FINAL REPORT

PROPOSED NEW LARGE TRANSMISSION NETWORK ASSET

DEVELOPMENT OF ELECTRICITY SUPPLY TO PORT MACQUARIE

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Executive Summary

This final report covers a proposal for the construction of a new large transmission network asset for the development of electricity supply to Port Macquarie.

Section 1 provides a description of the context of this final report within the regulatory process and summarises the outcomes of that process.

Section 2 describes in detail the regulatory requirements, nature of the growing load in the area, the limitations affecting the transmission network in the area and the need for augmentation of supply to the area. The agreed network performance requirements (planning criterion), against which the need and effectiveness of augmentation options are to be assessed, is presented.

In Section 3 three feasible network augmentation options are described. Option 1 involves the replacement of the existing 132 kV line between Kempsey and Port Macquarie by a double circuit 132 kV line. Options 2 and 3 involve the construction of a single or double circuit 132 kV line between Kempsey and Herons Creek.

The capital costs of these options are in the range of $28 million to $48 million.

In Section 4 the results of an application of the regulatory test to Options 1 to 3 are presented.

In Section 5 it is concluded that Option 1 satisfies the regulatory test. Consequently it is proposed to construct that option. This involves the replacement of the existing 96G Kempsey – Port Macquarie 132 kV line by a new double circuit 132 kV line and provision of associated 132 kV line switchbays at Kempsey and Port Macquarie, to be in service by summer 2010/11.

Section 6 provides information that may be relevant to persons who may wish to dispute any aspect of this final report.

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 (which includes the Port Macquarie area) 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 final report has been prepared in accordance with Clause 5.6.6 (h) 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 Port Macquarie area.

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 supplying the Port Macquarie 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;
- An assessment of the outcome of the regulatory test and proposed actions; and
- Information that may be relevant to persons who may wish to dispute any aspect of this final report.

1.2. Outline of Consultation Process

TransGrid published a description of limitations affecting the transmission network supplying Port Macquarie in its Annual Planning Statements for 1999 - 2001 and Annual Planning Reports (APRs) for 2002 - 2007. The APR 2007 included a summary of a new large transmission network asset proposal to meet these limitations with the preferred option being the construction of a double circuit 132 kV transmission line between Kempsey and Port Macquarie.

In July 2007 TransGrid and Country Energy published an application notice covering a proposal for a new large transmission network asset that would address the network limitations described in Section 2.5. A summary of the application notice was published on NEMMCO's website on 27th July 2007. Interested parties were invited to make submissions in the period to 7th September 2007. No submissions were received.

TransGrid and Country Energy have applied the regulatory test to all known reasonable options to meet the network limitations described in this final report and have determined the option that satisfies the test.

Accordingly TransGrid has completed its obligations under clause 5.6.6 (b) of the Rules and will proceed in accordance with the proposed actions detailed in Section 5 of this final report. These involve the replacement of the existing 96G Kempsey – Port Macquarie 132 kV line by a new double circuit 132 kV line and provision of associated 132 kV line switchbays at Kempsey and Port Macquarie, to be in service by summer 2010/11.

Persons wishing to dispute any matter in this final report are referred to Section 6.

A summary of this final report has been published on NEMMCO's website.

2. Identification of a Necessity for Augmentation

2.1. Regulatory Requirements

2.1.1. Requirements of the National Electricity Rules

This final report covers a proposal for a new large transmission network asset.

The requirements of the National Electricity 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;
- 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 TNSPs 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 solely by the inability to meet the minimum network performance requirements set out in schedule 5.1 of the Rules or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction - the option minimises the present value of costs, compared with a number of alternative options in a majority of reasonable scenarios;

(b) in all other cases - the option maximises the expected net present value of the market benefit (or in other words the present value of the market benefit less the present value of costs) compared with a number of alternative options and timings, in a majority of reasonable scenarios.

The Rules define a reliability augmentation as:

> A transmission network augmentation that is necessitated solely 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 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 circuit (a line or a cable) or transformer, during periods of forecast high load.

These requirements are underpinned by the introduction in 2005 of mandatory licence conditions for DNSPs which inter-alia set out reliability standards for subtransmission and distribution networks. The licence conditions specify N-1, one minute reliability levels for subtransmission lines and zone substations supplying loads greater than or equal to 15 MVA in rural areas.

Consequently Country Energy has requested that TransGrid incorporates 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 contingency 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.

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 Port Macquarie area includes the majority of the Port Macquarie – Hastings local government area. It has a population of around 70,000. The area electrical load is characterised primarily by urban residential loads and commercial/light industrial loads in the main population centres and rural loads in surrounding areas.

TransGrid's 132 kV system on the NSW north coast is shown in Figure 1 on the next page. The Stroud to Port Macquarie load area of interest is indicated by the dotted ellipse.

