Request for Information –

Emerging Transmission Network Limitations

Supply to Inland Central Queensland

(including the Bowen Basin coal mining area near Moura, Blackwater, Emerald, Dysart and Moranbah)

Powerlink Queensland
14th October 2002

1.0 Executive Summary

Powerlink has identified emerging limitations in the electricity network supplying inland central Queensland.

This area is defined as being west of Powerlink's 275kV transmission grid, south of Collinsville and north of Biloela. It includes major mining developments in the Bowen Basin and the towns of Biloela, Moura, Blackwater, Emerald, Dysart and Moranbah.

Electricity demand in inland central Queensland is heavily dependent on mining activities and related electricity demand from Queensland Rail for its coal transport network. Demand has grown strongly over recent years. Demand is anticipated to grow at a more moderate level of approximately 3.5% p.a. over the next five years. However, there are numerous proposals for new mine developments not included in these forecasts.

Inland central Queensland is primarily supplied by a 275kV transmission circuit between Broadsound and Lilyvale (50km north-east of Emerald). This is supported by a 132kV network. Power can also be injected into the network in this area from a combined cycle 55MW gas turbine power station at Barcaldine.

Consistent with the National Electricity Code and its transmission licence requirements, Powerlink plans future network augmentations so that the reliability and power quality standards of Schedule 5.1 of the Code can be met during the worst single credible fault or contingency (N-1 conditions) unless otherwise agreed with affected participants.

In inland central Queensland, the most critical element is the 275kV supply feeder between Broadsound and Lilyvale. Powerlink has identified that, when this feeder is out of service, the following network limitation is likely to occur:

- from the summer of 2004/05 onwards, emergency thermal ratings will be exceeded in the 132kV network to the south of Lilyvale (that is, some items of plant will become overloaded).

If no corrective action is taken, interruptions to customer supply will need to occur throughout the area to prevent equipment overloads.

The analysis is based on assumptions about future electricity demand and anticipated generation patterns. It indicates that reinforcement of supply to inland central Queensland is required prior to late 2004 to avoid loss of supply to customers during a 275kV network contingency.

Powerlink seeks comments on this discussion paper and information on solutions to the emerging limitations which may be able to be provided by parties other than Powerlink. Submissions are due by Monday 11th November 2002. A decision is required by early 2003 if any option involving significant construction is to be in place by the summer of 2004/05.

2.0 Introduction

Powerlink has identified emerging limitations in the electricity network supplying inland central Queensland. Powerlink's Lilyvale and Calvale 275/132kV substations are the primary supply points for this area, which includes the major Bowen Basin mining area and nearby towns including Biloela, Moura, Blackwater, Emerald, Dysart and Moranbah.

Corrective action is required if reliable supply is to be maintained during credible contingencies. This document seeks information on potential solutions that may be available. It is an integral part of Powerlink's approach to meeting National Electricity Code requirements that ensure adoption of the most cost-effective solution to future network limitations.

2.1 Purpose of the 'Request for Information'

The purpose of this paper is to:

- provide information about the existing transmission network in the relevant area
- provide information about emerging network limitations and the expected time at which action must be taken to maintain system reliability
- seek comments on the approach and assumptions adopted
- seek information on solutions to the emerging limitations which may be able to be provided by parties other than Powerlink
- explain the process to be used to evaluate alternative solutions. This includes transmission options that are presently being scoped by Powerlink.

2.2 Background

Powerlink Queensland is responsible for ensuring its network has sufficient capacity to provide network services to customers[1]. If technical limits of its transmission system will be exceeded, Powerlink is required to notify Code Participants within the time required for corrective action.

Before constructing any major network augmentation to maintain reliability of supply, Powerlink must also meet the following regulatory requirements[2]:

- consult with Code Participants and interested parties regarding alternative solutions, including those which may be provided by parties other than Powerlink. These may include local generation, demand side management (ie – initiatives by customers to

[1] Powerlink's transmission authority includes a responsibility "to ensure as far as technically and economically practicable, that the transmission grid is operated with enough capacity (and if necessary, augmented or extended to provide enough capacity) to provide network services to persons authorised to connect to the grid or take electricity from the grid." (Electricity Act 1994, S34.2).

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

manage or reduce demand), interconnectors and options involving other networks including market network services.

- demonstrate proper consideration of various market development scenarios, including variations in electricity demand growth rates, and the ability of reasonable options to satisfy emerging network limitations under these scenarios.

- 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 Lilyvale substation and the inland central Queensland area it supplies.

3.0 Existing Supply System to Inland Central Queensland

3.1 Geographic Region

The geographic region covered by this 'Request for Information' is broadly defined as the inland central Queensland area: west of Powerlink's 275kV transmission grid, south of Collinsville and north of Biloela (see map below).

