Baroota substation upgrade

RIT-T: Project Specification Consultation Report

May 2014

Version 1

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1. Introduction

1.1 Background

ElectraNet and SA Power Networks are proposing transmission and distribution network augmentations at Baroota 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 and SA Power Networks 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 Baroota substation.

This report:

- Describes the identified need which ElectraNet and SA Power Networks are 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 and SA Power Networks currently consider may address the identified need; and
- Discusses specific categories of market benefit which in the case of this specific RIT-T assessment are unlikely to be material.

1.2 Submissions

ElectraNet and SA Power Networks welcome 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 within 12 weeks after publication.

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

[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.

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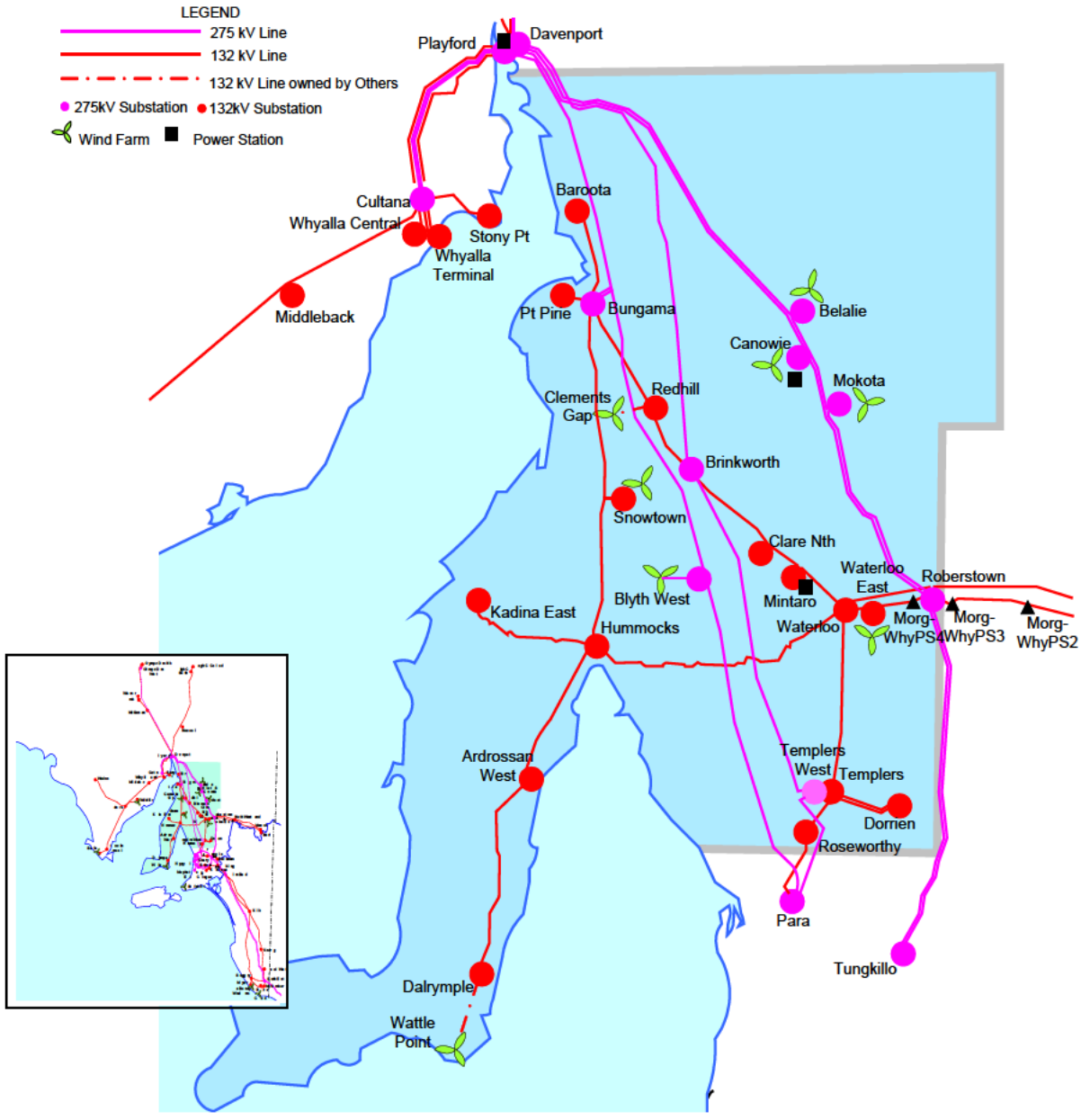
2. Background

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 currently has no committed projects in the Mid North region that will affect this RIT-T assessment.

