APPLICATION NOTICE

PROPOSED NEW LARGE TRANSMISSION NETWORK ASSET

DEVELOPMENT OF ELECTRICITY SUPPLY TO THE NSW FAR NORTH COAST

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Executive Summary

This application notice has been prepared to provide a basis for TransGrid and Country Energy to consult with registered participants and interested parties to identify options for the development of electricity supply to the far north coast area of New South Wales that will be included in an application of the Australian Energy Regulator's regulatory test.

Section 1 provides the context of this application notice within the regulatory process. It is proposed to allow interested parties to make submissions and provide other feedback in the period to 06/06/2008. A final report that will include a decision on the proposed actions is envisaged to be published in the period to October 2008.

Section 2 describes in detail the regulatory requirements relating to proposals for new large transmission network assets, the existing supply arrangements and nature of the growing load in the far north coast area and the network limitations that give rise to a need to augment supply to the area. The agreed network performance requirements (planning criterion) against which the need and effectiveness of augmentation options are assessed are also described.

In Section 3 two feasible network augmentation options are described. Option 1 involves the construction of a 330 kV transmission line between Dumaresq and Lismore. Option 2 involves the construction of a second 330 kV line between Armidale and Lismore. A number of other network developments that were considered but not put forward as reasonable options are also described.

The capital costs of the network options are around $190 million for Option 1 and $275 million for Option 2.

In Section 4 the results of a preliminary application of the regulatory test considering Options 1 to 2 are presented.

In Section 5 it is concluded that Option 1 is the lowest cost option in all cases and would satisfy the regulatory test. On this basis, subject to completion of the consultation process, the preferred actions are for TransGrid to proceed with construction of Option 1.

Section 6 provides contact details for provision of written submissions on this application notice.

1. Introduction

1.1. Purpose and Scope

TransGrid owns the majority of the transmission network within NSW and is responsible inter alia for planning and developing its network to meet the requirements of customers within the state and to facilitate operation of the National Electricity Market (NEM). As part of its planning responsibilities and the requirements of the National Electricity Rules (the Rules) TransGrid consults with NEM registered participants, NEMMCO and interested parties on emerging limitations within its transmission network and options being considered to relieve them.

Country Energy owns the subtransmission and distribution networks on the NSW north coast and is responsible for planning and developing those networks.

TransGrid and Country Energy have responsibilities under the Rules to carry out joint planning to facilitate the optimal development of connections between the transmission and distribution networks within Country Energy's network area.

This application notice has been prepared in accordance with Clause 5.6.6 (c) of the Rules. It relates to a proposal for a new large transmission network asset that will address emerging limitations in the transmission network supplying the far north coast area of New South Wales.

It includes:

- A summary of the load forecast for the area;
- A description of the network reliability criterion that has been adopted for planning purposes;
- A description of transmission network limitations identified by TransGrid and Country Energy that have led to the necessity for an augmentation of the transmission network in the far north coast area;
- A description of all reasonable network and non-network options that have been identified to meet these limitations;
- An analysis of the ranking of these options in accordance with the Australian Energy Regulator's (AER's) regulatory test;
- A preliminary assessment of the outcome of the regulatory test and proposed actions; and
- An invitation to NEM registered participants and interested parties to make submissions on this application notice.

1.2. Outline of Consultation Process

TransGrid has published a description of limitations affecting the transmission network supplying the far north coast area in its Annual Planning Statements for 1999 to 2001 and Annual Planning Reports (APRs) for 2002 to 2007. The APR 2007 includes a summary new large transmission network asset proposal for supply to the far north coast area.

This application notice covers consultation and application of the regulatory test to reasonable network and non-network options to meet these limitations and is the first step in the formal consultation process that is required by the Rules.

A summary of this application notice has been published on NEMMCO's website. In accordance with Clause 5.6.6 of the Rules it is intended to proceed with further consultation on this new large transmission network asset proposal as follows:

Interested parties have until 06/06/2008 to provide written submissions in respect of this proposal - refer to Section 6 for contact details.

The Rules provide for further periods of 30 business days for the consideration of submissions and 21 business days for holding meetings with interested parties (if required) prior to the publication of a final report on the proposal that will include a decision on the proposed actions.

The final report for this proposal is envisaged to be published in the period to October 2008.

2. Identification of a Necessity for Augmentation

2.1. Regulatory Requirements

2.1.1. Requirements of the National Electricity Rules

This application notice covers a proposal for a new large transmission network asset.

The requirements of the Rules for new large transmission network asset proposals are set out in Clause 5.6.6. This requires applicants (in this case TransGrid) inter-alia to:

- Set out the reasons for proposing the new large transmission network asset including the actual or potential constraint or inability to meet network performance requirements;
- Describe all reasonable network and non-network options to address the constraint;
- Rank the options in accordance with the principles of the AER's regulatory test including detailed analysis of why the applicant considers the new large transmission network asset satisfies the regulatory test;
- Where relevant provide analysis of why the applicant considers the new large transmission network asset is a reliability augmentation; and
- Provide an augmentation technical report or consents to proceed from affected Transmission Network Service Providers if the new large transmission network asset is likely to have a material internetwork impact.

These requirements are underpinned by Clause 5.6.2 (c) of the Rules which requires that a necessity for an *augmentation* or *extension* to the transmission system should be identified by network service providers.

2.1.2. Requirements of the Regulatory Test

The regulatory test may be applied in either one of two ways. The regulatory test states that an option satisfies the test if:

(a) in the event the option is necessitated principally by inability to meet the service standards linked to the technical requirements of schedule 5.1 of the Rules or in applicable regulatory instruments - the option minimises the costs of meeting those requirements, compared with alternative option/s in a majority of reasonable scenarios;

(b) in all other cases - the option maximises the expected net economic benefit to all those who produce, consume and transport electricity in the national electricity market compared to the likely alternative option/s in a majority of reasonable scenarios. Net economic benefit equals the market benefit less costs.

The Rules define a reliability augmentation as:

> A transmission network augmentation that is necessitated principally by inability to meet the minimum network performance requirements set out in schedule 5.1 or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction.

Thus for reliability augmentations clause (a) of the test should be used. That is for reliability augmentations the option that satisfies the regulatory test is the one that minimises the cost of meeting the minimum network performance requirements set out in schedule 5.1 of the Rules or via a jurisdictional or customer requirement.

2.2. Jurisdictional Requirements – Reliability Criterion

As stated in its Annual Planning Report TransGrid is expected by the NSW jurisdiction to plan and develop its transmission network on an "N-1" basis. That is, unless specifically agreed otherwise by TransGrid and the affected distribution network owner or major directly connected end-use customer, there will be no inadvertent loss of load (other than load which is interruptible or dispatchable) following an outage of a single element (a line or a cable) or transformer, during periods of forecast high load.

These requirements are underpinned by mandatory licence conditions for New South Wales Distribution Network Service Providers. The licence conditions for Country Energy specify N-1, one minute reliability levels for subtransmission lines and zone substations supplying loads greater than or equal to 15 MVA in urban and non-urban areas. Consequently Country Energy has requested TransGrid to incorporate N-1 reliability levels into its planning standards and processes.