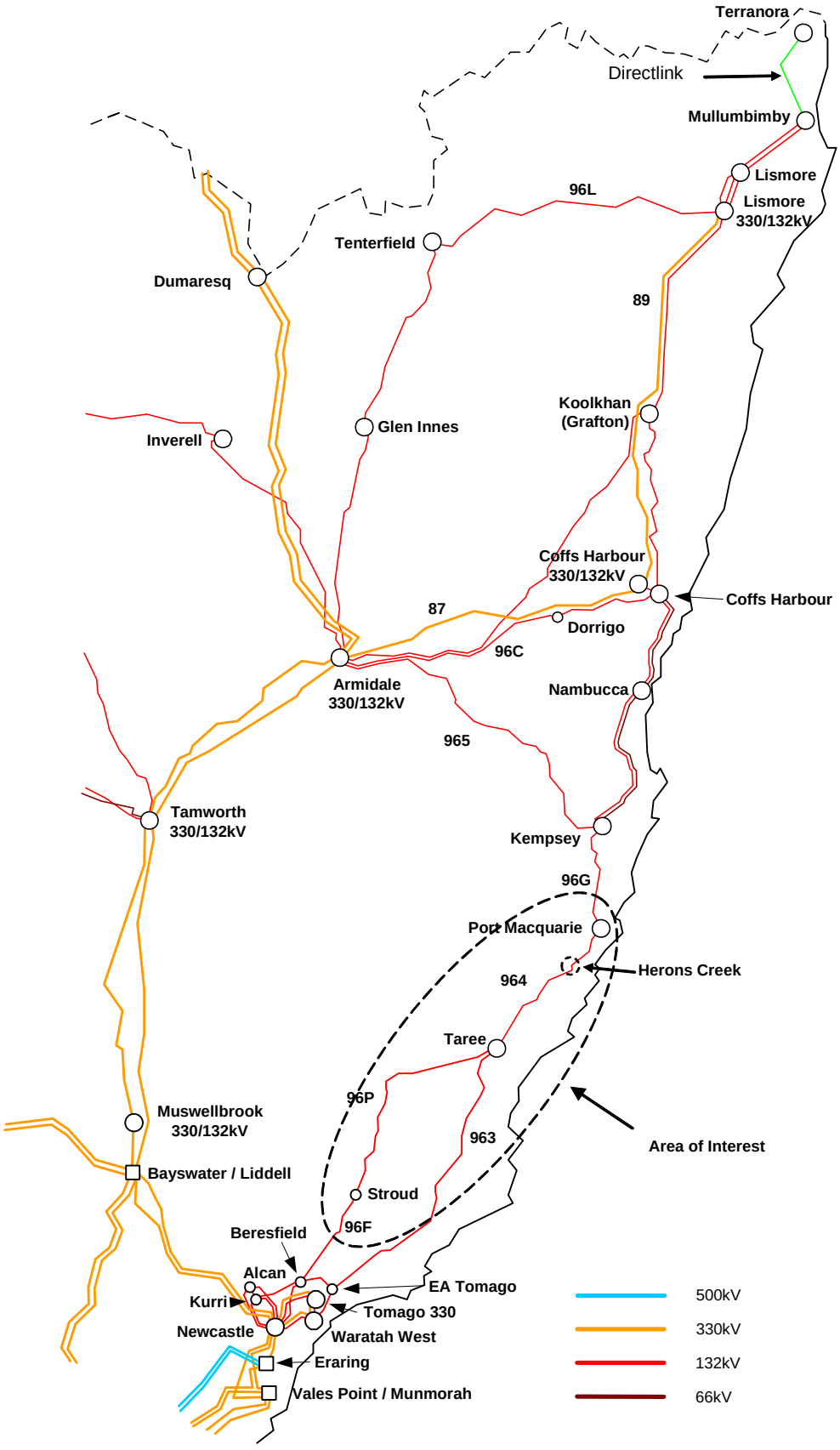
To cater for the growing load at Port Macquarie, the existing transformers at Port Macquarie 132/33 kV substation are being replaced by larger units. Those larger transformers will have a larger tapping range than the existing units, which will help to manage voltage levels at Port Macquarie.

Over the years, TransGrid has installed a number of banks of capacitors at its substations on the mid north coast 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. Whilst all capacitors may be required after a critical line outage, it is not possible to have them all in service before such an event as voltage levels could be too high. The automatic control schemes will switch the capacitors into service (if they are required) within ten to 15 seconds.

Table 1 Capacitor Installations at TransGrid Substations in the Port Macquarie Area

TransGrid Substation at	Capacitors Installed
Taree	2 x 7 MVAr at 33 kV 2 x 9.5 MVAr at 66 kV 1 x 20 MVAr at 132 kV
Port Macquarie	2 x 7.5 MVAr at 33 kV 2 x 12 MVAr at 132 kV
Kempsey	2 x 7 MVAr at 33 kV 1 x 12 MVAr at 132 kV

Figure 1 Transmission System Supplying the NSW North Coast



As the reactive loads in the area are already fully compensated, the ability to manage voltage conditions by installing additional capacitors is limited.