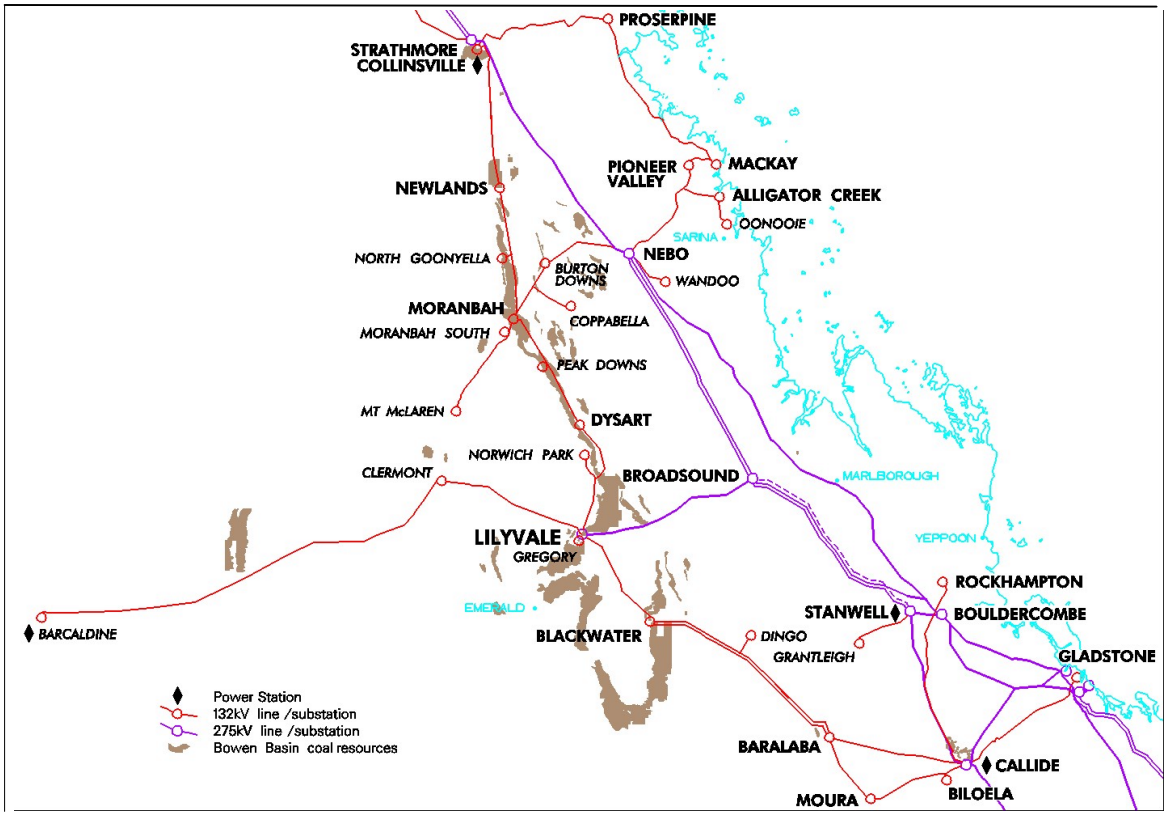
This area includes the Bowen Basin mining developments, and surrounding areas including the towns of Biloela, Moura, Blackwater, Emerald, Dysart, and Moranbah.

Lilyvale substation, the major bulk supply point in the electricity system servicing this area, is situated approximately 300km northwest of Gladstone and approximately 50km north-east of the town of Emerald. Calvale substation, which is the critical supply point during a contingency, is located adjacent to Callide Power Station near Biloela.

3.2 Existing Supply System

The target area of inland central Queensland receives its electricity supply from:

- a single 275kV transmission line which connects the area to the main state grid
- a 132kV electricity network owned by Powerlink that runs in parallel to the main 275kV transmission grid
- a single radial 132kV line (Lilyvale-Clermont-Barcaldine) owned by Ergon which connects a privately-owned combined cycle gas turbine generator connected at Barcaldine.



The major injection of power into the electricity network supplying inland central Queensland occurs via a 275kV single circuit line between Broadsound (on the main 275kV transmission grid mid way between Rockhampton and Mackay) and a 275/132kV substation at Lilyvale.

This central injection is supported by power flows into the southern end of the 132kV network from Calvale (near Callide Power Station), and into the northern end of this network from Nebo (west of Mackay) and Collinsville.

Power can also be injected into the 132kV network from a 55MW power station located at Barcaldine. This power station consists of an open cycle gas turbine that powers a supplementary steam turbine, and usually operates between 7am and 9pm weekdays. When operating, this power station produces more power than is required in the local Barcaldine area. Some of its output flows into the 132kV network via Ergon's single circuit 132kV line to Clermont and Lilyvale.

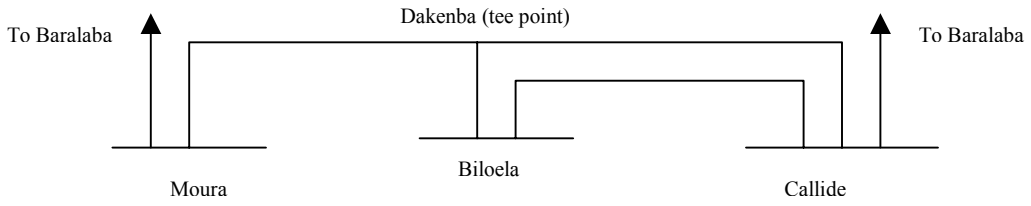
Customers in the area are supplied from 132kV substations at Biloela, Moura, Dingo, Blackwater, Rangal, Gregory, Lilyvale, Clermont, Barcaldine, Norwich Park, Dysart, Peak Downs, Moranbah, Moranbah South, Mt McLaren, Coppabella, Burton Downs, North Goonyella and Newlands[3].

