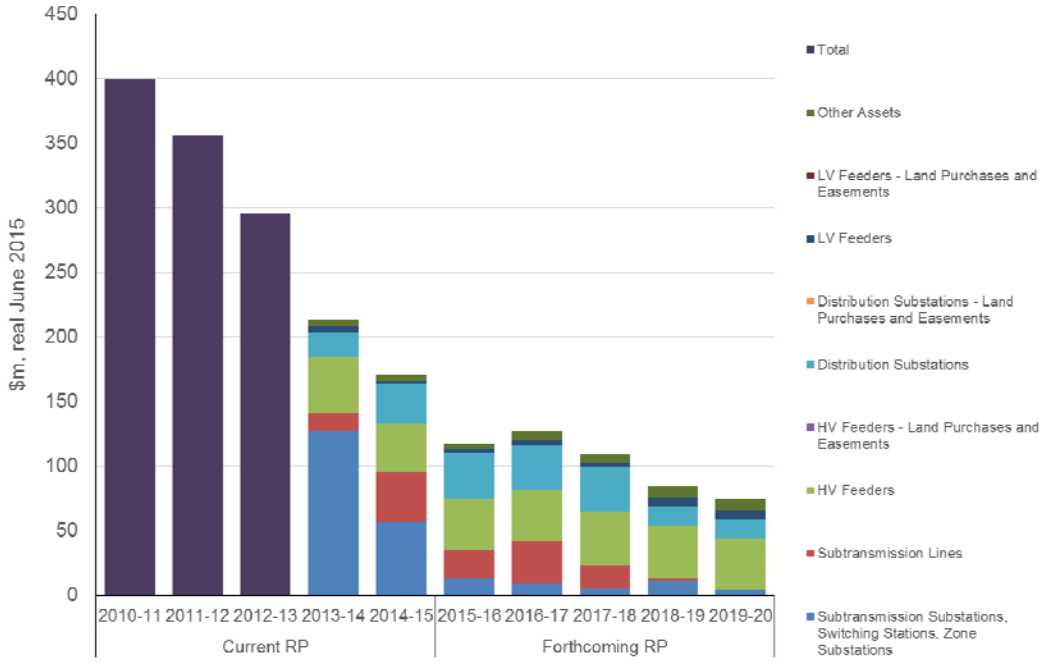
32. From information provided in its Regulatory Information Notice (RIN) documentation, Energex is proposing $513m of total direct augmentation expenditures in the forthcoming regulatory period. Refer to Table 1 and Figure 2 below. This equates to average annual forecast expenditure of $103m, compared to an average annual spend of $287m in the current period.

Table 1: Augmentation capex (direct costs)- $m, real June 2015

	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Subtransmission Substations, Switching Stations, Zone Substations	13	9	5	11	4	**42**
Subtransmission Lines	22	33	19	2	1	**77**
HV Feeders	40	40	41	40	39	**200**
HV Feeders - Land Purchases and Easements	0	0	0	0	0	**0**
Distribution Substations	34	34	34	15	15	**133**
LV Feeders	4	4	4	7	7	**25**
Other Assets	4	7	7	9	9	**35**
Total	**118**	**127**	**109**	**85**	**74**	**513**

Source: Energex RESET RIN 2015-20 – Consolidated Final

Figure 2: Augmentation capex (direct costs) - $m, real June 2015



Sources: Energex RESET RIN 2015-20 – Consolidated Final. Note: the RIN data only provided details of augex expenditure from 2013-14 to 2019-20. We used the total figures for 2010-11 to 2012-13 for the completeness of the data trend.

33. As provided in Energex's 2015 - 2020 Regulatory Proposal and capex summary documents, Energex is proposing a total of $726m for augmentation capital expenditure (including direct and indirect costs) in the forthcoming regulatory period.

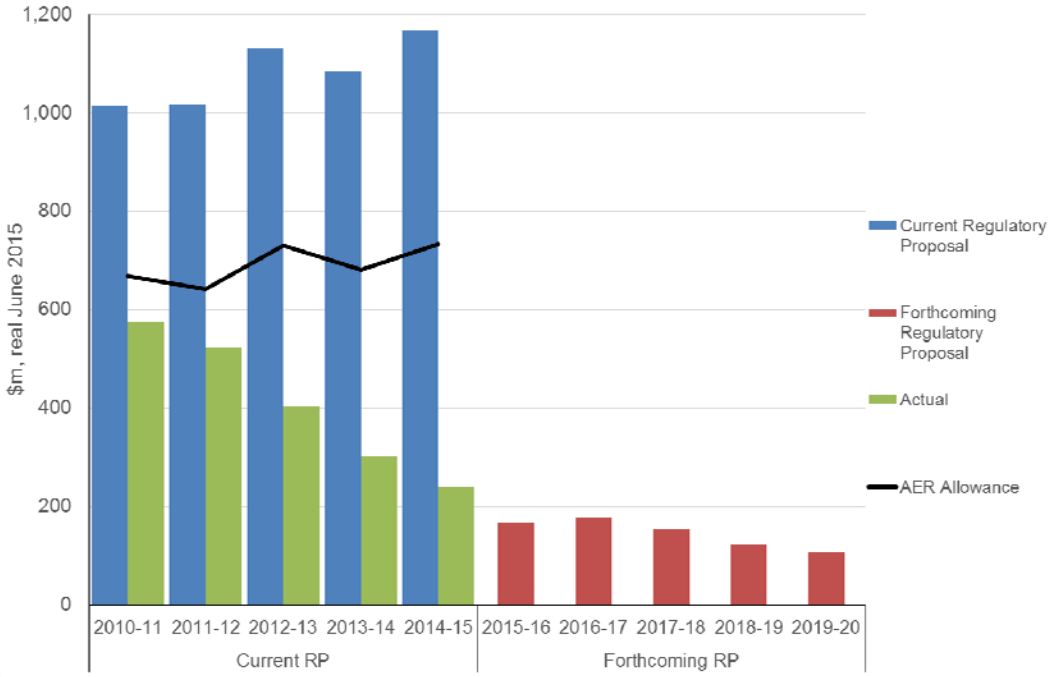
34. Table 2 and Figure 3 below provide a comparison of augex between the current and forthcoming RCP. Energex's actual augex spend in the current RCP of $2,042m is $1,414m less than its AER allowance of $3,456m.

Table 2: Total augmentation capex (direct & indirect costs)- $m, real 2014-15

	Current RCP	Forthcoming RCP					
	Total	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Regulatory Proposal	**5,416**	167	178	155	121	105	**726**
AER Allowance	**3,456**	-	-	-	-	-	**-**
Actual	**2,042**	-	-	-	-	-	**-**

Sources: AER EGX 028 - Capex summary 040215 and RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, table 9.1, page 104

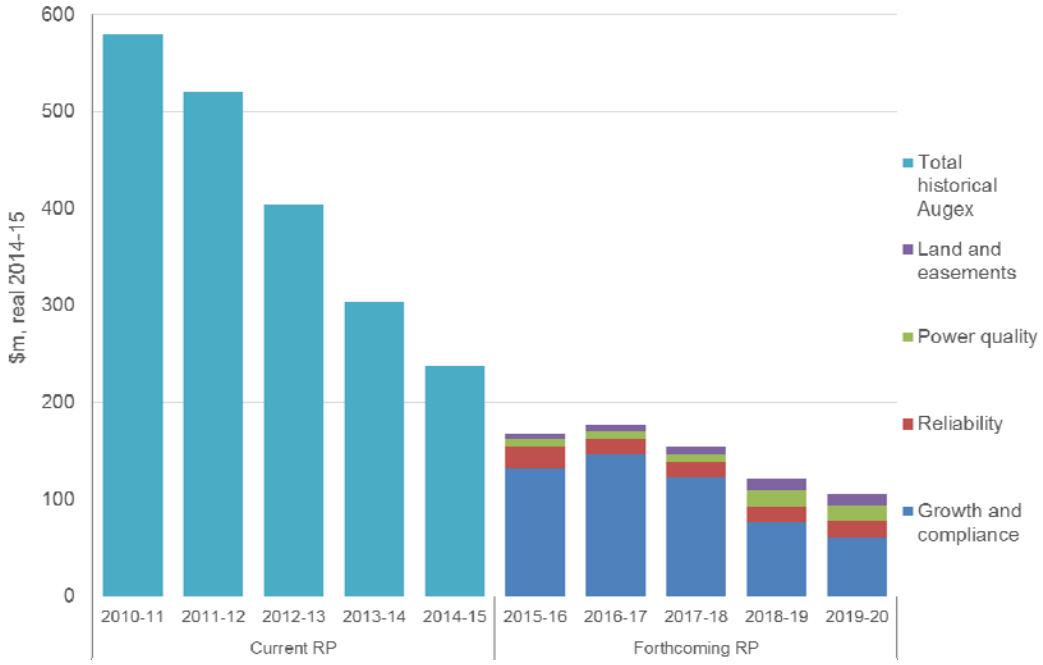
Figure 3: Total augmentation expenditures (direct & indirect costs) by RCP, including current RCP AER allowance - $m, real 2014-15



Sources: AER EGX 028 - Capex summary 040215 and RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, table 9.1, page 104

35. Figure 4 below provides a summary of Energex's proposed augex by expenditure category for the forthcoming RCP.

Figure 4: Proposed augex by category (direct & indirect costs) - $m, real 2014-15



Source: RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, Table 9.5 page 134 and Table 9.2, page 127

36. In its regulatory proposal, Energex describes the proposed augmentation capex as being driven by the need to address localised increases in peak demand, improve the

reliability of worst performing feeders, mitigate power quality issues, and purchase land and easements for the long term development of the network. Energex also identifies other proposed augmentation expenditure for network compliance issues.

2.2.2 Observations on augex trends

37. Energex's augmentation capex has reduced during the current regulatory control period. This is primarily driven by a reduction in peak demand growth, the ENCAP review in 2011-12 and, more recently, changes to the Distribution Authority. Energex has reduced its forecast for the forthcoming RCP to reflect subdued growth in peak demand and the requirements as now set out in its Distribution Authority.

2.3 Replacement expenditure

2.3.1 Summary of Energex's proposed repex

38. From information provided in its Regulatory Information Notice (RIN) documentation, Energex is proposing $1,250m of total direct replacement expenditures in the forthcoming regulatory period. This equates to average annual forecast expenditure of $250m in the forthcoming RCP, which reflects a 59% increase over the average annual spend of $157m in the current RCP. Refer to Table 3 and Figure 5 below for details of repex by year and asset category.

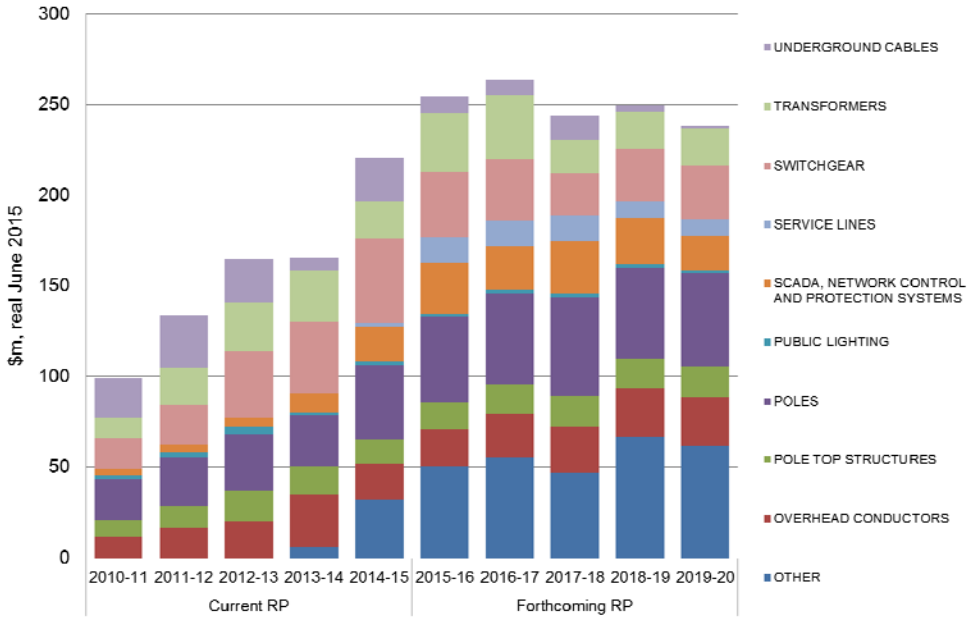
Table 3: Replacement expenditures (direct costs) - $m, real 2014-15

	Current RP	Forthcoming RP					
ASSET GROUP	Total	2015-16	2016-17	2017-18	2018-19	2019-20	Total
OTHER	**38**	50	55	47	67	62	**281**
OVERHEAD CONDUCTORS	**98**	21	24	25	27	27	**124**
POLE TOP STRUCTURES	**67**	15	16	17	16	16	**80**
POLES	**149**	47	50	54	51	52	**253**
PUBLIC LIGHTING	**13**	2	2	2	2	2	**10**
SCADA, NETWORK CONTROL AND PROTECTION SYSTEMS	**42**	28	24	29	25	19	**124**
SERVICE LINES	**2**	14	14	14	9	9	**60**
SWITCHGEAR	**162**	36	34	23	30	30	**153**
TRANSFORMERS	**107**	32	35	18	20	20	**126**
UNDERGROUND CABLES	**107**	9	9	13	3	2	**36**
TOTAL	**785**	**254**	**264**	**244**	**249**	**238**	**1,250**

Sources: Energex RESET RIN 2015-20 – Consolidated Final[4]

[4] For information on expenditure related to "Other" category, please see section 7 (repex)

Figure 5: Replacement expenditures (direct costs) - $m, real 2014-15



Sources: Energex RESET RIN 2015-20 – Consolidated Final.

39. As provided in Energex's 2015 – 2020 Regulatory Proposal and capex summary documents, Energex is proposing total replacement expenditures of $1,773m (including direct and indirect costs) in the forthcoming regulatory period. Table 4 and Figure 6 below provide a comparison of replacement expenditures between the current and forthcoming RCP.

40. Energex forecasts that its actual repex spend in the current RCP of $1,195m will be $137m less than it proposed in its 2010 RP and $38m less than the AER allowance. However, Energex is currently tracking $30m behind its year-to-date budget for the main categories (C20 and C25) in 2014/15, so it would appear that its Actual spend for the current RCP will be less than is shown in its Regulatory Proposal.[5]

41. Energex's proposed total repex of $1,773m in the forthcoming period is $578m (48%) higher than the presented total actual repex of $1,195m in the current period.

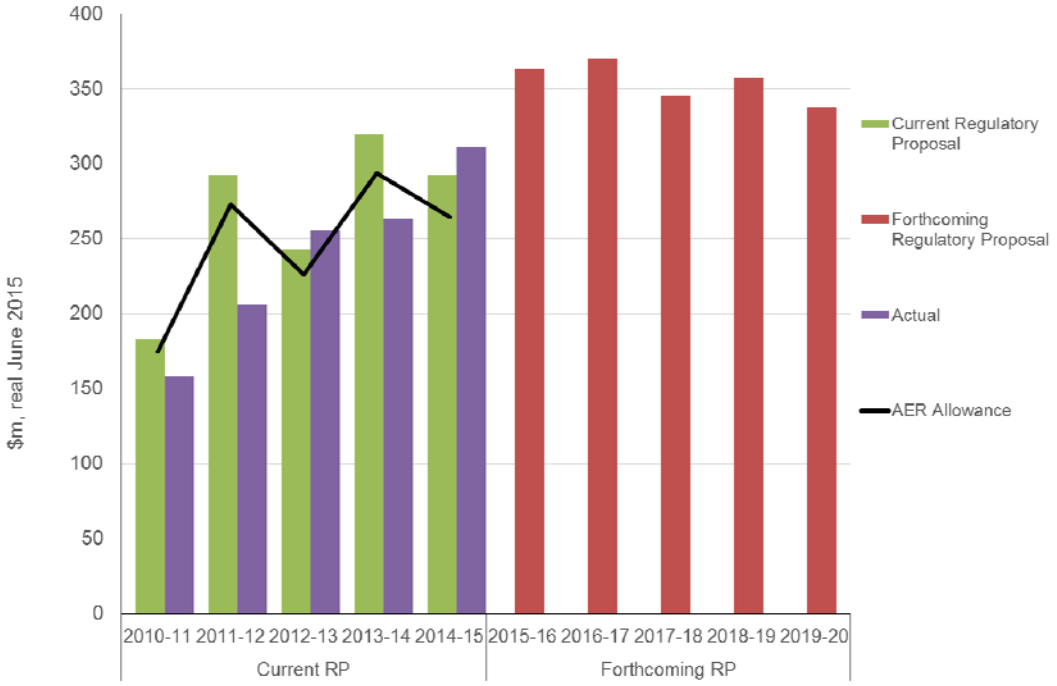
Table 4: Total repex (direct and indirect costs) - $m, real 2014-15

	Current RCP	Forthcoming RCP					
	Total	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**Total**
Regulatory Proposal	**1,332**	363	370	345	357	338	**1,773**
AER Allowance	**1,233**	-	-	-	-	-	**-**
Actual	**1,195**	-	-	-	-	-	**-**

Sources: AER EGX 028 - Capex summary 040215 and RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, table 9.1, page 104

[5] EGX031, response to question EMCa021, section 1.3

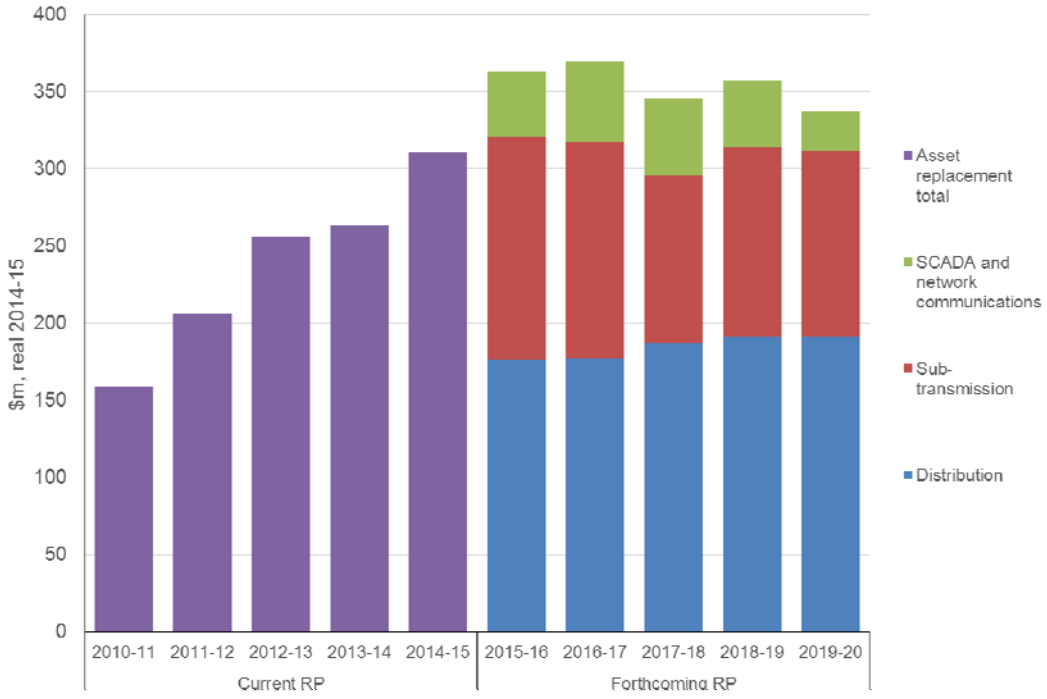
Figure 6: Total repex (direct and indirect costs) - $m, real 2014-15



Sources: AER EGX 028 - Capex summary 040215 and RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, table 9.1, page 104

42. Figure 7 below provides a summary of repex (including direct and indirect costs) by expenditure category for the forthcoming RCP.

Figure 7: Replacement expenditures by category (direct and indirect costs) - $m, real 2014-15



Source: RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014, Table 9.5 page 132 and Table 9.2, page 127

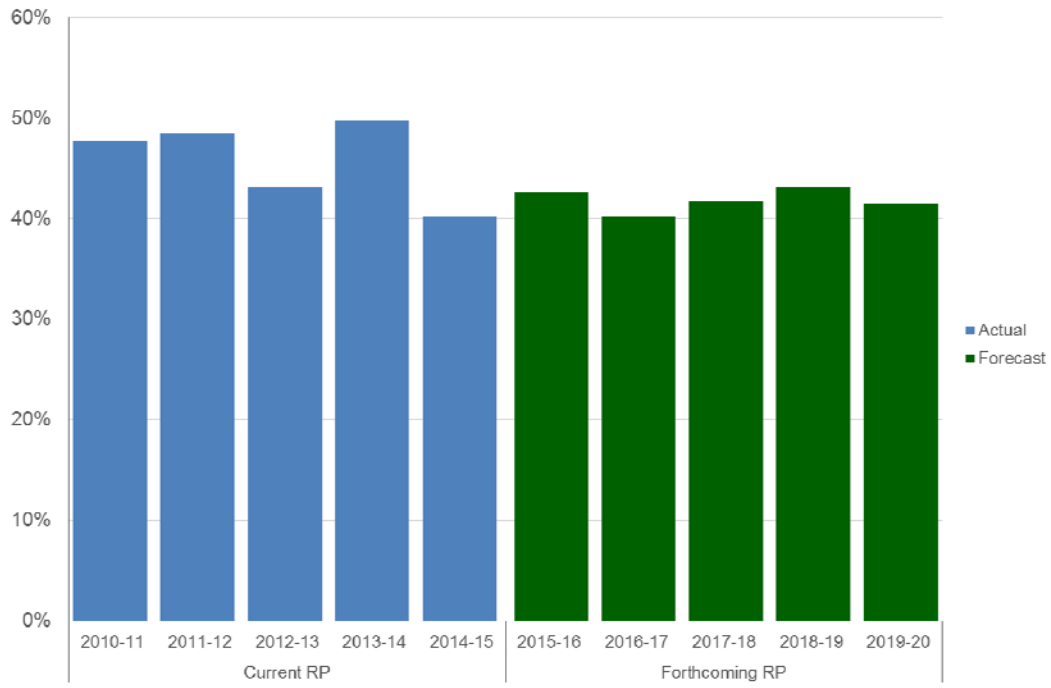
2.3.2 Observations on repex trends

43. Energex describes its focus for repex as being on safety, maximising the value from existing assets, and the replacement or renewal of ageing assets to maintain existing levels of service and safety. Given the head-room afforded by a low WACC, and the movement of significant expenditure into Alternative Control Services (ACS) from Standard Control Services (SCS) the increase of 59% in direct costs (48% increase in total costs) is clearly significant. Moreover its proposal is for an immediate and significant step increase in 2015/16, relative to current year (2014/15) expenditure and which it appears Energex will under-spend by $30m. In section 7 of this report, we looked for evidence that might justify such an increase.

2.4 Capex overheads

44. While the focus of our review has been on capex direct costs, we had reason to observe the level of indirect costs in Energex's proposal relative to direct costs, and which are shown in the graph below as an "on-cost" percentage. These show a stable / declining trend, indicating that Energex has assumed that its indirect cost overheads will adjust broadly in line with its direct capex requirements.

Figure 8: Ratio of capex on-costs (indirect costs / direct costs)



Source: AER EGX 028 - Capex summary 040215 and Energex RESET RIN 2015-20 – Consolidated Final

2.5 AER's focus issues and hypotheses

45. In its preliminary assessment, the AER noted that:[6] (i) Energex's augmentation expenditure appeared to include a small number of large growth projects where demand forecasts had been historically over-estimated; (ii) the impact of solar PV on its forecast

[6] Based on advice provided to EMCa by the AER as part of the terms of reference

requires investigation; (iii) the replacement expenditure is increasing around 30% compared to last RCP or almost 200% (comparing to 2008-10 on a direct cost basis); and (iv) that the expenditure justifications provided did not seem to be consistent with good industry practice.

46. The AER identified a number of areas in which there may be systemic issues with business' capex forecasts. They identified three hypotheses:

- **'The business' forecast is reasonable and unbiased'**: the business' proposed expenditures are a reasonable forecast of the unbiased efficient cost of maintaining performance at the required or efficient service levels. There are no in-built systemic biases which result in the forecast being higher or lower than is efficient.

- **'The business' costs and work practices are prudent and efficient'**: the business uses the minimum resources reasonably practical to achieve the capex objectives and maintain the required or efficient service levels.

- **'The business' risk management is prudent and efficient'**: the business manages risk such that the cost to the customer of achieving the capex objectives at the required or efficient service levels is commensurate with the customer value provided by those service levels.

3 Governance and Management Framework

3.1 Overview

47. In this section, we describe our assessment of the governance and management processes that Energex uses to plan and approve its augex and repex projects and programs. We also identify and discuss any systemic issues that we found with these processes.

48. Energex has a governance structure comprised of: (i) the Audit and Risk Committee (ARC) responsible for overall oversight of the risk management structure for the Board; (ii) a Regulatory Committee to assist the Board in relation to the preparation of its Regulatory Proposal (including pricing proposal and significant regulatory issues); and (iii) the Network & Technical Committee (NTC) to recommend strategies and approaches to the Board on network and technical issues. Each committee is governed by a charter established by the Board, which sets out its role and responsibilities and how the committee will operate.[7]

49. The committee charter for the NTC states that the overarching role of the NTC is to "*oversee Energex's approach to the distribution of safe,* reliable electricity, consistent with the balanced commercial framework approved by the Board".[8] The charter includes providing oversight of management's planning and implementation of technical systems, capital and operating investment, plans and resourcing to address identified issues.

50. In the delivery of Energex's Program of Work (PoW), the CEO is supported by the Executive Management Team Network Operations Committee (EMT NOC). The role of

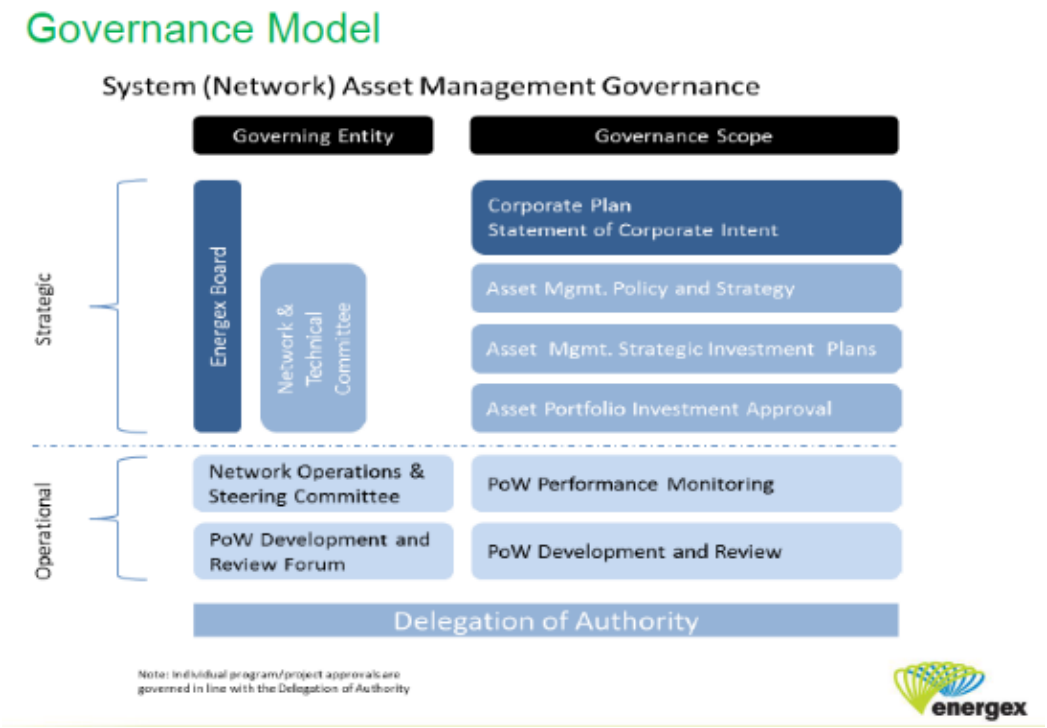
[7] Appendix 50 - Energex's Enterprise Risk Management – Risk Management Overview, page 4

[8] Network & Technical Committee Charter - Section 2, page 1

the EMT NOC is to *"review and advise on the establishment and performance of the program of works against the plan"*.[9]

51. We are advised that "*the overall Program of Work (PoW) has been developed within the Energex strategic objectives, Corporate Plan and annual Statement of Corporate Intent with Board level direction and oversight by the Board and NTC*".[10] Energex has an asset management policy and strategy that provides the overarching direction and objectives for asset management. The asset management strategic objectives are supported by a range of strategies and plans, Network Asset Management Programs (NAMP) and Project Approval Reports. Energex's governance model is shown in Figure 9 below.