In accordance with these principles TransGrid and Country Energy have jointly agreed that the network performance requirements for reliability to be applied to this area are as follows:

1. With all network elements in service the loading on each element is not to exceed the continuous rating of that element and the voltage levels at end-user premises are to be within acceptable levels.
2. Following outage of one network element the loading on each remaining element is not to exceed the short time emergency rating of that element whilst operator actions, such as opening of other network elements and transferring of loads via lower voltage networks, are taking place.
3. With one network element out of service and following operator actions:
    - The loading on each remaining element is not to exceed the sustained emergency rating of that element;
    - The voltage levels at end-user premises are to be within acceptable levels following switching of reactive plant and operation of transformer tap-changers. This requires that voltages at the low voltage busbars of TransGrid substations on the north coast do not fall below 1.05 per unit.

In terms of network reliability standards as described in the Rules this constitutes a nominal “N-1” reliability criterion (as described in S5.1.2.2 (b) (4)).

2.3. Local Supply Arrangements

The far north coast area of New South Wales (referred to in this document) includes the Ballina, Bellingen (part), Byron, Clarence Valley, Coffs Harbour, Kyogle, Lismore and Richmond Valley local government areas. It has a population of around 270,000. The area electrical load is characterised primarily by rural loads with urban residential loads and commercial/light industrial loads in the main population centres.

TransGrid’s 330 and 132 kV system on the NSW north coast is shown in Figure 1 on the next page with the far north coast area indicated by the dotted ellipse.

As the load has grown the transmission network has expanded and progressively higher voltages have been introduced. 132 kV was introduced in the mid 1960s and 330 kV in the early 1990s. The major historical network developments are shown in Table 1.

Over the years TransGrid has installed a number of banks of capacitors at its substations in the area to manage voltage levels both with all network elements in service and during outage conditions. Country Energy has also installed a number of capacitors at its substations within the area. Table 2 shows capacitors installed at 330 kV and 132 kV substations on the Far North Coast.

In addition TransGrid installed a Static Var Compensator (SVC) at Lismore 330/132 kV substation in 1999 to provide dynamic voltage control.

Figure 1 Transmission System Supplying the NSW North Coast

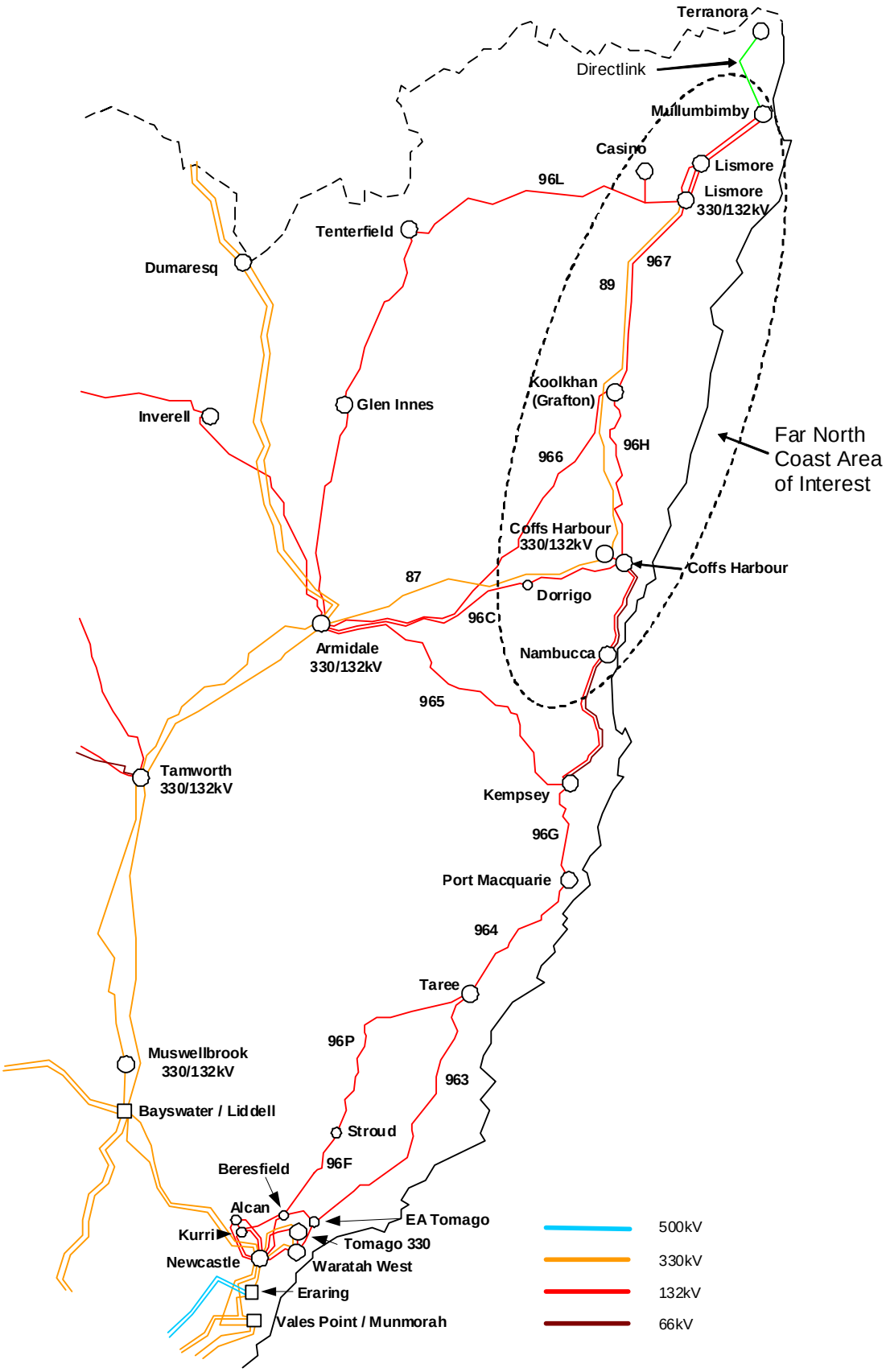


Table 1 Development of the TransGrid 330 kV and 132 kV Network Supplying the North Coast

Development	Date
First Newcastle – Taree line and Taree substation	Mid/late 1950s
Armidale – Koolkhan line and Koolkhan substation	Early 1960s
Armidale – Kempsey line and Kempsey substation	Mid 1960s
Koolkhan – Lismore line and Lismore substation, Armidale – Glen Innes – Tenterfield line and Glen Innes and Tenterfield substations	Late 1960s
Tenterfield – Lismore line	Early 1970s
Second Newcastle – Taree line	Mid 1970s
Armidale – Coffs Harbour line and Coffs Harbour substation, Coffs Harbour – Koolkhan line	Late 1970s
Taree – Port Macquarie line and Port Macquarie substation	Late 1970s
Armidale Coffs Harbour (330 kV construction), Koolkhan – Lismore (330 kV construction)	Early 1980s
Port Macquarie – Kempsey line	Mid 1980s
Coffs Harbour – Koolkhan line (330 kV construction), Operation of 330 kV construction lines at 330 kV, Lismore 330/132 kV substation	Early 1990s
Lismore SVC	Late 1990s
Coffs Harbour – Kempsey line and Nambucca substation	2002
Coffs Harbour 330/132 kV substation	2006

Country Energy commissioned a 132 kV supply to Casino from TransGrid's Tenterfield – Lismore 132 kV line in 2007.

