Dalrymple substation upgrade

RIT-T: Project Specification Consultation Report

April 2013

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1. Introduction

1.1 Background

ElectraNet is proposing transmission network augmentations at Dalrymple to ensure the reliability standards set out in the South Australian Electricity Transmission Code (ETC)[1] continue to be met.

This Project Specification Consultation Report (PSCR) has been prepared by ElectraNet as part of the prescribed National Electricity Rules (NER)[2] process for the approval of proposed shared network augmentations. It represents the first stage of the consultation process in relation to the application of the Regulatory Investment Test – Transmission (RIT-T) to the upgrade of the Dalrymple substation.

This report:

- Describes the identified need which ElectraNet is seeking to address, together with the assumptions used in identifying this need;
- Sets out the technical characteristics that a non-network option would be required to deliver in order to address this identified need;
- Describes the credible options that ElectraNet currently considers may address the identified need;
- Discusses specific categories of market benefit which in the case of this specific RIT-T assessment are unlikely to be material;
- Identifies the preferred option and reasons for the preferred option; and
- Identifies that ElectraNet claims an exemption from drafting a Project Assessment Draft Report.

1.2 Submissions

ElectraNet welcomes written submissions on this PSCR. Submissions are particularly sought on the credible options presented and from potential proponents of non-network options.

Submissions are due on or before 4 July 2013.

Submissions should be emailed to consultation@electranet.com.au. Submissions will be published on the ElectraNet website. If you do not wish for your submission to be made publicly available please clearly stipulate this at the time of lodging your submission.

Further details in relation to this project can be obtained from:

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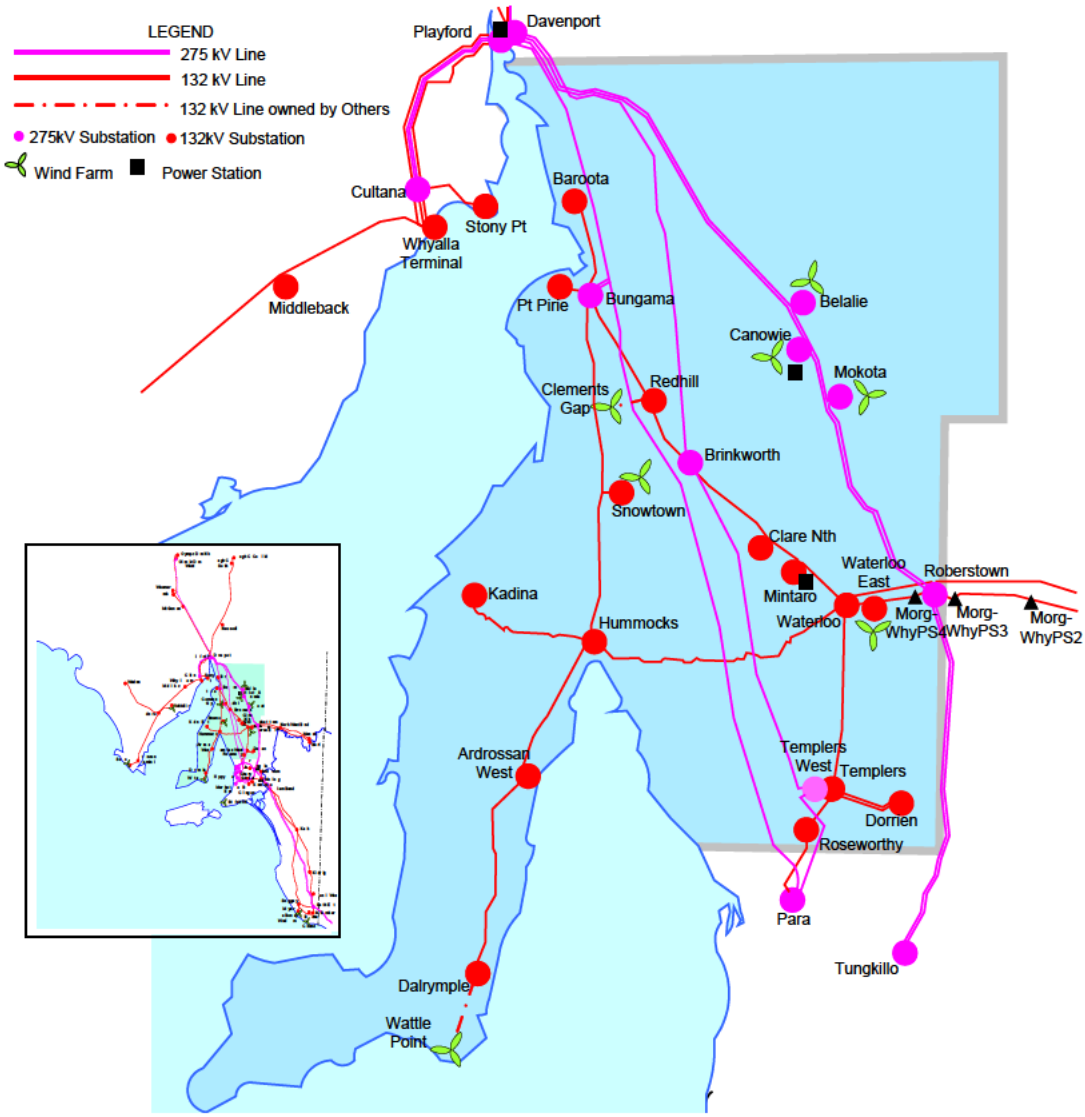
[1] Electricity Transmission Code, TC/07, available at: http://www.escosa.sa.gov.au/electricity-overview/codes-guidelines-rules/electricity-codes.aspx#T45.
[2] National Electricity Rules, clause 5.16.4.

2. Background

2.1 Existing Mid North network

The Mid North 132 kV transmission system comprises a network that supplies major load centres at Ardrossan, Brinkworth, Clare, Kadina and Port Pirie, as well as other loads in the Barossa Valley and Yorke Peninsula regions. It derives its supply from the Main Grid 275 kV system via 275/132 kV substations located at Para (near Elizabeth), Templers West, Robertstown, Brinkworth and Bungama (near Port Pirie). Figure 1 is a geographical diagram of the region.

Figure 1: Geographical diagram of the Mid North region



The Mid North 132 kV system operates in parallel with the 275 kV Main Grid system that connects the major sources of generation at Port Augusta with the Adelaide metropolitan load centre. As a consequence, power flows in the Mid North 132 kV system are not only

determined by the loads that must be supplied within the region but also by flows on the Port Augusta to Adelaide 275 kV system[3].

The Mid North of South Australia contains a mixture of electrical loads including agriculture, grazing, aquaculture and viticulture loads. Commercial loads also comprise a significant portion of total load at the major centres of Port Pirie, Kadina, Port Wakefield, Clare and on the Yorke Peninsula and in the Barossa Valley.

2.2 Committed network developments and existing generation

ElectraNet has a program of committed projects to address supply reliability requirements in the Mid North. These projects are summarised in Table 1 below.

Table 1: Committed projects in the Mid North region

Connection Point	Scope of Work	Timing
Hummocks	Install 2x25 MVA 132/33 kV transformers and upgrade a section of the 132 kV bus	2013
Waterloo	Rebuild Waterloo substation on an adjacent site with 2x25 MVA 132/33 kV transformers	2013
Kadina East	Install 15 MVar 132 kV switched capacitor bank	2013

There are currently no anticipated network developments in the Mid North region that will affect this RIT-T assessment.