Figure 9: Energex Governance Model



Source: Overview AER_EMCA Pres Jan 2015 Augex Day 1 - Part A, slide 13

52. Collectively, this reflects a typical utility investment governance framework.

53. Energex states that it's proposed expenditure is based upon meeting the following objectives:

- "*We will deliver network price stability to reduce costs to customers and deliver a price decrease should the Queensland Government Solar Bonus Scheme be removed from our network prices";*
- *"We will continue to deliver a safe and reliable electricity supply to homes and businesses and plan our network to meet future needs and technologies";*
- *"We will continue to deliver services to our customers including demand management programs, easy to use communication channels, tree trimming,*

[9] Executive Management Team Network Operations Committee (EMT NOC) Section 2, page 1

[10] AER EGX 025 Q5 PART 1 - Governance and Portfolio Management, page 1

community safety as well as storm and emergency response. We commit to providing customers with a safe and reliable electricity supply as well as high standards of service".[11]

54. Energex's objectives of safety, reliability, efficiency and sustainability underpin its strategy. Its governance processes are aligned with its committee charters,[12] asset management strategy,[13] corporate plan,[14] policies and procedures, and its design, operations, and maintenance standards.

3.2 Assessment

3.2.1 Managing to a desired price outcome

55. Energex states in its Regulatory Proposal that, in the context of delivering efficiencies in its capex and opex programs, it "considers that customers' concerns, particularly with respect to prices, have been taken into account in this regulatory proposal, noting network prices are expected to stabilise over the forthcoming regulatory control period whilst network performance is maintained".[15] We looked for further evidence of this in our assessment of how Energex was taking a price outcome objective into account in establishing a prudent and efficient capex forecast in its RP.

56. In its 5 year corporate plan, Energex states that: "*Over the next five years, Energex will focus on achieving stable and predictable energy prices and offering valued energy services to customers and sustainable returns for shareholders. This is consistent with Energex's 2015-20 Regulatory Proposal and the Government's priority to reduce electricity prices and improve overall business efficiency*."[16] We did not see explicit evidence of this directive to Energex from Government. We did see evidence that price was a key objective in the development of Energex's forecast.

57. Energex stated an aspirational revenue objective to "*deliver controllable network price increases of CPI (or less) sustainably.*"[17] We note that the CPI (or less) target appears to be a foundational objective of its corporate planning and asset management strategies.[18] Energex states in its corporate plan: "*The financial projections for the 2015-2020 regulatory control period reflect a reduction in the capital expenditure program due to the aspirational goal of stabilising controllable network price increases while delivering appropriate shareholder returns.*"[19]

[11] Regulatory Proposal Summary - "What it means for customers", page 2

[12] AER EGX 025 – Governance and Portfolio Management - Question 4 – NTC and NOC charters

[13] Appendix 13 - Asset Management Strategy – page 10, Figure 3

[14] Appendix 10 - Summary of Energex's 5 year corporate plan – key target areas, page 9

[15] Regulatory proposal, page 298

[16] Appendix 10 - Summary of Energex's 5 year corporate plan, page 5

[17] RDP2015 Regulatory Proposal, page 9 (pdf p31)

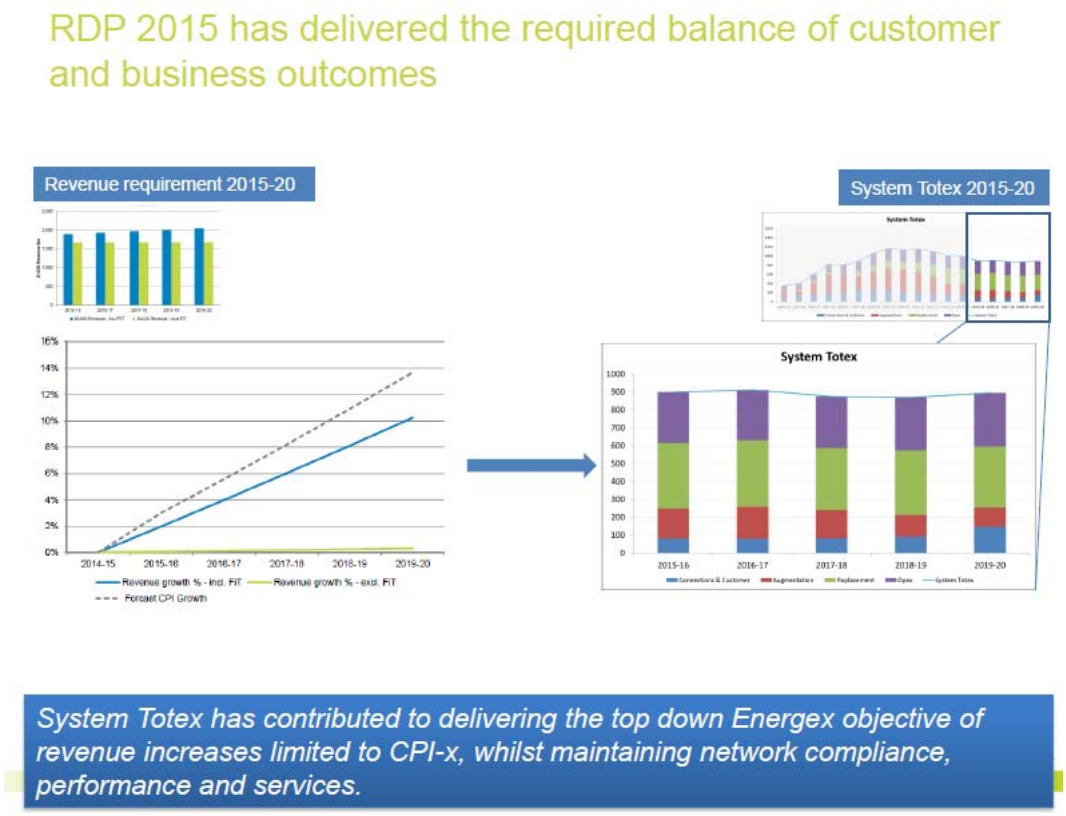
[18] Appendix 10 - Summary of Energex's 5 year corporate plan, page 5; "aspirational goal" linked to the 5 year objective "to deliver sustainable capital and operating programs," page 10; also Appendix 13 - Asset Management Strategy aspirational goal, page 4

[19] Appendix 10 - Summary of Energex's 5 year corporate plan, page 8

58. We are advised that Energex's PoW has been developed to achieve the Energex strategic objectives, Corporate Plan and Annual Statement of Corporate Intent, including review and oversight by the Board and NTC. In describing the review process, Energex states: *"This iterative approach enabled Energex to optimise its five year program of work to balance risk, cost and performance targets (including capex/opex trade-offs). It also ensured that bottom-up programs were aligned with top down targets".*[20]

59. The cornerstone objective communicated by management and reflected in Energex's strategy documents is "*to cap network price increases of CPI (or less) sustainably*".[21] Its NTC presentation on this matter is shown in Figure 10 below:

Figure 10: November 2014 NTC Presentation



Source: AER EGX 025 Q5 PART 5 - Governance and Portfolio Management - NTC Committee Presentation November 2014

60. Energex advised that this is a principal driver that *"sets a cap on capex expenditure and drives a risk/budget trade-off for project approval and inclusion in the RP".*[22] A key question is whether the cap could be lower. During our onsite sessions, we asked if this had been tested (i.e., did Energex reach a level of expenditure whereby any further reductions would present an unacceptable level of risk to the business?). Energex's response and the information provided (examined below) suggests to us that this

[20] EXG 025 Q5 Part 1 – Governance and Management, page 1

[21] Refer to "RDP2015 Regulatory Proposal", "Asset Management Strategy" and "Summary of Energex's 5 year corporate plan"

[22] Overview AER_EMCA Presentation Jan 2015 Day 1 Part A – reference discussion around slide 12

process may not have resulted in an optimal capex forecast outcome and should have been tested further.

61. While Energex's objective of containing network price increases below inflation could be construed as a cost forecasting discipline, this objective is not within the remit of the NER's prescription of prudent and efficient expenditure.[23]

62. A forecasting process designed to constrain expenditure levels to maintain "*network price increases below CPI"* may result in a network capex forecast that is either too high or too low. We note, for example, that this constraint was not applied in the current RCP, when network prices increased considerably on the basis of what were then perceived to be high capex requirements. In either case, it would be only by coincidence that such a constraint would result in a prudent and efficient capital expenditure forecast. Moreover, we consider that specific factors in this instance provide significant headroom and which may allow Energex to meet this objective without necessarily allowing only for prudent and efficient capital expenditure. These factors include a low WACC, transfer of services from SCS to ACS (in regards to repex) and considerably reduced augex requirements relative to the allowance in the current RCP, due to rapid and recent declines in electricity demand growth.

63. Capex should be set to provide the prudent and efficient expenditure required to operate a safe and reliable network. We consider that a CPI price cap objective on the overall business does not provide a meaningful discipline that would lead Energex to a prudent and efficient capex level.

3.2.2 Portfolio management and top-down assessment

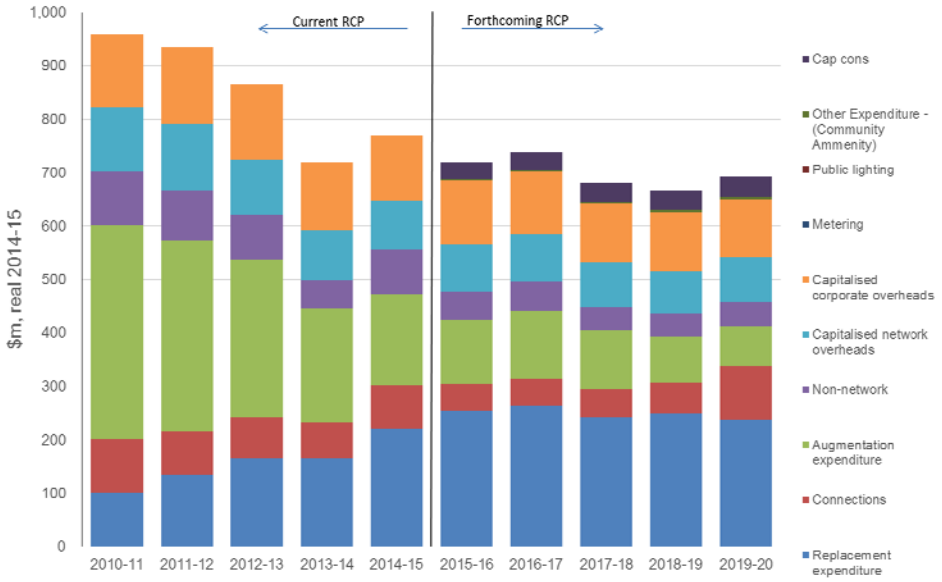
Total capex perspective

64. Energex has proposed a reduction in total capex compared to actual capex spend in the current RCP. Energex advised that the lower capex forecasts reflect lower forecast expenditure on augmentation, while expenditure on aged asset replacement is expected to rise.

65. As shown in Figure 11 below, we observed that Energex's lower expected augex (direct costs) across the forecast period is largely offset by a higher forecast level of repex (direct costs). It is unclear to us whether Energex sees the higher level of repex as an 'opportunity' presented by the decline in augex. Accordingly, we sought evidence of Energex's portfolio management and top-down assessment process and criteria.

[23] Rule 6.5.7 b) and c) of version 58 of the National Electricity Rules (NER) provides a description of capital expenditure criteria and objectives

Figure 11: Energex's capex summary



Source: Energex RIN data

Network investment process applies budget-risk threshold

66. Energex makes use of a Network Risk Based Assessment Framework built upon the Australian Standard AS/NZS ISO31000 "*Risk Management – Principles & Guidelines*" as an input to its network investment and governance process.[24]

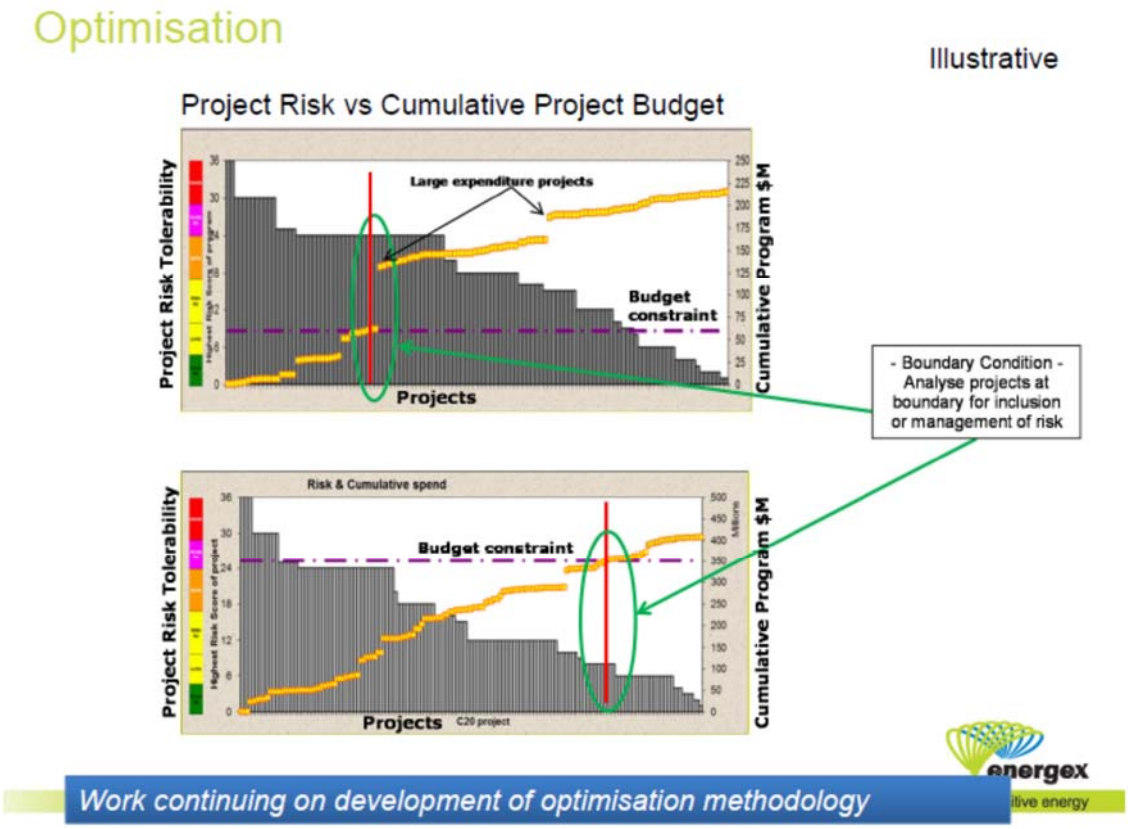
67. The network investment process considers the portfolio of projects and programs proposed for inclusion in future Programs of Work. Energex states that work is prioritised based on the network risk framework. Energex apply a top-down iterative review process including "*a budget/risk trade-off over a five year view*".[25]

68. As shown in Figure 12 below, Energex applies a budget/risk threshold (boundary condition) to identify projects or programs for inclusion in the RP.

[24] AER EGX 25 PART 3 - PDF PROD n3724814 item 5 Asset Management

[25] Presentation Day 1, slide 12 – Energex explained and presented in graphs the "risk scores applied to all work; 5 year view is a budget/risk cut-off applied to a priority order." The Chief Executive explained the process sought an "outcome CPI or less price"

Figure 12: Capex risk/spend optimisation process



Source: AER EGX 25 PART 3 - 2014/15 – 2018/19 Program of Work & Optimising the Program of Work for 2015 to 2020, Network and Technical Committee Presentation, November 2013

69. We observed that Energex's defined budget/risk boundary condition appears to result in the acceptance of a disproportionate number of low risk category projects. We reached this view following Energex's response to our questions during the on-site sessions. As discussed in section 5, we did not find sufficient evidence that the budget/risk boundary condition for the RP was tested beyond defining a desired price outcome.[26]

70. In response to a more effective top-down challenge, we consider that the approval of lower risk and lower cost/benefit projects might have been rationalised or deferred. In the absence of clear evidence of such a challenge, we are unable to conclude that the proposed expenditure is prudent and efficient.

Changing financial conditions used as a condition for prudent expenditure

71. In discussions with its Board, Energex states: "*Energex has continued to apply the CBRM methodology to underpin bottom up forecasts for Repex. Consistent with Board direction, this has been complemented by an increased integration of risk frameworks into project and program level assessment with the objective to deliver Repex within depreciation while not increasing the public or work safety risk profile*".[27] We observed

[26] AER EGX 25 PART 1-5 Q5 responses

[27] EGX025 Q5 Part 1 Governance and portfolio management, page 4

NTC documentation, referring to Table 5, that: "*in a continuing low growth environment SCS depreciation exceeds Energex Initiated System Capex spend by 2019/20*" [28] .

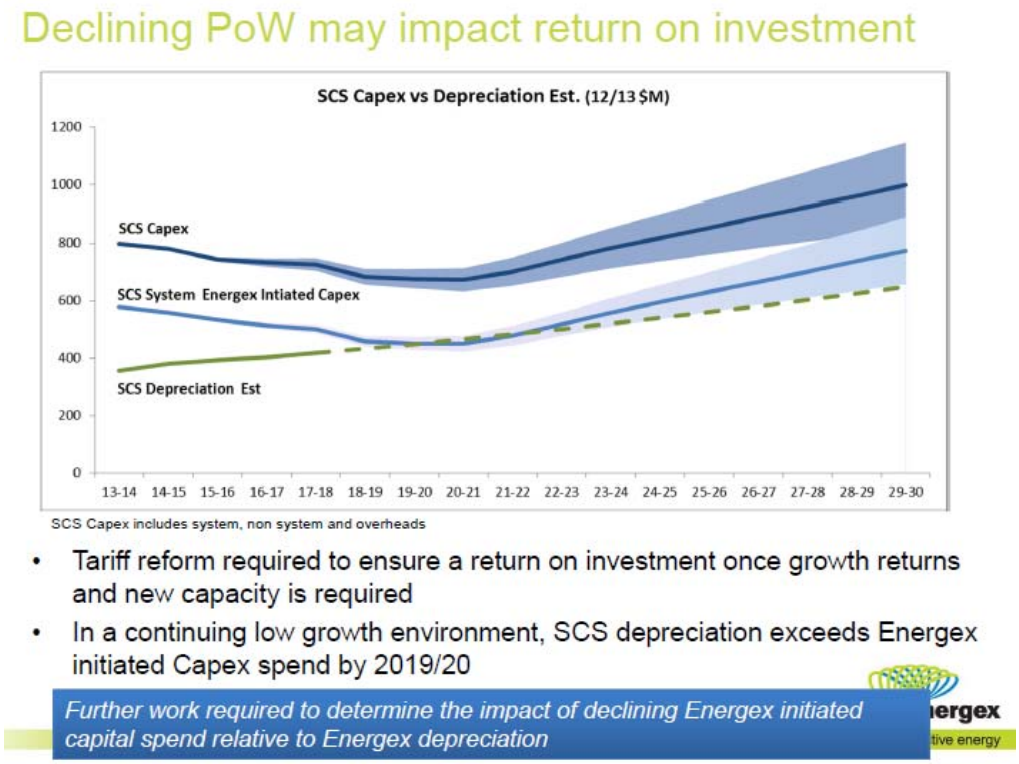
Table 5: Capex forecast and depreciation estimate

SCS Capex (12/13 $M – includes overheads)	Business Forecast 13/14	Business Forecast 14/15	Business Forecast 15/16	Business Forecast 16/17	Business Forecast 17/18	Business Forecast 18/19
SCS Capex	798	780	744	733	726	683
SCS System Energex Initiated	578	559	532	513	501	458
SCS Depreciation Estimate	356	379	394	404	418	433

Source: AER EGX 25 PART 3 - PDF PROD NTC Memorandum 21/11/2013, slide 7

72. We note Management's advice that "*refurbishment capex represents a practical lowest prudent Capex".* However, we do not consider the advice (as shown in Figure 13 below) that "*further work is required to determine the impact of declining capital expenditure relative to Energex depreciation and its impact on investment returns*"[29] to be an effective objective for the budget/risk boundary.

Figure 13: Energex's perception that declining PoW may impact ROI



Source: AER EGX Q5 25 PART 3 - PDF PROD NTC Memorandum 21/11/2013, slide 8

[28] EGX025 PART 3 - PDF PROD n3724814 item 5 Asset Management (Extract) Network Technical Committee Memorandum 21/11/2013, page 3

[29] EGX025 PART 3 - PDF PROD n3724814 item 5 Asset Management (Extract) Network Technical Committee Memorandum 21/11/2013, page 3

Step changes in expenditure at RCP boundary

73. We note Energex's continuing commitment to stronger predictive forecasting capability, its CBRM programs and investment in network monitoring and data collection. However, in a number of asset categories, there appears to be step changes in program structure whereby one program concludes and another commences at the boundary of the RCP. In Section 7, we observe that a significant proportion of expenditure does not appear to result from the application of a CBRM methodology and is more aligned with RCP revenue reset cycles. A more robust top-down challenge process may have tested this apparent shifting focus of expenditure between regulatory periods.

Summary

74. It is our view that a robust top-down challenge process to the expenditure process may have identified opportunities to reduce forecast capex. We find that an effective challenge to that expenditure has not occurred.

75. As a consequence, the budget/risk boundary criteria appears to have resulted in Energex including a disproportionate number of lower risk category projects in its proposed capex. Further, step changes in expenditure appear to align more with the RCP revenue reset cycles rather than from application of Energex's CBRM methodology.

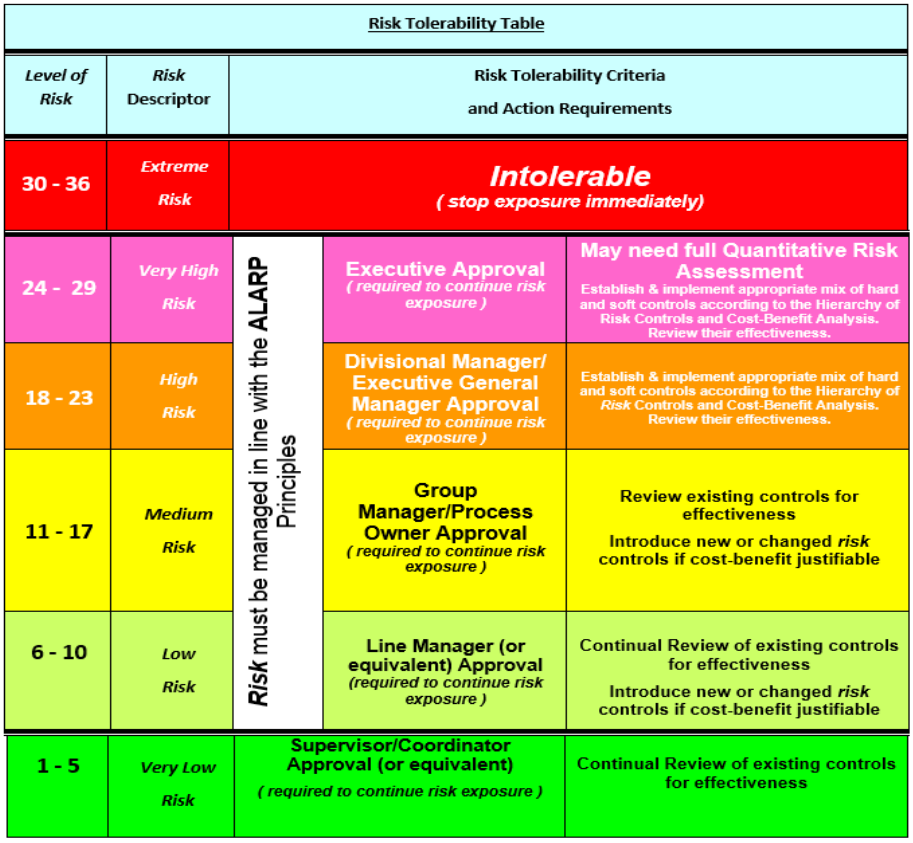
3.2.3 Application of risk framework

76. Energex has established a risk management framework consisting of a tiered structure of policy, standard and guidelines documents that set out the corporate (Board and executive level) and operational requirements, reporting and escalation. Energex has developed a governance structure comprising review committees with responsibility for review of risks at all levels in the business.

77. Energex states its risk appetite as: "*Within the objective of achieving balanced commercial outcomes (as contained within the Energex business planning objectives and goals), the Energex Board has adopted 'As Low As Reasonably Practicable (ALARP) within business constraints' in the determination of its Risk Appetite.*"[30] Energex has developed a risk tolerability scale to guide the actions to be taken by the business. Refer to Figure 14 below.

[30] Appendix 50, page 6

Figure 14: Risk tolerability scale



Risk Tolerability Table				
Level of Risk	*Risk* Descriptor	Risk Tolerability Criteria and Action Requirements		
30 - 36	*Extreme Risk*	***Intolerable*** *(stop exposure immediately)*		
24 - 29	*Very High Risk*	***Risk*** must be managed in line with the **ALARP** Principles	**Executive Approval** *(required to continue risk exposure)*	**May need full Quantitative Risk Assessment** Establish & implement appropriate mix of hard and soft controls according to the Hierarchy of Risk Controls and Cost-Benefit Analysis. Review their effectiveness.
18 - 23	*High Risk*		**Divisional Manager/ Executive General Manager Approval** *(required to continue risk exposure)*	Establish & implement appropriate mix of hard and soft controls according to the Hierarchy of *Risk* Controls and Cost-Benefit Analysis. Review their effectiveness.
11 - 17	*Medium Risk*		**Group Manager/Process Owner Approval** *(required to continue risk exposure)*	Review existing controls for effectiveness Introduce new or changed *risk* controls if cost-benefit justifiable
6 - 10	*Low Risk*		**Line Manager (or equivalent) Approval** *(required to continue risk exposure)*	Continual Review of existing controls for effectiveness Introduce new or changed *risk* controls if cost-benefit justifiable
1 - 5	*Very Low Risk*	**Supervisor/Coordinator Approval (or equivalent)** *(required to continue risk exposure)*		Continual Review of existing controls for effectiveness

Source: RED 00559 - Network Risk Based Assessment Framework Manual page 10

78. The risk framework documents include requirements for the consideration of three risk levels: an inherent risk, residual risk (after treatment or application of risk controls) and target risk. We did not find consistent application of this three tier risk assessment as discussed in sections 6 and 7.