Table 2 Capacitor Installations at 330 kV and 132 kV Substations on the Far North Coast

Substation	Capacitors Installed
Lismore 132/66 kV (Country Energy)	2 x 10 MVAr at 66 kV 1 x 12 MVAr at 132 kV
Lismore 330/132 kV	2 x 30 MVAr at 132 kV
Koolkhan (Grafton)	2 x 8 MVAR at 66 kV
Coffs Harbour	2 x 7 MVAr at 66 kV 1 x 20 MVAr at 132 kV
Nambucca	2 x 8 MVAr at 66 kV

2.4. Local Load Forecast

Demand on the far north coast has grown strongly over recent years and is expected to continue to do so. Forecast winter and summer maximum demands are shown in Table 3 and Table 4.

Table 3 Winter Peak Demand Forecasts (MW)

Supply Point	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Coffs Harbour	94.5	68.6	70.7	73.0	75.4	77.8	80.3	82.8	85.5	88.2
Dorrigo	4.1	4.2	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
Koolkhan	58.1	60.1	62.1	64.2	66.4	68.7	71.0	73.4	75.9	78.5
Lismore	182.4	188.9	195.8	202.5	209.3	216.1	223.5	231.4	240.2	248.1
Macksville	0.0	10.0	10.3	10.5	10.8	11.0	11.3	11.6	11.9	12.2
Nambucca	20.5	12.0	12.3	12.6	12.9	13.3	13.6	13.9	14.3	14.6
Raleigh	0.0	12.0	12.4	12.8	13.2	13.6	14.0	14.5	15.0	15.4
Tenterfield	6.3	6.5	6.6	6.8	6.9	7.1	7.3	7.4	7.6	7.8
West Sawtell [1]	0.0	17.0	17.6	18.1	18.7	19.4	20.0	20.7	21.3	22.0
Total	366	379	392	405	418	431	446	460	476	492
Diversified Total	351	364	376	389	401	414	428	442	457	472

Note 1: West Sawtell is a generic name for Boambee South substation which was used prior to the exact location of that substation being determined.

Table 4 Summer Peak Demand Forecasts (MW)

Supply Point	2007/ 08	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15	2015/ 16	2016/ 17
Coffs Harbour	100.6	95.0	84.0	88.5	93.1	98.1	103.3	108.8	114.5	120.6
Dorrigo	3.6	3.6	3.7	3.8	3.9	3.9	4.0	4.1	4.2	4.3
Koolkhan	64.7	67.8	70.9	74.0	77.2	80.4	83.7	87.1	90.5	94.0
Lismore	187.6	197.3	207.2	217.3	227.5	238.0	248.6	259.4	270.4	281.6
Macksville	0.0	0.0	10.6	11.1	11.6	12.2	12.8	13.4	14.0	14.7
Nambucca	19.2	20.0	11.2	11.7	12.2	12.7	13.3	13.8	14.4	15.0
Raleigh	0.0	12.0	12.5	13.1	13.6	14.2	14.8	15.4	16.1	16.8
Tenterfield	5.4	5.6	5.7	5.8	6.0	6.1	6.2	6.4	6.5	6.7
West Sawtell	0.0	0.0	16.0	16.8	17.6	18.5	19.4	20.4	21.4	22.5
Total	381	401	422	442	463	484	506	529	552	576
Diversified Total	370	389	409	429	449	470	491	513	536	559

Figure 2 below shows actual and forecast winter maximum demands (in MW) for the far north coast.

Figure 2 Actual and Forecast Winter Max Demands

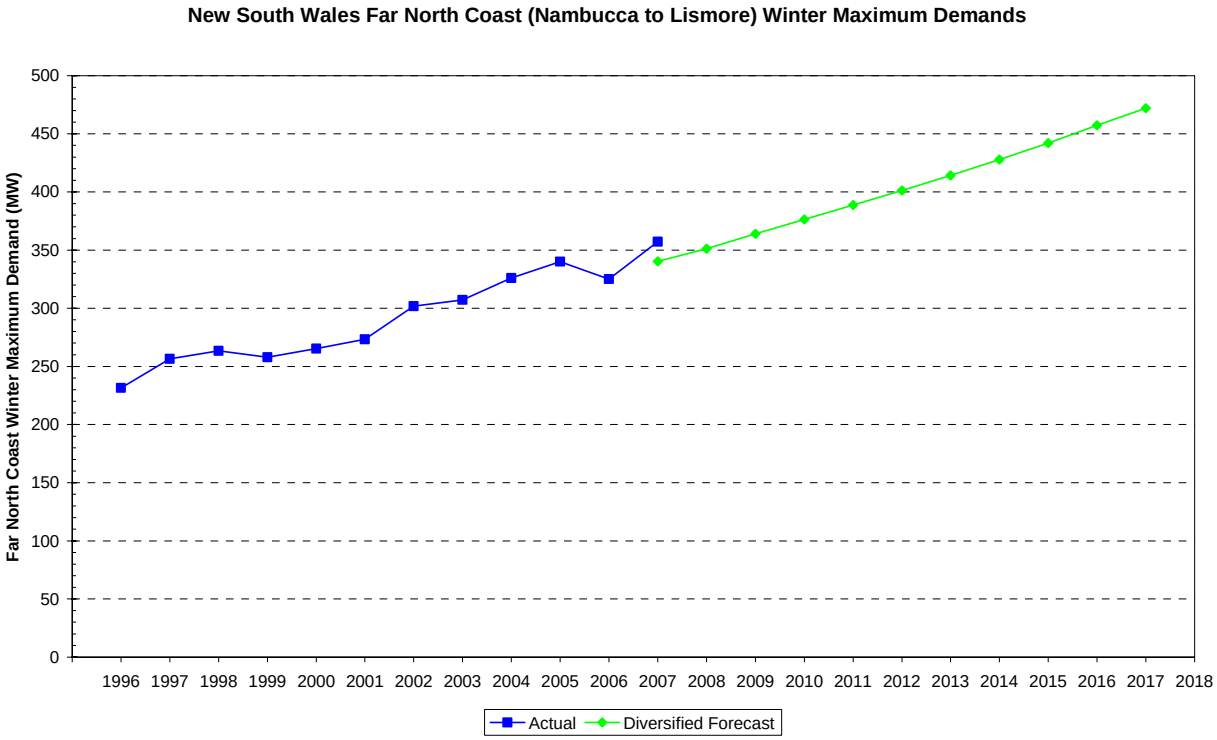
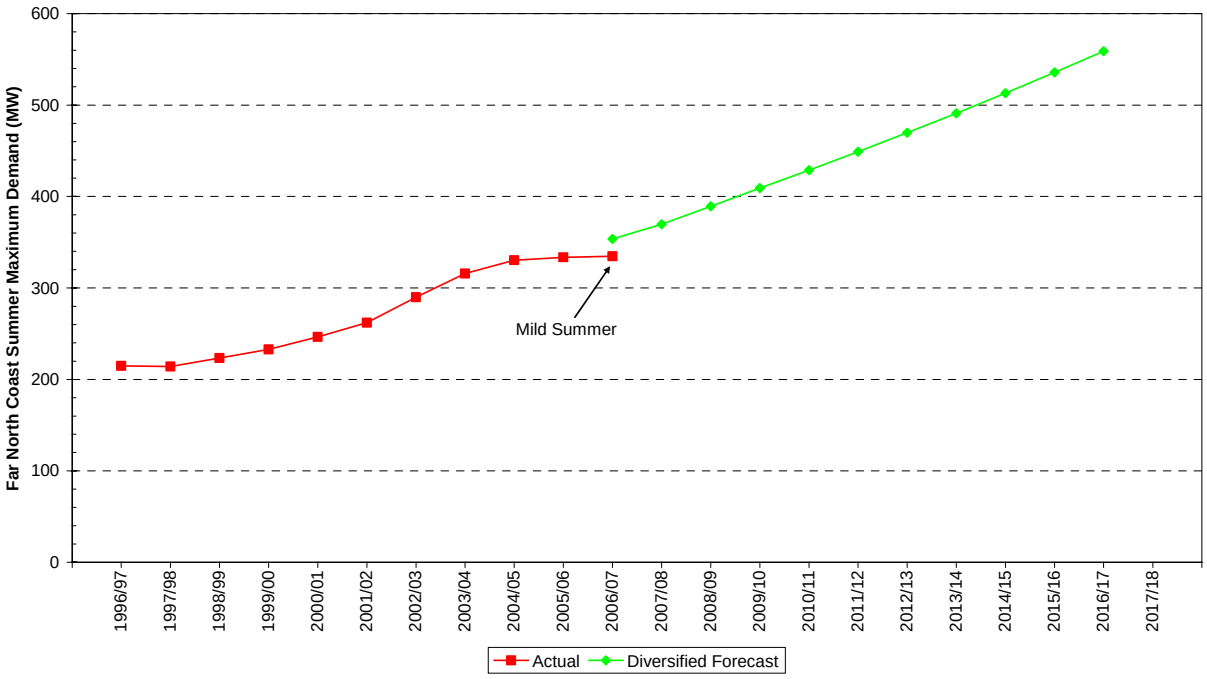


