TRANSPOWER

Request for Information Paper

Alternatives to transmission investment for meeting future electricity supply requirements for Auckland and North Isthmus

September 2004

TABLE OF CONTENTS

1. Introduction

1.1 Background

Peak electricity demand in the Auckland and North Isthmus (including Northland) regions is forecast to grow by approximately 12% to 2181 MW by 2010 which is approaching the voltage stability limit of 2190 MW of the existing system[1]. To continue maintaining N-1 security in accordance with Transpower's current grid security standards[2], Transpower will either need to invest substantially in its infrastructure by 2010, or be able to rely on suitable alternatives to transmission investment being in place by this date.

As the owner of the national grid, Transpower has an obligation to promote efficient investment in the transmission system. It is important to note that much of New Zealand's significant transmission capacity investment occurred 40-50 years ago. Investment since then has been of a supplementary nature, extending the life of certain assets through prudent maintenance programmes, or increasing capacity in the short term by fine tuning asset settings such as through thermal line upgrades.

Transpower has in recent months communicated high-level transmission augmentation proposals for the upper North Island to the industry and the public. Central to Transpower's proposals is the construction of a new 400 kV line into Auckland to meet security of supply needs beyond 2010. The general content of these proposals is available on Transpower's website: http://www.transpower.co.nz/?id=4724

1.2 Regulatory Structure

The Electricity Commission will in the future regulate the cost recovery of transmission investment by Transpower in accordance with Part F of the Electricity Governance Rules (the EGRs). As part of the process by which Transpower proposes and obtains approval from the Electricity Commission to recover costs of transmission investment, alternative (ie, non-transmission) solutions must be identified and assessed.

At this point, many of the relevant requirements and decisions necessary to the approval processes under Part F are not in place or have not been made. In particular, the Grid Reliability Standards, the Grid Investment Test and the Statement of Opportunities have yet to be published, and, as a consequence, the requirements applying to Transpower in seeking approval of transmission investments have yet to be fully defined. Nevertheless, if no alternatives to transmission are forthcoming then Transpower needs to proceed urgently with progressing a transmission solution. This urgency is reflected in the Electricity Commission's plan for Transpower to deliver its first Grid Upgrade Plan in mid 2005. This Request for Information process is therefore required to provide Transpower, and through Transpower, the Electricity Commission, with up to date information on alternatives to transmission investment that might defer the need for Transpower investment in the grid.

1.3 Electricity Commission Engagement

The Electricity Commission has been consulted on the scope and content of this Request for Information document, and supports the publication of it.

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[1] The voltage stability limit of 2190 MW is based on the demand, generation and transmission assumptions contained in this report.

[2] The Electricity Commission is required to develop Grid Reliability Standards in the future, which may or may not differ from Transpower's. Until then Transpower intends to proceed on the basis of Transpower's grid security standards, which are similar to those used in other first world countries.

1.4 Purpose and Scope

Transpower seeks information on alternatives to transmission investment which may be technically and economically more viable than Transpower's proposed transmission solutions.

The purpose of this Request for Information is to assist Transpower to identify and assess alternatives to transmission investment and provide an opportunity for providers of alternative solutions to transmission investment to submit details of their proposals for consideration by Transpower. This will enable Transpower to compare the cost effectiveness of alternatives to transmission investment with the option of augmenting the national grid. The aim is to meet future requirements for the benefit of electricity consumers, as part of developing long term plans for investment in the grid.

It is anticipated that alternatives to transmission investment will incorporate one or more of the following factors:

- New generation which may be grid connected or embedded; and/or
- Demand side management.

The way in which alternatives to transmission investment are to be progressed under Part F of the Electricity Governance Rules is still to be clarified.[3] At this stage, Transpower is requesting information so that it can:

- Identify whether there are technically and economically viable alternatives to transmission investment, which defer the proposed transmission investment by 12 months or more;
- Assess the proposed alternative solutions to transmission investment;
- Identify the organisations interested in and capable of providing such alternatives to transmission investment;
- Obtain indicative costs to support a decision;
- Establish likely timeframes for commercial operation of any proposed alternative solutions.

Depending on the outcome of this Request for Information, Transpower may:

- Recognise identified alternatives to transmission investment in its Grid Upgrade Plan presented to the Electricity Commission for approval.
- Issue a Request for Proposal to preferred submitters;
- Enter into discussions or negotiations with any one or more preferred submitters;
- Proceed on a basis other than set out in this Request for Information;
- Take no further action.