79. For network risk assessments, Energex mapped a range of risks scores that result from evaluating semi-qualitative risks against a 6x6 assessment matrix and applying these to the tolerability scale shown above. In addition, detailed consequence tables for each risk category are provided that provide guidance for risk assessments.

80. As discussed in Section 7, we observe the application of the corporate risk assessment criteria (for likelihood and consequence) to repex programs results in a conservative engineering bias towards over-estimation of risk. This makes it more difficult for senior managers to determine an appropriate risk-based prioritisation for the multitude of projects/programs in its list and is likely to have led to exaggeration of the repex activity forecast.

3.2.4 Business targets and dashboards

81. We looked for KPIs and dashboard measurements that may highlight works management and delivery of capex. From the information received, we observe clear targets and forecasts for expenditure and project milestone delivery including stretch targets.

82. However, as discussed in Section 4, we observe that performance is being measured against annual and stretch targets that are materially less than 100%. We note that the performance dashboards included objectives for project delivery as per program at 90% and stretch targets at 95%.[31] We observed "*C25 planned program physicals complete to target*" had a target level of 90%, corresponding to 14 out of 16 NAMPs.[32]

83. In our onsite meetings, we sought an explanation of the performance scorecard that showed positive results for underperforming delivery of the repex program, referred to as 'NAMP'. We were not provided with an adequate response. Energex also stated that it was common to allocate more work than was required by the work crew to promote efficient program delivery. Whilst this can be an effective means to avoid non-productive time in the field, this may also indicate an over-estimate in the program.

84. Our review of the performance dashboards leads us to consider that work programs are aspirational and there may be an expectation of under-delivery built into the performance and program objectives.

3.3 Concluding remarks

85. We observed the dominance of a CPI price outcome objective in the review and challenge of Energex's forecast. Energex appears to consider it satisfactory that the proposed level of overall capex (augex and repex) can be incurred while maintaining the price outcome objectives that it has set. We consider that a price outcome objective for the overall business does not provide a meaningful discipline that would lead Energex to a prudent and efficient capex level.

86. We note the review process undertaken by Energex in assembling its forecast; however, we did not see evidence of sufficiently robust top-down challenge to determine the optimal level of risk. We have observed in our assessments inconsistencies in the application of risk assessments, a conservative engineering bias towards over-estimation of risk and a disproportionately high number of low risk category projects. In the absence of a robust top-down challenge, we consider that the expenditure program that Energex has proposed is likely to be sub-optimal and to reflect an elevated forecast of expenditure.

87. Our review of the management of the Program of Work also suggests that performance targets for completing the works program are set below 100%, which implies that an expectation of under-delivery is acceptable.

[31] EGX 026 – Question 7 PDF slides – CEO scorecard and AER EMCa Deliverability - 30 January 2015 - V2 – NPMG Day 2 Presentation Part B, slide 14

[32] EGX026 Performance scorecard, Corporate and CEO performance scorecard

4 Sourcing, Procurement, Deliverability and Efficiency

4.1 Overview

88. In this section we summarise and assess the methodologies and practices that Energex states it has in place to ensure that the proposed 2015-20 program of works can be prudently, effectively and efficiently delivered. Our assessment is based on information provided by Energex in our onsite meeting and responses to questions on the delivery of the program of works and assurance process.

89. Energex states the process is iterative to achieve the best balance. Asset Management specify the requirements for each project and program, priorities and risk categories. We are advised the assumptions that underpin program development include workforce efficiencies, internal and external resources and ACS / contestable works (a program variable that must be managed).[33]

90. We note the modelling tools used by Energex "*include long term high-level requirements detailed in SIFT; PoW is modelled and project managed using Oracle Primavera; and day to day work management through the Works Management systems in Mincom Ellipse*".[34]

91. Energex advises that protocols define and communicate requirements for procuring electrical network assets in accordance with its procurement policy, including a focus on minimising the whole of life costs of its assets.

[33] AER EGX 025 Q4 Developing the PoW – presentation slide 2-4

[34] AER EGX 025 Q4 Developing the PoW – presentation slide 5

4.2 Assessment

4.2.1 Program deliverability

92. Energex provided examples of resourcing projections and compared internal and external resourcing capability against the PoW requirements, as shown in Figure 15 below.

Figure 15: Resource capability vs POW

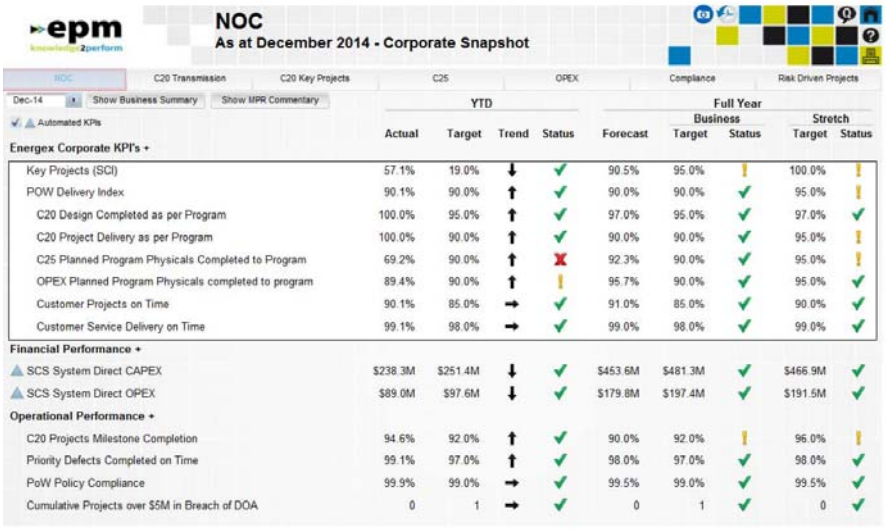
Source: AER EGX 026 - Performance scorecard_09022015 Question 10 Assurance slide 9-11

93. Responding to our questions during the onsite meetings on the level of assurance provided to the Board and/or Executive on the deliverability of the RP, Energex advised that *"the data indicates the resource requirements are deliverable through appropriate management controls."*[35]

94. Energex provided dashboards that display delivery to the 2014/15 Program of Work, categorised as C20 (transmission program) and C25 (distribution program), as shown in Figure 16 below.

[35] AER EGX 026 - Performance scorecard_09022015 Question 10 Assurance, slide 8

Figure 16: Performance Dashboards



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NOC

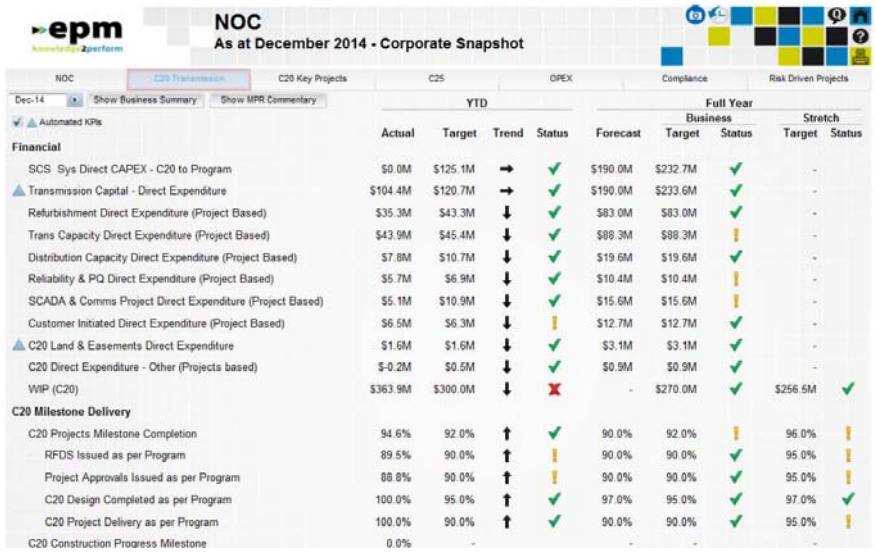
As at December 2014 - Corporate Snapshot

NOC | C20 Transmission | C20 Key Projects | C25 | OPEX | Compliance | Risk Driven Projects

Dec-14 | Show Business Summary | Show MPR Commentary

Automated KPIs

Energex Corporate KPI's +	YTD Actual	YTD Target	YTD Trend	YTD Status	Full Year Forecast	Full Year Business Target	Full Year Business Status	Full Year Stretch Target	Full Year Stretch Status
Key Projects (SCI)	57.1%	19.0%	↓	✓	90.5%	95.0%	!	100.0%	!
POW Delivery Index	90.1%	90.0%	↑	✓	90.0%	90.0%	✓	95.0%	!
C20 Design Completed as per Program	100.0%	95.0%	↑	✓	97.0%	95.0%	✓	97.0%	✓
C20 Project Delivery as per Program	100.0%	90.0%	↑	✓	90.0%	90.0%	✓	95.0%	!
C25 Planned Program Physicals Completed to Program	69.2%	90.0%	↑	✗	92.3%	90.0%	✓	95.0%	!
OPEX Planned Program Physicals completed to program	89.4%	90.0%	↑	!	95.7%	90.0%	✓	95.0%	✓
Customer Projects on Time	90.1%	85.0%	→	✓	91.0%	85.0%	✓	90.0%	✓
Customer Service Delivery on Time	99.1%	98.0%	→	✓	99.0%	98.0%	✓	99.0%	✓
Financial Performance +									
SCS System Direct CAPEX	$238.3M	$251.4M	↓	✓	$453.6M	$481.3M	✓	$466.9M	✓
SCS System Direct OPEX	$89.0M	$97.6M	↓	✓	$179.8M	$197.4M	✓	$191.5M	✓
Operational Performance +									
C20 Projects Milestone Completion	94.6%	92.0%	↑	✓	90.0%	92.0%	!	96.0%	!
Priority Defects Completed on Time	99.1%	97.0%	↑	✓	98.0%	97.0%	✓	98.0%	✓
PoW Policy Compliance	99.9%	99.0%	→	✓	99.5%	99.0%	✓	99.5%	✓
Cumulative Projects over $5M in Breach of DOA	0	1	→	✓	0	1	✓	0	✓



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NOC

As at December 2014 - Corporate Snapshot

NOC | C20 Transmission | C20 Key Projects | C25 | OPEX | Compliance | Risk Driven Projects

Dec-14 | Show Business Summary | Show MPR Commentary

Automated KPIs

Financial	YTD Actual	YTD Target	YTD Trend	YTD Status	Full Year Forecast	Full Year Business Target	Full Year Business Status	Full Year Stretch Target	Full Year Stretch Status
SCS Sys Direct CAPEX - C20 to Program	$0.0M	$125.1M	→	✓	$190.0M	$232.7M	✓	-	
Transmission Capital - Direct Expenditure	$104.4M	$120.7M	→	✓	$190.0M	$233.6M	✓	-	
Refurbishment Direct Expenditure (Project Based)	$35.3M	$43.3M	↓	✓	$83.0M	$83.0M	✓	-	
Trans Capacity Direct Expenditure (Project Based)	$43.9M	$45.4M	↓	✓	$88.3M	$88.3M	!	-	
Distribution Capacity Direct Expenditure (Project Based)	$7.8M	$10.7M	↓	✓	$19.6M	$19.6M	✓	-	
Reliability & PQ Direct Expenditure (Project Based)	$5.7M	$6.9M	↓	✓	$10.4M	$10.4M	!	-	
SCADA & Comms Project Direct Expenditure (Project Based)	$5.1M	$10.9M	↓	✓	$15.6M	$15.6M	!	-	
Customer Initiated Direct Expenditure (Project Based)	$6.5M	$6.3M	↓	!	$12.7M	$12.7M	✓	-	
C20 Land & Easements Direct Expenditure	$1.6M	$1.6M	↓	✓	$3.1M	$3.1M	✓	-	
C20 Direct Expenditure - Other (Projects based)	$-0.2M	$0.5M	↓	✓	$0.9M	$0.9M	✓	-	
WIP (C20)	$363.9M	$300.0M	↓	✗	-	$270.0M	✓	$256.5M	✓
C20 Milestone Delivery									
C20 Projects Milestone Completion	94.6%	92.0%	↑	✓	90.0%	92.0%	!	96.0%	!
RFDS Issued as per Program	89.5%	90.0%	↑	!	90.0%	90.0%	✓	95.0%	!
Project Approvals Issued as per Program	88.8%	90.0%	↑	!	90.0%	90.0%	✓	95.0%	!
C20 Design Completed as per Program	100.0%	95.0%	↑	✓	97.0%	95.0%	✓	97.0%	✓
C20 Project Delivery as per Program	100.0%	90.0%	↑	✓	90.0%	90.0%	✓	95.0%	!
C20 Construction Progress Milestone	0.0%	-			-	-		-	

epm knowledge2perform

NOC

As at December 2014 - Corporate Snapshot

NOC | C20 Transmission | C20 Key Projects | C25 | OPEX | Compliance | Risk Driven Projects

Dec-14 | Show Business Summary | Show MPR Commentary

Automated KPIs

Financial	YTD Actual	YTD Target	YTD Trend	YTD Status	Full Year Forecast	Full Year Business Target	Full Year Business Status	Full Year Stretch Target	Full Year Stretch Status
Distribution Capital - Direct Expenditure	$133.9M	$130.7M	↓	!	$263.6M	$247.7M	!	-	
WIP (C25)	$106.3M	$94.0M	↓	!	-	$90.0M	✓	$85.5M	✓
Planned									
C25 Planned Program Direct Expenditure	$57.7M	$60.8M	↓	✓	$126.9M	$110.4M	!	-	
C25 Planned Program Physicals Completed to Program	69.2%	90.0%	↑	✗	92.3%	90.0%	✓	95.0%	!
Reactive									
C25 Reactive Program Direct Expenditure	$10.1M	$17.6M	↑	✓	$20.0M	$34.9M	✓	-	
Customer									
C25 Customer Direct Expenditure	$66.1M	$52.3M	↓	✗	$116.7M	$102.4M	!	-	
Customer Projects on Time	90.1%	85.0%	→	✓	91.0%	85.0%	✓	90.0%	✓
Customer Service Delivery on Time	99.1%	98.0%	→	✓	99.0%	98.0%	✓	99.0%	✓
Efficiency									
C25 Unit Rate Efficiency	2.6%	0.0%	→	✓	2.6%	0.0%	✓	-	

Source: AER EGX 026 - Performance scorecard_09022015 Question 8, slide 1-3

95. The program of works performance is monitored and reported at NTC (monthly and quarterly), NOC (monthly) and Department level (monthly).[36] As described in section 3, we observe that in some areas the annual targets can be set at less than 100%. This may suggest that some elements of the planned work program is aspirational in terms of delivery or has been deferred for pre-agreed reasons.

96. We are otherwise satisfied that the metrics observed reflect an expected industry standard to ensure bottom–up and top-down assurance of program delivery.

4.2.2 Procurement

97. Energex advised that key specifications for the purchase of assets are a requirement to minimise the whole of life costs, and that associated assessment criteria are incorporated into Energex's procurement process for evaluating plant and equipment purchases.[37]

98. Energex's Network Maintenance and Procurement protocols[38] impose processes to ensure new electrical network assets (and services) procured by Energex are safe, reliable, serviceable and fit for use on the Company's electrical networks. These include:

- suitability and competency of external service providers and contractors who carry out work on the electrical network;
- common defects found in assets currently procured by the Company are notified to the Procurement Manager;
- new electrical network assets are procured to recognised standards and specifications consistent with meeting the Company's requirements; and
- data about asset condition, asset performance and associated maintenance costs, feedback into design, procurement and refurbishment/replacement decisions for optimisation of asset management.

99. From the information provided, we consider that Energex's procurement processes, practices and protocols are generally consistent with expected industry standards.

4.2.3 Labour sourcing

100. We are advised that Energex's Enterprise Bargaining Agreement (EBA) has a number of provisions that impact on the business' ability to be efficient. The agreement provides employment security for all employees for the tenure of their employment. While this is present, Energex's ability to reduce workforce will be limited to natural attrition and sanctioned voluntary redundancy processes.

101. Restrictions have been in place for a number of years on the use of contractors in undertaking work on the high voltage network. Energex advise there are specified consultation requirements that must be followed when contracting out "core work".

[36] AER EGX 026 - Performance scorecard_09022015 Question 9, page 3

[37] RDP2015 Regulatory Proposal CONFID - NEW as at 3 Nov 2014 1.1, page 159

[38] RED 01056 JW network maintenance protocol v0 2; RED 00807 JW Asset management policy v0 2 - procurement protocol; and RED 00490 JW protocol refurbishment and replacement v0.2

102. Energex advised that, in terms of its use of contractors, the EBA specifies that contract resources are entitled to rates of pay and allowances that, in aggregate, are no less favourable than those paid at Energex. This means that external providers are able to negotiate enterprise agreement outcomes similar to that of Energex. Energex advised that, even though external contractors used equivalent labour rates, it did not prevent them from competing and delivering higher labour productivity for the equivalent work.

103. We are satisfied that the EBA is not a material constraint to the deliverability of the RP. However, while Energex has worked effectively within the bounds of the EBA, it does impose cost inefficiencies arising from its constraints on the wider use of contractors and inflexible pay scales.

4.3 Concluding remarks

104. We are satisfied that the performance metrics observed reflect expected industry practice to ensure bottom–up and top-down assurance of program delivery and we are satisfied that the proposed program of augex and repex is deliverable. However, we note that this target-setting approach suggests that a level of under-delivery and/or deferral is expected on the annual program.

105. From the information provided, we consider the procurement processes, practices and protocols to be generally consistent with industry standards.

106. We are satisfied that the EBA is not a material constraint to the deliverability of the RP. Energex has been able to utilise contractors to effectively balance resourcing requirements. However, the EBA does appear to impose some level of cost inefficiencies arising from its constraints on the wider use of contractors and inflexible pay scales.

5 Capex Forecasting Methodologies

5.1 Overview

107. In this section we summarise and assess the methodologies that Energex uses to forecast its augex and repex requirements. This can be considered in two parts:

- The methodologies used to forecast required activities; and
- The methodologies used to estimate the costs of those activities.

108. The key components of Energex's capex forecasting process can be summarised as follows:[39]

- Prepare key inputs including information on customer requirements, demand forecasts, legislative obligations, asset condition information and reliability and security standards;
- Establish required network performance outcomes;
- Prepare a capital program that addresses the relevant drivers;
- Consider capex/opex trade-offs including non-network solutions;
- Optimise to achieve target network performance, including risk outcomes; and
- Finalise program taking account of deliverability and re-considering risk.

[39] RP Appendix 19, section 7

5.2 Assessment

5.2.1 Augmentation activity forecasting

Energex's augex forecasting methods

109. Energex's proposed augex is categorised according to the following four drivers:

- Growth and compliance;
- Reliability;
- Power quality; and
- Land and easements.

110. A breakdown of proposed expenditure, by these categories, is shown in section 6.1.

111. Energex states that it uses a project-based approach to forecasting augex with the key input being its demand forecasts by bulk supply and zone substation and for sub-transmission and distribution feeders. Using these forecasts, Energex determines needs through "*assessment of its network performance against current planning, reliability and security criteria*".[40] This security criteria was reduced following the ENCAP review and Energex advise that the changes are now reflected in its forecasts.

112. Energex states that it considers network and non-network options (including demand management) and also applies risk assessment to each project against a counterfactual that the network upgrade does not proceed within the nominated time period.

113. Energex provided a sensitivity assessment of lower demand growth which appears to show a decrease in augex of only around $20m arising from a 5% decrease in forecast growth. This would roughly translate to zero growth for the period.[41]

114. Our assessment of Energex's demand forecast is provided in section 6. In this section, we consider only the methodology by which Energex has developed its proposed augmentation requirements from that demand forecast. We also take as a given the planning, reliability and security criteria that Energex applies.

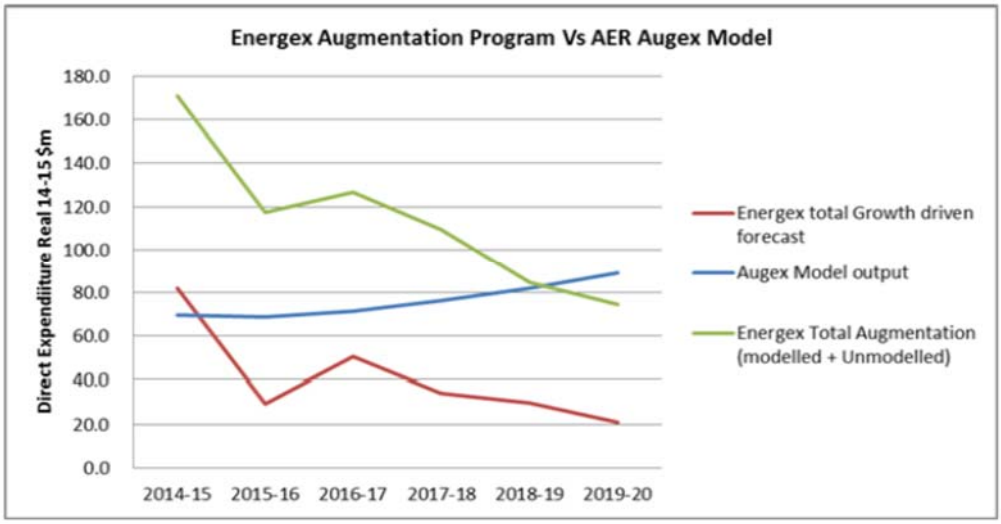
Methods for review of Energex's forecast

115. Energex has compared its augex forecast with outputs from the AER's augex model (as shown in Figure 17 below) and concluded that this "*shows Energex in a favourable position with modelled output higher than bottom-up build*."

[40] Appendix 19, section 7.3.1

[41] On-site presentation, Overview of Augex Capital Investment, 29/1/2015, page 20

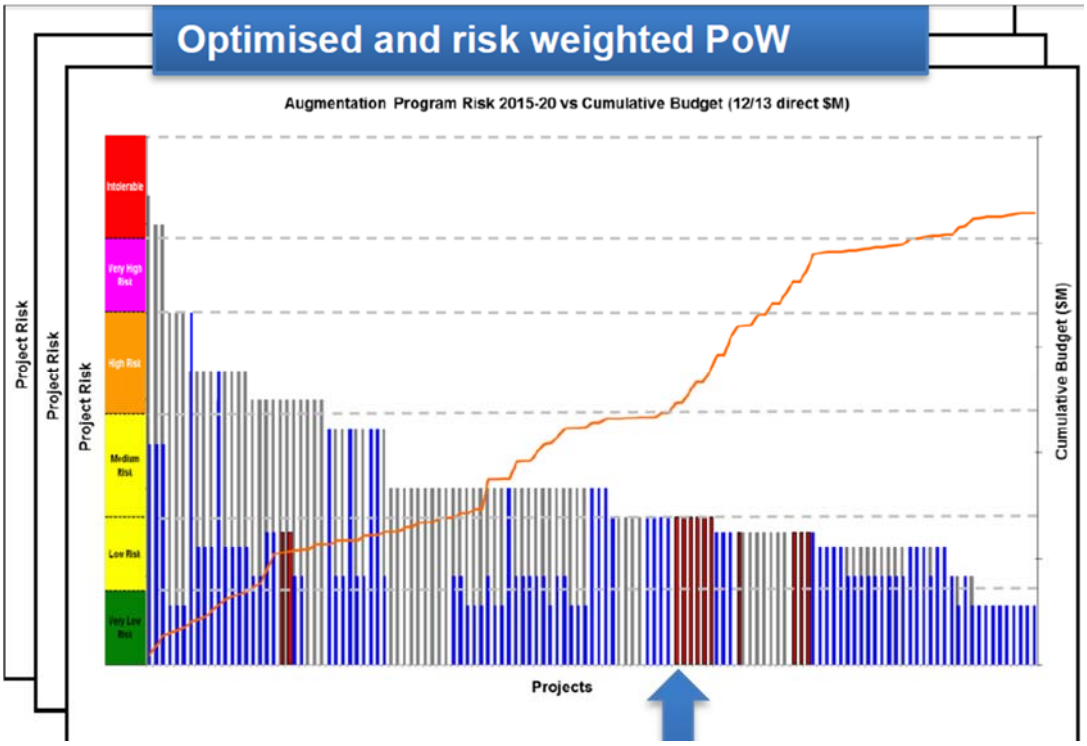
Figure 17: Comparison of augmentation program with AER augex model



Source: Appendix 19, section 7.3.1

116. Figure 18 below illustrates Energex's application of its project risk assessments for its program of work in the 2015-2020 RCP.

Figure 18: Program risk for augmentation capex



Source: On-site presentation, Overview of Augex capital investment

117. Energex's asset management investment process considers the portfolio of projects and programs proposed for inclusion in future Programs of Work (POW). Energex states that: *"the profile generally takes the form of a program or portfolio of projects stacked by risk score (highest to lowest) versus cumulative program budget to enable program*

optimisation profiles to be developed".[42] The output of this process is presented as being an optimised portfolio of work across the capital and operating programs.

118. Energex also advised that its network risk framework and investment optimisation overall approach is being updated to ensure alignment with the changing focus of asset investment and consistency with published standards.[43]

Components of augex require separate assessment

119. While Energex gives prominence to demand growth in describing its augex forecasting methodology, a significant amount of augex is not growth-driven, as Energex shows in its comparison with the AER augex model outputs. We note that Energex's augex modelling does appear to validate that its proposed expenditure is within scale (provided that the amounts that Energex has deducted for non-growth augex are valid).[44]

120. The majority of proposed non-growth expenditure appears to be for 'compliance', which is aggregated within the 'growth and compliance' expenditure category. Since Energex's descriptions of its augex forecasting methodology do not explicitly address the determination of its 'compliance' requirements, we have relied on our project reviews to assess the reasonableness of these forecasts.

Further option assessment and DM may allow some further deferrals, but we don't expect these to be significant

121. From the description provided at our on-site meetings, we are satisfied that Energex is considering non-network options in its investment decision-making processes. We are less convinced that targeted DM opportunities have been adequately taken into account in Energex's RP augex forecast. While it would be difficult to do so at a specific level as the DM opportunities typically present closer to the time of augmentation commitment, we consider that the balance of probability is towards some opportunities arising for prudent deferral. Similarly, on balance, we would expect Energex's augex decision processes closer to the time of commitment to pick up some non-network options not already identified. These "portfolio-level" opportunities to defer or roll out augex do not seem to have been factored into the forecasts.

Energex's risk assessment may be leading to some excess expenditure in the forecast

122. We note that Energex's program of work risk scores for augmentation projects as shown in Figure 18 contain a large number of projects with low risk ratings. From the graph, it would appear that these comprise around 50% of the proposed augex. This suggests that, despite the significant decrease in proposed augex relative to the current RCP, there may be a significant component of augex that could be further deferred. We consider this further in our project-level assessments in section 6.