Figure 3 below shows historical and forecast summer maximum demands (in MW) for the far north coast.

Figure 3 Actual and Forecast Summer Maximum Demands



2.5. Description of Network Limitations

If all elements of the 330 kV and 132 kV network are in service it is presently capable of adequately supplying the far north coast at all times within a ten year planning horizon. However it is presently, or is expected to be, limited by the single contingency events described in the following sections.

2.5.1. Outage of the 87 Armidale – Coffs Harbour 330 kV Line

If the 87 Armidale – Coffs Harbour 330 kV line is out of service at times of high demand then:

- Unacceptably low voltages could occur at Lismore or on the mid north coast;
- The 96C Armidale – Coffs Harbour 132 kV line may be overloaded; and
- The 965 Armidale – Kempsey 132 kV line may be overloaded. This limitation will be overcome by the installation of a phase angle regulator in the line at Armidale (planned for late 2008).

The extent of these limitations depends inter alia on the magnitude and direction of power flows on QNI. The limitations may be managed via southward power flows on Directlink to the extent that the transmission system in Queensland and Directlink can accommodate them.

Table 5 and Table 6 below show the level of Directlink support required to manage all of the above limitations over a range of QNI flows. Changes in the level of support required reflect load growth, developments within the 132 kV network supplying the mid north coast and in some cases different limitations determining the level of support required.

Additional information on the individual limitations is provided in Appendix A.

Table 5 Approximate Level of Directlink Support Required During Summer (87 Line Outage)

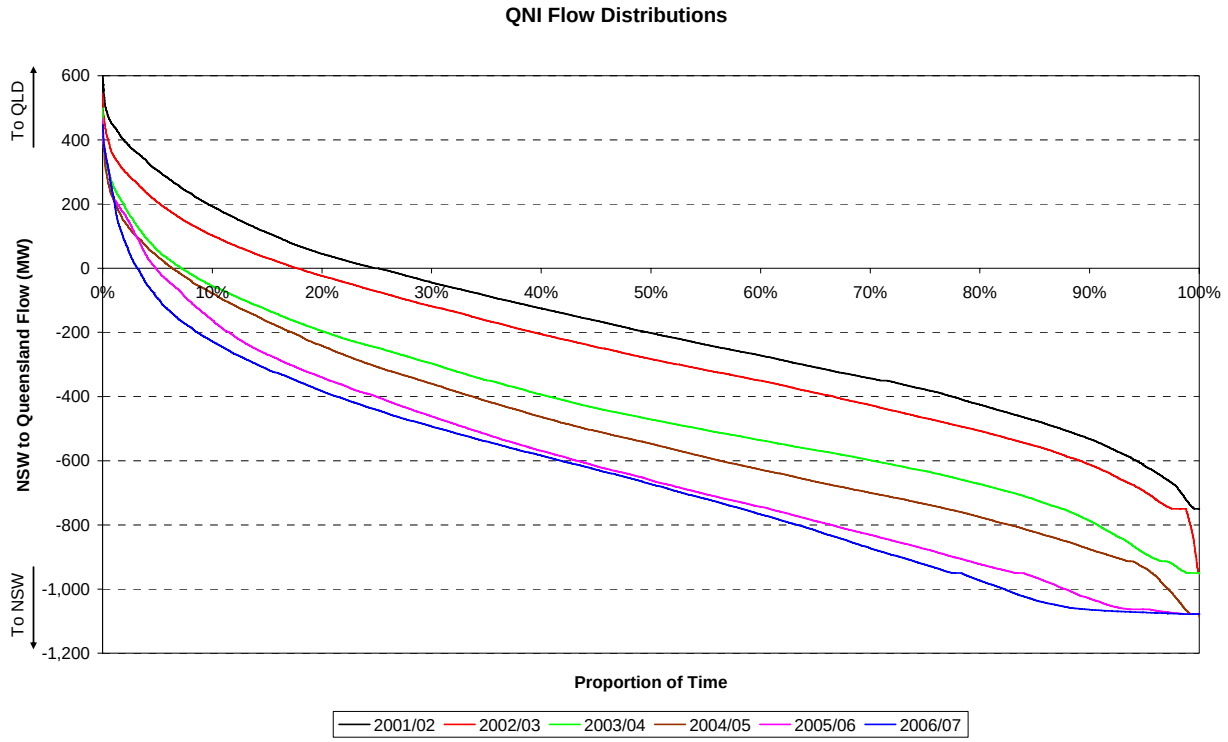
Summer	500 MW Export to QLD on QNI	No Flow on QNI	1,000 MW Import to NSW on QNI
2007/08	60	65	120
2008/09	80	95	135
2009/10	75	95	155
2010/11	105	125	190
2011/12	140	140	200

Table 6 Approximate Level of Directlink Support Required During Winter (87 Line Outage)

Winter	500 MW Export to QLD on QNI	No Flow on QNI	1,000 MW Import to NSW on QNI
2008	20	35	70
2009	40	55	110
2010	40	60	110
2011	65	80	135
2012	80	85	140

The level of support required increases with southward flows (import to NSW) on QNI. Since QNI was commissioned flows on it have been primarily southward and have increased in magnitude and duration. High levels of import to NSW are expected to continue over the next several years. Figure 4 below shows the distribution of flows on QNI from 2001/02 to 2006/07.

