



ActewAGL Regulatory Proposal 2014-2019

**Peer review of AER analysis for
the new Molonglo zone substation**

Report to

Australian Energy Regulator

from

Energy Market Consulting associates

This report has been prepared to assist the Australian Energy Regulator (AER) with its determination of the appropriate revenues to be applied to the prescribed distribution services of ActewAGL Distribution (ActewAGL). The AER's determination is conducted in accordance with its responsibilities under the National Electricity Rules (NER). This report covers a particular and limited scope review as defined by the AER and should not be read as a comprehensive assessment of ActewAGL's project or associated expenditure.

To the extent that this report utilises quantitative data, it relies on information provided to EMCa by the AER and which in turn is sourced from ActewAGL. EMCa disclaims liability for any errors or omissions, for the validity of information provided to EMCa by other parties, for the use of any information in this report by any party other than the AER and for the use of this report for any purpose other than the intended purpose.

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

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About EMCa

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

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Findings

Background

1. ActewAGL has proposed building the new 132/11kV 55MVA Molonglo zone substation in its network augmentation capital expenditure forecast for the 2014-2019 Regulatory Control Period (RCP) to meet growing demand in the Molonglo district.
2. Electricity networks are generally designed with bulk supply points (or zone substations) located as close to the load centre as possible. The Molonglo substation project is intended to provide a new supply point for the Molonglo district and ultimately to supply some projected 55,000 new consumers via ActewAGL's distribution network.

Our assessment of the options analysis

3. We have reviewed the supplied information, analysis and justification for the Molonglo project and consider that there has been insufficient analysis of the available alternate options to meet the projected demand growth. We consider that the options analysis provided by ActewAGL incorporates a bias to advance the Molonglo zone substation project. This bias is due to the absence of adequate consideration of the potential benefits of prudent deferral options.

Our assessment of the NPV analysis

4. We accept the mechanics of the model provided and applied by ActewAGL to calculate the project net present value (NPV) and to compare options, with the intent to identify the option that presents the lowest cost to consumers.
5. We have applied this model to an alternate option that includes deferral of the Molonglo zone substation project into the next RCP. This option generates a lower (net) cost of \$20.67m,¹ compared with ActewAGL's preferred solution of \$21.82m. Sensitivity analysis provides confidence that the deferral is reasonable and would present a lower cost to consumers.

¹ Calculated in NPV terms.

6. Whilst the best long term option may well be the construction of the Molonglo zone substation we consider that, on balance, ActewAGL will find that this expenditure can be prudently deferred into the next RCP. It is our view that this deferral can be achieved by:
 - adoption of the short-term feeder extensions proposed by ActewAGL (i.e., Streeton, Hilder and Black Mountain) by 2016/17 to add 8.6MVA of network capacity; and
 - addition of the Woden feeder extension in 2018/19 to add a further 5.5MVA of network capacity by 2019/20, allowing the forecast demand to be met in this RCP.
7. We consider that this deferral should not result in a material increase in risk, and should be manageable by ActewAGL.

Other findings

8. Whilst we undertook a limited analysis of the proposed options, we consider that it would have been prudent for ActewAGL to consider additional augmentation options, including non-network solutions such as Demand Side Management (DSM), to ensure that all prudent deferral options were considered. Accordingly, we consider that additional prospective benefits were not adequately explored.
9. An important benefit of deferral is the preservation of options (such as the advancement of solar PV and energy storage technologies) that may become economically attractive during the RCP and which could mitigate the potential risk of stranded investment.
10. Furthermore, we are concerned that the demand forecast included in the justification appears to incorporate an over-estimation bias. The linear growth rate used may not accurately reflect local conditions and/or adoption of new technologies and energy efficiency. This too suggests that ActewAGL may not have selected the optimal timing for the proposed Molonglo zone substation.

Preliminary assessment matters

11. Our findings, which concur with the AER's initial observations, are summarised below:
 - i. the judgment and reasoning of the AER in coming to the view that this substation is not required in the next Regulatory Control Period is sound and is drawn accurately from the project options presented by ActewAGL; and
 - ii. the supporting NPV modelling is sound and justifies the position that deferral of the Molonglo zone substation until after the 2014-19 regulatory period is reasonable.

1 Introduction

1.1 Purpose and scope of requested work

12. The purpose of this report is to provide the AER with an opinion on the analysis and modelling of the Molonglo zone substation that was undertaken by the AER as part of its review of ActewAGL's Revised Revenue Proposal (RRP). The assessment contained in this report is intended to assist the AER in its own analysis of the capital expenditure proposed for this augmentation project as an input to its Final Decision on ActewAGL's revenue requirements.
13. The AER has sought peer review by EMCa of ActewAGL's capital project submission for the Molonglo zone substation. The purpose is to:
 - provide an independent review of the material provided by ActewAGL to support the justification of the project, including NPV analysis;
 - provide an independent review of the material provided by the AER, following its own analysis; and
 - summarise our findings in relation to our technical and economic assessment of the project as nominated in the scope of work.
14. This advice and the assessment that we have undertaken is based on a limited scope review in accordance with the terms of reference provided by the AER. It does not take into account all factors or all reasonable methods for determining an expenditure allowance in accordance with the National Electricity Rules (NER). We understand that the AER will establish a capital expenditure allowance for ActewAGL based on assessments undertaken by its own staff.

1.2 Our approach

15. In considering this matter, we have:
 - i. identified relevant supporting information to assist our understanding of the project, including reference to ActewAGL's RP, RRP and the AER's own analysis;
 - ii. assessed the technical aspects of the business case proposed by ActewAGL and the economic analyses prepared by the business and by AER staff; and
 - iii. considered the modelling, assumptions and sensitivity of the supplied NPV analysis.
16. The AER has specifically asked us to consider the material provided by ActewAGL in its RP, RRP and project justification report and advise whether:
 - i. the judgment and reasoning of AER staff is sound and is drawn accurately from options presented by ActewAGL; and
 - ii. the supporting NPV modelling is sound and correctly justifies the position that it is more likely that ActewAGL, acting prudently, would defer the Molonglo zone substation until after the next regulatory period (i.e., post-2019).
17. We have also considered the extent to which the prospective deferral of this project into the next RCP would minimise the NPV of the cost to consumers.
18. The limited nature of our review does not extend to review of all options and alternatives that might be reasonably considered by ActewAGL. However, where we have identified information that is material to our findings, we have referenced this information accordingly.