Price constraint

123. The main top-down constraint that Energex appears to have applied is based on assessed price increase outcomes. On the evidence presented, it would appear that

[42] AER EGX 25 PART 3 - PDF PROD n3724814 item 5 Asset Management NTC November 2013

[43] AER EGX 25 PART 3 - PDF PROD n3724814 item 5 Asset Management

[44] Refer to Figure 17

Energex has not sufficiently challenged projects that are low risk, but which can be undertaken within this tariff objective.

Consideration of recent changes to the value of Customer Reliability (VCR)

124. AEMO recently reduced the planning value of VCR. We asked Energex what effect this would have, and were informed that it would likely be small. We have reviewed the basis for this statement and accept this conclusion.

5.2.2 Replacement activity forecasting

Energex's repex activity forecasting methods

125. Energex states that the primary purpose of asset replacement expenditure is to "*maintain the existing level of supply and standard of service*".[45] Energex states that it develops its bottom-up repex forecasts using Condition Based Risk Management (CBRM) for high value transmission assets, whereas its replacement forecasts for distribution assets are based on "*historical failure and replacement rates"*.

126. The various approaches that Energex applies to different asset categories are shown in Table 6 below.[46]

Table 6: Repex activity forecasting methods[47]

Asset Category	Trend Analysis	CBRM	Obsolescence	Repex Comparison
Poles (Wood, Nailed, Concrete, Steel)	✓	✓		✓
Pole Top Structures	✓	✓		✓
Overhead conductors	✓	✓		✓
Underground Cables <33 kV	✓			✓
Underground Cables ≥33 kV		✓	✓	✓
Service Lines	✓			✓
Transformers – Pole Mounted	✓	✓		✓
Transformers – Kiosk Mounted	✓	✓		✓
Transformers – Power		✓	✓	✓
Switchgear – Switch	✓	✓		✓
Switchgear – <11kV Circuit Breaker	✓		✓	✓

[45] Appendix 19 - section 7.3.1

[46] AER question EMCa021, section 1.2

[47] Red tick indicates primary method

Asset Category	Trend Analysis	CBRM	Obsolescence	Repex Comparison
Switchgear – ≥11kV Circuit Breaker		✓	✓	✓
AFLC		✓	✓	✓
Field Devices	✓		✓	✓
Communications Network Assets	✓		✓	✓
Communications Site Infrastructure	✓		✓	✓
Communications Linear Assets	✓	✓	✓	✓
OTE Environment and Server Migration			✓	✓

Source: EGX031, response to question EMCa021, section 1.2

Limited use of CBRM – majority is 'trended'

127. Whilst Energex's documentation refers to CBRM as the "*preferred method of evaluating condition related risk,*"[48] its tabulation of methods shows that the majority of the proposed repex projects and programs are forecast using a 'trend analysis' approach. Energex states that a 'lower complexity' CBRM model is used to support trend forecasts. We review the application of this approach in our assessment of Energex's repex forecast in section 7.

128. Whilst we acknowledge the role of trending as a methodology, we note in section 2 that the overall repex proposed by Energex represents a significant increase on past expenditures. This suggests that the proposed expenditure is not based purely on an extrapolation of recent trends and we therefore sought evidence of other factors that are trending upwards. For example, accelerating risk (which may be a function of accelerated aging and accelerated obsolescence) is a potential rationale for such a trend. We sought evidence for this hypothesis in our reviews of the project and program information provided by Energex, as described in section 7.

129. In the absence of an adequate top-down portfolio-level constraint, a bottom-up program of work is likely to be biased towards an over-forecasting of requirements. We sought evidence of Energex's top-down discipline in our project assessments.

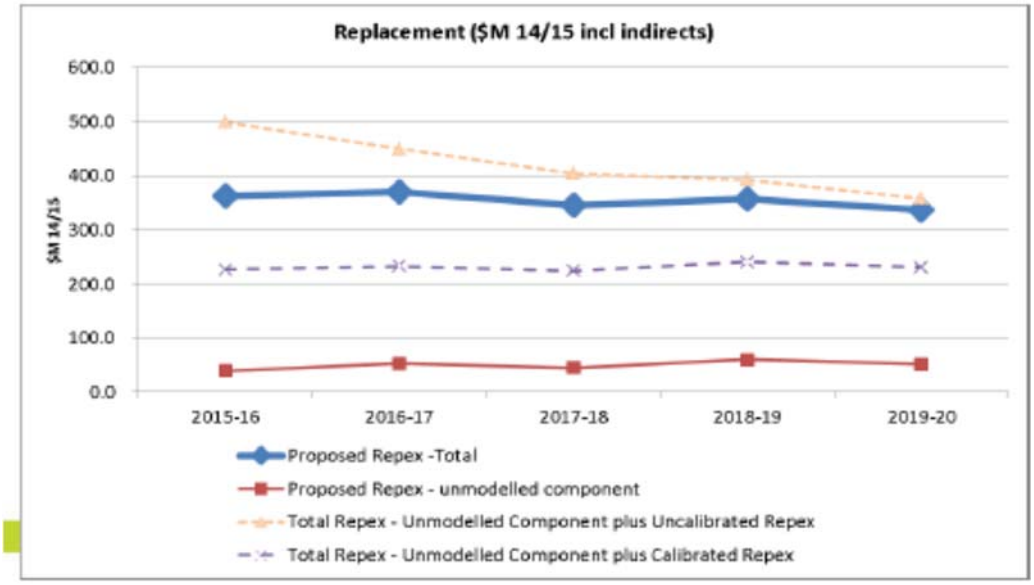
Top-down repex model comparison appears not to have constrained the proposed program

130. Energex provided the following chart to illustrate its assessment of its portfolio of potential repex projects and programs relative to outputs from the AER's repex model and according to their levels of risk. Refer to Figure 19 below. Energex states that it also

[48] AER EGX031, response to question 21(c)

undertook a top-down assessment using AER's repex model to account for the Board's risk tolerance and "*customer outcomes*".[49]

Figure 19: Comparison of replacement program with repex model



Source: Presentation on Network Asset Renewal and Replacement capex, slide 30

131. While noting that the proposed repex lies between the calibrated and un-calibrated repex model outputs, these form a very wide band (in effect, a +30% / -40% range) around Energex's proposed expenditure. The calibrated repex model output is around 30% to 40% lower than the repex proposed by Energex for the forthcoming period.

132. Whilst it is not within our scope to consider the validity of the repex model output that Energex has provided, it is difficult to see how these outputs provide any meaningful top-down bearing on the proposed expenditure level given their wide range.

133. The methodologies table shown in Table 6 above suggests that repex model outputs were used to assess proposed repex activities at the asset category (plant) level. We did not observe this consideration in the program and project reviews that we undertook. We did not see evidence that the repex model considerations resulted in any top-down constraint on the bottom-up repex programs and projects.

134. In support of its program, Energex compared the mean plant lives arising from its proposed repex activities with the repex model calibrated and un-calibrated outputs. For all assets except 33kV underground cables, its proposed programs will achieve a lower mean life when compared to calibrated repex model outputs (except for CBs and protection relays) and a higher mean plant life when compared to un-calibrated repex model outputs. This result is unsurprising, given that the proposed expenditure lies between the calibrated and un-calibrated repex model outputs and, while informative, does little to validate the level of expenditure that Energex has proposed.

[49] Ibid section 1.1

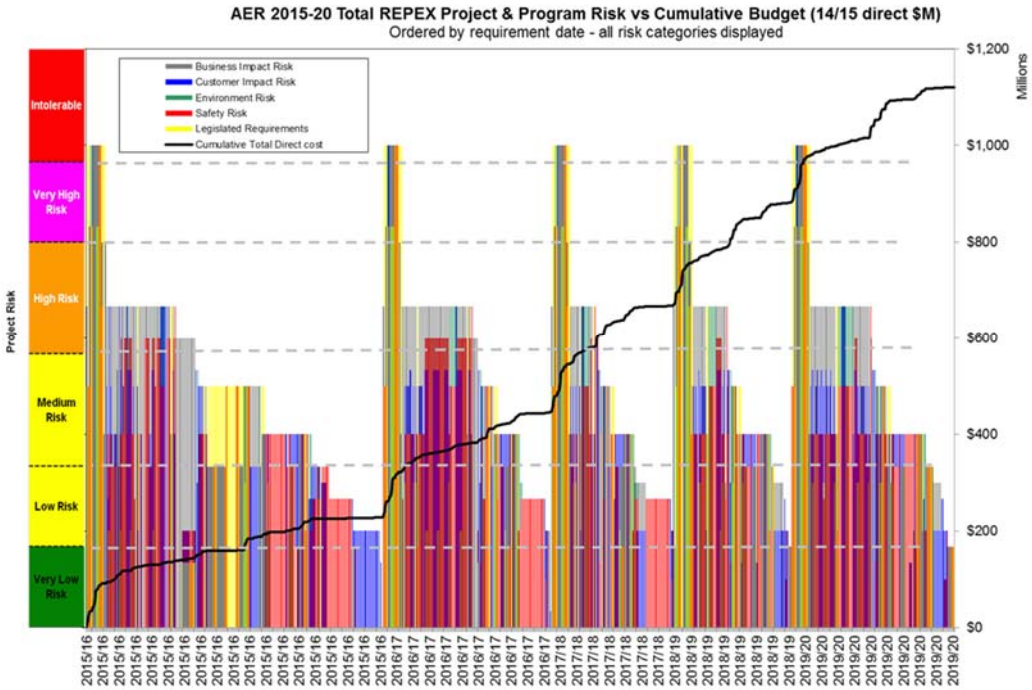
Risk considerations appear not to have constrained the program to an optimal level

135. There are several aspects of the application of Energex's risk framework that we consider would have led it not to constrain its bottom-up program to an optimal level.

136. Firstly, we note from the risk matrices, that the ALARP concept appears to have been applied not only to risks at the 'high' to 'intolerable' level, but also to 'low' risk considerations. This exhibits a degree of engineering conservatism that would naturally lead to over-forecasting of activity requirements. The ALARP principle allows for risks to be mitigated to the point where the cost is 'grossly disproportionate' to the benefits. However, because it applies a considerably lower cost hurdle than is normally required in a straightforward cost/benefit analysis, it is most applicable to high or intolerable risks. This leaves standard cost benefit analysis as the preferred tool for the vast majority of risk assessments. We have made observations in relation to the application of the risk framework in our assessment to the repex projects and programs in section 7.

137. Secondly, we observe that a considerable number of repex programs that Energex has included in its forecast have been assessed by Energex as having a 'Low' or 'Very Low' risk. Refer to Figure 20 below. In the on-site meetings, we questioned the justification for including such risks and were told that these risk are considered to have 'high consequences'. Our understanding of Energex's risk assessment framework is that each project risk rating already includes consideration of consequence. A subsequent re-consideration of consequence does not appear to be part of this methodology and would lead to over-forecasting

Figure 20: Program risk for replacement capex



Source: Response EGX031, section 1.6

138. Finally, we observe that the risk profile of projects over time does not seem to provide strong evidence of risk-based prioritisation. We observe 'Intolerable" risks being more-or-less evenly addressed over the period and a significant number of medium and low

risk programs being undertaken in the first year, when we would expect risk-based prioritisation to indicate opportunity for deferral.

Main constraint on program appears to be related to desired price outcomes

139. As discussed in section 3, we observe that the forecast has been constrained primarily by a desired price outcome, rather than determination of a prudent and efficient program.

No evidence of consideration of net deferrals

140. Relative to the repex forecasts for the current RCP in its Regulatory Proposal, Energex expects to spend around $137m less than it proposed and $38m less than the AER allowance.[50]

141. We sought information on Energex's budget for 2014/15 and found that it is currently underspent by $30m against its YTD budget for its core C20 and C25 sub-transmission and distribution expenditure categories.[51] We also noted the reasons provided for spending less in the previous years of the current RCP. For example, Energex explains its underspend in 2010/11 as the result of diversion of resources to assist with restoration work following the floods and assisting Ergon following cyclone Yasi. This underspend was $16.5m.[52] We infer that the remainder of the variance in the last RCP occurred as a result of prudent deferrals or efficiency of projects included in the last RP.

142. Whatever the factors, on the balance of probability we would expect that a range of factors is likely to arise in the next RCP, similar to the current RCP overall and the current year, and which will continue to result in Energex prudently spending less than it has forecast.

5.2.3 Cost Estimation

Overview

143. In this section we summarise and assess the methodologies and practices that Energex states it has in place to ensure cost estimates are prudent and cost efficient.

144. The Energex Estimating Framework[53] applies to the estimation of all Standard Control Services (e.g. C20, C25 and OPEX) and Alternate Control Services (e.g. C35) projects within Energex.

145. The Energex estimation framework has been implemented with the objective of providing estimation accuracy; providing consistency of network project and program cost estimation; and providing an efficient mechanism for network project cost estimation.[54]

[50] Refer to Table 4

[51] AER EGX031, section 1.3

[52] AER EGX031, section 1.5

[53] Energex Estimating Framework (RED948) Day 2 Presentation Part B

[54] Energex Estimating Framework (RED948) Day 2 Presentation Part B application, page 3

146. Energex's Estimation Methodology[55] uses a combination of comparative and standard cost estimating methodologies, underpinned by a bottom-up approach as the basis for the estimation process of individual projects. This provides the platform for the development of forecast capital and operating expenditure. Energex advised that: [56]

- "*Comparative costing is used where a statistically significant historical sample size exists, whereby actual project or program costs are reconciled and assessed, which forms the basis of the cost estimate. This approach is based on experience of the past and makes use of the information contained in previous proven project designs that closely match the attributes of a new project.*"

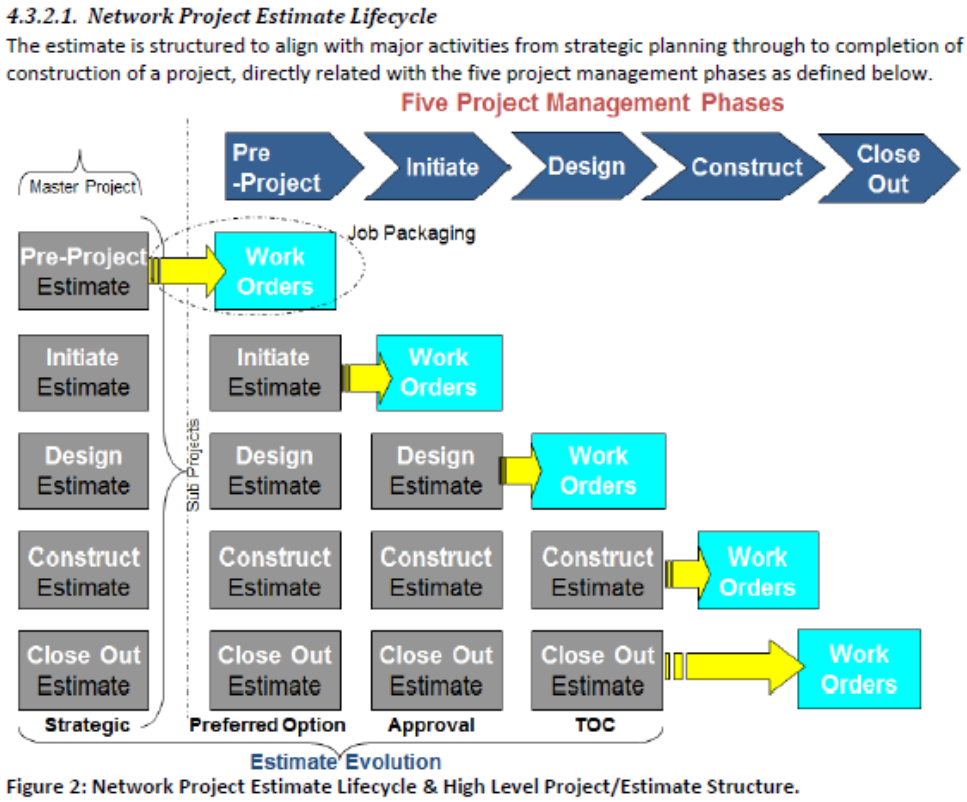
- "*Standard cost estimation forms the basis of typical larger, lower volume high complexity type network projects. With this approach, the most common network configurations associated with transmission, sub-transmission and distribution 'project types' or 'work' are catered for, incorporating the experience and knowledge of standard ways of construction of network components*."

- "*Underpinning both the comparative and standard cost estimation methodologies is a bottom up approach that consolidates associated labour, materials, external/contract costs with the defined scope of works. Standard costs are refined and adjusted based on project specific and expert knowledge*."

[55] ENERGEX Estimating Methodology (RED1005)

[56] ENERGEX Estimating Methodology (RED1005), page 6

Figure 21: Network project estimate lifecycle



Source: ENERGEX Estimating Methodology (RED1005)

147. Energex considers estimates through the life cycle of a project to provide the required level of confidence within the various degrees of scoping that exist through the project evolution phases (e.g., strategic planning, project planning, post design). Energex stated that *"the underlying premise is that scope defines estimate accuracy."* [57]

148. The corporate 'Ellipse' estimation system is used to produce these project and program estimates. "*This application contains specific modules which are utilised to provide an effective and efficient foundation for network project estimation in Energex*."[58]

149. The estimating framework appropriately defines how the foundation units, Ellipse compatible unit modules and the estimating units are managed and built up.[59]

Assessment of cost estimation process

150. Energex cost estimates are based on a combination of comparative, standard cost and bottom-up estimating methodologies to develop the capex program. In response to questions asked by the AER, Energex advised:[60]

[57] Energex Estimating Framework (RED948) Day 2 Presentation Part B objective, page 4

[58] Energex Estimating Framework (RED948) Day 2 Presentation Part B objective, page 4

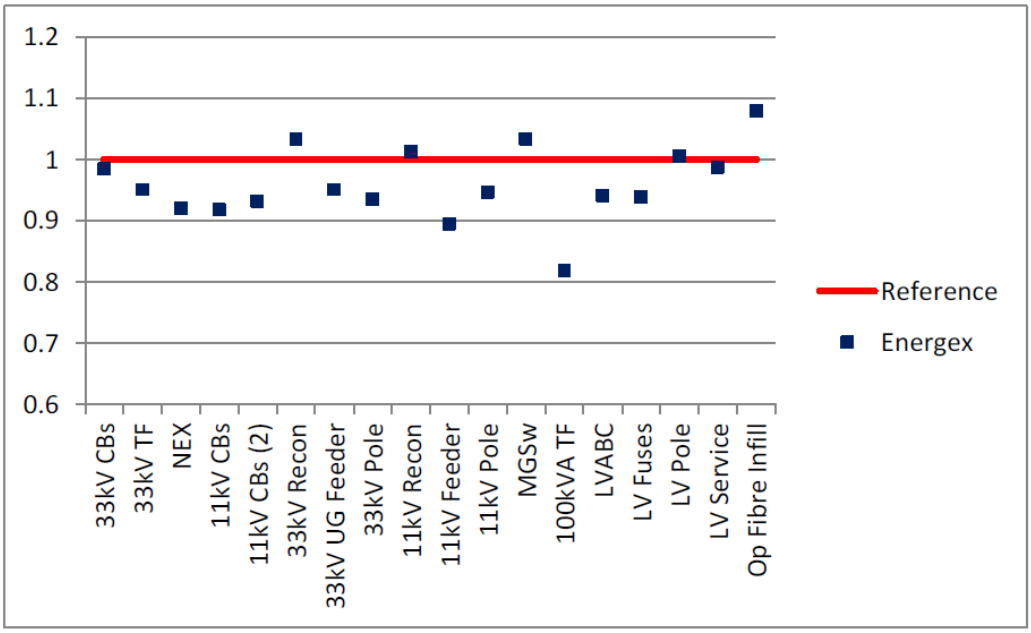
[59] AER presentation V2 Day 2 part B - slide 3; Energex Estimating Framework (RED948) Day 2 Presentation Part B objective, page 6

[60] AER EGX 038 - Cost Estimation_05022015 Question 41 PDF, page 5 (re: attached Schedule 1 - Supplementary Information, Question 5.3 response, page 1)

- "*No items in the forecast capex have been derived from competitive tender;*
- *No items in the forecast capex have been based upon a competitive tender process for similar projects however historical costs are built into Energex's estimating process as part of continuous feedback.*"
- "*No items in the forecast capex have been derived from estimates obtained from contractors or manufacturers*."
- "*No items in the forecast capex have been derived from independent benchmarks however Energex unit rates have been independently reviewed (Appendix 23 Unit rate review – AECOM).*"

151. Energex unit rates were independently reviewed by AECOM who concluded that there was a "*reasonable correlation with the reference estimates*" provided by Energex. Refer to Figure 22 below.

Figure 22: Energex unit cost benchmarking



Source: Appendix 23 Unit rate review - AECOM

152. Project estimates are considered at key stages in the planning, design and construction gated processes. Energex advised that the majority of the projects and programs in its 2015-20 capex forecast are based on strategic estimates.

153. Energex advised that, for large capital projects, the project estimate incorporates contingency costs associated with identified risks and uncertainty. Energex stated that *"these cost items are removed from the program build to reflect that project risk will balance out across the entire program".*[61]

154. We observed that the cost estimation process is subject to review to maintain currency and incorporate changes in work practices, contract arrangements and materials impact. These reviews may be ad-hoc requests as well as periodic reviews (annually

[61] AER EGX 038 - Cost Estimation_05022015 Question 41 PDF, page 5 (re: PDF attached, page 5)

and quarterly) to "*reflect overhead and on-cost rate change requirements for (the) forthcoming financial year, or identified quarterly changes in trends associated with unit rate types of work*".[62] Energex has undertaken one complete cycle of review.

155. On the basis of the information provided we are satisfied that the framework and methodology applied to cost estimation is reasonable and without evidence of systemic bias.

5.3 Concluding remarks

156. While Energex's advice is that augex expenditure is not sensitive to forecast growth, the credibility of Energex's augex forecasting methodology is undermined by:

- A significant discrepancy between the top-down and bottom-up forecasts, which Energex has not adequately reconciled;
- Significant proposed non growth-related augex (i.e., for compliance) - a category for which Energex was substantively underspent in the current RCP and for which it has not adequately described its forecasting methodology, drivers or prioritisation process; and
- Inclusion of a significant number of projects that address only low-risks.

157. For augex, we consider that it likely that there is over-estimation bias in Energex's forecasting methodology. This suggests inadequate consideration, at the portfolio level, for net deferrals that are likely to arise from targeted DM and from more detailed options analysis.

158. For repex, Energex presents CBRM as its preferred forecasting methodology. However, the evidence provided by Energex indicates that trending was the primary methodology used to develop expenditure forecasts for the majority of categories. At a more detailed project level, it is not clear how trending has been applied. Further, the proposed significant step increase in repex appears to be inconsistent with the application of historical trending to the majority of line items and Energex has not presented drivers that would adequately justify this step increase.

159. We observe that the application of risk assessment (and resulting risk profiles) for repex programs does not appear to provide sufficient evidence of risk-based prioritisation, as evidenced by the inclusion of an inappropriately high number of low risk rated projects in the capital expenditure forecasts. We also observe that Energex's repex modelling does not appear to have had any meaningful role in constraining its proposed program. Energex did not provide evidence of an effective top-down challenge being applied as part of its repex forecasting process - only of overall expenditure modelling that sought to achieve a price outcome.

160. Accordingly, we consider that the capex programs may be biased upwards and include: (1) projects that were not subjected to a robust top-down challenge; (2) compliance programs with inadequate justification of forecasting methodology; (3) programs for which forecasts have been developed by trending at an excessive rate; and (4) projects with risks rated as "*Low*" and "*Very Low*".

[62] AER EGX 038 - Cost Estimation_05022015 Question 38 PDF, page 1

6 Proposed Augex

6.1 Overview

Expenditure summary

161. According to the information supplied in the RIN, Energex propose a total direct augmentation capex of $513m for the 2015/20 RP. This is a significant decrease compared to the 2010/15 RP.

162. In this section, we concern ourselves with an assessment of the application of the governance and management and forecasting methodologies to the projects and programs proposed within the augmentation expenditure category.

Drivers of augmentation capex

163. Energex advised that revised security standards (ENCAP) and more recently the Customer Safety Net standards, when combined with reduced network demand growth, has resulted in significant reduction in security and reliability driven augex. The proposed augex includes a limited number of major growth projects to meet areas of customer growth with the remainder targeting compliance based projects.

164. Energex advised that the proposed sub-transmission (C2020) and distribution expenditure (C2060) forecasts are built based on comprehensive load flow and fault level analysis using industry standard modelling tools (DINIS, Sincal and PSS/E).

Program overview

165. Energex's proposed augmentation capex is shown in Table 7 below. We note that there is a difference between the total augex (direct costs) sourced from the supporting information provided by Energex and the data supplied from the RIN. We used the supporting information in our assessment that is directly related to the projects and programs within the scope of our review.

Table 7: Summary of Energex network augex (direct costs)

$m, 2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Growth and compliance	**89.3**	**101.3**	**83.7**	**51.6**	**41.4**	**367.3**
Sub-transmission	31.5	41.4	22.7	13.3	4.2	113.1
Distribution (11kV)	18	19.6	20.7	19.8	18.9	97
Low voltage programs	38.9	39.1	39.1	17.3	17.4	151.8
Demand management	1	1.2	1.2	1.2	1	5.6
Reliability	**14.6**	**11**	**11**	**11.1**	**11.2**	**58.9**
Power quality	**5.8**	**4.9**	**4.9**	**11.4**	**11.5**	**38.4**
Land and easements	**3.3**	**5.4**	**5.5**	**7.7**	**7.8**	**29.6**
Total direct augmentation	**112.9**	**122.6**	**105.1**	**81.9**	**71.8**	**494.3**

Source: EMCa analysis[63]

6.2 Assessment

166. The main components of proposed augex, and the movements between actual prior RCP expenditure and Energex's proposed expenditure, are outlined in section 2. The following subsections provide summary briefings on the material components of the proposed augex, and which were used to evidence systemic issues reported in our findings.

6.2.1 Demand Forecasting

How Energex has forecast demand

167. Energex prepares a bottom-up forecast for each individual zone substation (i.e., spatial forecasts) based on its knowledge and understanding of its customer base and its assessments of future growth in the communities supplied from each zone substation. The forecasts produced for all zone substations are aggregated to bulk supply substations and connection points.

168. Forecasts are then aggregated to an Energex system total, and reconciled to a system maximum demand forecast. The system maximum demand forecast is derived mainly using an econometric model, but with some "post-modelling" adjustments, for example, to take account of expected further growth in PV and which is adjusted out in the calibration of the econometric model. Energex then adjusts the zone substation Spatial Maximum Demand forecasts to reconcile to the System Maximum Demand forecast. At the onsite meeting, Energex advised that it decreased the spatial forecasts (except to the extent of maintaining future demand from "block" loads) by around 10%.