1.5 Structure

The remainder of this paper is structured as follows:

Section 2: Establishes the need for augmentation
Section 3: Provides the assessment criteria for receiving and assessing alternative solutions to transmission investment in the grid.

[3] The Electricity Commission is currently reviewing the rules and processes required to consider transmission alternatives.

Section 4: Details the procedure for submitting information to Transpower.
Appendix A: Provides a template for use by submitters in providing information
Appendix B: Discusses the Security Criteria used in this document
Appendix C: Shows the network schematic for Auckland and North Isthmus regions

2. Establishing the Need

Transmission into the Upper North Island (Whakamaru to Auckland)

Transpower is planning to construct a new 400 kV line between Whakamaru and Otahuhu to supply demand in the Auckland and North Isthmus region. High level cost estimates have been prepared on the basis of desk top estimates only. The project costs are estimated at $400-500 million ±30%. Alternatives to transmission investment could defer construction of this line. The critical lines to be addressed in terms of reduced loadings are:

- The existing Otahuhu-Whakamaru 220 kV lines;
- The existing Otahuhu-Huntly 220 kV line.

Transmission into the North Isthmus (Otahuhu to Henderson)

As well as the 400 kV line route from Whakamaru, Transpower is also planning to reinforce the supply from Otahuhu to the North Isthmus. Two broad options are being evaluated by Transpower, namely an underground cable route between Penrose and Albany or a new 220 kV transmission line between Otahuhu and Henderson. High level cost-estimates place the costs of these solutions between $160-250 million $\pm$ 30%. The critical line to be addressed in terms of reduced loading is the existing Otahuhu-Henderson 220 kV line.

The grid upgrade case for each of these projects consists of an assessment of the various elements that go into the existing power supply. These inputs are:

- The existing transmission system;
- Location, capacity and operational characteristics of generation plant;
- Demand or load; and
- The security criteria determining what state of security is required.

These are considered with relevance to each supply issue in the following sections:

2.1 Existing Transmission System

Transmission into Auckland (Whakamaru to Auckland)

The Auckland region is supplied mainly over a number of 220 kV lines from the Waikato region to the south, including:

- The double circuit Stratford-Taumarunui-Huntly-Otahuhu line;
- The double circuit Whakamaru-Otahuhu C line; and
- The single -circuit Whakamaru-Otahuhu A&B lines.

Limited supply from the core grid is also provided through the following 110 kV lines:

- The double circuit 110 kV Arapuni-Hamilton-Bombay-Otahuhu line; and
- The bonded double circuit 110 kV Arapuni-Pakuranga line.

Transmission to North Isthmus (Otahuhu – Henderson)

The North Isthmus region is supplied from Otahuhu via the following 220 kV circuits:

- Otahuhu-Henderson double circuit line (with one circuit passing through Southdown);
- Henderson-Marsden A double circuit line.

Limited supply from the core grid is also available from the following 110 kV line:

- Henderson-Maungatapere A line.

Figure 1 shows the entire upper North Island region, while a line schematic of the Auckland and North Isthmus networks is provided in Appendix C.

