ElectraNet SA
electricity transmission network

Request for Information

Projected Transmission Network Limitations

Lower Flinders Region of South Australia

Ageing Network Assets

ElectraNet SA
April 2003

Contents

1.0 Introduction

This document seeks information on potential solutions to projected network limitations on the 132 kV transmission network that services the Lower Flinders region in the mid-north of South Australia, which can under certain contingency operating conditions impact on supply to areas as distant as the Eyre Peninsula and far west coast regions of South Australia. Corrective action is required if reliable supply is to be maintained during credible contingencies. The paper is an integral part of ElectraNet SA's approach to meeting National Electricity Code requirements that ensure adoption of the most cost-effective solution to future network limitations.

1.1 Purpose of the Discussion Paper

The purpose of this discussion paper is to:

- Provide information about the existing transmission network in the relevant area;
- Provide information about projected network limitations and the expected time at which action must be taken to maintain system reliability during contingencies;
- Seek information on solutions to the projected limitations which may be able to be provided by solution providers other than ElectraNet SA;
- Explain the process to be used to evaluate alternative solutions.

1.2 Discussion Paper Context

ElectraNet SA is required to ensure its network is operated with sufficient capacity to provide network services to customers in accordance with the provisions of the National Electricity Code (NEC) and the South Australian Transmission Code (SATC). If the technical limits or reliability requirements of its transmission system are forecast to be exceeded, ElectraNet SA is required to notify Code Participants within the time required for corrective action. Prior to construction of any major network augmentation, ElectraNet SA must also meet the following regulatory requirements[1]:

- Consult with Code Participants and interested parties regarding alternative solutions, including those which may be provided by solution providers other than ElectraNet SA such as local generation, market network services, and demand side initiatives;
- Demonstrate proper consideration of various market development scenarios, including variations in electricity demand growth rates, and the ability of new or proposed demand-side responses and/or new or proposed generation capacity to satisfy projected network limitations;
- Ensure that the recommended solution meets reliability requirements at the lowest total net present value cost when compared with other feasible solutions.

This discussion paper is a critical step in fulfilling these regulatory obligations in relation to supply to the Lower Flinders region of South Australia.

[1] As set by the ACCC and contained in Chapter 5 of the National Electricity Code.

2.0 Existing Supply System to the Lower Flinders Region of South Australia

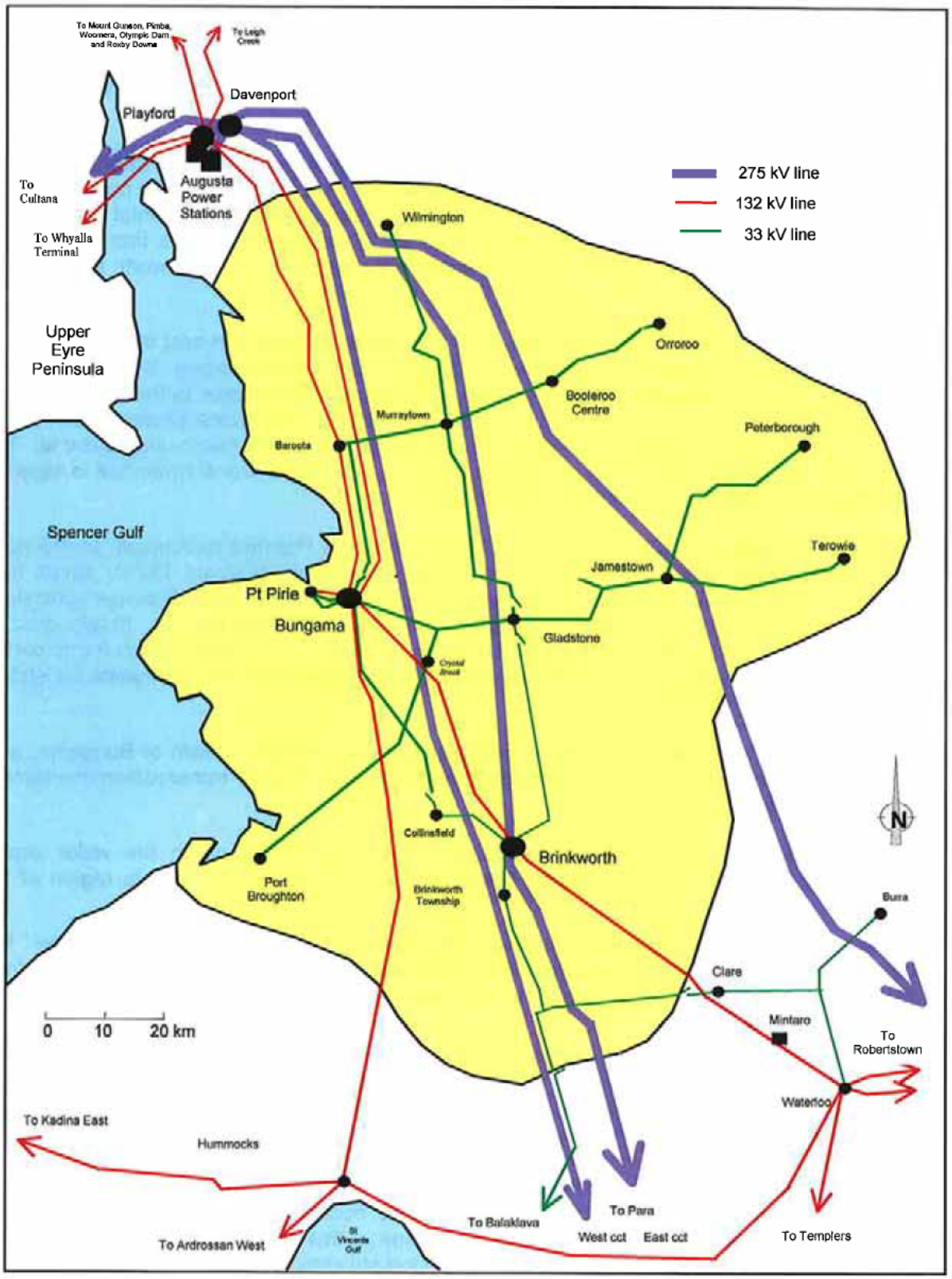
2.1 Geographic Region

The main region of concern is the area around Port Pirie, in the Lower Flinders region of South Australia. However, shortcomings in the Lower Flinders transmission system have the potential to directly impact areas as far-reaching as the Eyre Peninsula and far west coast regions of the State under certain contingency situations.