169. Since the last regulatory review process, Energex's forecasting methodology has been changed to incorporate recommendations from the AER and a number of recommendations produced from joint working studies undertaken by Energex with Ergon Energy. The framework used by Energex was recommended by ACIL Tasman consultants. In particular, Energex has taken measures to address the need for a Load

[63] The supplied table aligns with information provided by Energex EGX010 and EGX030 (for breakdown of growth and compliance)

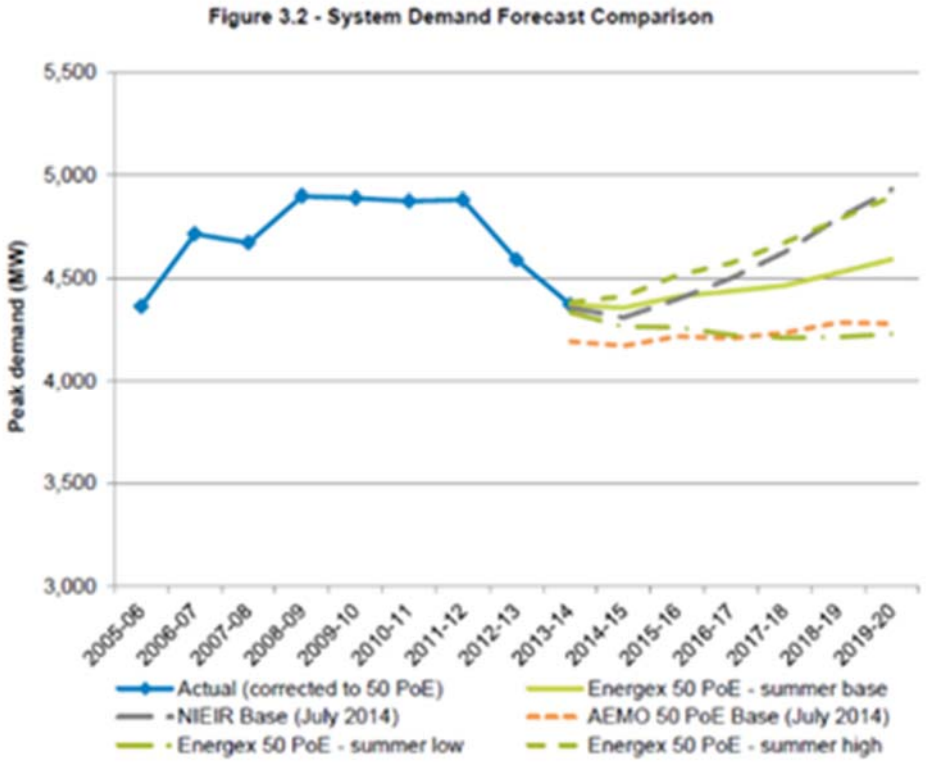
Forecast System Maximum Demand process that delivers a top down system maximum demand forecast that reconciles the bottom up forecasts.

Energex's demand forecast and reviews

170. Energex's maximum demand during the current regulatory control period has remained static, which is significantly less than what Energex anticipated for the current RCP. This was due to supressed economic conditions, milder weather and changes in customer behaviour.

171. Energex expects average annual growth in peak demand of around 1.1 per cent in the 2015–20 period.[64] This contrasts with its experience from 2010–11 to 2014–15, when Energex experienced a decline in peak demand from 4,875MW to 4,356MW (1.1 per cent p.a.).[65] Refer to Figure 23 below.

Figure 23: Energex Maximum Demand Forecast



Source: Maximum Demand forecast – Appendix 16 Energex Maximum demand, Customer and Energy Forecasting Methodologies page 22

172. Energex engaged NIEIR in July 2014 to produce a ten year maximum demand forecast using NIEIR models. The forecast at 50% Probability of Exceedance (PoE) and 10% PoE was then compared with externally provided demand forecasts from Powerlink, AEMO and NIEIR. The results of these forecasts are also compared in Figure 23. Energex's RP states that the: "*submission is based on a medium growth scenario*" which is higher than the AEMO forecast, with a higher starting point and a slightly higher growth rate evident.

[64] RDP2015 Regulatory Proposal - NEW as at 3 Nov 2014 Table 8.3, page 99

[65] RDP2015 Regulatory Proposal - NEW as at 3 Nov 2014 Table 3.2, page 35

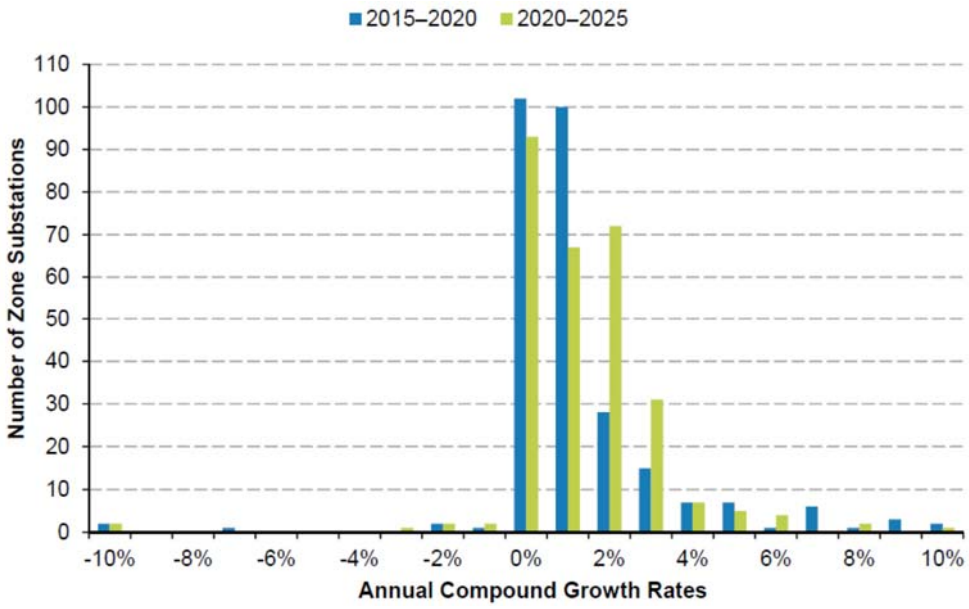
173. We note that the peak demand model was reviewed by Frontier Economics, with their main findings summarised below:

- data for high and low economic scenarios was not available to reproduce forecasts;
- economic drivers only appear in the model as interactions with temperature variables possibly leading to biased estimates; and
- there is no discussion on how the projections of the economic drivers obtained from external sources has been validated.

174. Subject to the above provisos, it was Frontier's view that Energex's peak system demand forecasting model meets AER's criteria for good forecasting methodology. Frontier Economics recommended the use of additional test parameters in future versions of the Energex's Forecast Guidelines.[66]

175. Energex notes that growth-related augex is a function of the pockets of growth that it expects, regardless of the overall system-wide growth rate, as shown in Figure 24 below.[67]

Figure 24: Substation augmentation vs Growth rates



Source: AER Pres Jan 2015 Forecasting and DM slide 15

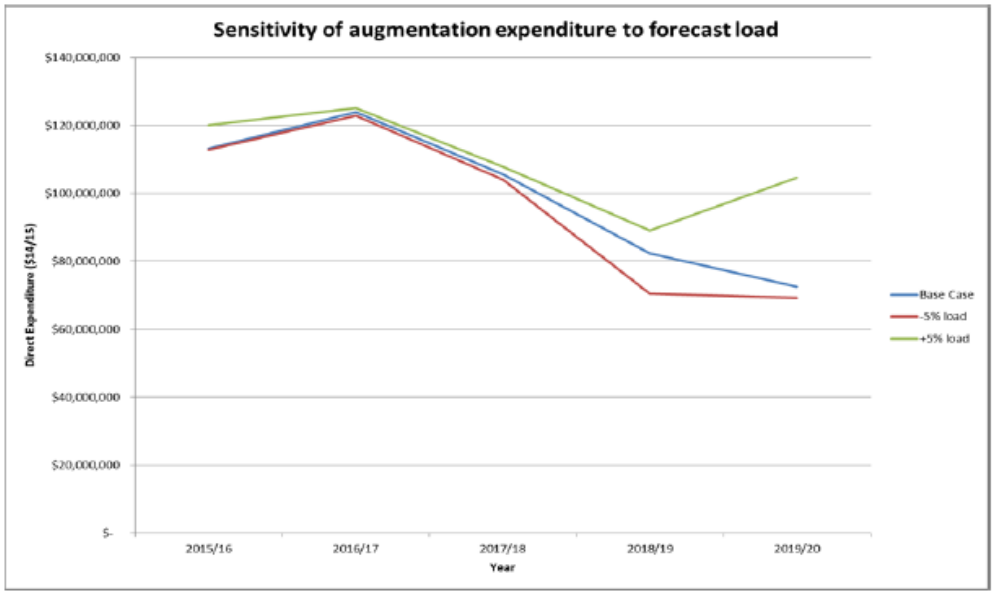
176. We sought further information on the sensitivity of the proposed augex to the demand forecast. Energex advised that *"the augmentation forecast expenditure will not materially change with a change in demand forecast".*[68] Figure 25 below illustrates the sensitivity of Energex's augex to a +/-5% variance in load. The chart suggests that no material change in augex would arise until 2018/19.

[66] Appendix 16, page 21

[67] AER Pres Jan 2015 Forecasting and DM, slide 15

[68] Overview AER_EMCA Pres Day 1 Part A Jan 2015 Augex, slide 20

Figure 25: Sensitivity of augmentation costs to forecast demand



Source: *Overview AER_EMCA Pres Day 1 Part A Jan 2015 Augex, slide 20*

Summary on demand forecasting

177. While we have not been engaged to undertake an assessment of the demand forecast, there are aspects which we consider to be cause for concern:

- Energex is forecasting demand growth despite the fact that no growth in demand has occurred over the current RCP;
- Energex's forecast is significantly greater than AEMO's forecast;
- Frontier Economics' review findings give cause for concern, and do not seem consistent with Frontier Economics' overall conclusion that the model is suitable; and
- While the top-down trim process led to a reduction in substation demands, we consider that a discrepancy between the top-down and bottom-up forecasts of the order described by Energex is greater than we would expect to see and requires explanation. The lack of explanation reduces the credibility of both forecasts.

178. Energex's advice is that augex expenditure is not sensitive to forecast growth, however it is unclear how the TRIM changes (reductions) are carried forward into the project assessments. Our observations in the sub-sections below suggest that reconciliation of the top-down and bottom up forecasts may not have carried forward to the project level assessments.

6.2.2 Demand Management

Inclusion of demand management in plans[69]

179. Energex's Asset Management Strategy, Demand Management Program and corporate plan identifies the core elements of its demand management strategy and references to a suite of concurrent, co-ordinated demand management programs.[70]

180. Energex's asset management strategy states that all proposals are reviewed following the detailed assessment of emerging network limitations. It advises "*network solutions are assessed against non-network options such as demand management to develop credible and cost effective solutions to address prevailing network limitations*."[71]

181. On questioning, Energex's management confirmed that "*all network evaluations included a requirement for consideration of demand side options*."

Consideration in demand forecast

182. Energex advised that substation maximum demand forecasts incorporate weather-corrected starting demand, growth rates, block loads, load transfers "*and demand management reductions".*[72]

183. The methodology applied by Energex and as recommended by consultants ACIL Tasman includes "*modifying the calculated system maximum demand forecasts by the reduction achieved through the application of demand management initiatives. An adjustment was also made in the forecast for solar PV and the expected impact of electric vehicles."*[73]

184. Energex advised that it incorporated demand management initiatives into the summer and winter substation forecasts and the resulting reductions were captured in the Substation Investment Forecasting Tool (SIFT) and the ten year maximum demand forecasts. "*The demand management initiatives captured were the broad application of control capability for air conditioning, pool pump and hot water and targeted network limitation substations."*[74]

185. Energex also engaged NIEIR to produce an independent ten year maximum demand forecast using NIEIR models in July 2014. The results of the two forecasts were compared in the RP which states that the "*demand management load reductions are included in both forecasts".*[75]

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69 We have assessed the inclusion of demand management in Energex's augex plans. It is not within our scope to consider opex cost impacts or the prospective net benefits of Energex's DM program.

70 Appendix 13 - Asset Management Strategy, page 16; Demand Management Program & Appendix 10; Summary of Energex's 5 year corporate plan, page 11

71 Appendix 13 - Asset Management Strategy, page 13

72 Appendix 16 - Energex Maximum Demand, Customer and Energy Forecasting Methodologies, page 14

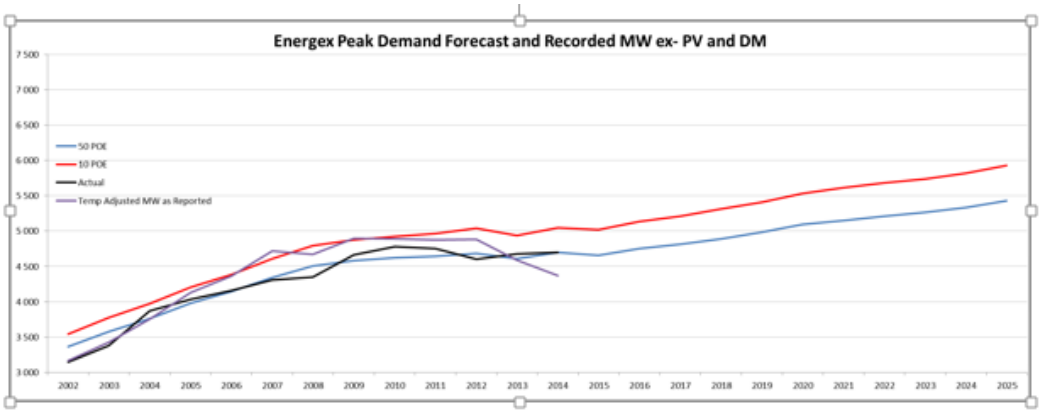
73 Appendix 16 - Energex Maximum Demand, Customer and Energy Forecasting Methodologies, page 20

74 Appendix 16 - Energex Maximum Demand, Customer and Energy Forecasting Methodologies, page 39

75 Appendix 16 - Energex Maximum Demand, Customer and Energy Forecasting Methodologies, page 29

186. The chart provided by Energex below "*shows the recorded peak demands without the impact of DM and solar PV, the unadjusted 10PoE and 50PoE forecasts and the reported temperature adjusted peak demands*."[76]

Figure 26: Recorded peak demands without the impact of DM and solar PV



Source: AER EGX 029 - Demand Forecasting_050215

Summary on allowance for demand management

187. We are satisfied from the advice received that Energex's demand forecasting methodology accounts for demand management savings at the aggregate level through an explicit reduction that it makes to its econometric system peak demand forecast model. Therefore, these reductions are effectively accounted for within the aggregate spatial demand forecasts. We note that their DM strategy assumes very high take up of EV/batteries by 2020 in the RCP. A reduced DM program would lead to a higher demand forecast.

188. We sought to identify the extent to which the spatial demand forecasts have been taken into account in forming augex projects. Observations on this are included in the following sub sections.

6.2.3 Sub-transmission augex

Overview of sub-transmission augex

189. Energex has stated that it has "*reduced its sub-transmission capex forecast for the 2015-20 regulatory control period to reflect subdued growth in peak demand and Energex's approach to meeting Schedule 3 of the DA through the new Customer Outcome Standard (COS)*".[77]

Expenditure trends

190. The resulting expenditure forecast is provided in Table 8 below.

[76] AER EGX 029 - Demand Forecasting_050215

[77] AER EGX 010, page 5

Table 8: Growth and compliance augex (direct costs)

$m, 2014-15 Direct cost	Budget code	Description	2015-16	2016-17	2017-18	2018-19	2019-20
C2020	TCAP	Sub-transmission	31.5	41.4	22.7	13.3	4.2
Total C2020			**31.5**	**41.4**	**22.7**	**13.3**	**4.2**
Total - Growth and Compliance (Direct only)			**89.3**	**101.3**	**83.7**	**51.6**	**41.4**
Total - Growth and Compliance (as per Table 9.5)			***132.0***	***146.4***	***123.1***	***76.3***	***60.6***

Source: AER EGX010

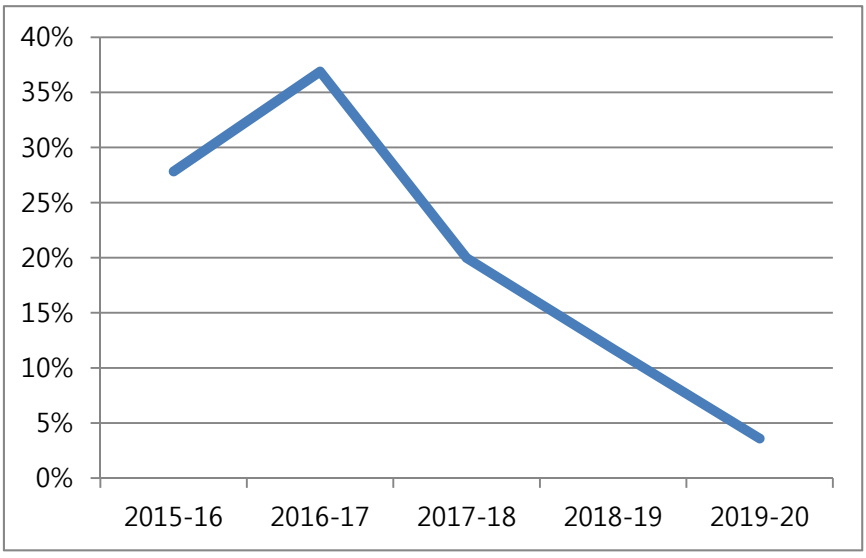
191. The sub-transmission program is split into growth, compliance (safety, fault level limit, security standard limit, flood mitigation and voltage limit) and Powerlink driven. The largest components are security standard limits (30%) and safety (23%).

Expenditure assessment

192. For the 2015-20 RCP, Energex proposes to undertake work on 90[78] projects. The total amount included for sub-transmission projects in the RCP is $113.1m, of which the two largest projects account for $61.2m (54%). We reviewed both of these sub-transmission projects. The remainder of the proposed sub-transmission project schedule is composed of relatively low-cost projects.

193. The sub-transmission augex is heavily front-loaded with 85% occurring in the first three years of the RCP. This is unlikely to be a realistic forecast of what will actually occur and it seems more likely to us that some work will be deferred and smoothing of the profile is likely. Whilst the deferral and smoothing may not materially alter the overall augex for the RCP, it will increase the probability that some work later in the program will be deferred to the 2020/25 RCP. Energex has not provided evidence of consideration of such possibility.

Figure 27: Energex sub-transmission augex – annual % vs RCP total



Source: AER EGX 010 – Q1 Augmentation 190115.docx

194. Our approach to project reviews is to assess, from the perspective of an approving body, the business case for expenditure (including project prudency and efficiency). In

[78] AER EGX 030 – Augex Summary 050215 and AER EGX 010 – Q1 Augmentation 190115.docx

doing so, we consider the status of the project in terms of its stage of development (i.e., Gate 1, 2, 3, etc.) and the materiality of expenditure. For sub-transmission, we reviewed two large projects that we would expect to have well-developed business cases and supporting documentation to support their inclusion in the RP.

WR361747 New 132kV Feeder from Palmwoods to West Maroochydore

195. The 'SunCoast Project' has an estimated cost of $48.6m. This project involves the construction of a new 132kV double circuit overhead line from Palmwoods (H9) to West Maroochydore (SSWMD) on the Sunshine Coast.

196. The Sunshine Coast is a high growth area, currently supplied from six zone substations (serving a total of 85,426 customers) via a double circuit 132kV line with Feeders F777 and F778 to Mooloolaba zone sub. The SunCoast project was originally approved by the Board in October 2010 as a more extensive project. Following a substantial reduction in load growth, the project was reduced to the current plan.

197. The summer peak load increased from 196MVA in January 2014 to 220MVA in January 2015 (increase of 12%). The data provided indicated that, during the 2015 peak, five of the six zone subs exceeded the 50% PoE load and two of them exceeded the 10% PoE load. There is reasonable evidence of a number of major projects in the northern part of the region which support improving the regional security of supply.

198. The 10% PoE load was exceeded for Caloundra (SSCLD) and Currimundi (SSCMD), which are the two southernmost subs on the Sunshine Coast. Yet, the proposed new feeders supply into West Maroochydore (SSWMD) which is the northernmost sub in the region. There is also a plan for further residential and commercial development in Caloundra South. This growth does not appear to be addressed by the SunCoast project.

199. On the basis of the documents reviewed and the discussions during the onsite session with Energex we consider that the SunCoast project is sufficiently justified. Energex has deferred and revised this project as the situation changed which is aligned with their stated asset management strategy and practices. We did not find any evidence of systemic issues in our project review.

WR 6239816 - 3rd 110/11kV transformer at West End

200. The 3rd 110/11kV transformer at West End project[79] comprises the installation of a new 60MVA 110/11kV transformer at West End Zone Sub Station (SSWED) and the transfer of 11kV loads from Charlotte St Zone Sub Station (SSSCT) to SSWED in 2021. The project includes a new switch room and GIS switchgear, plus additional 11kV bus and switchgear. Analysis shows that the project is required for completion no later than October 2022.

201. The SSWED provides supply to approximately 1,530 commercial and industrial customers and 6,630 domestic customers in West End and surrounding suburbs. The SSSCT provides supply to approximately 688 commercial and industrial customers and 1,609 domestic customers in the Brisbane CBD.

[79] WR6239816 WED - Install 3rd Transformer.pdf

202. The total project cost is set out in the information provided. The Planning Proposal Report concludes that the Project Cost is $20.4m. However, the cost shown during the 2015-20 period is $12.6m. There is no indication provided of project staging, so it is not clear if a further $7.8m is scheduled for 2021 onwards. The Planning Proposal Report states that the present value of the capex is -$64.5m. This suggests a further $50m is planned for the following RCP and that this project may be a component of a much larger suite of projects.

203. The purpose of the project is to meet forecast additional loads in the Brisbane CBD area, including:

- Brisbane Bus and Train Tunnel – 47.9MVA at Dutton Park, plus 35.3MVA at Victoria Park, requiring N-1 security in 2020;
- Queens Wharf Precinct – Commercial development in 2019, adding 15MVA on Charlotte St Zone Sub Station; and
- West End Residential Development – adding 5MVA on West End Zone Sub Station by 2018, plus 5MVA on West End Zone Sub Station by 2020.

204. The project appears to be justified on the basis of meeting the proposed additional loads, if and when they occur. The first stage of the West End Residential Development on its own does not justify the project. The timing of the second stage is key. Any delay may allow for deferral of the project into the following RCP if the Brisbane Bus and Train Tunnel does not proceed as expected.

205. A key disadvantage of the project option selected is that it increases the security rating of the substation from Urban to CBD, with much more onerous restoration times. This disadvantage is not quantified, but it suggests other options should be more seriously considered.

206. Energex proposes this project for inclusion in the 2015/20 RP on the basis of an assessment of forecast demand growth in the Brisbane CBD including specific new loads. The inclusion of the project is underpinned by a number of assumptions as identified above. We have concerns regarding the sensitivity of the assumptions to:

i. deferral of the connection of major loads; and

ii. options that may be available to avoid increases in the security rating of the substation.

207. Whilst we consider that it is reasonable for Energex to have identified the need for the project, we remain unconvinced from the information provided that the expenditure will be required in the 2015/20 RCP.

Summary on sub-transmission augex

208. In general, we found that the documents provided by Energex to support the inclusion of projects in the proposal are not well structured. For example, it is difficult to reconcile the sequencing of expenditure for costs provided for project WR6239816.

209. The projects that we reviewed account for 54% of the total sub-transmission augex proposed for the RCP. It is unclear how the TRIM process applied to Energex's overall

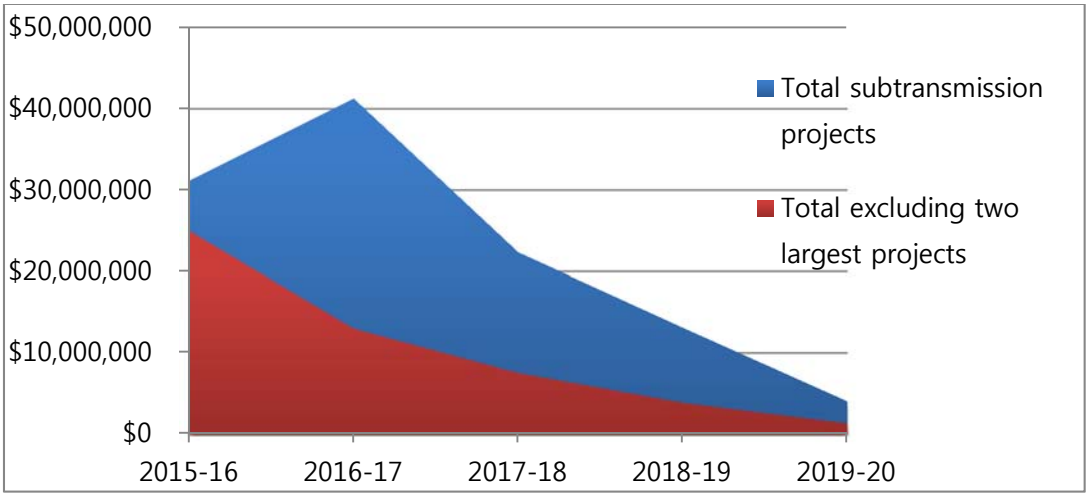
demand forecasts was applied to the specific augex projects and, if so, whether this impacted the timing of project commencement.

210. We observe that these projects are dependent on the commitment of large new loads and that the proposed expenditure is heavily front-loaded. There is a reasonable chance that the proposed timing for these projects will change. Unless additional information can be provided to confirm the need and timing for these projects, consideration should be given to submitting them as contingent projects.

211. Energex has proposed a total sub-transmission augex program of $113.1m. The program contains 90 C2020 projects.[80] Of the total sub-transmission program forecast, the two largest projects account for 54% ($61.2m) and the remaining 88 projects account for 46% ($51.9m).[81]

212. In Figure 28, the blue area represents the $61.5m forecast augex for the two largest projects. The red area represents the proposed $50.4m forecast augex for the remaining 88 projects.

Figure 28: Augex forecast for Subtransmission projects



Source: AER EGX 030 – Augex Summary 050215 and AER EGX 010 – Q1 Augmentation 190115.docx

213. Deferral of the need for one or both of the two largest projects will have a significant impact on Energex's augex program requirements and timing. For the remaining 88 projects, the program is also heavily front-loaded (with 49 projects scheduled for completion in the first year of the RCP).

214. We have seen no evidence that the front-loaded profile is logical or reasonable. We would expect the program to be prioritised to reflect a more balanced work schedule. At the portfolio level, we consider that the proposed profile is something that a top-down assessment would have identified and challenged. Had this been done, we would expect to see (but did not find) clearly documented supporting justification. This supports our finding set out in section 5.2.1 of an insufficient top-down challenge.

[80] EGX010, Attachment 1B – C2020 project forecast

[81] This analysis is based on the total sub-transmission augex of $113.1m. Calculation of the total augex from EGX030 Attachment 1A produces a slightly lower total of $111.9m

215. We consider it likely that the sub-transmission augex program will not be delivered as proposed. A number of projects will be deferred, with some deferred beyond the RCP.

