



**ElectraNet Revenue Determination:
Technical Review**

**Further advice on ElectraNet's
Revised Revenue Proposal**

PUBLIC (REDACTED) VERSION

**Report to
Australian Energy Regulator**

**Energy Market Consulting associates
Strata Energy Consulting**

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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 transmission services of ElectraNet from 1 July 2013 to 30 June 2018. The AER's determination is conducted in accordance with its responsibilities under the National Electricity Rules (NER).

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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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1 Introduction

1.1 Background

1. On 31st May 2012, ElectraNet provided its Transmission Network Revenue Proposal to the AER, for the period 1 July 2013 to 30 June 2018¹. EMCa was engaged by the AER to provide technical advice and demand forecasting advice and we reported on both matters on 30th October 2012². The AER published its Draft Decision in 2012. ElectraNet provided its Revised Revenue Proposal on 17th January 2013 (the RRP) and EMCa was engaged to provide advice on specific matters arising from ElectraNet's revised proposal.

1.2 Scope

2. The matters that we advise on in this report were contained in a Terms of Reference (TOR) provided by the AER in late January 2013 and contained twelve items, plus a requirement to take account of submissions provided³. The TOR are reproduced in the current report, in the sections that they relate to.
3. In considering how to advise the AER, we took the Draft Decision as the baseline and considered the question as to whether any information presented by ElectraNet in its RRP would lead us to recommend to the AER to modify its Draft Decision. While we

¹ We refer to this as the Revenue Proposal (RP)

² *Advice on Forecast Capital and Operational Expenditure, Contingent Projects and Performance Scheme Parameters*, Report to AER (30th October 2012) and *Review of Demand Forecast proposed by ElectraNet*, Report to AER (30th October 2012). We refer to these generally in the current report as our 2012 reports/advice to the AER.

³ These were numbered B.1 to B.13, and are referred to accordingly in the current report.

have referred to information and logical argument presented in our 2012 advice to the AER where it is also relevant to ElectraNet's RRP, that advice was provided in the context of ElectraNet's initial RP and so has been superseded both by the Draft Decision itself and by ElectraNet's RRP.

4. ElectraNet has adopted the substance of much of what EMCa recommended in that advice and which the AER took into account in its Draft Decision. This is the case, for example, in regards to its demand forecasts, its associated demand-driven capex, in relation to contingent projects, STPIS and land and easements capex
5. In its RRP ElectraNet has stated in numerous places that EMCa's 2012 advice and understanding was incorrect. In the current report, we have not responded to each such statement except to the extent that it is relevant to the matters that we have been asked to advise on. Other than in regards to the matters noted in the previous paragraph, ElectraNet has largely re-provided similar information to what was provided in the initial RP, with limited or no further primary analysis⁴. The re-provided information has helped in confirming that we had not misunderstood the original information in our 2012 assessment and in regards to most issues has allowed us to also confirm the substance of these findings.

1.3 Information reviewed

6. In undertaking the current review, we primarily relied on assessment of the following:
 - The AER's Draft Decision
 - ElectraNet's RRP, including Appendices A to Q of that RRP, and other supporting documents and models provided by ElectraNet in conjunction with its RRP
 - Responses to information requests. EMCa made eleven further information requests in reviewing the RRP. We also reviewed information provided in response to information requests made by the AER.
7. It is relevant to our assessment that, as was the case with ElectraNet's initial RP, there were a number of errors and inconsistencies in the RRP. This included discrepancies in land and easements capex figures, errors in the models provided and errors in regards to defect data that we relied on in assessing maintenance needs. While it is not unreasonable to expect some discrepancies in the volume of information provided, we consider that the amount of such errors and subsequent correction requirements was greater than we would normally expect to encounter.

1.4 Structure of this report

8. This report is largely structured by section according to the TOR. The following table maps the TOR against the relevant sections of the report.

⁴ For example, in relation to asset management, and in relation to its proposed portfolio risk factor

Table 1: *TOR and relevant sections of this report*

B.1 Augmentation and connection capex	Section 3: Augmentation and Connection Capex
B.2 Replacement and refurbishment capex	Section 5: Replacement and refurbishment capex. See also appendix 5
B.3 Land and easement capex	Section 7: Land and easement capex. Appendix 1 also provides further information
B.4 Capex – Portfolio risk and prudence adjustments	Section 6: Cost estimation. See also appendix 3 and appendix 9
B.5 Transmission line refit asset lives	Section 12: Line refit asset lives
B.6 ElectraNet's asset management framework	Section 4: Asset management and its implications
B.7 Corrective maintenance opex	Section 4: Asset management and its implications (especially section 4.3). See also appendix 7
B.8 Operational refurbishment opex	Section 4: Asset management and its implications (especially section 4.4)
B.9 Opex efficiency factors	Section 9: Opex efficiency. See also appendix 6
B.10 Network optimisation opex	Section 8: Network optimisation
B.11 Contingent projects	Section 10: Contingent projects. See also appendix 6
B.12 STPIS	Section 11: STPIS

9. Further detailed information is provided in other appendices, including some overall data comparisons (between the initial RP, EMCa's 2012 advice, the Draft Decision and ElectraNet's RRP) in appendix 4.

2 Summary of findings and implications

2.1 Key findings

11. Having reviewed the information provided by ElectraNet in its RRP, and further information provided in response to queries, our key findings are as follows.

Demand forecast and implications for augmentation, connection and replacement capex

12. Noting that ElectraNet has reduced its demand forecast to a level that is close to (but still above) the level we have recommended in our 2012 reports, we consider that the demand-related reductions that ElectraNet has now made to its augmentation, connection and replacement capex are reasonable.

Contingent projects, and land and easements capex

13. ElectraNet has reduced the number of proposed contingent projects and has reduced the proposed land and easements capex, and has provided considerable further information on both aspects. With some modification to triggers we now recommend accepting all except one of the contingent projects and we recommend accepting a higher level of land and easement expenditure than was allowed for in the Draft Decision.

Asset management and implications for routine maintenance, corrective maintenance, opex refurbishment, capex refurbishment and replacement capex

14. In regards to asset management, we consider that ElectraNet's RRP response does not provide valid reason for the AER to modify the substance of its Draft Decision. We remain concerned about governance issues relating to the decision to implement an enhanced maintenance regime and the lack of a satisfactory overall rationale as to why maintenance costs should increase substantially but without any material evidence of offsetting benefits. We find that information presented in regards to corrective maintenance defects and claimed benefits of replacement capex deferrals was misleading, we do not agree with the analysis of the costs of the regime that

ElectraNet has prepared for the RRP and no valid new information has been presented with regards to the decision cut-offs for opex refurbishment. We consider that the Draft Decision remains appropriate in regards to the AER's decisions and adjustments that are driven by conclusions regarding the enhanced maintenance program: namely in regards to routine maintenance, corrective maintenance, opex refurbishment, capex refurbishment and replacement capex.

Cost estimation: Portfolio risk and prudence

15. We do not accept the arguments presented by ElectraNet in seeking to apply a portfolio risk factor uplift to its capex and in seeking not to apply a prudence adjustment. Having undertaken further investigation of the purported basis for the portfolio risk factor, we consider that the analysis used by ElectraNet and its advisers is weak and does not support the claimed uplift. We have undertaken new cost estimation analysis using ElectraNet's own project data, and this analysis supports the adjustments made by the AER in its Draft Decision, namely to reduce the portfolio risk factor applied to augmentation and connection projects, to disallow such uplift on replacement projects and to apply a prudence adjustment to proposed replacement and refurbishment capex.

Other matters: Network optimisation, opex efficiency, line refit asset lives and STPIS

16. In summary, for the other matters that we were asked to review:
 - We support the proposed network optimisation expenditure, but we consider this is a one-off security/compliance capex project, not opex;
 - We consider that no new evidence was presented that would lead us to revise our view that an opex efficiency adjustment should be applied, and that the level that we estimated in our 2012 review is appropriate;
 - We consider that the AER's adjustment to line refit asset lives was appropriate, and we refute ElectraNet's arguments for a shorter life;
 - Noting that ElectraNet has accepted the AER's Draft Decision in regards STPIS, except for the weightings, we consider that the Draft Decision remains appropriate and we are not persuaded by the arguments that ElectraNet has put forward to vary the weightings.

2.2 Summary of recommendations

17. In this section we summarise the recommendations that are made in the subsequent sections of the report.

2.2.1 Capex

Capex cost estimation: Portfolio risk and prudence

18. We recommend that the AER applies the same proportionate adjustments for portfolio risk and prudence as it applied in the draft decision. These adjustments should be applied only to non-WIP network components of the proposed expenditure. Specifically these involve proportionately reducing the proposed non-WIP expenditures as follows:
 - Reducing proposed augmentation and connection expenditure to have the effect of applying a portfolio risk factor of +2.6%, in place of the factor of +4.9% that

ElectraNet has proposed, that is, applying a reduction of 2.3% to the proposed expenditure;

- Reducing replacement and refurbishment expenditure to have the effect of applying a portfolio risk factor of zero (in place of 4.9%) and a prudence adjustment of -7%, that is, applying a reduction of 11.9% to the proposed expenditure.

Augmentation and connection capex

19. We consider that the augmentation and connection capex proposed in ElectraNet's RRP is reasonable and we recommend that it should be accepted.

Land and easements capex

20. We recommend that the AER:
 - Does not accept the RRP land and easements figure of \$41.4m proposed by ElectraNet; and
 - Amends its Draft Decision (\$13.4m) and accepts an amount of \$21.9m.

Replacement and refurbishment capex

21. We recommend that the AER not accept ElectraNet's proposed replacement and refurbishment capex.
22. Consistent with our conclusions in sections 4 and 6, we recommend that the AER maintains in its Final Decision the relevant adjustments made in its Draft Decision, and which should be applied to ElectraNet's proposed RRP expenditures. Specifically, we recommend:
 - A reduction to account for a minimum level of benefits from deferred refurbishment and replacement expenditure that we expect to result from the enhanced maintenance regime that ElectraNet has introduced. This adjustment of \$50m is as recommended in section 6 and should be allocated pro-rata between replacement and refurbishment capex;
 - Reduction of the portfolio risk factor and application of a prudence adjustment to all replacement and refurbishment capex. We recommend combining these to a single adjustment that has the same combined effect as the two adjustments made in the Draft Decision, that is, a reduction of 11.9% to the expenditure that ElectraNet has proposed. This adjustment should be made to the non-WIP component of network expenditure, net of the enhanced maintenance benefit adjustment above.

2.2.2 Opex

Routine maintenance

23. We recommend that the AER:
 - Maintains the position set out in the Draft Decision on routine maintenance expenditure, allowing \$80.9 million.

Corrective maintenance

24. We recommend that the AER:
 - Does not accept ElectraNet's RRP proposal for corrective maintenance;

- Retains the AER's trended corrective maintenance otherwise determined in the Draft Decision.

Operational refurbishment

25. We recommend that the AER:

- Does not accept the amount for operational refurbishment that ElectraNet has proposed in its RRP; and
- Maintains the Draft Decision amount in respect of operational refurbishment.

Network optimisation

26. We recommend that the AER:

- Accepts the proposed \$4.9m expenditure allowance for line sag clearance remediation in the next RCP, by adding it to the security/compliance capex proposed in the RRP;
- Does not accept the \$4.9m line sag remediation work as "Network Optimisation Opex"; therefore the adjusted opex for this category will be zero. As it was not in the "base year opex" no adjustment to "revealed costs" is required to achieve this outcome.
- Removes the "aerial line survey" project (project 11734) amount of \$4.9m from the proposed "compliance/security" capex and AER should satisfy itself that an amount of around 25% of this amount in total (i.e. of the order of \$245,000 per year over the 5 years) is implicitly allowed for by means of revealed cost or otherwise, in adjusted opex.

27. As an observation, the proposed amount for line sag remediation (\$4.9m) is the same as is proposed for the aerial line survey work. Therefore the net result of the reclassifications above will be to retain compliance and security capex at the amount proposed in the RRP, while disallowing the Network Optimisation opex.

Opex efficiency

28. We recommend that the AER applies a 2.5 per cent efficiency adjustment, as provided for in the Draft Decision.

2.2.3 Other matters

Contingent projects

29. We recommend that the AER accepts the following project, as presented⁵:

- 10 – Davenport Reactive.

30. We recommend that the AER accepts the following ten projects, subject to amendment of the triggers to ensure that they are objective:

⁵ Numbers refer to the numbering allocated in the RP

- 2 – Lower Eyre Peninsula;
 - 4 – Riverland;
 - 5 - Fleurieu Peninsula reinforcement;
 - 6 – Yorke Peninsula;
 - 8 – South East to Heywood interconnection;
 - 11 – Upper south east generation expansion;
 - 16 – Mid North Connection Point;
 - 17 - Port Pirie system reinforcement;
 - 21 - Upper North Region line reinforcement;
 - East Terrace transformer.
31. We recommend that the AER disallows any contingent projects for which the triggers are not satisfactorily amended to clearly describe the trigger events (in particular, where these are step loads) and the relevant connection points that they apply to.
32. We recommend that the AER rejects the following project, on the grounds that it is not probable and is based on general demand growth, with no identified step load trigger event:
- 14 – Northern suburbs reinforcement.

STPIS

33. We reaffirm our findings and recommendations from our 2012 advice. Specifically we do not find a case for re-weighting the average outage duration parameter and recommend that the Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter weighting be increased from 0.1 (as proposed by ElectraNet) to 0.2.

Line refit asset lives

34. We recommend that the AER maintains the position set out in the Draft Decision to assign an asset life of 27 years to the 'Transmission lines refit—insulators replacement 2013–18' asset class for the 2013-18 RCP.

3 Augmentation and connection capex

3.1 Scope and information sources

3.1.1 AER's scope for EMCa review

35. Our terms of reference for this review are contained in section B.1 of the AER's TOR, as follows:

The technical consultant must review ElectraNet's revised augmentation/connection capex forecast and confirm that it is consistent with the revised demand forecast. This review should include an assessment of the reasonableness of including Work in Progress capex projects in the forecast capex, given the revised demand forecast.

3.1.2 Background and source Information

Information sources

36. Our review has been principally based on the following information:
- Draft Decision: Attachment 4.3: Load Driven Capex;
 - RRP: section 6.2.5: Load driven projects;
 - Other relevant information:
 - RRP: section 4: Demand Forecast;
 - RRP: Appendix F: Oakley Greenwood review of demand forecast;
 - RRP: Appendix G: Connection point forecast.

Key background data

37. The following tables summarise the projected expenditure requirements, from ElectraNet's initial RP, EMCa's recommended adjusted amount, the AER Draft Decision and ElectraNet's RRP.

Table 2: *Augmentation and connection capex comparison⁶*

\$million (real 2012/13)

	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Augmentation	117.9	98.3	98.7	88.3
Connection	133.3	101.8	101.8	88.5

Source: RRP, RP, EMCa TR report, AER Draft Decision

Table 3: *Augmentation capex by category*

\$million (real 2012/13)

	RP	EMCa adjusted for Draft Determination	RRP
Load driven (Non-WIP)	33.0	22.8	22.8
IT, Communication (Non-WIP)	22.9	22.9	23.0
Market benefit, Outage management (Non-WIP)	2.8	2.8	2.8
WIP	47.6	47.6	39.7
Projects excluded in RRP	11.5	3.2	-
Portfolio risk	-	1.2	-
	117.9	98.3	88.3

Source: RRP, RP, EMCa TR report

Table 4: *Connection capex comparison*

\$million (real 2012/13)

	RP	EMCa adjusted for Draft Determination	RRP
Load driven (Non-WIP)	76.5	47.9	43.5
WIP	55.6	55.6	45.0
Projects excluded in RRP	1.2	-	-
Portfolio risk	-	1.7	-
	133.3	101.8	88.5

Source: RRP, RP, EMCa TR report

3.2 Relevant aspects of Draft Decision and ElectraNet response

3.2.1 Demand forecast

38. The AER's Draft Decision was based on a lower demand forecast for the 2013-18 RCP compared with ElectraNet's original demand forecast, and adopted a substituted (lower) capex forecast. The AER deferred \$103.7m of load-driven capex for three years, including nine new augmentation and connection projects and three large replacement projects with an augmentation component. The AER accepted EMCa's advice that a considerable portion of the connection and augmentation capex was not driven by demand growth and projects already commenced and to be commissioned in 2013 or 2014 could not be deferred.

⁶In this and subsequent sections, EMCa recommended costs are based on ElectraNet's escalation factors and before the application of AER's escalation factors.

39. ElectraNet did not accept the AER's substituted demand, instead adopting connection point demand forecasts based on advice from SA Power Networks' revised connection point forecasts which ElectraNet states has now been prepared based on a 10 per cent probability of exceedance planning margin (and which was as recommended by EMCa/NZIER). The revised connection point forecasts are provided in appendix G of the RRP⁷. ElectraNet presents a revised state-wide diversified demand forecast as its primary presentation of its demand forecast, in figure 4-1 of the RRP, though it is not clear whether this forecast has been used at all for planning purposes.
40. The revised connection point forecasts led to deferral of significant load-driven investment for the 2013-18 RCP, in the order of \$130m.⁸

3.2.2 Augmentation capex

41. In its RRP for augmentation, ElectraNet has:
 - Maintained non load-driven capex (\$25.8m) as per the RP and as per AER's Draft Decision. This is mainly telecommunications and network IT projects;
 - Reduced load-driven non-WIP projects by deferring them such that the aggregate expenditure on these projects (\$22.8m) is as per the AER's draft decision. One load-driven project (East Terrace Transformer Upgrade) has been re-presented as a contingent project;
 - In addition, three projects that were previously proposed as WIP have been removed from the RRP, and a number of other WIP projects have been adjusted such that the proposed expenditure is reduced. The aggregate for WIP projects was \$59.1m in the RP, and \$50.8m in the Draft Decision and in the RRP is now reduced to \$39.7m.

3.2.3 Connection capex

42. In its RRP, ElectraNet has:
 - Reduced non-WIP connection projects from \$77.7m to \$43.5m. This is less than the adjusted connection capex included in the Draft Decision (\$47.9m) and which was based on AER's acceptance of EMCa's lower demand forecast;
 - ElectraNet has also reduced proposed WIP expenditure from \$55.6m to \$45m. The Draft Decision did not adjust the RP proposed WIP expenditure.

⁷ The revised connection point forecasts were originally provided in Appendix G, ENET299. We found these to be in error, with two connection points transposed, which was material as one of those (Adelaide Central) is a 'virtual' connection point that is not included in aggregate demand because this would "double up" as it is a component of Eastern Suburbs. Corrected data was provided in ENET327.

⁸ See ElectraNet RRP, Table 6-4, p.64. Note that this figure includes significant deferrals of replacement capex.

3.3 Our review of ElectraNet response

Demand forecast

43. ElectraNet has presented a revised state-wide diversified demand forecast graphically in figure 4-1 of its RRP and this graph purports to show that ElectraNet's demand forecast is now below the adjusted demand forecast that the AER used in its Draft Decision.
44. We have examined this graph and find that it is misleading, in that the historical data, AEMO data and ElectraNet forecast are state diversified demands, whereas the EMCa line on this graph is the regional sum of connection point demands, and is not diversified to state level. The correct comparison with the AER's draft decision is the sum of connection point demands provided by ElectraNet in its (corrected) version of appendix G⁹, and which is 121 MW (3%) higher than the AER's draft decision.
45. Despite this anomaly, we have re-assessed the reasonableness of the augmentation and connection capex forecasts, as below.

Augmentation

46. The proposed non load-driven expenditure and the deferrals of load-driven non-WIP expenditure are in line with the Draft Decision and we propose that these amounts should be accepted.
47. Approximately \$12m of the \$19m reduction in WIP project expenditure for the next RCP results from expenditure having been brought forward into the current RCP, which would seem to be inconsistent with the reduction of the demand forecast. However changes to current RCP expenditure are outside the scope of this review and the net reduction for the next RCP appears to reflect a reasonable re-work of forecasts based on the lower demand forecast.
48. We have also reviewed the expenditure profile for the proposed WIP augmentation projects and we find that, for all projects of any significance, the majority of expenditure will have been incurred before the start of the next RCP. Even if the project was unlikely to be fully required at the time of commissioning, it is unlikely that there would be any merit in cancelling or deferring remaining work.

Connection

49. The RRP adjusted capex is below that in the AER's Draft Decision and appears to reflect a reasonable re-work based on the lower demand forecast. On this basis we propose that the AER accepts the proposed amounts.
50. The apparent reduction in WIP connection expenditure results from ElectraNet having re-categorised around \$7m of expenditure on Waterloo substation out of connection

⁹ ENET327

and adding around \$9m for this project, into replacement¹⁰. Nevertheless, ignoring this substation, connection WIP expenditure has been reduced both in the current RCP and as proposed for the next RCP.

51. One material WIP project, Munno Para Substation (\$33.6m) has the majority of expenditure being incurred only in the 2013-18 RCP (13% of its forecast expenditure will have been incurred before the commencement of the next RCP). This project is required due to changes to the ETC and it being a Category 4 connection. The original date for commissioning of this project was 2014. Given this it is unlikely that the change in demand forecast would have pushed it out of the next RCP, we consider that it is reasonable to retain this project as proposed by ElectraNet.
52. The majority of expenditure on other WIP projects will have already been incurred prior to the start of the next RCP and, as with augmentation projects above, it is unlikely that there would be any merit in cancelling or deferring remaining work.

3.4 Findings and recommendations

53. We consider that the augmentation and connection capex proposed in ElectraNet's RRP is reasonable and we recommend that it should be accepted.

¹⁰ In EN response to AER RRP 001, ElectraNet states that this project was misclassified in the RP and that this has been corrected in the RRP

4 Asset management and its implications

4.1 Enhanced maintenance regime, its implementation and expected benefits

4.1.1 Scope and information sources

AER's scope for EMCa review

54. Our terms of reference for this review are contained in section B.6 of the AER's TOR, as follows:

In relation to ElectraNet's asset management framework, the technical consultant must:

- *Consider whether ElectraNet has provided evidence of 'good industry practice' outcomes, consistent with ElectraNet's asset management framework, when making forecast expenditure decisions. This should be particularly considered in the context of ElectraNet moving from a high/medium/low risk based forecasting method to the more refined methods under ElectraNet's asset management framework (as discussed in EMCa's October 2012 report, section 6.6.4);*
- *Must identify the decision making processes used by ElectraNet and explain the process by which the technical consultant gathered an understanding of this decision making process (e.g. site visits, document reviews, 'sit ins' with asset managers etc.);*
- *Provide worked examples of 'good industry practice' decision making processes.*

Information sources

55. Our review has been principally based on the following information:

- Draft Decision: Attachment 3: Forecast expenditure, especially 3.4 Reasons for Draft Decision;
- RRP: section 5: Asset management framework - in regards framework only, but not in regards replacement capex, economic analysis or quantification of benefits of the enhanced condition based maintenance regime);
- RRP: section 7.2: Opex / AER's top-down assessment;
- ENET308: Appendix O: Condition and risk assessment;
- ENET309: Appendix P: Replacement and maintenance decision framework;
- ENET310: Appendix Q: Asset refurbishment plan – section 4 (Framework) only;
- SKM 23 November 2007 report to AER.

4.1.2 Relevant aspects of Draft Determination and ElectraNet response

56. In its Draft Decision, the AER stated that it considered that there was a lack of good governance regarding the decision to implement the enhanced maintenance regime, including a lack of cost benefit analysis that would be expected to accompany such a decision. The AER noted the considerable increases in maintenance that were being proposed, in conjunction with increases in replacement and refurbishment capex and without evidence of capex deferral benefits that ElectraNet's concept diagrams indicated should arise from the higher levels of maintenance.
57. The AER accepted EMCa's estimate of the costs of the enhanced maintenance regime, and made an adjustment to the proposed replacement and refurbishment capex to account for the benefits that should arise from that investment.
58. At a high level, ElectraNet's RRP response is that:
 - The estimated incremental implementation costs of the enhanced maintenance regime have been significantly overstated, and are in the order of \$30.1 million rather than \$52.7 million, noting that \$9.1 million of that \$30.1 million had already been expended in the 2008-13 RCP;
 - ElectraNet's expenditure forecasts have been developed based on the best asset condition information available from its enhanced condition-based maintenance regime and as a result, any economic benefits have already been taken into account in the forecast period through deferred substation and line replacement investment timing;
 - There can be no reasonable expectation that the information gathered through the proposed new condition monitoring expenditure which is focused on transmission lines will defer further replacement capex in the 2013-2018 regulatory period. This is because there is no transmission line replacement capital expenditure included in the forecast.
59. At a more detailed level, ElectraNet's RRP response is that:
 - ElectraNet's replacement capex forecasts are supported by detailed asset condition assessments and cost benefit analyses and there is no basis for the view that further efficiencies can be achieved;
 - It is unreasonable to expect any benefits from the incremental maintenance expenditure in the 2013-18 RCP (estimated by ElectraNet to be 21.0 million, and by

EMCa to be \$35.4 million) to be realized in the 2013-2018 RCP. ElectraNet take this view because it claims that future incremental spend is related to lines and there is no replacement capex for lines that can be deferred;

- The switch to a condition-based maintenance regime has resulted in the deferral of seven full substation replacements of an indicative estimated capital value of \$273 million compared with the position at the time of the 2007 Asset Management Plan¹¹;
- Much of the operational refurbishment budget is to collect further condition-based data to assist in asset management decision-making;
- The anticipated deferral of corrective maintenance from the switch to a condition-based maintenance regime is unlikely to eventuate. For example, substation corrective maintenance is unlikely to be deferred from the 2013-18 RCP to a later RCP because such corrective maintenance mainly consists of high risk asset defects for which corrective action is required within 30 days;
- It has used a sampling approach to implement condition-based maintenance.

4.1.3 Our review of ElectraNet response

Our approach

60. Our original recommendations in relation to ElectraNet's asset governance and management framework were developed by:
 - Reviewing ElectraNet's revenue proposal and supporting appendices, and in particular examining the TALC and SCAR methodologies;
 - Assessing these methodologies against industry benchmarks, and in particular PAS 55 Asset Management Standard (2008 4.2), AS/NZS ISO 31000:2009 Risk Management/Principles and Guidelines and the New Zealand Asset Management Support Group (NAMS) International Infrastructure Management Manual;
 - On-site visits and attendance at presentations by ElectraNet;
 - Interviews with individual managers at Executive, Senior Management, and Management level to test how high level asset management strategies, methodologies and decisions were applied in practice; and
 - Reviewing ElectraNet capex and opex proposals against historical internal practice.
61. Our present recommendations have been developed by reviewing the information previously provided and now provided (and which is little different), focusing on the estimates of ElectraNet's costs of moving to condition-based maintenance and reviewing ElectraNet's Asset Management Plans since 2007 to identify the changes in capex and opex priorities over time leading to the claimed benefits.

Governance and business case for the enhanced maintenance regime

62. At the on-site meetings and in information requests during assessment of the initial RP, ElectraNet was asked to provide a business case that sets out the overall costs

¹¹ Refer ElectraNet RRP, Table 5-3, p.43.

and expected benefits of implementing the enhanced maintenance regime. The lack of an evident business case was also stated in the Draft Decision.

63. ElectraNet has not provided evidence that a business case was prepared for the decision to implement the enhanced form of condition-based maintenance that it utilises and such information as was prepared for decision-making purposes falls far short of describing the overall costs and tangible and quantifiable expected benefits of the regime. Given that this is a significant investment and major strategic initiative we consider the lack of a business case indicates a weakness in ElectraNet's internal governance processes. ElectraNet might also have been expected to impose stronger project management disciplines, for example by trialling condition-based maintenance in some way, such as via a Plan, Do (Trial), Study, Act approach before committing the investment in time, money, and strategic direction to the extensive condition-based maintenance model it has implemented. While condition-based maintenance may represent good industry practice, it could be expected that ElectraNet as an organisation would evaluate and document its decision to move to this form of maintenance prior to committing significant expenditure to it, and in particular to demonstrate that the comprehensive condition-based maintenance approach that it adopted was applicable for ElectraNet's business and was economically justified.
64. In terms of the cost of implementation, ElectraNet originally advised a figure of \$200k during our on-site sessions in Adelaide¹². Despite requesting business case information, no further estimate of the cost was provided during assessments leading to the Draft Decision. In its RRP, and apparently only in response to EMCa's estimate contained in the Draft Decision, ElectraNet has developed an estimate of \$30m for this cost.
65. In terms of establishing benefits, the lack of a business case makes it difficult to evaluate the identified benefits of the comprehensive condition-based maintenance compared with alternatives. It is also difficult to determine a counterfactual for comparing whether any benefits have been delivered by switching to condition-based maintenance compared with a business as usual case. This is because the benefits would have been expected to be identified in the business case. In the absence of a business case from ElectraNet, we have assessed the claims that ElectraNet has made in its RRP and have undertaken further analysis of the costs and expected benefits in order to test the prudence of the enhanced maintenance regime.
66. It may also have been the case that an alternative approach to implementing condition-based maintenance, such as through a staged or sampling approach, would have produced higher economic value. The absence of a business case means that this potential value will have been foregone.

Our assessment of the proposition that replacement projects have been deferred as a result of the enhanced maintenance regime

67. In the RRP, ElectraNet has claimed that it has deferred \$273 million in substation costs planned in the 2007 Asset Management Plan. We have reviewed this claim with

¹² Advised in response to specific questions as to the incremental costs, at the on-site sessions

a view to assessing whether this has occurred due to the implementation of the condition-based maintenance programme, prudency reviews, lower growth expectations, or other factors. In response to an information request in the course of our 2012 Technical review, ElectraNet at that time claimed deferrals of the order of \$3.5bn¹³. While noting the large reduction in claimed benefits, we have set aside that claim and have focused on the claim of \$273m now made.