Figure 4 QNI Flow Distributions



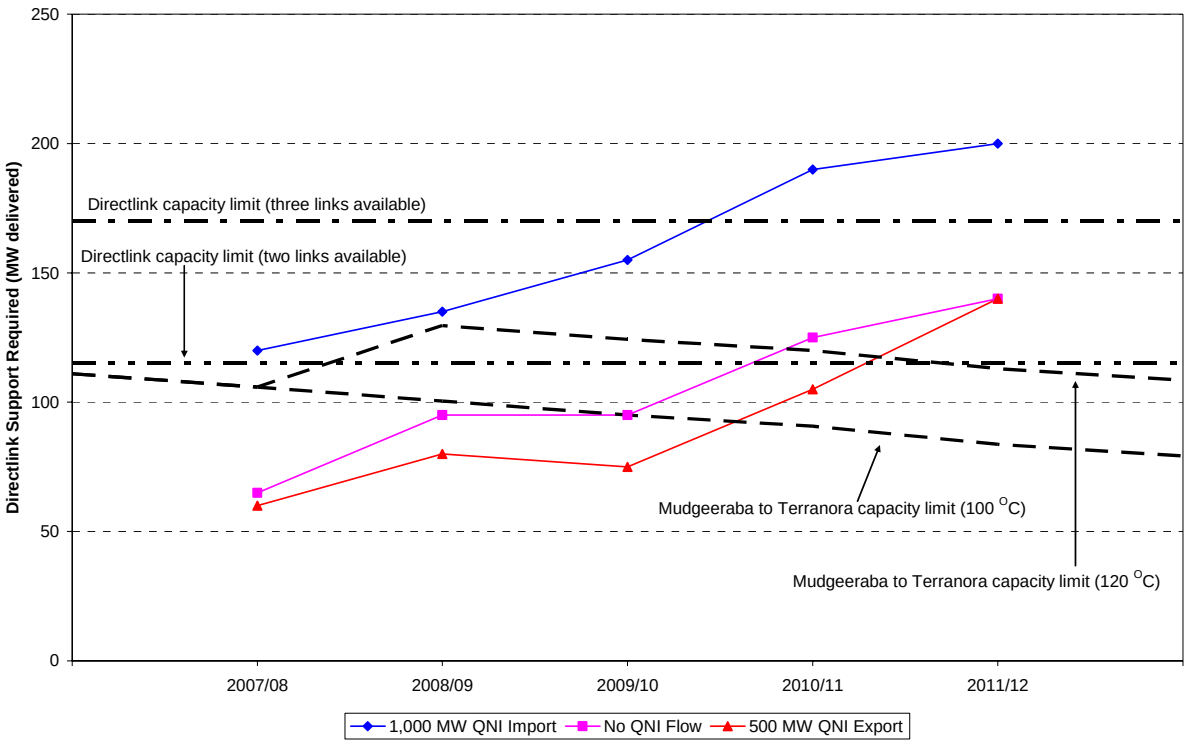
Directlink consists of three nominal 60 MW dc links operating in parallel. Its capability is limited to around 170 MW (delivered at Mullumbimby) with three links in service or 115 MW if one dc link is out of service. Recent experience indicates that the availability of all three dc links cannot be guaranteed.

The capability of the transmission and distribution networks within Queensland to accommodate high southward flows on Directlink at times of high southeast Queensland load is limited by:

1. The thermal rating of the two Mudgeeraba – Terranora 110 kV circuits. These circuits supply both the Terranora (Tweed Shire) load and southward flows on Directlink. As the Terranora load grows the capability to support southward flows on Directlink will diminish.
2. Voltage limitation within the network supplying the Gold Coast/Tweed area. This limitation depends on the Gold Coast/Tweed area load (including southward flows on Directlink), southeast Queensland load, generation dispatch (particularly within southeast Queensland) and the availability of reactive plant in southeast Queensland.

Figure 5 below shows the required level of Directlink support in summer for three levels of QNI flow together with the capabilities of Directlink and the Queensland transmission network[1].

Figure 5 Required Level of Summer Support via Directlink



2.5.2. Outage of the 89 Coffs Harbour – Lismore 330 kV Line

If the 89 Coffs Harbour – Lismore 330 kV line is out of service at times of high demand the 967 Koolkhan – Lismore 132 kV line and the 96H Coffs Harbour – Koolkhan 132 kV may be overloaded and low voltages may occur at Lismore. The severity of these limitations does not vary with QNI flows. They can be managed by southward power flows on Directlink. Table 7 and Table 8 show the approximate levels of Directlink support required in summer and winter.

Table 7 Approximate Level of Directlink Support Required During Summer (89 Line Outage)

Summer	Support Required (MW)
2007/08	20
2008/09	25
2009/10	35
2010/11	45
2011/12	55

[1] The capability of the Queensland transmission network is based on the thermal capacity of the Mudgeeraba – Terranora 110 kV circuits (expressed in MW delivered by Directlink at Mullumbimby, assuming that the Tweed area load is at its forecast maximum). The Mudgeeraba – Terranora 110 kV circuits are to be uprated to 120 degree operation by summer 2008/09. However, it will not be possible to operate these lines at 120 degrees prior to a critical outage occurring. It is expected that pre-contingent flows on these lines will be limited to the 100 degree rating and that higher flows would be possible should a critical contingency occur. Figure 5 shows the limitation imposed by both 100 degree and 120 degree ratings for these lines.

Depending on load/generation conditions and reactive plant availability within southeast Queensland, the voltage limitation may be more onerous.

Table 8 Approximate Level of Directlink Support Required During Winter (89 Line Outage)

Winter	Support Required (MW)
2008	5
2009	5
2010	10
2011	15
2012	25

2.5.3. Coffs Harbour 330/132 kV Transformer Capacity Limitations

If the Coffs Harbour 330/132 kV transformer is out of service low voltages can occur at Coffs Harbour 66 kV busbar and on the low voltage busbars of 132 kV substations on the mid north coast with the lowest voltages being at Coffs Harbour. The onset of this limitation depends to a small extent on the magnitude and direction of flows on QNI.

To accommodate the growing load at Coffs Harbour it is planned to replace the existing 60 MVA 132/66 kV transformers by 120 MVA units by summer 2009/10. The new transformers would have a larger tapping range than the existing units. It is also planned to replace the No.1 66 kV capacitor, which is approaching the end of its serviceable life, by a larger unit. The new transformers and the larger capacitor will help to maintain adequate voltage levels.

The expected onset of this limitation for a range of flows on QNI is shown in Table 9 below.

Table 9 Onset of Low Voltages at Coffs Harbour

	500 MW Export to QLD on QNI	No Flow on QNI	1,000 MW Import to NSW on QNI
Onset	Summer 2013/14	Summer 2014/15	Summer 2013/14

2.5.4. Network Limitations Summary

Table 10 below shows the timing of the expected occurrence of the network limitations described in Sections 2.5.1 to 2.5.3.

Table 10 Onset of Network Limitations

Limitation	Year of Onset
Unacceptably low voltages at Lismore or overloading of the 96C Armidale – Coffs Harbour 132 kV line on outage of the 87 Armidale – Coffs Harbour 330 kV line.	Existing without Directlink support (and with less than three dc links of Directlink available). Around 2010 with Directlink support (all three dc links of Directlink available).
Unacceptably low voltages at Lismore or overloading of the 967 Armidale – Coffs Harbour 132 kV line on outage of the 89 Coffs Harbour – Lismore 330 kV line.	Existing without Directlink support. Beyond 2010 with Directlink support.
Unacceptably low voltages at Coffs Harbour on outage of the Coffs Harbour 330/132 kV transformer.	Summer 2013/14 or Summer 2014/15 depending on QNI flows.