There are currently no anticipated network developments in the Mid North region that will affect this RIT-T assessment. The planned Dalrymple substation upgrade project will address unrelated supply reliability requirements in the Mid North. This project is summarised in Table 1 below.

Table 1: Planned projects in the Mid North region

Connection Point	Scope of Work	Timing
Dalrymple Substation	Install 2nd 25 MVA 132/33 kV Transformer	2016

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).

[3] Further information on the Mid North region is available within Chapter 5 of ElectraNet's 2013 South Australian Transmission Annual Planning Report available at: http://www.electranet.com.au/assets/Reports-and-Papers/TAPR2013-Final-28June2013final.pdf.

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 is to be commissioned in 2014, being a 270 MW expansion of the existing Snowtown Wind Farm, but connecting to the 275 kV Main Grid.

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 and SA Power Networks meet the revised reliability standard set out in the ETC with respect to the Baroota connection point. The need for this investment was identified in ElectraNet's 2013 South Australian Transmission Annual Planning Report (TAPR)[5].

In February 2012, the ETC was revised with new reliability standards to apply from 1 July 2013. These new standards reclassify the Baroota connection point from reliability category 1 to category 2 from 1 December 2017. ETC reliability category 2 requires "N-1" equivalent transformer capacity sufficient to meet 100% of contracted agreed maximum demand (AMD).

The existing Baroota substation has a single 10 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 Baroota transformer, ElectraNet and SA Power Networks can ensure uninterrupted supply in accordance with the new category 2 reliability standard applying to the Baroota connection point from 1 December 2017.

3.2 Electricity Transmission Code requirements

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

The previous ETC reliability standards which applied through to 30 June 2013 assigned the Baroota 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 took effect from 1 July 2013 assigns the Baroota connection point to category 1 until 1 December 2017, 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:*

[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 South Australian Transmission 2013 APR, pages 70-71

[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 2017 to ensure that ElectraNet and SA Power Networks can continue to supply load with no interruption in the event of any unplanned loss of the existing 132/33 kV transformer at Baroota in order to meet the revised reliability standard assigned to the Baroota connection point.

3.3 Assumptions made in relation to the identified need

The following sections describe the assumptions underpinning ElectraNet and SA Power Networks' assessment of the identified need. As part of the analysis 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 Baroota connection point; and
- forecast demand growth at the Baroota 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 Baroota connection point, the only relevant load forecast is that for the Baroota connection point.

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

Figure 3 shows the load duration curve for the Baroota connection point for the 2009/10 peak load year. The annual energy demand at the Baroota connection point during the peak load year was approximately 25 GWh.

Figure 2 Daily peak load profile for Baroota (31 Dec 2009)