Port Pirie is South Australia's third largest regional centre outside of Adelaide, with a population of about 18,000. The Pasminco Port Pirie Smelter is based in Port Pirie, and is the world's biggest lead refinery, producing lead, silver, gold, copper, zinc, and other valuable metals. It is Port Pirie's largest employer, with the majority of Port Pirie's commercial and business enterprises, health, education, and sporting facilities, providing directly or indirectly for the needs of the smelter's employees and their families. The region generally to the north, east and south of Port Pirie is used mainly for crop, and to a lesser extent, sheep farming. The growing of wine grapes is becoming increasingly popular in the area, but is still in its infancy.

DIAGRAM 1

ELECTRICITY SUPPLY NETWORK FOR THE LOWER FLINDERS REGION IN THE MID-NORTH OF SOUTH AUSTRALIA



2.2 Existing Transmission System

The 132 kV transmission network that supplies the Lower Flinders region is shown in Appendix 1. Primary supply to the region is provided by four ElectraNet SA connection points; Brinkworth, Bungama Rural, Bungama Industrial - Port Pirie grouped connection point, and Baroota. (Bungama substation essentially comprises two transformers, one dedicated to rural loads, and the other servicing industrial loads. The rural transformer is referred to independently as the *'Bungama Rural'* connection point, while the Bungama Industrial transformer and Port Pirie substation are together referred to as the *'Bungama Industrial and Port Pirie'* grouped connection point, in the context of the South Australian Transmission Code.)

With reference to Diagram 1, it can be seen that the city of Port Pirie and nearby industrial customers are supplied from the Bungama Industrial and Port Pirie connection point, while the rural area to the north, east and south of Port Pirie, in an approximately radial arc of about 80 kilometres, is supplied by an underlying 33 kV sub-transmission network that is owned by ETSA Utilities and supplied jointly from ElectraNet's Bungama Rural, Brinkworth and Baroota connection points.

The Brinkworth connection point lies about 60 kilometres to the south-east of Bungama, and the two substations are connected by a single 132 kV transmission line. Brinkworth substation also connects to Waterloo substation, a further 60 kilometres to the south-east, via a 132 kV transmission line that also connects the Mintaro gas turbine power station to the 132 kV system. The dispatch from Mintaro is market driven and therefore unpredictable. The Brinkworth connection point itself contains a 60 MV.A 275/132 kV transformer that is supplied from the Davenport-Para 275 kV transmission line.

Bungama substation is supplied by two 132 kV lines from Playford switchyard, to the north (the western-most circuit going via Baroota connection point), a single 132 kV circuit from Brinkworth 275/132 kV connection point, and a single 132 kV circuit from Waterloo substation, to the south east of Brinkworth. However, the line from Waterloo first heads west to Hummocks substation, then north up to Bungama. Port Pirie substation, which forms part of the Bungama Industrial and Port Pirie connection point, is supplied from Bungama substation via a single radial 132 kV line.

Baroota 132/33 kV connection point is situated about 25 kilometres north of Bungama, and, as mentioned, is supplied from the Playford-Bungama 'west' 132 kV transmission line using a *"tee"* arrangement.

For completeness, the following information is provided in relation to the wider supply arrangements for the four connection points that service the Lower Flinders region of the State:

Brinkworth 275/132 kV connection point is supplied by the Davenport-Para 275 kV *'east'* line using a tee arrangement, while Waterloo substation is supplied via a single 132 kV line from Robertstown 275/132 kV substation, to the east, and a second 132 kV line from Para substation, to the south.

Playford 132 kV switchyard, to the north, contains two 275/132 kV transformers that are supplied by a single radial 275 kV line from nearby Davenport substation. This supply is supplemented by two 132 kV lines from Cultana 275/132 kV substation (near Whyalla). Davenport substation's 275 kV supply is provided jointly by four 275 kV circuits on three transmission lines connecting to the transmission network in the south of the State, and a local coal-fired, base-load generator. Playford's 275 kV supply is provided by the radial line from Davenport, but also connects to a separate coal-fired generator located adjacent Playford switchyard. However, the operating regime of this generator is far less predictable than that of the generator that connects to Davenport substation.

Supply to Whyalla Terminal substation on the upper Eyre Peninsula is via two 132 kV circuits from Playford switchyard, and also via a 275 kV line between Davenport and Cultana substations.

2.2.1 Technical Information

Substations/generators	Basic composition
Bungama substation	1x50 MV.A 132/33 kV transformer ("Industrial") *plus* 1x10 MV.A 132/33 kV transformer ("rural")
Port Pirie substation	1x48 MV.A 132/33 kV transformer
Brinkworth substation	1x60 MV.A 275/132 kV transformer *plus* 1x10 MV.A 132/33 kV transformer
Playford switchyard	2x160 MV.A 275/132 kV transformers
Waterloo substation	2x10 MV.A 132/33 kV transformers
Playford power station	4x60 MV.A coal-fired steam generators
Northern power station	2x250 MV.A coal-fired steam generators
Mintaro power station	1x90 MW gas turbine generator

Transmission Lines	Asset age (years)	Length (km)	Summer rating (MV.A)	Winter rating (MV.A)
Playford-Baroota 132kV	51	56.3	29	79
Baroota-Bungama 132kV	51	26.0	29	79
Playford-Bungama 132kV	48	85.1	8	79
Bungama-Hummocks 132kV	51	100.1	107	123
Waterloo-Mintaro 132kV	50	16.6	180	199
Mintaro-Brinkworth 132kV	50	45.8	180	199
Bungama-Brinkworth 132kV	50	55.7	144	168
Bungama-Port Pirie 132kV	35	6.3	111	129

2.2.2 Committed Transmission Augmentations

At the time of writing this report, ElectraNet SA has no committed transmission augmentations that will impact on the 132 kV transmission network that services the Lower Flinders region of South Australia.