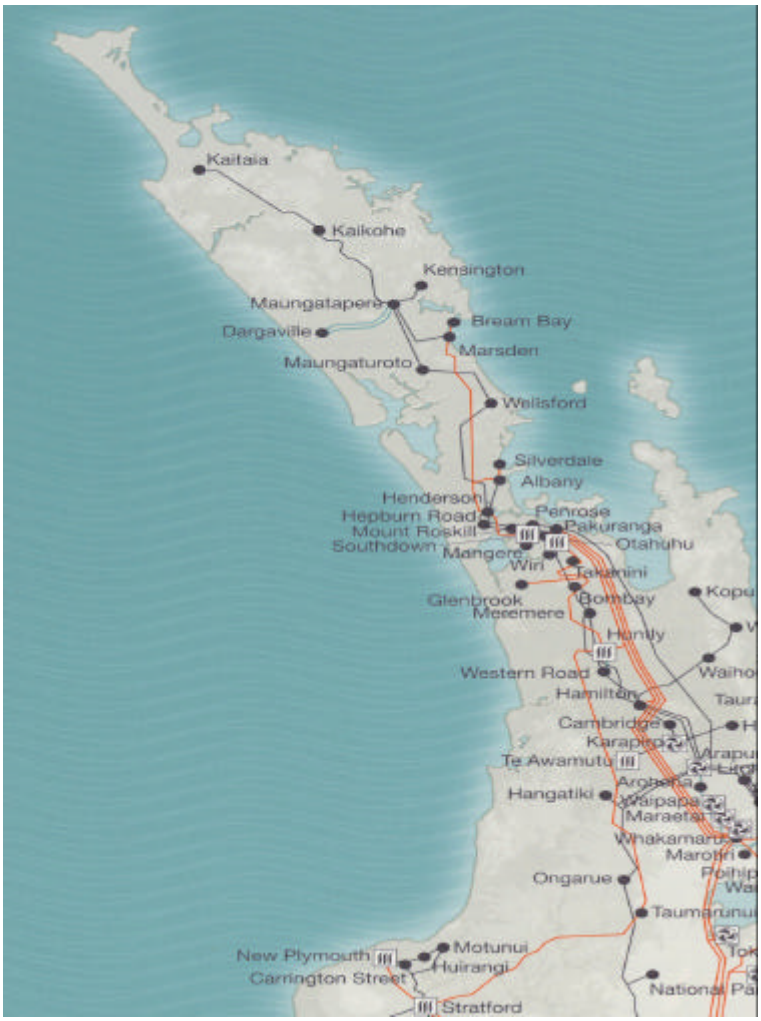

Figure 1: Upper North Island Region

Further detail on the existing transmission system is available in Transpower's System Security Forecast 2001/02. The next edition will be submitted to the Electricity Commission in early December 2004.

Note that a number of committed minor upgrade transmission projects are being undertaken in the Auckland region prior to 2005 to defer the need for further investment in the region until 2010. These projects include:

- Increasing the thermal operating limits of the Otahuhu-Henderson 220 kV circuits 1 and 2 from 765/695 MVA to 984/938 MVA, winter and summer ratings respectively.
- Increasing the thermal operating limits of the Huntly-Otahuhu 220 kV circuit 1 from 493/404 MVA to 670/614 MVA winter and summer ratings respectively.

2.2 Generation

Existing/Committed Generation

The combined installed generation capacity in the Auckland (including Auckland City) and North Isthmus regions is 2095 MW, and available capacity is 1983 MW.[4] A break down of these figures is given in the table below:

Generating Station	**Installed Capacity MW**	**Available Capacity MW**
Glenbrook	99	53[5]
Otahuhu A	80	36
Otahuhu CC	395	373
Southdown	116	116
Huntly[6]	1405	1405
TOTAL	**2095**	**1983**

Table 1: Generation in Auckland and North Isthmus Regions

The table includes the new generation at Huntly (E3P) recently confirmed publicly by Genesis. Transpower is aware that at least two other significant generation projects have been proposed, by Contact and Mighty River Power at Otahuhu and Marsden respectively. However, neither project is reflected in this document, as they are still some way from being regarded as committed or confirmed. For the purposes of assessing future transmission and non-transmission alternatives, generation scenarios will be developed using information obtained from a range of sources including the Electricity Commission and respondents to this Request for Information.

2.3 Demand

Auckland city dominates electricity demand in the upper North Island. It contains over 30% of New Zealand's population and the presence of many large power-consuming industries. Local generation from Glenbrook, Otahuhu and Southdown when it is fully available can meet only about 25% of demand; hence the region's reliance on the transmission circuits from the central North Island.

Transpower has developed its electricity demand forecasts based on the historical relationship between electricity demand and its underlying economic drivers (population growth and distribution trends, industry growth etc).

[4] Available capacity excludes power used on site by co-generation hosts, and the effect of temperature on the gas turbine plant.

[5] Glenbrook is a co-generating station and generally injects between 30 and 60 MW onto the Grid. Only the grid connected generating unit values are shown here.

[6] The existing power stations at Huntly and E3p are included in the table of generating stations above because while it is located in the Waikato region, its proximity to the Auckland region (compared to generation at Whakamaru), means that it does have a positive effect on supply security.