Undervoltage load shedding (UVLS) schemes have been installed at Port Macquarie and Taree to interrupt some load should sustained low voltages occur. These schemes are designed to operate after about 20 seconds after all capacitors have been switched into service to restore voltages to more acceptable levels.

2.4. Local Load Forecast

Demand in the Stroud to Port Macquarie area has grown strongly over recent years and is expected to continue to do so. Forecast winter and summer maximum demands are shown in Table 2 and Table 3.

Table 2 Winter Peak Demand Forecasts (MW)

Supply Point	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hawks Nest			10.0	10.4	10.7	11.1	11.5	11.9	12.3	12.7
Herons Creek				23.0	23.7	24.5	25.3	26.1	26.9	27.8
Nabiac				40.0	41.2	42.4	43.7	45.0	46.4	47.8
Port Macquarie	78.0	80.7	83.6	79.5	82.3	85.1	88.1	91.2	94.4	97.7
Stroud	32.0	33.0	34.1	35.2	36.3	37.5	38.7	39.9	41.2	42.5
Taree 33 kV	26.0	26.7	27.3	28.0	28.7	29.4	30.2	30.9	31.7	32.5
Taree 66 kV	76.0	78.3	80.6	27.0	27.9	28.7	29.6	30.4	31.4	32.3
Total	212	219	236	243	251	259	267	275	284	293
Diversified Total	206	212	229	236	243	251	259	267	276	284

Table 3 Summer Peak Demand Forecasts (MW)

Supply Point	2006/ 07	2007/ 08	2008/ 09	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	2014/ 15	2015/ 16
Hawks Nest			10.0	11.0	11.6	12.1	12.7	13.4	14.0	14.7
Herons Creek				21.6	22.9	24.2	25.6	27.1	28.6	30.3
Nabiac				38.0	39.9	41.9	44.0	46.2	48.5	50.9
Port Macquarie	67.0	70.6	74.3	72.2	76.1	80.1	84.3	88.8	93.5	98.5
Stroud	33.5	35.1	36.8	38.6	40.5	42.4	44.4	46.6	48.8	51.1
Taree 33 kV	29.1	30.2	31.3	32.5	33.7	35.0	36.4	37.7	39.2	40.7
Taree 66 kV	69.4	72.7	76.2	26.9	28.2	29.5	30.9	32.4	34.0	35.6
Total	199	209	229	241	253	265	278	292	307	322
Diversified Total	187	196	215	226	238	249	262	275	288	303

These forecasts include new supply points. Those new supply points and the existing supply points at which they reduce demand are shown in Table 4 below.

Table 4 New Supply Points

New Supply Point	Existing Supply Point(s) Off-loaded
Hawks Nest	EnergyAustralia's 33 kV network from the Newcastle area and Stroud 33 kV
Herons Creek [Note 4.1]	Taree 66 kV and Port Macquarie 33 kV
Nabiac	Taree 66 kV

Note 4.1: Herons Creek is approximately 20 km south of Port Macquarie. A 132/66 kV substation there is being considered to reduce constraints on Country Energy's 66 kV network supplying the area from Taree, the loading of the Taree 132/66 kV transformers and the loading on the 33 kV network ex-Port Macquarie.

Figure 2 shows actual and forecast winter maximum demands (in MW) for the Stroud to Port Macquarie area.