1.3 Structure of this report

19. Our main findings are summarised at the beginning of this report.
20. In section 2, we provide a contextual overview of ActewAGL's RP and RRP in relation to this project, along with the hypotheses and focus issues that the AER has asked us to assess. This section includes consideration of the AER's draft decision and ActewAGL's response.
21. In section 3, we describe our review of the technical considerations, modelling, assumptions and sensitivity of the NPV analysis supplied for the Molonglo substation project.
22. In Appendix A, we provide a summary of the information that we have reviewed in undertaking our assessment.

2 Background

2.1 Introduction

23. This section provides background context regarding our assessment. Information was sourced from ActewAGL's RP, RRP and the AER's draft decision for the 2014-19 RCP.²
24. We first describe the project information proposed by ActewAGL, including the changes made as part of its RRP. We summarise ActewAGL's proposal based on the information supplied to the AER, together with any explanations and responses that ActewAGL subsequently provided to the AER in response to information requests.
25. Subsequently, we summarise the focus issues that the AER has already developed from its initial assessment, and which the AER has asked us to review.

2.2 ActewAGL's proposed Molonglo zone substation project

Summary of the Molonglo zone substation project

26. In its RP, ActewAGL states that it has only installed one zone substation since the early 1990s (being East Lake zone substation in late 2013) and submits that major augmentation is now required in the network to meet forecast demand and security of supply, including in the Molonglo area. ActewAGL has

² The RCP is 1 July 2014 - 30 June 2019 (5 years). The AEMC deferred the full regulatory determination process for ActewAGL's next RCP (2014–19). As part of the transitional arrangements, the AER determined a placeholder revenue allowance for a transitional regulatory control period (1 July 2014 to 30 June 2015) on 16 April 2014. ActewAGL has subsequently submitted its RRP for the period 1 July 2015 – 30 June 2019.

included a number of major augmentation projects for the 2014-19 RCP, including the Molonglo zone substation.

27. ActewAGL's initial RP included \$24.6m (\$2013–14) to establish a new Molonglo zone substation to service projected growth in the Molonglo valley area. Construction for the substation is proposed to commence in 2015–16 and to be completed by mid-2018.³
28. ActewAGL describes the scope of the project as being “*a new zone substation in the Molonglo district for the provision of power to new suburbs in Molonglo and North Weston. The new zone substation will enable network load balancing through the transfer of some load in Weston Creek currently supplied by the Woden zone substation, thereby deferring the need for capacity augmentation at the Woden zone substation*”.⁴
29. ActewAGL notes that the project was deferred from the prior RCP as follows:
 - “*the Molonglo zone substation was deferred from the 2009-14 regulatory period by utilising feeders from nearby zone substations*”,⁵ and
 - “*Construction of the Molonglo zone substation was originally planned for the 2009–14 regulatory control period but was deferred due to deferred urban development in the areas to be serviced by this zone substation*”.⁶
30. We have considered this context where it has a material impact on the timing of the proposed project in the 2014-19 RCP.
31. In its RRP, ActewAGL included a detailed project justification report for the Molonglo zone substation project. Attachment D6 “*addresses the AER’s concerns with the adequacy of ActewAGL Distribution’s risk and options analysis and justification of project timing*”.⁷ We have reviewed this information and the preliminary review undertaken by the AER.

Alternative options considered

32. ActewAGL has proposed three short-term feeder augmentation projects to supply the first 8.6MVA of load in the Molonglo Valley from existing zone substations before a longer term solution is required. Four longer term options are considered in its analysis: (1) do nothing; (2) construct the Molonglo zone substation; (3) feeder augmentations from existing zone substations; and (4) Woden zone substation extension. A DSM option was also considered, but excluded due to its high cost.
33. Of the options considered, ActewAGL asserts that the preferred solution (Option 2 - “Molonglo Zone Substation”) has the lowest (net) cost. ActewAGL states that: “*the recommended option (Option 2 – “Molonglo Zone Substation”) is the lowest NPV option and meets the criteria of providing a long term,*

³ Regulatory Proposal 2 June 2014 page 103

⁴ Final revised regulatory proposal 20 Jan 2015 (public), page 294

⁵ Final revised regulatory proposal 20 Jan 2015 (public), page 286

⁶ Final revised regulatory proposal 20 Jan 2015 (public), page 294, footnote 539

⁷ Final revised regulatory proposal 20 Jan 2015 (public), Page 310

*reliable supply to the planned 55,000 consumers in the Molonglo District by 2042/43.*⁸

ActewAGL's summary of the AER's Draft Decision

34. ActewAGL advises that the Molonglo zone substation was one of five major augmentation projects that was subject to engineering review by the AER. ActewAGL describes the draft decision as having significantly reduced the proposed augex *"primarily because the AER considered ActewAGL Distribution did not adduce sufficient evidence in respect of project evaluation, justification and timing"*.⁹

ActewAGL's RRP response to the AER's draft decision

35. ActewAGL has proposed inclusion of the Molonglo zone substation in its RRP with an updated (reduced) cost estimate of \$22.7m. This includes three feeder projects that increase network capacity to the area prior to commissioning of the new substation.
36. ActewAGL considers that the augmentation project is required to meet current and expected future demand and to ensure continued quality, reliability and security of supply in the area.
37. In its RRP, ActewAGL has proposed a deferral of 12 months within the RCP for the Molonglo zone substation and associated feeders, with commissioning targeted for 2018/19.¹⁰ ActewAGL has proposed this deferral in response to criticisms of an overly conservative approach to network augmentation. However, ActewAGL states that *"the 11kV feeders providing the initial supply solution will be above their firm rating but lower than their emergency rating in the year prior to the zone substation being required."*
38. ActewAGL responds to other issues raised in the draft decision including the appropriateness of its internal management costs and project management costs associated with this project. These items are beyond the scope of our review and are not considered further.
39. ActewAGL has included the Molonglo zone substation as a pass through event. We have not been requested to review this aspect of its proposal.

2.3 AER focus issues

Summary of draft decision

40. The AER issued its draft decision on ActewAGL's distribution determination for the 2015-19 RCP on 27 November 2014.
41. In its draft decision, the AER included a substitute estimate of total capex that was 38% lower than ActewAGL's proposal. The AER arrived at its decision by

⁸ Reference to lower NPV outcomes has been assumed to refer to the lower (net) cost.