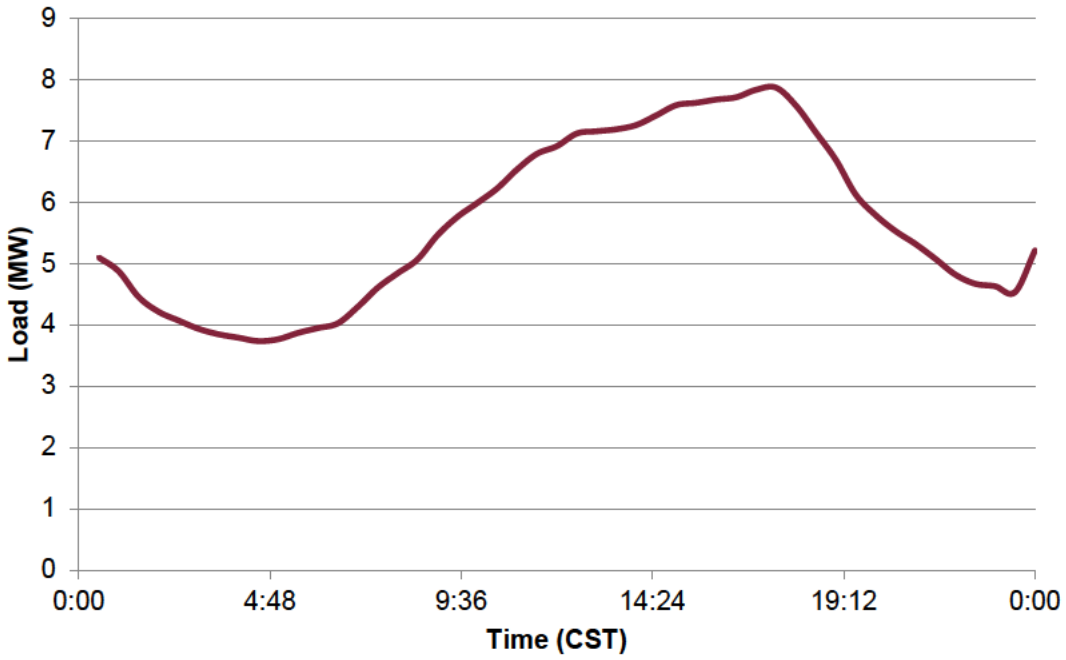
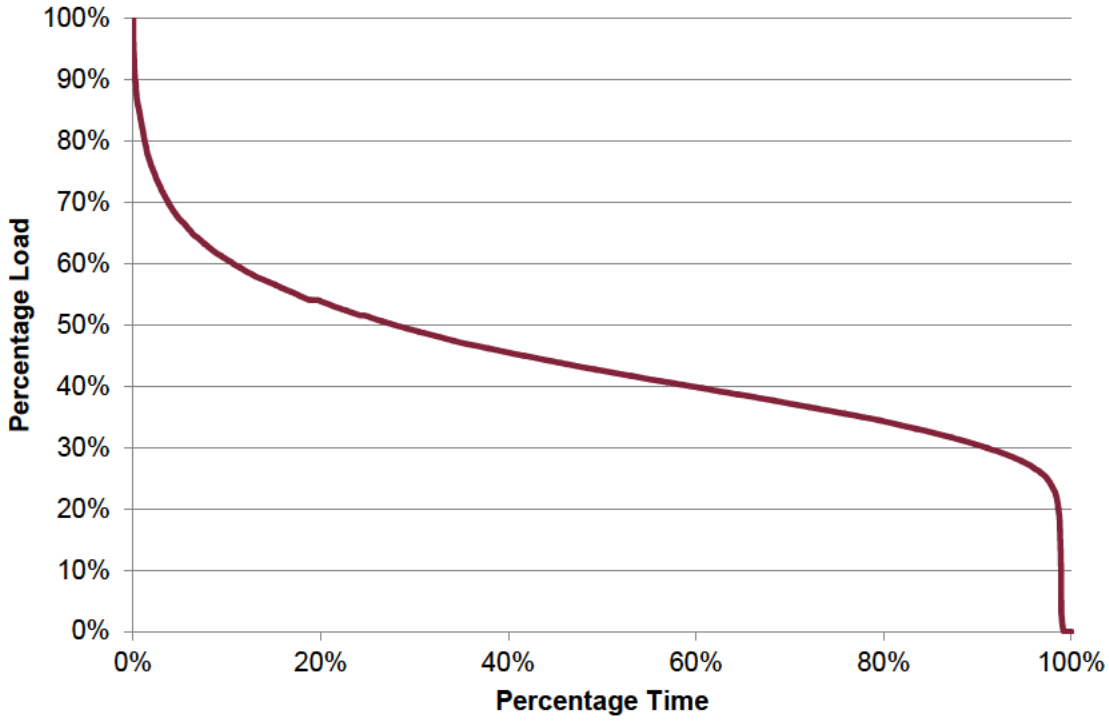