Figure 2 Actual and Forecast Winter Max Demands

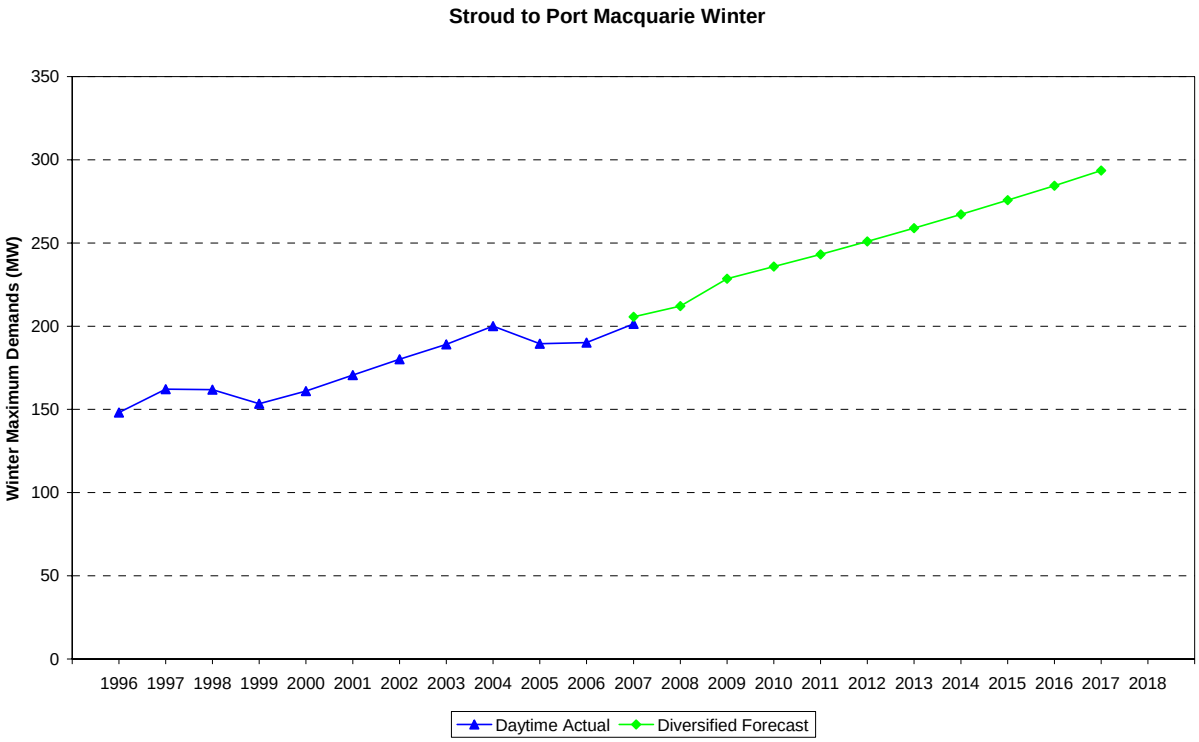
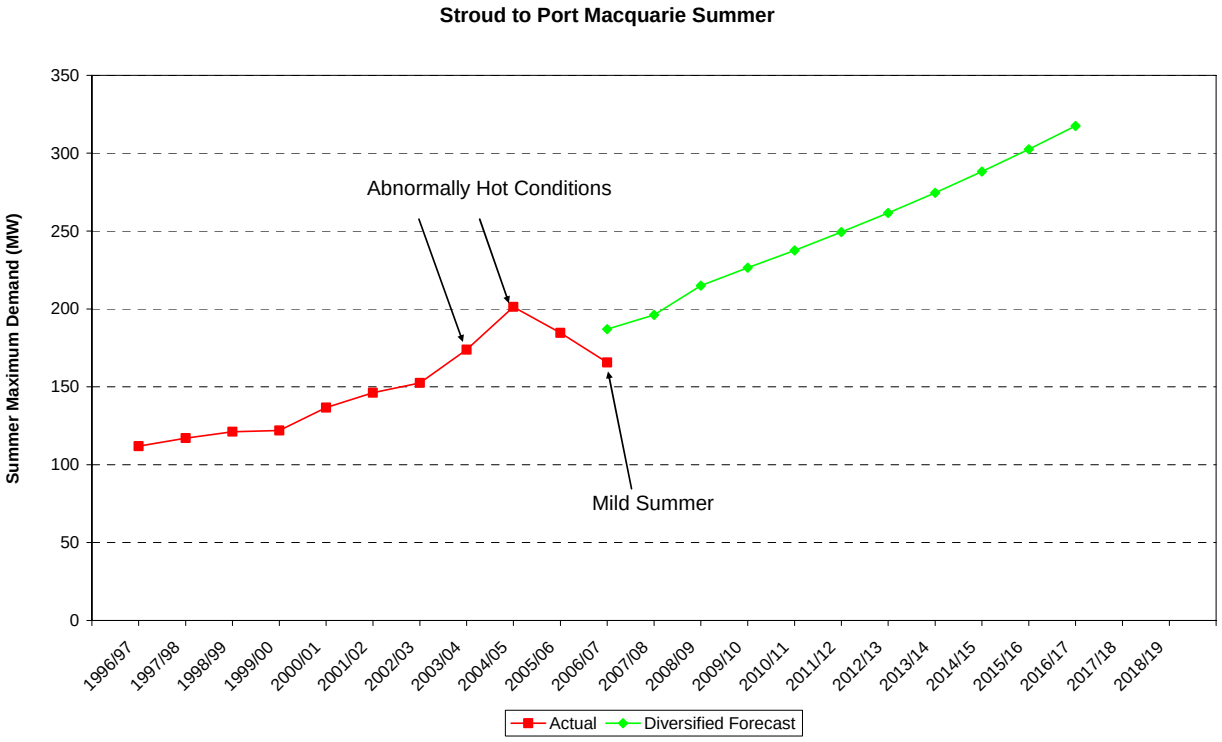


Figure 3 shows historical and forecast winter maximum demands (in MW) for the Stroud to Port Macquarie area.