3.2.1. Technical Information

Ratings of Powerlink equipment relevant to future supply to the inland central Queensland area :

Powerlink 275kV & 132kV Feeders	Summer Normal (MVA)	Summer Emergency (MVA)	Winter Normal (MVA)	Winter Emergency (MVA)
Broadsound-Lilyvale 275 kV	440	637	676	898
Lilyvale – Gregory 132kV	66	98	114	151
Lilyvale – Blackwater 132kV	137	193	201	264
Lilyvale-Dysart 132kV	182	239	232	293
Callide A – Baralaba 132kV	126	165	152	194
Callide A – Dakenba – Moura 132kV (Dakenba is the tee point for Biloela – see below)	84	113	121	154

Diagram Showing 132kV Network Between Callide and Moura



[3] An additional 132kV substation at Kemmis is planned for commissioning in April 2003

Powerlink Substations	Transformer No. & Rating
Lilyvale 275/132 kV	2x200 MVA
Calvale 275/132kV	1x250MVA
Nebo 275/132kV	2x200MVA

3.3 Future Network and Generation Development

Two 40MVAr 132kV shunt capacitor banks to assist with managing voltage stability in the inland central Queensland area have been approved for commissioning in late 2002.

These capacitor banks will be located at Lilyvale substation. They have been included in the planning studies that have identified emerging network limitations in inland central Queensland.

Powerlink is not aware of any other network augmentations or generation developments in the target area.

4.0 Load Characteristics

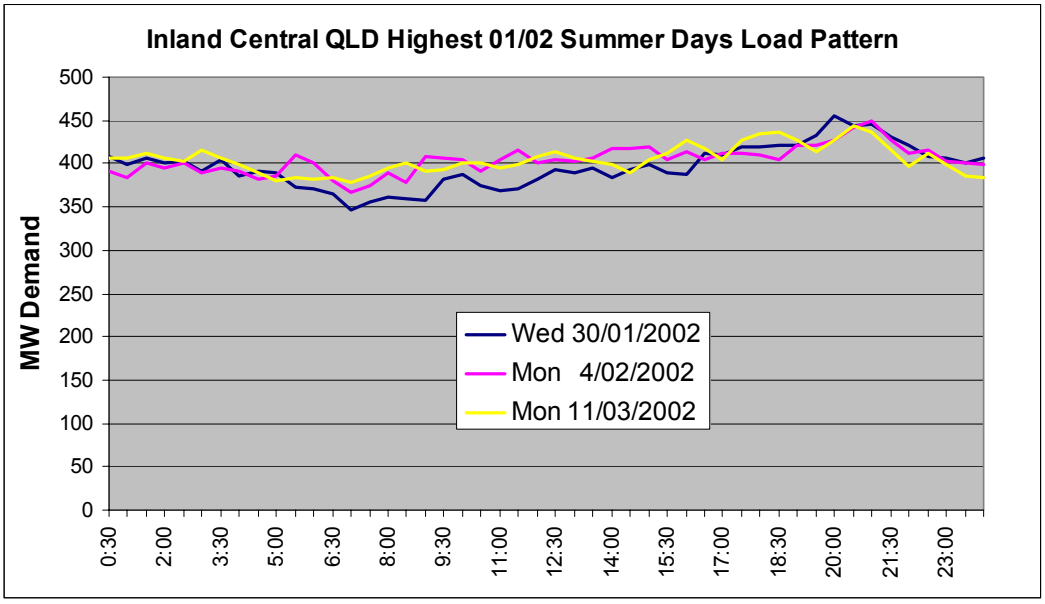
4.1 Overview

The majority of the electricity demand in the inland Central Queensland area is associated with the major mining area of the Bowen Basin, and related electricity demand from Queensland Rail for its coal transport network. Agricultural, domestic and commercial loads also contribute to the total energy use in the area.