Existing generation on the Mid North 132 kV network includes a mixture of gas turbine plant and wind farms.

The 90 MW Mintaro open cycle gas turbine (OCGT) is connected to the 132 kV system while the OCGTs at Hallett power station (192 MW) are connected to the 275 kV Main Grid. There is also a 50 MW distillate fired generator embedded in the SA Power Networks 33 kV distribution network at Angaston.

There are eight existing wind farms operating in the Mid North, which are widely scattered throughout the region. The wind farms connected to the 132 kV system are Wattle Point (90.8 MW, near Edithburgh on the Yorke Peninsula), Snowtown (98.7 MW), Clements Gap (56.7 MW, south of Port Pirie) and Waterloo (111.0 MW, east of the Waterloo area). The wind farms connected to the 275 kV Main Grid are Brown Hill (94.5 MW), Hallett Hill (71.4 MW), North Brown Hill (132.3 MW) and The Bluff (52.5 MW), all located in the vicinity of Canowie, Mokota and Belalie.

The Snowtown Stage 2 Wind Farm has been confirmed as a committed project, being a 270 MW expansion of the existing Snowtown Stage 1 Wind Farm but instead connecting to the 275 kV Main Grid.

[3] Further information on the Mid North region is available within Chapter 9 of ElectraNet's 2012 Annual Planning Report available at: http://www.electranet.com.au/assets/Uploads/2012APR.pdf.

3. Identified need

3.1 Description of the identified need

This RIT-T is being undertaken as a reliability corrective action[4] in order to ensure that ElectraNet meets the revised reliability standard set out in the ETC with respect to the Dalrymple connection point. The need for this investment was identified in ElectraNet's 2012 Annual Planning Report (APR)[5].

In February 2012, the ETC was revised to allow new reliability standards to apply from 1 July 2013. These new standards reclassify the Dalrymple connection point from reliability category 1 to category 2 from 1 December 2016. ETC reliability category 2 requires "N-1" equivalent transformer capacity sufficient to meet 100% of contracted agreed maximum demand (AMD).

The existing Dalrymple substation has a single 25 MVA 132/33 kV transformer installed. Reliability corrective action is therefore needed to ensure that, in the event of an unplanned outage of the existing Dalrymple transformer, ElectraNet can ensure uninterrupted supply in accordance with the new category 2 reliability standard applying to the Dalrymple connection point from 1 December 2016.

3.2 Electricity Transmission Code requirements

The Essential Services Commission of South Australia (ESCOSA) is responsible for establishing the ETC, which primarily focuses on the standards of transmission system supply reliability required to be provided at individual exit points[6].

The current ETC reliability standards which apply through to 30 June 2013 assign the Dalrymple connection point to reliability category 1. For category 1 connection points, ElectraNet is required to provide equivalent transmission line and transformer capacity for at least 100% of contracted AMD.

Clause 2.4 of the new ETC which takes effect from 1 July 2013 assigns the Dalrymple connection point to Category 1 until 1 December 2016, from which point reliability category 2 will apply. For category 2 connection points, ElectraNet is required to provide equivalent transmission line and "N-1" transformer capacity for at least 100% of contracted AMD.

Clause 2.6.1(b) of the ETC also requires ElectraNet to:

> *(i) in the event of a failure of any installed transformer or network support arrangement, use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable;*
>
> *(ii) in the event of an interruption arising from the failure of the installed transformers or network support arrangements:*

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4 Defined in NER Chapter 10 as *"Investment by a Transmission Network Service Provider in respect of its transmission network for the purpose of meeting the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments and which may consist of network or non-network options"*.

5 ElectraNet's 2012 APR, page 102.

6 An 'exit point' is defined in the ETC as a *connection point* through which a *transmission customer* imports electricity from the *transmission network*.

A. *restore at least "N" equivalent transformer capacity within 8 days of the commencement of the interruption; and*

B. *use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable after the commencement of the interruption.*

Clause 10.1 of the ETC defines "N-1" as follows:

> *"N-1" means the ability of the transmission system to continue to supply the contracted amount of agreed maximum demand connected to the transmission system without interruption should any one element fail.*

Reliability corrective action is required by 1 December 2016 to ensure that ElectraNet can continue to supply load with no interruption upon any unplanned loss of the existing 132/33 kV transformer at Dalrymple in order to meet the revised reliability standard assigned to the Dalrymple connection point.

3.3 Assumptions made in relation to the identified need

The following sections describe the assumptions underpinning ElectraNet's assessment of the identified need. As part of the network studies undertaken to identify the need for reliability corrective action, assumptions were made regarding:

- the committed Mid North network augmentation projects set out in section 2.2;
- characteristics of the load profile at the Dalrymple connection point; and
- forecast load growth at the Dalrymple connection point.

3.3.1 Characteristics of the load profile

As the relevant ETC reliability standards identified in section 3.2 apply specifically to the Dalrymple connection point, the only relevant load forecast is that for the Dalrymple connection point.

Figure 2 shows the load profile on the day of record peak demand for the Dalrymple connection point (31 December 2009).

Figure 3 shows the load duration curve for the Dalrymple connection point for the 2009/10 peak load year. The annual energy demand at the Dalrymple connection point during the peak load year was approximately 29 GWh.

Figure 2: Daily peak load profile for Dalrymple (31 December 2009)