⁹ Final revised regulatory proposal 20 Jan 2015 (public), Page 292

¹⁰ Final revised regulatory proposal 20 Jan 2015 (public), Page 312

including a reduction to the Molonglo zone substation and associated feeder of \$24.6m (\$2013-14) “...as there was limited justification of alternative options”.¹¹

42. In its Attachment 6, the AER states: “we consider ActewAGL did not provide sufficient evidence that its proposed Molonglo zone substation is the efficient solution to growth in the Molonglo valley area. ActewAGL did not demonstrate it considered and quantified solutions such as demand management or feeder solutions from Woden zone substation. ActewAGL also did not quantify the benefits of the Molonglo zone substation, even though it considered an alternative project with a lower net present cost.”¹²
43. The AER was critical of ActewAGL’s limited options analysis and selection of the preferred option without providing details of the claimed ‘intangible benefits’ that supported its selection over another with a lower net present cost.
44. The AER considered that ActewAGL had not appeared to investigate potentially more efficient solutions including: “... distribution feeder augmentation solutions from the Woden zone substation. ActewAGL projected spare capacity of 10 MVA at Woden zone substation, which is sufficient to supply the initial load the Molonglo Zone Substation would provide for.”¹³
45. The AER concluded that: “While there may be a long-term need for additional capacity in the Molonglo area, we consider that:
 - ActewAGL’s risk and options analysis is inadequate
 - ActewAGL did not adequately justify the timing of the project
 - the project costs are high and incorporate inefficient practices.”¹⁴

Summary of AER’s initial assessment

46. The AER considered that, of the options selected for comparison by ActewAGL, its preferred option 2 (construct Molonglo zone substation) represents the lowest cost to consumers (in NPV terms) to meet the forecast demand in the Molonglo area.
47. The AER considered that ActewAGL’s options analysis has biased its own NPV analysis, including not adequately considering the deferral benefits of one or more of the sub-options in its own analysis.
48. To be able to defer the Molonglo substation into the next RCP (i.e., from 1 July 2019 or later), a total of approximately 9.2MVA of network capacity is expected to be required from alternative sources.
49. The AER’s analysis suggests that the inclusion of the Woden feeder to be constructed in 2018–19 (considered as part of the proposed option 3) would

¹¹ AER Draft decision, ActewAGL distribution determination 2015–16 to 2018–19 Overview, page 49

¹² AER Draft decision, ActewAGL distribution determination 2015–16 to 2018–19, Attachment 6: Capital expenditure, page 6-10

¹³ AER Draft decision, ActewAGL distribution determination 2015–16 to 2018–19, Attachment 6: Capital expenditure, page 6-37

¹⁴ AER Draft decision, ActewAGL distribution determination 2015–16 to 2018–19, Attachment 6: Capital expenditure, page 6-38

add 5.5MVA of capacity at a cost of \$2.3m. This would increase the total available capacity in the Molonglo area to 14.1MVA which would be sufficient to supply the expected demand until mid-2022. From 2022, additional capacity would be required (based on ActewAGL's current forecasts), either from the construction of a substation at Molonglo or the addition of feeders from existing substations.

50. Having established the potential for the Molonglo zone substation to be constructed in the 2014-19 RCP, the AER requested that EMCa review the robustness of the alternative solutions proposed and the NPV analysis associated with its prospective deferral.

2.4 Summary

51. ActewAGL proposed \$24.6m in capital expenditure for the new Molonglo zone substation to meet projected load growth. Of the options considered, ActewAGL asserts that this project has the lowest (net) cost.
52. The AER reviewed ActewAGL's submission. In its draft decision, the AER excluded expenditure associated with this project due to insufficient options analysis. Specifically, the AER considered that ActewAGL did not appear to have investigated other (potentially more efficient) solutions.
53. Subsequently, the AER asked EMCa to review its analysis of alternative options to meet projected load growth in the Molonglo area and advise whether it minimises the NPV of the cost to consumers.

3 Review of project justification and modelling

3.1 Introduction

54. In this section we describe the results of our review of the technical considerations and modelling assumptions for the new Molonglo zone substation project. We first provide an overview of the electricity network.
55. We have taken into account the information provided to us by the AER, from ActewAGL including additional information requests and responses from ActewAGL. A summary of the information relied upon in our review is provided in Appendix A.

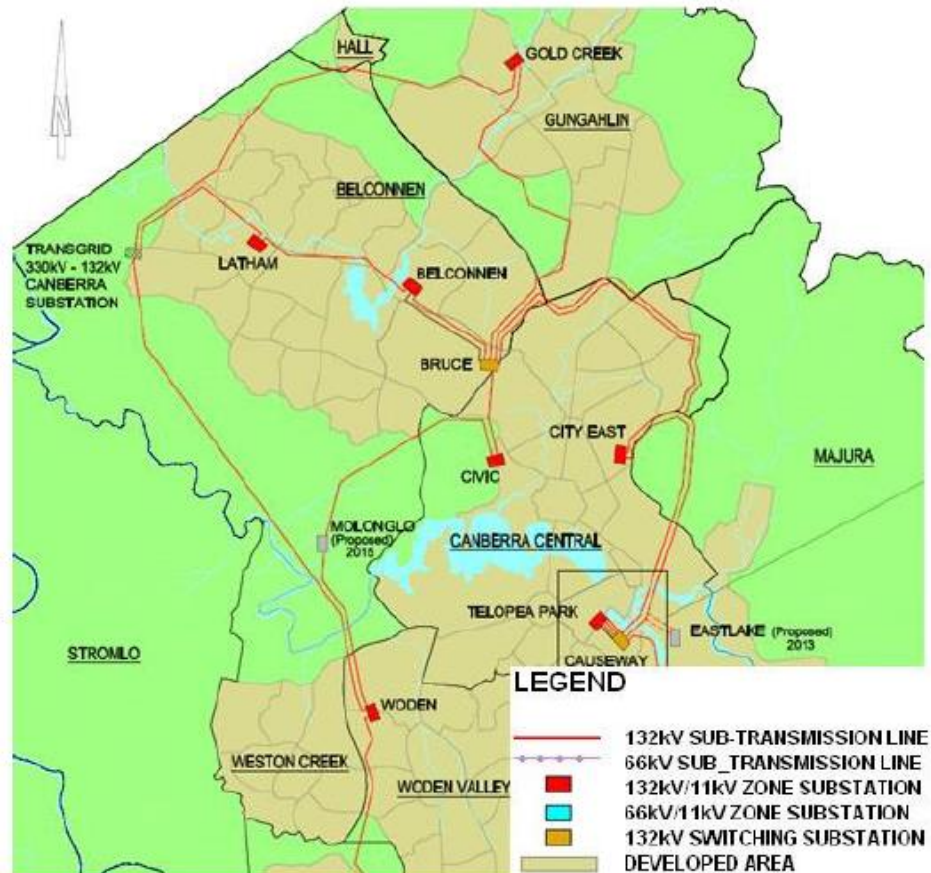
3.2 Network overview of supply to Molonglo district

56. The Molonglo district has been rezoned by the Government for mixed residential and commercial use. ActewAGL forecasts demand growth of 1.5 to 2MVA per year, up to a total demand of 53MVA by 2042/43.¹⁵
57. There are four existing zone substations located within 10km of the proposed site of the Molonglo zone substation: (1) Lathan; (2) Belconnen; (3) Civic; and (4) Woden. The area load is currently being supplied by the Cotter 11kV feeder from the Woden zone substation.
58. The land for the proposed Molonglo zone substation site has been purchased and development approvals granted. There is an existing 132kV sub-transmission line that runs between Civic and Woden zone substations. This

¹⁵ D6, Project Report Molonglo district supply solution, page 4

line would supply the new zone substation as shown in Figure 1 below. The proposed rating for the Molonglo zone substation is 132/11kV 55MVA.