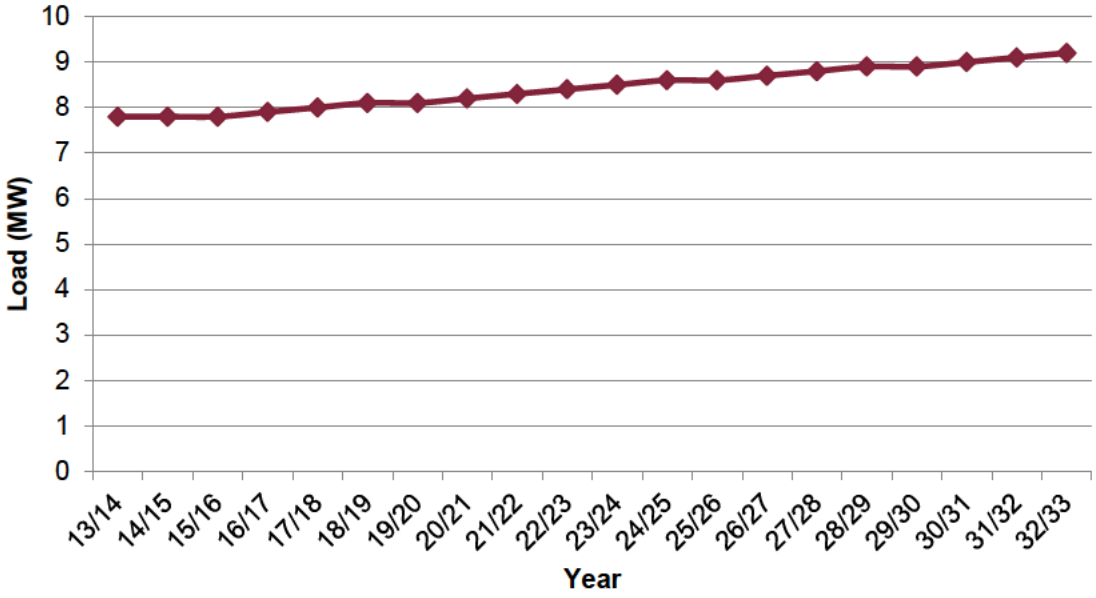
Figure 3 Load duration curve for Baroota (2009/10)



3.3.2 Forecast demand growth

Figure 4 shows SA Power Networks' most recent 2014 demand forecast for underlying demand growth at the Baroota connection point. The forecast is based on a 10% probability of exceedance (PoE), a moderate rate of economic development and 6% annual growth in solar photovoltaic systems. There are no ElectraNet customers directly connected to the transmission network at Baroota.

Figure 4: Moderate 10% PoE demand forecast for Baroota



According to the SA Power Network's moderate 10% PoE demand forecast, the average load growth rate for the Baroota connection point over the next 20 years is 0.87% 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 2017 in order to ensure that ElectraNet and SA Power Networks meet the revised reliability standard set out in the ETC for the Baroota 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 Baroota connection point from 1 December 2017. As stated in 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 Baroota in the event of an outage of the existing Baroota transformer.

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

ElectraNet and SA Power Networks consider it likely that the only non-network option capable of providing continuous N-1 equivalent transformer capacity at the Baroota connection point would be new generation. As a non-meshed connection point with a single transformer, an unplanned outage of the existing Baroota transformer would result in an interruption to the entire Baroota 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 Baroota transformer does not result in an interruption to the supply of the Baroota load. A brief interruption to the supply of the Baroota load as a result of a proposed generator starting up immediately after an unplanned outage of the existing Baroota transformer would not meet the requirements of 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 Baroota in the event of an outage of the existing transformer at Baroota. 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 Baroota 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 2017.

Table 2 Forecast non-network requirements (MW)

Year	Maximum requirement (MW)	Operating profile
2017/18	8.0	Continuous operation to meet Baroota load 24/7.
2018/19	8.1	
2019/20	8.1	
2020/21	8.2	
2021/22	8.3	
2022/23	8.4	
2023/24	8.5	
2024/25	8.6	
2025/26	8.6	
2026/27	8.7	

[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)

Given that a generation solution must be able to supply the entire load at the Baroota connection point in the event of an outage of the existing Baroota 132/33 kV transformer, the forecast maximum generation requirement provided in Table 2 is identical to the forecast peak load at Baroota provided in section 3.3.2. As indicated in 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. In the event of an outage of the existing Baroota transformer, a generator would be required to ramp up at a sufficient rate so as to ensure supply to the Baroota load is not interrupted.