Figure 3 Actual and Forecast Summer Maximum Demands



2.5. Description of Network Limitations

2.5.1. Onset of Network Limitations

If all elements of the 132 kV network are in service, it is presently capable of adequately supplying the Port Macquarie area at all times within a ten year planning horizon. However, should the 96G Kempsey – Port Macquarie 132 kV line be out of service at times of high demand, unacceptably low voltages would occur at Port Macquarie.

The capacity of this system is thus presently exceeded. Once the planned replacement of the Port Macquarie transformers by larger units (having lower impedance and a larger tap changer range than the existing units) is completed, the risk exposure will reduce but will not be completely removed.

When the Kempsey – Port Macquarie line is out of service, Stroud, Taree and Port Macquarie are supplied from Newcastle. The loads at Stroud and Taree contribute to low voltages at Port Macquarie, although to a lesser extent than loads at Port Macquarie. The relative contributions are shown in Table 5.

Table 5 Relative Contribution to Low Voltages at Port Macquarie

Location	Stroud	Taree	Port Macquarie
Contribution (relative to load at Port Macquarie)	Approx. 25%	Approx. 50%	100%

The timing of the expected occurrence of the network limitations is shown in Table 6 below.

Table 6 Onset of Network Limitations

Limitation	Year of Onset
Unacceptably low voltages at Port Macquarie on outage of the Kempsey – Port Macquarie 132 kV line at times of high demand.	Existing

2.5.2. Risk Exposure

Load is expected to be at risk of being interrupted at times of highest demand. On days of high demand load may be at risk for several hours.

As indicated previously, with all transmission lines in service, adequate voltage levels can be maintained. Under these conditions it may not be possible to have all capacitors in service (to prevent voltage levels from being too high). For similar reasons transformer automatic tap-changers may not be near their maximum voltage boost positions. Under these conditions should 96G line be forced out of service it would take ten to 15 seconds for capacitors to automatically switch into service and up to several minutes for transformer tap-changers to reach their maximum voltage boost positions. Should unacceptably low voltages still exist after the capacitors have been switched into service the UVLS schemes at Port Macquarie (and possibly Taree) may operate.

Thus following 96G line being forced out of service there are two periods during which there would be a risk of load interruptions:

1. In the period after capacitors have switched there would be a risk that the UVLS scheme at Port Macquarie may operate; and
2. In the “medium term” after transformer tap-changers have operated there would be a risk that load may need to be interrupted to maintain satisfactory voltage levels or that load which may have been interrupted by the UVLS scheme may not be able to be restored.

The approximate risk exposure[1] to operation of the UVLS scheme at Port Macquarie is shown in Table 7 and Table 8 below. Due to difficulties in modelling the behaviour of the capacitor control schemes[2] in an hourly loadflow simulation, a range[3] within which the exposure is expected to lie is given.

Table 7 Summer Exposure to UVLS Operation for 96G Outage

Summer Note 7.1	Total Hours at Risk	No. of Periods During Which Load May be at Risk Note 7.2
2007/08	95 - 440	30 - 120
2008/09	405 - 620	105 - 180
2009/10	570 - 890	155 - 240
2010/11	825 - 1,140	220 - 290
2011/12	1,065 - 1,430	295 - 350
2012/13	1,330 - 1,770	355 - 410
2013/14	1,685 - 2,140	395 - 470

Note 7.1: Summer is the period from October to March inclusive.
Note 7.2: Load may be at risk during more than one period per day.

Table 8 Winter Exposure to UVLS Operation for 96G Outage

Winter Note 8.1	Total Hours at Risk	No. of Periods During Which Load May be at Risk Note 8.2
2008	75 - 110	25 - 30
2009	140 - 170	30 - 35
2010	190 - 220	40 - 45
2011	270 - 320	45 - 50
2012	345 - 400	55 - 60
2013	470 - 540	65 - 70
2014	600 - 670	75 - 80

Note 8.1: Winter is the period from April to September inclusive.
Note 8.2: Load may be at risk during more than one period per day.

The exposure to the risk that load may need to be interrupted to maintain acceptable voltage levels (or that which may be interrupted by the UVLS schemes may not be able to be restored) is shown in Table 9 and Table 10 on the next page.

[1] Risk exposures have been estimated based on hourly loadflow simulations. Each hourly simulation study involved running 8,760 loadflow simulations for a particular year (one for each hour). The hourly loads at each substation for 2006 were used as the "base case load profile". To represent future years, the load in each hour was scaled so that the maximum load was that in the forecast published in the 2006 Annual Planning Report. As the summer and winter forecasts have different growth rates, separate summer (October to March) and winter (April to September) load profiles for future years were developed.