2.3 Existing Distribution System

Transmission supply to the Lower Flinders region is provided by four ElectraNet SA connection points. The city of Port Pirie and nearby industrial customers are supplied from Port Pirie substation via the radial Bungama-Port Pirie 132 kV line, and two 33 kV lines, which are similarly supplied from Bungama 132/33 kV substation. One of these 33 kV feeders provides a tie between Bungama and Port Pirie 132/33 kV substations, and the other between Bungama substation and Port Pirie South 33 kV substation. A 33 kV line then provides a connection between Port Pirie and Port Pirie South substations.

The mainly rural area to the north, south and east of Port Pirie is supplied from Bungama Rural, Brinkworth and Baroota connection points via a 33 kV sub-transmission network that is owned by ETSA Utilities. As can be seen from Diagram 1, Bungama, Brinkworth and Baroota can be tied together via the 33 kV network, but under normal conditions, this interconnected network is operated in an open configuration. However, since the route-length of the most direct of the interconnecting feeders is over 60 kilometres, the feasibility of any one of the connection points providing back-up for either of its neighbouring connection points via this underlying 33 kV network must be discounted. As can also be seen from Diagram 1, the remainder of the area under consideration is supplied by radial 33 kV lines.

2.4 Existing and Committed Generation

A single 90 MW gas turbine powered generator is located at Mintaro, about 45 kilometres south east of Brinkworth on the Brinkworth-Waterloo 132 kV line. Two coal-fired power stations, one comprising four 60 MW generators, and the other, two 250 MW generators, are situated at Port Augusta, approximately 80 kilometres to the north of Bungama at the top of Spencer Gulf. The generators are privately owned, and dispatch is market driven.

NEM data indicates that the two 250 MW generators at Port Augusta are being operated as base-load generators, while the remaining generators at Port Augusta and the single generator at Mintaro are dispatched on an opportunity basis. The generators at Port Augusta contribute to the supply of the Lower Flinders connection points via the 132 kV network that connects into Bungama and Brinkworth substations.

3.0 Load Characteristics

3.1 Strategic Significance

The load in the Lower Flinders region is predominantly due to the Pasminco Port Pirie Smelter. Residential load plus a number of smaller industrial concerns located in and around Port Pirie proper, and rural properties to the north, south and east of Port Pirie, make up the remainder of the load.

3.2 Load Growth Overview

Electricity demand in the mid-north of South Australia as a whole is currently growing at approximately 2.3% per annum. However, the load in the Lower Flinders region is predominantly due to a single, relatively constant load. Load growth in such cases is dominated by the expansion plans of the individual customer. The relevant Distribution Network Service Provider (ETSA Utilities) has surveyed the customer and advises that no load increase above 5 MW has been anticipated for 2002/03 and beyond. Demand forecasts issued by ETSA Utilities for the connection points supplying the Lower Flinders region suggest that load growth will settle to a rate of about 2.1% per annum in the medium term.

Table 1: Forecast total electricity demand at summer peak load levels for the connection points supplying the Lower Flinders region of South Australia

	Lower Flinders	Port Augusta
Summer 2002/03	85.3	30.5
Summer 2003/04	87.7	31.3
Summer 2004/05	90.1	32.2
Summer 2005/06	92.6	33.1
Summer 2006/07	95.1	34.0

ElectraNet SA obtains electricity demand forecasts over a ten-year horizon from ETSA Utilities, South Australia's electricity distributor. ETSA Utilities advises that these forecasts take account of any known demand management programmes in-place or proposed, and also the presence of embedded generation that may reduce the forecast of demand that needs to be supplied via each transmission connection point.

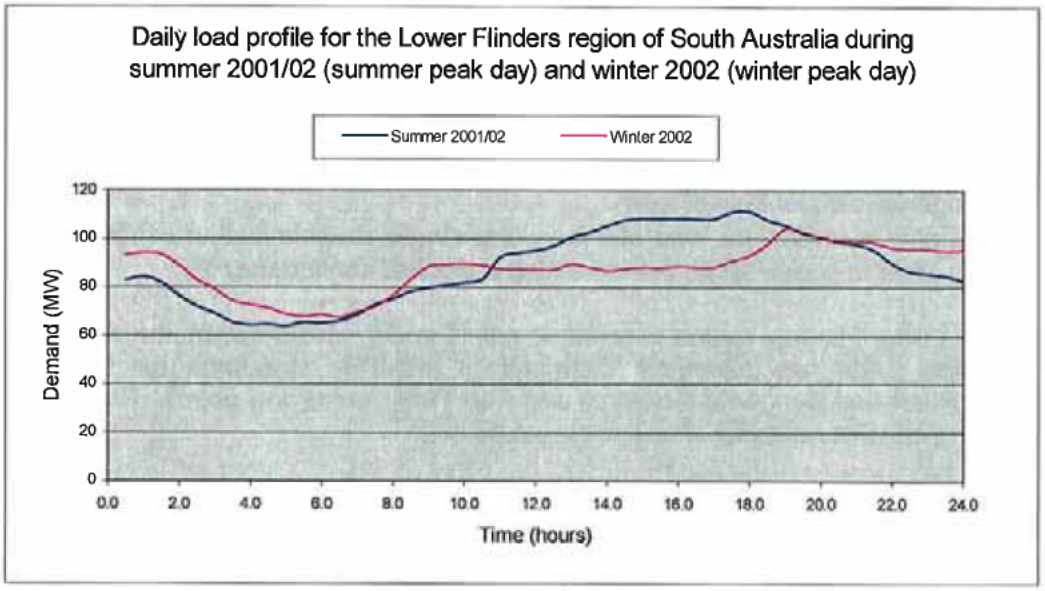
When incorporated in ElectraNet SA's transmission system modelling, it is evident that *both* the Playford and Brinkworth substations, *and* the 275/132 kV 160 MV.A transformer at Para substation, all show steadily increasing loads, as indicated in Table 2.