6.2.4 Distribution augex

Overview of distribution augex

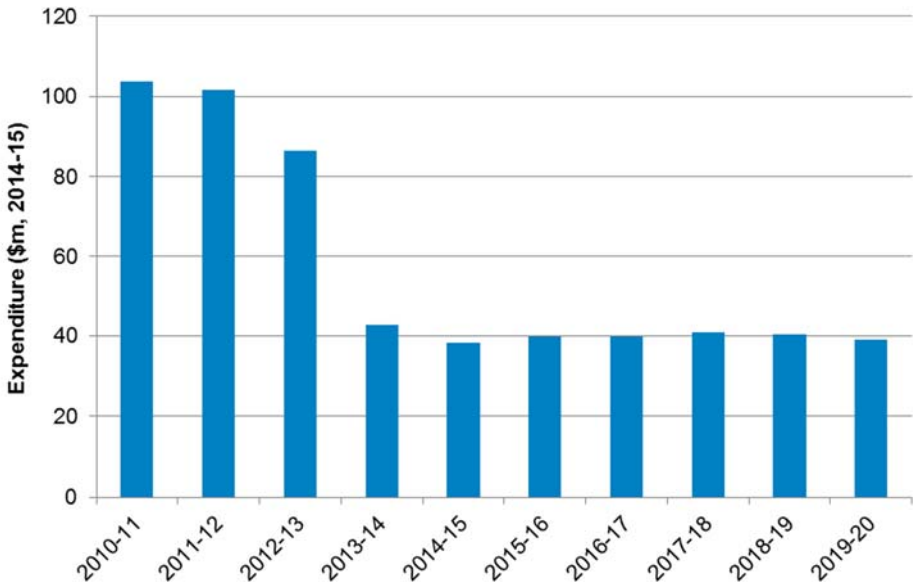
216. Energex has an '11 kV Distribution Strategic Plan 2015-20', which describes its distribution (11kV) augmentation program (C2060). The program is significantly reduced due to lower demand growth and introduction of the COS.

217. Energex's LV augmentation program (C2565) is based on the 'Network Asset Management Plan – Distribution Augmentation'. These projects are related to growth, bushfire and flood mitigation programs.

Expenditure trends

218. Figure 29 below sets out the augmentation expenditure profile for HV feeders and clearly demonstrates the substantial reduction in augmentation that occurred in 2013/14.

Figure 29: Augmentation expenditure - HV feeders



Source: EGX030 (Based on the RIN data)

219. The following table provides a breakdown of Energex's distribution augex proposal.

Table 9: Distribution augex (direct costs)

$m, 2014-15 Direct cost							
Category	Budget code	Description	2015-16	2016-17	2017-18	2018-19	2019-20	Total
C2060	DCAP	Distribution (11kV)	18	19.6	20.7	19.8	18.9	97
	Growth	11 kV mesh network	1.6	2.5	3.3	3.4	3.4	14.2
	Growth	11 kV radial network	3.6	10.5	9.6	10.7	9.7	44.1
	Growth	COS – tie capacities	3.6	3	3	3	3	15.6
	Comp	11 kV voltage management	0.8	1.9	3	1	1	7.7
	Comp	Fault level mitigation	7.2	0.4	0.4	0.4	0.4	8.8
	Comp	Security of highway crossings	1.1	1.1	1.1	1.1	0.7	5.1
C2565			38.9	39.1	39.1	17.3	17.4	151.8
	CA03	Uprate pole transformer	3.8	3.9	3.8	3.8	3.8	19.1
	CA04	Uprate Padmount transformer	0.7	0.7	0.7	0.7	0.7	3.5
	CA17	Retrofit transformers with LV protection	23.4	23.4	23.5	0	0	70.3
	CA28	11kV wildlife proofing	0.1	0.1	0.1	0.1	0.1	0.5
	CA49	Bushfire and flood mitigation	1.9	1.9	1.9	1.9	1.9	9.5
	CA50	Neutral integrity monitoring	1.1	1.1	1.1	2.8	2.8	8.9
	COIN	11kV & LV augmentation & minor works	7.9	8	8	8	8	39.9
Total - Distribution			**56.9**	**58.7**	**59.8**	**37.1**	**36.3**	**248.8**

Source: EMCa analysis based on information supplied by EGX010

220. Refer to Table 9 above. For Energex's 2015-20 Regulatory Proposal, the total amount included for distribution augex (comprised of C2060 and C2565) is $249m. The programs of work for each expenditure category are shown above.

221. For distribution augex, our approach to review this total expenditure category has been to assess the business case for the project expenditure, whilst also taking into account the justification for any step changes observed in the volumes of planned activity.

C2060 expenditure assessment

222. The expenditure forecast for distribution C2060 projects is $97m.

223. The four largest distribution projects for which Project Approval Reports have been provided by Energex are all quite small. The total cost of all four projects is $1.7m (1.8%). The two largest of these were reviewed.

Resolve 11kV Overhead Thermal Fault Limitations at WFD, CBW, CBT

224. The largest project we reviewed is to '*Resolve 11kV Overhead Thermal Fault Limitations at WFD, CBW, CBT*' at a cost of $760,327.[82] This project addresses the thermal fault rating limitations of identified segments of several feeders from Woodford Zone Substation (SSWFD), Caboolture West ZS (SSCBW) and Caboolture ZS (SSCBT).

225. In the event of a three phase to ground fault, there is a potential for conductor failures causing safety risks. This is part of a wider Energex program to mitigate this risk.

226. The project involves installing MDOs (drop out isolation devices) on sections of 11kV spurs, installing a recloser on the backbone of CBW11 and re-conductoring sections of 11kV overhead backbone feeder at SSWFD, SSCBT and SSCBW. Works include 2.5 km of overhead re-conductoring, 5 MDO fuse installations and 1 recloser installation.

[82] EGX040_Project_Approval_Report WFD, CBW, CBT 11kV TFL.pdf

227. Energex has carried out a risk based assessment of the risk associated with delaying the project completion (which indicates a low risk). The project is largely driven by safety considerations with no great technical drivers.

228. We conclude that this project could be delayed. The low level risk assessment rating for this project indicates a potential systemic issue with the broader conductor project/programs.

Deception Bay Project

229. The second largest project reviewed is the Deception Bay Project to establish new 11kV feeder ties to Mango Hill Substation (SSMHL) at a total cost of $474,961[83]. This project addresses growth of residential and commercial load in the North Lakes area supplied by three feeders from SSMHL.

230. The 11kV feeder MHL12A is forecast (at 50% PoE) to exceed 100% utilisation in summer 2014/15 and feeder MHL13A is forecast (at 50% PoE) to exceed 94% utilisation in the same year.

231. The proposal is to establish a new feeder tie between DBY10 and MHL12A and to upgrade the feeder tie between DBY10 and MHL3A.

232. Based on acceptance of the information provided by Energex that the area of North Lakes is currently undergoing some dramatic load growth, our view is that the project documentation supports early completion.

233. Regarding systemic issues identified in this project review, we note that Energex's risk assessment[84] of delaying the project considers it to be an 'Intolerable' risk with 'Extreme' consequence that is 'very likely' to occur. In our view, the realistic consequence of project deferral could be the lost ability to connect some load growth at the full required capacity during periods of peak load. For the risk to be assessed at the highest end of Energex's risk assessment framework suggests that the risk rating is biased towards overestimation.

C2565 expenditure assessment

234. We understand that a number of Energex's C25 and C35 programs are categorised as being short cycle time, high volume type activities on Energex's LV and 11kV distribution networks. Energex has advised that they manage the approval of specifically nominated C25/C35 capital program works on a 'hub-by-hub' basis using delegated financial authority, reviewed annually as opposed to individual project or program approval.

235. The C2565 program includes seven activities described in the Network Asset Management Program (NAMP), being CA03, CA04, CA17, CA28, CA49, CA50 and COIN totalling $151.8m.[85]

[83] EGX 040

[84] Responses to AER Requests AER EGX 012 - Repex_23012015 Appendix 5 (RED560_Network risk assessment procedure).pdf

[85] See Table 7, low voltage programs

236. Two programs comprise 72% of the forecast expenditure (i) CA17 – Retrofit transformers with LV protection ($70.3m) from 15/16 to 17/18 only, and (ii) COIN – 11kV & LV augmentation & minor works ($39.9m).[86]

237. We understand that these programs are built up from information stored in the corporate ERP system, and that the "*forecast expenditure for these programs is approved by the NTC at a program level and as such no separate approval documentation exists for individual NAMP line investments*."[87] However, the changes across the current RCP and forthcoming RCP are not adequately explained, such as the step change in CA17 to complete the program within three years of the RCP.

238. On review of the example submission provided for the 2014/15 program, [88] we note that a risk score did not form part of the submission approval process. Rather, implementation of strategy, policies and plans recorded in the NAMP was used. Accordingly we consider there may be opportunities to adopt a lower expenditure forecast profile for some of this work.

Summary of distribution augex

239. Given the small sample of project documentation provided by Energex to support this expenditure, we are unable to conclude that the proposed expenditure is efficient and prudent. From the limited information provided to support the C2060 distribution augex, we determined that some of the proposed expenditure is likely to be considered for deferral due to a low risk assessment.

240. For the C2565 expenditure we consider that the formulation of this program has not been subject to adequate governance and top-down challenge to establish the optimal level of risk, and the absence of a supplied risk assessment raises concerns over the prudency of the forecast. Had this been done, we would expect to see (but did not find) clearly documented supporting justification.

241. We observe that the forecasting methodology has not been clear defined, and infer that it is likely these programs follow a trending approach. In section 7, we discuss further, the application of risk assessments included for the NAMP to which this program relates, and consider the same biases for over estimation are likely to exist for this expenditure category.

242. Based on the summary information provided, we consider that prudency is undermined by a lack of robust options and risk and cost-benefit analysis to support the timing/volume of the planned activity. Further, we found that risk assessment has been undertaken at too high a level to assist meaningful decision making both within and across the program. We consider that this is likely to lead to a bias to maintain or increase the forecast.

[86] AER EGX 010

[87] AER EGX 041

[88] AER EGX 041

6.2.5 Power Quality augex

Overview of power quality augex

243. Energex's power quality strategy is described in the Power Quality Strategic Plan, with proposed programs for the 2015-20 regulatory period included in the NAMP – Distribution Augmentation.

244. The strategic plan is targeted at meeting Energex's compliance obligations, with a primary driver being its response to the penetration of customer solar photovoltaic (PV) systems on the network.

Expenditure trends

245. The direct augex for power quality over the forthcoming RCP is depicted in Table 10 below.

Table 10: PQ capex programs

$m, 2014-15 Direct costs		2015-16	2016-17	2017-18	2018-19	2019-20
C2030	PQ Monitoring at zone substations	0.6	0.0	0.0	0.0	0.0
Total C2030		***0.6***	***0.0***	***0.0***	***0.0***	***0.0***
C2565	CA44 - PQ monitoring on pad mounted transformers	0.8	0.7	0.7	3.4	3.4
	CA46 – Solar remediation works	3.4	3.3	3.3	5.2	5.2
	CA48 – PQ monitoring on LV circuits	0.9	0.9	0.9	2.8	2.8
Total C2565		***5.1***	***4.9***	***4.9***	***11.4***	***11.5***
Total - Power Quality		**5.8**	**4.9**	**4.9**	**11.4**	**11.5**

Source: EGX 010

246. We observed a step change in the forecast expenditure for power quality. This is evident in the step increase in the volume of initiatives, as shown in Table 11 below.

Table 11: Summary of 2015-20 capex initiatives for Power Quality

Table 4: Summary of PQ 2015-20 CAPEX Initiatives

Ref #	Initiative Title	2010-15 Current units	2015-20 Proposed units	NAMP	Years	Spend Cat
Monitoring / Reporting & Data Analytics						
PQ1A	Distribution Transformer monitoring (<100kVA) - Pole	270	1,854	CA15	5	C25
PQ1B[1]	Distribution Transformer monitoring (≥ 100kVA) - Pole	3,530	6,865	CA17	3	C25
PQ2	Distribution Transformer monitoring - Padmount	520	1,750	CA44	5	C25
PQ3	LV Circuit monitoring	Nil	1,800	CA48	5	C25
PQ4	Customer monitoring	Nil	4,200	CA48	5	C25
PQ5	Neutral Integrity Monitoring	Nil	28,050	CA50	5	C25
Rectification Works						
PQ6A	Uprate & Reconfigure LV Network (OH)	Nil	720	CA46	5	C25
PQ6B	Uprate & Reconfigure LV Network (UG)	Nil	120	CA46	5	C25
PQ7[2]	Reconductor mains with LVABC (Fault level and PQ program)	500km	660km	CA08	5	C25

Note:
1. Initiative PQ2 meter component is part of an LV fuse installation program.
2. Initiative PQ7 is part of a reconductoring refurbishment program.

Source: Power quality strategic plan (Table 4)

Assessment of power quality augex

247. A total of seven dedicated programs are proposed by Energex, with only two of these existing in the current RCP. Many of these programs relate to power quality monitoring as described below, with expenditure profiles reflecting step increases in year 1 then again in year 4 of the RCP.

248. Energex forecast a continuing increase in PV connections of *"…around 70% compared to 2013/14 levels."*[89] However, we observe that the 2014/15 levels identified by Energex[90] indicate higher forecasts that continue to be projected near-constant until a further reduction is evident in 2019/20. The statements made regarding falling demand

[89] Appendix 29 - Power Quality strategic plan, page 17

[90] Ibid

in response to elimination of the feed-in tariff are also not consistent, as the forecast connections of 1,250 per month are only evident in the final year of the RCP.

249. We note that the forecast will result in installed PV capacity of 1,352,000 kVA or 1.32GW by the end of the RCP.[91] We have not been provided with any external reviews of the growth in connections or model(s) that Energex has relied upon in assembling the forecast. We consider that the forecasts may be overstated as they do not account for expected softening of growth.

250. In our on-site review meetings, Energex alerted us to a compliance issue with the over-voltage set-points for customer inverter systems not being set correctly by installers, and having to retrospectively correct these. This is supported in the documentation which states: "*Energex is proposing to address non-compliant settings in conjunction with proposed capital and operating programs to address high voltages on the network."*[92]

251. We were not able to identify where Energex has included this in their proposal and contend that this should not be included as an expense of the service provider, but rather as a requirement of the customer installation (or cost where that requirement is addressed by the service operator) that should be charged to the customer.

Power quality monitoring

252. We note from the CA15 program description[93] that: "*A limited roll-out in the early years of the period will provide Energex with the opportunity to review and improve PQ monitoring schemes and address areas (listed below) before a full roll-out from 2018/19*".

253. We observe from the supplied volume forecast[94] that quantities of monitoring schemes forecast in 15/16 are planned to increase to 254 (being 450% of the average annual installed quantities in the last RCP). These volumes are forecast to increase further to 600 by 18/19 so that "*the program should be completed by the end of the next regulatory period (2020-25) assuming a continuing rollout of 600 units per annum"*.

254. We observe similar profiles exist for other categories, where the justification of the proposed increases is not substantiated:

- CA44 – PQ monitoring of padmount transformers. We note a step change in year 4 on the basis that "*the program should be completed by the end of the next regulatory period (2020-25) assuming a continuing rollout of 650 units per annum*";[95] and
- CA48 – low voltage circuit monitoring. We note that the program is targeting "*LV circuits with excessive solar PV penetration and circuit length*" and reflects "a *limited roll-out in the early years of the period*". We observe, however, that the forecast

[91] Appendix 29 - Power Quality strategic plan, Table 1, page 15

[92] Appendix 29 Power Quality strategic plan, page 11

[93] NAMP – Distribution augmentation, page 12

[94] EGX 10, Attachment 3

[95] NAMP – Distribution augmentation, page 20

volume commences with 800 units increasing to 1,800 units by the end of the RCP to complete the program in 2020-25. Justification of this increase is not provided.

255. The CA17 - Retrofit Transformers with LV Protection program, whilst primarily focused on the LV fuse retrofits, includes provision to "*retrofit smart meters to remotely read voltage and demand measurement and replace maximum demand indicators"*. We note that the forecast quantities are consistent with the level of 14/15 (whilst a step change from the prior year of 13/14) to 17/18 where the program is completed. The rationale for completing this program in the third year of the RCP and the volume of activity forecast is not provided.

256. The analysis provided in support of the PQ monitoring in the strategic plan shows a declining trend in the number of insurance claims by number and percentage of paid versus total resolved claims. The relevance of PQ enquiries (where a graph of customer complaints has been included) is not evident.

257. Energex also propose monitoring of excessive voltages based on the experience of SP Ausnet (CA50 - Neutral Integrity Monitoring) with limited assessment of the options and benefits provided in the supporting information.

258. The monitoring programs generally include extension of the existing programs in place in the current RCP and commencement of new ones so that "*by 2019/20, it is expected that most pole transformers 100kVA and above will have monitoring installed …*" and "*… the majority of single phase and three phase transformers less than 100kVA at the end of feeders*" will have been addressed.

259. Energex describe this as "*comprehensive coverage"*. We would consider this to be above the level of monitoring present at most network operators.

260. The inclusion of some form of monitoring to validate and improve the data for Energex including undertaking trend analysis to address identified risks is likely to provide benefits. We have not however seen a cost benefit analysis that considers the use of the existing meter population, consideration of alternatives, options regarding level of deployment and associated expenditure, or the benefits that may arise from this level of expenditure.

261. A major driver appears to be one of compliance. However, we note in an earlier draft decision, the QCA has expressed a view that appears to support continuation of targeted approaches: "*We are of the view that the targeted approaches to managing and remediating power quality problems currently employed by the distributors are likely to be more efficient solutions to power quality problems than attempting to drive more widespread improvements through imposing additional regulatory requirements to those already included in the Code*."[96]

PV remediation

262. The CA46 – Solar PV capex remediation program, is also referred to as '*Uprate and reconfigure LV network (OH and UG)*' in the Power Quality strategic plan. We note that

[96] QCA, Drafted decision Review of Minimum Service Standards and Guaranteed Service Levels to apply in Queensland from 1 July 2015, March 2014, page 29

Energex has proposed to target areas of the network with a solar penetration of 40% and long circuits, and has estimated quantities of 422[97].

263. The focus of the program is described as installing additional distribution transformers to split LV areas. The supporting documentation refers to a 'limited roll-out' relating to PQ monitoring, which we consider is likely an error.[98] Forecast volumes commence at 140 and increase to 210 in year 3, continuing to 2020-25 to complete the program. In this case, the program appears to be determined such that the program is completed in the next RCP rather than by application of the criteria.

264. Energex makes reference to the advantages of moving to the 230V standard, including the suggestion of avoiding significant capital expenditure. Energex observe that similar changes have already occurred in other states, however do not provide any details on its plans to assist this change, other than having developed a discussion paper and continuing investigation.

265. It appears that the introduction of the 230V standard may provide significant benefits to Energex. However, Energex has assumed in its proposal that it is unlikely to be implemented in the RCP and therefore has not included this change in its forecast.

Risk assessments

266. We note that network risks are assessed in accordance with the network risk framework. However, we saw no evidence of risk assessments undertaken by Energex in the associated NAMP Risk assessments that relate directly to these programs, or the change in risk by considering options. Based on our review of the program documentation, we suspect that the risk assessments, if provided, would likely indicate that the proposed forecast has been over-estimated.

Summary

267. We found that the forecasts are subject to over-forecasting bias and do not account for expected softening of growth in PV.

268. We consider that the proposed expenditure is above the level of power quality monitoring present at most network operators and that, whilst some form of monitoring is likely to be reasonable, an appropriate cost benefit analysis has not been provided to support the proposed level of expenditure and increases in the forecast.

269. We find that the absence of cost benefit analysis, and inconsistency of data, raises concerns regarding the robustness of the forecast for PV remediation. The step change evident in the sample of programs reviewed is not adequately supported, and suggests that the top-down challenge process was not sufficiently robust to remove the apparent shifting focus of programs.

[97] EGX10, Attachment 3, page 22

[98] The discussion included in NAMP – Distribution Augmentation, page 23 includes a description of a roll-out that is more applicable to PQ monitoring than for LV augmentation, and is used in the justification of PQ monitoring. The same text exists in the description of CA44 and CA48, We suspect that this has been included in error in the supplied documentation.

6.2.6 Reliability augex

Overview of reliability augex

270. Energex has developed a reliability strategic plan to meet its compliance obligations within the Distribution Authority, in addition to meeting stakeholder expectations and achieving balanced commercial outcomes.

271. As part of the introduction of the new Distribution Authority on 30 June 2014, Energex was required to achieve MSS targets and undertake an improvement program for the worst performing feeders. The assessment criteria is defined within the Distribution Authority.

272. Section 11.1 of the Distribution Authority[99] states that "*The purpose of the improvement programs are to enable customers with the worst reliability outcomes to benefit from tailored network improvements."*

Expenditure trends

273. The proposed reliability augex for the forthcoming RCP is $58.9m.

Worst performing feeder program

274. Energex has identified 18 rural worst performing feeders (approx. 4% of the rural feeder population) and 4 urban worst performing feeders (approx. 0.3% of the urban feeder population) per annum to address during the next regulatory control period.

275. Energex states[100] that "*by ranking the worst performing feeders by their SAIDI contribution from unplanned 11kV events, the feeders which would benefit most from capital expenditure to improve reliability can be identified.*"

276. We observe that Energex applies an average to the SAIDI from the last three years. However, improving trends or removal of isolated events that may not be representative of a performance trend do not appear to have been considered in the selection process.

277. Energex has assumed that "*similar quantities of reliability projects on worst performing feeders will be required each year of the regulatory control period. Therefore, an allowance of 22 projects has been continued for future years.*" Energex also suggest that "*based on the 2013/14 worst performing feeder list, this proposed reliability program of work will address 29% of rural worst performing feeders and 6% of urban worst performing feeders in any given year.*"[101]

278. Whilst we understand the purpose of the program is to improve the worst reliability outcomes, we note that the general level of reliability is improving, and may suggest that the assumed level of reliability expenditure could be reduced over time. Energex has not provided a trend of reliability improvement for the worst feeders over time to support the continued level of expenditure.

[99] Department of Energy and Water Supply, Queensland Government, *Distribution Authority No. D07/98 issued to Energex Limited*

[100] Appendix 28 - Network reliability strategic plan, page 18

[101] Appendix 28 - Network reliability strategic plan, page 19

Reliability improvement

279. Energex has proposed a statistical method of calculating the 10% probability of exceedance (1 in 10 year event) for achieving the MSS targets by feeder category. We note, however, that a breach of the Distribution Authority only applies where Energex has exceeded the same MSS limit three years in a row.

280. Energex state that: "*To allow for this variation, ENERGEX must target performance levels better than the MSS limits to reduce the risk of non-compliance*". Energex conclude, based on performance being forecast to continue below target, that there is no funding gap, and "*no investment will be required to address the reliability gap on either urban or rural networks*".[102]

Summary on reliability augex

281. We note that network reliability has generally been improving and is both within MSS targets and Energex's lower 10% PoE target for urban and rural networks. We have not been provided a cost benefit analysis associated with the corresponding expenditure and consider the case for increasing expenditure for reliability improvement to be, as yet, unproven.

282. Whilst the Distribution Authority nominates the criteria for developing a worst performing feeder program, our reading indicates that it does not specify the scale of the program required. Accordingly, we consider there is scope for reductions to this program on the basis of current reliability performance being achieved at Energex and Energex's own customer research.

283. Energex has applied a unit cost approach, consisting of a number of augmentation options, to build the forecast for reliability augex. We consider such an approach to be reasonable for this type of activity. However, we consider that the proposed options have contributed to a higher unit cost and forecast than is required to manage Energex's reliability improvement compliance requirement.

6.3 Concluding remarks

284. Energex has proposed a significant reduction in augex for the 2015/20 RCP. Whilst the reduction in growth-related augex is supported by revised (lower) demand forecasts, the evidence provided by Energex does not support the proposed level of non-growth related augex.

285. We summarise our assessment of systemic issues and resultant biases in section 6.3.1 below, then describe the implications of this assessment regarding Energex's proposed augex in section 6.3.2, as required by our terms of reference.

6.3.1 Systemic issues leading to over-estimation

286. We consider that the systemic issues identified in our review reflect a bias that has led to an over-estimation of forecast expenditure in the forthcoming RCP. The impact of this

[102] Appendix 28 - Network reliability strategic plan, page 16

overestimation bias differs across components of the augex program, where we found that the proposed increased level of augmentation capex has not been:

- adequately linked to a prudent needs-driven analysis, including consideration of net deferrals, softening of demand growth and efficient timing of expenditure;
- adequately supported by cost-benefit analysis and appropriately applied risk assessment; and
- subjected to an adequate top-down challenge process to determine the optimal expenditure program.

287. We also found that the absence of documentation has, in some cases, hindered our assessment of Energex's augmentation capex proposal. This raises further concerns regarding the prudency of the forecast.

6.3.2 Assessment of prudent and efficient level of expenditure

Aggregate impact

288. We consider that the systemic issues identified reflect a bias towards cost and risk over-estimation that is likely to exist across Energex's total augmentation capex forecast. We reviewed a sample of projects to find supporting evidence of the systemic issues identified in our governance level review. Based on our assessment, we estimate the aggregate impact of these systemic issues on proposed augmentation capital expenditure to be in the order of 15% to 25%.

289. Table 12 below summarises the range of identified assessment impacts for each of Energex's categories of augmentation expenditure.

Table 12: Impact of systemic issues by expenditure category

Augmentation capex	Impact of systemic issues
Growth and compliance	5% - 15%
Power quality	25% - 50%
Reliability	50% - 80%
Land and easements	not reviewed
Total	15% - 25%

Source: EMCa analysis

290. We consider that the reduction of Energex's proposed augmentation expenditure, proportionately reduced by this amount, is representative of the prudent and efficient expenditure level that Energex will reasonably require in the forthcoming RCP.

291. It is our view that Energex can and is likely to manage this lower level of expenditure through project re-prioritisation and prudent deferral of lower-risk projects. There may also be an opportunity to explore alternative treatments to address identified risks. We consider that this level of adjustment reflects a prudent and efficient outcome and is achievable.

Growth and compliance

292. In a number of cases, we found insufficient justification by Energex of the activity forecast and/or insufficient evidence of robust options analysis and consideration of alternate solutions. This finding is supported by our program assessments.

293. Our assessment of the impact of the systemic issues upon the sample of project expenditure included a number of aspects:

- We considered opportunities for optimisation across the portfolio, including the potential for project deferrals, greater tolerance to risk and the timing of proposed expenditure. We found that:

  i. the proposed sub-transmission expenditure is heavily front-loaded, and is dependent on the timing of a number of block loads. On the balance of probability, we consider that the timing of individual projects is likely to change (including a level of deferral beyond the forthcoming RCP); and

  ii. the proposed C2060 distribution expenditure includes a disproportionately high number of projects with a low risk assessment. We consider that a proportion of this expenditure can reasonably be deferred.

- We also considered evidence where, in our view, the scope was over-estimated or the proposal was not adequately justified for inclusion in the RCP such that the forecast could be reasonably reduced. For example, we consider that a proportion of the proposed C2565 distribution expenditure was not adequately justified, nor subjected to adequate governance review, and is likely to be over-estimated.

294. In summary, it is our view that the over-estimation of required growth and compliance capital expenditure in the forthcoming RCP is in the order of 5% to 15%.

295. In addition, we note that project WR 6239816 (3rd 110/11kV transformer at West End) is dependent on the connection of major new loads such as the Brisbane Bus and Train Tunnel. Whilst we were not asked to review the accuracy of the demand forecasts, we consider that if the certainty and/or timing of these loads are in doubt, the corresponding forecast for this project (i.e., $12.6m) might also be considered for deferral and/or consideration as a contingent project.

Power Quality

296. We found that Energex's forecasts are subject to over-forecasting bias and do not account for an expected softening of PV growth. We identified the absence of sufficient cost-benefit analysis and justification of the step changes in expenditure around RCP set points. This finding was supported by our program assessments.

297. Our assessment of the impact of the systemic issues upon the sample of project expenditure included a number of aspects:

- We considered opportunities for optimisation across the portfolio, including the potential for project deferrals, greater tolerance to risk and the timing of proposed expenditure. We found that:

  i. the proposed program is above the level of power quality monitoring present at most network operators;

ii. in the absence of sufficient justification of the forecast, and adequate risk assessment, the proposed step change in expenditure has not been proven; and

iii. the forecast is not supported by robust analysis and we consider that it is overestimated by up to 50%, being representative of completing the program over two RCPs.