As weather conditions in November and December 2006 were milder than normal, the loads were lower than normal. Thus, this analysis may, to a small extent, underestimate the summer risk exposures.

The load forecast in the 2007 Annual Planning Report would not be expected to materially alter these conclusions.

[2] The capacitor control schemes monitor voltage levels and reactive power flows on 132 kV lines at the substation at which they are installed. The various settings at which they operate are designed to give a co-ordinated response across the whole Mid North Coast area.

[3] The range is defined by the pre-contingency voltage profile on the 132 kV network. If voltages at the substation 132 kV busbars are at the low end of the acceptable range (due to capacitors not being in service), the transformer tap changers will be closer to their maximum voltage boost position than they would have been had the voltage at the 132 kV busbars been higher. Due to the different transformer tap changer positions, the final voltages at the substation low voltage busbars following a critical outage and automatic switching of capacitors will be higher for the case with lower initial 132 kV voltage levels than for the case with higher initial 132 kV voltage levels.

Table 9 Summer Exposure to Low "Medium Term" Voltages for 96G Outage

Summer	Total Hours at Risk	No. of Days Some Load at Risk	Max Duration on any Day (hours)	Approx. Max. Load at Risk Note 9.1 (MW)
2007/08	195	30	12	35
2008/09	335	45	14	50
2009/10	525	65	14	65
2010/11	710	80	14	85
2011/12	965	105	16	105
2012/13	1,210	125	16	130
2013/14	1,525	175	16	170

Note 9.1: The approximate maximum load at risk is based on reductions in real power demand (MW) at Port Macquarie. Should the load reductions also include reactive power (MVAr) or be at other locations, the quantities would be different.

Table 10 Winter Exposure to Low "Medium Term" Voltages for 96G Outage

Winter	Total Hours at Risk	No. of Days Some Load at Risk	Max Duration on any Day (hours)	Approx. Max. Load at Risk Note 10.1 (MW)
2008	15	10	2	30
2009	30	20	3	35
2010	65	40	3	45
2011	115	60	4	55
2012	170	75	4	65
2013	240	90	4	75
2014	325	110	5	85

Note 10.1: The approximate maximum load at risk is based on reductions in real power demand (MW) at Port Macquarie. Should the load reductions also include reactive power (MVAr) or be at other locations, the quantities would be different.

2.6. Joint Planning

Country Energy and TransGrid have jointly planned the 330 kV and 132 kV network supplying the north coast, including the Port Macquarie area 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 final report 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 part of Country Energy's normal planning processes demand management options are investigated as alternatives and compared with network expansion options. The most technically feasible and cost effective option(s) are selected for implementation. This is also a regulatory requirement as stipulated in the Demand Management for Electricity Distributors Code of Practice.

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. They have also been described in a document titled "Transmission Network Limitations on the New South Wales Mid North Coast". The original version of this document was jointly published by TransGrid and Country Energy in July 2002 and a revised version in early May 2006.

TransGrid received three submissions/enquiries in response to the May 2006 document:

- A preliminary enquiry from a party considering the Mid North Coast as one of a number of possible locations for additional generation in New South Wales;
- A general proposal to establish generation in the area should natural gas become available; and
- A preliminary enquiry from a party contemplating aggregating end-use customer demand reductions.

Whilst it is accepted that these proposals may be progressing, no definitive non-network options that could address the network limitations described in Section 2.5 have arisen. Consequently there are no non-network options in the application of the regulatory test summarised in Section 4.

3. Options

TransGrid and Country Energy have developed three network options to meet the limitations described in Section 2.5. They are described in the following sections.

3.1. Option 1: Provide an Additional 132 kV Circuit between Kempsey and Port Macquarie

This option would involve replacement of the existing 96G Kempsey – Port Macquarie 132 kV line by a new double circuit 132 kV line and provision of associated 132 kV line switchbays at Kempsey and Port Macquarie. Sections of new line route (adjacent to the existing line) may be required to facilitate construction of the line and to reduce the risk of interruptions to Port Macquarie during the construction period.

These works are estimated to cost $28 million (± 25%) and could be completed by summer 2010/11.

Options involving the construction of a new single circuit 132 kV line between Kempsey and Port Macquarie without replacing the existing line were also investigated. However it was considered that the community/environmental impacts of these options would be greater than for Option 1 and they would not be pursued further.

3.2. Option 2: Construct a Kempsey – Herons Creek Single Circuit 132 kV Line

This option would involve construction of a new single circuit 132kV line approximately 70 km long, between Kempsey and the Herons Creek area and provision of associated 132 kV line switchbays at Kempsey and Herons Creek.

The line would use a route similar to that of Country Energy's Kempsey – Telegraph Point – Kew 66 kV line and may replace part of that line between Telegraph Point and Herons Creek.