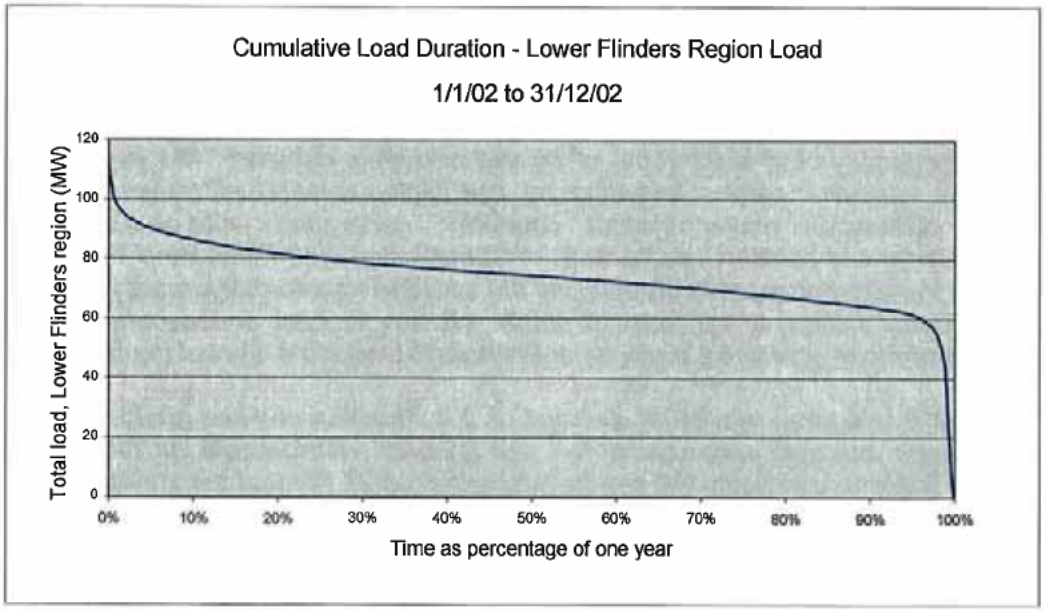
Table 2: Forecast demand on the two 275/132 kV substations that supply the 132 kV transmission network in the Lower Flinders region of South Australia

Substation	Projected substation loadings under system normal conditions and at peak load times for the Lower Flinders region of South Australia (MW)				
	Summer 2002/03	Summer 2003/04	Summer 2004/05	Summer 2005/06	Summer 2006/07
Playford 2x160 MV.A 275/132 kV tie transformers	164.3	165.3	167.0	168.0	168.9
Brinkworth 1x60 MV.A 275/132 kV transformer	34.7	35.3	35.7	36.3	36.9
Para 1x160 MV.A 275/132 kV transformer	82.4	83.8	84.7	85.7	87.0

3.3 Pattern of Use

While peak electricity demand in the Lower Flinders region of South Australia occurs during the summer months of the year, overall electricity usage is generally higher in the winter months. Despite this, the average variation in loads from summer to winter is only about 5 MW. Given that the lower temperatures in winter allow for higher circuit ratings (as noted in section 2.2.1), it remains that summer is the critical period relevant to ensuring that the transmission network in the mid-north region of South Australia has sufficient capacity and rating to maintain a reliable supply.





4.0 Transmission Planning Criteria

As a transmission network service provider (TNSP), ElectraNet SA must comply with technical standards in the National Electricity Code. In particular, requirements relating to reliability and system security contained in Schedule 5.1 of the Code are relevant to planning for future electricity needs. In addition, as a licensed transmission entity in South Australia, ElectraNet SA is required to comply with the service obligations imposed by the South Australian Transmission Code.

The South Australian Transmission Code allocates reliability standards for each connection (exit) point or group of connection points within the transmission network and thereby imposes specific requirements on ElectraNet for planning its transmission network. Examples of the specified levels of reliability include:

- *'N' or 'System Normal'* : Defined as the ability to supply all load with all elements of the electricity system intact (i.e. supply cannot be maintained during a single fault or contingency without loss of load).
- *'N-1'* : able to meet peak load with the worst **single** credible fault or contingency;
- *'N-2'* : able to supply all peak load during a **double** contingency

Of the four Lower Flinders region connection points under consideration, the South Australian Transmission Code has allocated 'Category 3' reliability standards for the Brinkworth, Bungama Rural and Bungama Industrial and Port Pirie connection points. For this category, the following specific reliability standards must be met:

"A transmission entity shall not contract for an amount of agreed maximum demand greater than 100% of installed line capacity. A transmission entity shall provide N-1 line capacity of at least 100% of agreed maximum demand. N-1 capacity may be provided by whatever means including by the implementation of transmission system capability, distribution power system capability, generating unit capability or load interruptibility (or any combination thereof). A transmission entity shall use its best endeavours to restore contracted line capacity within 2 days of an interruption.

A transmission entity shall not contract for an amount of agreed maximum demand greater than 100% of installed transformer capacity. A transmission entity shall provide N-1 transformer capacity of at least 100% of agreed maximum demand. N-1 capacity may be provided by whatever means including by the implementation of transmission system capability, distribution power system capability, generating unit capability or load interruptibility (or any combination thereof). A transmission entity shall keep in stock at least ones spare transformer capable of replacing the installed transformer capacity. In the event of a transformer failure, a transmission entity will use its best endeavours to repair the installed transformer or install a replacement transformer within 4 days of the failure.

In the event that agreed maximum demand at a connection point or group of connection points exceeds available capacity for N-1 (for lines or transformers) as required for this category, a transmission entity will use its best endeavours to meet the standards within 12 months and, in any case, within 3 years."