The following projections were made in determining the demand growth:

- Population growth: 0.5% p.a
- GDP Growth: 2.2% p.a
- Demand price elasticity: -0.07
- Peak demand growth rate is same as energy growth rate.
- Technology and energy efficiency to occur at current rate
- Distributed generation: 5%

For the Auckland and North Isthmus regions, Transpower forecasts that electricity demand will continue to grow at a steady rate of 2.3% per annum out to 2040, although over the next six years Transpower's forecast growth for the region is 2.5% per annum. The high demand growth figure is 3.0% and the low growth figure is 2.0%. The total combined demand in the North Isthmus and Auckland regions under the medium forecast is projected to increase from about 1,900 MW currently to about 2,181 MW by 2010, and 2476 MW by 2015.

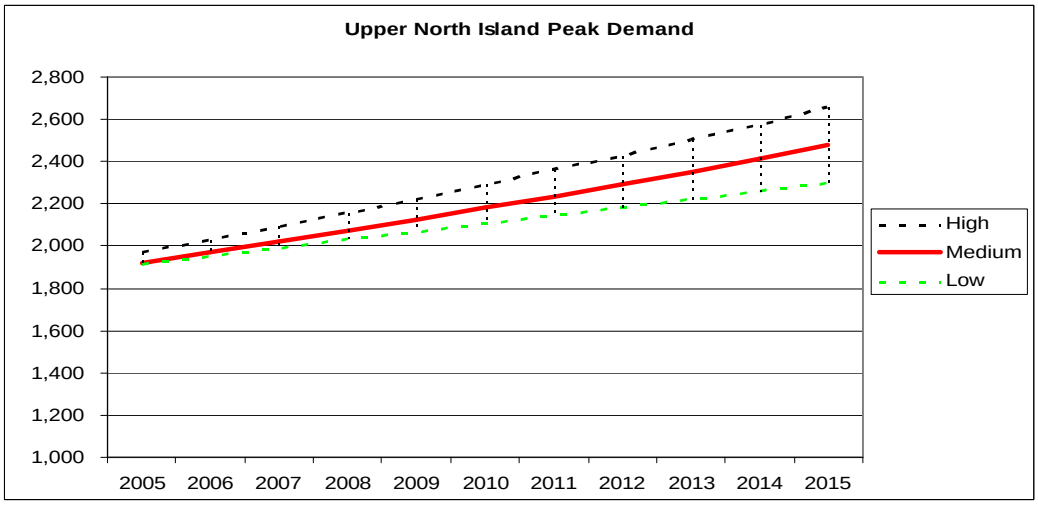

Figure 2: North Isthmus and Auckland Peak Demand

Year	North Isthmus Demand (MW)	Auckland Demand (MW)	Combined Demand (MW)
2005	719	1203	1922
2006	737	1232	1970
2007	756	1263	2019
2008	776	1296	2072
2009	796	1330	2125
2010	817	1364	2181
2011	838	1399	2237
2012	859	1435	2294
2013	881	1472	2352
2014	903	1509	2412
2015	926	1550	2476