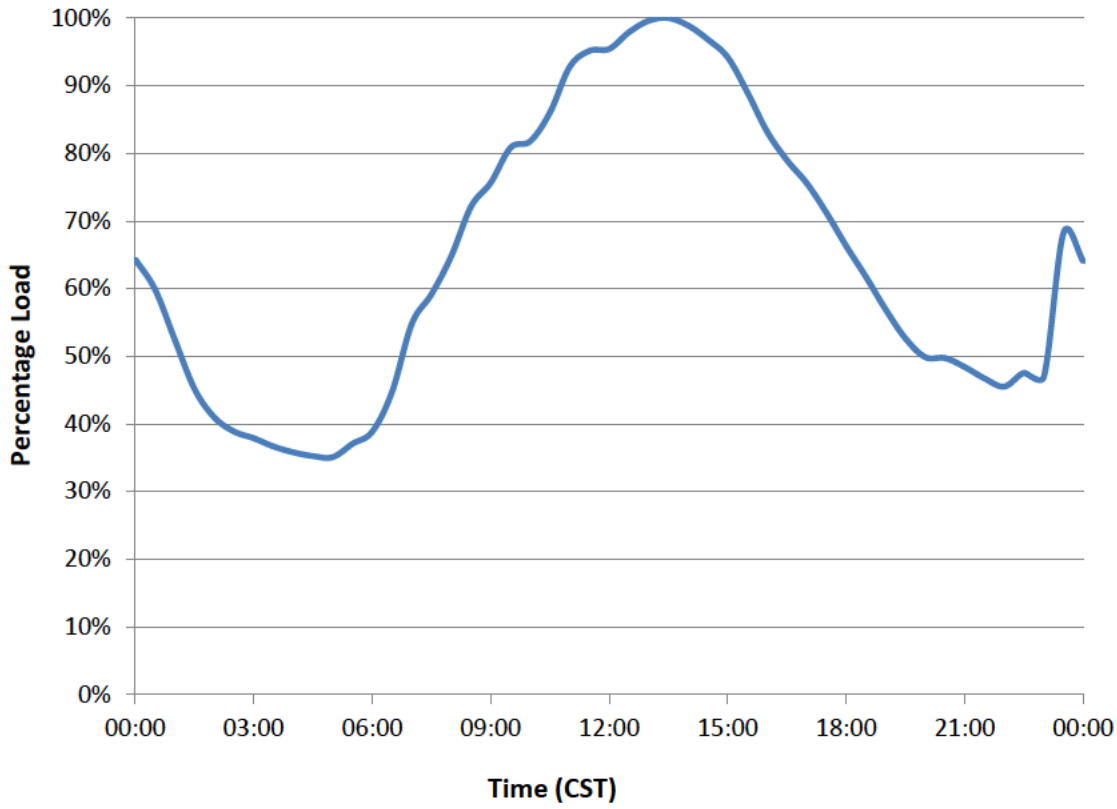
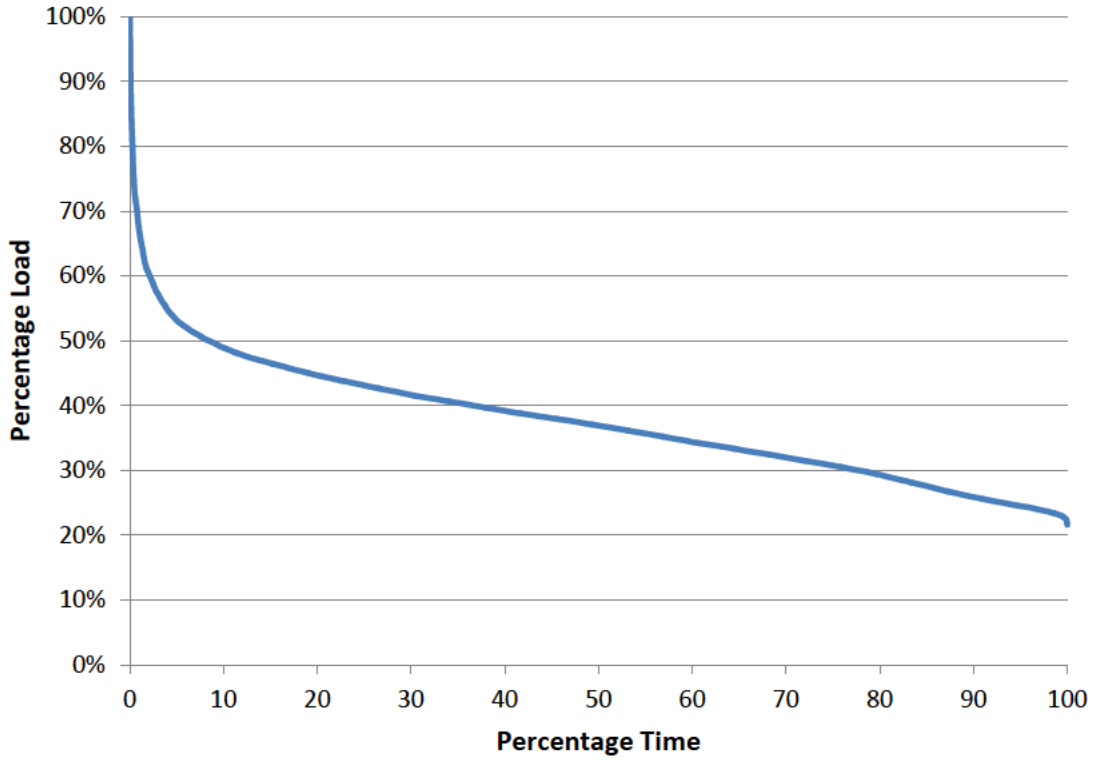


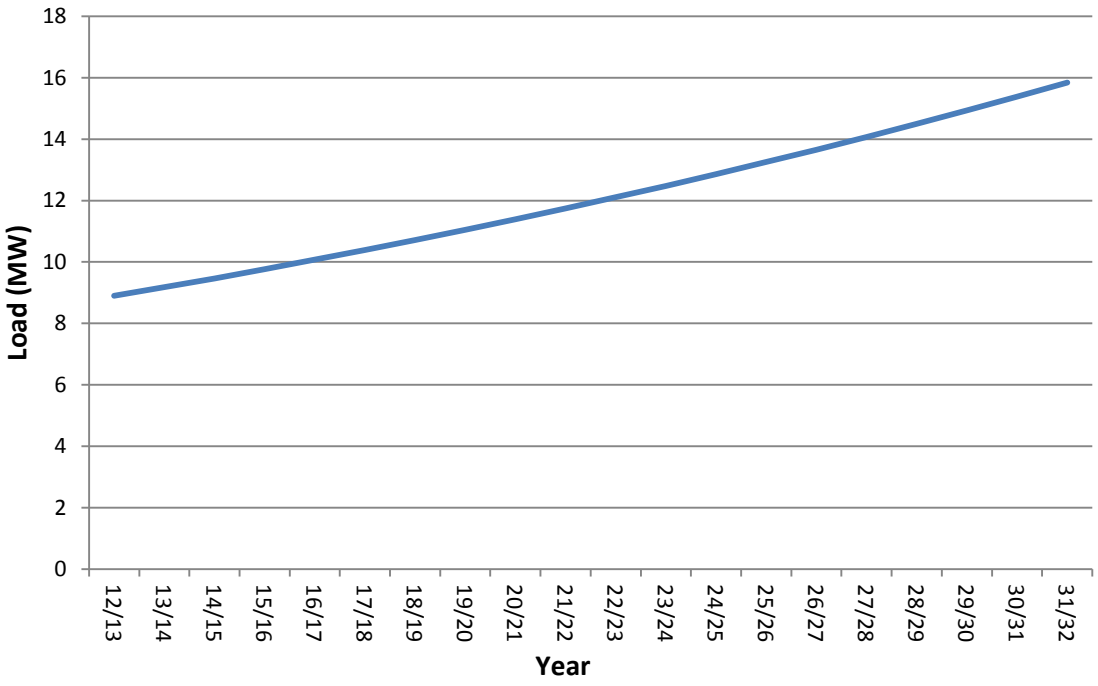
Figure 3: Load duration curve for Dalrymple (2009/10)



3.3.2 Forecast load growth

Figure 4 shows SA Power Network's most recent 2012 load forecast for underlying load growth at the Dalrymple connection point. The forecast assumes a growth rate based on a 10% probability of exceedance (PoE), a moderate rate of economic development and 6% growth in solar photovoltaic systems. There are no directly connected ElectraNet customers at Dalrymple.

Figure 4: Moderate 10% PoE load forecast for Dalrymple



According to the SA Power Network's moderate 10% PoE load forecast, the average load growth rate for the Dalrymple connection point over the next 20 years is 3.1% per year.

3.4 Required technical characteristics of non-network options

This section describes the technical characteristics that a non-network option would be required to deliver in order to address the identified need[7].

As outlined in section 3.1, the identified need is for reliability corrective action by 1 December 2016 in order to ensure that ElectraNet meets the revised reliability standard set out in the ETC for the Dalrymple connection point. To meet the identified need and satisfy the revised ETC reliability standard, non-network options, either individually or collectively, must be capable of providing continuous N-1 equivalent transformer capacity at the Dalrymple connection point from 1 December 2016. As stated within section 3.2 above, the effect of the definition of "N-1" within clause 10.1 of the ETC is that there cannot be an interruption to the load supplied from Dalrymple upon outage of the existing Dalrymple transformer.