68. In the Revised Revenue Proposal, ElectraNet claimed savings from the following seven substation projects:

Table 5: *Substation replacement deferral*

Table 5-3 Substation replacement deferral from the 2013-2018 regulatory period

Substation	Region	Indicative Replacement Cost (\$m)
Happy Valley 275kV & 66kV substation	Metro	53
Brinkworth 275kV & 132kV substation	Transmission	33
Dry Creek 66/11kV Power Station	Metro	8
Mount Gambier 132/33/11kV substation	South East	18
Berri substation	Riverland	16
North West Bend substation	Riverland	23
South East substation	Transmission	121
Total		273

Source: *ElectraNet Asset Management Plan 2007*

69. We reviewed the 2007 – 2012 Asset Management Plan (AMP) to find evidence that supported ElectraNet's claims that these major substation replacement capital projects were actually planned replacement capital projects that had been deferred.
70. In addition, we reviewed the 2007 Annual Planning Reviews (APR), and the APRs from all subsequent years to seek confirmation of ElectraNet's assertion for each of the seven projects, that they had been deferred and that this was a result of having implemented its enhanced condition-based maintenance regime.
71. In our view a project would need to satisfy a number of conditions to justify ElectraNet's claim of savings. These are that the project would need to:
- Be included in the 2007 Asset Management Plan or Annual Planning Review;
 - Be a substation replacement project;
 - Have been scheduled in the 2007 AMP or APR for construction prior to 2019; and
 - Be deferred beyond the 2013-2018 Regulatory Control Period in the RRP.
72. Our findings are that:

¹³ ENET271, page 9

- We were unable to find evidence in the 2007 – 2012 AMP that supported ElectraNet’s claims that these major substation replacement capital projects were planned. If these projects had been planned it would have been expected that they would have been included in the Capital Projects Plan (appendix 15¹⁴ of the 2007 – 2012 AMP) which lists all the planned capital projects to 2025;
 - We found that only one replacement capital project in the Capital Projects Plan was attributable to the above listed substations. This project was for the Happy Valley 275kV Secondary Systems replacement with an estimated project cost of \$9.8m. Dry Creek is listed in the Capital Projects Plan but as a connection project for 66kV switchgear upgrading and secondary system replacement with an estimated project cost of \$3.6m;
 - Three of the projects were not mentioned in the 2007 APR, being Brinkworth, Dry Creek and South East substations. Two of these, Brinkworth and South East were not mentioned in any of the Plans through to 2012. Therefore claims of savings for these appear invalid;
 - The 2007 – 2012 AMP identified a connection capital project at Berri which would not be required if an augmentation project was to proceed. Berri substation is included in the 2007 APR for removal of all significant transmission infrastructure, rather than rebuilding. It is part of a broader transmission augmentation project, not replacement. Therefore claims of savings for this appear invalid;
 - Of the remaining projects, none were shown in the 2007 APR with a completion date prior to 2019:
 - North West Bend has always been planned to occur from 2023 onwards, so savings claims appear invalid;
 - Happy Valley had no date forecast in the 2007, 2008 or 2009 APRs, but the 2010 APR showed it was due during 2013-2018. However the \$53m appears invalid as the total cost predicted in the 2012 APR was \$17m;
 - Mt Gambier had a date of 2019. In subsequent APRs it has had dates within the 2013-2018 RCP. Currently it appears to be once again outside of the next RCP period and therefore has not been deferred relative to the 2007 APR. The saving on this project would be \$18m.
73. It is also not clear whether these deferrals were due to reductions in condition monitoring or changes in demand forecasts. We note that in the 2007 APR the forecast for 2012 demand was 4,180MW, while in the 2012 APR the forecast for 2020 demand was 4,170MW. This would suggest the deferrals might be due to reductions in demand forecasts, and we note that in the current review ElectraNet has made significant reductions in replacement capex as a result of lowering demand forecasts.
74. In summary, we can only find evidence of possible savings from the replacement capital projects included in the Capital Projects Plan of the 2007 – 2012 AMP due to

¹⁴ElectraNet 2007 – 2012 Asset Management Plan section 9.2.1 states that *The capital projects programme is the projected capital projects programme for the N2025 long term planning horizon based on ElectraNet’s process to assess investment prudence and the current resource constraints, it includes both network augmentations based on probabilistic forecasts and asset replacement based on asset condition assessment and risk profile.*

deferment Happy Valley substation of \$9.8m. This is deferral of expenditure, not absolute savings and the NPV of savings would be represented by the cost of capital applied to the deferral of expenditure (i.e. the amount and number of years of the deferral). Given the significant possibility that the deferral was reasonably likely to be due to reductions in demand, we are unconvinced by ElectraNet’s argument that implementation of condition-based maintenance led to the deferral of this project and any possible savings indicated from the projects presented above appear to be considerably less than either the \$30m cost figure claimed by ElectraNet or our own estimate of the order of \$50m cost.

- 75. In addition we have found that of the replacement projects proposed in the 2007 AMP for 2008-13 RCP, not one was deferred beyond the current RCP. On the other hand \$56m of projects that were not planned in the 2007 APR were brought forward into the current RCP (as shown below). \$42m of these projects are in the final two years of the current RCP. Even since May 2012 when it presented its initial RP, ElectraNet has brought forward replacement capex, increasing the 2012/13 replacement capex expenditure from its RP estimate of \$69.5m, to its RRP estimate of it \$93.1m.

Table 6: Replacement projects

Project No	Project Name	Year	Category	Phrase	RRP					Total
					2008/09	2009/10	2010/11	2011/12	2012/13	
10389	Cherry Gardens Aged Asset Replacement	2009	Replacement	Complete	1.2	0.7	0.0	-	-	1.9
11124	Outage Management 2009-2011	2012	Replacement	Phase 4	0.0	0.2	0.5	0.6	0.0	1.3
11233	IT OCS Software 2010-2012	2012	Replacement	Phase 4	-	0.0	0.4	0.7	0.0	1.1
11313	Mannum-Adelaide Pump Station 1-3 and Millbrook Substations	2018	Replacement	Phase 0	-	-	-	0.6	2.0	2.7
11316	Morgan-Whyalla 1-4 Substations Replacement	2017	Replacement	Phase 0	-	-	-	1.1	2.6	3.7
11355	Davenport 275kV 50Mvar Reactor Stage 2	2012	Replacement	Phase 5	-	-	1.9	2.6	0.0	4.5
11359	Transformer Refurbishment Projects	2013	Replacement	Phase 4	0.1	1.3	2.6	0.6	3.0	7.7
11360	Auxiliary Supplies Refurbishment Projects	2013	Replacement	Phase 4	0.2	0.7	0.4	0.9	3.0	5.2
11362	Site Asset Replacements (ETSA Utilities)	2013	Replacement	Phase 4	-	0.1	1.3	1.9	1.5	4.8
11363	Site Asset Replacements (Tenix Alliance)	2013	Replacement	Phase 4	-	0.0	2.2	1.5	1.1	4.9
11380	Yadnarie Reactor Replacement	2013	Replacement	Phase 1	-	-	-	0.2	2.7	2.9
10453.z	Davenport to Para 275kV Line Uprating	2009	Replacement	Complete	1.5	-	-	-	-	1.5
10467.z	Whyalla to Pt Lincoln 132kV Line Uprating	2009	Replacement	Complete	14.2	0.3	-	-	-	14.5

Source: RRP

- 76. Given the serious implications of our findings for the integrity of ElectraNet’s claims in the Revised Revenue Proposal we asked ElectraNet to identify exactly where in the 2007 AMP we could find the information sources for table 5-3 on these projects. ElectraNet responded as follows:

The source of information from 2007 AMP is in Section 10.1 Asset Replacement Projects, pg 59 to 62, Tables 10.1 through to 10.8.

Note that the nominated replacement timing is listed by RCP in each Table in the “Final Combined Plan” column. Legend is as follows:

Final Combined Plan (i.e. RCP)	Regulatory Control Period
1	2003-08
2	2008-13
3	2013-18
4	2018-23
5	2023-28

Table 5-3 of the revised Revenue Proposal therefore lists those substation replacement projects that had already been deferred from the 2013-18 forecast period as at the time of the May 2012 Revenue Proposal relative to the program documented in the 2007 Asset Management Plan.

Source: ENET359

- 77. It can be seen from ElectraNet’s response that it has provided no direction whatsoever to the source of its claimed savings of \$273m for the seven listed substation

replacement projects. The additional information relates only to clarification of the coding of project timings. We again reviewed the 2007 AMP and found no further justification for the projects to be considered to have been deferred from those planned in 2007.

78. We consider that ElectraNet is unable to provide a clear and unambiguous quantification of the benefits realised from the implementation of its comprehensive condition based asset management regime. The benefits have not been established either prior to, during or retrospectively to support the investment. In our opinion, this represents a serious lack of governance and control for this significant strategic investment.
79. Our view remains that ElectraNet would be expected to recover at least the cost of its investment in comprehensive condition-based maintenance over a reasonable period through benefits realised in asset replacement capex. As the system has already been established over several years it is reasonable to expect to see benefits to be seen in the next RCP, which covers a period out to eight years from the commencement of the enhanced regime. We consider that the proposed expenditure does not reflect this.

ElectraNet's claimed incremental cost of condition-based maintenance regime

80. ElectraNet claims that the incremental cost of the implementation of condition-based maintenance is \$30.1 million, rather than the \$52.7 million estimated by EMCa and that only \$20 million of this expenditure is to occur in the 2008-13 RCP.¹⁵ ElectraNet has claimed that it is only legitimate to consider the benefits arising from this future expenditure and that these will arise only in subsequent periods.
81. ElectraNet appears to have only produced a cost breakdown of the incremental costs of implementing its enhanced condition-based maintenance regime in response to the AER's Draft Decision. In the RRP, ElectraNet has set out its cost estimate and compared this with EMCa's estimate that was undertaken based on information provided by ElectraNet but which ElectraNet had not collated into a relevant aggregate estimate of the cost. This comparison is set out below.

¹⁵ElectraNet Revised Revenue Proposal, Table 5-1, p.35.

Table 7: Comparison of estimates of incremental cost of enhanced maintenance regime

Table 5-1 Incremental cost of enhanced maintenance regime (\$2011-12)

Cost estimate	2008-2013	2013-2018	Total
Routine Maintenance	9.0	15.0	24.0
Operational refurbishment	4.9	15.0	19.9
Asset manager support	2.4	5.4	7.8
Total opex	16.3	35.4	51.7
Capex (IT)	1.0	-	1.0
Total - EMCa	17.3	35.4	52.7
Routine Maintenance	2.7	5.1	7.8
Operational refurbishment	4.9	14.4	19.3
Asset manager support	1.0	1.5	2.5
Total opex	8.6	21.0	29.6
Capex (IT)	0.5	-	0.5
Total - ElectraNet	9.1	21.0	30.1

Source: RRP, p.35

82. ElectraNet has not described its method for calculating its estimate, nor its assumptions nor the reasons why its estimate is lower than EMCa's, other than to claim that EMCa's estimate reflects the entire cost of its condition-based maintenance regime and not the incremental cost of the enhanced regime.
83. Our 2012 advice to the AER estimated the incremental costs of the enhanced condition-based maintenance regime, based on information that ElectraNet had provided. The major difference in the table above relates to incremental routine maintenance costs. For this we observed the following information provided by ElectraNet:
- Over the three years from 2009/10 to 2011/12, ElectraNet's routine maintenance costs increased (in real terms) from \$9.3m to \$12.0m and then to \$13.4m, i.e. an increase of \$4.1m or 44%;
 - ElectraNet's average routine maintenance expenditure in the first three years of the current RCP (which includes the significant step increase in 2010/11) was \$10.4m and its estimated cost in the final two years of the current RCP is \$13.4m, i.e. an increase of \$3m;
 - These increases in routine maintenance costs are described by ElectraNet as follows¹⁶:

Routine – increased inspection and maintenance effort for transmission lines, including an expanded aerial inspection program driven by asset condition and fire start risk has seen a cost increase over the period. New regulatory vegetation clearance requirements have also increased costs
 - ElectraNet has also described increases in overall maintenance costs as largely being driven by implementation of its enhanced condition-based inspections and

¹⁶ RP, page 43

related maintenance regime, as is shown in the following quote from ElectraNet's RP¹⁷.

In particular, the following factors increased the cost of compliance and resulted in overall maintenance costs in the current period exceeding the relevant allowance:

- *the continued implementation of the established maintenance regime to address fire start risk and revealed asset condition;*
 - *an increase in the aerial inspection program;*
 - *a change in the Technical Regulator's vegetation management requirements;*
84. In its response ENET172, ElectraNet provided annual costs for vegetation management from 2009/10. These show a slight decrease from 2009/10 to following years. Therefore this could not be a component of the increase in the routine maintenance expenditure that is observed over the period from 2009/10 to 2011/12.
85. ElectraNet also explained to EMCa that the condition-based information gathering and assessment is now built into its routine maintenance procedures, which it has estimated from the work units associated with the relevant maintenance procedures, asset headcount, and unit pricing. It is consistent with these explanations, therefore, that routine maintenance costs increased as the enhanced routine maintenance procedures were deployed.
86. On the basis of this information we estimated that the incremental routine maintenance cost of the enhanced maintenance regime is of the order of \$3m p.a., hence our estimate of \$9m for the three years that it applied in the current RCP, and \$15m in the next RCP for a total of \$24m.
87. In its RRP, ElectraNet has estimated an incremental routine maintenance cost that equates to approximately \$1m p.a. If this figure were correct, then it would leave unanswered the question why routine maintenance costs increased (depending on the reference point) by around \$3m to \$4m per annum over this period.
88. In relation to the incremental cost of operational refurbishment and capex IT, ElectraNet's estimate of costs differs in aggregate from our estimate by around \$1m. For materiality reasons, we have not investigated this difference any further.
89. ElectraNet has also made a somewhat lower estimate of the incremental cost of asset manager support. Given the wealth of condition data now being collected and the need to make use of this data through analysis and judgment in order to drive the savings that can be expected from it, we would be surprised if ElectraNet's estimate of only \$300,000 per annum for incremental asset manager support were accurate. If ElectraNet's estimate is correct, this would however be consistent with our observation that the intensive investment in information collection has not been balanced by appropriate Asset Management attention to technical/economic assessments of the benefits to be provided by use of the data. It would also be consistent with the

¹⁷ RP, page 42

view that neither the costs nor the benefits of the regime were properly assessed prior to implementation or since.

90. Nevertheless for the purposes of this assessment of the indicative incremental costs of the regime, and given materiality, we propose to accept ElectraNet's estimates for the operational refurbishment, capex (IT), and asset manager support components.
91. Combining our estimate of the routine maintenance component with ElectraNet's RRP estimate components, we arrive at the following updated incremental cost estimate of condition-based maintenance:

Table 8: EMCa revised indicative estimate of the incremental cost of the enhanced maintenance regime

Opex category	Amount
Routine maintenance	\$24.0m
Operational refurbishment	\$19.3m
Asset manager support	\$2.5m
Capex (IT)	\$0.5m
TOTAL	\$46.3m

Source: EMCa analysis, from information provided by ElectraNet

Use of condition-based maintenance

92. EMCa agrees with ElectraNet's view that the use of condition-based maintenance in determining maintenance needs and replacement needs is good industry practice. That said, ElectraNet has introduced comprehensive condition-based maintenance in a manner that may not be optimal in matching project benefits to project costs. In our view this is likely to be because, without a firm business case, ElectraNet has paid insufficient attention to the expected benefits. There is a lack of evidence that either costs or benefits have been adequately considered prior to or during the implementation of this program.
93. Comprehensive condition-based maintenance is expensive to implement due to the high cost of data collection and analysis. Such a comprehensive approach has traditionally been implemented in industries where there is a very low tolerance for failure and the large costs of implementing and operation are offset against unacceptable or very large costs of failure (for example, in the airline, nuclear, and military equipment industries). ElectraNet appears to have fully implemented its model without adequately articulating the specific management strategies that are likely to arise from its use. It may have been advantageous to pilot aspects of the approach and realise specific benefits in decision-making towards asset management before unrolling the full approach across all assets. For example, in relation to transmission lines, it may have been preferable for ElectraNet to have targeted worst performing lines in the initial roll-out of condition-based maintenance rather than to plan for assessment of all lines. This may have sped up realisation of initial benefits, and provided greater confidence to implement the full approach. The use of sampling, statistical techniques, and 'read off' may also have helped to speed up the realisation of benefits.

94. ElectraNet asserts in its RRP that it has used sampling techniques to implement condition-based maintenance.¹⁸ However, it has offered nothing specific to suggest this is the case and information provided to us in the course of the Technical Review strongly indicated a comprehensive assessment by indicating percentages of assets surveyed and the resulting percentages remaining. Most of the RRP response indicates an expectation that the benefits of condition-based maintenance will be deferred well past the 2013-18 RCP, despite full implementation of the approach for substations during the 2008-13 RCP.
95. In a more thoroughly and consistently implemented approach to condition-based maintenance, EMCa would have expected to see much clearer targeting of benefits from implementation, including more specific identification of reductions in corrective maintenance and deferral of refurbishment and replacement capex, including in the way in which high, medium, and low prioritisation has been assigned to particular capital projects within the TALC. These benefits would be consistent with ElectraNet's own concept diagrams, and which we referred to and elaborated on in our 2012 advice¹⁹.
96. ElectraNet argues that it is unreasonable to expect that additional transmission line replacement condition data that is proposed to be collected during the 2013-18 RCP will defer replacement capex during that RCP, since no transmission line replacement capex is scheduled in this time. EMCa acknowledges and agrees with this point. However, it is also the case that the investment in past condition based asset management could have been expected to deliver well in excess of its cost, and we would not expect a lag of 5 years or more before any benefit is realised. Rather than attempting to retrospectively reconstruct the detailed business case at this stage we consider that, taking a broad view, at least the costs should be recovered in the 2013-18 RCP.
97. EMCa considers that on-going corrective maintenance both for substations and for lines appears to be overstated by ElectraNet and this will be addressed in more detail in other sections of this report. EMCa notes here that ElectraNet's capex and opex programmes:
- Do not seem to address the benefits of previous corrective maintenance in deferring present and future refurbishment or replacement of assets, despite ElectraNet's assertion of expected extensions to the life of assets from using condition-based maintenance²⁰;
 - Do not reflect the possible reductions in replacement capex;
 - Present a conflicting message in the corrective maintenance appendix in respect of transmission lines.

¹⁸ ElectraNet RRP, p.35.

¹⁹ See figures 13 and 36 of our 2012 Technical Review and surrounding text

²⁰ElectraNet RRP, pp.36-40.

Quantifying the expected benefits from the enhanced maintenance regime

98. From our executive management, Board and senior consulting experience, we consider it reasonable to expect that an investment in such a change in work practices should achieve a payback at least within 5 to 10 years; therefore it is reasonable to expect that benefits will exceed costs over the 8 years that will have elapsed by the end of the next RCP. It would not be unusual to seek Benefit/Cost ratios for an improvement initiative such as this, of the order of 2X to 5X and even 10X the investment cost of the initiative.
99. We have noted ElectraNet's argument that the lines condition assessment work which is proposed for the next RCP cannot provide incremental benefits in the next RCP since no lines replacement capex is proposed in this period. While we have concerns at the suggestion that an investment in condition assessment of the order of \$14m will not achieve any benefit for at least 5 years, as a working assumption we will exclude this cost from consideration of expected benefits.
100. Our calculation of the residual net investment is therefore of the order of \$32m. We have also undertaken a present value analysis across the time-periods of the expenditure, and this produces an almost identical present value: that is, an investment cost with a present value of \$32m as at the commencement of the next RCP (i.e. as at June 2013).
101. If the benefits do not all occur at that time (i.e. at the commencement of the next RCP) then their value must be discounted back to that time in order to determine the NPV. We have calculated that if benefits were spread evenly across the next RCP, a positive NPV project justification would require benefits in excess of \$41m. With a simple 2X multiplier (and no discounting of costs or benefits) benefits would need to exceed \$64m and for a 2X Benefit:/Cost ratio on an NPV basis, the benefits would need to exceed \$82m.
102. As an example, if two \$50m replacement projects totalling \$100m could be deferred by 5 years, the present value of that deferral benefit (using a WACC based on the Draft Decision) is of the order of \$36m and, other factors being equal, this would justify an investment of the order of that which ElectraNet has made.
103. As we have presented in section 4.1.4, we have not observed any replacement and refurbishment capex deferrals that could be said to have resulted from the enhanced maintenance regime; to the contrary, replacement capex has been brought forward. Further, ElectraNet has proposed significant increases in its corrective maintenance and opex refurbishment budgets. These effects are not consistent with ElectraNet's asset management concept graphs that are used to explain the asset management principles underlying the enhanced maintenance regime.
104. Although ElectraNet has not adequately identified or quantified the benefits that it will achieve from its enhanced maintenance regime, we maintain the view that we explained in our 2012 Technical Review, that ElectraNet will obtain benefits and that a prudent and efficient expenditure forecast needs to take account of the benefits that are expected to occur. We consider that benefits in the \$42m to \$82m range that we have assessed as being required to justify the investment cost, should be realistic and (since it falls well within this range) that the Draft Decision assessment of a \$50m remains a reasonable estimate.

4.1.4 Findings and recommendation

Findings

105. We maintain our view that ElectraNet's asset management framework represents good industry practice as a concept but have concerns regarding the manner in which it has been implemented and its ability to provide the full benefits that we would expect to see from implementation such a regime. In particular, our view remains that development of the mechanisms for asset strategy optimisation are not yet mature and may not be producing appropriately optimised asset management plans.
106. Of specific relevance to our review of proposed expenditure for the next RCP, It would appear that the transition to the enhanced condition-based asset management framework has and will be a major driver of opex requirements. Yet ElectraNet has not provided sufficient evidence to support its implementation in the form of a business case in accordance with good expenditure governance and setting out:
- The full incremental costs of the implementation;
 - Consideration of deployment options, including sampling, different means of collecting condition data, "fix now while on-site" versus "fix later" options for minor corrective work and specific analysis and consideration of major expenses within the program (such as aerial survey work);
 - A clear and convincing statement of the expected benefits for various aspects, in excess of the costs of implementation, and including an action plan and monitoring program to enable assessment of the benefits and redirection of the program if/as required during the deployment; and
 - Convincing evidence that the comprehensive asset data that has been collected is being fully utilised when prioritising asset management tasks and making expenditure decisions; and
 - A resulting pattern of lower forward capex or opex costs, with timings.
107. At a more detailed level, we consider that ElectraNet has not demonstrated:
- That a number of projects categorised as high risk are categorised appropriately and will not subsequently be found to be medium or low risk with resulting re-prioritization and deferral of some projects;
 - Evidence (other than the assertion in its RRP, and which is contrary to information provided during on-site sessions and in other documentation) that it is using sampling techniques or pilot processes to better target the implementation of the framework in order to reduce costs, achieve early benefits, or test whether full implementation is justified²¹;

²¹ ElectraNet's response to the suggestion that it is not obtaining information by sampling appears to be that it is prioritising its information collection. This is a different point. ElectraNet has provided information that its program involves an assessment of the condition of all of its assets.

- That its use of condition-based maintenance has achieved a shift in expected asset lives, and what the extent of that shift is;
- Strong evidence of rigorous cost-benefit analysis underlying its asset management processes; or
- That TALC as employed at has yet to reach a 'fully mature level' of use in asset related informed decision-making.

Recommendations

108. We maintain our findings and recommendations from our Technical Review that:

- A reduction of \$50m should be made pro-rata to the proposed replacement and refurbishment capex, to account for a reasonable estimate of the benefits that can be expected to arise from implementation of the enhanced maintenance regime²².

109. If the AER wishes to amend its Draft Decision then we consider that an adjustment reducing replacement and refurbishment capex by an amount in the range of \$42m to \$82m would be reasonable.

4.2 Routine maintenance

4.2.1 Scope and information sources

AER's scope for EMCa review

110. A specific review of ElectraNet's RRP with regards to routine maintenance was not included in our terms of reference. In this subsection, we re-iterate the position reached in our 2012 Technical Review, since it forms an important part of the logical argument regarding the implications of the asset management regime for proposed expenditure.

Information reviewed

111. Our review has been principally based on the following information:

- Draft Decision: Attachment 5.4.3: Technical Review (Routine Maintenance subsection);
- RRP: section 7.5.1: Routine Maintenance.

4.2.2 Relevant aspects of Draft Decision and ElectraNet response

From the Draft Decision

112. In the Draft Decision the AER accepted ElectraNet's proposed routine maintenance forecast because ElectraNet presented evidence of having thoroughly considered

²² See EMCa, October 2012, p. 60.

routine maintenance requirements and approved ElectraNet's routine maintenance forecast of \$80.9 million (\$2012-13)²³.

ElectraNet's response

113. In the RPP²⁴ ElectraNet states that it has undertaken a review of its forecast routine maintenance expenditure and has concluded that it is able to maintain the expenditure included in the RRP at the level approved by the AER in its Draft Decision.
114. ElectraNet noted that changes in the augmentation capex forecast due to reduced demand forecasts had implications leading to increases and to decreases in forecast routine maintenance expenditure. ElectraNet considers that the net impact of these changes is not material.

4.2.3 Our review of ElectraNet response

115. ElectraNet's discussion of the flow on effects of the reduced demand forecasts into routine maintenance is logical and that the net effect is likely not to be material. It is noted that the impacts of capex project deferral demonstrates the interaction between capex and opex and the ability of decisions in one to affect the other (the capex/opex trade off).
116. We consider that ElectraNet's acceptance of the level of routine maintenance expenditure included in the Draft Decision is appropriate.
117. We note that in its Draft Decision the AER anticipated that the level of routine maintenance expenditure should lead to a decrease in corrective maintenance over time. We reconfirm our view that these benefits should be expected to flow and be measured and reported by ElectraNet.

4.2.4 Findings and recommendations

118. We recommend that the AER:
- Maintains the position set out in the Draft Decision on routine maintenance expenditure of \$80.9 million.

4.3 Corrective maintenance

4.3.1 Scope and information sources

AER's scope for EMCa review

119. Our terms of reference for this review are described in section B.7 of the AER's TOR and are as follows:

²³ AER DD, p.156.

²⁴ RRP section 7.5.1 page 84

Consider ElectraNet's revenue proposal, EMCa's draft decision technical report and ElectraNet's revised revenue proposal expenditure profiles in relation to the AER's 'top-down' opex forecasting approach, and justification for change from this 'top-down' trend;

Review and respond to section 7.5.2 of ElectraNet's revised revenue proposal, including reviewing the defect and backlog calculations and any new evidence that could justify a move from the AER's draft decision on corrective maintenance.

Information sources

Information reviewed

120. Our review has been principally based on the following information:

- Draft Decision: Attachment 5.4.3: Technical Review (Corrective Maintenance subsection);
- RRP: section 7.5.2: Corrective Maintenance;
- RRP: section 7.2: Opex / AER's top-down approach.

Key data

121. The table below summarise the projected corrective maintenance expenditure requirements, from ElectraNet's initial RP, EMCa's recommended adjusted amount, the AER Draft Decision and ElectraNet's RRP. The subsequent table provides a breakdown of the adjustments recommended in our 2012 advice.

Table 9: *Corrective maintenance opex comparison*

\$million (real 2012/13)

	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Corrective maintenance	68.8	48.1	43.7	68.4

Source: RRP, RP, EMCa TR report, AER Draft Decision

Table 10: *Corrective maintenance adjustments table*

\$million (real 2012/13)

	Adjustments
Revenue Proposal	68.8
Adjustments :	
Reduction - Lines	(11.2)
Reduction - Substations	(8.2)
Efficiency adjustment	(1.2)
EMCa adjusted	48.1

Source: EMCa 2012 TR report

122. In its current RCP ElectraNet spent \$43m on corrective maintenance work, against an AER allowance for this period of \$31m (and which was approximately the amount proposed by ElectraNet in its 2008 RRP).

4.3.2 Relevant aspects of Draft Decision and ElectraNet's response

From the Draft Decision

123. The AER's Draft Decision assessed key factors underpinning ElectraNet's proposed total forecast opex. A key issue was that ElectraNet had not sufficiently factored the expected benefits of its enhanced asset management framework into its opex (or capex) proposal. ElectraNet forecast corrective maintenance to rise by around 50 per cent in the 2013-18 RCP compared to the current RCP despite increasing routine maintenance aimed at picking up emerging asset problems before they result in the need for corrective maintenance. The AER expected that ElectraNet would be able to use its asset management strategies to designate more assets as 'correct later' rather than 'correct now'.
124. ElectraNet proposed \$23 million for corrective maintenance of substations and \$40 million for corrective maintenance of transmission lines. The costs were to cover a backlog of already identified defects and a base level of assumed incoming defects. The AER noted that this represented an increase of \$25.3 million on top of the revealed cost trend line.²⁵
125. The AER considered that ElectraNet overstated its corrective maintenance forecast because it did not properly allow for reductions in the rate of new defects that will arise once the first round of the condition assessment cycle is complete. The AER noted that ElectraNet is only partly through its first assessment cycle, which is prioritised to address high risk defects first (such as fire start defects) and further defects in descending order of risk. As the high risk defects are progressively addressed, fewer new defects will arise in subsequent inspection cycles.
126. ElectraNet submitted that the decreasing trend of incoming defects rates, was offset by the 'bath tub effect', which is an increased expenditure requirement at the start and end of asset life. The AER disagreed that the bath tub effect offset ElectraNet's decreased corrective maintenance requirements as modern substation equipment was modular, prefabricated and pretested and therefore reduced 'start of life' defects. The AER also considered that warranty provisions may cover the costs associated with 'start of life' defects.