298. In summary, it is our view that the over-estimation of required power quality capital expenditure in the forthcoming RCP is in the order of 25% to 50%.

Reliability

299. We identified that the bulk of the expenditure is associated with the worst feeder program, established by a requirement in the Distribution Authority, and that the network reliability has generally been improving.

300. We found that Energex has not provided sufficient evidence of cost-benefit analysis and justification of the step changes in expenditure. This finding was supported by our program assessments.

301. Our assessment of the impact of the systemic issues upon the sample of project expenditure included a number of aspects:

- We considered opportunities for optimisation across the portfolio, including the potential for project deferrals, greater tolerance to risk and the timing of proposed expenditure. We found that:

  i. The forecast level of expenditure to comply with the requirements of the Distribution Authority has not been adequately justified and a proportion of the program can be considered for deferral;

  ii. Reductions to this program are supported by Energex's current reliability performance and its own customer research; and

  iii. The level of expenditure is significantly higher than that proposed by Ergon, for comparison, as being subject to a similar worst performing feeder program under the same jurisdictional requirements.

- We also considered evidence where, in our view, the scope was over-estimated or the proposal was not adequately justified for inclusion in the RCP and the forecast could be reasonably reduced. Energex has applied a unit cost approach, consisting of a number of augmentation options, to build-up the forecast for reliability augex. We consider such an approach to be reasonable for this type of activity. However, we consider that the proposed options have contributed to a higher unit cost and forecast than is required to manage Energex's reliability improvement compliance requirement.

- We also consider there to be opportunity for review of the reliability augex program, with a view to reducing its scope within the requirements of the Distribution Authority. In the absence of better information from Energex, the proposed forecast is not proven and we consider that it can be reduced by at least 50%.

302. In summary, it is our view that the over-estimation of required reliability capital expenditure in the forthcoming RCP is in the order of 50% to 80%.

Land and easements

303. We did not review this expenditure category.

7 Proposed Repex

7.1 Overview

Expenditure summary

305. According to the information supplied in the RIN, Energex has proposed a total direct replacement capex of $1,250m for the 2015/20 RP. This is an increase of 59% compared to actual direct replacement capex for the 2010/15 RP. We discuss the increase relative to the current RCP both for direct and for total (i.e., direct and indirect) replacement capital expenditure in section 2, and the movements across the period.

306. In this section, we concern ourselves with an assessment of the application of the governance and management and forecasting methodologies to the projects and programs proposed within the replacement expenditure category.

Drivers of replacement capex

307. Energex stated that a key driver is the significant proportion of assets that are reaching the end of their expected life, and are forecast for replacement over the next couple of regulatory control periods (ten plus years)[103]. The repex forecast for 2015/20 RCP suggests that Energex is proposing increasing its programs as a result of its asset management practices.

Program overview

308. Energex's proposed replacement capex is shown in Table 13 below. We note that there is a difference between the total augex sourced from the supporting information provided by Energex and the data supplied from the RIN. We used the supporting information in our assessment that directly relates to the projects and programs within the scope of our review.

[103] Energex Asset Management Strategy, page 7

Table 13: Summary of Energex's network repex

$m, 2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Distribution total	**117.4**	**120.6**	**126.3**	**127.8**	**129.4**	**621.5**
Distribution C2540	92.3	93.8	96.1	96.2	99.6	478.0
Distribution C2545	*25.1*	*26.8*	*30.2*	*31.5*	*29.8*	143.4
Sub-transmission (C2025 & C2040)	**97.1**	**95.5**	**72.9**	**81.6**	**80.9**	**428.0**
SCADA and network communications	**28.2**	**36.5**	**34.0**	**29.0**	**17.6**	**145.2**
Total direct asset replacement	***242.7***	***252.6***	***233.2***	***238.4***	***228.0***	***1194.7***

Source: EMCa analysis

Asset replacement strategy

309. Drivers of replacement capex in Energex's asset replacement strategy are based on the application of three core maintenance methodologies: Predictive; Preventive; and Reactive. The Predictive methodology uses current asset information, engineering knowledge and practical experience to predict future asset condition, performance and risk of failure for network assets. Energex utilises a Predictive Risk Management methodology for evaluating condition related risk.

310. This approach allows for proactive management of assets, through tools such as Condition Based Risk Management (CBRM), where asset data is mature and reliable - and for the use of more basic predictive and reactive (e.g., run to failure) methods for lower value and consequence assets where asset data is less mature.

Application of Condition Based Risk Management

311. In 2007, Energex commenced trials on CBRM and subsequently invested in a CBRM model methodology. This was developed and implemented during the 2010/15 RP. Energex considers that the CBRM methodology is now fully integrated into Energex's asset management approach.[104] We sought, but Energex did not provide, details of any post-implementation review that assessed the realisation of the expected benefits from use of CBRM at the time of its approval. Such a review would have been valuable in supporting Energex's improvement claims and its repex forecast.

312. The maturity of Energex asset data has been improving, but does not cover all network asset categories. As we have seen in most electricity network businesses that have adopted CBRM, data for substation assets is generally developed first, with data for cables and lines being acquired incrementally. Energex uses a data accuracy scoreboard and periodic audits to monitor data accuracy. For its asset management strategy, Energex confirmed that "*the asset refurbishment & replacement program is developed primarily using CBRM, including key asset classes (i.e., transformers, switchboards & circuit breakers)".*[105]

313. In its response to our question on the dominant method used to develop repex forecasts, Energex stated that: "*CBRM, implemented in a manner that is consistent with the principles of Energex's risk management framework, is the preferred method of evaluating condition related risk except in the case of asset classes where the effort required to develop and maintain CBRM models is not warranted.*"[106]

[104] AER EGX 032 – CBRM

[105] Energex Asset Management Strategy, page 7

[106] AER EGX 031 – Repex forecasts

314. We have discussed the specific methods applied by Energex for replacement capital expenditure in section 5 of our report.

Top down challenge process

315. Energex states that it applied the AER's repex model as a top down assessment of the bottom up program build. This comparison was presented to the Network Technical Committee (NTC) which provides oversight of prudent and efficient expenditure.[107] In providing this oversight, the NTC also takes into consideration the Board's risk tolerance and balances this against the level of proposed expenditure and customer outcomes.

316. The NTC process is likely to have had an impact on the bottom up forecast expenditure and resulting network heath and risk positions. From a total repex perspective, it is not possible to see the full impact of the top down review to confirm that a more detailed assessment of asset categories was undertaken, as discussed earlier in section 5.

7.2 Assessment

317. The main components of proposed repex, and the movements between actual prior RCP expenditure and Energex's proposed expenditure, were outlined in section 2. The following subsections provide summary briefings on the material components of the proposed repex, and which were used to evidence systemic issues reported in our findings.

318. We note the difficulty in reconciling forecast expenditure provided in the program information with the RIN data in the absence of expenditure category analysis provided in the RP. As a result, we necessarily relied heavily on the information provided in responses to our questions during the on-site review meetings and RIN data for trend analysis.

7.2.1 'Other' asset category

Overview of 'other' asset category

319. Energex has proposed significant programs that it has presented as being in the 'Other' category of the Reset RIN due to:

- Asset replacement not being directly or implicitly linked to the age of the asset; and
- Affected assets not being included in the AER's Repex categories.

320. The strategy adopted by Energex is specific to the asset grouping or program defined within this expenditure category and documented in the relevant NAMP document.

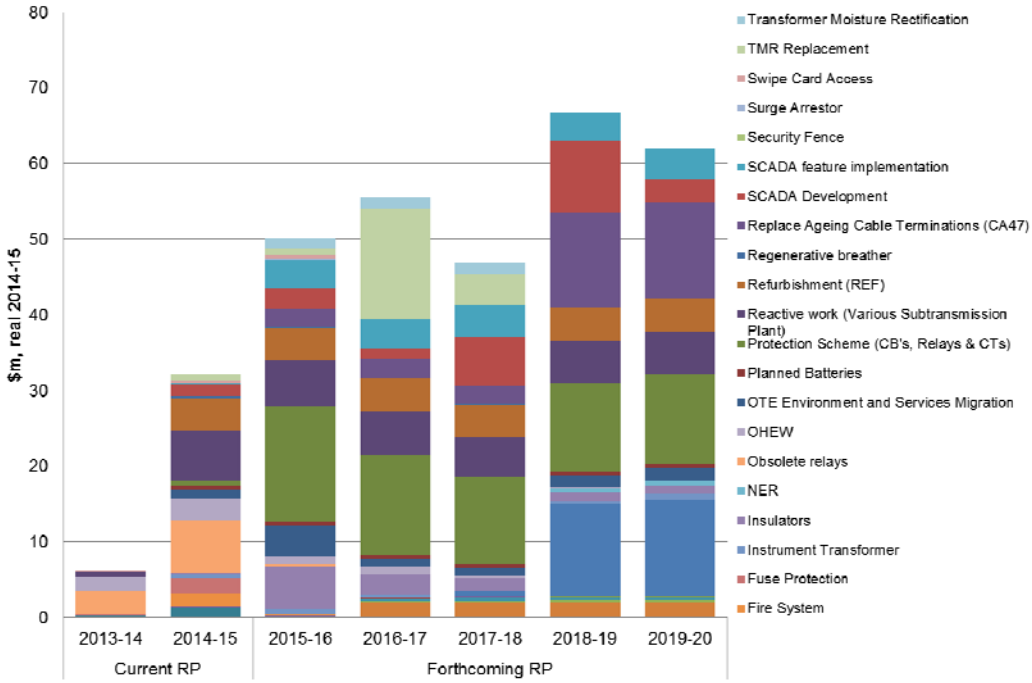
Expenditure trends

321. The repex for the 'Other' asset category over the final two years of the current RCP is compared with the forthcoming RCP in Figure 30 below[108].

[107] Details of this process can be found in Energex's response to EGX025, question 5

[108] Energex did not provide disaggregated data prior to the last two years of the current RCP

Figure 30: Energex OTHER asset category repex compared with historical spend



Source: Energex RIN data

322. The forecast expenditure profile reflects significant growth in specific targeted replacement projects from the current RCP. The RIN profile shows a step increase from 2014-15 levels, which is a further step increase from 2013-14.

323. The RIN profile shows increases to specific programs during the RCP, notably for: i) protection schemes in 2015-16; ii) TMR replacement in 2016-17; iii) SCADA development in 2017-18; and iv) replacement of ageing cable terminations and condition monitoring in 2018-19. We note that many of the nominated programs do not include historical expenditure which strongly suggests that the programs were created to align with the forthcoming RCP.

324. We observe a similar trend for aging cable terminations from the expenditure forecast data supplied from Energex in response to our questions during the on-site meeting. However, whilst replacement volumes are specified, the expenditure for each year of the RCP is not provided in the supporting NAMP document.

Protection systems

325. Energex states that the replacement strategy for protection relays[109] is predictive. Energex has proposed a targeted replacement for obsolete protection schemes initially focussing on implementing 33kV bus zone protection. Energex plans to target a total of 70 relays and 200 CTs per year. The risk assessment for this program has been assessed as 'Moderate' to 'Low', and not been adequately linked to the proposed replacement volumes.

[109] REPEX Model supporting information - describes the scope of the Protection System program as including Bus zone protection at locations where high fault levels exist, bus schemes are not present, bus faults are currently cleared via low speed overcurrent protection, transformer ended feeders without diverse communications and 11kV feeders without under frequency load shed control

Trunked Mobile Radio (TMR) network replacement

326. Energex advised that the current provider has not guaranteed service beyond 2017/18. In the absence of support from this provider, Energex must identify an alternate solution. Energex stated that, for the purposes of their RCP forecast, Energex proposed the option to install a TMR network[110] as an extension of the network.

SCADA development

327. Energex has identified seven programs to modernise the SCADA / Control Systems technologies.[111]

328. Whilst Energex has included discussion of options within each of these programs, these are high level and without assessment of the impact to forecast expenditure or risk. The identification and realisation of benefits does not appear to have been included, nor does the opportunity to coordinate development projects as part of other projects appear to have been discussed. Accordingly, we consider that the justification provided for the proposed increase is not adequately supported.

Replacement of aging cable terminations

329. For this project,[112] also referred to as cast iron pot heads, Energex proposes to replace high risk end of life cable terminations.[113] This includes LV, 11kV and 33kV cables.

330. The proposed replacement volumes are 228 units for the first three years, increasing to over 1,140 units for the last 2 years of the RCP and into the first year of the next RCP. Energex state that: "*It is proposed to replace all problematic cable terminations by the end of the determination period (approximately 4,100 over 5 years),"* and "*High risk sites portended for replacement in initial years".* We observe that the forecast is not entirely consistent with these statements, and other than targeting completion of the program within the RCP, Energex has not provided sufficient justification for the five-fold increase in the expenditure forecast or for selection of the end-date of the next RCP as the timeframe for this program.

Condition monitoring

331. Energex has proposed a variety of condition monitoring[114] schemes to assess the condition of its assets. Over the forthcoming RCP, Energex will target power transformers, bulk and zone substation switchgear, HV cables and termination structures and HV overhead mains.

332. The risk assessment provided for this program is 'Moderate'. Our review of the provided information suggests that the program will run in the last three years of the RCP;

[110] REPEX Model supporting information - describes the scope of the TMR replacement program as catering for the need to pay for a replacement network to meet Energex requirements

[111] REPEX Model supporting information - describes the scope of the SCADA development program as including initiatives to keep the existing arrangements operating and to commence the work to transition to a commercial system

[112] REPEX Model supporting information - describes the scope of the Aging cable terminations as where high risk and "end of life" Cable Terminations exist, the cable needs to be replaced feeding the Ground Transformer

[113] Asset replacement strategic plan, page 31; NAMP Distribution asset replacement, page 40

[114] REPEX Model supporting information - describes the scope of the condition monitoring program as better assessment of equipment condition such that it is replaced just before failure or that it is better to run to failure

however, this profile is not supported by sufficient analysis of the available options, risk or impact to expenditure.

Reactive works

333. Energex has forecast the expenditure requirement for its reactive works program "*based on historic switchgear, transformer, civil and miscellaneous reactive projects with the allowance for infrequent large projects annualised into a cost per year*".[115] Historical data was not provided to support these statements. Energex stated that it has made adjustments for other projects (such as 'obsolete relays' and 'obsolete schemes projects').

Summary

334. We observe an increase in this expenditure category in the RP including a large number of discrete programs in the 'Other' category when compared to the current RCP. Based on our review of the information provided in support of the larger programs, we consider that the proposed step increases are without sufficient justification. This category does not appear to be adequately supported by analysis of the drivers, options and risk.

335. We have found evidence of programs that appear to align with the timing of the RCP revenue reset cycles and are without adequate forecasting rigour, that if subject to a robust top-down review process are likely to result in a reduction to the forecast expenditure.

336. We did not find sufficient consideration of risk, within the programs or as applied to this expenditure category in relation to other expenditure categories to support the proposed level of expenditure.

7.2.2 Transformers

Energex's strategy for transformers

337. Energex utilises a Predictive Risk Management (CBRM) methodology for evaluating condition-related risk for transformers.[116]

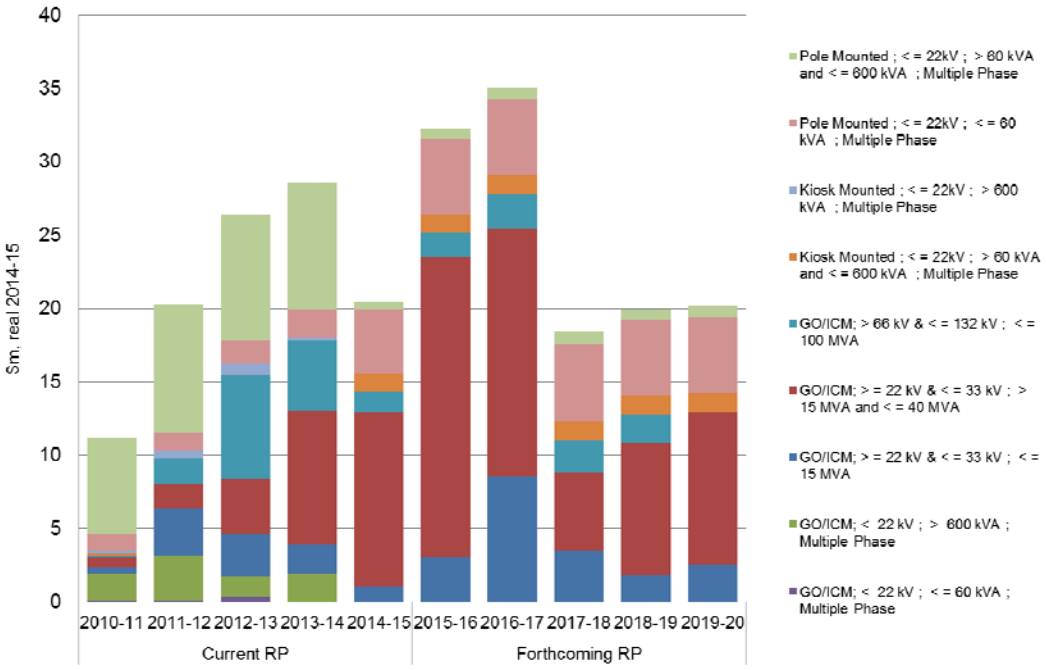
Expenditure trends

338. The repex for transformers for the current and forthcoming RCPs is depicted in Figure 31 below.

[115] NAMP sub-transmission replacement, page 37

[116] NAMP – Sub-transmission replacement, page 7

Figure 31: Energex transformer repex compared with historical spend



Source: Energex RIN data

339. The forecast expenditure reflects an increase from 2014-15 levels primarily driven by increasing expenditure in replacement of 33kV transformers >15MVA. Over the RCP, the forecast expenditure for 33kV <15MVA and 11kV 60kVA transformers is also above historical averages.

Alignment of expenditure and strategy

340. For 132 - 110kV transformers, Energex has proposed to replace five transformers based on the CBRM analysis. Energex stated that these assets are now approaching, have reached or have passed their economic life. We observe from the provided analysis that five transformers are older than the nominated program mean life.[117] The discussion of program life and economic life does not align with the provided graph and, when applied, show that only four transformers are older than both metrics.

341. Energex stated that transformer age and condition based on the CBRM analysis is the key driver for replacement of the five 132kV and 110kV transformers in next five years. The CBRM analysis was presented by a distribution of Health Index (HI), show five transformers with a HI of 7-8 and a further 4 with a HI of 6-7.

342. The project list shows five transformer replacement projects comprising replacement of 8 transformers[118] and a further project to replace and upgrade a standby transformer (WR191427 PRG - Replace Standby 30MVA with 60MVA).

343. For 33kV transformers, Energex has proposed to replace 56 33kV transformers over the period 2015/16-2019/20. Energex stated that these assets are now approaching, have

[117] NAMP – Sub-transmission replacement, Figure 1 – 132kV & 110kV Transformer - Population and Mean life

[118] NAMP – Sub-transmission replacement, Appendix A, WR614464 includes three transformers, WR6040390 includes two transformers

reached or have passed their economic life.[119] Energex stated that: "*One of the replacement drivers is that the majority of 33kV transformers have Fuller tap changers fitted. These units have a high maintenance cost due to the frequent maintenance required compared to other tap changer type.*"

344. The forecast has been prepared following review of the CBRM data, including maintaining a HI category less than or equal to 6-7 for 33kV transformers. This reflects a higher target than for 132 and 110kV transformers and consider the differentiation of HI categories to be reasonable for these asset types. The project list aligns with the nominated number of transformers to be replaced.

Summary

345. We note the lumpiness of the forecast from the CBRM model and the addition of an average number of replacements proposed by Energex. We would expect the smoothed program assumption to have been included in the expenditure forecast.

346. We would expect to have seen additional analysis in support of the transformer replacements to have been included in the supporting information, due to (i) the typical critical nature of these assets and the impact on the network; (ii) the expenditure associated with what is typically a small number of assets; and (iii) specific justification for inclusion of an upgrade to a transformer capacity in the replacement expenditure forecast.

347. We are satisfied that the forecast has been developed based on CBRM analysis and, notwithstanding the absence of some supporting information, have not identified any systemic issues with the forecast.

7.2.3 Overhead conductors

Energex's strategy for overhead conductors

348. Energex stated that the overhead conductors strategy includes results from the inspection program and CBRM.[120]

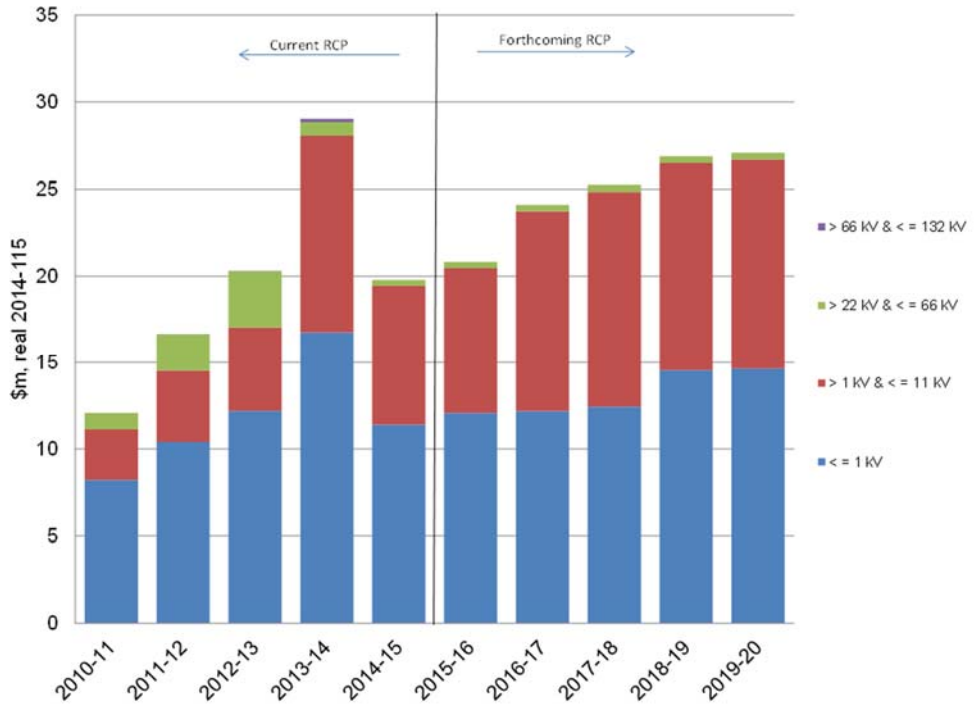
Expenditure trends

349. The repex for overhead conductors over the current and forthcoming RCPs is depicted in Figure 32 below.

[119] NAMP – Sub-transmission replacement, page 7

[120] NAMP-Asset Replacement, page 17

Figure 32: Energex overhead conductor repex compared with historical spend



Source: Energex RIN data

350. The forecast expenditure reflects an increase from 2014-15 levels corresponding with increasing expenditure in 11kV replacement and smaller increases in LV conductor replacement.

351. Energex advised that the step change shown for 2013-14 was the result of a change in reporting methodology, and not indicative of a change in work volumes. Energex has since advised of a corrected number of replacement units for 13/14 being a reduction of approximately 50%.[121]

352. The expenditure forecast data supplied from Energex in response to our request during the on-site meeting reflects a continuing program of replacement. Energex advised that the RIN data includes apportionment of conductor replacement from other programs where conductor is replaced, however we note that the forecast expenditure exceeds the levels provided in the RIN data.

Alignment of expenditure and strategy

353. We note that Energex has advised that the forecast expenditure is based on CBRM, yet "*a health profile is not available for 11kV conductor due to data unavailability.*"[122]

354. We also note from section 5, that the dominant forecasting methodology for the conductor program is stated as being trend analysis.[123] Whilst we expect Energex

[121] Energex advised that replacement units for 11kV and LV overhead replacement reduced from 992 kms to 494 kms, following removal of 'open project units' consistent with historical reporting (AER EGX 033)

[122] NAMP-Asset Replacement, page 18

[123] EGX031

applied a combination of methods to arrive at its forecast, the absence of clarity of its forecast methodology casts a level of doubt on its forecast.

11kV and LV replacement

355. Energex has proposed a number of targeted replacement programs based on condition and age to mitigate potential safety issues, including 7/.064 copper, 7/.080 copper and 3/12 steel conductors. For low voltage conductors, Energex propose conductor replacement of small copper conductor with LV aerial bundled conductor.

356. Energex have stated that the "*Low Voltage and 11kV overhead conductors make up 96% of the expenditure in this asset category*."[124] The volumes included in its RESET RIN appear to remain relatively stable across the RCP, from 506kms in 14/15 to 562kms in 19/20, totalling 1,797kms of LV and 1,421kms of 11kV conductor replacement over the RCP.

357. In its sub-transmission replacement plans Energex has proposed replacement of a further 1,188km of 11kV overhead conductor based on the output of its CBRM model and 720km in its distribution replacement plans, allocated to "non-backbone" replacement of small gauge conductor. Energex advised that the distribution replacement will target small size 11kV conductor.

Overhead earthwire replacement

358. We note that Energex is planning a volume of OHEW replacements, with no planned replacements of 33kV, 110 or 132kV overhead conductor. For the OHEW, the NAMP states that 73kms will be replaced during the RCP with 2 projects completed in 2014/15. Energex advised, in response to questions issued by the AER, that 5 projects including a total of 128km will be completed over the RCP.[125] This represents a large difference that has not been explained.

359. We note that OPGW was selected as a replacement for the OHEW at an increased cost of 6%. Energex stated that this was consistent with their strategy; however, Energex did not provide justification and supporting analysis to confirm that this reflects a prudent decision. We consider that this cost increment does not seem unreasonable.

33kV replacements

360. Energex advised[126] that it is not proposing any planned repex replacements of 33kV overhead conductor in the 2015/16 – 2019/20 period. Energex is proposing 33kV re-conductoring projects under augex due to 33kV fault level constraints. The 33kV overhead conductor replacement volumes and expenditure included in the RIN correspond with incidental replacements due to the apportionment from pole replacements.

Summary

361. The bulk of the forecast is comprised of LV and 11kV conductor replacement. We have not seen sufficient evidence that the selection of the proposed volume of replacement is

[124] EGX 033, Table 3: Reset RIN Overhead Conductor Forecast

[125] EGX012, page 22

[126] EGX033

justified. We consider that, in the absence of this justification the proposed expenditure cannot be considered prudent and efficient.

362. We have concerns that (i) the absence of a clear forecasting methodology applied to this expenditure category, and (ii) qualitative nature of risk assessment have led to an over-estimate of the expenditure forecast.

363. We found inconsistencies in the information provided by Energex that cast further doubt on the prudency of the forecast expenditure for overhead conductors.