Figure 1: Map of network configuration servicing Molonglo area



Source: D6, Project Report Molonglo district supply solution

3.3 Technical considerations

59. In this section, we review the technical considerations associated with ActewAGL's options analysis, including review of the feasibility of the AER's preferred option.

Needs identification and project driver

60. The primary driver for this project is to meet the forecast local demand that ActewAGL states will exceed the proposed supply capabilities from the four existing zone substations by 2018/19.¹⁶

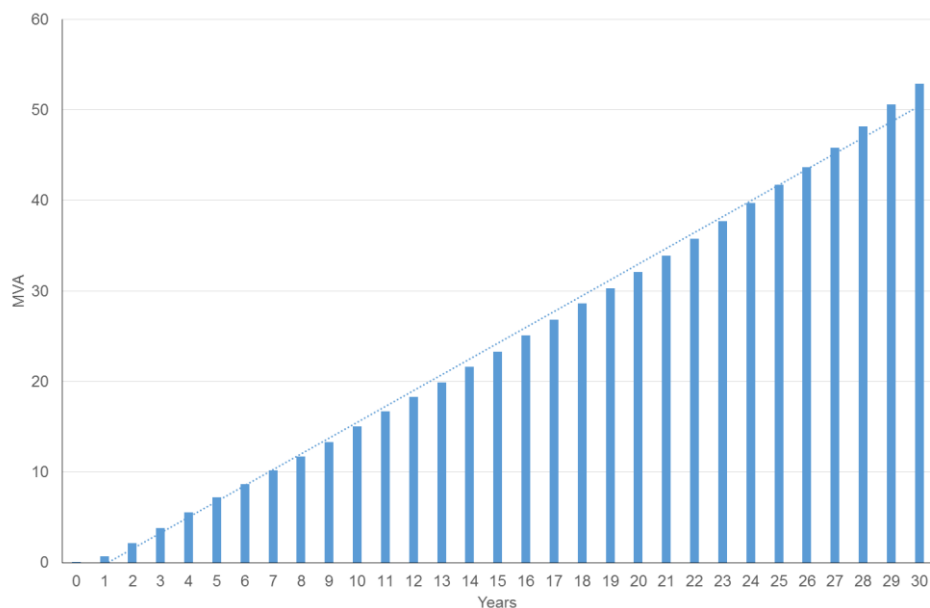
Demand forecast

61. We observed that the Molonglo zone substation was considered in the context of supplying a total planned population of 55,000 in the Molonglo district over the next 20 years.

¹⁶ D6, Project Report Molonglo district supply solution, Page 8

62. We were not asked to review the demand forecast. We note that the AER “*acknowledge the potential growth in the Molonglo Valley area, and that ActewAGL would have to service that growth*”.¹⁷ To assist our review of the AER’s assessment, we sought evidence regarding how ActewAGL’s growth assumptions might have influenced its selection of options and whether this had a material impact on the NPV analysis.
63. ActewAGL advised that: “*demand growth in the Molonglo District will increase from 2.1 MVA in February 2015 to 8.7 MVA in February 2019 - in the current 2014 – 19 regulatory period. With the three (3) planned feeder extensions, AAD are able to supply 8.6 MVA from the Woden and Civic Zone Substations which will provide electricity supply for the forecast demand until 2018/19. The load from the Molonglo District is forecast to increase by 1.5 MVA (2.8%) to 2.0 MVA (3.8%) per annum to 52.9 MVA in FY 2042/43*”.¹⁸
64. We have reproduced the forecast regional demand growth in Figure 2 below from the information provided by ActewAGL. We observe that ActewAGL has adopted a near linear growth rate for demand that includes a large period of uncertainty beyond the current RCP. We expect that, among other things, incentives for energy efficient market products and the ACT government scheme for increased efficiency in electricity consumption should impact (i.e., reduce) the longer term forecast. Accordingly, we consider that, on the balance of probability, the demand growth projections are likely to be over-stated.

Figure 2: Molonglo District Forecast Demand



Source: EMCa analysis from ActewAGL data

Consideration of non-network options

65. ActewAGL states that “*Demand Side Management (DSM) options were also considered for both the initial supply and deferral of the long term supply*”

¹⁷ AER Draft decision, ActewAGL distribution determination 2015–16 to 2018–19, Attachment 6: Capital expenditure, page 6-36

¹⁸ D6 - ActewAGL, PJR (Molonglo district supply solution) page 9

solution for the Molonglo district” as demonstration of its consideration of non-network solutions.¹⁹

Application of planning standards

66. ActewAGL states that: *“the justification and timing of the projects have been based on the ActewAGL Distribution Network Augmentation Standard, and the Distribution Network Planning and Expansion Framework, not on the basis of project specific unserved energy (also known as energy at risk) and VCR studies. However, VCR calculations have been used to assess the best long term consumer supply solution.”²⁰*
67. We were not asked to review the *Distribution Network Augmentation Standard* or the *Distribution Network Planning and Expansion Framework*. We therefore take as a given ActewAGL’s claim that this project is consistent with its planning standards and the requirements therein (such as the adoption of a standard zone substation size of 55MVA as part of its design principles).
68. ActewAGL’s network design features 11kV distribution feeders. At this operating voltage, distribution feeders are typically associated with shorter distances (i.e., less than 10km) or lightly loaded urban applications. Subject to the results of engineering modelling, we consider that where 11kV feeders are installed over longer distances, consideration of voltage regulation support may be required.

Development planning assumptions

69. We note that ActewAGL has adopted a 2.5kVA per dwelling assumption for the planning and design of its electricity distribution network. We consider that this value is at the lower end of industry practice.
70. We consider that ActewAGL’s planning assumptions regarding: (i) 75% loading for distribution feeders; and (ii) commissioning of new feeders one year in advance of the identified constraint are reasonable.