4.2 Pattern of Use

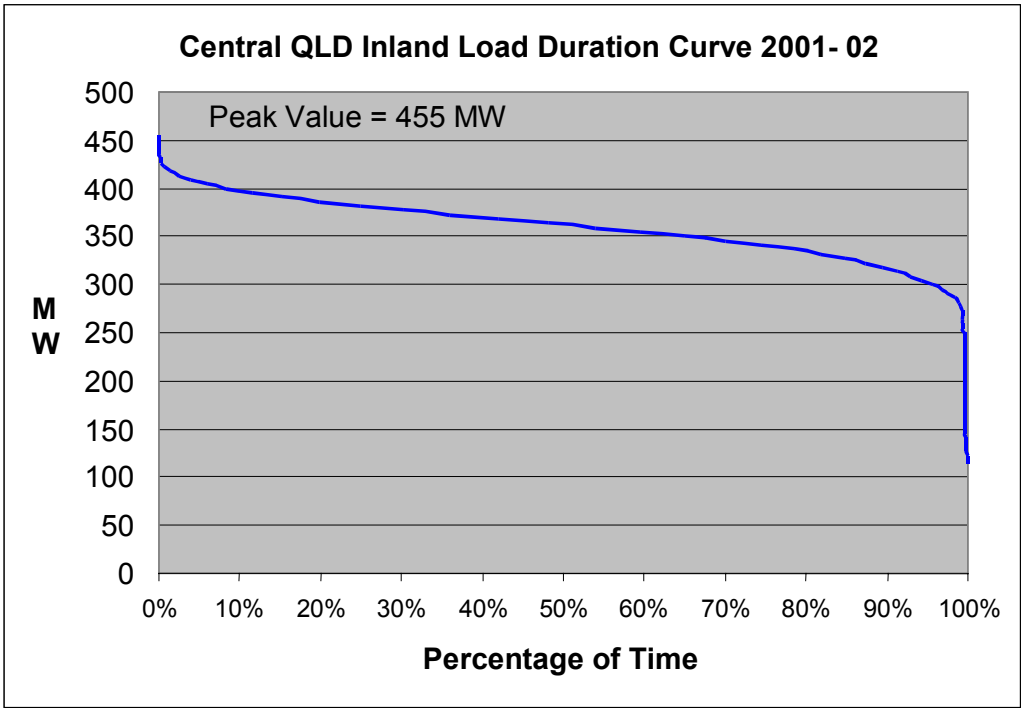
The pattern of electricity use in the target area is driven by the large mining excavation and rail component of the load.

This results in a relatively constant demand profile (see sample graph below) over a 24 hour period with a characteristic demand ripple driven by the numerous large individual loads. Such large individual loads include dragline excavators and multi-locomotive coal trains.



Analysis of aggregate and average data has been carried out. This shows that no daily pattern appears to exist for the mining/rail load in inland Central Queensland. However, weekend loads are lower than weekdays. The data also shows that high demands occur for comparatively long periods. This characteristic can be seen in the relatively flat load duration curve on the following page.

When analysing the performance of the network under consideration, Powerlink has taken the characteristics of the load into account. For example, the analysis uses a loading level which excludes extreme demands which occur only approximately 1% of the time (ie – the almost vertical “tip” on the far left of the load duration curve on the following page).



4.3 Load Growth

Given that it is a mining region, electricity demand in inland central Queensland is heavily dependent on mining activities.

In forecasting electricity demand in the area, Powerlink obtains forecasts from Ergon for the local connection points over a ten-year horizon. Any committed new mining developments, known changes in rail operations, as well as any known local embedded generation or demand side initiatives are incorporated into the forecasts.

Powerlink compares these forecasts with an independent assessment of energy and demand forecasts for the Queensland region carried out by the National Institute of Economic and Industrial Research (NIEIR). Ergon's forecasts prepared in June 2002 were an upward revision on the previous year's forecasts. This was found to be consistent with the June 2002 NIEIR forecast.

Over recent years, electricity demand in inland central Queensland has grown strongly at approximately 4.1%p.a. Load forecasts indicate more moderate growth of approximately 3.5%p.a over the next five years, which is consistent with the longer-term trend. Historical and forecast electricity demand is shown in the table below.

It should be noted that this demand forecast does not include any as yet uncommitted mining developments.

There are a large number of proposals now under consideration for new mining developments in the inland Central Queensland area. If publicly announced proposals for developments, such as those at Monto and Rolleston, become committed and operational in the timeframe of this study, this would significantly increase the relevant electricity demand forecasts.

Table 1: Peak Summer Electricity Demand – Inland Central Queensland

Inland Central Queensland Coincident Peak Summer Demand[4]		
Year (summer)	*Actual Demand (MW)*	*Forecast Demand (MW)*
1995/96	357	
1996/97	386	
1997/98	426	
1998/99	404	
1999/00	419	
2000/01	437	
2001/02	455	
2002/03		470
2003/04		491
2004/05		511
2005/06		528
2006/07		541

[4] Forecast Demand is based on medium economic growth forecast and typical weather (ie- 50% probability of exceedance forecast). Forecast shown is the sum of forecast demands at relevant 132kV substations – Biloela, Moura, Dingo, Blackwater, Rangal, Gregory, Lilyvale, Clermont, Barcaldine, Norwich Park, Dysart, Peak Downs, Moranbah, Moranbah South, Mt McLaren, Coppabella, Burton Downs, North Goonyella, Newlands, and the future substation at Kemmis.