ElectraNet RRP

127. ElectraNet did not agree with the AER's assessment of its forecast corrective maintenance and did not accept the AER's substituted forecast
128. ElectraNet argued that it had projected future corrective defect rates based on recent historical levels of actual revealed risk. For substations, ElectraNet said it would expect to see a reduction in the rate of new defects by the end of the 2013-18 RCP as a result of the advanced level of maturity of the substation condition dataset (currently 100 per cent complete), while it did not expect to see a reduction in the rate of new

²⁵ AER DD, p.157.

defects for transmission lines until after the 2013-18 RCP as the condition dataset for lines was only 40 per cent complete, due to longer inspection cycles, due to the fact no major lines replacement works were undertaken in the current RCP or are scheduled for the 2013-18 RCP, and due to the large number of old transmission lines.

129. ElectraNet rejected the view that modern substation equipment would have lower defect rates, arguing such equipment may have higher defect rates because of its complexity, and limited field experience or history. ElectraNet argued warranty conditions typically only covered replacement cost, not consequential loss caused by failure of equipment in service.
130. ElectraNet argued EMCa's calculation of the backlog of defects for both substations and lines had been incorrectly calculated, resulting in a provision that was too small.
131. ElectraNet argued that its corrective maintenance schedule focussed solely on high priority maintenance covering equipment that had commenced to fail, and either degraded performance or posed an unacceptable public safety and fire start risk. There was no credible or prudent option to correct later available to ElectraNet to address asset defects identified for corrective maintenance response, as they required a short-term response given the nature of the risks involved including fire start and public safety risks.

4.3.3 Our review of ElectraNet response

Defects data

132. ElectraNet claims EMCa miscalculated the size (and associated cost) of addressing the backlog of substation and transmission line corrective maintenance. This is understood to be a result of an ElectraNet graph being mislabelled. Although in the RRP ElectraNet corrected its graph, it did not take the opportunity to present more up-to-date data, which is now available. We therefore sought and were provided with more up-to-date defects data, which we comment on later in this section.
133. EMCa has found no reason to amend its comments on the AER's top-down (or base year extrapolated) approach to evaluating ElectraNet's opex components. EMCa considers the AER approach is valid and can be complemented by an analysis of the validity of the reasons for any 'step changes' in corrective maintenance levels.

Proposed expenditure in light of historical expenditure and condition assessment cycles

134. EMCa notes that in the current RCP, ElectraNet has overspent by nearly 40% (\$12m) relative to the AER's assumed level for current RCP corrective maintenance. This was to address critical risks as they were identified (mostly in regards to lines, and including fire start risks)²⁶, as well as incurring new spending on aerial line surveys. In other words, the step change contemplated in the 2013-18 RCP comes on top of a

²⁶ ElectraNet RRP, p.76.

considerable step change in actual corrective maintenance spending in the current RCP.

135. In viewing the justifications for a step change in corrective maintenance spending, ElectraNet has failed to satisfactorily explain specific reasons for the increases in corrective maintenance. We consider that the defects now being identified through a more structured information-collection program are unlikely to have just arisen – in other words, they are of the same nature as defects previously arising and being managed under ElectraNet’s previous maintenance regime.
136. Condition data for substations (where the data set is 100 per cent complete) and transmission lines (where the data set is 40 per cent complete and represents a substantial sample of the population of lines) has been collected yet the benefits of the correction of defects found from this significant assessment do not appear to have been factored into future corrective maintenance schedules for substations or transmission lines.

137. In its Review of ElectraNet Revenue Proposal 2008 – 2013, SKM noted that:

Projects addressing medium asset risks have been included in the forecast but programmed over a ten year period.....Assets classed as high risk have been targeted for completion over 5 years during the next regulatory period.²⁷

138. SKM also noted that:

once the first approximately 5 year cycle of increased maintenance is complete, SKM would expect the overall opex spend to reduce as corrective maintenance backlogs are eliminated and improved routine maintenance and inspection results in reduced defect rates.²⁸

and

As a result of the significant increase in inspection and routine maintenance proposed by ElectraNet for the upcoming regulatory period. ElectraNet assert that this increased activity in the short term will result in a higher rate of defects identified and hence corrected, and correspondingly for the first maintenance cycle there will be no decrease in corrective maintenance associated with the additional routine maintenance. SKM would expect corrective maintenance costs to decrease in subsequent regulatory period.²⁹

139. ElectraNet placed significant emphasis in its response in the RRP on the fact that it had not collected full condition-based maintenance data for transmission lines and only just finished collecting substation condition data for substations. However in its 2008 review SKM found that, by that time, ElectraNet had undertaken *detailed*

²⁷SKM Review of ElectraNet Revenue Proposal 2008 – 2013 Section 7.6.2

²⁸SKM Review of ElectraNet Revenue Proposal 2008 – 2013 Page xiv

²⁹SKM Review of ElectraNet Revenue Proposal 2008 – 2013 Section 7.6.4

*condition assessment reports for all of ElectraNet's substation sites*³⁰. The inspections undertaken in the current RCP are therefore a second cycle of inspections. There was clearly an expectation that all high risk defects (correct within 3 months) and most of the medium risk defects identified in this pre 2008 condition assessment of all substation sites should have been corrected in the subsequent five years. It is beyond belief that subsequent cycles of condition inspections would not find a significantly reduced number of high and medium risk defects.

140. The fact that inspections of all line assets have not yet been fully completed needs to be taken into account. However, lines are far less complicated than substations and it would be highly unlikely that high and medium risk defects found on lines would continue to be found at anywhere near the same rate as on the first inspection.
141. ElectraNet has argued that it would not be possible to defer corrective maintenance for the 2013-18 RCP because the corrective maintenance scheduled contains only high risk items where assets have already commenced to fail and will degrade network performance (substations), or commenced to fail and present unacceptable failure consequences related to safety or fire start risk (transmission lines). However this is contradicted by ElectraNet's data (which we used for the Technical Review analysis) which shows that significant amounts of the proposed corrective maintenance are not driven by high risk defects (affecting safety and reliability) but by "asset risks" which ElectraNet has itself defined as being lower risks³¹. Further, whilst the risk level based on ElectraNet's internal assessments is difficult to independently validate, it is reasonable to assume that there is a bias towards higher risk ratings. This is likely because, notwithstanding the SCAR assessment process, rating a borderline high risk defect as medium or low risk has greater consequences for the personnel making the rating than the reverse.
142. Our view remains that the level of defects detected will reduce in the second pass of inspections due to the work already undertaken in addressing them. We consider that ElectraNet's assumption that defects identified will reduce by 20% is very conservative. It is more likely in our view that defect detection will reduce to 20%. A conservative "middle ground" would be a further 20% reduction in line with the Draft Decision (i.e. of the order of 40% overall).
143. Taking the above assessment into account we consider that a conservative adjustment to the corrective maintenance would be to accept ElectraNet's assurance that non-deferrable high risk defects included in the corrective maintenance forecast cannot be deferred, but to make an adjustment to account for the expected reduction in identified defects. A reasonable corrective maintenance expenditure forecast would take the expected reduced rate of defect identification into account.

³⁰SKM Review of ElectraNet Revenue Proposal 2008 – 2013 Section 7.6.1

³¹ We observe, for example from ElectraNet's defects data, large proportions of the defects including "signage", defects to "rights of way" and to buildings "infrastructure". ElectraNet's own data indicates that it is treating these as being lower risks, by the fact that it is correcting such defects at a much lower rate than they are incoming.

Defect trends – new assets versus old assets

144. ElectraNet argues that the reduction in detected defects will be offset by an increase in defects seen on newly purchased, installed and commissioned equipment. ElectraNet explains the step change in corrective maintenance costs in theoretical terms by arguing that the costs associated with correcting faults in equipment newly brought into service (the so-called 'bathtub' effect) offset savings from a reduction in the rate of corrective maintenance due to reduced defect detection.
145. In the absence of clear information from ElectraNet providing separate evidence for each of these effects, EMCa rejects this argument because:
- ElectraNet has produced no evidence to support the proposition that a decreasing trend in incoming defect rates is in fact offset by an increase in corrective maintenance spending on early faults in new equipment and, contradicting its proposition, has argued that deferring replacements will increase defects;
 - ElectraNet has pointed to secondary systems failure as the most common cause of new equipment failure yet these failures are typically easily corrected, tend not to have large consequential costs and would most likely be dealt with in the operational maintenance budget rather than the corrective maintenance budget³²;
 - Increasing front-end "bathtub" effects would depend on the rate of introduction of new equipment and would be separate from trends in incoming defect rates.
146. Bathtub effects are generally associated with the introduction of a new product or model (e.g. type of car), which undergo an early life cycle discovery phase that identifies design and new component issues. The construction of a standard design substation from commonly used components is very different to the introduction of new product lines and would be expected have failure rates on the stable mid-point on the curve. We would not expect an organisation such as ElectraNet to be purchasing untried and untested equipment.

4.3.4 Findings and recommendations

Findings

147. On balance we consider that the evidence that ElectraNet has presented indicates that it has been under-maintaining its assets (particularly its lines) for some time prior to the current RCP and that condition data does indicate a need for increased corrective maintenance, which has occurred in the current RCP and should continue in the next RCP. However, we are cognisant that in its 2008 report to the AER SKM reached the same conclusion based on ElectraNet's presentation of condition data at that time and expected overall opex spend to reduce during the current RCP as corrective maintenance backlogs were eliminated. The continued existence of these backlogs is evidence that ElectraNet has not prioritised them as being sufficiently high-risk as to warrant expenditure to date.

³² The anecdotal description of the consequences of a transformer failure in Vietnam is, in our view, a distraction involving different equipment in a different environment and is not relevant to the arguments that ElectraNet is attempting to make.

148. ElectraNet continues to present its asset management framework through stylised diagrams and theory rather than through factual and objective demonstration of achievement and realised measurable benefits. Without such evidence it is difficult to accept ElectraNet's proposition that it requires a further step increase of the magnitude that it has proposed. We consider that ElectraNet has taken insufficient account of the considerable reduction in new defects that we would expect to arise following first-pass (and, it would appear in some ways, second-pass) assessment and remedial work.
149. In the course of the RRP review we have found ElectraNet's defect information to be erroneous and contradictory. We see evidence of declining new defects. Further, in reviewing the nature of a large proportion of defects (for example signage, easement defects, substation infrastructure), we consider that the analytical approach taken by ElectraNet which assumes that the backlog of such defects should be entirely eliminated, is not realistic or necessary and would be a more aggressive goal than ElectraNet has actually applied during the current RCP. We are also concerned that, in making its recommendations on corrective maintenance expenditure for the current period SKM was advised that a complete cycle of substation assessment had already been completed at that time (five years ago) and considered that corrective maintenance backlogs would be eliminated during the current RCP based on costs then approved. Yet ElectraNet is putting these same propositions forward again five years later.
150. Taking these factors into account, we consider that a pure trending approach, as the AER has used in its Draft Decision, is a reasonable method to predict the levels of corrective maintenance that will be required for the prudent maintenance of these assets as this reflects the level of work that ElectraNet has chosen to undertake in the current period, based on significant rounds of condition assessment already undertaken.
151. We would also expect that, with proper analysis of the condition data that ElectraNet has previously and is currently collecting, ElectraNet should be in a position to provide a sounder basis for its future expenditure proposals.

Recommendation

152. We recommend that the AER:
- Does not accept ElectraNet's RRP proposal for corrective maintenance;
 - Retains the AER's trended corrective maintenance otherwise determined in the Draft Decision.

4.4 Operational refurbishment

4.4.1 Scope and information sources

AER's scope for EMCa review

153. Our terms of reference for this review are covered in section B.7 of the AER's TOR and are as follows:

Consider ElectraNet's revenue proposal, EMCa's draft decision technical report and ElectraNet's revised revenue proposal expenditure profiles in relation to the AER's 'top-down' opex forecasting approach, and justification for change from this 'top-down' trend;

Review and respond to section 7.5.3 of ElectraNet's revised revenue proposal, including a response to the suggestion that the AER's draft decision did not allow \$15m for lines condition monitoring and any new evidence that could justify a move from the AER's draft decision on operational refurbishment opex.

Background and source information

Information sources

154. Our review has been principally based on the following information:

- Draft Decision: Attachment 5.4.3: Technical Review (Operational refurbishment subsection);
- RRP: section 7.5.3: Operational refurbishment;
- RRP: section 7.2: Opex / AER's top-down approach.

Key background data

155. The table below summarise the projected opex refurbishment expenditure requirements from ElectraNet's initial RP, EMCa's recommended adjusted amount, the AER Draft Decision and ElectraNet's RRP. The subsequent table provides a breakdown of the adjustments recommended in our 2012 advice.

Table 11: *Operational refurbishment opex comparison*

<i>Million (real 2012/13)</i>				
	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Operational refurbishment	64.9	48.8	47.0	66.8

Source: RRP, RP, EMCa TR report, AER Draft Decision

Table 12: *Operational refurbishment adjustments table*

<i>million (real 2012/13)</i>	
	Adjustments
Revenue Proposal	64.9
Adjustments :	
Tail-end projects	(14.5)
Efficiency adjustment	(1.6)
EMCa adjusted	48.8

Source: EMCa 2012 TR report

156. In the current RCP ElectraNet spent \$36m, which was \$3m less than the AER regulatory allowance for this period.

4.4.2 Relevant aspects of Draft Decision and ElectraNet response

AER Draft Decision

157. In its Draft Decision, the AER did not accept the opex component of ElectraNet's proposed refurbishment expenditure over and above the costs revealed by trending costs forward from the 2010-11 base year. This was because it considered ElectraNet had not sufficiently demonstrated a reason for the step change increase in its expenditure requirements.³³
158. ElectraNet proposed \$64.8 million for operational refurbishment as an opex category for 2013–18, but another \$54.2 million for refurbishment as part of its capex program, for a total over the 2013–18 RCP of \$119.0 million. The AER noted this was nearly three and a half times the actual refurbishment expenditure in 2008–13 (\$35.8m). In trend terms, ElectraNet's proposed refurbishment opex exceeded the historical cost trend by \$18.1m (36 per cent), an 81 per cent increase on the allowance for this opex category in the 2008–13 regulatory control period.
159. The AER considered that \$15 million within the operational refurbishment category for 'assessing asset condition (mostly for transmission lines) and for continuing to deploy the integrated asset management framework' was more properly within the maintenance support cost category (which includes: 'asset condition monitoring and analysis').
160. Furthermore, ElectraNet's opex refurbishment program is driven by needs identified through condition assessment but ElectraNet chose to reduce its opex refurbishment expenditure in 2011-12 and 2012-13, which suggested ElectraNet is already prudently deferring some operational refurbishment expenditure and has therefore made the judgment that it can do so while maintaining an acceptable level of risk.

ElectraNet RRP

161. ElectraNet argued that the \$15 million included for condition assessment was properly within the operational refurbishment cost category. It argued that all outsourced field costs have consistently been categorised as operational refurbishment and there was no duplication with expenditure under the maintenance support cost category.
162. ElectraNet noted that it had underspent in the opex refurbishment category in 2011-12 and 2012-13 in order to reprioritize and redirect funds to urgent corrective maintenance.³⁴ However ElectraNet considers that, while short term deferral was possible, this work could not reasonably be deferred until after the end of the 2013-18 RCP.

³³ AER Draft Decision, p.158.

³⁴ ElectraNet RRP, p.93.

163. ElectraNet state that if the transmission line inspection and testing was excluded then this would have the effect of disallowing funding for completing these specific activities, which would lead to an unacceptable increase in bushfire risk.
164. ElectraNet considered condition assessment was critical to help complete its understanding of the condition of transmission lines, to address safety and environmental issues, and to avoid quantified failure consequences and impacts.
165. ElectraNet listed its refurbishment project works, risk impacts, timing drivers, and cost estimates in table 7-3 of the RRP.³⁵ ElectraNet added that the reduction in demand forecast had caused some replacement works to be deferred, which had led in turn to an increase in operational refurbishment projects, specifically at Keith and Kincaig substations.

4.4.3 Our review of ElectraNet response

166. On review of ElectraNet's proposed operational refurbishment projects, we consider that all of the proposed projects, with the exception of the transmission lines condition assessment project (\$14.8 million), appear to be consistent with the operational refurbishment categorization. These projects are generally addressing safety, environmental, or bushfire risk. However, in practice we consider that ElectraNet is likely to have scope to undertake prudent management of these activities, as has occurred in the current RCP.
167. Consistent with Total Asset Life Cycle methods, operational refurbishment projects justified by operational needs only (e.g. reliability and interruptions) should be tested by cost-benefit analysis against other options, such as early asset write off and replacement, corrective maintenance, or doing nothing. Operational refurbishment does not include high risk defects, as these are undertaken in shorter timeframe as corrective maintenance, but does include some medium and low risk defects that ElectraNet has determined will need to be addressed in the RCP. As individual projects progress it is reasonable to expect that changes will occur to the operational refurbishment portfolio in order to take account of revised and refined input assumptions.
168. In EMCa's Technical Report to the AER on ElectraNet's RP we concluded that based on our assessment of ElectraNet's process for establishing the operational refurbishment forecast, a more reasonable estimate of the required increase is of the order of 50% of the proposed step increase. This equated to an allowance of \$50.4m, being an increase of around \$14.5m from the current level and a reduction of the same amount from that proposed³⁶.
169. The reason for our recommended adjustment was based on an assumption that the enhanced condition-based maintenance regime will allow ElectraNet to make more

³⁵ElectraNet RRP, Table 7-3, pp.95-97.

³⁶ The amounts stated here are for the "tail-end" adjustment (see table 12) before application of the overall opex efficiency adjustment

effective informed decisions throughout and beyond the RCP. The theoretical and stylised information that was provided by ElectraNet failed to convince us that ElectraNet has effectively determined the appropriate cut-off point for projects to be included and therefore of the need for the large step increase in expenditure that ElectraNet has proposed. We concluded that effective informed decisions would be made as the RCP progressed but that the proposed increase in expenditure did not adequately take this into account.

170. In the RRP ElectraNet has not addressed the issue regarding the basis for determining the effective cut off point and deferral options for operational refurbishment decisions taking into account the various trade-off strategies that it can apply. In the RRP ElectraNet has again set out its concept for condition and risk based asset management but has not adequately demonstrated how this has been applied when making decisions in practice.
171. Our review of the RRP has not changed our view that a more reasonable estimate of the required increase in expenditure is of the order of 50% of the increase sought by ElectraNet. This now equates to \$51.4m, being an increase of around \$15.5m from the current level and a reduction of the same amount from that proposed. This is a top-down adjustment. ElectraNet has yet to financially commit to the specific projects or programs of work that it will undertake over the next RCP and when it does so, our judgment is that, through the more decision-focused business cases it will then undertake, it will find opportunities to prudently rationalise and to prudently defer projects and will not find it necessary to spend the amount that it has proposed for regulatory purposes. Similarly, and despite the condition assessment that had been undertaken prior to the current RCP, ElectraNet spent less on opex refurbishment in the current RCP than the AER had allowed.
172. Our assessment does not make any particular judgment as to which projects or programs might differ in practice from the budget put forward for regulatory proposal purposes. As the AER's top down trend assessment arrived at substantially the same figure as we have done we consider that the AER's analysis is appropriate.
173. Regarding ElectraNet's proposed \$2m increase in operational refurbishment due to deferral of the two substation replacement projects at Keith and Kincaig substations there are two aspects to consider:
- 1) Is operational refurbishment necessary on these substations in order to maintain safety and performance?
 - 2) Should the estimated \$2m expenditure be additional to the top down trend assessment or would be expected to be accommodated within that value?
174. We consider that, given the condition assessment reports on both Kincaig and Keith substations, operational refurbishment expenditure will be required to be made due to the deferral of the replacement of the assets. Regarding the second question our estimate of a required increase in expenditure of 50% of the increase sought by ElectraNet would now equate to \$51.4m, i.e. an increase of \$1m relative to the adjusted amount that we proposed in our 2012 advice; that is it implicitly allows for half of the additional \$2m that ElectraNet has sought. However, this change does not materially affect our opinion that, given that the AER's top down trend assessment arrived at substantially the same figure as we have done, we consider that the AER's top-down adjustment is reasonable.

175. As an observation, we note that we have similarly disregarded as immaterial the reduction in routine opex that should in principle flow from ElectraNet's reduced augmentation and connection program (relative to its initial RP).

4.4.4 Findings and recommendations

176. We recommend that the AER:

- Does not accept the amount for operational refurbishment that ElectraNet has proposed in its RRP; and
- Maintains the Draft Decision amount in respect of operational refurbishment.

5 Replacement and refurbishment capex

5.1 Scope and information sources

5.1.1 AER's scope for EMCa review

177. Our terms of reference for this review are contained in section B.2 of the AER's TOR, as follows:

- *Reconcile revenue proposal to the AER's draft decision and understand any variances;*
- *Review and respond on the primary order of difference, expected to be the deferral benefits from an enhanced maintenance regime;*
- *Review the Asset management Framework chapter of the Revised revenue proposal, particularly the claimed evidence of benefits of deferred expenditure already being taken account of in ElectraNet's expenditure forecasts;*
- *Review SKM's consultant report from the ElectraNet's 2007 determination to review evidence for baseline costs and prospective enhanced maintenance.*

178. We have described our assessment of the asset management regime, including the purported benefits from replacement capex deferral, and the references to baseline capex from the 2007 SKM report, in section 4. The current section draws on our findings from that assessment.

5.1.2 Background and source information

Information sources

179. Our review has been principally based on the following information:

- Draft Decision: Attachment 3.4: Reasons for Draft Decision (on Forecast Expenditure);

- RRP: section 5: Asset Management, especially 5.3: Ability to defer replacement capex, 5.4: Economic analysis, 5.5: Benefits of the enhanced maintenance regime;
- ENET310: Appendix Q: Asset refurbishment plan;
- ENET313: Unit asset replacement project pack;
- SKM 23 November 2007 report to AER.

Key background data

180. The following table summarises the replacement and capex refurbishment expenditure forecast as ElectraNet proposed in the RP, as recommended by EMCa from a technical review perspective, as per the AER's Draft Decision and as ElectraNet has now proposed in its RRP.

Table 13: *Replacement and refurbishment capex comparison*

\$million (real 2012/13)

	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Replacement	398.0	148.0	261.6	342.7
Refurbishment	54.1	43.1	42.1	53.6

Source: RRP, RP, EMCa TR report, AER Draft Decision

5.2 Relevant aspects of Draft Decision and ElectraNet response

5.2.1 AER Draft Decision

181. In its advice to the Draft Decision, EMCa reviewed a sample of ElectraNet projects comprising 48 per cent of total network projects. This included replacement and refurbishment projects equal to 43 and 74 per cent of total proposed replacement / refurbishment capex, respectively. EMCa identified expected gains of \$11.5 million from its review of the replacement capex projects which equated to 7 per cent of the value of its sample. Based on these findings, EMCa estimated that gains of 7 per cent across replacement / refurbishment capex were likely as projects were developed further and ElectraNet applied engineering/economic prudence in its decision-making.
182. The AER reduced ElectraNet's replacement and refurbishment capex forecast by \$31.7 million by way of a prudence adjustment.
183. Due to the 'grandfathering' arrangements in the NER, the AER considered it had limited scope to make adjustments to ElectraNet's SA Water asset replacement capex. It therefore accepted ElectraNet's proposed capex forecast relating to SA Water's asset replacement programme despite some concerns that the proposed replacement option may not be the most efficient and prudent option.
184. The AER reduced replacement capex by \$56.5m due to its adoption of a lower demand growth forecast. This amount was based on advice from ElectraNet regarding a deferral of projects consistent with this lower demand forecast.

185. The AER reduced ElectraNet's proposed replacement and refurbishment capex by \$50 million to account for trade-offs between increased opex and reduced capex.³⁷ ElectraNet's asset management framework is condition-based, with some increases in opex to forestall and defer asset refurbishment and replacement. In its Draft Decision, the AER's substitute opex allowance included a step change increase to ElectraNet's routine maintenance opex, increases in corrective maintenance and increases in opex refurbishment and the reductions in replacement and refurbishment capex were made to account for the benefits that are likely to flow from implementing this enhanced asset management framework.³⁸
186. The AER also adjusted the real cost escalators applied by ElectraNet.

5.2.2 ElectraNet's Response to the key points

187. In its RRP, ElectraNet disagreed with the draft decision in regards to the following adjustments to its proposed replacement and refurbishment capex:
- Application of a prudence adjustment;
 - The AER's decision not to apply a portfolio risk factor uplift to its estimated replacement project costs;
 - The adjustment to account for the benefits of the enhanced maintenance regime; and
 - Escalation.
188. In its RRP ElectraNet has adopted a lower demand forecast, as noted in section 3. As a result of this lower demand forecast, ElectraNet has deferred two significant replacement projects (Keith and Kincaig substations), which lead to a reduction of \$57.8m in proposed replacement capex in the next RCP.

5.3 Our review of ElectraNet response

189. For replacement capex, the reduction between the Initial and revised RPs is due to the revised load forecast and the deferral of replacement projects that have a demand driven component, such as Kincaig substation replacement. It is perhaps surprising that over \$50m of projects categorised as replacement were affected by the change in demand forecast. However the demand-related reduction that ElectraNet has made is consistent with its advice to us in reviewing its RP.
190. This demand-related adjustment in essence accounts for the reduction in ElectraNet's proposed replacement expenditure in the RRP compared with its initial RP.
191. ElectraNet did not accept any of the other adjustments made by AER. Specifically, it did not accept reductions based on:

³⁷ AER Draft Decision, p.34.

³⁸ AER Draft Decision, p.27.

- The benefits from enhanced maintenance;
- Prudence;
- Lack of evidence for portfolio risk for these projects;
- Escalation.

192. We have considered these matters in the following sections:

- The benefits of the enhanced maintenance regime arise from consideration of the significant changes that ElectraNet has made to its asset management process. These matters were considered in section 4: Asset Management;
- The prudence adjustment and ElectraNet's proposed application of a 4.9% uplift for portfolio risk, are considered under section 6: Cost Estimation;

193. In section 4, we concluded that it would be reasonable to expect a benefit in the form of reduced replacement and refurbishment capex expenditure in the next RCP of the order of \$40m to \$80m, and that such a benefit is not already inherent in ElectraNet's expenditure proposal. We advised that maintaining the AER's Draft Decision with a \$50m reduction pro-rated across replacement and refurbishment capex would be a reasonable adjustment to reflect this expected benefit.

194. Following a re-examination of project expenditure outcomes that is described in section 6, we concluded that it is likely that cost estimation for proposed replacement and refurbishment capex projects will have over-estimated the costs, both by applying a portfolio risk factor uplift of 4.9% to the sum of the proposed project costs and by not allowing for prudence improvements that have historically led to lower costs being incurred across the portfolio of projects, and which we would expect to also be the case in future. In aggregate we find that ElectraNet spent 16% less on such projects than it had estimated for the purpose of its previous regulatory reset. We advised that it would be reasonable for the AER to maintain its Draft Decision by disallowing the 4.9% portfolio risk uplift and applying a -7% prudence adjustment.

195. EMCa has not been asked to advise on overall cost escalation.

5.4 Recommendation

196. We recommend that the AER not accept ElectraNet's proposed replacement and refurbishment capex.

197. Consistent with our conclusions in sections 4 and 6, we recommend that the AER maintains in its Final Decision the adjustments made in its Draft Decision, and which should be applied to ElectraNet's proposed RRP expenditures. Specifically, we recommend:

- A reduction to account for a minimum level of benefits from deferred refurbishment and replacement expenditure that we expect to result from the enhanced maintenance regime that ElectraNet has introduced. This adjustment, of \$50m is as recommended in section 6 and should be allocated pro-rata between replacement and refurbishment capex;
- Reduction of the portfolio risk factor and application of a prudence adjustment to all replacement and refurbishment capex. We recommend combining these to a single adjustment that has the same combined effect as the two adjustments made in the Draft Decision, that is, a reduction of 11.9% to the expenditure that ElectraNet has

proposed. This adjustment should be made to the non-WIP component of expenditure, net of the enhanced maintenance adjustment above.

6 Cost estimation

6.1 Scope and information sources

6.1.1 AER's scope for EMCa review

198. Our terms of reference for this review are contained in section B.4 of the AER's TOR and are as follows:

- *review greenfields / brownfields risk arguments proposed by ElectraNet;*
- *review the Evans & Peck technical report provided with ElectraNet's revised revenue proposal;*
- *based on current RCP project-level data to be provided by the AER that will allow tracking between project timings and costs as proposed and actual timings and costs, undertake a project tracking analysis to seek evidence with regards to portfolio risk and prudency adjustments and apply this to the revised revenue proposal projects.*

6.1.2 Key information sources

199. The main information sources used in this review are as follows:

- Draft Decision: Attachment 4.4.1: Asset Management Framework (Portfolio Risk Factor and Prudency subsections);
- RRP: section 6.2.1: Portfolio Risk Factor;
- RRP: section 6.2.2: Prudency;
- ENET300: Appendix H: Evans & Peck capital program estimating risk allowance;

- Proposed project expenditure from 2008 Draft Decision, and actual project expenditure from response ENET 318.