ElectraNet and SA Power Networks note 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 and SA Power Networks have obligations under the NER, ETC and connection agreements to ensure supply reliability is maintained to customers. Failure to meet these obligations may give rise to liability claims.

If the proponent of a proposed generation option wishes to provide generation support services to ElectraNet and/or SA Power Networks as part of meeting ElectraNet and SA Power Networks' 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 and SA Power Networks are required to apply the RIT-T to this investment, as none of the exemptions listed in NER clause 5.16.3(a) apply.

ElectraNet and SA Power Networks have classified this project as a reliability corrective action because failure to take action will result in violation of the ETC category 2 reliability standard at the Baroota connection point from 1 December 2017.

This project has not been foreshadowed in the National Transmission Network Development Plan as it does 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 two credible options currently considered to be capable of addressing the identified need described in section 3.1[11]. These credible options are expected to be both technically and commercially feasible and able to be implemented in sufficient time to meet the identified need[12].

ElectraNet and SA Power Networks have jointly identified two credible network options which would address the identified need discussed in section 3.1. Both options address the need for ElectraNet and SA Power Networks to continue to meet ETC reliability standards.

This section also discusses the other options considered by ElectraNet and SA Power Networks, and the reasons why these are not considered to be credible options for the purpose of this RIT-T assessment.

4.1 Option 1: Upgrade the existing Baroota Substation as a brownfield option to include 2 x 10MVA 132/33 kV Transformers

An ElectraNet condition assessment report produced for the Baroota Substation in March 2012 indicates that the majority of the primary equipment is in poor condition and that the existing 132 kV ganged interrupter and fuse arrangement are both out-dated and pose a safety hazard. Most of the secondary equipment is also in average to poor condition and the overall switchyard, plant layout and equipment are not in accordance with current ElectraNet design standards or good electricity industry practice. In addition, the existing substation is located on a road easement and is subject to potential flooding.

Option 1 is to upgrade the existing Baroota substation as a brownfield option utilising the existing 10 MVA transformer installed in 2008. The scope is to include the following:

- Expand land for bigger substation footprint
- Installation of two 132 kV circuit breakers
- Installation of additional 10 MVA 132/33 kV transformer
- Installation of communication equipment
- Installation of 33 kV bus section
- Installation of two 33 kV line exits
- Upgrade or replace associated substation infrastructure and control room based on condition
- Decommissioning and/ or remediation of redundant equipment and site to comply with Environmental Protection Agency (EPA) requirements

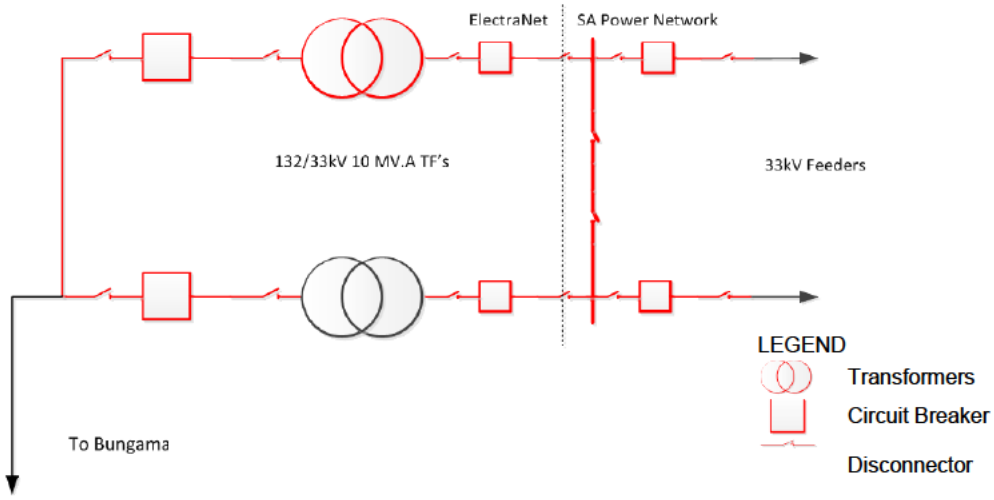
Figure 5 below presents an electrical representation of the Baroota substation after augmentations required under this option are implemented. Existing assets are shown in black while augmented assets are shown in red.