2.6. Joint Planning

Country Energy and TransGrid have jointly planned the 330 kV and 132 kV network supplying the New South Wales north coast for many years.

TransGrid and Country Energy have carried out joint annual planning reviews as required by Clause 5.6.2 (b) of the Rules. As required by Clause 5.6.2(c) they have identified that the limitations described in Section 2.5 give rise to a need for network augmentations and have carried out joint planning to determine options for these augmentations.

2.7. Reliability Augmentation

It follows from Sections 2.1 – 2.5 that the proposals covered by this application notice constitute a reliability augmentation and that the regulatory test should be applied in accordance with Clause 1(a) of the test.

2.8. Material Internetwork Impact

The Rules require TransGrid to assess whether a proposed new large transmission network asset is reasonably likely to have a material internetwork impact.

TransGrid has determined that none of the options described in Section 3 will impose power transfer constraints or adversely impact on the quality of supply to adjoining transmission networks.

2.9. Consideration of DSM and Local Generation

As discussed in Section 1.2 the network limitations described in Section 2.5 have previously been described in TransGrid's Annual Planning Statements and Annual Planning Reports from 1999 to 2007.

In August 2003 TransGrid and Country Energy published a document titled "Emerging Transmission Network Limitations on the New South Wales Far North Coast". That document sought proposals from proponents of developments which may relieve the limitations in the transmission network supplying the area. No responses relating to new developments were received.

None the less proponents of non-network developments which may relieve the limitations in the transmission network are encouraged to submit proposals in response to this document.

3. Options

TransGrid and Country Energy have developed two network options to relieve the network limitations detailed in Section 2.5. They are described in the following sections together with descriptions of other network developments that have been considered but not put forward as reasonable options.

Both options involve uprating the 96C Armidale – Coffs Harbour 132 kV line to allow it to operate with a conductor temperature of 100 ^{O}C. This would increase the summer day contingency rating of 96C by around 20 MVA thus reducing the amount of support required from Directlink for outages of the 87 Armidale – Coffs Harbour 330 kV line. Table 11 and Table 12 below show the level of Directlink support required to manage network limitations for an outage of 87 line under conditions of high import to NSW over QNI.

These works are estimated to cost $8 million (± 25%) and could be completed by late 2009.

Table 11 Approximate Level of Directlink Support Required During Summer (87 Line Outage, 1,000 MW Import to NSW on QNI)

Summer	96C Not Uprated	96C Uprated
2009/10	155	90
2010/11	190	130
2011/12	200	150
2012/13	>200	165

Table 12 Approximate Level of Directlink Support Required During Winter (87 Line Outage, 1,000 MW Import to NSW on QNI)

Winter	96C Not Uprated	96C Uprated
2010	110	35
2011	135	65
2012	140	80
2013	>140	100

As indicated in Section 2.5 the amount of support available via Directlink is subject to a number of uncertainties. Uprating 96C line provides an opportunity to reduce the level of support required thus increasing the likelihood that the required level of support can be delivered.

3.1. Option 1: Dumaresq – Lismore 330 kV Line

This option would involve:

- Uprating of the 96C Armidale – Coffs Harbour 132 kV line to a conductor temperature of 100 ^{O}C;
- Construction of a new 330 kV line between Dumaresq 330 kV switching station and Lismore 330/132 kV substation;
- Provision of 330 kV switchgear at Dumaresq and Lismore to connect the new line;
- Provision of 50 MVAr 330 kV line connected shunt reactors at Dumaresq and Lismore;
- Provision of two 40 MVAr 132 kV capacitors at each of Lismore and Coffs Harbour 330/132 kV substations; and
- Provision of a second 330/132 kV transformer and related 330 kV and 132 kV switchgear at Coffs Harbour 330/132 kV substation.

The new line would around 215 km in length. It is anticipated that it could utilise parts of the route of the existing 96L Tenterfield – Lismore 132 kV line. However to enable the 132 kV supply to Casino to be retained the line route between the Casino area and Lismore 330/132 kV substation would be new.

These works are estimated to cost $190 million (± 25%) and could be completed by late 2011.

This option would overcome the limitations described in Section 2.5 over at least a ten year planning horizon.

3.2. Option 2: Armidale – Lismore 330 kV Line

This option would involve:

- Uprating of the 96C Armidale – Coffs Harbour 132 kV line to a conductor temperature of 100 ^{O}C;
- Construction of a new 330 kV line between Armidale 330/132 kV substation and Lismore 330/132 kV substation;
- Provision of 330 kV switchgear at Armidale and Lismore to connect the new line;
- Provision of 50 MVAr 330 kV line connected shunt reactors at Armidale and Lismore;
- Provision of two 40 MVAr 132 kV capacitors at each of Lismore and Coffs Harbour 330/132 kV substations; and
- Provision of a second 330/132 kV transformer and related 330 kV and 132 kV switchgear at Coffs Harbour 330/132 kV substation.

The new line would be around 300 km in length. As per Option 1 it is anticipated that it could utilise parts of the route of the existing 96L Tenterfield – Lismore 132 kV line.

These works are estimated to cost $275 million (± 25%) and could be completed by late 2011.

This option would overcome the limitations described in Section 2.5 over at least a ten year planning horizon.

3.3. Consideration of Other Network Developments

3.3.1. Armidale – Kempsey Area 330 kV Line and Kempsey 330/132 kV Substation

Consideration has been given to the development of a new 330 kV line between Armidale 330/132 kV substation and a new 330/132 kV substation in the Kempsey/Port Macquarie area. This is expected to be part of longer term plans to provide a 330 kV network to serve the mid north coast. The 330 kV line would utilise parts of the route of the existing 965 Armidale – Kempsey 132 kV line.

To meet the network limitations described in Section 2.5 this development would involve:

- Reconstruction of 965 line from Armidale to a location just to the west of Kempsey as a single circuit 330 kV line and reconstruction of the remaining section to Kempsey as a high capacity double circuit 132 kV line; and
- Establishing a 330/132 kV substation just to the west of Kempsey.

It would not be possible to take the 965 line out of service to reconstruct it until both circuits of the Coffs Harbour – Kempsey double circuit 132 kV line are operating at 132 kV.

It is anticipated that the development could not be completed until late 2013 (two years later than Options 1 and 2).

The capability of this development to meet the network limitations during outages of 87 line is limited by the thermal rating of the Kempsey – Macksville/Nambucca double circuit 132 kV line. This can be managed for a few years via southward power flows on Directlink. The support required via Directlink in summer is shown in Table 13 on the following page.

Table 13 Approximate Level of Directlink Support Required During Summer (for an Outage of 87 Line)

Summer	Support Required (MW)	Support Available (MW)[2]
2014/15	15	99
2015/16	30	95
2016/17	60	91
2017/18	90	87

The capability of Directlink to provide these levels of support is limited by voltage and thermal limitations in the Queensland network.

Consequently this development would overcome the network limitations described in Section 2.5 until summer 2017/18 provided that the voltage limitations within the Queensland network are less onerous than the thermal limitations.