6.2 Relevant aspects of Draft Decision and ElectraNet response

6.2.1 Cost Estimation Risk Factor – Portfolio Risk Factor

200. In its RP, ElectraNet sought to apply a risk factor to the estimation of capital projects, known as a portfolio risk factor (also referred to as a cost estimation risk factor, or CERF). ElectraNet applied a Portfolio Risk Factor of 4.9 per cent to all uncommitted network capital project cost estimates, reflecting the inherent asymmetric risk that ElectraNet considers to be associated with project cost estimating due to unforeseen factors at the time of the initial estimate.
201. The AER's Draft Decision applied a Portfolio Risk Factor to project cost estimates as follows:
- 0 per cent for replacement and refurbishment projects;
 - 2.6 per cent for all other capex projects.
202. The AER considered that a lower Portfolio Risk Factor should apply to brownfields replacement and refurbishment projects due to lower risk and greater known circumstances. For other capex projects, it considered that, due to improvements in ElectraNet's cost estimation processes since 2008, the Portfolio Risk Factor should be no higher than that which applied in the 2008-13 RCP.
203. In response, ElectraNet relied on an Evans and Peck January 2013 paper, *Capital Program Estimating Risk Allowance – Response to AER Draft Decision*, and an earlier Evans and Peck paper as provided with the initial Revenue Proposal to support its original proposal for a 4.9 per cent Portfolio Risk Factor adjustment to apply to all uncommitted network capex (augmentation, connection, replacement and refurbishment). The Evans and Peck papers propose a Portfolio Risk Factor based on their review of certain project cost outcomes from the historical ElectraNet capital program. ElectraNet also stated that a number of its replacement projects are at greenfields sites.
204. The Portfolio Risk Factor adjustments made in the Draft Decision had the effect of reducing replacement and refurbishment expenditure by 16.2m, and reducing other capex by \$3.4m.

6.2.2 Evans and Peck report (January 2013)

205. Evans and Peck claim that their analysis takes account of the improvements that ElectraNet has made in its estimating methodologies. They reject and criticise the AER's Draft Decision observation that improvements in ElectraNet's estimating system will reduce the risk factor, on the basis that improvements in cost estimation techniques will only improve the 'known' components of an estimate and not the 'unknown' components.

206. Evans and Peck disagree that brownfields risks are lower than greenfields risks for capital projects and cite a range of brownfields risks that would justify the application of a Portfolio Risk Factor:
- Full quantification of the extent of site contamination (e.g. Oil, PCBs);
 - Full quantification of the need for remediation of earth grids, underground services and other underground infrastructure, the extent of which is not fully apparent until excavation commences;
 - Reduced flexibility in the use of machinery such as cranes and excavators, and the need for increased manual excavation in the vicinity of live equipment;
 - Realignment of boundaries / fences with uncertain approval and stakeholder response, often requiring engagement with neighbours with assets right up to the site boundary;
 - Temporary bypass of existing transmission infrastructure to maintain security of supply, often entailing multiple stages and subsequent reinstatement of a permanent arrangement;
 - Complicated outage planning and project staging associated with maintaining existing assets in service;
 - Difficulties in the integration of new technology with old, particularly in relation to secondary systems;
 - Compromised designs driven by unacceptable clearances and spacing, and the need to replace more equipment than originally envisaged;
 - The discovery of structural limitations / defects in existing buildings, plant and equipment;
 - The triggering of new environmental standards.
207. Evans and Peck quote an article from Exploration and Production magazine relating to the oil and gas industry to support their argument that brownfields risks are significant:

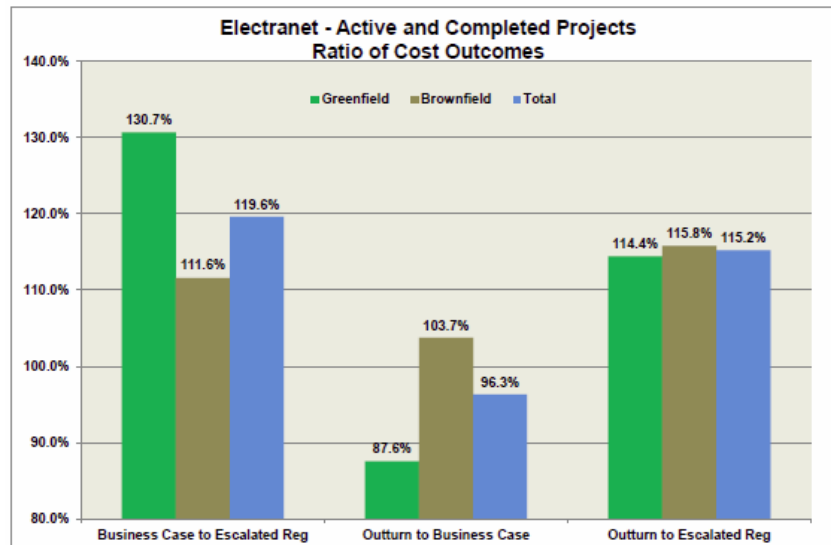
A fundamental differentiator with Brownfield projects, whether they consist of minor repairs and/or modifications or major retrofits and upgrades, is the complex interdependencies that arise when combining existing and new facilities, in physical and process terms, as well as the commissioning start-up and operations aspects. Minimizing disruption to ongoing operations is a critical factor that is not normally an issue on a Greenfield project. More importantly, there are far greater safety considerations to be taken into account both from a design and an offshore implementation perspective in the Brownfield project environment.

These factors radically change the focus required for successful execution of Brownfield projects".³⁹

208. Evans and Peck present evidence in their Figure 3.1 (reproduced below) on cost overruns for greenfield and brownfield projects.

³⁹Evans and Peck, January 2013, p.5.

Figure 1: Ratio of Cost Outcomes on Current ElectraNet Projects



Source: Evans and Peck, January 2013, p.4

209. Evans and Peck state that the data indicates that risks in brownfields projects emerge “in the delivery phase rather than the planning phase, [but] the net effect is similar to that for Greenfield projects”.⁴⁰ They also note the greater cost overruns present in brownfields projects.
210. Evans and Peck also state that, because the Portfolio Risk Factor is established on a whole of portfolio basis it is “numerically incorrect” to apply it to only one component of the portfolio, such as greenfields projects. Also that it is not appropriate to compare risk factors from other transmission network service providers or other time periods as the capital spending programmes for those TNSPs or time periods are likely to be different.

6.3 Our review of ElectraNet response

6.3.1 Assessment of Evans & Peck analysis of Portfolio Risk Factor

General issues with Evans & Peck analysis

211. EMCa has been provided with the data that we are informed was used by Evans & Peck in arriving at its proposed requirement for a 4.9% cost risk factor to be applied. Evans & Peck’s report explains the methodology used to derive this estimate and ElectraNet arranged for a representative from Evans & Peck to provide further explanation.
212. Central to Evans & Peck’s analysis is the assumption that the base planning object (BPO) costs used by ElectraNet for individual project costing are the “most likely”

⁴⁰Evans and Peck, January 2013, p.5.

costs. That is, that they are the “P50” (or median) costs for which there is a 50% probability of cost over-run and a 50% probability of cost under-run. Due to asymmetric outcomes (with cost over-runs tending to be proportionately greater than under-runs) Evans & Peck state that the aggregate cost for a portfolio will exceed the sum of the median or P50 cost estimates.

213. While this is mathematically correct, it has not been demonstrated that the BPO costs used by ElectraNet are in fact P50 cost estimates in a strict sense, and despite the label applied to them. ElectraNet has explained to us that the BPO costs are calculated from actual costs of projects undertaken and as such represent competitive costs for such projects.
214. As in our review for the AER of Powerlink’s proposed capex⁴¹, we asked how the costs from actual projects were adjusted to remove the asymmetric risk component of the actual costs in determining the BPO unit costs that are used for cost estimating purposes. No explanation as to whether or how this has been done was provided by Powerlink (which operates a similar cost estimation process) or by ElectraNet. In the absence of such an adjustment, it is difficult to avoid the conclusion that the BPO costs inherently include the effects of asymmetric cost over-runs, since they are based on actual project costs which included such over-runs to the extent that they occurred in practice.
215. We reviewed the data used by Evans & Peck. First we observe that there are only 29 projects in the dataset for which there are actual costs to compare with the estimated costs⁴². We observe that only 3 of these projects are labelled as augmentation and connection projects and 4 are labelled as replacement projects. The remaining 22 are either security/compliance projects, or are un-categorised⁴³. Evans & Peck state that ElectraNet added a further 32 projects for which there was not a final cost, but for which ElectraNet considered that it had a sufficiently final estimate that it could be treated as an actual cost. These estimate components that were used as “actual” costs were provided by ElectraNet and were accepted without review by Evans & Peck, for its analysis.
216. Evans & Peck chose to analyse the project cost outcome variances by developing a “curve fit” using a simulation model (@RISK). Because the project sizes vary considerably, they prepared the data by in effect slicing each project into virtual components, each of around \$1m size. From this, the dataset analysed is reported as containing values for what in effect are 585 “virtual” projects⁴⁴.

⁴¹ EMCa’s Powerlink Technical Review report (18 April 2012)

⁴² There is a slight discrepancy with the Evans & Peck 2012 report, which states that there were 27 such projects. However we do not consider this difference of 2 projects material to our assessment.

⁴³ ElectraNet response ENET338

⁴⁴ This would imply that Evans & Peck analysed \$585m of projects. However from the data provided we observe that there was only actual cost data for around \$160m of projects.

217. Evans & Peck's report does not refer to the statistical level of confidence of its proposed risk factor. However by synthesising a large number of virtual projects, there would be no ability to determine confidence intervals, since the data would apparently comprise 585 projects when in reality there were only 29 (or 59, if the ElectraNet estimates are considered). The small sample size is an unavoidable factor, however we consider it to be a major weakness of the Evans & Peck analysis that statistical confidence levels are not reported and that the method used would not have facilitated a proper understanding of confidence levels. We consider it likely that, if properly determined, the Evans & Peck assessment of a 4.9% portfolio risk factor would have poor statistical significance.
218. Evans & Peck found that business case estimates were on average 18.9% higher than the Level A regulatory estimates. After normalising, they found an 8.5% positive asymmetric risk variance between the Level A estimates and the actual costs, but that 3.3% of this variance was accounted for between the business case and the actual cost. They suggested that this could indicate that the business case estimates contained a contingency of this amount, and on this basis they have adjusted out the 3.3% component. Using multiplicative factors, this led them to the 4.9% asymmetric risk variance that they have proposed⁴⁵.
219. By analysing Level A to Business Case and Business case to Outcome variances separately, by focusing on asymmetry rather than aggregate portfolio cost variance, by hypothesising the existence of contingencies, by its dataset including a large number of small projects that are not classified as augmentation, connection or replacement projects, by using a dataset selected by ElectraNet and containing a number of uncompleted projects and by making an 18.9% "normalisation" adjustment to all estimates, we consider that Evans & Peck has over-complicated the analysis and in the process has not produced a meaningful case or a meaningful value for adjusting the cost estimates produced by ElectraNet's cost estimation tool.
220. We have undertaken our own analysis of a dataset comprising project costs as proposed for the current RCP, against the actual costs of those projects, for all projects that were proposed and undertaken. This analysis is described in section 6.3.3.

Improvements in cost estimation

221. We consider that Evans and Peck is wrong in its view that improvements in cost estimation are unlikely to reduce the impact of unknown or unanticipated events on capital projects. Improvements in estimating could be expected to target improved intelligence and project management thereby reducing the range and potential impact of unknown events. ElectraNet has demonstrated dramatically increased knowledge of every aspect of its substations through on-site inspections and improved interaction with SA Power Networks. It is difficult to conclude that ElectraNet's initiatives in asset management information gathering and assessment will not have significantly reduced the incidence of unknown factors, particularly in relation to "brownfields" projects.

⁴⁵ $1.085 * 0.967 = 1.049$

Estimating Brownfields Portfolio Risk Factor

222. EMCa note the list of brownfields risks provided by Evans and Peck. We consider that each of the items listed would be a known factor or event and it would be expected that improvements in asset intelligence and project and contractor management would be able to reduce the size of cost mis-estimations relating to those factors over time. We also consider that complications arising from factors such as outage planning and project staging are known factors that ElectraNet would have considerable experience with managing, and would be addressed through continual improvements to asset and project management over time.
223. The Exploration and Production magazine article quoted by Evans and Peck does not support its argument as the article simply identifies the nature of the (known) risks faced by brownfield projects rather than arguing that such risks lead to asymmetric cost estimation for brownfields projects.
224. Evans & Peck informed us⁴⁶ that it had not estimated asymmetric risk differences between greenfield and brownfield projects. It appears therefore that there is no quantitative basis for its statements that the portfolio risk factor should be higher for brownfield projects. From the data provided to us by ElectraNet, and which was apparently used as the basis for Evans & Peck's analysis of average variances (as in figure reproduced in section 6.2.2 above), we observe that there were 50 brownfields projects and only 11 greenfield projects, four of which were land and easement acquisitions. It is unlikely that any meaningful conclusions could be drawn from such a dataset.
225. EMCa's analysis of historical capital projects does not support Evans and Peck's view that brownfields projects have an asymmetric and positive cost profile, as we show in section 6.3.3.
226. We also note ElectraNet's point that a number of replacement projects are at "greenfields" sites. We consider this to be essentially semantic in that, as described to us by ElectraNet, the sites are effectively adjacent to or within a short distance from the existing sites that they are replacing. As such we consider that ElectraNet will have a good understanding of the sites and any conditions that would otherwise affect project risk.

Application of Portfolio Risk Factor to individual capex categories

227. Evans and Peck claim that their portfolio approach should not be used on a disaggregated basis and that analysis from one time-period should not be applied to another. However, this is what Evans & Peck's projection of historical outcomes on the future capex programme attempts to do. Given the portfolio of projects for the next RCP is quite different to the current RCP, ElectraNet would need to make adjustments to reflect the make-up of the portfolio for the next RCP (e.g. changes in the make-up of augmentation and replacement projects). We consider that, with due consideration of factors that might lead to differences, analysis of the historical data set can provide an indication of future outcomes and, axiomatically, only historical data is available.

⁴⁶ Teleconference, 6th March 2013

Moreover, if brownfields project cost variance is potentially different to greenfields, as Evans and Peck argue, then it may be more appropriate to estimate Portfolio Risk Factor on a separate basis for each category of capital project. This is as we proposed for the Draft Decision, and we consider this further in light of our own analysis in section 6.3.3.

Proposed Portfolio Risk Factor

228. As the argument made by Evans and Peck about brownfields and greenfields Portfolio Risk Factors is not accepted, a different basis for applying separate Portfolio Risk Factors for greenfields and brownfields capex components must be found.
229. EMCa considers there is value in examining the issue of prudence before reaching a conclusion with regards to the proposed Portfolio Risk Factor. This is because project outturns are influenced by both factors. Accordingly, EMCa examines the issue of prudence below and then presents its conclusions on Portfolio Risk Factor and prudence adjustments in combination, in section 6.3.3.

6.3.2 Prudence

230. The Draft Decision proposed an adjustment to reduce proposed refurbishment and replacement capex by 7% on the basis that engineering prudence would on average lead to reductions of this order, as the projects progressed from concept stage to implementation. The estimate was based on prudence opportunities that we identified from our analysis of sample projects.
231. ElectraNet rejected the application of a prudence adjustment on the basis that (a) it was derived from only a small number of instances where we had identified prudence opportunities and (b) for the most part it disagreed with our analysis of those opportunities.
232. ElectraNet has stated in its RRP that it will make prudent decisions throughout the RCP and that the majority of the asset replacement projects in the RP are in the early phases of the PMM. We remain of the view that the forecast asset replacement and refurbishment capex is likely to be a higher value than ElectraNet will actually spend during the RCP as some projects will reduce in cost due to the application of engineering/economic prudence⁴⁷.
233. In the RRP ElectraNet has made changes to the three projects in which we identified prudence opportunities and in appendix 3 we provide a response on some of the matters of project engineering that ElectraNet raises. While some of the changes that ElectraNet has made in the RRP could be said to be prudence adjustments now made, further sampling and detailed analysis would be required to derive a generic adjustment by inspection of detailed project information.
234. As additional information on which to base our advice, we have therefore considered engineering prudence improvements as projects progress through the PMM gate

⁴⁷ See examples provided in 2012 TR report, and referred to in the current report in Appendix 3

process, as part of our assessment of overall project cost outcomes in the next section. By measuring cost outcomes for specific projects against the concept estimates for those projects, we are effectively seeing the combined effect of cost estimation variance and the application of engineering prudence, through the whole of the PMM gate process from concept estimate to project outcome. This is the analysis that we present in section 6.3.3 below.

6.3.3 Evidence of portfolio risk and prudence adjustment from the current RCP

Purpose of analysis

235. In order to provide further indications as to the levels of portfolio risk and prudence that might lead to a systematic bias between the proposed expenditure and actual outcomes, we assessed all projects proposed for and completed in the current RCP. As this analysis looks at the actual expenditure compared with the expenditure previously proposed for regulatory purposes, it is reasonable to interpret it as encompassing the concept of portfolio risk (that is, the risk that the actual costs of the portfolio of projects may exceed the aggregate of ElectraNet's individual project cost estimates for the proposed projects, absent any change to the engineering of the project) and also the extent to which engineering prudence applied at the project level might reduce or increase project costs as they move through the PMM gate processes from concept estimates through to commissioning.

Analysis of current RCP project data

236. Data is available for ElectraNet's projected costs for all projects that were proposed (in 2007) for the current RCP⁴⁸. Further data has been provided as part of the current proposal, which shows the actual costs of these projects⁴⁹.

237. Key aspects of our data preparation process are as follows:

- We analysed projects proposed for the period of the current RCP only. Where a project is now presented as being almost complete (as at 2013) we included it and, for completeness, added in ElectraNet's estimate for any small amount of remaining expenditure. We excluded two projects that have been deferred such that considerable amounts (in excess of \$20m) are now proposed to complete these projects in the next RCP, given that there is not yet a true "actual" cost for these projects.
- We adjusted all proposed and actual costs to \$2012/13.
- We removed from consideration projects for which there was not a projected/actual comparison. That is, projects that were proposed but not undertaken, and projects that were undertaken though they weren't proposed in 2007. By excluding these roll-ins and roll-outs, the analysis solely measures project cost changes, and not project timing changes that also affect the portfolio outcome.

⁴⁸ ElectraNet's Cost information template 31 May 2007, www.aer.gov.au

⁴⁹ ENET 318 - Submission Guideline Templates Cost Information.xlsm (Public)

- Where projects had been split (e.g. into augmentation and replacement components), we combined them and treated them as a single project, as identified by ElectraNet's common project number. Where ElectraNet had reclassified a project between 2007 and now, we included it in "all project" analysis but ignored it for the purposes of subset analysis based on project types (e.g. augmentation versus replacement projects).
238. We then provided the data on an anonymous basis to MetService, a firm with specialist forecasting and statistical analysis capability, for statistical analysis⁵⁰. The analysis used two models: non-parametric bootstrap analysis, and Bayesian analysis fitting the data to a log/log model.
239. Depending on the model used, the data indicates a portfolio under-spend of between 5 per cent and 7 per cent. That is, the portfolio of completed projects cost between 5 per cent and 7 per cent less than ElectraNet had estimated in 2007 for the current RCP. The analysis also indicated that replacement and refurbishment projects under-spent by a greater amount, coming in at an aggregate 16 per cent below estimate, while the sub-portfolio of augmentation and connection projects came in between proposed cost and a 3 per cent over-spend. The raw data showed portfolio total variances of 5% underspend for "all projects", 1% overspend for augmentation and connection projects and 14% underspend for replacement projects.

Table 14: *Raw data assessment of current RCP project cost outcomes relative to previous Revenue Proposal budgets for those projects*

	All projects	Augmentation and connection projects	Replacement projects
Number of projects	44	23	12
Total value (\$m as proposed)	598	347	141
Total cost (\$m as incurred)	567	352	122
Mean % project overspend (underspend)	-5%	1%	-14%

Source: EMCa analysis

240. Because of the relatively small number of data points, we were particularly interested in the levels of confidence for resulting differences between proposed and actual expenditure. Depending on the model, the confidence interval for one standard deviation was ± 6 per cent to ± 9 per cent for all projects. Because of the smaller sample sizes, the confidence intervals for augmentation and connection projects were higher, being between ± 7 per cent to ± 11 per cent, and for replacement and refurbishment projects the relevant confidence intervals were ± 15 per cent to ± 22 per cent.
241. Taking account of the confidence intervals, the conclusions that we draw from this analysis are that:
- Applying a positive "portfolio risk factor" of 4.9 per cent to the "all projects" portfolio budget is not justified;

⁵⁰ The MetService report (see appendix 9) was provided to AER, and we understand that AER has provided this report on a confidential basis to ElectraNet

- On the balance of probability, it is more likely that “all projects” and “replacement” projects will under-spend rather than over-spend, that “replacement and refurbishment” projects will under-spend by more than “all projects” and also that “replacement and refurbishment” projects will under-spend by more than “augmentation and connection” projects;
- Taking into account the combined effects of portfolio risk and prudence, there is not a case for applying any positive risk factor to the aggregate portfolio budget although there may be a case to apply a small aggregate positive adjustment to the augmentation and connection projects, along with a negative adjustment to replacement and refurbishment projects.

Implications for Augmentation and connection projects

242. Given the mean outturn for “augmentation and connection” projects of the order of 0 per cent to 3 per cent over-spend, the Draft Decision portfolio risk factor for augmentation and connection projects, of +2.6 per cent is a more likely outcome than a risk factor of +4.9 per cent as proposed by ElectraNet. As per the Draft Decision, this would imply a reduction of 2.3 per cent to the portfolio budget of augmentation and connection projects proposed by ElectraNet.

Implications for replacement and refurbishment capex

243. Given the mean out-turn for “replacement” projects of a 16 per cent under-run, the application of the previously assumed “prudence adjustment” of -7 per cent, and zero portfolio risk factor, is a more likely outcome than application of a risk factor of +4.9 per cent (and no prudence allowance). As per the Draft Decision, this would imply a reduction of 4.9 per cent plus 7 per cent for a total of 11.9 per cent reduction to the portfolio budget of replacement and refurbishment projects proposed by ElectraNet.

Other experience

244. In analysis we conducted in relation to two other electricity transmission utilities⁵¹, we similarly found a net under-spend at the portfolio level against project budgets prepared for regulatory purposes five years earlier. As with the current analysis, this analysis compared actual versus proposed costs for the same projects, and ignored project roll-ins and roll-outs from the portfolio. As with the current analysis, the subject utilities undertook cost estimation using a “Base Planning Objects” approach with unit costs based on tendered actual unit costs. The average under-runs were more than the level that we find from ElectraNet’s data and, as with the ElectraNet data, the sub-portfolio of replacement and refurbishment projects have a significantly greater under-run than augmentation and connection projects.

ElectraNet and Evans & Peck review of our analysis

245. The AER provided our data and associated analysis report to ElectraNet, who in turn provided it to Evans & Peck. Subsequent to our drafting of the analysis reported above, we have been provided with ElectraNet’s response (and which includes a response from Evans & Peck). Having reviewed that response, we confirm our

⁵¹ For confidentiality reasons, the transmission utilities cannot be disclosed

recommendations. We have addressed the key matters raised in that response in appendix 8.

6.4 Findings and recommendations

6.4.1 Findings

246. We consider that the Evans & Peck analysis is deficient in a number of respects and, on examination, does not support the conclusion that a 4.9% portfolio risk factor uplift should be applied to the aggregate of all project costs estimated using ElectraNet's costing systems.
247. Our analysis of ElectraNet's own project cost performance, using its previous regulatory submission proposed project costs against the outcome costs for those same projects, provides what we consider to be sufficient evidence that a cost uplift factor of less than the proposed 4.9% should be applied to augmentation and connection projects, and that a negative adjustment should be applied to replacement and refurbishment cost estimates. This is consistent with the Draft Decision.

6.4.2 Recommendations

248. We recommend that the AER applies the same proportionate adjustments for portfolio risk and prudence as it applied in the draft decision. These adjustments should be applied only to non-WIP network components of the proposed expenditure. Specifically these involve proportionately reducing the proposed non-WIP network expenditures as follows:
- Reducing proposed augmentation and connection expenditure to have the effect of applying a portfolio risk factor of +2.6%, in place of the factor of +4.9% that ElectraNet has proposed, that is, applying a reduction of 2.3% to the proposed expenditure;
 - Reducing replacement and refurbishment expenditure to have the effect of applying a portfolio risk factor of zero (in place of 4.9%) and a prudence adjustment of -7%, that is, applying a reduction of 11.9% to the proposed expenditure.

7 Land and easement capex

7.1 Scope and information sources

7.1.1 AER's scope for EMCa review

249. Our terms of reference for this review are contained in section B.3 of the AER's TOR, and are as follows:

- *The technical consultant must:*
 - *Relate each proposed land and easements project (all 6 projects) to the relevant network projects;*
 - *Form a view on the need for the purchase of land and easements based on the level of certainty for the network project;*
 - *Review ElectraNet's analysis of each proposed acquisition against the land and easement criteria including options considered, acquisition timing and business case analysis;*
 - *Form an opinion on the case for acquiring land and easements in the 2013–18 RCP.*

7.1.2 Background and information sources

Information sources

250. Our review has been principally based on the following information:

- Draft Decision: Attachment 4.4.2: Strategic Land and easement acquisitions;
- RRP: 6.2.4: Strategic land and easement acquisition costs;
- ENET301: Appendix I: Strategic land business case;
- ENET302: Strategic land business case (confidential material);

- ENET324 which responded to request EMCa063, and which corrected errors in some data provided by ElectraNet in its RRP

Key background data

251. The following tables summarise the projected expenditure requirements, from ElectraNet's initial RP, EMCa's recommended adjusted amount, the AER Draft Decision and ElectraNet's RRP.

Table 15: *Land and easement capex comparison*

\$million (real 2012/13)

	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Easement/Land	65.8	14.4	13.5	41.4

Source: RRP, RP, EMCa TR report, AER Draft Decision

252. The table on the next page lists the projects now proposed (in the RRP), the amounts and status of each project and explanatory material and the explanations provided by ElectraNet.

Table 16: Land and easement projects and related network projects and timing

Project No	Land and easement project	Status	Land cost (RP ENET191)	Total (Prior expenditure)	Land and easement project cost (RRP CAPEX model)		Associated Network project			ENET191 response (RP)
					Total (2014-18)	Network project no	Network project name	Network Project Timing (RP) (ENET191)		
11383	Mt Barker South Triple Circuit Easement Expansion	WIP	5.4	1.4	4.4	N/A	No network project specified	2025-2030	11383 Mt Barker Triple Circuit Easement Expansion: At this point the line replacement project has not been scoped as the network trigger dates are not clear. However the easement acquisition addresses a known issue that would compromise the security of the network.	
11738	Mallala to Para 275kV Double Circuit Land & Easements - Rev1	Non-WIP	9.5	Non- WIP	10.0	11886	Contingent 14 - Northern Suburbs Reinforcement	2018-2023	11738 Mallala to Para 275kV Double Circuit Land & Easements - Relates to EC.11886 Mallala to Para 275 kV DC Line.	
11739	11739 Templers to Para 275kV Double Circuit Land & Easements - Rev2	Non-WIP	8.7	Non-WIP	8.2	12805	Contingent 14 - Northern Suburbs Reinforcement	2018-2023	11739 Templers to Para 275kV Double Circuit Land & Easements - Relates to EC.12805 Templers to Para 275 kV DC Line.	
11132	Fleurieu Peninsula Strategic Land and Easement Acquisition	WIP	5.3	0.7	7.3	10313	Contingent 5 - Fleurieu Peninsula Reinforcement	2024	11132 Fleurieu Peninsula Strategic Land and Easement Acquisition - Relates to Network Project EC.10313 Fleurieu Peninsula Reinforcement	
11630	Eyre Peninsula Reinforcement - Land Acq	WIP	7.2	2.1	10.7	11201	Contingent 2 - Lower Eyre Peninsula Reinforcement	2018-2022	11630 Eyre Peninsula Reinforcement Land and Easement Acquisition - Relates to EC.11201 Lower Eyre Peninsula Reinforcement	
11461	Cultana to Stony Point Land and Easement Acquisition	WIP	0.4	0.2	0.9	12802	Not contingent project in RRP (was contingent project No.1 - Eyre Peninsula Connection Point)	2016-2024	11461 Cultana to Stony Point Easement - Relates to EC.12802 Cultana to Port Bonython Line Augmentation; also, EC.11440 Point Lowly 132 kV substation and EC.11555 Cultana Industrial 132 kV Substation. These projects are all related to expected step-load increases in the upper Eyre Peninsula, the timing of which is presently uncertain. However, the easement acquisition addresses a known issue that would compromise the security of the network and ElectraNet's ability to meet the ETC requirements. Project EC.11448 Cultana to Stony Point Hazard Mitigation relates to the existing Cultana to Stony Point line.	
			36.6		41.4					

Source: RRP, ENET191

7.2 Relevant aspects of Draft Decision and ElectraNet response

7.2.1 Key points noted by ElectraNet, from the Draft Decision

254. The key points noted by the AER in its Draft Decision are as follows:⁵²

- ElectraNet's historic costs on land and easement acquisitions are very low and there is a major proposed increase from the 2011/12 year onwards;
- These increases could not be justified on the basis of the forthcoming changes to the Electricity Transmission Code which will require ElectraNet to use its 'best endeavours' to acquire all necessary land and easements within three years of a change in forecast agreed maximum demand at a connection point. The AER considered this three year lead time did not justify ElectraNet's proposed capex which included expenditure for 14 land parcels and easements that were not required to meet demand for prescribed transmission services until at least the 2023–28 RCP;
- Land and Easements are considered 'strategic' if they are to be acquired in the 2013-18 RCP but are not expected to be used for the commencement of transmission projects until after the completion of that RCP. However, the capex criteria in the NER require that proposed expenditure must reasonably reflect the efficient and prudent costs of maintaining the quality, reliability and security of supply of prescribed transmission services. The AER accepted that strategic land acquisitions could be included in capex in certain circumstances but removed those acquisitions that were not supported by robust cost-benefit assessment, were in areas that were unlikely to be encroached upon, or were not required until after the end of the 2018-2022 RCP. The AER accepted a limited number of proposed strategic land and easement acquisitions;
- The AER excluded 11 projects for which land or an easement is already designated for ElectraNet's use by planning instruments, including the 30 Year Greater Adelaide Plan and Council designations;
- The AER identified additional acquisitions proposed by ElectraNet that are not subject to planning instruments but traverse regional areas removed from urban locations and townships. The AER excluded these acquisitions as the Connor Holmes report submitted by ElectraNet observed that the remoteness of these acquisitions gives rise to low risks of other land users encroaching on ElectraNet's potential easements.