The fourth connection point that supplies the Lower Flinders region is Baroota. The South Australian Transmission Code has allocated 'Category 1' reliability standards for this connection point, and for this category the following specific reliability standards must be met:

"A transmission entity shall not contract for an amount of agreed maximum demand greater than 100% of installed line capacity. A transmission entity shall have no obligation to provide N-1 line capacity beyond that necessary to maintain power system performance and

quality of supply standards under the NEC. A transmission entity shall use its best endeavours to restore contracted line capacity within 2 days of an interruption.

A transmission entity shall not contract for an amount of agreed maximum demand greater than 100% of installed transformer capacity and shall have no obligation to provide N-1 transformer capacity. A transmission entity shall keep in stack at least one spare transformer capable of replacing the installed transformer capacity. In the event of a transformer failure, a transmission entity shall use its best endeavours to repair the installed transformer or install a replacement transformer within 4 days of the failure."

The assessment of projected network limitations in section 5.0 therefore covers the capability of the existing network to have supply restored as quickly as possible, and contracted line and transformer capacity reinstated to agreed levels within the prescribed times mentioned above following the loss of any single element. For the 132 kV transmission network in the Lower Flinders region of South Australia, the *'most critical single element'* is the Davenport-Playford 275 kV line during a high load period and coinciding with a time when Playford Power Station is not generating. However, if Playford Power Station is on line, the most critical contingency shifts to an unscheduled outage of the Baroota-Bungama 132 kV line under summer operating conditions.

5.0 Projected Network Limitations

The following issues are listed to highlight projected limitations concerning the transmission network that supplies the Lower Flinders area and that have the potential to impact on the Eyre Peninsula and far west coast regions of the State under certain contingency conditions:

- **Projected Non Compliance with SATC and NEC Requirements**

  Electricity demand has grown to the point where the existing network is no longer able to supply customer load during a single contingency on the Davenport-Playford 275 kV line during a high load period and coinciding with a time when Playford Power Station is not generating, or an outage of any of the Playford-Baroota, Baroota-Bungama or Playford-Bungama 132 kV lines under high summer demand conditions.

- **Aged Assets at end of Technical and Operating Life**

  Bungama 132 kV substation was built in the early 1950's and uses high maintenance bulk oil and air blast equipment. The control cabling within the substation is of the Vulcanised Indian Rubber type that has deteriorated with age and is in need of replacement. Considerable upgrading of protection and earthing systems is required to bring the substation up to what is now regarded as "Good Electricity Supply Industry Practice".

- **Operational Flexibility and System Security**

  Studies have recently identified that following a critical contingency involving the Davenport-Playford 275 kV line under high demand operating conditions, the Brinkworth and Cultana 275/132 kV transformers will become overloaded. To avoid system security violations and wide-spread long term loss of customer load, automatic controls will operate to minimise customer impact and supply-outage duration.

These projected network limitations are discussed in more detail in the following section.

5.1 Network Limitations

As mentioned, primary supply to the Lower Flinders region of South Australia is provided by four ElectraNet SA connection points; Brinkworth, Bungama Rural, Bungama Industrial and Port Pirie, and Baroota.

Because of their design and age the two Playford to Bungama 132 kV lines are a source of power flow limitations on the Lower Flinders transmission network. These two lines were the first long distance high-voltage transmission lines built in South Australia, and as a result construction and quality assurance practices were under development and not at the levels now achievable. As a consequence, many of the spans on these lines did not meet the original clearance requirements. Recent analysis shows that this situation has worsened as the lines have aged.

ElectraNet SA has undertaken considerable works to increase the ground clearances on many of its 132 kV and 275 kV transmission lines that were built to the original British clearance standards to minimise the risk of public contact with these lines.

Work undertaken on the Playford-Bungama and Playford-Baroota-Bungama lines has addressed high priority sections of line and mechanical strength issues only. A substantive rebuild of these lines is required if these lines are to continue to be serviceable at present-day loading levels.

The age, physical condition, and electrical standards to which Bungama 132 kV substation was built are also factors that need to be taken into consideration.

Bungama 132 kV substation was built in the early 1950's and uses old bulk oil and air blast equipment which is at the end of its service life. The control cabling within the substation is of the Vulcanised Indian Rubber type that has deteriorated with age and is in need of replacement. Protection systems within the substation require upgrading to bring them up to what is now regarded as "Good Electricity Supply Industry Practice" and there is also a need to refurbish the substation earthing system.

Following a critical contingency involving the Davenport-Playford 275 kV line, supply to the Eyre and Lower Flinders 132 kV systems would be provided predominantly by the Brinkworth and Cultana 275/132 kV transformers. Studies indicate that should this contingency occur under peak load conditions, both transformers would overload and potentially trip, leading to voltage collapse on the Eyre and Lower Flinders 132 kV systems. To minimise disruption of supply to customers in the Lower Flinders area and to prevent the Brinkworth transformer from overloading, automatic controls will operate to disconnect the Cultana transformer, and under-voltage controls will then act to disconnect 132 kV lines north of Bungama and shed load at Bungama substation. The Cultana transformer would then be re-energised to supply customers in the Eyre Peninsula and upper-north areas of the State. This sequence of automatic switching, by necessity, has the potential to cause significant disruption to customer supply and network operation, and is directly attributable to insufficient 275/132 kV capacity in the Lower Flinders region.

5.2 Capability During Single Contingencies

There is a range of technical factors that influence network capability, including line and equipment thermal ratings, protection requirements, transient stability, reactive support, generation and load patterns, and voltage stability. In addition, appropriate allowance must also be made to include sufficient capability in the system to allow equipment to be maintained in accordance with accepted asset maintenance practices.

In light of these requirements, the following single contingencies on the Lower Flinders 132 kV transmission network are of particular concern:

- For an outage of the Davenport-Playford 275 kV line under high demand operating conditions, automatic controls will operate, resulting in significant disconnection of customer load in the region of Bungama and disruption to network operation, in order to avoid overloading plant and potential voltage collapse. Studies indicate that the existing 275/132 kV 60 MVA transformer at Brinkworth substation is not able to support all of the load in the Lower Flinders region following such a critical contingency.