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

Costs for this option are estimated to be between $20-25 million. This estimate is currently being refined and will be reported in the PADR. Annual operating and maintenance costs are estimated to be about 2% of the capital cost.

The estimated construction timetable is about 12 months, with commissioning prior to 1 December 2017 as required by the ETC.

Figure 5: Configuration of the Baroota substation under option 1



4.2 Option 2: Rebuild Baroota Substation at a nearby site to include 2 x 10MVA 132/33 kV Transformers

Option 2 is to rebuild the substation at a new site located near the current substation along the Bungama – Baroota 132 kV line. The new substation is to include the following:

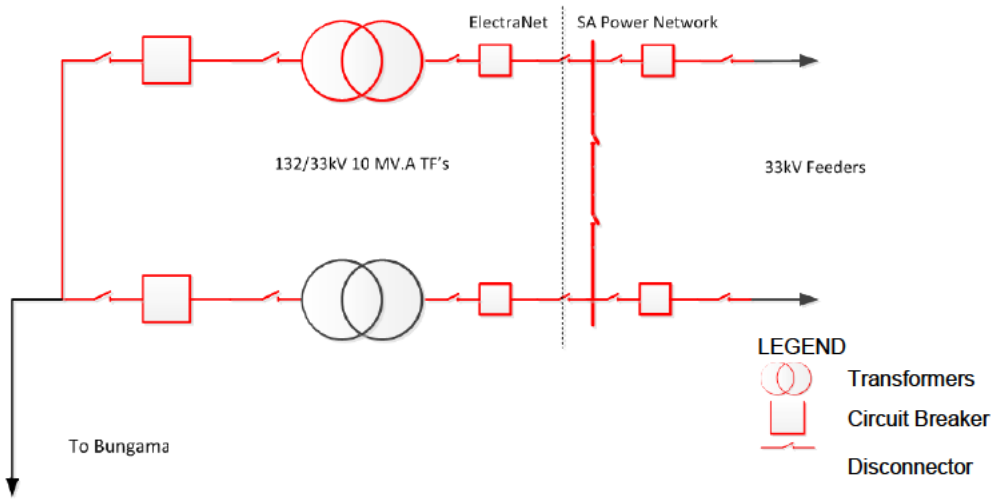
- Purchase land for new substation
- Installation of two 132 kV circuit breakers
- Installation of two 10 MVA 132/33 kV transformers
  - One of the transformers is to be the existing 10MVA transformer, relocated to the new site
- Installation of communication equipment
- Installation of 33 kV bus section
- Installation of two 33 kV line exits
- Associated substation infrastructure and control room
- Decommissioning and/ or remediation of redundant equipment and existing site to comply with Environmental Protection Agency (EPA) requirements

Figure 6 below presents an electrical representation of the Baroota substation after augmentations required under this option are implemented. Existing assets are shown in black while augmented assets are shown in red.

Total costs for this option are estimated to be between $20-25 million. The breakdown of costs between ElectraNet and SA Power Network costs will be provided in the PADR. Annual operating and maintenance costs are estimated to be about 2% of the capital cost.

The estimated construction timetable is about 12 months, with commissioning prior to 1 December 2017 as required by the ETC.

Figure 6: Configuration of the Baroota substation under option 2



4.3 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 and SA Power Networks consider it likely that the only non-network option capable of providing continuous N-1 equivalent transformer capacity at the Baroota connection point would be new generation.

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

[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.

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.

4.4 Options considered but not progressed

This section discusses additional options which ElectraNet and SA Power Networks have considered but do not consider technically and/ or economically feasible, and therefore which are not considered to be credible options.

ElectraNet and SA Power Networks considered two alternative solutions, which are:

- Generation Support; and
- Distribution Network Support.