7.2.2 ElectraNet's Response to the key points

255. ElectraNet responded under three headings.

⁵² AER Draft Decision, pp.34-35 and pp.128-130.

Significant increase in forecast capex

256. ElectraNet argued that departure from historical expenditure trends is not a reasonable reason to decline the proposed increased since transmission development was by its very nature lumpy. ElectraNet considered the transmission projects were driven by emerging asset replacement requirements based on condition and risk and by ongoing demand growth which will see the network exceed its capacity in a number of locations.
257. Nevertheless, ElectraNet have reviewed the 20 strategic land and easement acquisitions originally proposed in light of revised demand forecasts in the Draft Decision, and removed 14 projects. ElectraNet argued for inclusion of the remaining six projects in Table 6-3 of its RRP.

Protections afforded by planning instruments

258. ElectraNet stated that:

... it is important to note that the planning system, while giving assurances on land use policy, cannot guarantee development rights unless ElectraNet acquires the necessary easements for a line corridor.⁵³

and

While ElectraNet is formally engaged at the development plan amendment (DPA) stage, it can only provide comment and seek to influence outcomes. At the DPA stage, ElectraNet cannot secure provisions to be made through the state strategic land use planning system for future power line corridors and major substation sites. ElectraNet has no formal legal authority within the South Australian land use planning system, which is only afforded to Government departments, agencies and corporations.⁵⁴

ElectraNet considered that it was imperative that ElectraNet acquires key substation sites and easement corridors where there was a high risk of being effectively 'locked out' of future access through changes in surrounding land use.⁵⁵

Cost Benefit Analysis

259. ElectraNet reviewed its strategic land and easement acquisition projects in response to the concerns expressed by the AER and set out business case evaluations for each of the projects in the RRP. For some of these projects ElectraNet have reconsidered the project proposals and have split the projects into two parts, one to be included in this RCP, and the second deferred to a later period.

⁵³ ElectraNet RRP, p.62.

⁵⁴ ElectraNet RRP, p.62

⁵⁵ ElectraNet RRP. p.63.

7.3 Our review of ElectraNet response

7.3.1 Significant increase in capex

260. The increase in capex is not considered in itself to justify adjustment. Nevertheless the trend raised questions as to forecasting accuracy and drivers, when compared with the requirement that was proposed in the current RCP and with purchases not having been made, but rather being loaded into the final years of the current RCP.

7.3.2 Planning instruments

261. While ElectraNet has not acknowledged the need to actively pursue legislative change to provide corridor and site protection through land use planning designations, we have nevertheless assessed each of the six projects on the basis proposed by ElectraNet, namely that designations do not provide sufficient protection in South Australia and acquisition in advance of need is necessary in some circumstances.

7.3.3 Cost benefit analysis

262. ElectraNet have now provided a reasonable level of information in their business cases to enable us to review our previous assessment of the projects we recommended for inclusion. Our evaluations of the six projects put forward in the RRP are provided in appendix 1.

263. We note that the land and easement projects are for the most part linked to projects that are, at least in the next RCP, presented as contingent projects. We have assessed each land and easement project on its merits as presented and have considered the likely timings of the associated network projects. Where these are contingent projects, we have considered primarily whether that project is likely to be required beyond the next RCP (i.e. it is mainly a question of timing) as well as the circumstances where it may be triggered as a contingent project within the next RCP.

264. In summary, ElectraNet has undertaken a significant review of the land and easement projects first proposed in the RP, with clear reductions where justification was weak, and has provided much more detail than was provided in the RP. In particular ElectraNet has provided details of the issues surrounding each project in the form of a business case which includes economic evaluation of the proposed project compared with the next best alternative. In two cases it has introduced a refined option in which it has split the project in two, tackling the critical parts of the line route in the next RCP and deferring the non-critical part to a later period. This is a sensible approach.

7.3.4 Encroachment risk

265. EMCa notes that each of the above projects recommended for acceptance is considered to have been justified on the basis of the real risk of encroachment in the next five years. If this encroachment risk is not considered genuine on the basis of further advice or facts, then the project could be deferred until the next RCP.

7.4 Findings and recommendations

7.4.1 Overall findings

266. On consideration of the additional information presented, we consider that the capex allowed for Land and Easements should be increased from the \$13.4m in the Draft Decision to \$21.9m. This compares with ElectraNet's \$41.4m requested in the RRP.

267. A summary of our findings is presented below, with our recommendation in the 'Approve' Column.

Table 17: Land and easement projects

Summary	Approve	Defer	RRP	DD	RP
EC 11630 Eyre Peninsula Reinforcement	6.4	4.3	10.7		11.7
EC 11132 Fleurieu Peninsula Strategic	0.0	7.4	7.4		5.4
EC 11738 Mallala to Para 275kV	8.6	1.3	9.9		11.7
EC 11739 Templers to Para 275kV	6.0	2.2	8.2		9.9
EC 11383 Mt Barker South	0.0	4.4	4.4		4.5
EC 11461 Cultana to Stony Point	0.9	0.0	0.9		0.5
Other					22.1
Total	21.9	19.6	41.4	13.4	65.8

Source: RRP, RP, AER Draft Decision

268. The two projects which have been split are EC 11738 and EC 11739 and we recommend that this approach is also possible in the case of EC 11630, with the total amount deferred from the three projects being \$7.8m.


269. All of these projects are linked to future line construction projects with planned construction in some future regulatory period. In some cases these are up to 20 years out. The expenditure is recommended for approval where the following conditions prevail:

- The increase in capacity will be required in the next 20 years, although the timing may be uncertain;
- There is no known reasonable alternative route for the line due to system design, geographic, environmental or competing development constraints;
- There is a high risk of encroachment on the line route from urban or semi urban development, or from environmental protection pressures. Delay in securing easements will significantly increase the risk of being unable to obtain these easements at a reasonable cost;
- The only available solution would be to underground the line in the encroached areas, with consequently much higher capital cost;

- The similarity of the discount rate to the anticipated land price escalation rates means that the net present cost of purchasing the land early is little different to deferring purchase till later;
- The project has been evaluated to consider the cost benefits of being split to purchase easements for high risk areas only with lower risk areas deferred till later.
- ElectraNet provided further information on the need to purchase land and easements for the whole route of EC 11630 on the Eyre Peninsular. The information did not provide a convincing argument that the land should be purchased so far in advance of the need. We remain of the view that ElectraNet has the time available to defer purchase of this land until closer to the time when it is required.

7.4.2 Further observations and considerations

270. In making these recommendations we raise the following issues for the AER's further consideration:

- In each case we have accepted ElectraNet's assertion that the rate of urban, semi urban or industrial development in the high risk areas of each route is such that deferring the purchase of easements will significantly increase the possibility of being unable to obtain the easements. We have no way of confirming the validity of these assertions, but our approval is totally dependent on their accuracy. The relative cost between obtaining easements in the high risk areas and the low risk areas is huge. [C-I-C]

- In our experience it is sometimes necessary to purchase land in order to apply an easement and then to resell. It is not clear whether these projects include the actual purchase of land, and if so, how the resale revenue is handled. In the event that land is purchased for future use and is subsequently found to be surplus to requirements, the revenue from the sale needs to be accounted for. As a matter of practice, our recommendation is that all land holdings for future transmission routes should be recorded in a separate asset register, which is reviewed at each regulatory reset. If deemed surplus such land should then be sold during the next period and the revenue offset against the approved revenue;
- In the majority of the projects considered, the transmission route is shown in the 30 Year Plan for Greater Adelaide, and in most cases is also contained in District plans. ElectraNet maintain a dialogue with the local authorities to attempt to protect their access, but they emphasise that they cannot absolutely safeguard against competing uses obtaining zoning changes which interfere with the future transmission route. ElectraNet also refer to the theoretical availability of compulsory purchase powers, although these do not seem to be considered further as an option. Our view is that compulsory purchase is a poor option as it is generally a case of acting after the event, and is also likely to engender considerable public antagonism. A preferred approach would be to encourage Government to pass legislation to allow absolute protection of key transmission corridors, where a grid company can show that these are reasonably required to support regional development. There is sound logic to this where the development is required in support of a general growth strategy of a state, but it is not reasonable to expect current electricity consumers to fund land banking for some future development. This is an inter-generational issue that can limit the need for unnecessary electricity price increases.

7.4.3 Recommendations

271. We recommend that the AER:

- Does not accept the RRP land and easements figure of \$41.4m proposed by ElectraNet; and
- Amends its Draft Decision (\$13.4m) and accepts an amount of \$21.9m.

8 Network optimisation opex

8.1 Scope and information sources

8.1.1 AER's scope for EMCa review

272. Our terms of reference for this review are contained in section B.10 of ElectraNet's TOR and are as follows:

- *The technical consultant must:*
 - *Review the rationale for proposed network optimization work, contained in section 7.5.4 of ElectraNet's revised revenue proposal;*
 - *Consider the categorization of proposed network optimization work. For example, should the work be classified as security / compliance opex?*
 - *Briefly respond to the logic and implications of ElectraNet removing works to improve transfer capabilities, including with respect to the STPIS.*

8.1.2 Background and information sources

Information sources

273. Our review has been principally based on the following information:

- Draft Decision: Appendix A.2: Step Changes (Network optimization subsection);
- RRP: section 7.5.4: Network Optimisation.

Key background data

274. The following tables compare the proposed expenditure in the RRP, with the initial RP, Draft Decision and EMCa recommended amounts.

Table 18: *Network optimisation opex comparison*

\$million (real 2012/13)

	Initial RP	EMCa Recommended	AER Draft Decision	Revised RP
	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
NORM / Network Optimisation	13.3	13.0	-	4.9

Source: RRP, RP, EMCa TR report, AER Draft Decision

275. The initial RP proposed lines and substations projects. The RRP proposes only a series of lines projects, as described below.

8.2 Relevant aspects of Draft Decision and ElectraNet response

276. The AER's Draft Decision did not approve network optimisation as a new category of opex and rejected ElectraNet's proposed allowance. The AER argued that ElectraNet had not demonstrated the economic case for the costs or benefits of the network optimisation opex category as a way of deferring capital augmentation.

277. In response to a request from the AER, ElectraNet provided a single example of a possible capex augmentation deferral at an upfront opex cost of \$650,000. However, ElectraNet did not quantify the value of the remaining portion of the proposed network optimisation budget (\$12.65 million), the timing of deferrals, or how the deferrals linked to the capex program or forecast.⁵⁶

278. The AER considered this type of expenditure was business as usual rather than a step change in response to new circumstances. The AER considered that if the network optimisation projects had a net positive value then they would displace the need for an equivalent amount of opex in other opex categories.⁵⁷

279. ElectraNet responded in the RRP that it had informed the AER that the programme was for:

- Minor substation primary plant and secondary systems works to remove bottlenecks and similar minor expenditure on transmission lines to improve network transfer capability;
- Minor works to address transmission line non-compliance issues.⁵⁸

280. ElectraNet has proposed in its RRP to retain only the second category above in its network optimisation (\$4.9 million), in order to "remediate high risk low hanging

⁵⁶ AER Draft Decision, p.285.

⁵⁷ AER Draft Decision, pp.285-286.

⁵⁸ ElectraNet RRP, p.99.

transmission line spans with clearance violations of 1 metre or more and some spans with violations of between 0.5 and 1.0 metre”.⁵⁹

281. ElectraNet argues this expenditure was not allowed for in the AER’s revealed cost top-down forecasts as it was not allowed for in the 2010-11 base year or elsewhere.

8.3 Our review of ElectraNet response

8.3.1 Assessment of proposed line sag compliance remediation

282. In the RRP, ElectraNet states the expenditure is “directly aimed at maintaining the safety and security of the transmission system”.⁶⁰ ElectraNet has provided additional information (ENET328 and 329) that satisfies us that it has identified specific line compliance defects, that it has assessed the materiality of these defects and that the amount proposed represents prudent expenditure to remedy those that represent a material safety and compliance breach. ElectraNet also confirmed, in response to our query, that it had misclassified the expenditure in the RRP opex model as relating to substations, and confirmed that they are transmission lines projects.
283. The non-compliance may also be leading to a need to de-rate these lines and may therefore be limiting line flows. Essentially they are a one-off correction to what was likely to have been non-compliant construction, though it is also possible for line sag to increase over time.
284. We support the inclusion of an expenditure allowance consistent with this work being undertaken. However we consider that there are questions regarding its categorisation. ElectraNet’s statement of the driver as being safety and security related does not seem to fit well with a categorisation under Network Optimisation opex, even if an additional benefit may be some increased line flow capacity. It is a one-off, or at least occasional, cost. We consider that the most suitable category would be to recognise this as a one-off security/compliance project, categorised as capex, as the work is bringing the construction of these lines up to the standard at which they are supposed to operate.
285. ElectraNet advised that aerial survey work already carried out had identified the need to re-tension these lines. ElectraNet responded that it has not carried out remediation work to correct these line sag compliances in the current RCP. This confirms therefore that the work is not implicit in the AER’s revealed opex costs, under another category.

⁵⁹ ElectraNet RRP, p.100.

⁶⁰ ElectraNet RRP, p.102.

286. As an observation, given the non-compliance and apparent safety drivers for this work, we question why the proposed project has been extended over five years rather than being completed more promptly.

8.3.2 Classification and quantum of aerial survey work to identify line clearances

287. In the course of assessing the proposed line clearance compliance work, we observed the costs incurred in undertaking the aerial survey work that has identified the need for this remedial work, and ElectraNet's proposal to undertake a further full aerial survey in the next RCP. ElectraNet has reported that it has incurred \$3.4m to conduct the aerial surveys in the current RCP and inspection of its capex model indicates that it proposes to incur a further \$4.9m in the next RCP. These are significant amounts that are more than the cost of the proposed remedial work.
288. First, it seems unlikely to us that a full aerial survey will be needed to identify whether line sag is increasing. Having undertaken the first survey and remedied the non-compliant line sags, a sample approach will more cost-effectively identify any further deterioration.
289. Second, we note the survey inspections have been classified as capex, which seems anomalous given that the compliance remediation work itself has been proposed as opex. Whilst we understand that this classification of the aerial survey inspections has been incorporated into ElectraNet's regulatory accounts, and therefore into the RAB, we suggest further regulatory accounting consideration of the matter. It would appear to us that that the work is little different in nature to other asset condition assessment work, which ElectraNet undertakes as part of routine maintenance and under the heading of operational refurbishment⁶¹.
290. In broad terms we would consider it reasonable to include in the forward projections an amount of around 25% of the amount spent in the current RCP, to allow for further sampling to assess whether and where line sag is increasing, that is, around \$1.2m or \$245,000 per year, and that this should be allowed for as opex.

8.4 Findings and Recommendations

8.4.1 Findings

291. We consider the proposed line sag remediation work is justified. However we consider this should be better categorised as compliance and security capex. The work is not included in current RCP base-year opex, therefore, whether treated as opex or capex, the proposed expenditure should be explicitly allowed for as a one-off expenditure item.

⁶¹ For example, the \$15m of transmission line condition assessment that is proposed for the next RCP in addition to the aerial line survey work above.

292. Separately, we consider that the aerial survey work to identify line clearances should more properly be considered as opex in the next RCP. We consider that a considerably smaller amount than is proposed should be required in this next RCP, to allow solely for sampling to confirm that there has been no further deterioration in line clearances. This should be of the order of \$245,000 per year and may be considered to be within the bounds of materiality of AER's revealed opex costs. We note that ElectraNet has also allowed generally for lines condition assessment with approximately \$15m included under "opex refurbishment".

8.4.2 Recommendation

293. We recommend that the AER:

- Accepts the proposed \$4.9m expenditure allowance for line sag clearance remediation in the next RCP, by adding it to the security/compliance capex proposed in the RRP;
- Does not accept the \$4.9m line sag remediation work as "Network Optimisation Opex"; therefore the adjusted opex for this category will be zero. As it was not in the "base year opex" no adjustment to "revealed costs" is required to achieve this outcome;
- Removes the "aerial line survey" project (project 11734) amount of \$4.9m from the proposed "compliance/security" capex and AER should satisfy itself that an amount of around 25% of this amount in total (i.e. of the order of \$245,000 per year over the 5 years) is implicitly allowed for by means of revealed cost or otherwise, in adjusted opex.

294. As an observation, the proposed amount for line sag remediation (\$4.9m) is the same as is proposed for the aerial line survey work. Therefore the net result of the reclassifications above will be to retain compliance and security capex at the amount proposed in the RRP, while disallowing the Network Optimisation opex.

9 Opex efficiency

9.1 Scope and information sources

9.1.1 AER's scope for EMCa review

295. Our terms of reference for this review are given in section B.9 of the AER's TOR and are as follows:

- *The technical consultant must:*
 - *Review the basis for ElectraNet's proposed 2.5 per cent opex efficiency factor and confirm evidencesupporting the number from within ElectraNet's internal systems and from a 'good industry practice perspective'.*

9.1.2 Background and information sources

Information sources

296. Our review has been principally based on the following information:

- Draft Decision: Attachment 5.4.2: AER's top down assessment (opex efficiency factor subsection);
- RRP: section 7.4: Opex efficiency factor;
- ENET304: Appendix K: PWC report: Opex efficiency assumptions.

Key background data

297. An efficiency adjustment of 2.5% was made in the Draft Decision. This had the following impact on opex, by category:

Table 19: *Indicative impact of OPEX efficiency adjustments made in Draft Decision*

<i>\$million (real 2012/13)</i>	
	Adjustments
Routine Maintenance	2.0
Corrective Maintenance	1.7
Operational Refurbishment	1.6
Network Optimisation	0.3
Support	3.7
Network Operations	1.2
	10.6

*note: Reduction for corrective maintenance not applied for this adjustment

Source: EMCa analysis

9.2 Relevant aspects of Draft Decision and ElectraNet response

9.2.1 Draft Decision

298. The AER's Draft Decision was to apply an opex efficiency factor adjustment of 2.5 per cent to the 2010-11 base year total controllable opex. The AER then trended this reduced base year amount to establish substitute forecasts for the next regulatory period (with limited step changes and other adjustments).

299. The AER considered an opex efficiency factor adjustment of 2.5 per cent was appropriate because:⁶²

- ElectraNet has introduced a formalised improvement and innovation program under which it identified inefficiencies in its current practices and implemented solutions to reduce such inefficiencies;
 - For example, ElectraNet's outsourced field maintenance contract allows for forward maintenance works to be scheduled in conjunction with capital works, works in remote areas to be coordinated to reduce travel time, and defects to be fixed 'on the spot' when the fix can be done in the time allocated for inspection and routine work.
- ElectraNet has identified efficiencies in the order of 5 per cent for the majority of routine maintenance;
- The AER considers ElectraNet can also be reasonably expected to achieve efficiencies in other areas of other field work and support functions;
- These efficiency savings have been realised in the latter part of the 2008–13 regulatory control period but are not reflected in the 2010–11 base year, which is the basis of the AER's substitute forecast;
- ElectraNet has proposed capex efficiencies of 1 to 2 per cent, and opex efficiencies should be relatively easier to achieve;

⁶² AER DD, pp.154-155

- ElectraNet was able to achieve opex efficiencies of 2.9 per cent (relative to the AER decision), in the three years of actual expenditure: 2008-09, 2009-10 and 2010–11.

9.2.2 RRP

300. ElectraNet has presented four reasons why it considers the 2.5 per cent efficiency gain assumption used in the Draft Decision is invalid. ElectraNet has claimed that:

- There is no specific evidence or basis for the proposed 2.5 per cent efficiency factor and all expected efficiencies have already been built in to ElectraNet’s proposed opex. ElectraNet claims that the 2.5 per cent efficiency factor is speculative and unsubstantiated;
- Evidence of past efficiencies achieved has no bearing on ElectraNet’s ability to achieve further efficiencies. Further, that efficiencies achieved after the “base year” should not be taken into account otherwise they weaken the incentive properties of the regulatory regime. ElectraNet states that it will continue to pursue efficiencies, but considers that it cannot reasonably predict any particular outcome from this. ElectraNet claims that a business that has achieved past efficiencies will find it more difficult to achieve further efficiencies;
- ElectraNet rejects the AER’s decision to trend forwards from the first three years of the current RCP to arrive (after adjustments) at a substitute base year. It also rejects the suggestion that it has brought forward work into the current RCP;
- ElectraNet considers that the “scale factors” used (by ElectraNet and by the AER) in forecasting opex implicitly assume material productivity improvements and that applying an efficiency factor effectively double-counts efficiencies that have already been factored into the forecast.

9.3 Our review of ElectraNet response

9.3.1 Scope and interpretation of the NER

301. In line with our scope, we have considered whether ElectraNet’s RRP presents valid reason for the AER to modify its Draft Decision, such that it should not apply an efficiency adjustment of 2.5 per cent. In doing so, EMCa is specifically concerned with advising the AER in regards to forecasting operating expenditure that reasonably reflects the efficient costs to achieve the operating expenditure objectives, as required by the NER. We have not been asked by the AER to consider the interaction between forecasting an efficient expenditure and the incentive properties of the EBSS.

302. We consider that forecasting an efficient level of operating expenditure requires consideration of the likelihood that the business will continue to reduce inefficiencies, and a reasonable estimate of the quantum of such improvements.

303. EMCa also assumes a symmetry of outcomes from this forecast – that is, that the regulatory regime is not designed solely to reward ongoing efficiency improvements but is also designed equally to penalize a lack of improvements (in situations where ongoing reductions in inefficiencies can reasonably be expected). PwC’s report

provided at Appendix K to ElectraNet's RRP addresses the opex efficiency factor and appears to recognise this symmetry, referring to the "...reward (penalty) from an improvement (decline) in operating expenditure...".⁶³ The tenor of the ElectraNet RRP is that the business should always obtain a benefit from improving efficiency, rather than that it should obtain a benefit (penalty) by spending less (more) than the efficient regulatory allowance⁶⁴.

9.3.2 Evidence for the quantum of assumed efficiency gain

304. EMCa does not accept ElectraNet's suggestion that there is no evidence for the assumed 2.5 per cent efficiency gain, or that it is speculative or unsubstantiated.
305. The proposed expenditure is a forecast and it is axiomatic that specific evidence of achievement of efficiencies will not be available until after the period is over. As explained in our 2012 TR, based on our executive management and senior consulting experience we consider that it is reasonable to assume that a business such as ElectraNet will continue to achieve efficiency improvements. Moreover ElectraNet has a focus on continuous improvement and has implemented structures and mechanisms to achieve this. In its RRP ElectraNet has stated that it will continue to pursue such efficiencies. We consider that the balance of probabilities is that ElectraNet will continue to reduce inefficiencies during the 2013-18 RCP.
306. We do not accept ElectraNet's contention that efficiency improvements are already built into its proposed opex. ElectraNet's arguments confuse efficiencies with scale economies. ElectraNet's (and the AER's) trend forecasts properly recognise economies of scale, particularly in regard to "support" activities, meaning that not all opex will increase in direct proportion to the growth of ElectraNet's asset base.
307. Our quantification of the proposed adjustment was based on three sources of evidence:
- ElectraNet's achieved historical efficiency gains relative to the regulatory allowance;
 - Evidence presented to us by ElectraNet of efficiency gains that it was in the process of implementing, and which would reduce a significant proportion of its maintenance costs by 5 per cent. These gains were not implemented in the trended base year derived by the AER;
 - The efficiency gains proposed by ElectraNet as being achievable in its capex program.

⁶³PwC, Appendix K to ElectraNet RRP, p.7.

⁶⁴ The conceptual arguments put forward by ElectraNet also avoid the real issue as to how to measure improvements in efficiency. The implication is that improvements in efficiency are indicated by reducing costs and the PwC examples provided in Appendix K of the RRP are based on this simplifying assumption. The assumption is demonstrably invalid - ElectraNet has proposed increases in opex and these are not assumed to indicate reductions in efficiency. We observe that ElectraNet has not proposed a means of measuring improvements in efficiency, and that the EBSS is based simply on variances relative to the regulatory allowance.

308. We maintain the view that historical achievement of efficiency gains can be a guide to the ability of a business to achieve further gains, particularly where it has a continuous improvement framework. We measured efficiency gains of 2.9 per cent against the regulatory allowance in the three years for which actual cost data was provided and ElectraNet has not disputed the quantum of that efficiency gain. Our measure of historical gains was based on the first three years of the current RCP as these were the three years in which expenditure had been incurred and reported.
309. ElectraNet disputed that it had brought forward spending in years 4 and 5 of the current RCP, and which led it to spend in excess of the regulatory expenditure time profile in those years. As noted in our advice to the AER's Draft Decision, we were presented with evidence of spending to achieve the overall RCP allowance in the final two years; however, this is not central to our reasoning that in assessing past performance it is valid to use only years in which actual and measurable expenditure was incurred.
310. We also took account of ElectraNet's proposed capex efficiency factor. ElectraNet has proposed a capex efficiency gain rising to 2 per cent. As we stated in our Technical Review, we consider it reasonable to assume that a greater gain can be achieved in opex than in capex, and that given the existence of the continuous improvement program and the gains that have been and are currently being achieved, that this gain should be applied to the forecast from the first year. For clarity, we note that this is not a 2% per annum gain, it is an aggregate gain of 2% over the entire 5-year RCP, relative to the base year of 2010/11. This could, for example, be achieved by gains of just over 0.5% per annum, from the base year through to the end of the next RCP.
311. As noted in our Technical Review, ElectraNet stated in presentation to us that its continuous improvement program was in the process of implementing gains that would be of the order of 5 per cent and would apply to "a significant proportion" of opex. We have conservatively assumed this gain to apply to 50 per cent of opex.
312. We have also confirmed that future efficiency gains have not been allowed for in ElectraNet's proposed opex and that applying an adjustment would not double count.
313. On the basis of this information, we consider that (other factors being equal) it is likely that ElectraNet will under-spend an opex forecast that does not include an allowance for ongoing reduction of inefficiencies gains and that an adjustment of 2.5 per cent to the forecasts otherwise developed will assist in meeting the NER objective of estimating the efficient level of opex.

9.4 Findings and recommendations

314. We recommend that the AER applies a 2.5 per cent efficiency adjustment, as provided for in the Draft Decision.

10 Contingent projects

10.1 Scope and information sources

10.1.1 AER's scope for EMCa review

315. Our terms of reference for this review are contained in section B.11 of the AER's TOR, and are as follows:

- *Review section 15.2 of ElectraNet's revised revenue proposal regarding the relationship between the ex-ante capex forecast and contingent projects, and the implications of accepting proposed contingent projects;*
- *Review each of the 12 contingent projects proposed in ElectraNet's revised revenue proposal against new information and recommend whether to accept the contingent projects. This assessment should include an assessment of forecast loads and the nature of the proposed trigger events;*
- *Where the technical consultant considers that a contingent project should be accepted, review the specification and appropriateness of the proposed trigger events.*

10.1.2 Background and source information

Information sources

316. Our review has been principally based on the following information:

- Draft Decision: section 13: Contingent projects;
- Draft Decision: Appendix C: Contingent Projects appendix;
- RRP: section 15: Contingent projects;
- RRP: ENET306: Appendix M: Revised contingent project summaries.