[7] In accordance with NER clause 5.16.4(b)(3).

ElectraNet considers it likely that the only non-network option capable of providing continuous N-1 equivalent transformer capacity at the Dalrymple connection point would be new generation. As a non-meshed connection point with a single transformer, an unplanned outage of the existing Dalrymple transformer would result in an interruption to the entire Dalrymple load, in which case load reduction through interruptible demand contracts would serve no purpose and fail to meet the new ETC reliability standard.

The ETC requirement that there be no interruption to the load supplied from category 2 exit points also means that a proposed generation option would be required to generate continuously, 24 hours a day, 365 days a year to ensure an unplanned outage of the existing Dalrymple transformer does not result in an interruption to the supply of the Dalrymple load. A brief interruption to the supply of the Dalrymple load as a result of a proposed generator starting up immediately after an unplanned outage of the existing Dalrymple transformer would violate the ETC reliability standard.

In order to address the identified need, a generation solution would need to be located[8] so as to meet 100% of the contracted AMD at Dalrymple in the event of an outage of the existing transformer at Dalrymple. To ensure that a level of reliability equivalent to that of a second transformer was provided[9], new generation would need to be directly connected to the 33 kV bus at the Dalrymple connection point.

Table 2 indicates the size of the load (in MW) which would be required to be served by new generation at times of peak demand, together with the operating profile[10] that new generation would be expected to meet in order to enable the ETC reliability standards to continue to be met beyond 1 December 2016.

Table 2 Forecast non-network requirements (MW)

Year	Maximum requirement (MW)	Operating profile
2016/17	10.1	Continuous operation to meet Dalrymple load 24 hours per day 365 days per year
2017/18	10.4	
2018/19	10.7	
2019/20	11.0	
2020/21	11.4	
2021/22	11.7	
2022/23	12.1	
2023/24	12.5	
2024/25	12.9	
2025/26	13.3	

Given that a generation solution must be able to supply the entire load at the Dalrymple connection point in the event of an outage of the existing Dalrymple 132/33 kV transformer, the forecast maximum generation requirement provided in Table 2 is identical to the forecast peak load at Dalrymple provided in section 3.3.2. As indicated in

[8] NER 5.16.4(b)(3)(ii)
[9] As required by the need for "N-1 equivalent transformer capacity" under the ETC as stated in section 3.2.
[10] NER 5.16.4(b)(3)(iii)

Table 2, continuous operation from a generation solution would also be required to ensure there is no interruption to supply in the event of an unplanned transformer outage. Upon outage of the existing Dalrymple transformer, a generator would be required to ramp up at a sufficient rate so as to ensure supply to the Dalrymple load is not interrupted.

ElectraNet notes that proposed generation options must be capable of reliably meeting electricity demand under a range of conditions and must meet all relevant NER requirements related to grid connection.

ElectraNet has obligations under the NER, ETC and its connection agreements to ensure supply reliability is maintained to its customers. Failure to meet these obligations may give rise to liability.

If the proponent of a proposed generation option wishes to provide generation support services to ElectraNet as part of meeting ElectraNet's reliability obligations, it must also be willing to accept any liability that may arise from its contribution to a reliability of supply failure.

3.5 Requirement to apply the RIT-T

ElectraNet is required to apply the RIT-T to this investment, as none of the exemptions listed in NER clause 5.16.3(a) apply.

ElectraNet has classified this project as a reliability corrective action because failure to take action will result in violations of the ETC category 2 reliability standard at the Dalrymple connection point from 1 December 2016.

The network options discussed in section 4.1 have not been discussed in AEMO's 2012 National Transmission Network Development Plan (NTNDP) as these options do not play a part in the main transmission flow paths between the NEM regions.

4. Potential credible options to address the identified need

This section sets out the credible options currently considered to be capable of addressing the identified need described in section 3.1[11]. All of the credible options are expected to be both technically and commercially feasible. Further, all options are able to be implemented in sufficient time to meet the identified need[12].

4.1 Network options

ElectraNet has identified two credible network options which would address the identified need discussed in section 3.1. Both options address the need for ElectraNet to continue to meet ETC reliability standards.

4.1.1 Option 1: Extend existing site and install a second 25 MVA 132/33 kV transformer

The proposed scope of work at the Dalrymple substation (shared site) under option 1 includes:

- install a second 25 MVA 132/33 kV transformer in parallel with the existing transformer at Dalrymple;
- install three new 132 kV circuit breakers to segregate the two transformers arranged in a four breaker mesh bus;
- expand distribution network infrastructure to accommodate the transmission network augmentations including 33 kV feeder works;
- relocation of ElectraNet's telecommunications tower and control building to accommodate the distribution system works;
- extend the boundaries of the existing site to allow space for the transmission and distribution system works described above; and
- generation support during substation commissioning.

Figure 5 below presents an electrical representation of the Dalrymple substation after augmentations required under option 1 are implemented. Existing assets are shown in black while augmented assets are shown in red.

There is insufficient space at the existing substation to accommodate a second 132/66 kV transformer and a four breaker mesh bus without extending the boundaries of the site. ElectraNet currently owns the vacant land surrounding the substation which reduces the cost of extending the substation boundary.

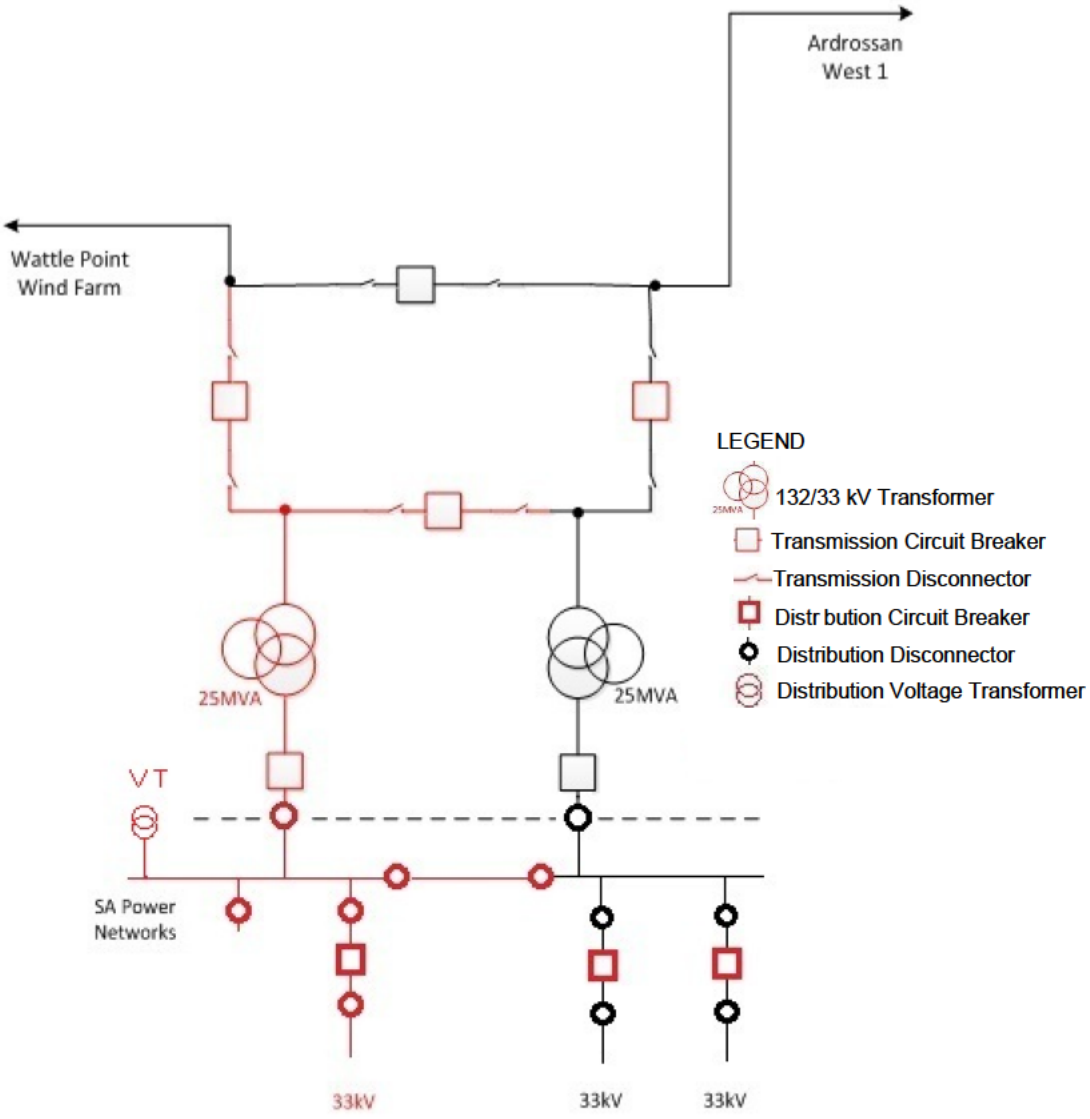
Some generation support will be needed during the implementation of the augmentations described above to minimise interruptions to the load supplied from Dalrymple.