Available network capacity

71. ActewAGL states that it has already considered options for utilising available network capacity.²¹ We have relied on the analysis presented in ActewAGL’s project justification reports to inform our assessment.

Risk assessment

72. ActewAGL’s project information includes assessment of the inability to meet demand as a major risk. We consider that this risk is not likely to be a key determinant between the options under consideration. There are no other risks identified that we consider are material to the selection of the preferred option and NPV analysis.

¹⁹ RRP Page 311

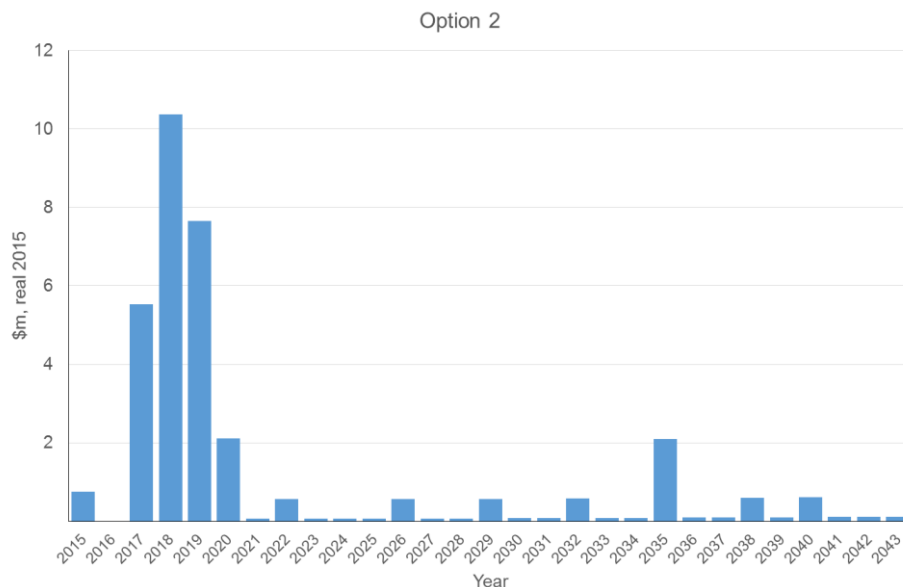
²⁰ RRP page 309

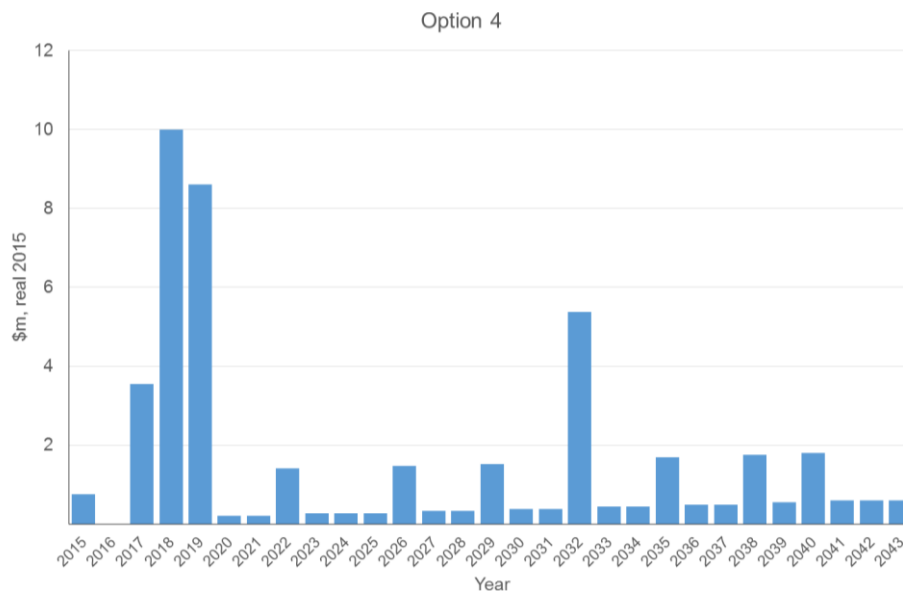
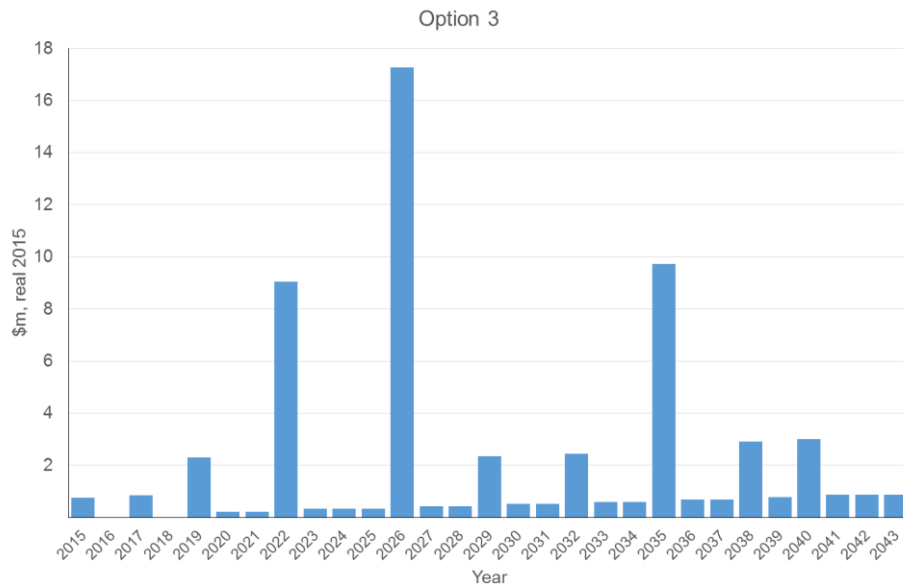
²¹ RRP page 302

Options analysis

73. ActewAGL considered three alternative options to the construction of the new Molonglo zone substation (Option 2) as the preferred solution: Option 1 - do nothing; Option 3 – feeder augmentation; and Option 4 – Woden zone substation extension. Options 3 and 4 were deemed to be unacceptable because they had a higher net cost than ActewAGL’s preferred solution.
74. The capex profile for the Molonglo zone substation (Option 2), 11kV feeder augmentation (Option 3) and Woden zone substation extension (Option 4) is shown in Figure 3 for the period 2015 - 2043. We observe that:
- For Option 2, the majority of proposed expenditure is planned to occur between 2017 and 2020, with very little expenditure in subsequent years. This project appears to address demand requirements well into the future after the initial investment, whereas the alternative options exhibit a higher degree of lumpiness and increased capex requirements over the period;
 - Each of the Option 3 and Option 4 alternatives appears to reflect independent ‘single asset’ solutions that bear little relationship to a strategic network development plan; and
 - Significant forecast expenditure for Options 3 and 4 in later years (i.e., after 2030) indicates the need for investment in a further major network design element. We infer that this reflects the addition of an incremental feeder to service area load growth from an existing zone substation (i.e., not by the addition of a new Molonglo zone substation).