Key background data

317. The following table shows the contingent projects as initially proposed and as now proposed in ElectraNet's RRP.

Table 20: *Contingent projects*⁶⁵

No	Project Name	RP Indicative cost (\$m Nominal)	RRP Indicative cost (\$m Nominal)
1	Eyre Peninsula Connection Point	33	n/a
2	Lower Eyre Peninsula Reinforcement	588	340
3	Upper Eyre Peninsula Reinforcement	113	n/a
4	Riverland Reinforcement	407	400
5	Fleurieu Peninsula Reinforcement	210	210
6	Yorke Peninsula Reinforcement	191	190
7	Para-Brinkworth/ Bungama - Davenport 275kV Transmission Upgrade	50	n/a
8	South East to Heywood Interconnection Upgrade	96	63
9	Northern Transmission Reinforcement - Load	247	n/a
10	Davenport Reactive Support	42	42
11	Upper South East Generation Expansion	48	50
12	Western Suburbs Reinforcement	20	n/a
13	Southern Suburbs Reinforcement	171	n/a
14	Northern Suburbs Reinforcement	48	50
15	Torrens Island Switchyard Development	54	n/a
16	Mid North Connection Point	59	60
17	Port Pirie System Reinforcement	36	52
18	South East Connection Point Reinforcement	25	n/a
19	South East Region Augmentation	28	n/a
20	Lower South East Region Transformer Reinforcement	19	n/a
21	Upper North Region Line Reinforcement	62	60
	East Terrace Transformer	n/a	23
		2,547	1,540

Source: RRP, RP

10.2 Relevant aspects of Draft Decision and ElectraNet response

318. ElectraNet originally proposed 21 contingent projects in its RP. In its Technical Review EMCa noted these projects were worth over \$2.5 billion compared with ElectraNet's forecast capex budget for the 2013-18 RCP of \$994m in equivalent nominal terms.
319. In its Draft Decision, the AER did not accept any of the proposed contingent projects. The AER found that:

⁶⁵Numbering of projects in this table and the remainder of this section follows the contingent project numbers assigned from our review of the initial RP


- 6 of the projects were associated with load growth that had already been taken into account in the development of ElectraNet's capex forecasts;
 - 10 of the projects were not considered probable during the 2013-18 RCP;
 - The 5 remaining projects might be classified as contingent projects with revision to the triggers.
320. ElectraNet has proposed 12 contingent projects in the RRP. ElectraNet has excluded 9 of the 10 projects that the AER considered to be "not probable". ElectraNet has also excluded from its RRP one project – Western Suburbs Reinforcement – that the AER excluded on the basis that it was within the demand forecast. Of the remaining projects that are proposed in the RRP, the AER considered that one was "not probable", 5 were load -driven projects but without an identified trigger and that 5 of the projects might be classified contingent with re-definition of the triggers. ElectraNet has proposed one new contingent project that was previously submitted as part of ex ante capex (East Terrace Transformer). ElectraNet's total budget expenditure for these 12 projects is \$1,540m.
321. In relation to the 6 load-driven projects, ElectraNet argued that these projects had been specifically excluded from the demand forecast used as the basis for forecasting capex for the 2013-18 RCP. In light of ElectraNet's revised reduced demand forecasts, it had decided to withdraw one project (Western Suburbs) but has added the East Terrace transformer project, as referred to above, removing it from the ex-ante capex forecast.
322. As a result, ElectraNet has now proposed 6 load-driven projects.
323. ElectraNet has retained one of the projects rejected as not probable, the Upper South East Generation Expansion project (retitled as the 'Upper South East Network Augmentation Project'). The project is driven by probable market benefits to relieve thermal constraints in the Tailern Bend to Tungkillio 275 kV corridor and to support a proposed generation project in the same area.
324. ElectraNet has retained the 5 remaining projects that required revision to the trigger events, and has broadly accepted the intent of the changes proposed, including the requirement to satisfy a regulatory investment test for transmission.
325. ElectraNet submitted further information in the RRP to justify inclusion of the 12 projects as contingent projects.⁶⁶

10.3 Our review of ElectraNet response

326. ElectraNet has provided more information in the RRP to support the 12 contingent projects, and with better reference to the NER requirements. However some of ElectraNet's claims regarding NER compliance are not well-supported – for example, its claim that the triggers are appropriately defined. Many of the triggers are not

⁶⁶ See ElectraNet RRP, section 15.5.1 and Table 5-1, pp.169-173.

objective as required by the NER and evidence around probability is lacking in some cases.

327. While ElectraNet has challenged the Draft Decision rationale in relation to the proposed load-driven contingent projects, it has withdrawn most of these projects.
328. EMCa sought further information from ElectraNet on 5 of the proposed projects which, as presented, had insufficient evidence of a step trigger event. In a teleconference EMCa sought to identify if there were in fact step triggers that had not been articulated either in the proposed triggers or in the background information. Through discussion with ElectraNet, step triggers were able to be identified for these projects. ElectraNet then (in response ENET347) provided information from which such triggers could be drafted though, at time of writing, the relevant events have yet to be re-presented by ElectraNet as revised triggers.
329. The further information provided subsequent to the RRP (in ENET347) would lead us to support four of the five projects that we initially queried, provided the triggers are appropriately modified. The projects, and additional information that leads us to this view, are as follows:
- 5 - Fleurieu (\$210m). ElectraNet presented this project in the RRP as being triggered by load growth, though the information presented indicated that it would not be needed within the RCP period and a specific load trigger was not proposed.
[C-I-C]

 - 11 - Upper south-east generation (\$50m). As presented in the RRP, it was unclear whether there was any tangible likelihood that the constraints referred to might warrant the proposed expansion. The further information indicates that generation constraints after commissioning of the South East to Heywood interconnector are anticipated to be of the order of 3,500 hours / year; also that ElectraNet has received a request for studies for a generator of significant size in that region, and which would exacerbate these constraints. EMCa considers that it is reasonable to consider these as trigger events and the proposed triggers should be modified to specifically refer to these events;
 - 17 - Port Pirie system reinforcement (\$52m). As presented in the RRP, the trigger referred to a "step load" leading to connection point loads or line thermal ratings exceeding capacity. However no evidence of the likelihood of such a step load was provided and the demand forecasts showed that the reinforcement would not be needed until around 2024. The further information provided indicates a reasonable probability of expansion of a specific major load and that the contingent project need would be triggered by a step load increase of greater than 12MVA. We are satisfied that such an event is sufficiently probable as to warrant inclusion as a contingent project and the trigger should be modified to quantify this step accordingly;
 - East Terrace (new contingent project, transferred from ex ante capex) (\$23m). As presented in the RRP, the trigger for this project was presented as general load growth, yet the RRP also stated that demand growth would not require this project until around 2025/26. EMCa identified two potential trigger events in supporting text: rail electrification and a new hospital. In further information, ElectraNet provided an indication that the combined step load resulting from these two trigger events would be of the order of 18MW. EMCa is satisfied that if rail electrification and the new hospital were to occur in conjunction than higher-than expected general load growth,

then this transformer upgrade is likely to be triggered and therefore this project could be accepted if the triggers are modified to make specific reference to these events and the associated step load increase.

330. Having reviewed the RRP and the further information provided by ElectraNet, EMCa does not support the inclusion of the Northern Suburbs Reinforcement project (\$50m) as a contingent project, on the grounds of probability. We have investigated demand growth from this connection point. ElectraNet has indicated that it expects this project to be needed in around 2020/21, when it expects demand to be 433 MW. ElectraNet's revised demand forecast for 2017/18 is 380 MW, which is 61MW (or 14%) lower than the demand forecast presented in its initial RP. With a proportionate margin between the medium and high forecasts, this would imply a revised high forecast of the order of 420 MW, which is still well below the capacity.
331. ElectraNet has not presented evidence of any particular step load event that could be considered to be a trigger. We therefore consider that the need for this project is related solely to general load growth which a TNSP's regulatory allowance is intended to cover, as explained in our 2012 Technical Review. ElectraNet has noted that the timing for this project is also affected by the location of load growth within the distribution network and is not solely a function of total demand. However no evidence has been provided of the extent to which an uneven growth in the distribution network might bring forward what already appears to be an unlikely need, in which by the end of the RCP there is still of the order of 13 MW of "head room" above even a "high" demand level.
332. In relation to the seven other projects, EMCa recommends acceptance of the Davenport reactive project with its proposed trigger, and supports the other six projects subject to further revisions to their trigger events.
333. The required trigger revisions are set out below:
- For load related triggers, ElectraNet needs to name relevant connection points (not just refer to a line section), specify a step load increase including both the size of the step and what it is relative to, and specify the nature of the load that is expected to give rise to that increase. ElectraNet could also specify the line thermal limit that would be breached if this step load was to occur, but breaching a line thermal limit is not in itself considered to be a "trigger event";
 - For market benefit triggers, ElectraNet should specify an objective assessment of net benefits (i.e. from external party such as AEMO) and where possible provide some numerical and verifiable indication of the circumstances or event in defining that trigger (for example the hours for which generation may be constrained, or the size of a new generator that would require reinforcement to accommodate unconstrained operation and which would likely lead to positive net market benefits).
334. EMCa's specific comments in relation to each of the 12 proposed contingent projects are listed in the table 21 in appendix 2. Also in appendix 2 we present indicative wording for revisions to trigger definitions and a summary of the amendment requirements, based on the narrative above.

10.4 Findings and recommendations

10.4.1 Findings

335. We support the inclusion of eleven of the proposed contingent projects, subject to better defining the triggers for all except one (Davenport reactive). We have reviewed these projects and we are satisfied that they are driven by step loads or other discrete events that meet the requirements for contingent projects. The triggers not accepted have been improved considerably compared to those presented in the RP, but still contain some ambiguities such that they cannot yet be accepted as objective in terms of the NER requirements.
336. We consider that one project (Northern Suburbs) is not probable; moreover that no specific trigger event has been defined. On the information provided, this project is likely to be needed at some stage in the next decade to meet general load growth in the northern suburbs of Adelaide and the timing of that need will be dictated by load growth outcomes, as is the case with all general load growth projects. Just as ElectraNet has the opportunity to defer projects beyond the RCP in the event that load growth is less than its medium forecast, without adjustment to its regulatory revenue allowance, so it may need to bring forward certain projects also without adjustment to the revenue allowance within the RCP. In this case even this possibility would appear to occur only if growth was above a “high” demand forecast and also quite skewed within the distribution network fed from this connection point.
337. In aggregate, the projects recommended for inclusion sum to \$1,490m.

10.4.2 Recommendations

338. We recommend that the AER accepts the following project, as presented⁶⁷:
- 10 – Davenport Reactive.
339. We recommend that the AER accepts the following ten projects, subject to amendment of the triggers (as illustrated in appendix 2) to ensure that they are objective:
- 2 – Lower Eyre Peninsula;
 - 4 – Riverland;
 - 5 - Fleurieu Peninsula reinforcement;
 - 6 – Yorke Peninsula;
 - 8 – South East to Heywood interconnection;
 - 11 – Upper south east generation expansion;
 - 16 – Mid North Connection Point;
 - 17 - Port Pirie system reinforcement;

⁶⁷ Numbers refer to the numbering allocated in the RP

- 21 - Upper North Region line reinforcement;
 - East Terrace transformer.
340. We recommend that the AER disallows any contingent projects for which the triggers are not satisfactorily amended to clearly describe the trigger events (in particular, where these are step loads) and the relevant connection points that they apply to.
341. We recommend that the AER rejects the following project, on the grounds that it is not probable and is based on general demand growth, with no identified step load trigger event:
- 14 – Northern suburbs reinforcement.

11 STPIS parameters

11.1 Scope and information sources

11.1.1 AER's scope for EMCa review

342. Our terms of reference for this review are described in section B.12 of the AER's TOR for this advice, and are as follows:

Review section 13.2 of ElectraNet's revised revenue proposal and advise whether there is any reason to reconsider the AER's Draft Decision on STPIS parameter weightings.

11.1.2 Information sources

343. Our review has been principally based on the following information:

- Draft Decision section 11: STPIS;
- RRP: section 13: STPIS / 13.2 Weightings.

11.2 Relevant aspects of Draft Decision and ElectraNet response

344. ElectraNet has accepted the AER's Draft Decision in respect of the STPIS except for the AER's proposed revised weightings for Average Outage Duration parameter and Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter.

345. The AER's Draft Decision proposed weightings of 0.2 per cent of Maximum Allowed Revenue for both Loss of Supply Event Frequency-Events sub-parameters.

346. ElectraNet has continued to propose that the Average Outage Duration parameter should be increased from 0.2 to 0.3 per cent of MAR. In addition to the original reasons provided in the RP, in the RRP ElectraNet presents the case that Supply Event Frequency sub-parameters and the Average Outage Duration parameter provide complementary incentives to restore supply following customer interruptions⁶⁸. ElectraNet considers their proposal for weighting the Average Outage Duration parameter provides a balanced set of measures by achieving equal weightings for the Average Outage Duration parameter and the combined Loss of Supply Event Frequency parameters of 0.3 per cent each. ElectraNet considers that this better achieves the National Electricity Objective.
347. ElectraNet disagrees with the proposal to increase the weighting of the Loss of Supply Event Frequency-Events > 0.0.5 System Minutes sub-parameter from 0.1 to 0.2. The main substance of their argument is that there is little time to respond to such incidents and as such the increased weighting just doubles the penalty imposed for this sub-parameter and provides no incentive to improve overall outage duration response.
348. ElectraNet criticises EMCa's statement that a "strong probability exists that ElectraNet's Average Outage Duration performance will improve in the 2013-18 RCP with no additional effort from ElectraNet", which it interprets as suggesting that the STPIS should be designed to minimise the prospect of incentive payments. ElectraNet also criticises what it sees as EMCa's view that the increased weighting for average outage duration should be disallowed because ElectraNet has no specific expenditure proposals to improve performance on the radial network, since ElectraNet considers performance improvements can be made from improved processes and heightened management oversight.

11.3 Our review of ElectraNet response

349. ElectraNet's concern that EMCa's advice sought to minimize the prospect of incentive payments is not correct. Our advice was in relation to maximising the incentive effect of the STPIS. We noted that ElectraNet's poor performance in average outage duration was based on a small number of high impact events, and if these events did not recur, then without significant effort, ElectraNet's performance was likely to meet the performance target. We continue to hold the view that increasing the weighting of this parameter, for what is a probable outcome under most scenarios, does not best achieve the National Electricity Objective in providing an incentive that will lead to performance improvements that, absent the incentive, may not occur.
350. We share ElectraNet's view that performance improvements may be achieved within existing allowances, and may result from improved processes and heightened management oversight. EMCa's previous advice was only to the effect that ElectraNet had not identified specific capex or opex proposals directly related to improving the performance of the radial network.⁶⁹ In this instance it would have been

⁶⁸It is noted at a later point in Section 13.2, ElectraNet also describe the two System Event sub parameters as complementing each other by design.

⁶⁹ EMCa October 2012, Paragraph 643.

helpful if ElectraNet's strategy, actions or reprioritizing of existing allowances to support improved performance, had been identified.

351. In the RRP, ElectraNet presents the case that Supply Event Frequency sub-parameters and the Average Outage Duration parameter provide complementary incentives to restore supply. We agree that the two Supply Event Frequency sub-parameters and the Average Outage Duration parameter together provide a complementary balanced set with regard to outage frequency and by implication to some extent asset reliability, and performance in restoration of supply. However, it is our opinion that all three should be viewed as equally balanced parts to the whole and as such would benefit from equal weighting.
352. To support the above reasoning we have considered that the Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter measure, when supply is first lost to customers, in many instances (although not all) will be due to:
- The failure of system design (N-1);
 - Asset failure;
 - Incorrect operation such as failure of automatic reclosing;⁷⁰ or
 - Where time allows, manual control operator action.
353. The Loss of Supply Event Frequency-Events > 0.2 System Minutes sub-parameter measures the events generally by which the system operator has not been able to further respond to the initial interruption by automated switching (SMART Grid techniques), by manual switching or, where time allows, rapid operational response on the ground.
354. Finally, the Average Outage Duration parameter is a measure that provides incentive where the restoration of supply falls beyond that restored under the Loss of Supply Event Frequency-Events > 0.2 System Minutes sub-parameter.
355. We consider that the Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter provides the greatest incentive where it is required for correct asset operation and reliability. The focus of this incentive is on:
- The heavily loaded circuits supplying the greatest number of customers;
 - Most consumers where there is little opportunity to respond when failure occurs; and
 - The radial circuits where failure of correct asset operation and reliability will mean long periods of disconnection for remote smaller communities.
356. It is this latter point that EMCa believes will be better addressed and provide greater incentive for improved operational performance of the remote radial circuits by

⁷⁰ Automatic reclosing involves reclosing a line shortly after it has opened due to a fault. Automatic reclosing manages transient faults (e.g. due to lightning, temporary contact with birds, trees, or events such as clashing lines) but not permanent faults.

increasing the weighting of the Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter rather than that of the Average Outage Duration parameter.

357. EMCa considers that the two Supply Event Frequency sub-parameters and the Average Outage Duration parameter together provide a complementary balanced set of incentives with regard to outage frequency, and by implication to some extent asset reliability, and performance in restoration of supply. As such, each provides a separate but equally important performance incentive. We consider that the three parameters together provide a balanced set of measures and incentives and should carry equal weighting and that this will best meet the National Electricity Objective

11.4 Recommendation

358. We reaffirm our findings and recommendations from our 2012 advice. Specifically we do not find a case for re-weighting the average outage duration parameter and we recommend that the Loss of Supply Event Frequency-Events > 0.05 System Minutes sub-parameter weighting be increased from 0.1 (as proposed by ElectraNet) to 0.2.

12 Line refit asset lives

12.1 Scope and information sources

12.1.1 AER's scope for EMCa review

359. Our terms of reference for this review are described in section B.5 of the AER's TOR, and are as follows:

The technical consultant must review ElectraNet's argument that the economic life of insulators will not equate to the insulators weighted average technical life, and provide advice to the AER on the appropriate asset lives to use.

12.1.2 Background and source information

Information sources

360. Our review has been principally based on the following information:

- Draft Decision: Section 8: Regulatory Depreciation Draft Decision, especially 8.4.1: Standard Asset Lives (transmission line refit asset class), Attachment (P186);
- RRP: 10: Depreciation / 10.2: Transmission line refit asset class.

12.2 Relevant aspects of Draft Decision and ElectraNet response

361. The AER's Draft Decision did not accept ElectraNet's proposed standard asset life of 15 years for the 'Transmission line refit' asset class, and determined a standard asset life of 27 years for this asset class.⁷¹
362. ElectraNet's transmission line asset class comprises four components:
- Conductors;
 - Insulators;
 - Supporting systems; and
 - Subcomponents.
363. ElectraNet determined a proposed standard asset life of 15 years based on the average remaining life of the next limiting components for these lines.
364. The AER considered it would be possible to extend the life of insulators by refitting them to other lines, or by asset management strategies to extend the life of the underlying transmission assets. The AER noted that other TNSPs employed these strategies and that there is no evidence that ElectraNet was systematically disposing of assets such as insulators before the end of their technical life. The AER considered that ElectraNet's asset management strategy suggests that it conducted condition assessments at the component level, and its refurbishment decisions are made at the component/asset type level as opposed to at the underlying asset level. The AER noted that ElectraNet was not anticipating replacing the underlying assets after 15 years.
365. ElectraNet responded in the RRP that:
- Installation of insulators was time-consuming and most of the cost related to non-material costs (around 80 per cent) which could not be recovered if the insulators were redeployed;
 - The costs of redeployment far outweighed the cost of buying and installing new assets.
366. ElectraNet concluded, based on its engineering assessment that it would be most cost effective to dispose of the insulators at the end of the life of the underlying transmission line assets.
367. In relation to the AER's view that the life of the insulators might be extended by asset management strategies to extend the life of the underlying assets, ElectraNet responded that it was speculative to assume the underlying line assets would exceed their remaining economic life, and there was no engineering basis for this view. They

⁷¹ The AER renamed this asset class 'Transmission Line Refit – Insulators Replacement 2013-18', which ElectraNet accepted.

argued that the prudent approach, consistent with accounting standards, was to assign a life based on the average remaining life of the next limiting component group.

12.3 Our review of ElectraNet response

368. We agree with ElectraNet's view and reasoning in its RRP that once underlying transmission assets are decommissioned it would generally not be cost effective to redeploy insulators. We consider that the insulators would generally be a 'write-off' due to the high labour and other costs of redeployment.
369. However, we consider that where it is possible to extend the life of the underlying assets through asset management strategies, then the economic life of the insulators could be extended to their technical life.
370. ElectraNet argue that they do not have adequate engineering information to take this approach, although this seems to contradict its assumption that they have adequate knowledge to determine 'next limiting component by condition assessment' and to provide a reasonable time span for asset life for these components.
371. We consider that a prime benefit of ElectraNet's move from an age-based asset management strategy to a condition-based asset management strategy should be the ability to extend asset lives without adversely affecting network performance. The operational refurbishment work conducted under the condition-based maintenance strategy is specifically designed to extend asset lives by deferring replacement. This is an example of the payback of the condition-based maintenance approach of using increased opex to extend asset lives. Our experience is that condition-based maintenance strategies on a worldwide basis have been highly successful in extending transmission tower asset lives, which are according to ElectraNet the assets mainly responsible for being the next limiting component.
372. EMCa would also suggest that if the life of the next limiting component has been determined sufficiently such that it is 15 years or less, then it calls into question these projects being categorised as capex refit projects. It may be the case that a more effective solution might be ongoing corrective maintenance to replace identified faulty insulators either on an incident by incident basis or in batch under operational refurbishment utilising opex rather than capex. On that basis, the expenditure may be less than has been proposed and may also be better classified as operational refurbishment because the expenditure ensures that the assets reach their predicted life rather than extending asset life.
373. On balance EMCa is convinced by the case put by ElectraNet that the insulators in question are defective and that better network reliability would be ensured by complete replacement. However, we consider the economic case is only justified if ElectraNet can be confident that the tower structures of the lines can have asset lives extended to a reasonable expected life of the replacement insulators.

374. ElectraNet is generally proposing to refit insulators during the 2013-18 RCP with 40 year technical lives rather than 20 year technical lives (see Table 10-1).⁷² This suggests that ElectraNet anticipates the likelihood that they will achieve more than 20 years' life from the insulators. If ElectraNet is not able to extend the lives of specific underlying assets through its asset management strategies, then it will be able to write off insulator lives under the TALC replacement plans at the time that the underlying assets are decommissioned. This can be done on a case-by-case basis for particular assets rather than, as ElectraNet has suggested, by adopting a uniform approach of shortening the lives of all insulators to 15 years.

12.4 Findings and recommendations

12.4.1 Findings

375. ElectraNet's argument that refit asset lives should be based on the time to next component failure (and which ElectraNet has stated to be 15 years) is not reasonable. It is considerably more likely in our view that the lines will be further refurbished and the refit components will last longer than the time to next component failure.
376. ElectraNet has purchased insulators with 40 year technical lives. It could have purchased with 20 year technical lives, but has not done so.
377. We consider it unlikely that the insulators could be refitted to other lines, but our recommendation does not rely on this assumption

12.4.2 Recommendation

378. We recommend that the AER maintains the position set out in the Draft Decision to assign an asset life of 27 years to the 'Transmission lines refit—insulators replacement 2013–18' asset class for the 2013-18 RCP.

⁷² ElectraNet RRP, p.133.

Appendices

Appendix 1: Analysis of proposed land and easement projects

EC 11630 Eyre Peninsula Reinforcement – Land Acquisition

379. This project is related to contingent project EC11201 Lower Eyre Peninsula Reinforcement, which is not scheduled for commissioning till 2024. The Revenue Proposal indicated 2018-2022 as the dates for EC 11201 and this has now been delayed. This suggests some delay in the timing of EC 11630 should be possible.
380. The project covers the land and easements for the 285km 275kV line from Cultana to Port Lincoln. The original proposal was to increase the easement width from 50m to 100m in order to accommodate a future 500kV line. We questioned the timing and justification for this. ElectraNet were asked to clarify the width of easement in the revised project and whether the budget reflects a 50m or 100m wide easement, but have yet to respond.
381. The project should be considered for inclusion on a cost benefit basis. There are two areas of the 285km line between Cultana and Port Lincoln where it may be increasingly difficult to secure easements in the future. [C-I-C]
- [REDACTED]
382. [C-I-C]
- [REDACTED]
- The net present cost of the deferred alternative is presented as \$42.8m compared with \$12.0m if included in this budget.
383. For the purposes of this revenue determination, EMCa recommends that the 2014-18 project cost be reduced by 40%, from \$10.7m to \$6.4m, by focussing only on the 85km of these two critical regions of the line route with deferral of activities on the remaining 200km of the line route till after 2018.

EC 11132 Fleurieu Peninsula Strategic Land and Easement Acquisition

384. This project relates to Network Project EC10313 Fleurieu Peninsula Reinforcement. Note that this land and easement project has increased from \$5.3m in the RP to \$7.4m in the RRP.
385. The project covers route assessment, investigation and acquisition of land and easements for 65km of 50m wide land for a 275kV line from Kanmantoo to Currency Creek. The line project was scheduled in the RP for completion in 2024. The primary argument for such early completion of this land and easements project is the time required for consultation and securing approvals and the possible cost of purchasing

additional land and constructing additional 275kV line if the optimal route is not achievable after 2018.

386. The region is currently largely agricultural, with a mixture of tourism, low level industrial and mining. It is anticipated that there may be intensive mining growth in the future. The line passes through predominately farming land of various types, none of which are likely to make it uneconomic to obtain easements at a later date. Furthermore, the terrain is of an open nature which would allow easy re-routing at relatively low cost.
387. The cost benefit evaluates the RRP case against an alternative requiring an additional 5km of easements plus 5km of 275kV line. This indicates a net present cost of \$15.8m for the alternative, against \$14.6m for the base case. In this evaluation the cost in 2022 of the original easements has risen to \$11.1m, however the additional 5km of easements for the increased route length is included at an additional cost of \$12.0m, which seems excessive and skews the cost benefit. Notwithstanding that, the low cost advantage of doing the project in the next RCP is not justified with the considerable uncertainty of the growth in demand.
388. The project should be excluded.

EC 11738 Mallala to Para 275kV Double Circuit Land & Easements

389. This project involves the acquisition of easements and development rights to enable the construction of 37.6 km of 275kV double circuit transmission line from Para Substation to Mallala Substation via the new Munno Para Substation. The line is part of the backbone 275kV grid and is expected to be required by 2032 when the thermal loading limits of existing lines are anticipated to be exceeded. A key consideration is that this line is considered a definite future requirement, even if the timing is uncertain. Hence the land and easements will not risk being stranded.
390. The acquisition of land and easements is planned to be completed by 2015. The justification for this being 14 years prior to construction commencement is that it is through an area signalled in the Greater Adelaide 30 Year Plan for significant urban development. Furthermore it is considered the only viable route for this grid strengthening and the only alternative is stated to be the inclusion of 6.6km of underground cable.
391. ElectraNet has supplied an options evaluation in which a variation of the original Revenue Proposal option is considered. This splits the project into two, the first being the acquisition of easements for the 6.6km of the route considered high risk in 2015, with the remaining 31.0km acquired in 2026. This option has a lower Net Present Cost and reduces the current project cost to \$8.6m.
392. This option is supported for inclusion at \$8.6m in the next RCP.

EC 11739 Templers to Para 275kV Double Circuit Land & Easements

393. This project involves the acquisition of easements to enable the rebuild of the existing 35.0km single circuit 275kV line as a double circuit 275kV line. The existing line is already over 50 years old. The new lines are to service increases in local residential, commercial and industrial loads.

394. ElectraNet consider there to be considerable risk of spreading urban development over the next 15 years which places 7.1km of the route in jeopardy of encroachment. There is no viable alternative route forcing the alternative of underground cable.
395. In the economic evaluation ElectraNet has introduced a new option which covers acquisition of easements for the 7.1km of high risk route by 2015, and defers the remaining 27.9km until the following Period. This option has a lower Net Present Cost than all other alternatives.
396. Under this option the cost in the next RCP is \$6.0m, with a further \$1.2m required in the subsequent RCP.
397. This option is supported.

EC 11383 Mt Barker South Triple Circuit Easement Expansion

398. This project provides for the acquisition of land and easements for a 4.1km route of 50m width alongside the existing triple circuit 275kV line. This is to enable the replacement of this line in due course due to asset condition in the next 20-30 years. The line is a key part of the grid.
399. The line is adjacent to the town of Mt Barker and there is currently consideration being given to rezoning an area including half the length of this line. ElectraNet consider that there is significant risk of urban development encroaching on the line route. However the Mt Barker Development Plan includes 'Principles of Development Control' in recognition of the need for development to consider the provision for the duplication of the power line as follows:
- Section 55: Development in proximity to infrastructure facilities should be sited and of a scale to ensure adequate separation to protect people and property;
 - Section 56: Development should make provision for the duplication of high voltage power lines south of the existing easement.

The only viable alternative is to replace the overhead lines with underground cables, at a much higher cost. The cost benefit analysis produces a net present cost for this alternative of \$9.9m compared with the preferred proposal cost of \$5.5m. (Note: The RRP shows a capex cost of \$4.4m, and a further \$1.4m is now shown as WIP and therefore appears to have been already purchased.)

This is a fine call. On the basis of the clear statements in the Mt Barker Development Plan, it is recommended that the project be deferred and that ElectraNet make strenuous efforts if necessary to protect the route via appeal against any changes to zoning that might impinge on the extra 50m width.

EC 11461 Cultana to Stony Point Land and Easement Acquisition

400. This project provides for the acquisition of a 50m wide easement for a new 275kV line over 25km between Cultana and Stony Point. It also covers the cost of land for a substation at Stony Point. This is associated with project EC 12802 Cultana to Stony Point 275kV Augmentation.
401. The total cost of this option in the next RCP is \$0.8m and the alternative if part of the route is constrained in the future is undergrounding with much higher costs. Although timing of the load increase is uncertain, it seems highly likely and the cost is minor.

402. It is not clear from the information provided as to why this project is so cheap.

403. It is recommended that this project be approved.

Appendix 2: Analysis of proposed contingent projects

Supporting information

404. The following table (table 21) summarises the revisions to triggers that would be required in order to accept the proposed contingent projects, with triggers to be modified in a manner represented by the templates in table 22.