This development is not considered to be a reasonable option and will not be considered further due to:

- It not being possible to complete it until two years after Option 1 or Option2 could be completed;
- The limited time before a further 330 kV augmentation (such as Option 1 or 2) would be required;
- Potential difficulties in reconstructing the 965 line if substantial parts of the new line have to be located in the same position as the existing line;
- The risk that voltage limitations within the Queensland network are more onerous than the thermal limitations;
- The potential risk of reduced availability of Directlink; and
- A consequent reduction in the network impedance between Armidale and the Newcastle area which would exacerbate limitations within the 132 kV network between the Newcastle area and Taree particularly for northward flows on QNI.

3.3.2. Ebenezer – Lismore 330 kV Line

Consideration has been given to the development of a 330 kV line between the Ebenezer area near Ipswich in southeast Queensland and Lismore. The Ebenezer area is a possible location of a future Powerlink Queensland 500/330/275 kV substation that would connect major transmission lines supplying southeast Queensland and Brisbane.

To meet the network limitations described in section 2.5 this development would involve:

- Establishment of a new 330/275 kV substation in the Ebenezer area;
- Construction of a new 330 kV line between Ebenezer and Lismore 330/132 kV substation;
- Provision of 330 kV switchgear at Lismore to connect the new line;
- Provision of 50 MVAr 330 kV line connected shunt reactors at Ebenezer and Lismore;
- Provision of two 40 MVAr 132 kV capacitors at each of Lismore and Coffs Harbour 330/132 kV substations; and
- Provision of a second 330/132 kV transformer and related 330 kV and 132 kV switchgear at Coffs Harbour 330/132 kV substation.

The new substation at Ebenezer may be a partial advancement of works for the development of supply to southeast Queensland and Brisbane that would otherwise be required at some stage. The Ebenezer - Lismore connection would also advance other future works for the development of supply to these areas.

[2] Based on the limit imposed by the rating of the Mudgeeraba – Terranora lines. As it would not be possible to operate these lines for extended periods with a conductor temperature of 120 degrees, this level of support would not be available on a pre-contingent basis. The voltage limitations within the Queensland network may impose a more onerous limit.

The Ebenezer - Lismore new line would be around 200 km in length. As per Option 1 it is anticipated that it could utilise parts of the route of the existing 96L Tenterfield – Lismore 132 kV line.

This development is not considered to be a reasonable option and will not be considered further as it:

- Faces difficulties in obtaining the line route from Ebenezer to Lismore due to the presence environmentally sensitive areas including National Parks and World Heritage Areas; and
- Would most likely advance future major works that would otherwise be required for the development of supply to southeast Queensland and Brisbane.

3.3.3. Armidale – Coffs Harbour – Lismore 330 kV Line

Consideration has been given to the development of a new 330 kV line between Armidale 330/132 kV substation and Lismore 330 kV substation via the Coffs Harbour area.

This development is not considered to be a reasonable option and will not be considered further as:

- A new line route between Armidale and Coffs Harbour would be required and this would be very difficult to obtain (particularly around the escarpment where there are a number of National Parks and Conservation Areas);
- A new 330 kV switching station would be required in the Coffs Harbour area because it would not be possible to connect the new line at the existing Coffs Harbour 330/132 kV substation;
- To overcome the limitation described in Section 2.5.2 it would be necessary to construct a 330 kV line between the Coffs Harbour 330 kV switching station and Lismore. The route for such a line would be very difficult to obtain; and
- Overall around 300 km of new 330 kV line would be required, together with a new 330 kV switching station, making this option significantly more costly than Option 1 and Option 2.

3.3.4. 132 kV Line Developments

Over the distances involved (greater than 200 km) the capacity of 132 kV transmission lines is limited by voltage drop considerations to around 40 MW to 50 MW (significantly less than the typical thermal rating of a single circuit 132 kV line). The far north coast load is forecast to grow at around 20 MW p.a. which would necessitate an additional 132 kV circuit every two to three years.

The environmental and community impact of proliferating 132 kV lines was recognised in the 1970s. Consequently all major lines supplying the Coffs Harbour to Lismore area from the early 1980s have been of 330 kV construction.

132 kV line developments are not considered to be reasonable options and will not be considered further due to the associated adverse environmental and community impacts.

4. Preliminary Application of the Regulatory Test

A preliminary application of the regulatory test, considering Options 1 and 2, has been carried out. A summary of the results is provided in the following sections.

4.1. Form of the Regulatory Test

As discussed in Section 2 the options covered by this application notice are a reliability augmentation and the regulatory test is to be applied in accordance with clause 1(a) of the test:

> (a) in the event the option is necessitated principally by inability to meet the service standards linked to the technical requirements of schedule 5.1 of the Rules or in applicable regulatory instruments - the option minimises the costs of meeting those requirements, compared with alternative option/s in a majority of reasonable scenarios;

TransGrid's interpretation of the regulatory test for reliability augmentations is as follows.

The following costs should be included:

- Capital costs of options;
- O&M costs of options; and
- Costs of complying with laws, regulations and applicable administrative requirements in relation to the option;

The following avoided costs should not be included:

- Reductions in electrical losses;
- Reductions in unserved energy;
- Deferrals or avoidance of generation or transmission investment elsewhere in the NEM (ie not associated with the option); and
- Avoided fuel costs elsewhere in the NEM.

Market development scenarios are only relevant to the extent that they affect the timing of the onset of network limitations and/or the ability of options to meet those limitations.

4.2. Preliminary Regulatory Test Application – Summary

4.2.1. Costs

For the preliminary regulatory test application only the capital and operating & maintenance costs of Options 1 and 2 have been explicitly included.

There are no known existing or anticipated government tax or subsidy schemes that would apply differently to the operation of Options 1 and 2.

There are no known emerging network limitations in the area (other than those described in Section 2.5) for which the solution would be differently affected by either of these options.

4.2.2. Scenarios

Only a single market development scenario has been considered which corresponds to a medium economic growth outcome and which does not explicitly model future generation or demand management developments. This is due to:

- The need for network augmentation being within the lead time of all known reasonable options.
- There being no known committed or advanced generation or demand management developments that are likely to affect the timing of the onset of the network limitations or the ability of any reasonable option to meet them.

4.2.3. Results

The present value of the costs of each option has been calculated for a base case of financial and technical assumptions and the options ranked accordingly. Sensitivity tests of these calculations due to reasonable variations to the major assumptions have been carried out.

The base case assumptions and the range over which sensitivity tests were conducted are shown in Table 14. The results of the analysis are shown in Table 15 and Table 16. Details of the costing model for the base case assumptions are shown in Appendix A.