The total indicative capital cost (in 2012/13 dollars) of option 1 is $23.6 million. Annual operating and maintenance costs are estimated to be around 2% of the capital cost.

The estimated construction timetable is around 12 months, with commissioning prior to 1 December 2016 as required by the ETC.

[11] As required by NER clause 5.16.4(b)(5).
[12] In accordance with the requirements of NER clause 5.15.2(a).

Figure 5: Configuration of the existing Dalrymple substation under option 1



4.1.2 Option 2: Rebuild Dalrymple substation at a nearby site and install a second 25 MVA 132/33 kV transformer

The proposed scope of work at both the existing Dalrymple substation and the proposed new site under option 2 includes:

- rebuild Dalrymple substation at a nearby site;
- install a second 25 MVA 132/33 kV transformer at the new site and relocate and install the existing transformer in parallel with the new transformer;
- install four new 132 kV circuit breakers to segregate the two transformers arranged in a four breaker mesh bus (allowing for an ultimate configuration of a six breaker mesh bus);
- 132 kV line works to connect new substation to existing transmission system;
- expand distribution network infrastructure at the existing Dalrymple substation to accommodate transmission network augmentations, including the installation of an

additional two 33 kV circuit breakers and 33 kV line works to connect the distribution network assets at the existing site to the new site;

- generation support during substation commissioning; and
- decommission the transmission network assets at the existing Dalrymple substation.

Figure 6: Configuration of the rebuilt Dalrymple substation and existing substation under option 2

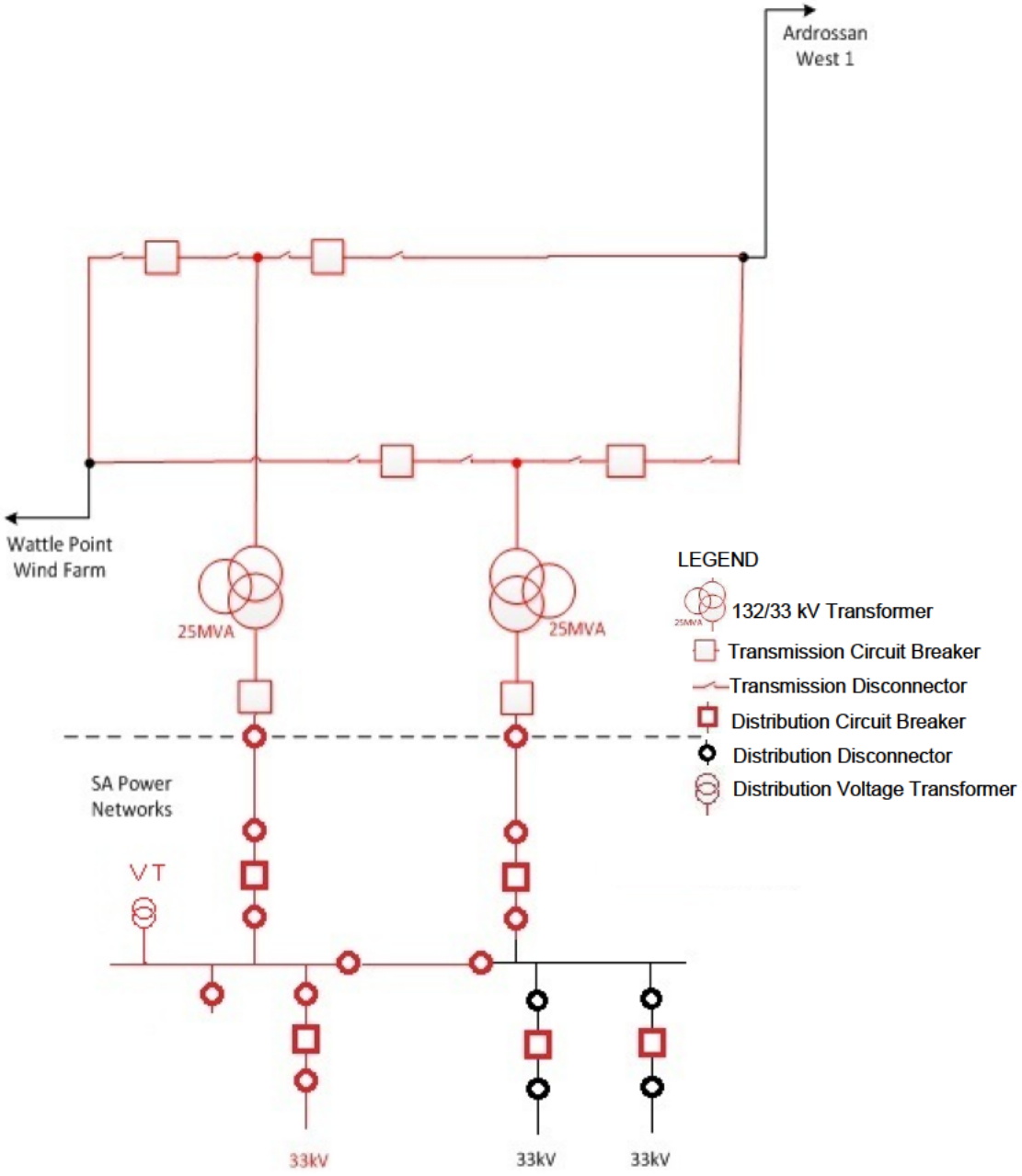


Figure 6 presents an electrical representation of the rebuilt transmission assets at the new site and distribution assets at the existing Dalrymple substation after augmentations required under option 2 are implemented. Existing assets are shown in black while augmented assets are shown in red. The transmission network arrangement shown in Figure 6 is very similar to that shown for option 1 in Figure 5, except for the slightly different transformer and line exit arrangement due to the more limited space available when extending the existing substation under option 1.