Figure 3: Comparison of capex profiles for options 2, 3 and 4 (\$m, 2015)





Source: EMCa analysis

75. The options analysis described by ActewAGL in relation to its consideration of Option 3 is “an assessment of 3 options, one of which is an 11kV feeder only option, supplying electricity from the available capacity at 3 existing zones substations (Woden, Civic, and Latham). This option has been assessed as being a higher net cost solution to the recommended Molonglo zone substation.”²²
76. Option 3 relies on extending the existing network until such time as capacity is exhausted and a major augmentation is required. We note that this option appears to ignore the opportunity to capture the optimal deferral benefits of delaying Molonglo zone substation.

²² RRP page 304-305

Assessment of alternative option

77. We consider that an alternative option (Option 5) exists that may defer the installation of the Molonglo zone substation, by undertaking a hybrid of the options considered by ActewAGL.
78. As part of the analysis for Option 3, ActewAGL appears to nominate a notional cost associated with a future zone substation.
79. ActewAGL does not appear to consider that the Molonglo substation represents a viable option for the major augmentation identified by ActewAGL once the capacity of the existing network is exhausted to mitigate the voltage or capacity constraint. Implied in the analysis is a substation other than at Molonglo. We make this observation due to the following:
- the cost included for the major augmentation is of a similar magnitude as Molonglo substation, indicating that expenditure at a substation is likely;
 - the level of expenditure proposed is different to Molonglo zone substation; and
 - expenditure associated with installing new distribution feeders is more expensive than for option 2, which we interpret as being supplied by an alternate location further away from the Molonglo area than the proposed Molonglo substation.
80. We observe that the options considered by ActewAGL appear to be focused on meeting the forecast network constraint through installation of the Molonglo zone substation versus a separate, alternate solution. It is our view that a hybrid solution, including the Molonglo zone substation as a component, was not adequately considered.
81. ActewAGL's Option 3 considered extending the existing network beyond 2018/19 and resulted in the prudent deferral of Molonglo zone substation into the next RCP. This option was not preferred by ActewAGL due to the higher cost associated with 11kV extension works in the latter years, where Molonglo zone substation could have been considered as an alternative to continuing to extend the existing network but was not. The analysis included installing a new Woden feeder²³ at a cost of \$2.3m. We believe the construction of the Woden feeder to be a viable and prudent option to include in the NPV analysis.

Confirming the alternative option will meet the projected demand

82. The demand information provided by ActewAGL, proposes the *“utilisation of the available network capacity to provide the initial supply to the Molonglo District with these three (3) planned feeder augmentation projects”*.²⁴ This indicates that the 8.6MVA supply provided by the Hilder and Streeton feeder extensions and the Black Mountain upgrade will be exhausted by early 2019.
83. In the next RCP (2019/20 to 2023/24) a total of approximately 19.6MVA capacity is forecast to be required, representing a further increase of 11MVA.

²³ Install 6 km feeder, double up with existing 11 kV breaker to provide 5.5 MVA (conduit exists along John Gorton Drive) – planned completion 2020

²⁴ D6 - ActewAGL, PJR (Molonglo district supply solution) Table 4 - page 9

84. We note that ActewAGL's Option 3 includes a Woden feeder to be constructed in 2018/19 with capacity of 5.5MVA added in 2019/20 at a cost of \$2.3m. The total available capacity of 14.1MVA established by this combination of options (i.e., 8.6MVA from the feeder options above) would allow the network to meet expected demand until mid-2022.
85. From 2022, additional supply capacity would be required. Based on the information provided by ActewAGL this would likely consist of a major augmentation. This may include re-consideration of a new zone substation at Molonglo or the addition of incremental feeders from existing zone substations. This would need to be in service by mid-2023, which would leave adequate time to install a major augmentation such as a zone substation.
86. We note that the prior RIT-D²⁵ assessment suggests development limitations to expanding supply from existing zone substations. For the purposes of assessing this alternative option, we therefore assume that the Molonglo substation could be constructed to meet demand from at least 2022.

3.4 Modelling, sensitivity and assumptions

87. In this section, we consider the impacts of the technical considerations in the NPV model and test the assumptions and sensitivity of the model.

Cost estimation and forecasting bias

88. ActewAGL states that: “*The methodology and estimated costs used for the Molonglo District supply solution are developed through the application of industry knowledge and Good Engineering Operating Practices based on historical similar projects*”.²⁶
89. We note that ActewAGL has engaged SKM to undertake the concept design for the Molonglo zone substation. We were not asked to review the basis of ActewAGL’s cost estimation and forecasting systems, or the engineering design proposed by SKM or ActewAGL for the substation or surrounding feeder augmentation. We have therefore relied upon, and applied, the costs provided by ActewAGL in our analysis.
90. We note that a cost estimate of \$22.7m (\$2014/15) and an NPV solution of \$21.8m is included in the information provided. The model includes a capital cost of \$22.2m for the substation and access road, which we consider to be broadly comparable. We have therefore not sought to explain the differences in these values.

Model selection and application

91. We have used the model supplied to us by the AER and which reflects the financial conditions in which ActewAGL operates. We have reviewed the model and consider that it reflects a typical financial evaluation model for a DNSP.

²⁵ ActewAGL - B16.1 Molonglo zone substation RIT-D – 2014 page 19 “ supply is not feasible other than the short term due to the nature of the terrain, existence of other developments and infrastructure and other construction restrictions”

²⁶ D6 - ActewAGL, PJR (Molonglo district supply solution) Page 11

We observe different depreciation scenarios which impact the NPV analysis. That impact is not considered material to the decisions arising from the NPV assessment.