7.2.4 Service lines

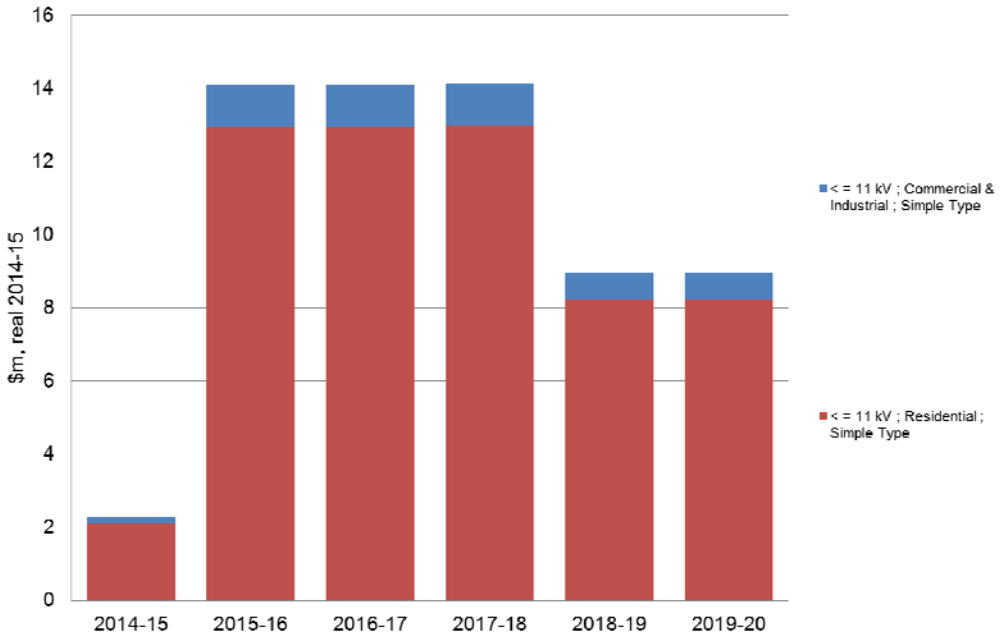
Energex's strategy for service lines

364. Energex stated that its initial focus is on a program to remove all open wire and concentric services from the network by 2017/18. However, as this reaches completion, the focus will shift to Energex's next identified priorities in line with condition based assessment and population age. This includes PVC covered services (Parallel web & Twisted), and a portion of older XLPE insulated services.[127]

Expenditure trends

365. The repex for service lines over the current and forthcoming RCPs is depicted in Figure 33 below.

Figure 33: Energex service lines repex compared with historical spend



Source: Energex RIN data

366. The forecast expenditure reflects a large step increase from 2014-15 levels corresponding with increasing expenditure in residential service lines proposed for the next RCP.

[127] NAMP – Distribution asset replacement, page 13

Alignment of expenditure and strategy

367. Energex proposed two primary initiatives, being: i) degraded PVC service cables; and ii) replacement of open wire and concentric neutral screened cables. The PVC service replacement in linked to the inspection program (SC01), whereas the replacement of open wire services is a targeted program to coastal areas. Energex supplied a graph of 'work orders relating to shocks' to represent the rate of incidence of electric shocks from service lines. The graph indicates that the trend is decreasing. There is no evidence provided that supports an inclining number of incidents from service lines.

368. Our review suggests that the data relating to service lines is not isolated from other electric shock data to determine whether a different trend is apparent.

Summary

369. We did not find sufficient analysis to support the proposed forecast for this asset category, and consider that the justification for the forecast expenditure is insufficient to support the proposed expenditure.

7.2.5 Poles

Energex's strategy for poles

370. Energex stated that the "*overall pole reinstatement strategy is to replace on age and condition with an average replacement age target of 52.2 years or a 1.8% replacement rate.*"[128] We note that the strategy includes inspection programs, asset refurbishment and augmentation programs.

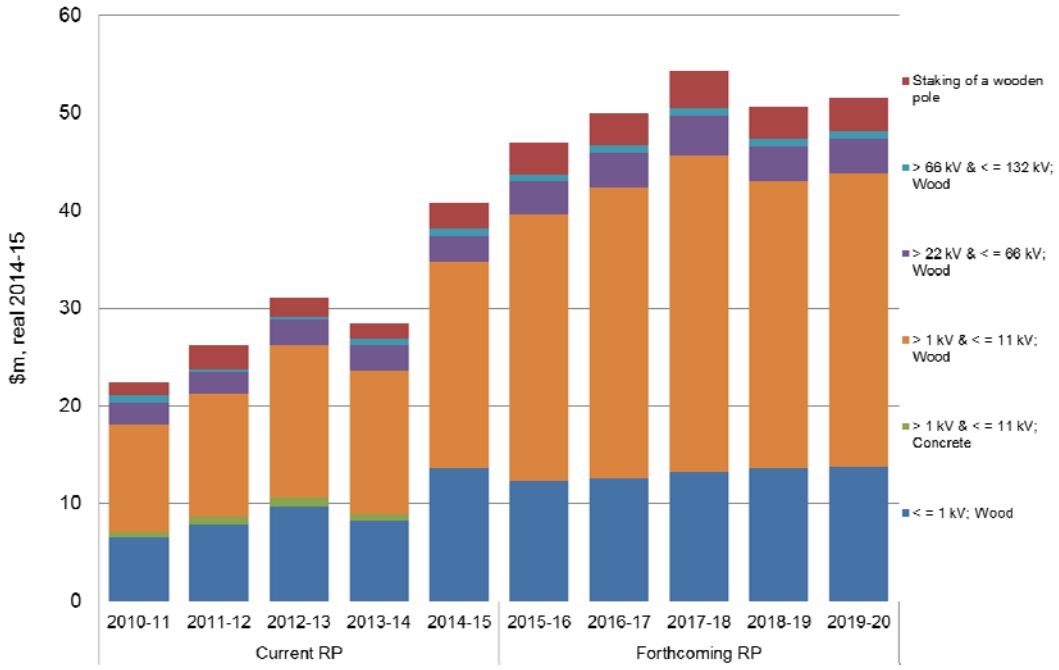
371. In addition to poles that fail inspection, Energex stated the need to accelerate the replacement of untreated (bush) poles. Energex also stated that these poles are significantly older than the average population age band and are susceptible to rapid degradation and failure. The Energex strategy is to replace all bush poles (current population approx. 60,000) over a 10 year period ending 2022/23.

Expenditure trends

372. The repex for poles over the previous and current RCPs is depicted in Figure 34 below.

[128] NAMP distribution asset replacement, page 48

Figure 34: Energex pole repex compared with historical spend



Source: Energex RIN data

373. The forecast expenditure reflects an increase from 2014-15 following a large increase from 2013-14 levels corresponding with increasing expenditure in 11kV wood poles over the RCP.

Alignment of expenditure and strategy

374. Energex has assumed a design life for wood poles of 50 years. Its strategy is to achieve an average life slightly in excess of this design life. Energex did not comment on the impact to wood pole life expectancy, based on a mid-life nailing program. We expect to see a life extension of 10-15 years from the addition of a pole nail, which should be reflected in the forecast replacement rate.

375. We note that Energex has built a simplified form of CBRM model for poles with asset age being the determining parameter for replacement. The forecast has been built "*using an expected 49 year replacement life which aligns closely with Asset Economic mean life*."[129]

376. We note that the "*11kV NAMP allocation has been derived as a proportion of total wood pole population by voltage. The health index categories provide the total pole counts requiring action where a standard health index exceeding 7 has been used.*"

Unassisted pole failure

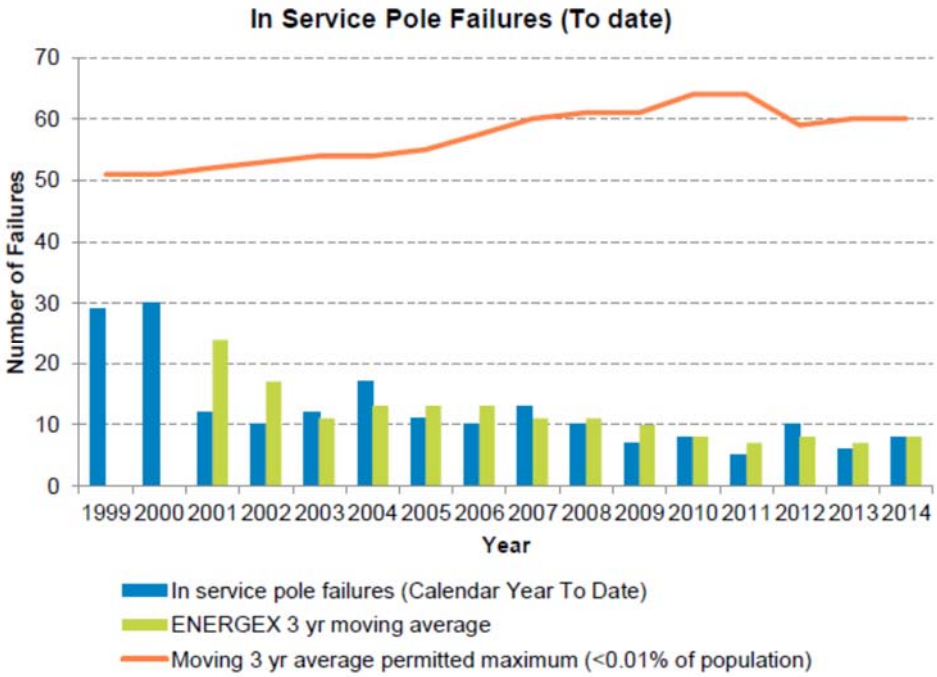
377. Energex stated that "*it is expected that 5 poles will fail each year during the five year period, based on in service failure history of the current population 176,715 LV wood poles.*" This compares with a legislated maximum of 59 pole failures per annum[130] and a

[129] NAMP distribution asset replacement, page 51

[130] Based on 0.01% of Energex's total pole population [ref]

current unassisted pole failure rate of 7 per annum on a three year rolling basis as shown graphically below.

Figure 35: Energex in service pole failure



Source: NAMP Distribution asset replacement, page 48

378. We note that the Board has set a low corporate risk appetite,[131] and together with the reporting requirements for in-service pole failures, these actions appear to drive a bias to overestimation of prudent forecast expenditure requirements.

Application of risk assessment

379. Energex undertook an assessment of the untreated and treated risk of "*Energex's maintenance, inspection and capital replacement programs undertaken for the period 2015 – 2020*" for each of the asset categories. For example, the untreated risk for LV poles is described as "*the maintenance, inspection and capital replacement programs were not included in the forecast*". The assessment of this risk is rated as between 'Very High' and 'Intolerable', as shown in Figure 36 below. We consider that the application of a risk assessment to such a high level does not assist decision making, including considerations of options and timing to determine a prudent and efficient level of expenditure.

[131] The Board has determined that Energex will have a 'low' Corporate Risk Appetite, as defined in the 'ALARP Principle' to the extent practicable within commercial and resource constraints [ref RED 00995 – Enterprise risk management manual]

Figure 36: LV wood pole risk assessment

Table 1: Untreated Risk Assessment Summary - LV Wood Pole

Untreated Risk Assessment				
Safety	**Environment**	**Legislative**	**Customer Impact**	**Business Impact**
Intolerable	Very High	Intolerable	Intolerable	Not Applicable

Source: NAMP Risk Assessments

380. We note that the assessment of the treated risk (being the case where the maintenance, inspection and capital replacement programs were included in the forecast) results in risk levels is between 'Low' and 'Very Low'. Energex has not provided options/sensitivity analysis around the selection of the proposed forecast expenditure level, and its impact on the risk level. We consider that there is insufficient analysis to determine whether the proposed program is prudent and efficient.

Bush pole management

381. Energex's pole program includes management of 'bush poles' (DF13) which account for approximately 35% by volume of pole replacements. Energex has a stated strategy to replace all bush poles (current population approx. 60,000) over a 10 year period ending 2022/23 through a combination of replacement through inspection or other capital works and a dedicated aging bush pole replacement program.

382. Energex states that the key driver for the dedicated replacement program is "*the ongoing response to the EDSD recommendation in relation to reducing the number in-service pole failures (17) in 2004*". We observe, however, a low pole failure rate that is consistently below the legislated performance level.

383. Energex has not provided sufficient information to support a dedicated replacement program for bush poles of this scale.

Summary

384. We consider that the assumptions applied by Energex reflect a conservative risk management approach to pole failure and is likely to have resulted in an inflated forecast expenditure. Further, we consider that this bias is likely to apply to all the expenditure categories for poles.

385. We note that Energex has applied a simplified CBRM model to its forecast, however we have observed assumptions of age based criteria that raise concerns over the methodology applied.

386. We consider that the information provided is insufficient to reasonably conclude that the proposed forecast expenditure reflects an optimal program and is efficient and prudent.

7.2.6 SCADA, network control and protection system

Energex's strategy for SCADA, network control and protection systems

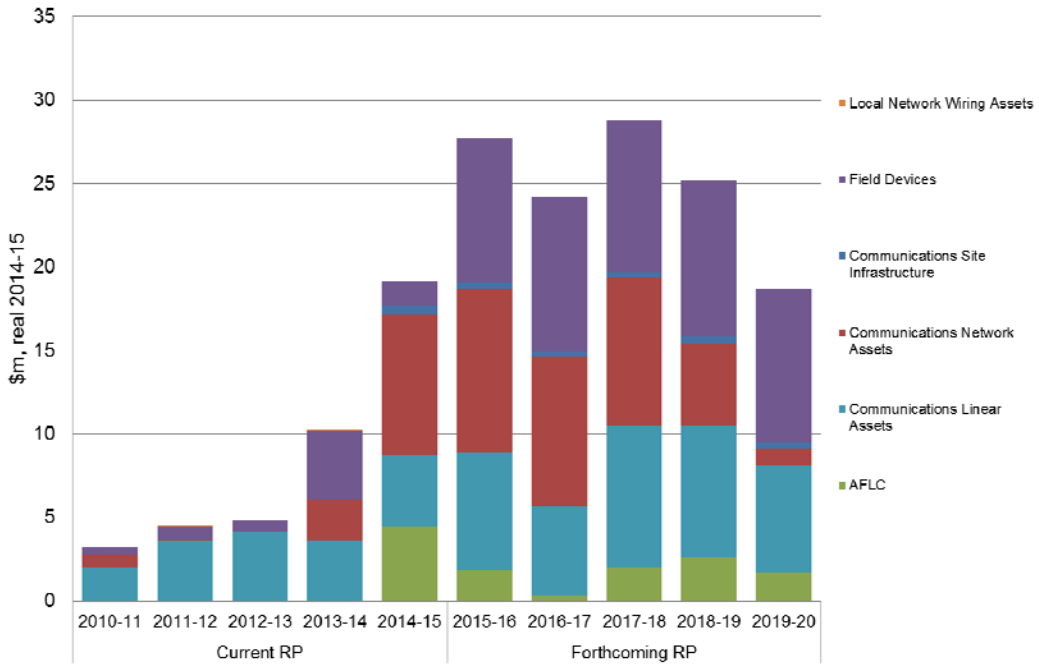
387. Energex has developed a SCADA and automation strategic plan[132] for the RCP which outlines its approach to new technologies, in response to what has traditionally been an internally-based development of SCADA systems and infrastructure.

388. Energex has also developed a telecommunications strategic plan[133] for the RCP.

Expenditure trends

389. The repex for SCADA, network control and protection system over the previous and current RCPs is depicted in Figure 37 below.

Figure 37: Energex SCADA, network control and protection system repex



Source: Energex RIN data

390. The forecast expenditure indicated an increase from 2014-15 levels corresponding with increasing expenditure in field devices and communications assets before decreasing later in the RCP.

Alignment of expenditure and strategy

391. Energex stated that the "*SCADA, network communications and protection relay replacement programs are driven by the obsolescence of system components and ability of these systems to continue to support a modern power network. The*

[132] Appendix 26 - SCADA and automation strategy

[133] Appendix 27 - SCADA and automation strategy

replacement of these assets forms part of a strategic plan that is unrelated to historical replacement rates and therefore difficult to model using Repex."[134]

Relay replacement

392. Energex has proposed a volumetric program of 2,000 relay replacements over the RCP, at the rate of 400 per year[135] as part of its protection systems program. Energex indicated a population of 18,469 relays and a primary asset defect rate of 0.15%. Energex also provided an age profile; however, the condition and failure data is limited to a single value reflecting the 5 year average. We expected to see an assessment of condition over time, consideration of treatment options for obsolescence (including substitution and aggregation with other programs) and the corresponding impact to risk and expenditure.

393. The risk scenario provided to support this replacement program is described as the "*failure of a conductor leads to energised wire falling to the ground or be caught up but still a person can walk into them. Conductor clashing or vegetation contact resulting in a bushfire. All of these can lead to serious injury, disability or death to the public.*" The risk level is rated as 'Moderate', which we assume is the residual risk level. We consider that this assessment includes a bias to the catastrophic consequence described.

394. The volumetric replacement of 400 units per annum does not include options analysis or differentiation of analysis across each year of the RCP for consideration of high risk or strategic sites. The basis of this volume of replacements is not proven.

SCADA

395. Energex stated in its strategy that "*the most efficient operation and economic efficient solution is to rationalise the existing fleet, integrate protection and SCADA where beneficial, and migrate to a commercial RTU core platform in the short term."*[136] Energex added that the strategy is in "*preparation for migration to IEC-61850 centric secondary system building blocks, once the risks to achieving the potential benefits on offer through the migration have reached an acceptable level*."

396. Energex prepared a range of 'investment choices' for its SCADA program, but provided little analysis of the recommended option that formed its planned strategic direction.

Telecommunications

397. The proposed telecommunications program reflects the continued investment in common infrastructure and risk-based replacement or renewal of existing assets.

398. Energex stated that the "*telecommunications system is sufficient to operate the network now, but it is evident that additional capability and performance will be required as the industry develops and Energex evolves to respond to the needs of its customers and the community*".[137] We note that a similar range of 'investment choices' are developed

[134] REPEX model supporting information

[135] NAMP sub-transmission replacement

[136] SCADA strategy

[137] Telecommunications strategy

for communications, however provide little analysis of the recommended option that forms part of its planned strategic direction.

Summary

399. We consider that the justification for the proposed programs is not proven. Energex has inferred benefits including deferred capital expenditure and reductions in maintenance cost for SCADA and for communications. However, these benefits do not appear to have been factored into the analysis provided or the expenditure forecasts.

7.2.7 Switchgear

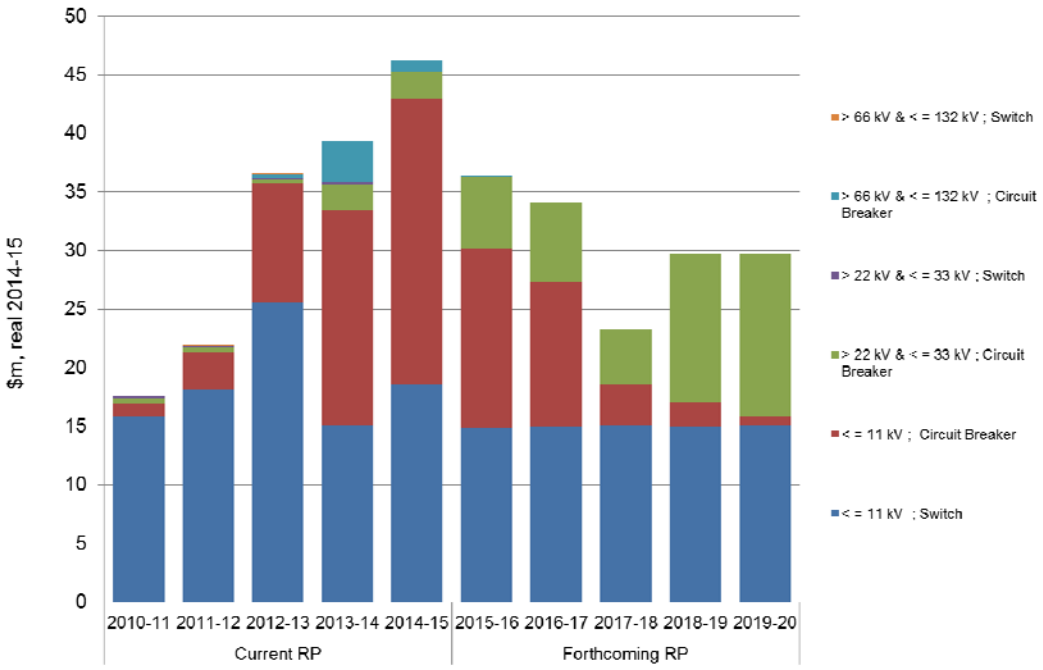
Energex's strategy for switchgear

400. Energex's strategy is focused on the removal of problematic oil filled circuit breakers at 11kV and 33kV.

Expenditure trends

401. The repex for switchgear over the current and forthcoming RCPs is depicted in Figure 38 below.

Figure 38: Energex switchgear repex compared with historical spend



Source: Energex RIN data

402. The forecast expenditure reflects a decreasing trend from 2014-15 levels corresponding with reductions to 11kV circuit breakers, then increasing levels for 33kV circuit breakers later in the RCP.

Alignment of expenditure and strategy

403. Energex's program mean life is less than asset economic life. This was explained to us as being the result of risk based replacements. We note that the program was developed based on its CBRM model.

404. Our review of the proposed program has identified an opportunity to smooth the forecast replacement rate for 33kV. The increasing rate in the last 2 years of the RCP suggests that some replacement may be deferred into the subsequent RCP.

405. We consider that there may also be opportunity to smooth the forecast replacement rate for 11kV. There is a high rate of replacement in the first 2 years of the RCP. The peak in 2016/17 is due to the current safety driven program for 11kV manually operated oil circuit breakers located in Energex commercial and industrial (C&I) substations.

Summary

406. We are satisfied that the forecast has been developed based on CBRM analysis and, notwithstanding the absence of some supporting information, have not identified any systemic issues with the forecast.

7.2.8 Pole top structures

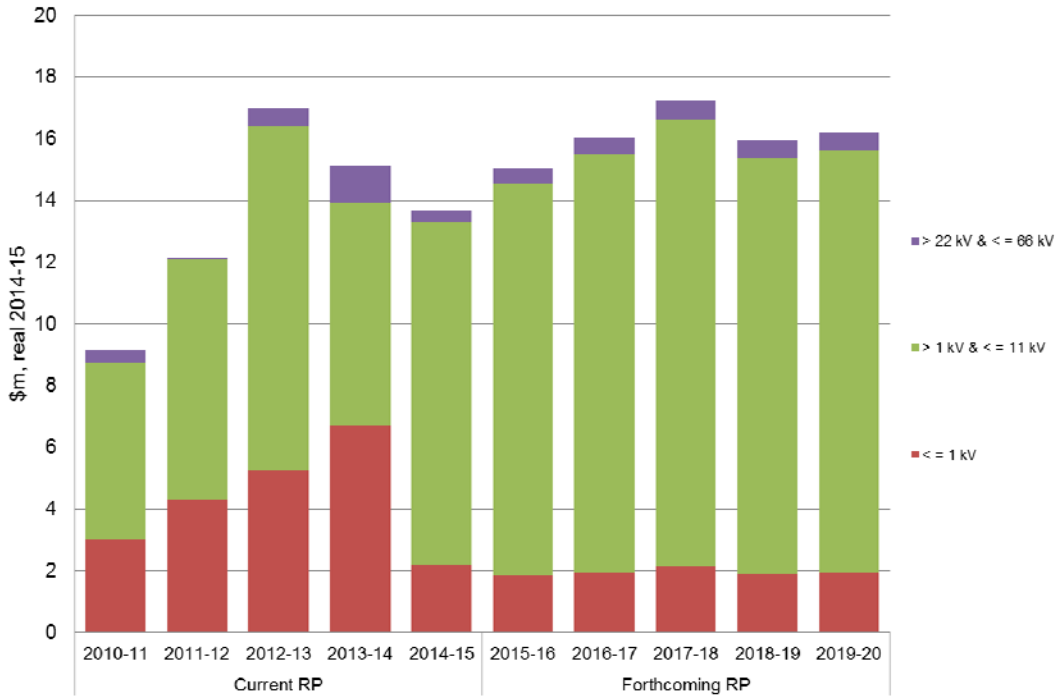
Energex's strategy for pole top structures

407. Energex did not explicitly state a strategy for pole top structures[138] other than to note that the main driver of replacement is asset condition.[139]

Expenditure trends

408. The repex for pole top structures over the current and forthcoming RCPs is depicted in Figure 39 below.

Figure 39: Pole top structure repex compared with historical spend



Source: Energex RIN data

[138] REPEX model supporting information defines Pole top structures to be cross arms fitted to poles

[139] REPEX model supporting information, page 12

409. The forecast expenditure reflects similar expenditure levels as those of 2014-15 levels, with smaller increases in 11kV pole top across the RCP. The forecast expenditure for these two programs is significant lower than the figure above and we therefore conclude that the forecast in the RIN includes proportionate allocation from other programs such as replacement of poles, 11kV conductor and pole mounted plant.

Alignment of expenditure and strategy

410. We understand that the dominant forecast methodology is trend analysis for pole top structures, supported by CBRM. Energex nominates two programs being CA21 and CA22 for planned crossarm replacement on the 11kV distribution network.

411. For the CA21 program (Replace 11kV Crossarms with Wide Trident), Energex describes the need for replacement of 11kV timber crossarms as arising from "*age or inspections/patrols identifying defective equipment that cannot be repaired*" and go on to say that "*the allocation is derived as a proportion of total 11kV Wood Crossarm population*."[140]

412. We note that the failure rate has been consistently improving whilst the forecast replacement volumes are forecast to remain at the current levels. We therefore deduce that the forecast is based on age only. Energex does not offer any analysis to support the condition, forecast failure rate or risk.

413. The program CA22 (Narrow Trident Replacement) is reducing as the "*population of this type of construction has been rapidly declining leaving a small targeted program for the next AER period.*"

Summary

414. We consider that Energex's forecast appears to be based on an age indicator and Energex has not provided sufficient analysis of the condition, forecast failure rate or risk to demonstrate the prudent level of expenditure proposed.

415. We therefore conclude that the justification for this program is insufficient to support the forecast expenditure.

7.2.9 Underground cables

416. For underground cables, Energex has proposed to undertake removal of gas filled 33kV cables and replace oil filled and solid insulation 33kV cables.

417. We have reviewed relevant background material and have not identified any systemic issues for this asset category.

7.3 Concluding remarks

418. We consider that Energex has developed a bottom-up repex program that is broadly based on substantiated focus areas. However, it is seeking to include significantly

[140] NAMP Distribution asset replacement, pages 26-28

increased levels of repex in some of its programs, and for this we found insufficient justification.

419. We find that the proposed replacement expenditure was not subject to a sufficiently rigorous top-down challenge. Specifically, we did not find evidence that a top-down challenge process was applied to test the tolerable boundaries of risk and cost.

420. We find that prudency and efficiency of the repex forecast is undermined by the following systemic issues in a large number of repex programs:

v. insufficient project and program analysis to support the timing and volume of activity, coupled with replacement targets that appear to coincide with regulatory end points;

vi. risk assessment that has been undertaken at too high a level to assist meaningful decision making both within and across the program;

vii. aggregate repex modelling presents alternative outcomes that are so wide as to be of little merit for use in a top-down challenge to validate the proposed expenditure levels; and

viii. inadequate justification of the proposed significant step increases in expenditure.

421. In summary, our analysis of a sample of repex expenditure programs supports the issues identified from our analysis of Energex's governance and management framework and its forecasting methodology, namely: (i) insufficient testing of the budget/risk boundary; (ii) lack of a sufficiently robust top-down challenge has led to a sub-optimal portfolio; (iii) expenditure does not appear to align with the CBRM methodology; and (iv) absence of robust risk assessment in accordance with the risk framework.