ElectraNet currently owns the vacant land upon which the rebuilt substation would be situated which reduces the cost of option 2.

The total indicative capital cost (in 2012/13 dollars) of option 2 is $32.0 million. Annual operating and maintenance costs are estimated to be around 2% of the capital cost.

The estimated construction timetable is around 12 months, with commissioning prior to 1 December 2016 as required by the ETC.

4.2 Non-network options

Section 3.4 sets out the required technical characteristics that a non-network option would be required to deliver in order to meet the identified need described in section 3.1. As indicated in section 3.4, ElectraNet considers it likely that the only non-network option capable of providing continuous N-1 equivalent transformer capacity at the Dalrymple connection point would be new generation.

ElectraNet considered the cost of a typical generation solution directly connected to the 33 kV bus at the Dalrymple connection point. ElectraNet estimates the total capital and operating and maintenance cost of a new distillate generator at Dalrymple to be approximately $3.5 million per MW per year[13]. Based on this indicative cost estimate, ElectraNet does not consider that a generation solution would be economically feasible. However, ElectraNet will consider the economic feasibility of all solutions proposed by proponents of non-network options should any submissions be received to this PSCR.

Non-network solutions must meet the required technical characteristics set out in section 3.4 and be willing to accept any liability that may arise from its contribution to a reliability supply failure as discussed in that section.

4.3 Options considered but not progressed

This section discusses additional options which ElectraNet has considered but does not consider are technically and/or commercially feasible, and therefore which are not considered to be credible options.

Under network option 2, ElectraNet and SA Power Networks considered decommissioning the distribution network assets at the existing Dalrymple substation and rebuilding equivalent network assets at the proposed new site. However, given that there is no need to replace most of the existing distribution network infrastructure in the near future and the cost of rebuilding these assets at the new site, ElectraNet and SA Power Networks consider that this option would not be economically feasible.

As stated in section 4.2, ElectraNet also considered the cost of a typical generation solution at Dalrymple, however, based on an indicative cost estimate, ElectraNet considers that a generation solution would not be economically feasible. Consequently, no specific non-network options have been identified by ElectraNet at this stage.

[13] ElectraNet's indicative cost estimate is based on assumptions and inputs to AEMO's 2012 NTNDP available at: http://www.aemo.com.au/Electricity/Planning/National-Transmission-Network-Development-Plan/Assumptions-and-Inputs.

4.4 Material inter-regional impact

In accordance with NER clause 5.16.4(b)(6)(ii), ElectraNet has considered whether any of the credible options above are expected to have a material interregional impact. ElectraNet considers this to be the same as a material inter-network impact, which is defined in the NER as:

"A material impact on another Transmission Network Service Provider's network, which may include (without limitation): (a) the imposition of power transfer constraints within another Transmission Network Service Provider's network; or (b) an adverse impact on the quality of supply in another Transmission Network Service Provider's network."

AEMO currently defines the criteria for material inter-network impact. AEMO's suggested screening test for whether or not a transmission augmentation has a material inter-network impact is that it satisfies the following:[14]

- A decrease in power transfer capability between the transmission networks or in another TNSP's network of no more than the minimum of 3 per cent of the maximum transfer capability and 50 MW;
- An increase in power transfer capability between transmission networks of no more than the minimum of 3 per cent of the maximum transfer capability and 50 MW;
- An increase in fault level by less than 10 MVA at any substation in another TNSP's network; and
- The investment does not involve either a series capacitor or modification in the vicinity of an existing series capacitor.

ElectraNet notes that none of the credible options set out in this PSCR involve either a series capacitor or modification in the vicinity of an existing series capacitor. Neither are any of the credible options discussed above expected to result in change in power transfer capability between South Australia and neighbouring transmission networks. In addition fault levels are not expected to increase by more than 10 MVA at any substation in another TNSP's network.

As a consequence, by reference to AEMO's screening criteria, there are no material inter-network impacts associated with any of the credible options.

[14] The screening test is set out in Appendix 3 of the *IRPC's Final Determination: Criteria for Assessing Material Inter-Network Impact of Transmission Augmentations, Version 1.3*, October 2004.

5. Materiality of market benefits for this RIT-T assessment

The NER require that all categories of market benefit identified in relation to the RIT-T are included in the RIT-T assessment, unless the TNSP can demonstrate that a specific category (or categories) is unlikely to be material in relation to the RIT-T assessment for a specific option[15].

Under NER clause 5.16.4(b)(6)(iii), the PSCR should set out the classes of market benefit that the TNSP considers are not likely to be material for a particular RIT-T assessment.

5.1 Market benefits relating to the wholesale market

The AER has recognised that if the proposed investment will not have an impact on the wholesale market, then a number of classes of market benefits will not be material in the RIT-T assessment, and so do not need to be estimated[16].

The credible network options described in section 4.1 do not address network constraints between competing generating centres and are therefore not considered to result in any change in dispatch outcomes and wholesale market prices.

Therefore, ElectraNet considers that the following classes of market benefits are not material for this RIT-T assessment for any of the credible network options:

- changes in fuel consumption arising through different patterns of generation dispatch;
- changes in voluntary load curtailment (since there is no impact on pool price);
- changes in costs for parties, other than for ElectraNet (since there will be no deferral of generation investment);
- changes in ancillary services costs;
- competition benefits; and
- Renewable Energy Target (RET) penalties.

ElectraNet notes that credible non-network solutions proposed to meet the identified need may potentially impact the wholesale market. If ElectraNet considers that a proposed non-network solution identified during the consultation period will impact the wholesale market, the materiality of all of the above classes of market benefits associated with that option will be assessed. As a result of that assessment, where any of these classes of market benefit are considered to be material, they will be quantified as part of the RIT-T assessment[17].

5.2 Other classes of market benefits

In addition to the classes of market benefits listed above, NER clause 5.16.1(c)(4) requires ElectraNet to consider the following classes of market benefits in relation to each credible option:

[15] NER clause 5.16.1(c)(6).
[16] AER, *Final Regulatory Investment Test for Transmission Application Guidelines,* June 2010, version 1, page 15.
[17] In accordance with NER clause 5.16.1(c)(5).

- differences in the timing of transmission investment;
- option value;
- changes in network losses; and
- changes in involuntary load shedding.

ElectraNet considers that none of the four classes of market benefits listed above will be material for this RIT-T assessment for the reasons set out below. ElectraNet does not consider that there are any other classes of market benefits which would be material for the purposes of this RIT-T assessment.

5.2.1 Differences in the timing of transmission investment

ElectraNet considers that none of the credible options discussed in section 4.1 will affect the timing of other unrelated transmission investments (ie transmission investments based on a need that falls outside the scope of that described in section 3.1.) Consequently, ElectraNet considers that market benefits associated with differences in the timing of unrelated transmission investment are not material to the credible options subject to this RIT-T assessment.

5.2.2 Option value

ElectraNet notes the AER's view that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change and the credible options considered by the TNSP are sufficiently flexible to respond to that change[18].

ElectraNet also notes the AER's view that appropriate identification of credible options and reasonable scenarios captures any option value, thereby meeting the NER requirement to consider option value as a class of market benefit under the RIT-T.

ElectraNet notes that changes in future demand levels are not relevant for this RIT-T, since the need for and timing of the required investment is being driven by an ETC category change rather than future demand growth. As a result, it is not relevant to consider different future demand scenarios in undertaking the RIT-T analysis. In addition, the sensitivity analysis discussed in section 6.2 has highlighted that the ranking of the options under the RIT-T is robust to changes in key assumptions (specifically network capital costs and the discount rate for the NPV analysis).