Establishment of a 132/66 kV substation in the Herons Creek area (approximately 20 km south of Port Macquarie) is an option being considered to relieve the loading on Country Energy's 66 kV and 33 kV networks supplying the Kew/Laurieton/Lake Cathie area and the 132/66 kV transformers at Taree. If the Herons Creek substation was to be established, the new line would be connected to it, otherwise a small 132 kV switching station would be required at Herons Creek.

The line and 132 kV switchbays at Kempsey and Herons Creek are estimated to cost $39 million (± 25%) and the switching station at Herons Creek an additional $7 million (± 25%). The works could be completed by summer 2010/11.

3.3. Option 3: Construct a Kempsey – Herons Creek Double Circuit 132 kV Line

This option would involve construction of a new double circuit 132kV line, approximately 70 km long, between Kempsey and the Herons Creek area and provision of associated line switchbays at Kempsey.

The line would use a route similar to that of Country Energy's Kempsey – Telegraph Point – Kew 66 kV line and may replace part of that line between Telegraph Point and Herons Creek.

If a Herons Creek 132/66 kV substation was to be established the new line would be connected to it via two 132 kV line switchbays, otherwise it would be "looped" into the existing Taree – Port Macquarie 132 kV line near Herons Creek to form a Kempsey – Port Macquarie 132 kV circuit and a Kempsey – Taree 132 kV circuit.

The new line and 132 kV switchbays at Kempsey and Herons Creek are estimated to cost $48 million (± 25%). The works could be completed by summer 2010/11.

4. Preliminary Application of the Regulatory Test

An application of the regulatory test, considering network options 1 to 3 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 final report 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 solely by the inability to meet the minimum network performance requirements set out in schedule 5.1 of the Rules or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction - the option minimises the present value of costs, compared with a number of alternative options in a majority of reasonable scenarios;

TransGrid and Country Energy'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;
- Costs associated with relevant government taxes;
- Negative costs associated with relevant government subsidies; and
- Costs of other transmission developments that may be required to address future limitations.

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. Regulatory Test Application – Summary

4.2.1. Costs

For this regulatory test application only the capital and operating & maintenance costs of Options 1 to 3 have been explicitly included.

There are no known existing or anticipated government tax or subsidy schemes that would apply materially differently to the operation of Options 1-3. The operation of schemes such as the New South Wales Greenhouse Gas Reduction Scheme would appear as common cost elements in the options and thus have not been explicitly included.

4.2.2. Scenarios

There are no known committed or advanced generation or demand management developments that are likely to affect the timing of the onset of the network limitations described in Section 2.5 or the ability of any of Options 1 – 3 to meet those limitations.

The need for the construction of one of Options 1, 2 or 3 is determined by existing limitations. Variations in the load forecast due, for example, to different economic growth rates, would not affect the need or timing of these options.

One of the options being considered to relieve the loading on Country Energy's 66 kV and 33 kV networks supplying the Kew/Laurieton/Lake Cathie area and the 132/66 kV transformers at Taree is the establishment of a 132/66 kV substation at Herons Creek. Such a substation would facilitate connection of

a new 132 kV line from Kempsey. The option that is adopted to meet this requirement would materially affect the costs of Options 1 to 3.

Accordingly two scenarios have been considered in this analysis:

1. Herons Creek 132/66 substation is established to supply the Kew/Laurieton/Lake Cathie area. A new single (or double) circuit 132 kV line from Kempsey could be connected to Herons Creek substation via one (or two) 132 kV switchbays; and
2. Another option is adopted to supply the Kew/Laurieton/Lake Cathie area. A Herons Creek 132 kV switching station would be required to connect a single circuit 132 kV line from Kempsey. A new double circuit 132 kV line could be looped in to the existing Taree – Port Macquarie 132 kV line at Herons Creek (without establishing the switching station).

4.2.3. Results

The present value of 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 11. The results of the analysis are shown in Table 12, Table 13 and Table 14. Details of the base case economic model are shown in Appendix A.

Table 11 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 12 Comparison of Options – Base Case

Option	Description	Scenario 1		Scenario 2	
		PV of Costs ($M)	Rank	PV of Costs ($M)	Rank
Option 1	Kempsey – Port Macquarie Line	13.5	1	13.5	1
Option 2	Kempsey – Herons Creek Single Circuit Line	19.3	2	22.9	3
Option 3	Kempsey – Herons Creek Double Circuit Line	23.5	3	22.0	2

Table 13 Comparison of Options - Results of Sensitivity Studies for Scenario 1

Sensitivity Case	Option 1	Rank	Option 2	Rank	Option 3	Rank
Base Case	13.5	1	19.3	2	23.5	3
12% Discount Rate	13.3	1	19.0	2	23.2	3
6% Discount Rate	13.1	1	18.7	2	22.8	3
25% Increase in Capital Costs	16.9	1	24.1	2	29.3	3
25% Decrease in Capital Costs	10.1	1	14.4	2	17.6	3
Decrease in Asset Lives	14.4	1	20.6	2	25.1	3
Increase in Asset Lives	13.0	1	18.6	2	22.7	3
Decreased O&M Cost	12.5	1	17.9	2	21.8	3
Increased O&M Cost	14.5	1	20.7	2	25.2	3