- An outage of the Playford-Baroota 132 kV line under typical summer operating conditions will overload the thermal rating of the Playford-Bungama 132 kV line.

- Alternatively, an outage of the Playford-Bungama 132 kV line under typical summer operating conditions will overload the thermal ratings of the Playford-Baroota and Baroota-Bungama 132 kV lines.

With consideration for these single contingencies, and based on the most recent forecast loads supplied by ETSA Utilities, Code compliant 132 kV voltage levels and operation within transmission line rating limits will not be achievable during the summer of 2003/04, indicating that some form of additional reinforcement of the system is urgently required.

5.3 Factors Impacting Timing of Required Corrective Action

5.3.1 Assumed Electricity Demand

Section 5.2 identified that, without corrective action, the existing system will be unable to maintain a secure supply during single contingencies at predicted load levels for the summer of 2003/04 and beyond.

The primary driver of this projected network limitation is the forecast growth in electricity demand in the area coupled to the relatively low rating of the Playford-Bungama 132 kV lines and the shortfall in 275/132 kV transformation capacity in the Lower Flinders region. The age and condition of these assets are further relevant factors. The 2003/04 timing conclusion was based on a load growth forecast that assumed normal summer temperatures and medium economic growth and practical implementation times. Changes to these assumptions do not alter the required timing for corrective action.

5.3.2 Assumed Generation Pattern

ElectraNet SA has carried out analyses examining the power flows and voltage levels on the 132 kV lines in the Lower Flinders transmission system with a variety of assumptions about plausible generation patterns. It has been found that during the most critical contingency for the area (loss of the Davenport-Playford 275 kV line at a high load period), when line ratings will be exceeded and voltage collapse commences, that the outcome is only sensitive to dispatch from Playford power station, and not sensitive to the level of generation from other existing and committed sources. However, in the event that Playford power station is generating at the time that this critical contingency occurs, generation at Playford power station will exacerbate, rather than diminish, the overloading of the Playford-Bungama or Playford-Baroota-Bungama132 kV lines.

5.3.3 Other Factors

There are no other factors, given the existing electricity supply system and absence of committed augmentations, which have been identified to influence the timing of projected network limitations in the Lower Flinders region of South Australia.

Augmentations to the distribution network may influence flows on the 132 kV and 33 kV systems in the relevant area, but would have minimal impact on the need to provide supply to the Lower Flinders 132 kV network under critical network operating conditions.

5.3.4 Conclusion

Any timing recommendation requires a balance of the risks associated with variations in electricity demand, temperature, and other assumptions. It is ElectraNet SA's conclusion that the capability of the transmission network must be addressed by the summer of 2003/04, or as soon as possible thereafter, if supply reliability and system security are to be maintained following a single contingency, thus ensuring that the network can meet NEC and SA Transmission Code service standards.

5.4 Projected Network Limitations - Summary

The projected network limitations for the Lower Flinders region 132 kV network are summarised below for clarity:

- The two Playford-Bungama 132 kV transmission lines were constructed in the early 1950's to superseded British design criteria and practices, and consequently are no longer adequately rated under some operating conditions for their present day duty. The lines are generally in poor mechanical condition due to their age and service life. Recent analysis shows that this situation has worsened as the lines have aged.
- Bungama 132 kV substation was built in the early 1950's and uses high maintenance bulk oil and air blast equipment. The control cabling within the substation is of the Vulcanised Indian Rubber type that has deteriorated with age and is in need of replacement. Considerable upgrading of protection and earthing systems is required to bring the substation up to what is regarded as "Good Electricity Supply Industry Practice".
- Studies using recently supplied load data have revealed to ElectraNet SA that a single contingency on the 275 kV Davenport-Playford circuit at Port Augusta, although physically remote from the Lower Flinders region, has the potential to overload the Lower Flinders 132 kV network and could ultimately lead to voltage collapse, under certain loading conditions. Since the existing 275/132 kV 60 MVA transformer at Brinkworth is not able to support all of the load in the Bungama region under this single contingency condition, it is evident that there is inadequate 275/132 kV support in the Lower Flinders region.

6.0 Market and Other Network Impacts

As noted in the previous section, the projected network limitations on the 132 kV network in the Lower Flinders region of the State are not particularly sensitive to market operations nor generation scenarios (apart from the absence of generation at Playford power station during the most critical contingency identified earlier in this document). The need for action is driven primarily by existing plant limitations and growth in the electricity demand in the region.

Market participants may wish to consider the following when developing alternative solutions:

- A new local generation option will be required to operate at certain times under contract with ElectraNet SA. This will be essential for reliability purposes, and such operation will be required regardless of the pool price at the time. (The National Electricity Code prevents a generator that is providing grid support from setting the market price.)

- A demand side management initiative (eg programme to reduce electricity usage during the relevant peak period) must provide positive proof that it is capable of reducing flows on the relevant network elements to below emergency ratings during single network contingencies within the required time. If this reduction is not achieved, the consequence is likely to be forced customer load-shedding of prolonged duration during single contingencies and this is not an acceptable outcome.

- A market network solution (eg programme to re-distribute the supply of electricity to an alternative regional reference node via a two-terminal link during the relevant peak period) must provide positive proof that it is capable of reducing flows on the relevant network elements to below emergency ratings during single network contingencies. If this reduction is not achieved, the consequence is likely to be forced customer load-shedding of prolonged duration during single contingencies and this is not an acceptable outcome. The relevant two-terminal link through which the network service is provided must not form part of a network loop, must be independently controllable, and must have a registered power transfer capability of at least 30 MW (unless a derogation has been applied for and granted by NECA).

- As noted earlier, following the most critical contingency for the area (loss of the Davenport-Playford 275 kV line at a high load period and with no generation at Playford power station), *'reducing'* the apparent 132 kV load attributable to the Lower Flinders region is a feasible means of avoiding 132 kV line overloads and ensuring against voltage collapse. Accordingly, any new generation proposal or a new injection point into the region would need to be connected at a suitable location on the Lower Flinders 132 kV system if an augmentation of the existing transmission network is to be avoided or delayed for a significant period.