The estimation of any additional option value benefit would require a significant modelling assessment, which would be disproportionate to any additional option value benefit that may be identified for this specific RIT-T assessment. ElectraNet does not therefore propose to estimate any additional option value market benefit for this RIT-T assessment.

5.2.3 Changes in network losses and involuntary load shedding

Given that network options 1 and 2 provide the same network capacity at two nearby locations, differences in changes in network losses and involuntary load shedding between the two options will be minimal. ElectraNet considers that the magnitude of the difference in the change in network losses or involuntary load shedding between the two

[18] AER, *Final Regulatory Investment Test for Transmission Application Guidelines,* June 2010, version 1, pages 39 and 75.

credible options compared to the cost difference between the options is such that these categories of market benefit would not be expected to materially affect the RIT-T outcome and therefore are not material for this RIT-T assessment.

6. Identification of the preferred option

This section sets out the results of the net present value (NPV) analysis for each of the credible options discussed in section 4 and identifies the preferred option under the RIT-T.

6.1 Net market benefits and the preferred option

ElectraNet has undertaken an NPV assessment in relation to the net market benefit of each of the credible options set out in section 4.1, in line with the RIT-T requirements.

The RIT-T defines the net market benefit for each option as the gross market benefit for that option, weighted across the reasonable scenarios considered, minus the costs of each option, all in present value terms.

As identified in section 5, there are no classes of market benefits that ElectraNet considers to be material for the purposes of this RIT-T assessment. The assessment of the net market benefit for each credible option is therefore based on the cost estimate for that option, in present value terms.

The RIT-T requires the calculation of market benefits to be undertaken across relevant reasonable scenarios[19]. The RIT-T states that the number and choice of reasonable scenarios must be appropriate to the credible options under consideration. Where the identified need is for reliability corrective action, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect the ranking of the credible options[20]. In addition, where there is a material degree of uncertainty in relation to the costs of a credible option, the RIT-T requires that the cost be calculated as a probability weighted present value of the direct costs under a range of different cost assumptions[21].

Sensitivity analysis performed by ElectraNet and presented in section 6.1.2 below demonstrates that the ranking of the credible options considered in this RIT-T assessment is robust to changes in the key assumptions, notably, changes in the discount rate used in the NPV analysis and different network capital cost assumptions. Therefore, changes in these variables need not be included as additional reasonable scenarios for the purposes of the NPV assessment. This approach is consistent with the AER RIT-T Assessment Guidelines[22]. ElectraNet notes that changes in future demand levels are not relevant for this RIT-T, since the need for and timing of the required investment is being driven by an ETC category change rather than future demand growth. As a result, it is not relevant to consider different future demand scenarios in undertaking the RIT-T analysis.

ElectraNet has conducted NPV analysis on both credible options in order to identify the preferred option. The NPV analysis has been undertaken over a period of 15 years from 2015/16 to 2029/30 using a discount rate of 10% (real, pre-tax)[23]. Table 3 summarises the net market benefit in NPV terms for each credible option.

19 AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 4, page 3.
20 AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 16(a), page 7.
21 AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 16(a), page 7
22 AER, *Regulatory Investment Test for Transmission Application Guidelines*, June 2010, p.26.
23 This discount rate represents a reasonable commercial rate, appropriate for the analysis of a private enterprise investment in the electricity sector as required by the RIT-T (AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 14, page 6).

Table 3 Net market benefit for each credible option (PV, $m)

Credible Option	Net Market Benefit	Ranking under RIT-T
Option 1: Extend existing site and install a second 132/33 kV transformer	-$23.7	1
Option 2: Rebuild Dalrymple substation at a nearby site and install a second 132/33 kV transformer	-$32.1	2

Table 3 shows that option 1 has the greatest net market benefit and is therefore the preferred option under this RIT-T assessment. Given that the identified need in this case is for reliability corrective action, as stated in section 3.1, it is allowable for the preferred option to have a negative net market benefit (ie a net economic cost)[24].

6.2 Sensitivity to different discount rates and capital cost assumptions

ElectraNet has tested the sensitivity of the results to changes in the discount rate and capital cost assumptions.

In relation to the discount rate, ElectraNet has incorporated a lower bound discount rate of 7.11%[25] as reflective of the regulatory weighted average cost of capital and a higher discount rate of 13%.

In relation to assumed network capital costs, ElectraNet has tested the impact on the RIT-T outcome of increasing the capital cost estimate for option 1 (upgrading the existing site) by 30%, compared to option 2 (the rebuild option). Given that the NPV assessment is driven by the relative differences in capital costs between the two options, it is relative changes in capital costs that could potentially change outcomes.

The results of the sensitivity analysis are summarised in Table 4. The relative ranking of the options for each sensitivity is shown in brackets.

Table 4 Sensitivity to different discount rates and capital cost assumptions ($m)

Sensitivity	Option 1	Option 2
If 7.11% discount rate applied	-$22.6 (1)	-$30.7 (2)
If 13% discount rate applied	-$24.3 (1)	-$33.0 (2)
If network capital cost estimate of option 1 increased by 30%	-$30.8 (1)	-$32.1 (2)

[24] NER clause 5.16.1(b); AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 1, page 3.

[25] This is the lower bound scenario for the discount rate, specified in AER, *Final Regulatory Investment Test for Transmission*, June 2010, version 1, paragraph 15(g), page 7. The estimate of the regulatory WACC (real, pre-tax) that would apply to ElectraNet is based on the AER's November 2012 draft determination for ElectraNet: http://www.aer.gov.au/node/16617.

The sensitivity analysis demonstrates that varying the discount rate does not affect the ranking of the options under the RIT-T. Option 1 remains ranked first, with a materially higher net market benefit.

ElectraNet does not expect that there would be a significant increase in the capital cost of network option 1 relative to the cost of option 2. However, notwithstanding this, the results of the sensitivity analysis show that a 30% increase in the assumed capital cost of network option 1 when compared with unchanged capital cost assumptions for network option 2 is also insufficient to change the rankings of the options (albeit that the magnitude of the difference between the options becomes marginal).

7. Exemption from preparing project assessment draft report

NER clause 5.16.4(z1) provides for a TNSP to be exempt from producing a Project Assessment Draft Report (PADR) for a particular RIT-T application, in the following circumstances:

- If the estimated capital cost of the preferred option is less than $35 million;
- If the TNSP identifies in its Project Specification Consultation Report its proposed preferred option, together with its reasons for the preferred option and notes that the proposed investment has the benefit of the clause 5.16.4(z1) exemption;
- If the TNSP considers that the proposed preferred option and any other credible options in respect of the identified need will not have a material market benefit for the classes of market benefit specified in clause 5.16.1(c)(4), with the exception of market benefits arising from changes in voluntary and involuntary load shedding.

ElectraNet considers that its investment in relation to the upgrade of the Dalrymple substation has the benefit of the exemption under NER clause 5.16.4(z1).

ElectraNet's preferred option for addressing the identified need, as detailed in section 6.1, is network option 1, extending the existing Dalrymple substation and installing a second 132/33 kV transformer. This option was described in section 4.1.1 and is estimated to have a capital cost of $23.6 million, which is below the $35 million threshold for the exemption. Section 5 has noted that there are no material categories of market benefit associated with the proposed preferred option or any other credible option.