Table 2: North Isthmus and Auckland Demand Forecast

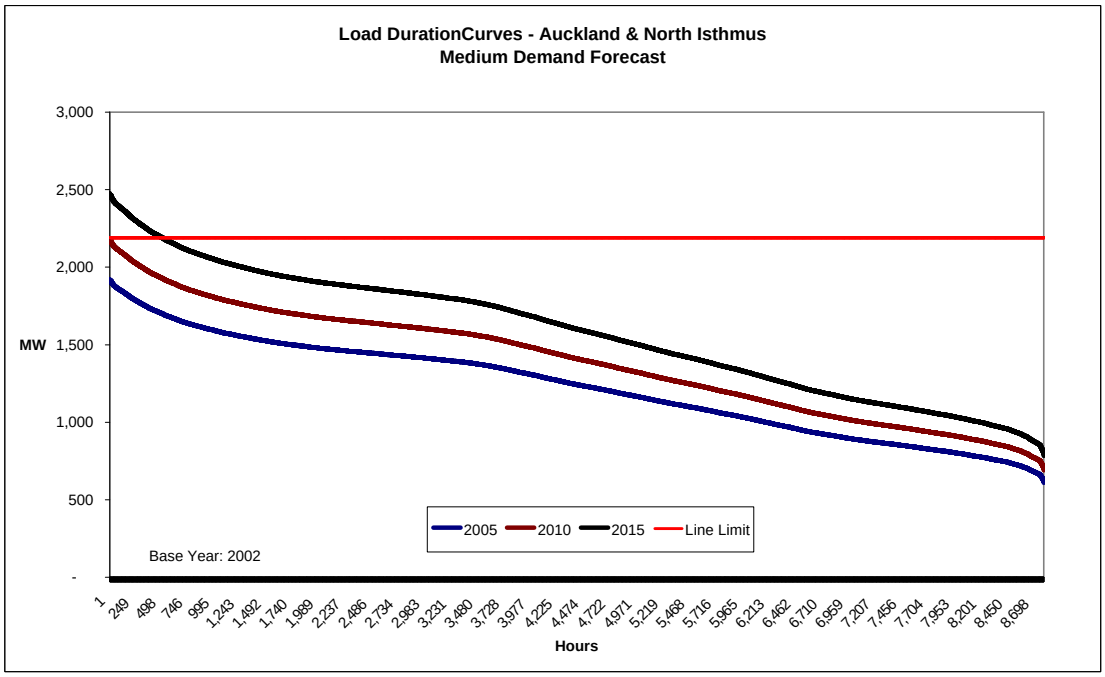

Figure 3: Load Duration Curves Auckland and North Isthmus Regions 2005/10/15

Figure 3 presents the load duration curves for the 2005, 2010 and 2015 years for the Auckland and North Isthmus regions. These curves show the number of hours that any particular level of demand is expected to be exceeded for that year. For example, in 2015, a demand of 2476 MW is not expected to be exceeded, while a demand of 870 MW is expected to be exceeded for the full year. Superimposed on this graph is the N-1 voltage stability limit for the region (shown as "line limit" on the graph).

Typical Daily Demand Curve

In the upper North Island, peak demand occurs in the winter. The daily demand curve in Auckland during winter is typified by a morning and evening peak with troughs during the late evenings, early morning and mid day. The following chart shows forecast "typical" winter daily profiles of the Auckland and North Isthmus demand against the line capacity limit of 2190 MW for the region.[7] Shortfalls in capacity can be expected to occur during morning and evening peak demand periods from 2010 onwards if new investment is not undertaken.

[7] The capacity limit represents the N-1 limit of the combined Auckland / North Isthmus / Northland region in accordance with the criteria explained in S.2.4.