7.0 Assessment of Alternative Solutions

7.1 Identifying Solutions

This discussion paper, and subsequent consultation, provides an opportunity for alternative solution providers to submit details of their proposals for consideration. The information provided in this document on projected network limitations in the Lower Flinders region of South Australia is intended to enable interested parties to formulate and propose feasible and definitive local generation, demand side management, market, and distribution network solutions.

7.2 Criteria for Solutions

As outlined in section 5.1, it is essential that action be taken as soon as possible to maintain a secure and reliable electricity supply to the Lower Flinders region of South Australia. However, with due consideration for delivery times for major items of plant, and the potential for delays caused by bad weather, ElectraNet SA will allow that any proposal received must be able to be implemented and commissioned prior to the summer of 2004/05, although implementation by 2003/04 is preferable. This action may involve augmentation of the transmission and/or distribution system, or the implementation of local generation and DSM options that reduce, defer, or eliminate the need for new network investment.

To assist solution providers in understanding the technical and other requirements, ElectraNet SA has identified the following criteria that must be satisfied if solutions are to meet the underlying need for augmentation of supply to the Lower Flinders region of South Australia:

Size: Feasible options must be large enough, individually or collectively, to meet the annual increase in demand for the entire Lower Flinders region. Options must be able to supply at least 70MW to eliminate the load shedding risk in 2004/05. A further 5MW of capacity would be required in each subsequent year to meet average annual load growth.

Time of year: Options must, at a minimum, be capable of meeting this demand growth during the peak summer months. The existing system is most in need of reinforcement during this summer peak, so options that do not reliably relieve this pressure do not represent viable options. However, since the summer peak is only about 5 MW greater than the winter peak (and with the disadvantage that circuit ratings are generally well below those of the winter ratings due to the warmer ambient temperatures – refer section 2.2.1), viable options must support single contingency supply capability at times of both summer and winter peak loading.

Location: To be a viable 'stand-alone' non-transmission solution, an option must reduce the contracted electricity demand that has to be supplied via the Playford-Bungama and Playford-Baroota-Bungama 132 kV transmission lines during loss of the 275 kV circuit from Davenport to Playford substations. This implies that any stand-alone local generation option must be located so as to reduce the load supplied out of Brinkworth substation. Transmission augmentation combined with generation outside the relevant area may be a viable solution and generation proponents interested in this approach are requested to provide a preliminary proposal to ElectraNet SA.

Timeframe: All options must be operational before the summer of 2004/05 at the latest.

Reliability: Options must be capable of reliably delivering electricity under a range of conditions and, if a generator, must meet all relevant Code requirements related to Grid connection.

Certainty: Options must be committed using proven technology and have funding and project management to deliver within the required timeframe. Corrective action is critical to the reliability of electricity supply to the Lower Flinders region of South Australia – it is not considered appropriate to rely on uncommitted developments that may or may not proceed.

Longevity: Options must be capable of providing solutions to the projected limitations in the Lower Flinders region of South Australia for a period of at least ten years.

Liability: If ElectraNet decides to enter into a contractual arrangement for the provision of network services, ElectraNet may require the contracting party to indemnify ElectraNet against any and all liabilities, including claims, losses, actions or proceedings it or a third party may suffer should the contracting party fail to deliver the support services in accordance with ElectraNet's requirements and any applicable laws, including those governing the timeliness and standards of service. This indemnity will also apply for any claims or losses that would apply during an interim period; for example, when customers have lost supply when a generator is running up prior to supplying load, or when switching is being undertaken on the distribution network.

7.3 Assessment of Solutions

The ACCC's Regulatory Test and Chapter 5 of the Code require ElectraNet SA to consider local generation, demand side management, and transmission options on an equal footing.

As the Lower Flinders region of South Australia augmentation is required to meet Code reliability standards, ElectraNet SA is required to carry out economic cost-effectiveness analysis:

"In the event an augmentation is proposed to meet an objectively measurable service standard linked to the technical requirements of Schedule 5.1 of the Code, the augmentation satisfies the Regulatory Test if it ***minimises the net present value of the cost*** *of meeting those standards having regard to a number of alternative projects, timings and market development scenarios."*

A proposed augmentation must pass the regulatory test irrespective of whether it is a transmission option or a non-transmission solution. This requires public consultation including appropriate disclosure of project costs.

If a non-transmission option is selected then it will be necessary for ElectraNet SA to enter into a grid support contract with the successful distribution network service provider, market network service provider, generator, retailer or customer (in the case of load shedding or demand side management) for the provision of the required grid support services.

8.0 Request for Information

ElectraNet SA invites submissions and comments in response to this discussion paper from National Electricity Market participants, solution providers, and any other interested parties.

Submissions should be presented in a written form and should clearly identify the proponent of the submission including contact details for subsequent follow-up if required. If parties prefer, they may request to meet with ElectraNet SA prior to providing a written response.

8.1 Submissions from Solution Providers

This is not a tender process – submissions are requested so that ElectraNet SA can fulfil its regulatory obligations to compare the net present value cost of alternatives to the option of augmenting the transmission supply system to maintain supply reliability.

If your submission proposes a solution, it should contain the following information:

- Details of the party making the submission (or proposing the solution).
- Technical details of the project (capacity, proposed connection point if relevant, etc.) to allow ElectraNet SA to assess the likely impacts on supply capability.
- Sufficient information to allow the costs of the solution to be incorporated in a cost-effectiveness comparison in accordance with ACCC Regulatory Test guidelines.
- An assessment of the ability of the proposed solution to meet the technical requirements of the National Electricity Code.
- Timing of the availability of the option, and whether it is a committed project.
- Other material that would be relevant in the assessment of the proposed solution.