Assumptions

92. We have included the following assumptions in our analysis:

- **Application of cost of losses:** We note that ActewAGL has provided its formula for the calculation of losses. For the comparative NPV assessment included in our review, we have applied the same values in alternate years associated with losses as a simplifying assumption. We have undertaken sensitivity analysis associated with the change in values to understand the relationship with the NPV.
- **Application of cost of VCR:** We note that ActewAGL has provided its formula for the calculation of losses. For the comparative NPV assessment included in our review, we have applied the same values in alternate years associated with VCR as a simplifying assumption. We have undertaken sensitivity analysis associated with the change in values to understand its relationship with the NPV.
- **Application of Capex:** The same capital expenditure and timing was applied for the deferred Molonglo zone substation scenario. Different VCR and network losses were examined for this deferral, as a part of the sensitivity analysis undertaken.
- **Application of depreciation** – the same depreciation profile for Option 2 was applied to the alternate option that considered deferral of the Molonglo zone substation scenarios.

Assessment of alternative option to defer Molonglo substation

93. The assumptions for deferral of the Molonglo substation expenditure into the next RCP are provided in Table 1 below. This includes the proposed Woden feeder augmentation in 2018/19 (as part of the initial augmentation) and the proposed Molonglo substation expenditure starting in 2019/20 with completion by 2021/22. The expenditure in Option 2 in 2022/23 for the Molonglo ZS Feeder (\$2.06m) and beyond is unchanged. This assumes that the distribution feeders to meet the future demand growth are installed from the Molonglo zone substation, consistent with ActewAGL's preferred option.

Table 1: Option 5 – Deferred Molonglo substation expenditure (\$m excl GST, 2015)

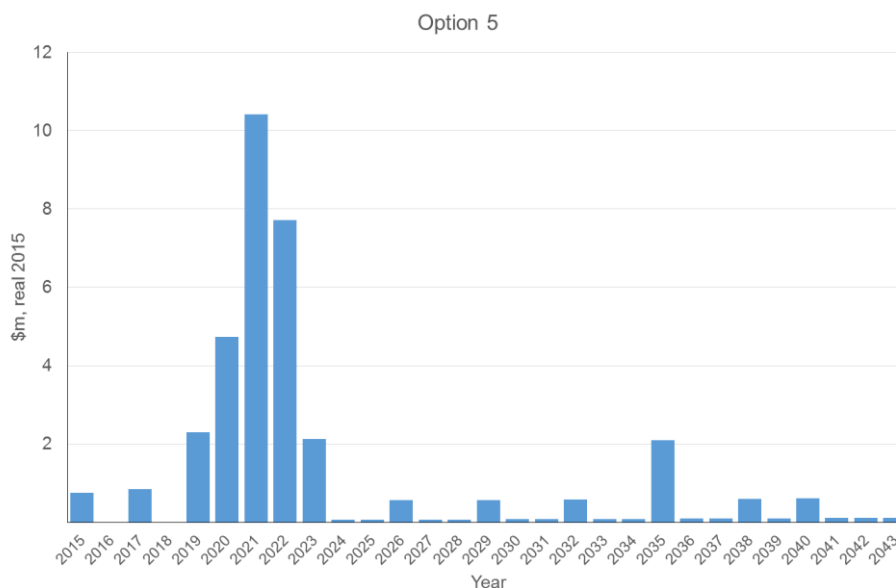
Option 5	2015	2016	2017	2018	2019	2020	2021	2022	2023
Initial augmentation	\$0.75		\$0.85		\$2.30				
Molonglo zone substation						\$4.15	\$10.37	\$6.22	
Substation access road						\$0.53			
Molonglo zone substation feeders								\$1.44	\$2.06
Network losses & VCR						\$0.06	\$0.06	\$0.06	\$0.07
Total	\$0.75	\$-	\$0.85	\$-	\$2.30	\$4.73	\$10.42	\$7.72	\$2.13

Source: EMCa analysis of Financial Evaluation Model Molonglo ZS_080115a

94. The capex profile for the alternate option (Option 5) is shown in Figure 4 below. We note that the capex for the 2014-19 RCP is minimised, and the Molonglo substation expenditure is front-loaded into the next RCP with corresponding distribution feeder expenditures in the outer years.

95. We consider that this is a reasonable scenario for comparison purposes.

Figure 4: Capex for alternate option 5 (\$m, 2015)



Source: EMCa analysis

96. As shown in Figure 5 below, the model summary results produce a NPV of (\$20.7m) for Option 5 compared with ActewAGL's preferred Option 2 NPV of (\$21.8m).

Figure 5: Summary Financial Analysis Results for Option 5

SUMMARY FINANCIAL ANALYSIS RESULTS FOR Molonglo Zone Sub						
SCENARIO:	Options Analysis				Option	Desc
Determine least net present cost of options analysed						
Project Purpose:						
To meet reliability and capacity requirements of customers in Molonglo						
RESULTS:						
	One	Two	Three	Four	Five	
Capital Outlay (Real 2014/15 \$)	\$0	\$33,346,682	\$59,916,145	\$44,771,568	\$35,146,682	
Nominal Capital & Cash Flows - 50 years	\$0	\$29,119,817	\$68,942,993	\$44,162,671	\$32,176,798	
NPV - 30 years	\$0	(\$21,816,516)	(\$27,692,581)	(\$24,925,942)	(\$20,671,848)	

Source: EMCa analysis of Financial Evaluation Model Molonglo ZS_080115a

97. This analysis suggests that the net present cost is minimised if ActewAGL was to defer the construction of the Molonglo substation until after July 2019 and meet the short-term capacity requirement via a feeder extension from the Woden zone substation.
98. By delaying the Molonglo project, ActewAGL would also be able to observe the demand growth in the new district and continue to assess the need and timing of future augmentations and other options, with a view to considering further prudent deferral of the Molonglo zone substation. In investment decision-making it is normal for there to be option preservation advantages in being able to defer a major investment and, while we have not quantified these, we consider that they further enhance the merits of the deferral option.

Sensitivity analysis

99. We note that ActewAGL undertook its own sensitivity analysis and concluded that the "inclusion of the VCR calculation and 11kV feeder losses did not alter

*the outcome of the NPV analysis and in fact strengthened the economic evaluation of the preferred option”.*²⁷

100. A load flow analysis may reveal that, while the Molonglo zone substation is deferred, there will be increased or decreased network losses and VCR costs. To test the sensitivity of this scenario, we considered a higher value of network losses and VCR associated with an alternate network configuration, being consistent with extending the existing network via Options 3 and 4. The network losses and VCR values were substituted into the analysis to provide a worst case outcome.
101. The assumptions for deferral of Molonglo substation, adjusted for worst case network losses and VCR, are presented in Table 2 below as Option 6. This includes the Woden feeder augmentation expenditure in 2018/19 and the Molonglo substation expenditure starting in 2019/20, for completion by 2021/22. The losses from the feeder augmentation in 2018/19 were extended to 2021/22. The expenditure in Option 2 in 2022/23 for the Molonglo ZS Feeder expenditure of \$2.06m is unchanged.