Network Option 1 is ElectraNet's preferred option in accordance with NER clause 5.16.1(b) because it is the credible option that maximises the net present value of the net economic benefit to all those who produce, consume and transport electricity in the market[26].

In accordance with NER clause 5.16.4(z1)(4), the exemption from producing a PADR will no longer apply if ElectraNet considers that an additional credible option that could deliver a material market benefit is identified during the consultation period.

Accordingly, if ElectraNet considers that any additional credible options are identified, ElectraNet will produce a PADR which includes an NPV assessment of the net market benefit of each additional credible option. Should ElectraNet consider that no additional credible options were identified during the consultation period, ElectraNet intends to produce a Project Assessment Conclusions Report that addresses all submissions received including any issues in relation to the proposed preferred option raised during the consultation period[27].

[26] As set out in clause 5.16.1(b) of the NER, a preferred option may have a negative net economic benefit (ie a net economic cost) where the identified need is for reliability corrective action.

[27] In accordance with NER clause 5.16.4(z2).

Dalrymple substation upgrade

Appendices

April 2013

Appendix A Definitions

Applicable regulatory instruments	All laws, regulations, orders, licences, codes, determinations and other regulatory instruments (other than the Rules) which apply to Registered Participants from time to time, including those applicable in each participating jurisdiction as listed below, to the extent that they regulate or contain terms and conditions relating to access to a network, connection to a network, the provision of network services, network service price or augmentation of a network.
AEMO	Australian Energy Market Operator
Base case	A situation in which no option is implemented by, on behalf of the transmission network service provider.
Commercially feasible	An option is commercially feasible under clause 5.6.5D(a)(2) of the Electricity Rules if a reasonable and objective operator, acting rationally in accordance with the requirements of the RIT-T, would be prepared to develop or provide the option in isolation of any substitute options[28]. This is taken to be synonymous with 'economically feasible'.
Costs	Costs are the present value of the direct costs of a credible option.
Credible option	A credible option is an option (or group of options) that:[29] (1) address the identified need; (2) is (or are) commercially and technically feasible; and (3) can be implemented in sufficient time to meet the identified need.
Economically feasible	An option is likely to be economically feasible where its estimated costs are comparable to other credible options which address the identified need. One important exception to this general guidance applies where it is expected that a credible option or options are likely to deliver materially higher market benefits. In these circumstances the option may be "economically feasible" despite the higher expected cost.[30] This is taken to be synonymous with 'commercially feasible'.
Identified need	The reason why the Transmission Network Service Provider proposes that a particular investment be undertaken in respect of its transmission network.[31]

[28] AER, *Final Regulatory Investment Test for Transmission Guidelines,* June 2010, version 1, page 10.
[29] NER clause 5.6.5D(a).
[30] AER, *Final Regulatory Investment Test for Transmission Guidelines,* June 2010, version 1, page 6.
[31] NER, Glossary.

Market benefit	Market benefit must be:[32] (a) the present value of the benefits of a credible option calculated by: (i) comparing, for each relevant reasonable scenario: (A) the state of the world with the credible option in place to (B) the state of the world in the base case, And (ii) weighting the benefits derived in sub-paragraph (i) by the probability of each relevant reasonable scenario occurring. (b) a benefit to those who consume, produce and transport electricity in the market, that is, the change in producer plus consumer surplus.
Net economic benefit	Net economic benefit equals the market benefit less costs.[33]
Preferred option	The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options. Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost).[34]
Reasonable scenario	Reasonable scenario means a set of variables or parameters that are not expected to change across each of the credible options or the base case.[35]
Reliability corrective action	Investment by a Transmission Network Service Provider in respect of its transmission network for the purpose of meeting the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments and which may consist of network or non-network options.[36]
State of the world	State of the world means a reasonable and mutually consistent description of all of the relevant market supply and demand characteristics and conditions that may affect the calculation of *market benefits* over the period of the assessments.[37]

[32] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (4), page 3.
[33] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (1), page 1.
[34] NER 5.6.5B(b); and AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (1), page 1.
[35] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph 15, page 6.
[36] NER, Glossary.
[37] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph 17, page 7.

Appendix B Checklist of Compliance Clauses

This section sets out a compliance checklist which demonstrates the compliance of the RIT-T with the requirements of clauses 5.16.4(b) and (z1) of the NER version 55.

NER clause	Summary of Requirements	Section
5.16.4(b)	A RIT-T proponent must prepare a report (the *project specification consultation report*), which must include: 1. a description of the *identified need*;	Section 3.1
	2. the assumptions used in identifying the *identified need* (including, in the case of proposed *reliability corrective action*, why the RIT-T proponent considers *reliability corrective action* is necessary);	Section 3.3
	3. the technical characteristics of the *identified need* that a non- *network* option would be required to deliver, such as: (i) the size of *load* reduction of additional supply; (ii) location; and (iii) operating profile.	Section 3.4
	4. if applicable, reference to any discussion on the description of the *identified need* or the *credible options* in respect of that *identified need* in the most recent *National Transmission Network Development Plan*;	N/A
	5. a description of all *credible options* of which the RIT-T proponent is aware that address the *identified need*, which may include, without limitation, alterative *transmission* options*, interconnectors*, *generation,* demand side management, *market network services* or other *network* options;	Section 4.1 Section 4.2
	6. for each *credible option* identified in accordance with subparagraph (5), information about: (i) the technical characteristics of the *credible option*; (ii) whether the *credible option* is reasonably likely to have a material *inter-regional* impact; (iii) the classes of market benefits that the RIT-T proponent considers are likely not to be material in accordance with clause 5.16.1(c)(6), together with reasons of why the RIT-T proponent considers that these classes of market benefit are not likely to be material; (iv) the estimated construction timetable and commissioning date; and (v) to the extent practicable, the total indicative capital and operating and maintenance costs.	Section 4.1 Section 4.4 Section 5.1 Section 5.2 Section 4.1 Section 4.1

5.16.4(z1)	A RIT-T proponent is exempt from paragraphs (j) to (s) if:	
	1. the estimated capital cost of the proposed *preferred option* is less than $35 million (as varied in accordance with a *cost threshold determination);*	Section 4.1.1
	2. the relevant Network Service Provider has identified in its project specification consultation report:	
	(i) its proposed *preferred option;*	Section 6.1
	(ii) its reasons for the proposed *preferred option;* and	Section 6.1 Section 6.2
	(iii) that its RIT-T project has the benefit of this exemption;	Section 7
	3. the RIT-T proponent considers, in accordance with clause 5.16.1(c)(6), that the proposed preferred option and any other credible option in respect of the identified need will not have a material market benefit for the classes of market benefit specified in clause 5.16.1(c)(4) except those classes specified in clauses 5.16.1(c)(4)(ii) and (iii), and has stated this in its project specification consultation report; and	Section 6.1
	4. the RIT-T proponent forms the view that no submissions were received on the project specification consultation report which identified additional credible options that could deliver a material market benefit.	TBD

Appendix C Moderate 10% PoE load forecast for Dalrymple

Year	Load forecast (MW)
2016/17	10.1
2017/18	10.4
2018/19	10.7
2019/20	11.0
2020/21	11.4
2021/22	11.7
2022/23	12.1
2023/24	12.5
2024/25	12.9
2025/26	13.3
2026/27	13.7
2027/28	14.1
2028/29	14.5
2029/30	14.9
2030/31	15.4
2031/32	15.8