Table 14 Comparison of Options - Results of Sensitivity Studies for Scenario 2

Sensitivity Case	Option 1	Rank	Option 2	Rank	Option 3	Rank
Base Case	13.5	1	22.9	3	22.0	2
12% Discount Rate	13.3	1	22.6	3	21.8	2
6% Discount Rate	13.1	1	22.3	3	21.4	2
25% Increase in Capital Costs	16.9	1	28.7	3	27.5	2
25% Decrease in Capital Costs	10.1	1	17.2	3	16.5	2
Decrease in Asset Lives	14.4	1	24.5	3	23.5	2
Increase in Asset Lives	13.0	1	22.1	3	21.3	2
Decreased O&M Cost	12.5	1	21.3	3	20.4	2
Increased O&M Cost	14.5	1	24.6	3	23.6	2

In each case Option 1 is the lowest cost option.

5. Conclusions and Proposed Actions

Option 1 has the lowest present worth of costs in all cases considered. Consequently TransGrid and Country Energy have concluded that it satisfies the regulatory test.

TransGrid and Country Energy therefore propose that TransGrid proceed with the construction of Option 1 as described in Section 3.1.

6. Notice of Disputes

Persons wishing to dispute the contents, assumptions, findings or recommendations of this final report are referred to clause 5.6.6 (j) of the Rules.

Disputing parties must lodge a notice of the dispute in writing to the AER and provide a copy of the dispute notice to TransGrid within 30 business days of the publication of the summary of this final report on NEMMCO's website.

TransGrid copies of dispute notices regarding this final report should be forwarded to:

Garrie Chubb
Tel: 02 9284 3553
fax: 02 9284 3456
email: garrie.chubb@transgrid.com.au

7. Appendix A – Least Cost Analysis of Base Case

Table 15 Least Cost Analysis of Base Case for Scenario 1 - Herons Creek 132/66 kV Substation Established

Option 1: Additional Kempsey - Port Macquarie Circuit

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				24.7								-20.3
Substation				2.8								-2.0
O & M Expenditure												
Line					0.49	0.49	0.49	0.49	0.49	0.49	0.49	
Substation					0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Total Expenditure				27.50	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-22.4
PV of Costs	**13.5**	**million**										

Option 2: Kempsey - Herons Creek Single Circuit Line

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				36.6								-30.1
Substation				2.8								-2.0
O & M Expenditure												
Line					0.73	0.73	0.73	0.73	0.73	0.73	0.73	
Substation					0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Total Expenditure				39.35	0.79	0.79	0.79	0.79	0.79	0.79	0.79	-32.1
PV of Costs	**19.3**	**million**										

Option 3: Kempsey - Herons Creek Double Circuit Line

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				42.2								-34.7
Substation				5.6								-4.1
O & M Expenditure												
Line					0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Substation					0.11	0.11	0.11	0.11	0.11	0.11	0.11	
Total Expenditure				47.79	0.96	0.96	0.96	0.96	0.96	0.96	0.96	-38.8
PV of Costs	**23.5**	**million**										

Table 16 Least Cost Analysis of Base Case for Scenario 2 - No Herons Creek 132/66 kV Substation

Option 1: Additional Kempsey - Port Macquarie Circuit

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				24.7								-20.3
Substation				2.8								-2.0
O & M Expenditure												
Line					0.49	0.49	0.49	0.49	0.49	0.49	0.49	
Substation					0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Total Expenditure				27.50	0.55	0.55	0.55	0.55	0.55	0.55	0.55	-22.4
PV of Costs	**13.5**	**million**										

Option 2: Kempsey - Herons Creek Single Circuit Line

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				36.6								-30.1
Substation				9.8								-7.2
O & M Expenditure												
Line					0.73	0.73	0.73	0.73	0.73	0.73	0.73	
Substation					0.20	0.20	0.20	0.20	0.20	0.20	0.20	
Total Expenditure				46.40	0.93	0.93	0.93	0.93	0.93	0.93	0.93	-37.3
PV of Costs	**22.9**	**million**										

Option 3: Kempsey - Herons Creek Double Circuit Line

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Residual
Capital Expenditure												
Line				42.2								-34.7
Substation				2.8								-2.0
O & M Expenditure												
Line					0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Substation					0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Total Expenditure				45.01	0.90	0.90	0.90	0.90	0.90	0.90	0.90	-36.8
PV of Costs	**22.0**	**million**										