5.0 Transmission Planning Criteria

As a transmission network service provider (TNSP), Powerlink 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 particular, Schedule 5.1 requires that:

- the power frequency voltage is maintained within limits outlined in S5.1.4;
- voltage fluctuations do not exceed limits set out in S5.1.5;
- harmonic voltage distortion does not exceed limits set out in S5.1.6;
- voltage unbalance does not exceed limits set out in S5.1.7;
- the power system can operate in a stable state as defined in S5.1.8;
- faults can be cleared in times specified in S5.1.9;
- NEMMCO be advised of current ratings as required in S5.1.12. NEMMCO has a related obligation (4.3.1 (f)) to operate the power system within all plant capabilities.

Schedule 5.1 also includes details of credible contingencies and levels of redundancy to be considered in planning and operating the transmission network, such as:

- 'System Normal': the absolute minimum level of reliability required. Defined as the ability to supply all load with all elements of the electricity system intact (ie – loss of supply would occur during a single fault or contingency),
- '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.

Consistent with the National Electricity Code and its transmission licence requirements, Powerlink plans future network augmentations such that the reliability and power quality standards of Schedule 5.1 can be met under conditions of 'N-1', unless otherwise agreed with affected participants.

5.1 Planning Criteria for Inland Central Queensland Network

This study assesses emerging network limitations in inland central Queensland. Consistent with Powerlink's planning criteria, section 6.0 covers the capability of the existing network to maintain supply during the disconnection of any single transmission element (ie: N-1 criterion). The most critical network element in inland central Queensland is the single 275kV transmission line between Broadsound and Lilyvale[5].

The assessment of network capability in inland central Queensland under N-1 conditions takes into account the normal operation of Barcaldine power station and a load management scheme that has been agreed with Ergon. This arrangement provides for the controlled shedding of specific small loads if Barcaldine power station is not operating[6] and a fault occurs on the 275kV transmission line between Broadsound and Lilyvale, at times of moderate to high loading. It ensures other transmission plant is not overloaded and statutory clearances are maintained.

[5] Network limitations outlined in section 6.0 are based on expected power flows during an outage of the 275kV transmission line between Broadsound and Lilyvale, and maximum current ratings of relevant transmission equipment advised to NEMMCO as required by S5.1.12 of the Code.

[6] Ergon has implemented a capacity arrangement with Barcaldine power station. The power station has historically operated reliably between 7am and 9pm weekdays.

6.0 Emerging Network Limitations

6.1 Overview

The electricity network supplying the target area in central Queensland is presently capable of supplying all of the area's power needs under system normal conditions[7]. As the load in the area grows, limitations in network transfer capability will be reached during an outage of the 275kV line between Broadsound and Lilyvale.

This critical contingency requires the area to be supplied over the 132 kV network from Barcaldine Power Station in the west (if generating), from Calvale in the south and from Collinsville/Nebo in the north. Capability is primarily limited by overloads (exceeding thermal ratings) of the 132kV network from the south and the Calvale 275/132kV transformer during the contingency.

6.2 Background - Thermal Ratings

Thermal ratings refer to the safe maximum current carrying capacity. If an item of transmission plant is disconnected due to a fault or other contingency, the remaining elements of the transmission system must carry the total load. It is important to ensure the thermal rating of the remaining equipment is not exceeded under these conditions.

Transmission lines and substation plant may be safely loaded above normal ratings only for very short periods. Extended operation above these ratings will cause line conductors to sag below safe levels and/or items of equipment to burn out. Many items of equipment, such as power transformers, also have absolute loading limits that cannot be exceeded at any time without risk of immediate failure of the equipment.

Powerlink's licence requires it to protect its transmission grid to ensure the safe transmission of electricity. Interruptions to supply may be required to avoid exceeding thermal ratings.

6.3 Thermal Limitations in the inland central Queensland area

Under normal transmission network conditions, but with no Barcaldine Power Station generation, power flows are within thermal ratings[8] as shown below:

Relevant 132kV Power Flows With All Network Elements in Service[9]

Equipment Rating MVA (summer normal/ summer emergency)	System Normal Barcaldine Power Station out			
	02/03	03/04	04/05	05/06
Calvale transformer (250/275)	232	240	244	263
Callide A – Baralaba 132kV line (126/165)	87	90	93	102
Dakenba – Moura 132kV line (84/113)	68	71	73	80
Baralaba-Blackwater 132kV line (93/124)	61	61	63	70

[7] That is, with all elements of the network in service and the combined cycle Barcaldine Power Station operating at 55MW.
[8] Except in summer 2005/06 when the Calvale transformer exceeds its normal 250MVA continuous rating.
[9] The power flows are based on a generation scenario with five units at Collinsville power station operating on minimum load and no output at Callide A power station. Sensitivity to assumptions is discussed in section 7.0.

However, analysis of the capability of the 132kV network during a contingency on the 275kV Broadsound - Lilyvale line has identified the following emerging network limitations:

(1) If Barcaldine power station generation is unavailable, a 275kV network contingency on a weekday could result in the Calvale transformer exceeding its 300MVA absolute loading limit from the summer of 2002/03 onwards. Powerlink and Ergon have agreed to implement an automatic load management scheme to prevent the transformer overloading and the cascading widespread interruptions to customers that would otherwise result. This load management scheme would be armed when Barcaldine Power Station is unavailable and load levels exceed the relevant thresholds. The 275kV contingency would then automatically activate the scheme and disconnect supply to the radial feeder supplying Clermont and Barcaldine.