As the submissions may be made public, any commercially sensitive material, or material that the party making the submission does not want to be made public, should be clearly identified. It should be noted that ElectraNet SA is required to publish the outcomes of the Regulatory Test analysis. If ElectraNet SA is unable to undertake the Regulatory Test for a particular proposal due to unwillingness by the proponent to provide sufficient information, then the proposal will by necessity be discarded. If solution providers elect not to provide specific project cost data for commercial-in-confidence reasons, ElectraNet SA will be required to rely on cost estimates from independent specialist sources, which may prejudice the outcomes of the regulatory test.

8.2 Timetable for Submissions

Please provide information by Wednesday 30th April 2003 to:

Hugh Westphalen,
Network Customer Manager,
ElectraNet SA,
PO Box 7096,
Hutt Street Post Office,
Adelaide, South Australia, 5000
Westphalen.Hugh@electranet.com.au
Tel: (08) 8404 7221
Fax: (08) 8404 7447

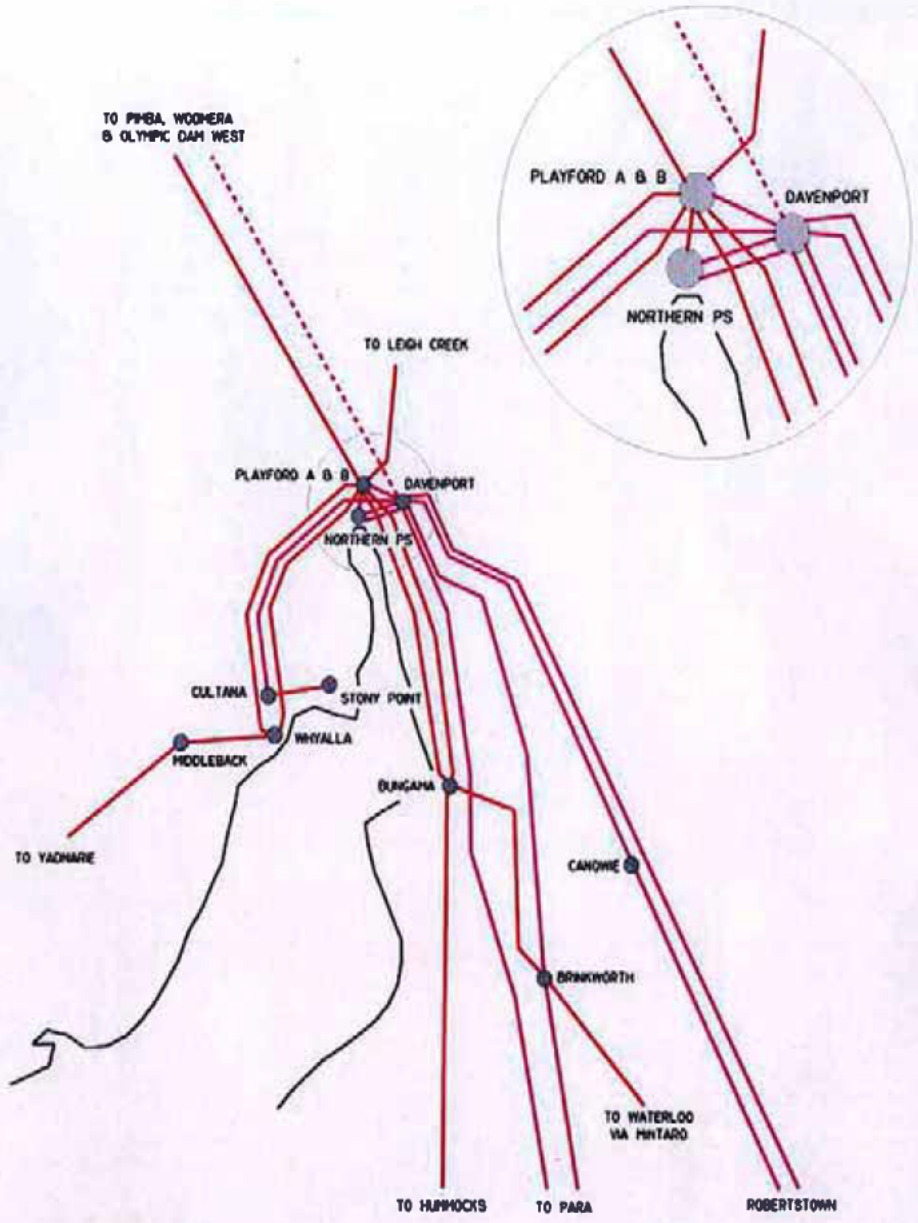
8.3 Assessment and Decision Process

ElectraNet SA intends to carry out the following process to assess what action, if any, should be taken to address the identified network limitations:

Part 1	Initial Information Request (this paper) Submissions (response to this paper)	Issued April 2003 Due by 30 May 2003
Part 2	Review and analysis. Likely to involve further consultation with Code participants and interested parties. Additional data may be requested to allow ElectraNet SA to carry out the economic assessment process as required by the National Electricity Code and the ACCC Regulatory Test.	June 2003-August 2003
Part 3	Presentation of draft report and recommendation of solution that satisfies the Regulatory Test. Submissions on draft report. Presentation of final report and recommendation.	September 2003
ElectraNet SA reserves the right to amend the timetable at any time. Amendments to the timetable will be made available on the ElectraNet SA website *(http://www.electranet.com.au/)*		

The consultation timetable is driven by the need to make a decision as soon as possible if any option involving significant construction is to be in place by the summer of 2004/05. At the conclusion of the process, ElectraNet SA intends to take immediate steps to implement the recommended solution to ensure that the reliability of the system can be maintained. For example, if the preferred solution is a network augmentation, it is anticipated that construction will begin by October 2003.

APPENDIX 1.



CONFIGURATION OF THE EXISTING 275kV & 132kV NORTHERN TRANSMISSION NETWORK.

275kV LINES (OTHERS)
275kV LINES
132kV LINES
SUBSTATION / POWER STATION

ElectraNet SA
electricity transmission network