4.4.1 Generation Support

As stated in section 4.3, ElectraNet and SA Power Networks also considered the cost of a typical generation solution at Baroota; however, based on an indicative cost estimate, ElectraNet and SA Power Networks consider that a generation solution would have substantial annual costs such that it would not be economically feasible. Consequently, no specific non-network options have been identified by ElectraNet or SA Power Networks at this stage. Also, this option does not address the condition of the existing Baroota substation.

4.4.2 Distribution Network Support

Another option considered to meet the ETC category 2 reliability standard (provide equivalent transmission line and "N-1" transformer capacity for at least 100% of contracted AMD) was to utilise the 33 kV distribution system as a network support service in the event of a failure of the existing 132/33 kV Baroota transformer. To make this option technically viable, the solution involves a new 33 kV distribution line from Bungama to Baroota including switchgear, telecommunications, unit protection as well as significant voltage control equipment. Also, additional transmission switchgear and secondary systems equipment will be required at the existing Baroota substation. High-level costs for this option are estimated to be between $30-40 million, which makes this option not economically viable.

4.5 Material inter-regional impact

In accordance with NER clause 5.16.4(b)(6)(ii), ElectraNet has considered whether 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 to indicate that a transmission augmentation has no 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 the two credible options set out in this PSCR involve neither a series capacitor nor modification in the vicinity of an existing series capacitor. Neither are the options discussed above expected to result in a 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 the credible options included in this PSCR.

[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 requires that all categories of market benefit identified in relation to the RIT-T are included in the RIT-T assessment, unless the NSP 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 NSP 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 and 4.2 above 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 and SA Power Networks consider that the following classes of market benefits are not material for this RIT-T assessment for 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 and SA Power Networks (since there will be no deferral of generation investment);
- changes in ancillary services costs;
- competition benefits; and
- Renewable Energy Target (RET) penalties.

ElectraNet and SA Power Networks note that credible non-network solutions proposed to meet the identified need may potentially impact the wholesale market. If ElectraNet and SA Power Networks consider 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].

[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).

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 and SA Power Networks to consider the following classes of market benefits in relation to the credible options:

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

ElectraNet and SA Power Networks consider 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 and SA Power Networks do 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 the credible options discussed in section 4.1 and 4.2 will not affect the timing of other unrelated transmission investments (i.e. 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 and SA Power Networks note 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 and SA Power Networks also note 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 and SA Power Networks note 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.

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 and SA Power Networks do not therefore propose to estimate any additional option value market benefit for this RIT-T assessment.

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

5.2.3 Changes in network losses and involuntary load shedding

Given both credible options included in this PSCR provide electricity supply at a nearby location, changes in network losses and involuntary load shedding will be minimal compared to the current location. ElectraNet and SA Power Networks consider that the change in network losses or involuntary load shedding 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.

Baroota substation upgrade

Appendices

May 2014

Version 1

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[19]. 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:[20] (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.[21] 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.[22]

[19] AER, *Final Regulatory Investment Test for Transmission Guidelines,* June 2010, version 1, page 10.
[20] NER clause 5.6.5D(a).
[21] AER, *Final Regulatory Investment Test for Transmission Guidelines,* June 2010, version 1, page 6.
[22] NER, Glossary.

Market benefit	Market benefit must be:[23] (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.[24]
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).[25]
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.[26]
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.[27]
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.[28]

[23] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (4), page 3.
[24] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (1), page 1.
[25] NER 5.6.5B(b); and AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph (1), page 1.
[26] AER, *Final Regulatory Investment Test for Transmission,* June 2010, version 1, paragraph 15, page 6.
[27] NER, Glossary.
[28] 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) of the NER version 62.

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 Section 4.3
	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 & 4.2 Section 4.5 Section 5.1 Section 5.2 Section 4.1 & 4.2 Section 4.1 & 4.2

Appendix C Moderate 10% PoE load forecast for Baroota

Year	Load forecast (MW)
2017/18	8.0
2018/19	8.1
2019/20	8.1
2020/21	8.2
2021/22	8.3
2022/23	8.4
2023/24	8.5
2024/25	8.6
2025/26	8.6
2026/27	8.7
2027/28	8.8
2028/29	8.9
2029/30	8.9
2030/31	9.0
2031/32	9.1
2032/33	9.2