From the summer of 2004/05 onwards, this automatic interruption provision is not expected to prevent the Calvale transformer overload and consequential widespread loadshedding. Other parts of the 132kV network south of Lilyvale will also be very heavily loaded in 2004/05. This is shown in the table below:

Relevant 132kV Power Flows During 275kV Broadsound-Lilyvale Contingency with Automatic Load Management Trip[10]:

Equipment Rating MVA (summer normal/ summer emergency)	275kV Feeder Out of Service Barcaldine Power Station Out[11]			
	02/03	03/04	04/05	05/06
Calvale transformer (250/275 – autotrip at 300)[10]	295	299	312	320
Callide A – Baralaba 132kV line (126/165)	139	143	146	148
Dakenba-Moura 132kV line (84/113)	104	108	111	113
Baralaba-Blackwater 132kV line (93/124)	93	95	97	98

Interested parties should note that the emerging network limitation is not solely a transformer capacity issue. The 132kV lines listed above would be required to carry high power flows under contingency conditions. Additional transformer capacity would be likely to change the balance of power flows in inland Central Queensland, and may cause these lines to reach emergency thermal ratings from 2004/05 onwards.

(2) If Barcaldine power station is generating, overloading of the Calvale transformer could occur in the summer of 2004/05, necessitating its automatic disconnection[12]. Without corrective action, this would result in widespread interruptions to customer supply throughout inland central Queensland.

[10] The power flows in the tables are based on a generation scenario with five units at Collinsville power station operating on minimum load and no output at Callide A Power Station. Sensitivity to this and other assumptions is discussed in section 7.0.

[11] This assumes the load management scheme agreed with Ergon has been implemented – see section 5.1.

[12] To protect the equipment and maintain safe operation, an automatic disconnection mechanism is set at 300MVA. This corresponds to an absolute loading limit. If this rating is reached, the transformer will be automatically taken out of service. If flows during a contingency reach the emergency thermal rating of 275MVA, Powerlink and/or NEMMCO will implement operational steps to reduce the loading on the Calvale transformer. This may include line switching, changes to generation dispatch or controlled disconnection of specific loads following a contingency.

Relevant 132kV Power Flows During 275kV Broadsound-Lilyvale Contingency[13]:

Equipment Rating MVA (summer normal/ summer emergency)	275kV Feeder Out of Service Barcaldine Power Station On			
	02/03	03/04	04/05	05/06
Calvale transformer (250/275 – autotrip at 300)[10]	288	295	307	315
Callide A – Baralaba 132kV line (126/165)	134	136	138	141
Dakenba-Moura 132kV line (84/113)	102	104	106	108
Baralaba-Blackwater 132kV line (93/124)	90	91	93	95

Exceeding emergency line and transformer ratings is not acceptable due to safety and other reasons outlined in section 5.2. If no corrective action is taken, interruptions to customer supply will need to occur throughout the area to prevent overloads of the 132kV network.

This indicates that corrective action is required prior to the summer of 2004/05 to avoid unacceptable overloads and loss of supply to customers in inland central Queensland during a 275kV network contingency.

[13] The power flows in the tables are based on a generation scenario with five units at Collinsville power station operating on minimum load and no output at Callide A Power Station. Sensitivity to this and other assumptions is discussed in section 7.0.

7.0 Factors Impacting Timing of Required Corrective Action

7.1 Assumed Electricity Demand

Section 6.1 identified that, without corrective action, overloads of Powerlink's 132kV network in inland central Queensland will occur during a single 275kV contingency by late 2004.

The primary driver of this emerging network limitation is the higher forecast growth in electricity demand in the area, exacerbated by the 'mothballing' of Callide A Power Station in early 2002. The 2004 timing conclusion was based on a load growth forecast that assumed typical temperatures and medium economic growth.

Electricity demand in the inland central Queensland area is most sensitive to developments in the local mining industry, and growth or reduction in associated rail transport requirements. This may impact the required timing for corrective action as follows:

New Mining Developments: Powerlink understands that a large number of new mining developments in inland Central Queensland are currently being considered. These are uncommitted projects, and are not included in the forecasts used by Powerlink to assess the supply needs of the area. Such new developments have the potential to significantly increase the electricity demand in the area by 30-60MW. If a commitment is made to begin production at a new mine prior to late 2004, this could increase the risk of plant overloads prior to the summer of 2004/05.

Rail Transport Operations: Ergon's local demand forecasts take into account the expected growth in rail transport activity in the inland central Queensland area. Should this be higher or lower than expected, it will alter the anticipated power flows across relevant network elements, and may impact the timing that emerging limitations will need to be addressed.

7.2 Assumed Generation Pattern

The relative outputs of generators connected to Powerlink's transmission network in central and north Queensland affect the pattern of power flows in inland central Queensland. However, the impact of generation on the most heavily loaded items of plant during a contingency at times of peak load is almost negligible. The scheduled generator having the largest impact is the Collinsville Power Station[14]. However, as can be seen in the table below, operation of Collinsville has only a minor impact during a 275kV contingency.