Table 14 Base Case Values and Range of Values Used in Sensitivity Checks

Parameter	Base Case Value	Sensitivity Checks at
Real Discount Rate	9%	6% and 12%
Annual O&M Cost	2% of Capital Cost	1% and 3% of Capital Cost
Asset Lifetimes		
Substations	30 years	20 and 40 years
Transmission Lines	45 years	30 and 60 years
Capital Costs	Nominal Value	±25% variation

Table 15 Comparison of Options – Base Case

Option	Capital Costs ($M)	PV of Costs ($M)	Rank
Option 1	189.6	110.9	1
Option 2	274.7	159.5	2

Table 16 Comparison of Options - Results of Sensitivity Studies

Sensitivity Case	Option 1	Rank	Option 2	Rank
Base Case	110.9	1	159.5	2
12% Discount Rate	111.5	1	160.5	2
6% Discount Rate	106.1	1	152.3	2
25% Increase in Capital Costs	138.6	1	199.4	2
25% Decrease in Capital Costs	83.2	1	119.6	2
Decrease in Asset Lives	118.3	1	169.8	2
Increase in Asset Lives	107.2	1	154.4	2
Decreased O&M Cost	102.7	1	147.7	2
Increased O&M Cost	119.1	1	171.3	2

In each case Option 1 has lower present value of costs and is therefore the highest ranked option.

5. Preliminary Conclusions and Preferred Actions

At this stage and subject to comments received during the consultation process TransGrid and Country Energy conclude that Option 1 would satisfy the regulatory test. The preferred actions would be for TransGrid to proceed with construction of Option 1 as described in Section 3.1.

6. Contact Details for Submissions and Enquiries

In accordance with the Rules TransGrid and Country Energy invite written submissions from interested parties on this application notice.

Submissions are due by 06/06/2008.

Submissions or other enquiries should be directed by email to:

regulatory.consultation@transgrid.com.au

Appendix A – Network Limitations on Outage of the 87 Armidale – Coffs Harbour 330 kV Line

Limitations

On outage of 87 line the transmission network may be affected by the following limitations:

- Overloading of the 96C Armidale – Coffs Harbour 132 kV line.

  The extent of this overload depends primarily on the loads in the Coffs Harbour area and the mid north coast and on the magnitude and direction of flows on QNI.

- Overloading of the 965 Armidale – Kempsey 132 kV line (prior to installation of a phase angle regulator in this line at Armidale).

  The extent of this overload depends primarily on the mid north coast loads and the magnitude and direction of flows on QNI. Once the phase angle regulator is installed (from summer 2008/09), power flows on the 965 line can be controlled (and this limitation is overcome). However limiting the loading of the 965 line increases the loading on 96C line.

  TransGrid's analysis assumes that (for an 87 line outage) once the phase angle regulator is installed the loading on the 965 line will, if necessary, be controlled to be just below the contingency rating of the line.

- Low voltages at Lismore or on the mid north coast.

  For an 87 line outage the 89 Coffs Harbour – Lismore 330 kV line remains in service. The transformer tapchanger control schemes at Coffs Harbour and Lismore 330/132 kV substations enable the 132 kV voltage level at Coffs Harbour to be managed provided that the output of the Lismore SVC remains within its capability.

  Voltage levels on the mid north coast depend primarily on the local load, the magnitude and direction of flows on QNI and future augmentations of the network supplying the mid north coast. The augmentations included in TransGrid's analysis are:

  - Installation of a phase angle regulator in the 965 line by summer 2008/09.
  - Operation of both circuits of the Coffs Harbour – Nambucca – Kempsey double circuit 132 kV line at 132 kV by summer 2009/10.
  - Provision of a second 132 kV circuit between Kempsey and Port Macquarie by summer 2010/11.
  - Establishment of a 330/132 kV substation at Tomago (in the Newcastle area) by summer 2009/10 and installation of a third 375 MVA transformer at that substation by summer 2011/12.

TransGrid's analysis determines the amount of support required from Directlink to manage each of these limitations (individually) for a range of flows on QNI. The results are shown in Table A1 and Table A2 below. Table 5 and Table 6 (both in Section 2.5.1) show the amount of support required to manage all of the limitations concurrently.

Directlink Capability

Directlink comprises three nominal 60 MVA dc links operating in parallel. Allowing for losses the maximum southward flow (delivered at Mullumbimby) is around 170 MW. Should one of the three dc links be out of service the maximum southward capability is around 115 MW and with two of the dc links out of service it is around 57 MW.

The reliability of Directlink was an issue during the AER's consideration (during 2005 and early 2006) of the application by Directlink Joint Ventures (DJV) to convert Directlink to regulated status. At that time Directlink's availability was around 80% (well below typical availability levels for transmission networks) and DJV gave undertakings to improve this. In its consideration of DJV's application the AER assumed that if the capacity of Directlink was taken to be that of two of the three links appropriate levels of availability could be achieved.

One or more of the dc links have been out of service on occasions recently. On this basis, the full capacity of Directlink cannot be guaranteed to be available.

Queensland Network Capability

The capability of the transmission and distribution networks within Queensland to accommodate high southward flows on Directlink at times of high southeast Queensland load is limited. The ability of these networks to support the required southward flows on Directlink (should they be required concurrent with high demands in the Gold Coast/Tweed area) cannot be guaranteed.

Table A1 – Level of Directlink Support Required During Summer

Summer	500 MW Export on QNI			Zero Flow on QNI			1,000 MW Import on QNI		
	96C Loading	965 Loading	Voltages	96C Loading	965 Loading	Voltages	96C Loading	965 Loading	Voltages
2007/08	50	20	60	65	20	60	120	115	80
2008/09	80	-	65	95	-	65	135	-	80
2009/10	75	-	75	95	-	75	155	-	90
2010/11	100	-	105	125	-	105	190	-	130
2011/12	115	-	140	140	-	135	200	-	160

Table A2 – Level of Directlink Support Required During Winter

Winter	500 MW Export on QNI			Zero Flow on QNI			1,000 MW Import on QNI		
	96C Loading	965 Loading	Voltages	96C Loading	965 Loading	Voltages	96C Loading	965 Loading	Voltages
2008	20	-	15	35	-	15	70	55	30
2009	40	-	30	55	-	25	110	-	45
2010	40	-	40	60	-	35	110	-	50
2011	60	-	65	80	-	65	135	-	80
2012	65	-	80	85	-	80	140	-	95

Appendix B - Present Value Cost Analysis of Base Case

Supply to the NSW Far North Coast: Preliminary Application of the Regulatory Test: Option 1

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Residual
96C Uprate		11.3										-8.8
Dumaresq - Lismore Line			120.9									-96.8
Dumaresq - Lismore Line Property			23.8									-19.0
Dumaresq SS Swbays & reactor			9.1									-6.4
Lismore SS Swbays & reactor + caps			11.0									-7.7
Coffs Harbour Caps + Transformer			13.4									-9.4
O+M Costs			0.34	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	
Total Expenditure		11.30	178.59	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	-148.04
PV of Costs ($Million)	**119.1**											
Total Capex Costs ($Million)	**189.6**											

Supply to the NSW Far North Coast: Preliminary Application of the Regulatory Test: Option 2

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Residual
96C Uprate		11.30										-8.79
Armidale - Lismore Line			201.88									-161.50
Armidale - Lismore Line Property			34.71									-27.77
Armidale SS Swbay			1.46									-1.02
Lismore SS Swbays & reactor + caps			12.00									-8.40
Coffs Harbour Caps + Transformer			13.39									-9.37
O+M Costs			0.34	8.24	8.24	8.24	8.24	8.24	8.24	8.24	8.24	
Total Expenditure		11.30	263.78	8.24	8.24	8.24	8.24	8.24	8.24	8.24	8.24	-216.86
PV of Costs ($Million)	**171.3**											
Total Capex Costs ($Million)	**274.7**											