Table 21: Summary of drivers and approaches for triggers

EN RP App. #	Project	Driver	Approach for trigger
Load driven – Step load causing demand increase			
21	Upper North Region Line Reinforcement	Load driven (step load)	EN to use template
2	Lower Eyre	Load driven (step load)	EN to use template
6	Yorke	Load driven (step load)	EN to use template
N/A	East Terrace	Load driven (step load)	EN to use template
16	Mid North Connection Point	Load driven (step load)	EN to use template
17	Port Pirie system reinforcement	Load driven (step load)	EN to use template
Market benefits			
8	South East to Heywood Interconnection Upgrade	Market benefits	Same as draft decision
11	Upper South East	Market benefits or new generation	To be amended to mention the constraint hours. An alternative trigger will be generation of X MW coming on ine.
Other			
4	Riverland Reinforcement	AEMO publication that available demand has fallen	To be amended to include actual available dispatch
10	Davenport Reactive Support	Retirement of generator	Same as draft decision
5	Fleurieu	Distribution system generation support option fails	To be amended to reflect actual driver. – Specific reference to trigger being the DNSP's inability to proceed with the proposed 50MW (firm capacity) generator
REJECT			
14	Northern Suburbs	REJECT (organic load driven)	REJECT

Source: EMCa analysis

405. The templates below are presented to assist with the specification of compliant triggers.

Table 22: *Indicative templates for trigger events*

<p>Lower Eyre</p>	<ol style="list-style-type: none"> 1. Customer commitment [such as for major new mining loads] to connect to the transmission network [south of Cultana] resulting in a step load increase in demand: <ul style="list-style-type: none"> - exceeding [50 MW], over and above the 2012–13 medium 10% PoE demand forecast of [87.5MW], - therefore requiring supply capacity in excess of [137.5MW] in total at [Port Lincoln, Middleback, Yadnarie, Wudinna and/or any new] connection points [on that part of the network] and - causing the [Cultana to Yadnarie 132 kV transmission line] to exceed its thermal limit of [73 MVA]. 2. Successful completion of the regulatory investment test for transmission including a comprehensive assessment of credible options showing a transmission investment is justified 3. ElectraNet Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.
<p>Port Pirie system reinforcement</p>	<ol style="list-style-type: none"> 1. Addition of a step load [such as a smelter extension] in the [Port Pirie area] <ul style="list-style-type: none"> - exceeding [12 MW], over and above the 2012–13 medium 10% PoE demand forecast of [81MW], - therefore requiring supply capacity in excess of [93MW] at [Port Pirie] connection points <p>that causes:</p> <ol style="list-style-type: none"> a. the total load on the [Bungama to Port Pirie 33 kV sub-transmission lines] to exceed their thermal rating [84 MVA] for an outage of the [Bungama to Port Pirie 132 kV transmission line] or [Port Pirie 132/33 kV transformer]; OR b. the total load on [the grouped Bungama to Port Pirie connection points] exceeding [93 MVA] causing [low voltage at Bungama for the loss of the single 200 MVA 275/132 kV transformer] 2. Successful completion of the Regulatory Test or regulatory investment test for transmission (as applicable), including a comprehensive assessment of credible options demonstrating that a transmission reinforcement in the region is economically justified 3. Formal request for an expanded regulated connection point from the DNSP 4. ElectraNet Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.

Source: EMCa analysis

406. The following table documents the key information presented regarding each of the contingent projects, and summarises the basis for EMCa's findings and recommendations.

Table 23: Contingent projects- project review summary

Project	Key Trigger	Cost	Comments	Recommendation
2 - Lower Eyre Peninsula Reinforcement	1. Customer commitment to a step load increase exceeding 50 MW on the transmission network south of Cultana substation, causing the Cultana to Yadnarie 132 kV transmission line to exceed its thermal limit (73 MVA)	\$340m (RP was \$588m)	<ul style="list-style-type: none"> Current load 30MW with general load forecast to increase to 47MW by 2018 (down from 51MW in RP) Step load driven – step exceeds general load forecast. Probable and specific large scale mining (mainly iron ore) 	<ul style="list-style-type: none"> Accept, provided trigger is modified with more objective definition of step load (what the step load is relative to)
4 - Riverland Reinforcement	1. Publication by AEMO of available Murraylink dispatch into South Australia that is insufficient to provide adequate support to the Riverland causing thermal limitations on the Robertstown to Berri transmission lines	\$400m (RP was \$407m)	<ul style="list-style-type: none"> Driven by decreasing transfer capability into SA Riverland region. This would be exacerbated by higher demand growth, but that is not the primary driver. General load growth forecast 127 MW by 2018 (down from 138MW in RP) Load is 120 	<ul style="list-style-type: none"> Accept provided trigger is modified
5 - Fleurieu Peninsula Reinforcement	1. Load growth in the distribution system in the Fleurieu Peninsula region that causes the total load on the Willunga to Square Water Hole 66 kV sub-transmission line to exceed its thermal limit (72 MVA)	\$210m (no change)	<ul style="list-style-type: none"> ElectraNet's current demand forecast would mean required in 2025. Further information indicates that load growth in itself is not the driver. [C-I-C] 	<ul style="list-style-type: none"> Accept provided trigger is modified trigger – reference to generation not proceeding

Project	Key Trigger	Cost	Comments	Recommendation
			[C-I-C]	
6 - Yorke Peninsula Reinforcement	1. Customer commitment to a step load increase exceeding 60 MW on the transmission network south of Ardrossan West substation, causing the Bungama to Snowtown to Hummocks 132 kV transmission line to exceed its thermal limit (105 MVA) on loss of the Waterloo to Hummocks 132 kV transmission line (and vice versa)	\$190m (RP was \$191m)	<ul style="list-style-type: none"> • Load forecast rising from 67MW current to 82MW by 2018 (down from 85MW in RP); • Driven by “load enquiries for significant connections” - mining based step load. 	<ul style="list-style-type: none"> • Accept provided trigger is modified (in relation to step change)
8. South East to Heywood Interconnection Upgrade	1. Successful completion of the regulatory investment test for transmission demonstrating positive net market benefits	\$63m (RP was \$96m)	<ul style="list-style-type: none"> • Project looks sufficiently “probable” to include, on a market benefits basis. Though note 9 Jan 2013 AEMO/ElectraNet report that the “magnitude of the net market benefits... are uncertain at this time”. 	<ul style="list-style-type: none"> • Accept provided trigger is modified
10. Davenport Reactive Support	1. Commitment to the temporary or permanent closure of Playford and Northern Power Stations during the South Australian summer period	\$42m (no change)	<ul style="list-style-type: none"> • Driven by thermal constraint and voltage and stability issues under single-contingency outage conditions (if these plants not operating); • Project looks sufficiently probably to include; • This was only compliant project accepted in the EMCa TR. (though not accepted in DD due to minor issues with original trigger definition). 	<ul style="list-style-type: none"> • Accept

Project	Key Trigger	Cost	Comments	Recommendation
11 - Upper South East Generation Expansion	1. Publication by AEMO of evidence of material constraints in the South East region of the transmission network	\$50m (RP was \$48m)	<ul style="list-style-type: none"> RRP contains reference to economic dispatch being affected at the moment; RRP contains reference to “if” new generation occurs and/or there is increased import and/or export through the interconnector with Victoria; Further information indicates constraints of the order of 3,500 hours, and current enquiry and studies relating to a significant size new generator; Note the “magnitude of the net market benefits... are uncertain at this time”. 	<ul style="list-style-type: none"> Accept, provided trigger is modified
14 - Northern Suburbs Reinforcement	<p>1. Load growth in the distribution system in the northern suburbs region that causes:</p> <p>-the total load on the Para to Elizabeth Heights 66 kV sub-transmission line to exceed its thermal rating (137 MVA) for an outage of the Munno Para 275/66 kV transformer; OR</p> <p>-the need to de-radialise supply to Gawler East.</p>	\$50m (RP was \$48m)	<ul style="list-style-type: none"> Current load 364MW with general load forecast to increase to 380MW (down from 441MW in RP, i.e. 14% decrease); ElectraNet’s current demand forecast would mean required in 2021/22 with a demand of 433 MW. No evidence of a specific step load increase event that would cause this to be brought forward to 2018. 	<ul style="list-style-type: none"> Not accepted, on the basis of lack of probability and based on general load growth without a defined step load trigger event
16 - Mid North Connection Point	1. Addition of a step load to the distribution system, in the upper north east of the mid-north region that causes the total load on the Bungama to Gladstone 33 kV	\$60m (RRP was \$59m)	<ul style="list-style-type: none"> Current load 281MW with general load forecast to increase to 323MW by 2018 (down from 367MW in RP); Driven by potential step load increase – 	<ul style="list-style-type: none"> Accept, provided trigger is modified (in relation to definition of step load)

Project	Key Trigger	Cost	Comments	Recommendation
	sub-transmission line to exceed 14 MVA and causing voltage limitations in the distribution network		state government report indicating that “larger scale mining activities have a high probability of occurring”.	
17. Port Pirie System Reinforcement	<p>1. Addition of a step load in the Port Pirie area that causes:</p> <ul style="list-style-type: none"> -the total load on the Bungama to Port Pirie 33 kV sub-transmission lines to exceed their thermal rating (84 MVA) for an outage of the Bungama to Port Pirie 132 kV transmission line or Port Pirie 132/33 kV transformer; OR - the total load on the grouped Bungama to Port Pirie connection points exceeding 93 MVA causing low voltage at Bungama for the loss of the single 200 MVA 275/132 kV transformer 	\$52m (RP was \$36m)	<ul style="list-style-type: none"> • Current load 80MW with general load forecast to increase to 85MW by 2018 (down from 93MW in RP); • ElectraNet’s current demand forecast would mean required in 2024; • Evidence of potential step load sufficient to justify this project being brought forward provided in further information (ENET 347). 	<ul style="list-style-type: none"> • Accept provided trigger is modified to refer to required step load increase
21. Upper North Region Line Reinforcement	1. Customer commitment to connect a step load along the Davenport to Pimba 132 kV transmission line that causes the total load to exceed 76 MW causing thermal limitations on the network	\$60m (RP was \$62m)	<ul style="list-style-type: none"> • Load previously identified for this region was 6.5MW and forecast flat (down from growth to 6.8MW in RP) • [Note: At time of drafting it remains unclear, pending clarification from ElectraNet, which connection points this project relates to and therefore cannot be matched to connection point demand forecasts provided by ElectraNet. The trigger must be specified in relation to 	<ul style="list-style-type: none"> • Accept, provided trigger is modified

Project	Key Trigger	Cost	Comments	Recommendation
			<p>measurable loads and not to a line thermal limit that has not been related to measurable loads];</p> <ul style="list-style-type: none"> • Driven by “growing interest in mineral exploration and resource development”; • Trigger involves a potential significant step increase and it appears that any such step increase would drive a need to augment capacity. 	
East Terrace Transformer	1. Forecast load exceeding 270MVA in the Adelaide central region	\$23m (not included in RP)	<ul style="list-style-type: none"> • Current demand is 224MW with RRP forecast rising to 247MW by 2018 (versus 283MW in RP). While High forecast not provided, extrapolating from RP band would indicate 265MW high demand forecast by 2018; • RRP states that, in the absence of a step increase, load will not exceed 270MVA until 2025/26; • Further information [ENET347(C)] provides evidence supporting the qualitative information in the RRP regarding two potential step loads: “state government’s proposed electric train network”, and a new hospital, totalling a net step increase of the order of 18 MW. In conjunction with a High demand level, this would lead to a load exceeding 270MVA and could 	<ul style="list-style-type: none"> • Accept, provided trigger is modified to include reference to the specific step loads and their quantities.



Project	Key Trigger	Cost	Comments	Recommendation
			reasonably trigger the proposed expansion.	

Source: RRP, RP, EMCa analysis

Appendix 3: Comments on ElectraNet response to prudency assessment from previous project sample review

407. We have considered ElectraNet's comments on the sample replacement projects (Kincraig substation, Kanmantoo substation, unit asset replacement) and provide the following observations.

Kincraig substation replacement

408. ElectraNet have deferred the Kincraig substation replacement project until 2020 therefore outside the 2013/18 RCP. The deferral has been attributed to the change in demand forecast methodology. However, ElectraNet provide some comments on EMCa's assessment of the project.

409. As the project has been deferred we do not intend to respond in detail to ElectraNet's comments on our review of this project other than to note that:

- ElectraNet identify that the use of prudency gains are likely to be available in the project, for example through consideration and consultation prior to application of the regulatory test;
- The documentation originally provided by ElectraNet for this project identified that a number of assets in the substation required replacement within 1 – 5 years. In managing the replacement of components of this project to fit to the new expected requirement date to meet demand ElectraNet appear to be making prudent decisions on the management of the substation assets;
- The estimated project cost provided by ElectraNet with the project documentation was \$36m. The substation load in 2020 is now forecast to be just over 30MW⁷³ and the current transformer capacity 2 x 25MW. The proposed transformer capacity is 2 x 60MW which will be 100% greater than that required to meet the expected demand in 2020.

Kanmantoo substations

410. Kanmantoo substation is currently Category 1. ElectraNet is seeking to change the status to Category 2. EMCa has not raised questions regarding the need to undertake this project on the basis of asset age and condition. We questioned why the substation is being replaced to a higher standard given that there are no step changes in load at this connection point.

411. ElectraNet proposes an investment to deliver n-1 security level when category 1 only requires n. ElectraNet has justified the higher replacement standard on the basis of its own economic assessment and has subsequently requested that ESCOSA reclassifies the connection as Category 2.

⁷³ RRP appendix G

412. In its economic assessment ElectraNet has used the South Australia state Value of Customer Reliability (VCR) of \$46,600/MWh. ElectraNet has calculated that this will deliver a present value of benefit from avoided unserved energy of \$17.9m. The forecast maximum demand for 2017/18 for the Kanmantoo substation is 2.7MW.
413. We note that: AEMO recommends the use of these values with appropriate caution as they do not represent regional specific survey responses. These figures are indicative for each state and it should be recognised that they will not affect planning decisions in each of those states because of the nature of the planning standards.⁷⁴
414. We concur with AEMO as experience from our own work in this area indicates that the less energy intensive businesses in central city business areas drive the higher values of lost load rather than higher energy intensive industrial consumers. It is also common that the industrial customers have not built in redundancy on their own site plant.
415. ElectraNet's use of the state VCR delivers a conclusion that the customers supplied via Kanmantoo substation would be prepared to pay \$17.5m to avoid the risk of a single transformer failure. If this is the case it would have been expected that the customers would, in the past, have been very willing to pay for the second transformer themselves.
416. In addition, ElectraNet have assumed that planned outages will incur the maximum VCR, yet in practice planned outages would be timed in coordination with the customers to avoid high cost of outages. Also, in using a standard methodology, ElectraNet has assumed that unplanned outages will occur each year. It is questionable that this would be the case given that the existing transformer will be replaced by a new one.
417. The results obtained from the economic analysis suggest that a local study should be undertaken to determine the accuracy of the VCR for customers connected to the Kanmantoo prior to changing the category of this substation. We would expect that ESCOSA will undertake a review of ElectraNet's economic analysis prior to raising the category of this connection. Such a review should take into account the nature of the connected customers and the likely outage risks.
418. Our review of this project has indicated that, in the early phase of a project, ElectraNet apply a standard input assumptions to the CBA and use of the State VCR. We would expect the assumptions including VCR to be reviewed and refined during the later stages of the project development.
419. We remain of the view that this project demonstrates that prudence gains are likely to be available as ElectraNet progresses the replacement project designs and as, ElectraNet notes in the RRP, through consideration and consultation prior to application of the regulatory test. Further we note that it is an integral part of the SA

⁷⁴<http://www.aemo.com.au/Electricity/Policies-and-Procedures/Planning/National-Value-of-Customer-Reliability-VCR>

regulatory framework that ElectraNet plans to reliability requirements that are externally set by ESCOSA and we do not consider it valid to overlook this framework when it produces an outcome that ElectraNet disagrees with.

Unit asset replacements

420. ElectraNet's proposed unit asset replacements are very early-stage and conceptual. It is almost certain that the full program will not be delivered as currently proposed for regulatory purposes. Given ElectraNet's asset management planning methodologies and the experience and knowledge of its contractors we consider that prudent decisions will be made that will reduce the overall cost of the program when it is implemented. Our analysis of historical outcomes has identified that prudence gains have been achieved in the past and we consider this to be an aspect of prudent management that will continue.

Appendix 4: Macro-level data comparison

CAPEX

421. The following table shows the proposed capex at the category level, tracking from the initial RP, EMCa's Technical Review, the Draft Decision and the RRP.
422. RRP augmentation, connection, replacement and land/easements capex are significantly below what was proposed in the RP. Augmentation and connection capex are also less than the draft decision, while replacement, refurbishment, land/easements and security/compliance capex are considerably more than the draft decision. Other categories are similar to the RP.
423. We have been asked to investigate and report on the following capex components:
- Augmentation and connection capex (B.1);
 - Replacement and refurbishment capex (B.2);
 - Easements and land capex (B.3).
424. We have also been asked to consider further the portfolio risk factor and prudence adjustments (B.4) which affect a number of capex categories. The requested further review of asset management (B.6) also has implications for replacement and refurbishment capex.

Table 24: Capex comparison RP to RRP – Next RCP period⁷⁵

\$million (real 2012/13)

	Revised RP						AER Draft Decision	EMCa Recommended	Initial RP
	2013/14	2014/15	2015/16	2016/17	2017/18	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Augmentation	38.0	11.4	10.7	12.7	15.3	88.3	98.7	98.3	117.9
Connection	39.0	17.4	17.8	10.6	3.8	88.5	101.8	101.8	133.3
Replacement	86.0	66.6	71.9	81.6	36.6	342.7	261.6	148.0	398.0
Refurbishment	1.1	6.2	29.5	14.7	2.1	53.6	42.1	43.1	54.1
Easement/Land	12.5	21.2	6.1	1.5	-	41.4	13.5	14.4	65.8
Security/Compliance	17.8	13.9	14.5	10.9	8.1	65.3	57.0	57.1	57.3
Inventory/Spares	5.3	3.8	4.7	3.0	2.1	18.9	18.0	18.2	18.4
IT	10.9	10.8	11.4	7.2	5.5	45.8	43.7	43.7	43.7
Facilities	0.7	1.5	2.1	0.6	0.6	5.6	5.4	5.6	5.6
Other	-	-	-	-	-	-	-	-	-
Total	211.4	152.8	168.8	142.9	74.2	750.1	641.8	530.2	894.1

Source: RRP, RP, AER Draft Decision

425. The following table presents current RCP expenditure as presented in the RP, and in the RRP. The last two years are of note, showing that actual 2011/12 expenditure was \$6.4m less than had been estimated in the RP, but ElectraNet nevertheless now estimates \$7.3m more expenditure than the RP in 2012/13, leading to a total for the current RCP that is almost exactly as proposed in the RP.

⁷⁵ EMCa recommended values were based on ElectraNet escalation factors, whereas the AER's Draft Decision applied different escalation factors.

Table 25: Capex comparison RP to RRP – Current RCP period

	RP						RRP						Difference
	2008/09	2009/10	2010/11	2011/12	2012/13	Total	2008/09	2009/10	2010/11	2011/12	2012/13	Total	
Augmentation	15.9	45.9	169.3	74.3	56.4	361.8	15.8	46.0	169.3	77.0	57.5	365.6	3.8
Connection	13.2	22.5	30.2	24.4	35.6	126.0	13.2	22.5	30.2	15.5	22.5	103.9	- 22.1
Replacement	61.5	37.8	20.1	48.5	69.5	237.4	61.5	37.8	20.1	51.5	93.1	264.0	26.7
Refurbishment	-	-	-	-	0.0	0.0	-	-	-	-	0.0	0.0	-
Strategic land/ easements	1.3	0.2	1.2	12.6	14.5	30.0	1.3	0.2	1.3	12.5	14.9	30.2	0.2
Security/compliance	4.1	8.7	11.5	14.5	23.8	62.7	4.1	8.6	11.5	14.6	18.4	57.3	- 5.3
Inventory/spares	4.3	2.6	2.3	2.5	4.1	15.8	4.3	2.6	2.3	0.5	3.5	13.3	- 2.6
Total Network	100.3	117.8	234.6	176.8	204.1	833.6	100.3	117.7	234.7	171.6	209.9	834.3	0.7
Business IT	7.1	6.3	7.6	7.9	12.7	41.6	7.1	6.3	7.6	6.9	13.8	41.7	0.1
Buildings/facilities	1.0	3.1	0.8	1.2	1.9	7.9	1.0	3.1	0.8	1.1	2.3	8.2	0.4
Total Non-network	8.1	9.3	8.4	9.1	14.6	49.5	8.1	9.3	8.4	8.0	16.1	50.0	0.5
Total Capex	108.36	127.1	243.0	186.0	218.7	883.1	108.5	127.1	243.1	179.6	226.0	884.2	1.1

Source: RRP, RP

OPEX

426. The following table shows proposed opex at the category level. Our main observations on this are that:

- Routine maintenance is similar and the Draft Decision has been accepted;
- RRP corrective maintenance and operational refurbishment is almost identical to that proposed in the RP. The Draft Decision was considerably less than this amount in both cases, and was also less than we proposed in our Technical Review of the RP;
- Network operations has been reduced by \$3.5m but is slightly above the Draft Decision, which was in turn slightly below what we proposed in our Technical Review;
- Network Optimisation is considerably less than was initially proposed. EMCa accepted the previously proposed work, but this was not accepted in the Draft Decision;
- RRP support costs are almost the same as the RP, and \$15.2m more than the Draft Decision, which was in turn similar to what we proposed in our Technical Review.

427. We have been asked to investigate and report on the following opex components:

- Corrective maintenance (B.7);
- Operational refurbishment (B.8);
- Network optimization (B.10).

428. We have also been asked to consider further the opex efficiency factor (B.9), which applies to all proposed opex. The requested review of asset management also has implications for our assessment of corrective maintenance and operational refurbishment.

Table 26: Opex comparison RP to RRP – Next RCP period

	Revised RP						AER Draft Decision	EMCa Recommendation	Initial RP
	2013/14	2014/15	2015/16	2016/17	2017/18	Total (\$m)	Total (\$m)	Total (\$m)	Total (\$m)
Routine maintenance	15.0	15.5	15.7	17.0	17.8	80.9	80.9	78.9	80.9
Corrective maintenance	14.9	15.1	14.0	12.1	12.3	68.4	43.7	48.1	68.8
Operational refurbishment	12.4	15.3	15.2	12.5	11.3	66.8	47.0	48.8	64.9
Network operations	8.3	8.5	8.8	9.0	9.2	43.8	40.3	41.4	47.4
NORM / Network Optimisation	0.8	1.2	1.2	1.2	0.5	4.9	-	13.0	13.3
Support	27.3	27.9	28.8	31.2	31.7	146.9	131.7	129.4	147.4
Total	78.5	83.6	83.7	83.0	82.9	411.7	343.6	359.6	422.8

Source: RRP, RP, EMCa TR report, AER Draft Decision

Table 27: Opex comparison RP to RRP – Current RCP period

	RP						RRP						Difference
	2008/09	2009/10	2010/11	2011/12	2012/13	Total	2008/09	2009/10	2010/11	2011/12	2012/13	Total	
Routine Maintenance	9.8	9.3	12.0	13.4	13.4	57.9	9.8	9.3	12.0	13.4	13.4	57.9	0.0
Corrective Maintenance	6.7	7.6	7.4	11.9	9.2	42.8	6.7	7.6	7.4	11.9	9.2	42.8	0.0
Operational Refurbishment	6.5	8.1	8.2	7.0	6.0	35.8	6.5	8.1	8.2	7.0	6.0	35.8	0.0
Network Optimisation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance Support	9.2	8.8	8.8	11.0	10.9	48.7	8.1	7.2	7.2	8.3	10.9	41.7	7.0
Network Operations	8.1	7.2	7.2	8.3	8.9	39.7	9.2	8.8	8.8	11.0	8.9	46.7	(7.0)
Asset Management Support	8.3	8.2	8.9	9.1	10.2	44.7	8.3	8.2	8.9	9.1	10.2	44.7	0.0
Corporate Support	5.1	5.8	5.8	5.8	6.7	29.2	5.1	5.8	5.8	5.8	6.7	29.2	0.0
Total Controllable	53.7	55.0	58.3	66.5	65.3	298.8	53.7	55.0	58.3	66.5	65.3	298.8	-

\$million (real 2012/13)

Source: ENET348, RP

WIP projects

429. In the following table we have listed all WIP projects as presented in the RP and as re-presented in the RRP. To distinguish overall project cost variances from timing variances, we have added prior expenditure (i.e. expenditure within the current RCP) and proposed expenditure in the next RCP, to give total project costs.
430. Between the RP and the RRP, total expenditure on the projects now listed as WIP has increased by \$12m. (Note that a number of these projects were not listed as WIP in the RP, presumably because at that time it was not anticipated that they would have commenced. The most notable feature is that work totalling around \$23m has been brought forward from the next RCP, into the current RCP. The main contributors to this are four augmentation projects and five replacement projects that (in the RP) were not proposed to commence in the current RCP, but which have now been commenced with \$22m being incurred in the current RCP.
431. In terms of changes at the category level, we note re-categorisation of the Waterloo substation project, which accounts for \$16.5m of the reduction in connection project costs and \$19.8m of the increase in replacement project costs.
432. Land and easement purchases for two projects have been brought forward to commence in the current RCP, and higher expenditure has also been incurred now in the current RCP on Eyre Peninsula land and easements.

Table 28: WIP projects detailed comparison – RP to RRP⁷⁶

WIP Analysis table

Smillion (real 2012/13)

Project No	Project Name	RP				RRP			
		Commission date	Prior expenditure	Next RCP	Total	Commission date	Prior expenditure	Next RCP	Total
Augmentation									
10615	Ardrossan West 132kV Sub Rebuild 2x25MVA	2013	17.0	0.4	17.4	2014	17.8	0.1	17.8
11101	Cultana 275 132kV Augmentation	2014	49.7	21.5	71.1	2015	48.3	23.6	71.9
11390	Tailem Bend 132kV Reactive Power Suppo	2013	-	2.8	2.8	2014	2.5	1.6	4.0
11510	Kadina East 132kV Capacitor Bank	2013	-	3.5	3.5	2014	2.4	2.2	4.6
11528	South East Backbone Telecoms Stage 2	2014	5.0	6.4	11.4	2015	8.4	1.8	10.2
11543	Magill Telecoms Bearer	2015	-	11.8	11.8	2015	4.1	9.5	13.6
11620	Dynamic Constraint Systems	n/a	-	-	-	2015	0.1	0.3	0.4
11912	TIPS to Kilburn to Northfield 275kV Loop	2013	0.7	1.4	1.4	2014	0.9	0.6	1.5
			72.4	47.6	119.3		84.4	39.7	124.1
Connection									
10386	Hummocks 132/33 kV Transformer Upgrade	2014	3.4	7.4	10.8	2014	6.0	4.7	10.7
10503	Waterloo Substation Replacement	2013	15.7	12.8	28.5	2014	6.5	5.5	12.0
10509	Whyalla Terminal Substation Replac	2014	4.7	1.6	6.3	2015	4.8	1.1	5.9
10615	Ardrossan West 132kV Sub Rebuild 2x25MVA	2013	7.1	0.1	7.3	2014	5.1	0.0	5.1
11209	Munno Para New 275 66kV Substation	2014	10.6	33.6	44.2	2015	5.2	33.7	38.9
			41.5	55.6	97.1		27.7	45.0	72.7
Replacement									
10503	Waterloo Substation Replacement	2013	6.2	5.0	11.2	2014	16.8	14.2	31.0
10509	Whyalla Terminal Substation Replac	2014	28.4	9.0	37.4	2015	29.0	6.1	35.2
11109	TIPS 66kV Section Secondary Systems Upg.	2013	10.3	0.9	11.2	2014	10.0	1.2	11.2
11218	Network Configuration Management	n/a	-	-	-	2014	1.6	0.1	1.7
11302	Para 275kV Secondary Systems & Minor Pri	2015	18.4	32.3	50.7	2016	19.3	30.3	49.6
11322	Barn Hill Telecoms Bearer Replacement	2014	-	1.9	1.9	2014	3.1	0.3	3.4
11380	Yadnarie Reactor Replacement	n/a	-	-	-	2014	3.3	0.4	3.7
11400	Davenport 275kV Reactor Replacement Sta	n/a	-	-	-	2014	3.6	0.2	3.8
11822	Riverland Telecoms Bearer	2015	-	4.1	4.1	2015	1.1	4.1	5.2
			63.2	53.2	116.5		87.8	57.0	144.7
Others (IT/ Inventory/ Security)									
10801	Geospatial Systems	n/a	-	-	-	2014	0.7	0.3	1.0
10921	Spare 120 MVA & 200 MVA Transformers	2013	2.0	4.5	6.5	2014	1.4	3.0	4.4
11236	IEC 61850 Training & Development Facilit	2013	2.9	3.5	6.4	2015	0.6	2.7	3.3
11242	Aerial Services Implementation	n/a	-	-	-	2014	0.2	0.2	0.4
11247	Fire and Security Systems Upgrade to SDM	n/a	-	-	-	2014	1.0	1.4	2.4
11338	Estimating System Functional Upgrade	n/a	-	-	-	2014	0.6	0.7	1.3
11386	Business Process Improvement - Stage 2	2013	1.0	1.5	2.5	2014	1.0	0.5	1.4
11396	Happy Valley Transformer Noise Mitigatio	2013	1.9	2.8	4.7	2015	0.4	3.0	3.4
11398	People Management System	n/a	-	-	-	2014	0.4	0.1	0.5
11399	Environment Health and Safety Managemen	n/a	-	-	-	2014	0.0	0.5	0.5
11435	Outage Optimisation Improvements	2013	0.6	0.8	1.4	2014	0.2	0.6	0.8
11735	Transmission Line Design	2016	1.5	8.9	10.4	2016	0.9	8.9	9.8
			9.8	22.1	31.9		7.4	21.9	29.3
Land and easements									
11132	Fleurieu Peninsula Strategic Land and Easem	2015	1.0	5.7	6.7	2015	0.7	7.3	8.0
11383	Mt Barker South Triple Circuit Easement Ex	n/a	-	-	-	2016	1.4	4.4	5.8
11461	Cultana to Stony Point Land and Easement	n/a	-	-	-	2015	0.2	0.9	1.1
11630	Eyre Peninsula Reinforcement - Land Acqui	2016	1.3	13.6	14.9	2015	2.1	10.7	12.7
			2.3	19.3	21.6		4.3	23.3	27.6
Total WIP			189.2	197.9	386.4		211.6	186.7	398.4

Source: RRP, RP

⁷⁶ N.B the analysis in this table should be read at the project level, not at the portfolio level. It comprises all WIP projects now proposed (in the RRP). It does not include projects previously proposed as WIP and which are now not included.

Appendix 5: Replacement and refurbishment expenditure reconciliation

433. A reconciliation of the changes from the RP to the RRP, and including EMCa's previous adjustments and the AER's Draft Decision adjustments, is shown below.