The results of analysis presented in section 6.3 assume five Collinsville units operating at minimum load. However, all generating units at Collinsville power station operating at maximum output during summer 2004/05 does not alleviate the Calvale transformer overload and has only a very small impact on loadings on other relevant network elements during a 275kV network contingency. The timing that corrective action is required is therefore not sensitive to generation output at Collinsville.

[14] Barcaldine Power Station, as an embedded generator connected to Ergon's network, has been considered according to arrangements in place with Ergon as discussed in section 5.1.

Relevant 132kV Power Flows During 275kV Broadsound-Lilyvale Contingency:

Equipment Rating MVA (summer normal/ summer emergency)	275kV Feeder Out of Service[15] 5 Collinsville units at min.				275kV Feeder Out of Service[15] 5 Collinsville units at max.			
	02/03	03/04	04/05	05/06	02/03	03/04	04/05	05/06
Calvale transformer (250/275 – autotrip at 300)	295	299	312	320	294	298	311	319
Callide A – Baralaba 132kV line (126/165)	139	143	146	148	138	140	144	147
Dakenba-Moura 132kV line (84/113)	104	108	111	113	103	105	110	112
Baralaba-Blackwater 132kV line (93/124)	93	95	97	98	92	93	96	98

It should also be noted that Powerlink's analysis assumes zero generation output from the recently 'mothballed' Callide A Power Station (120MW)[16]. This power station is owned by CS Energy. As published in Powerlink's 2002 Annual Planning Report, CS Energy has advised that it plans to return Callide A Power Station to service in 2005, depending on load developments in the Central Queensland area.

CS Energy is a participant in the National Electricity Market, and as such, makes decisions on the future operation of its plant on a commercial basis. Powerlink has not included the return of Callide A in its analysis due to the uncertainty of future market conditions. For information purposes, however, Powerlink estimates that the return to service of Callide A Power Station prior to late 2004 would reduce the loading on the Calvale transformer, and may defer the required timing for corrective action by twelve months.

7.3 Other Factors

Augmentations to the distribution network may influence the flows on the 275kV and 132kV system in the relevant area. Powerlink has held discussions with Ergon and it is established that there are no distribution augmentations likely to be committed in the near future that would impact the required timing for action to address the emerging transmission network limitations in supply to inland central Queensland.

There are no other factors, given the existing electricity supply system and committed augmentations, which have been identified to influence the timing of emerging network limitations in the western central Queensland mining area.

7.4 Conclusion

Without corrective action, a single contingency on the 275kV line between Broadsound and Lilyvale during the peak summer period from late 2004 will cause unacceptably high network overloads and automatic loss of supply throughout inland central Queensland. Prior to late 2004, some overloads may occur during a contingency that necessitate operational measures to reduce loadings to an acceptable level within a five to ten minute period.

These timings are based on an assessment of factors that affect relevant network loadings. Electricity demand above forecast levels may increase the risk of thermal overloads during a single 275kV contingency prior to summer 2004/05. Decreases in demand may reduce the risk of overloads.

[15] This assumes that the combined cycle generator at Barcaldine is unavailable and the load management scheme agreed with Ergon has been implemented – see section 5.1. See also footnote 10.
[16] No generation output from January 2002 onwards.

Taking these factors into account, Powerlink considers the existing electricity system supplying inland central Queensland must be augmented before October 2004. This is necessary to maintain supply reliability to customers during a single 275kV network contingency.

8.0 Assessment of Alternative Solutions

As outlined in section 7.0, it is essential that action be taken prior to the summer of 2004/05 to maintain a reliable electricity supply to inland central Queensland, incorporating the Bowen Basin mining area. This action may involve network augmentation, or the implementation of local generation and demand side management (DSM) options which reduce, defer or eliminate the need for new network investment.

8.1 Identifying Solutions

Each year, Powerlink publishes an Annual Planning Report, that documents the results of Powerlink's annual planning review of the capability of its network. Both the 2001 and 2002[17] issues of this report advised of emerging network limitations in the supply to Lilyvale and the central Queensland mining area. Powerlink has received no information regarding proposals to address these emerging limitations from prospective solution providers in the normal course of business or in response to its Annual Planning Reports.

This information paper, and subsequent consultation, provides a further opportunity for alternative solutions to be submitted for consideration. The information provided in this document on emerging network limitations in the inland central Queensland area is intended to enable interested parties to formulate and propose feasible and definitive local generation, network and demand side management solutions.

8.2 Criteria for Solutions

To assist solution providers understand the technical and other requirements, Powerlink has identified the following criteria which must be satisfied if solutions are to meet the underlying need for augmentation of supply to Lilyvale substation:

Size: Feasible options must be large enough, individually or collectively, to meet the annual increase in power flow across the 132kV network during contingencies on the existing 275kV line feeding Lilyvale substation. The required size of a generator or demand-side solution will depend on the location of the solution. It may or may not be directly reflective of the annual demand growth expected in the inland central Queensland area supplied from Lilyvale (approximately 15MW per annum).