Table 2: Option 6 - Deferred Molonglo substation expenditure (higher network and VCR losses)

Option 6	2015	2016	2017	2018	2019	2020	2021	2022	2023
Initial augmentation	\$0.75		\$0.85		\$2.30				
Molonglo zone substation						\$4.15	\$10.37	\$6.22	
Substation access road						\$0.53			
Molonglo zone substation feeders								\$1.44	\$2.06
Network losses & VCR						\$0.21	\$0.21	\$0.21	\$0.07
Total	\$0.75	\$-	\$0.85	\$-	\$2.30	\$4.88	\$10.58	\$7.87	\$2.13

Source: EMCa analysis of Copy of Financial Evaluation Model Molonglo ZS_080115a (modified)

102. As shown in Figure 6 below, the model summary results for Option 6 suggest a NPV of \$20.96m compared with the preferred Option 2 NPV of \$21.82m. The NPV difference between Option 5 and Option 6 for an increased VCR is marginal.

Figure 6: Summary Financial Analysis Results for Option 6 (higher network and VCR losses)

SUMMARY FINANCIAL ANALYSIS RESULTS FOR Molonglo Zone Sub							Menu
SCENARIO:	Options Analysis			Option	Desc:		
Determine least net present cost of options analysed				One	Do Nothing		
				Two	Molonglo Zone Substation		
Project Purpose: To meet reliability and capacity requirements of customers in Molonglo				Three	Feeder Augmentations		
				Four	Woden Zone Substation Extension		
				Five	Molonglo Deferral		
RESULTS:							
	One	Two	Three	Four	Five	Six	
Capital Outlay (Real 2014/15\$)	\$0	\$33,346,682	\$59,916,146	\$44,771,668	\$36,146,682	\$36,604,682	
Normal Capital & Cash Flows - 50 years	\$0	\$29,119,617	\$98,942,959	\$44,162,671	\$36,170,798	\$32,665,963	
NPV - 30 years	\$0	(\$21,916,616)	(\$27,692,991)	(\$24,626,942)	(\$20,671,848)	(\$20,961,758)	
Financial Conclusion							
Option 2 provides the lowest NPV outcome over a 30 year period. This analysis includes Energy at Risk (Value of Customer Reliability), 11kV Feeder Losses. Option 2 includes the access road and initial civil works (benching) for the zone substation site.							

Source: EMCa analysis of Financial Evaluation Model Molonglo ZS_080115a

103. We observe a small sensitivity to the depreciation schedule. However, for the purposes of our assessment, we have applied the same profile as Option 2.

²⁷ RRP page 308

104. A summary of the assessed options is shown in Table 3 below, including the results of the sensitivity analysis undertaken.

Table 3: Summary of NPV options

Option	NPV (\$m)	Comparison
Option 2 (ActewAGL recommended)	21.8	0%
Option 5 (defer Molonglo)	20.7	-5%
Sensitivity analysis	21.0	-4%

Source: EMCa analysis

3.5 Other considerations

105. We note that ActewAGL included limited consideration of non-network solutions, stating that: “*The DSM solution was not considered further as the investigation clearly shows it is not a viable solution when compared with the alternate network supply option*”.²⁸
106. We consider that analysis of options to deploy DSM and other non-network solutions to defer part of the planned augmentation expenditure, or used as part of a broader strategy is likely to produce benefits, including deferral of the zone substation project. From our experience, non-network solutions such as DSM can be used in conjunction with network solutions to effectively defer major augmentation projects. For example, applying the same analysis as ActewAGL, a DRUPS²⁹ solution at a cost of \$2.8m per year could be deployed to supply the capacity shortfall of 3MVA following the 3 feeder augmentation projects, thereby deferring the major augmentation project into the next RCP. Our modelling indicates that this provides a NPV which is comparable with the alternate option (Option 5) and lower than the recommended option.

3.6 Summary

107. We have reviewed the information provided by ActewAGL and were able to replicate the NPV analysis supplied by both ActewAGL and the AER.
108. We have reviewed the suggested alternative option from the AER and, based on our review of the supplied information, consider that this is a reasonable option.
109. We have applied this option to the NPV analysis and conclude that it generates a lower (net) cost of \$20.67m compared with ActewAGL’s preferred solution of \$21.82m. We have undertaken sensitivity analysis and consider that a comparable or lower NPV could be delivered considering hybrid network substation and feeder solutions. The deferral of substantial expenditure into the next RCP also has an option value by providing the opportunity to observe growth and the impact of technologies, to further consider alternative options

²⁸ AMP page 12

²⁹ The DSM solution was based on a Diesel Rotary Uninterruptable Power Supply (DRUPS).

(including DSM) and to make a better-informed decision when eventually a network augmentation is required.

110. Based on the information provided, we consider that whilst the best long term option is likely to be the construction of the Molonglo substation, it would appear that the expenditure can be prudently deferred into the next RCP for the purpose of determining a reasonable capex allowance. A way in which this deferral can be achieved would be through:
- adoption of the short-term feeder extensions already proposed by ActewAGL (namely Streeton, Hilder and Black Mountain) to add 8.6MVA of network capacity by 2016/17; and
 - addition of the Woden feeder extension to add a further 5.5MVA of network capacity by 2019/20, allowing the forecast demand to be met in this RCP.
111. The above conclusion is based on the assumption that ActewAGL's forecast demand is realised.
112. Under the above option, further augmentation would be required by 2022/23, allowing sufficient time for ActewAGL to determine the optimal augmentation, including reconsideration of the Molonglo zone substation.
113. We consider that the feeder extensions already proposed by ActewAGL will comply with ActewAGL's planning requirements including rating, interconnection and backup.

Appendix A Documents reviewed

114. In providing advice to the AER, EMCa reviewed a number of documents specific to the business case review. Refer to Table 4 below.

Table 4: Documents considered

Document Title
Revised Regulatory Proposal 2015 - 2019, January 2015
Project brief, Molonglo zone substation 7519206, Revision 4.0, 29 May 2014
Capital expenditure: Expenditure justification cover sheet, Version 2.10, 12 January 2015
Regulatory Investment Test, Molonglo Zone substation, Version 1.1, 26 May 2014
Draft decision ActewAGL distribution determination 2015–16 to 2018–19, Overview, November 2014
Draft Decision ActewAGL distribution determination 2015–16 to 2018–19, Attachment 6: Capital expenditure, November 2014
RIT-D