Table 29: Replacement adjustments table

\$million (real 2012/13)

	RP	EMCa adjusted for Draft Determination	Draft Determination	RRP
Revenue proposal		398.0	398.0	
Non-WIP (no material changes)				
Pumping station	-	123.4	-	-
Others	284.2			283.7
Non-WIP with material changes				
10619 Kincaig Substation Replacement and Transformer Upgrade - Rev 9 POE	41.3	39.3		2.1
11305 Keith Substation Rebuild - Option A - Rev 13 POE	18.6	17.7		-
After Demand adjustment	344.1	217.6	341.5	285.8
Non-WIP (taken out from RRP)				
11508 Mount Gambier East	0.3			-
11620 Dynamic Constraint Systems	0.4			-
WIP Project				
10503 Waterloo Substation Replacement	5.0			14.2
10509 Whyalla Terminal Substation Replac	9.0			6.1
11109 TIPS 66kV Section Secondary Systems Upg.	0.9			1.2
11218 Network Configuration Management	-			0.1
11302 Para 275kV Secondary Systems & Minor Pri	32.3			30.3
11322 Barn Hill Telecoms Bearer Replacement	1.9			0.3
11380 Yadnarie Reactor Replacement	-			0.4
11400 Davenport 275kV Reactor Replacement Stage 3	-			0.2
11822 Riverland Telecoms Bearer	4.1			4.1
Enhanced maintenance	-	44.8	44.8	
Portfolio risk	-	13.7	13.7	
Prudency	-	11.1	19.8	
Assumed escalation		-	1.6	
	398.0	148.0	261.6	342.8

Source: RRP, RP, EMCa TR report, AER Draft Decision

434. Refurbishment has changed little as ElectraNet has rejected the adjustments contained in the AER's Draft Decision. The table below provides a breakdown of the various components of the refurbishment forecast.

Table 30: Refurbishment adjustments table

\$million (real 2012/13)

	RP	EMCa adjusted for Draft Determination	Draft Determination	RRP
Revenue Proposal		54.1	54.1	
Non-WIP projects (no material changes)	54.1			53.6
Enhanced maintenance	-	5.2	5.2	
Portfolio risk	-	2.6	2.6	
Prudency	-	3.3	3.3	
Assumed escalation		-	1.0	
	54.1	43.1	42.1	53.6

Source: RRP, RP, EMCa TR report, AER Draft Decision

Appendix 6: Observation on PwC example regarding efficient expenditure allowance and EBSS impact

435. PwC submitted a letter addressing the flow-through of opex efficiencies over a number of RCPs⁷⁷. The PwC letter contains misleading examples which do not support the purported conclusions. For example the figure below assumes that the actual opex in the next RCP is more than the regulatory allowance. For this reason, the paper erroneously concludes that allowing for on-going efficiencies is inconsistent with the EBSS.

Table 31: Example of supposed effect of the EBSS in relation to an efficient expenditure allowance

Figure 8: Year 3 gain assumed to be replicated in year 6

	Current regulatory period					Next regulatory period				
	1	2	3	4	5	6	7	8	9	10
[1] Regulatory allowance	100	100	100	100	100	90	90	90	90	90
[2] Actual opex	100	100	95	95	95	95	95	95	95	95
[3] Opex used in EBSS	100	100	95	95	95					
[4] Underspend	0	0	5	5	5					
[5] Incremental gain	0	0	5	0	0					
[6] EBSS yr 1	0	0	0	0	0	0				
[7] EBSS yr 2		0	0	0	0	0	0			
[8] EBSS yr 3			5	5	5	5	5	5		
[9] EBSS yr 4				0	0	0	0	0	0	
[10] EBSS yr 5					0	0	0	0	0	0
[11] Within-period gain	0	0	5	5	5	-5	-5	-5	-5	-5
[12] EBSS amount						5	5	5	0	0
[13] Total gain	0	0	5	5	5	0	0	0	-5	-5

Source: PwC report, Appendix K of RRP, ENET304

436. While it is not within EMCa’s scope to review the EBSS incentive arguments in the PwC paper, the adjusted opex that EMCa is advising to the AER is intended as a reasonable forecast of efficient expenditure that will actually be incurred, as is required by the NER. It is not intended as a means of clawing back a previously-realised efficiency gain.

437. In the example above, if actual expenditure was 90 (i.e. as per the assumed efficient regulatory allowance) then the business would in fact realize the 3 further years of benefit with a value of “5”, as intended by the EBSS. It is PwC’s assumption that the business under-achieves the efficient forecast of expenditure used in the regulatory allowance that gives the mistaken impression in this example that the EBSS incentive has somehow been subverted.

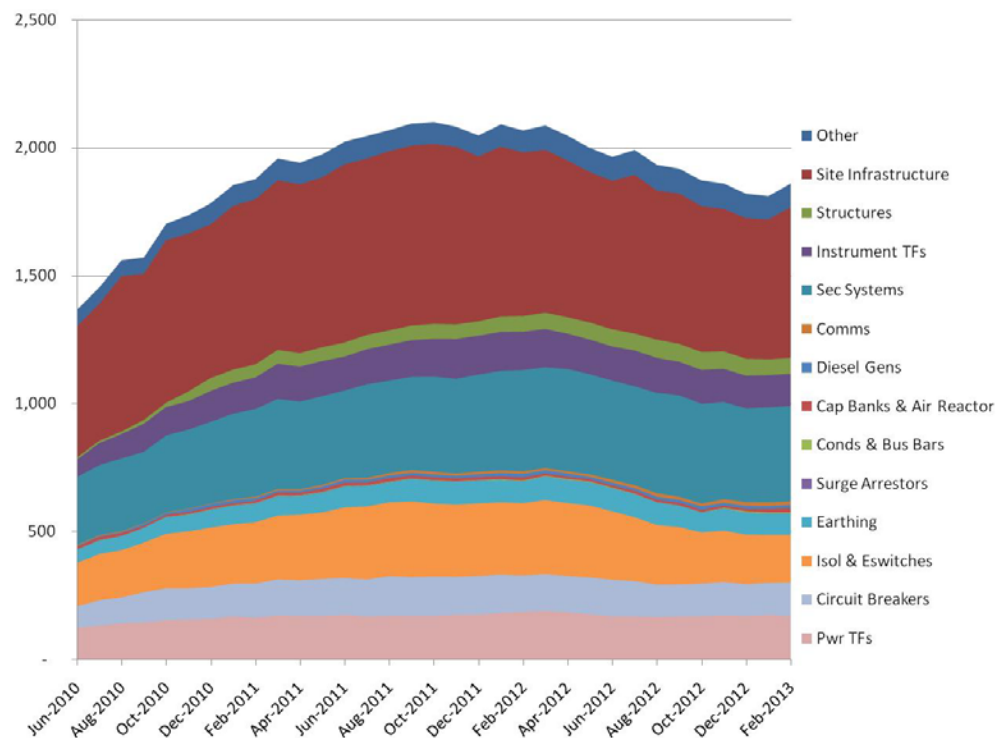
⁷⁷ RRP Appendix K, ENET304

Appendix 7: Defect maintenance analysis

438. The following table shows the nature of “active” substation defects over time, by the nature of the defect. An increase indicates that ElectraNet is deferring corrective work.

439. In broad terms it can be seen that ElectraNet is correcting defects involving power transformers and CBs at approximately the incoming rate. A large proportion of the defects relate to “site infrastructure”. It can be seen that the “stock” of active defects has been decreasing since around October 2011, due to the level of corrective maintenance being applied.

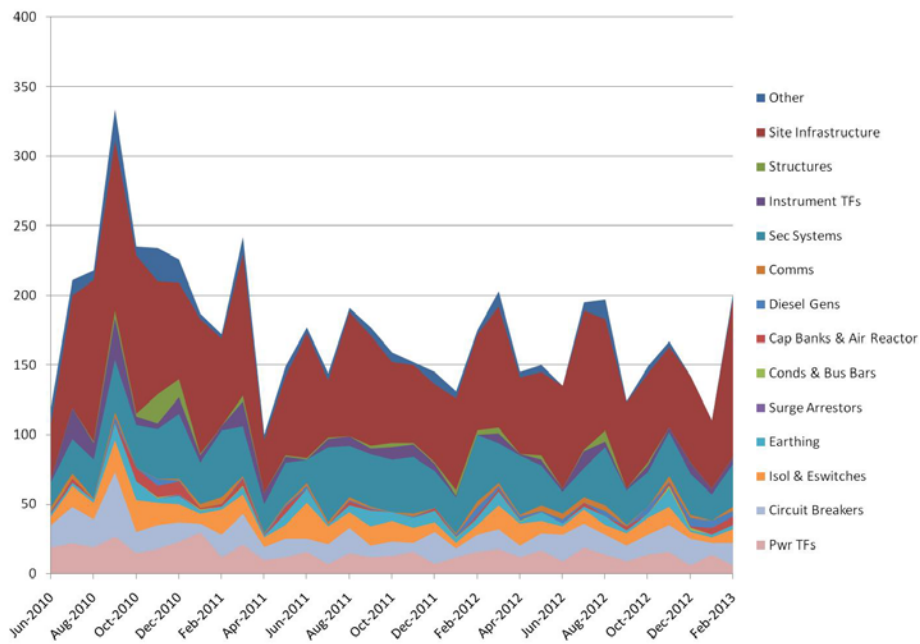
Figure 2: Substations defects (Active)



Source: ENET357

440. The following graph shows new substation defects. It can be seen that the initially high rate of incoming defects declined by around April 2011 and has remained static or declining since then. New defects relating to the main equipment (power transformers and CBs) are a relatively small proportion of overall new defects, and are also declining.

Figure 3: Substations defects (New)

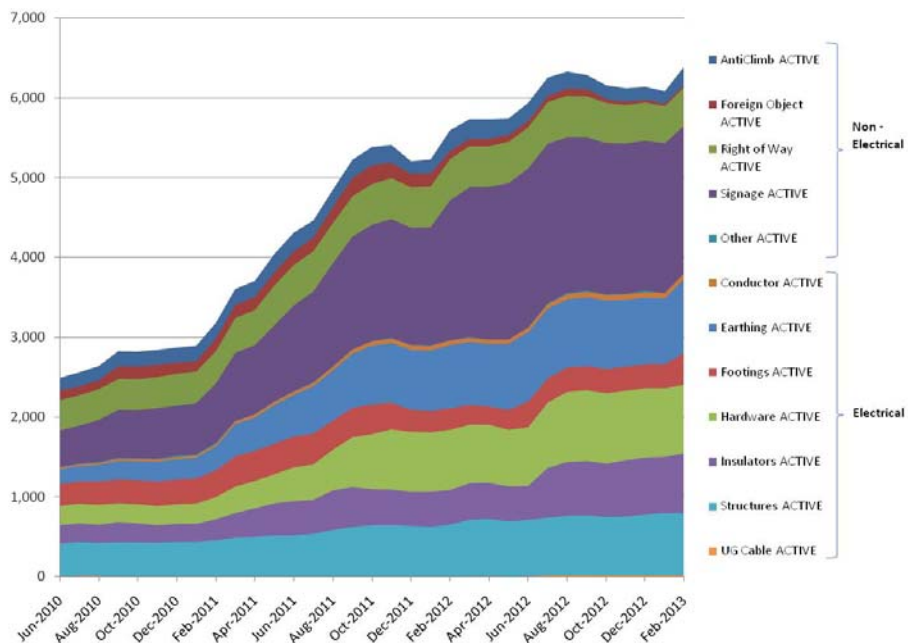


Source: ENET357

441. Then following table shows the nature of “active” lines defects over time, by the nature of the defect.

442. It can be seen that ElectraNet corrected lines defects over this period at a slower rate than incoming defects. The largest component of total defects is “signage”.

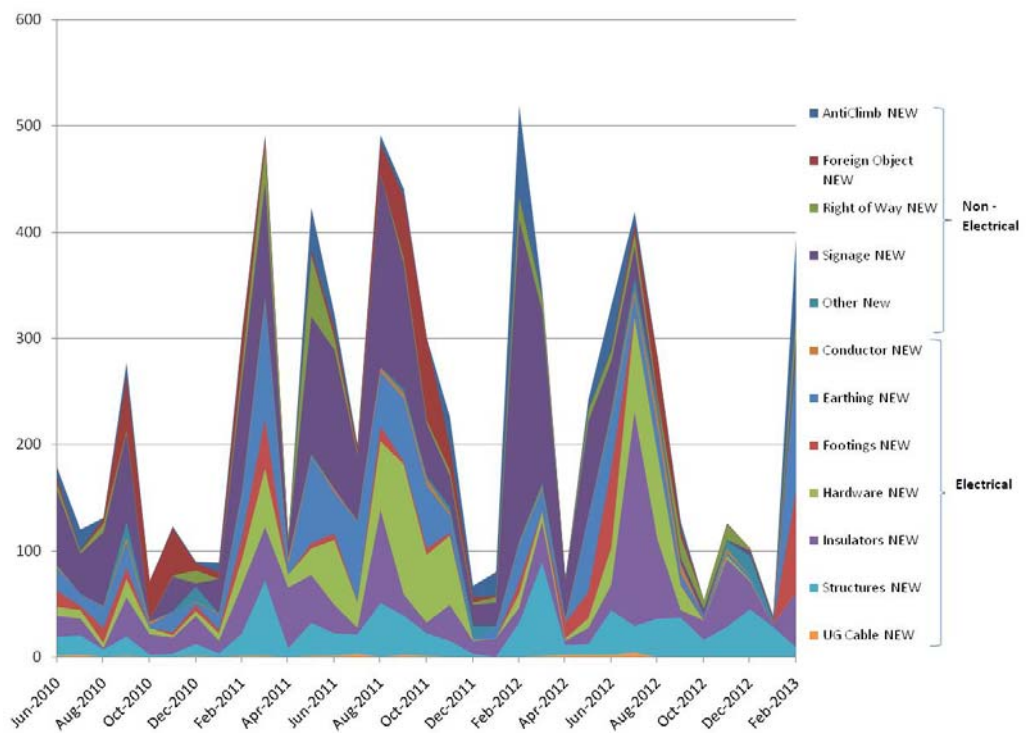
Figure 4: Lines defects (Active)



Source: ENET357

443. The following graph shows new incoming lines defects. Lines condition assessment is less far advanced than substations assessment; nevertheless the beginning of a reduction in the rate of incoming defects can be observed, from about April 2012. .

Figure 5: Lines defects(New)



Source: ENET357

- 444. ElectraNet asserts that while the volume of incoming defects has been increasing, the nature of the defects has been increasingly higher value. However this is not evident from examination of the nature of the defects as provided in the data above.
- 445. As an observation, the component defect data as originally provided in the RRP was erroneous and did not add to the total numbers of defects. EMCa sought clarification of this data and new data was provided around 10 days later. This data still does not exactly add to the totals provided, although the discrepancy is now small. It is unclear to us why data produced from ElectraNet’s comprehensive defect recording systems does not add and took a considerable amount of time to provide.

Appendix 8: Response to review feedback from ElectraNet regarding CERF and prudence adjustment analysis

446. On 25th March, the AER provided ElectraNet with EMCa's analysis of ElectraNet's current RCP project costs comparing the costs proposed with the costs incurred for each project⁷⁸. ElectraNet responded to this request with two documents: its own response (ENET368), notes on the MetService analysis⁷⁹ provided by Evans & Peck (ENET370) and a spreadsheet (ENET369).

447. We have reviewed those responses. The ElectraNet response makes a number of incorrect or exaggerated statements that are not supported either within its response or in the supporting Evans & Peck response. ElectraNet's principle statement is that

The EMCa analysis and accompanying statistical report cannot be relied on by the AER in making its final revenue determination for ElectraNet because of a number of fundamental errors and flaws in the data and analysis.

448. We address the main points made by ElectraNet and Evans & Peck as follows:

- Evans & Peck acknowledges the validity of the statistical methodology used by MetService and was able to reproduce the results from it. Evans & Peck noted that the data was different to the data provided to it by ElectraNet for its own analysis.
- Evans & Peck noted that two projects in the EMCa dataset required some adjustment. We have reviewed these two projects and we find that for one project that was proposed by ElectraNet with two line items separately categorised, the actual cost was reported in three separately categorised line items. Adding the third line item, as Evans & Peck has done, appears to be valid. For another project, ElectraNet reported a different project number for the project "as incurred" relative to the project "as proposed". On accepting that these line items are in fact the same project, then it would be valid to include this extra project in analysis. We have not recalculated the results, but the changes reported by Evans & Peck appear plausible: namely that the mean under-run has moved from -5.4% to -3.8%. Since there are only 42 projects in total, we are not surprised that making adjustments to two projects does alter the result. However the result is still a mean under-run against the costs that were proposed for these projects.
- ElectraNet has claimed that there are "a number of calculation errors" and that correcting for "just two of the more obvious errors produce materially different

⁷⁸ Request RRP17. The information provided included the underlying project data that had been analysed, and the MetService report on that analysis

⁷⁹ See appendix 9

results”. Other than the two data interpretation corrections that Evans & Peck has made, ElectraNet has not specified what other “errors” it considers have been made. ElectraNet has stated that the changes result in a finding that there was historically an overspend, not an underspend. Careful reading of Evans & Peck’s response to ElectraNet shows this statement is false. As noted above, the data changes do not produce a materially different result and they still show a mean under-run of -3.8% which does not support the +4.9% uplift that ElectraNet has proposed.

- ElectraNet claims that the sample of projects used in the EMCa analysis is “extremely limited” and “not representative of cost estimation risk”. The projects that we analysed in fact comprise all 42 projects that ElectraNet both (a) proposed and (b) completed or substantially completed within the period. It is not selective.
- ElectraNet has confirmed, as we observed from our inspection of the Evans & Peck data, that the dataset that ElectraNet provided to Evans & Peck included a number of projects that were not in fact complete but rather were at “an advanced stage in the approval process”. We have noted that the dataset that ElectraNet provided to Evans & Peck is different from the complete dataset that we have used and comprises only 29 completed projects, augmented by a further 30 projects which we assume to be those for which ElectraNet provided current estimates as “actual costs” based on them being “at an advanced stage in the approval process”.
- ElectraNet refers to our dataset including “only 12 of the 60 replacement projects in the current period”. The analysis is by definition a comparison of project costs as proposed, versus their outcome. We included all such projects and we can only assume that the additional projects that ElectraNet refers to above were either not proposed in the revenue determination for the current RCP or have not yet been completed.
- ElectraNet refers to the MetService analysis⁸⁰ being “hampered by the small dataset provided by EMCa”. As stated above, EMCa included all relevant projects and the number of observations was not materially different from the size of the dataset that ElectraNet provided to Evans & Peck. The quotation from the MetService report⁸¹ that “the lack of evidence for an effect...should not be interpreted as evidence of a lack of that effect” is a general and correct statement of statistical interpretation. Unlike the Evans & Peck analysis, we have calculated and stated confidence intervals from our analysis.
- ElectraNet has criticised EMCa’s analysis for comparing ElectraNet’s cost estimates with cost outcomes, and appears to imply that the cost estimates should have been modified by the AER’s decision for that RCP as “funding was not

⁸⁰ See appendix 9

⁸¹ See appendix 9

awarded for the full scope” of some projects. This is either a fundamental misunderstanding or a distortion of the regulatory process that ElectraNet is subject to. The AER does not provide or approve project funding; it determines revenue levels for the business. The assessment is of the validity of ElectraNet’s project cost estimation.

- ElectraNet also states that the comparisons should be with “Level A” pre-project cost estimates, not with the estimates that it provides for regulatory determination purposes, and which are at a variety of different stages. These arguments are illogical. We are currently engaged in assessing ElectraNet’s project costs as proposed in its RRP for the next RCP. It is therefore valid to compare actual costs with those that ElectraNet proposed in the past for its current RCP, regardless of the AER’s decision for revenue determination purposes and regardless that they were (as is the case now) at different stages in the estimation process at that time. The fact that they were at different stages in the cost estimation process makes the comparison more valid and more representative of the current situation.
- The Evans & Peck response to ElectraNet notes that the EMCa analysis is assessing average over-runs / under-runs and is not solely assessing asymmetric risk. This is correct. We consider that Evans & Peck’s focus on justifying an adjustment that is solely based on asymmetric risk, on the premise that the base unit cost estimates are “most likely” costs, is artificially narrow. Evans & Peck found significant mean cost overruns from the data that they were provided with, yet chose to ignore this by normalising the data to remove it and to assume (without evidence) that improvements to ElectraNet’s cost estimation processes would remove this source of variance. We are concerned with overall cost estimation accuracy and we have analysed ElectraNet’s performance in this regard.
- No evidence has been provided in regards to improvements in cost estimation accuracy.

449. We consider that the review and response provided by ElectraNet, and including Evans & Peck’s notes, has been helpful in confirming our findings. It has confirmed that our understanding of the Evans & Peck analysis and of the data that ElectraNet provided to Evans & Peck was essentially correct, has identified two minor corrections to our base data and has confirmed that the results of analysis with these two corrections supports the conclusion that we reached and the recommendations that we have made.

Appendix 9: MetService Project Budget Estimation Analysis



Project Budget Estimation Analysis

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17th February 2013

1 Introduction

A set of data containing budget estimates and actual over/under-runs for a population of 42 projects was provided, and two subsets, “A” containing 21 projects, and “B” containing 12 projects were designated. Of the 42 projects, 9 are in neither “A” or “B”; we have called this subset “C”.

The goal was to answer the following questions:

- For the “All Projects” data, what is the probability (and what level of confidence do we have) that there is a systematic bias at the aggregate portfolio level for
 - Under-estimating (that is for the total actual outcome expenditure, for the whole portfolio of projects, to be a cost over-run as opposed to a cost under-run, i.e. for the aggregate difference to be >0)
 - Under-estimating by more than 4.9% (that is, for the total actual outcome expenditure to be more than 4.9% greater than the portfolio budget, i.e. for the aggregate difference when measured as a percentage of the aggregate budget, to be $>4.9\%$)
- For subset “A”, what is the probability that this subset has, at the aggregate portfolio level, the same level of under- or over-estimation as the “All projects” total population (and with what level of confidence). And provide the probabilities and confidence levels for this subset for the 0% and 4.9% under-estimation thresholds, as for question 1.
- Likewise for subset B.

We interpret “at the aggregate portfolio level” to mean that the cost over-run is as a percentage of the total of either all projects, or either the “A” or “B” projects. In other words, the effects of over-runs on large projects will tend to out-weigh those of smaller projects. As a result, the analysis will have to take into account, somehow, the way in which such a portfolio of projects might be generated. Furthermore, when comparing (say) over-runs in “A” with those in “All projects” we must account for the fact the the projects in “A” are also contained in “All projects”.

It is also worth noting that provided there is a difference between (say) “A” and “All projects”, the probability on a-priori grounds that they do no differ is, essentially, 0. Instead we interpret this question as asking whether there is *statistically significant* evidence that they differ.

2 Non-parametric bootstrap

The data-set is relatively small, furthermore it is difficult to justify the usual sorts of normality assumptions. (Normality of both absolute and percentage over-runs is rejected by the Shapiro Wilk test [3], both for the data as a whole, and for each of the subsets, “A” and “B”.) In these circumstances a well tested procedure is the non-parametric bootstrap. [1]

In our implementation, we simulate the likely variation in the generation of the data, by sampling with replacement from the entire list of “All Projects”. Within this “bootstrap” sample of “All Projects” we will also have bootstrapped subsets “A” and “B”. Simulating a given estimate over a large number of bootstrap samples, we find the bootstrap sample standard deviation, which we use as a measure of uncertainty in our estimates over the original data.

The relevant estimates are:

- Over-run in “All Projects”: $-5\% \pm 6\%$

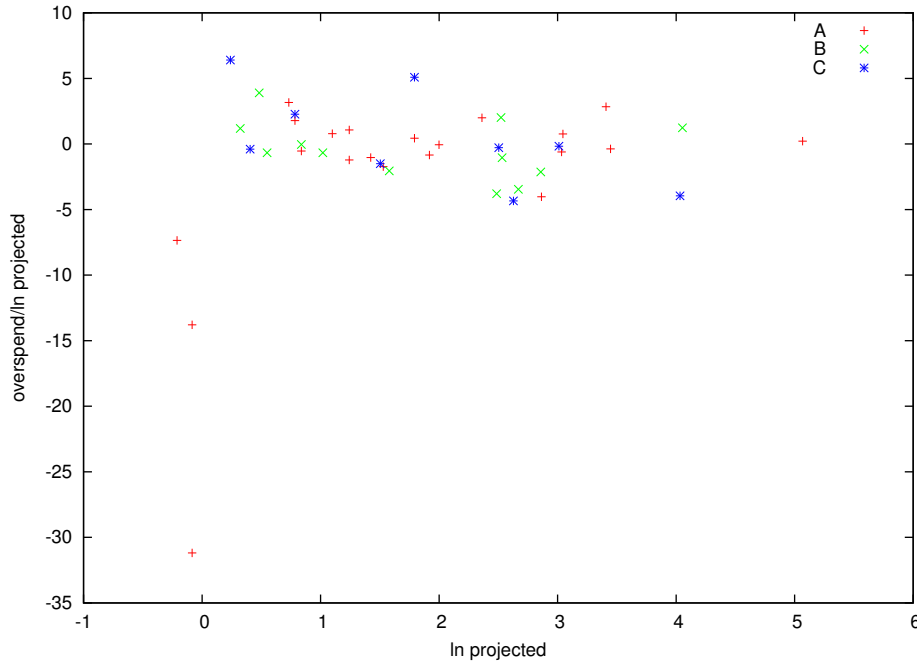


Figure 1: Plot of actual overrun divided by logarithm of the budget estimate vs the logarithm of the budget estimate.

- Over-run in “A”: $3\% \pm 7\%$
- Over-run in “B”: $-16\% \pm 15\%$
- Over-run in “A” minus Over-run in “All Projects”: $8\% \pm 7\%$.
- Over-run in “B” minus Over-run in “All Projects”: $-11\% \pm 13\%$.

Summarising, at the 5% level, the data *do not* constitute evidence that the mean aggregate

1. over-run in “All Projects”, “A”, or “B” differs significantly from 0;
2. over-run in “A”, or “B” does not exceed 4.9%;
3. over-runs of either “A” or “B” differs from that of “All Projects”.

However, there is evidence at the 5% level that the mean aggregate over-run in “All Projects” does not exceed 4.9%.

3 A Bayesian Approach

We also tried a more model-driven Bayesian approach to the problem. The model is suggested by Figure 1, in which we plot actual over-runs divided by the logarithm of the budget estimate vs the logarithm of the budget estimate. With the exception of three apparent outliers in “A” (which we will remove from further analysis), this suggests the following model for the cost over-runs, y , in terms of the proposed budget over-runs x :

$$\frac{y_i}{\log x_i} = a + b \log x_i + \epsilon_i$$

with $\epsilon \sim N(0, \sigma^2)$. Further-more, the Shapiro-Wilk test does not reject the hypothesis that the x are log-normal, so we take log-normality as a model for the project sizes.

We fit this model, allowing different values of the parameters for the different sets, “A”, “B”, and “C”, but link together the priors that we assign to these parameters so as to form a so called “hierarchical model”. The fitting was done with the MCMC package STAN. [2]

The relevant posterior estimates are given:

- Over-run in “All Projects”: $-7\% \pm 9\%$
- Over-run in “A”: $0\% \pm 11\%$
- Over-run in “B”: $-16\% \pm 22\%$
- Over-run in “A” minus Over-run in “All Projects”: $7\% \pm 10\%$.
- Over-run in “B” minus Over-run in “All Projects”: $-9\% \pm 19\%$.

Other than giving greater uncertainties, these results do not substantially disagree with the results obtained via the non-parametric bootstrap of the previous section.

Further more, we can give posterior probabilities:

- Probability that a portfolio of “All Projects” will over-run: 17%
- Probability that a portfolio of “All Projects” will over-run by more than 4.9%: 8%
- Probability that a portfolio of “A” will over-run: 46%
- Probability that a portfolio of “A” will over-run by more than 4.9%: 26%
- Probability that a portfolio of “B” will over-run: 18%
- Probability that a portfolio of “B” will over-run by more than 4.9%: 13%

4 Conclusion

Other than showing evidence that the over-run rate of “All Projects” is less than 4.9%, we were unable to find evidence to strongly support any of the suggested hypotheses. Given the relatively small amount of data that was available, this should not be surprising.

It should be remembered that the lack of evidence for an effect should not be interpreted as evidence of a lack of that effect.

References

- [1] EFRON, B., AND TIBSHIRANI, R. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. *Statistical Science* 1, 1 (1986), 54–77.
- [2] STAN DEVELOPMENT TEAM. Stan: A c++ library for probability and sampling, version 1.1, 2013.
- [3] WIKIPEDIA. Shapiro wilk test. http://en.wikipedia.org/wiki/Shapiro-Wilk_test.

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Glossary

AER	Australian Energy Regulator
AEMO	Australian Energy Market Operator
AMP	Asset Management Plan
BPO	base planning cost
DD	Draft Decision
DNSP	Distribution Network Service Provider
EBSS	Efficiency Benefit Sharing Scheme
EMCa	Energy Market Consulting associates
EN and ENET	ElectraNet
ESCOSA	Essential Services Commission of South Australia
ETC	Electricity Transmission Code (South Australia)
NER	National Electricity Rules
PMM	Project Management Methodology
PwC	Pricewaterhouse Coopers
RCP	Regulatory Control Period
RP	ElectraNet's initial Revenue Proposal
RRP	ElectraNet's Revised Revenue Proposal
SCAR	System condition and risk
STPIS	Service Target Performance Incentive Scheme

Strata	Strata Energy Consulting Limited
TALC	Total Asset Life Cycle
TNSP	Transmission Network Service Provider