Time of Year: Options must, at a minimum, be initially capable of meeting the increase in power flow during peak summer months. Winter capability will also be required within the next few years, as winter demands in inland central Queensland are not significantly different from summer demands.

Location: To be a viable 'standalone' non-transmission solution, an option must reduce the electricity that has to be transferred via the 132kV network during contingencies on the existing 275kV line supplying Lilyvale. This implies that any 'standalone' local generation option must be located so as to reduce the load at 132kV connection points supplied from Lilyvale 275kV substation.

[17] Published in June 2002, and available via Powerlink's website www.powerlink.com.au

Operation: If it is determined that a local generation option is the most appropriate solution to the emerging reliability issues, this generator will be required to operate at certain times to satisfy reliability criteria. 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).

Following a contingency, Powerlink may have a limited period (less than ten minutes) to reduce power flows below normal equipment ratings. However, if the contingency causes the loading on the Calvale transformer to reach its absolute limit of 300MVA, this will result in an instantaneous automatic disconnection.

Any alternative solution such as local generation or a demand side response must offload the 132kV network so as to prevent loss of customer supply during a contingency. Depending on the situation and the operating characteristics of a local generator, this is likely to require pre-contingent operation (ie – operation during periods at which the network would be at risk of overloading during a contingency). Demand side programs must either reduce load pre-contingency (ie – contain electricity demand to winter 2004 levels) or automatically disconnect sufficient customer supply following a contingency.

Timeframe: All options must be operational by October 2004. As outlined, the required timing for corrective action to address emerging network limitations is prior to the summer of 2004/05.

Reliability: Any generation solution must meet all relevant Code requirements related to grid connection. Options must also be capable of reliably delivering electricity under a range of conditions. Corrective action is required to address emerging network limitations that will otherwise significantly impact the reliability of supply to customers.

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 inland central Queensland area – it is not considered appropriate to rely on uncommitted developments that may or may not proceed. Commitment is required by the end of the first quarter in 2003.

8.3 Assessment of Solutions

The ACCC's Regulatory Test and Chapter 5 of the National Electricity Code require Powerlink to consider local generation, DSM, inter-regional and network options on an equal footing.

The Regulatory Test also specifies the assessment methodology to be used:

"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."

An augmentation proposed to meet an objectively measurable service standard linked to the technical requirements of Schedule 5.1 of the Code, or other statutory requirements, is referred to as a 'reliability augmentation'.

Any regulated augmentation proposed as a consequence of addressing the emerging network limitation in supply to central Queensland mining area as outlined in this report will be a 'reliability augmentation' because:

- there is a clear need for the augmentation based on the limitations identified in this report
- the limitations are based on an objectively measurable service standard linked to the technical requirements of schedule 5.1 of the Code as set out in this report.

This means the assessment of solutions will be based on minimising the net present value of the cost of meeting the service standard.

A public process is required, with disclosure of project costs and comparison of alternatives. As the outcome of the economic analysis could be a recommendation to proceed with a regulated solution, it is important that all feasible options are considered in the process.

If a non-network option satisfies technical requirements, is committed and can be implemented for a lower cost than a transmission augmentation, it will be necessary for Powerlink to enter into a network support agreement with the proponents of the alternative project to ensure supply reliability can be maintained. If regulated funding is required from Powerlink, it is necessary that grid support arrangements satisfy the Regulatory Test in terms of both economics and disclosure of relevant costs to the market.

9.0 Request for Information

Powerlink 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 Powerlink ahead of providing a written response.

9.1 Submissions from Solution Providers

This is not a tender process – submissions are requested so that Powerlink 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 an assessment of the likely impact 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 Powerlink is required to publish the outcomes of the Regulatory Test analysis. If solution providers elect not to provide specific project cost data for commercial-in-confidence reasons, Powerlink may rely on cost estimates from independent specialist sources.

9.2 Timetable for Submissions

Please provide information by Monday 11th November 2002 to:

Alison Gray
Manager Network Assessments
Powerlink Queensland
PO Box 1193
Virginia QLD 4014
Agray@powerlink.qld.gov.au
Tel: (07) 3860 2300
Fax: (07) 3860 2388

9.3 Assessment and Decision Process

Powerlink 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 (responses to this paper).	mid October Mid November
Part 2	Review and analysis. Likely to involve further consultation with Code participants and interested parties. Additional data may be requested to allow Powerlink to carry out the economic assessment process as required by the National Electricity Code and the ACCC Regulatory Test.	November to January
Part 3	Presentation of draft report and recommendation of solution which satisfies the Regulatory Test Submissions on draft report Presentation of final report and recommendation	January 2003 Mid March April
Powerlink Queensland reserves the right to amend the timetable at any time. Amendments to the timetable will be made available on the Powerlink website (www.powerlink.com.au)		

The consultation timetable is driven by the need to make a decision by early 2003 if any option involving significant construction is to be in place by the summer of 2004/05. At the conclusion of the process, Powerlink 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 need to begin in mid 2003.