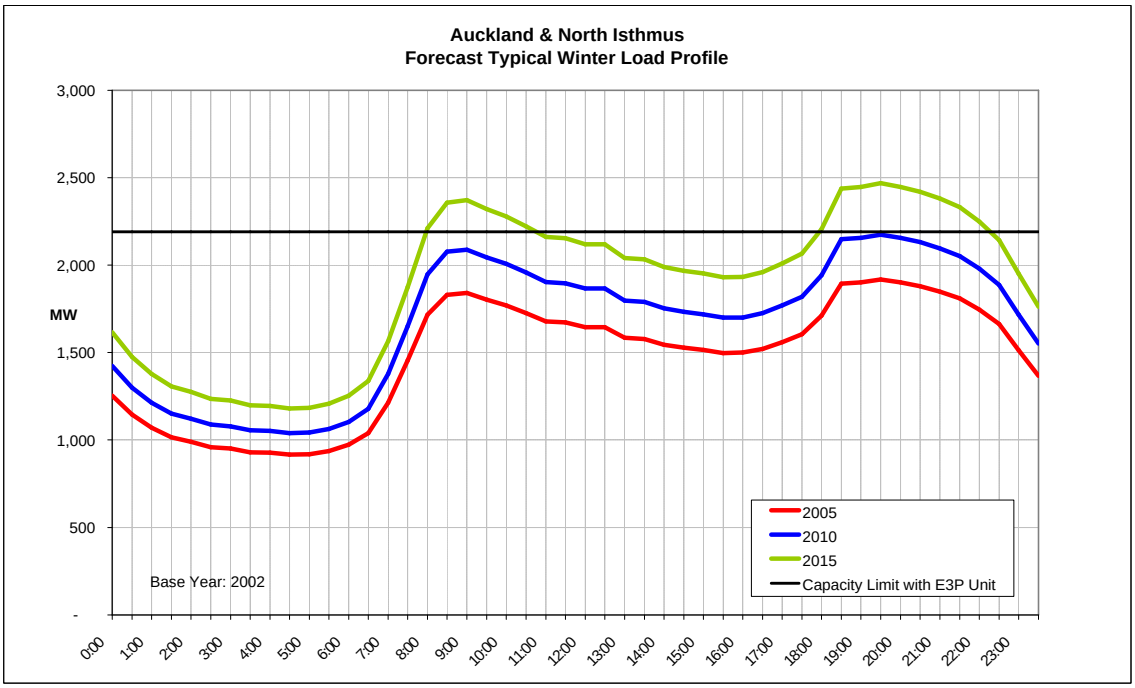

Figure 4: Auckland and North Isthmus Winter Load Profile

Figures 3 and 4 underline the need for investment to maintain the security standards of the region.

2.4 Security Criteria

Under Transpower's existing grid security standards, the main interconnected transmission system supplying Auckland and North Isthmus regions is designed to maintain supply while meeting N-1 security criterion, meaning that the system is in a secure state with all transmission facilities in service and in a satisfactory state following a single contingency. These standards are consistent with the real time standards for system operation applied by the system operator under Part C of the Electricity Governance Regulations. The single contingencies to be considered under an N-1 criterion are:

- Loss of a single transmission circuit;
- Loss of a single generating unit;
- Loss of a single bus section (for new transmission builds only);
- Loss of an interconnecting transformer;
- Loss of a single shunt connected reactive component, eg capacitor bank, SVC.

For further information on security criteria refer to Appendix B.

2.5 Forecast Transmission Adequacy

Transmission into the Upper North Island (Whakamaru to Auckland)

Based on forecast demand and committed generation, transmission supply problems into Auckland are likely to be experienced from 2010 under a medium demand growth scenario and will increase in severity as demand continues to increase unless new investment is undertaken. Table 3 details the likely shortfall in energy in GWh and peak demand in MW

unable to be supplied without new investment in transmission, generation or demand side alternatives. The capacity limit is 2190 MW based on the following assumptions:

- Regional power factor at 0.986
- All transmission circuits and capacitors in service
- The following key generators dispatched, as below[8]:

Huntly (4 units)	1000 MW
Huntly P40	40 MW
Huntly E3P	300 MW
Southdown	116 MW
Glenbrook	50 MW
Otahuhu B	324 MW
Otahuhu A	66 Mvar
Total Waikato River Gen	880 MW

The capacity and energy shortfall is based on maintaining N-1 security levels into the combined Auckland and North Isthmus regions. The critical contingency is the loss of the Otahuhu B Combined Cycle Gas Turbine unit leading to voltage collapse in the area.[9] The consequences of voltage collapse would be a partial or total loss of supply to the Auckland and North Isthmus regions.

Year	Additional energy requirement range (from low to high demand) above the current maximum secure network capacity. (GWh)	Additional peak demand requirement (from low to high demand) above the current maximum secure network capacity. (MW)
2005	0	0
2006	0	0
2007	0	0
2008	0	0
2009	0-1	0-32
2010	0-6	0-100
2011	0-19	0-170
2012	0-40	0-240
2013	1-71	30-313
2014	3-115	67-387
2015	7-178	108-468

Table 3: Electricity Shortfalls for Auckland and North Isthmus Regions 2005-15

The table assumes only committed generation including the recently confirmed generation project by Genesis (E3P at Huntly). The following two graphs represent the results in the table according to high medium and low demand growth.

It should be noted that the studies that this analysis is based on assume that all significant generation in the Auckland region, including Huntly, is available for dispatch and operates reliably for increasing periods of time during peak demand periods. Ideally there would be an allowance for unavailable generation made in establishing the timetable for new investment. This is because the reliability and availability characteristics of generation plant are lower than those for transmission assets. As the system peak demand continues to

[8] The generation assumptions used for voltage stability purposes may be less than the installed/available generation listed earlier, to better reflect actual operating configurations at any one time.
[9] Outage of an Otahuhu-Whakamaru circuit will also cause voltage problems, although not to the same extent as with the loss of the Otahuhu B CCGT unit.

increase throughout the decade, more and more reliance will be placed on this generation being available and operating reliably to supply the demand of the area within current grid security requirements.

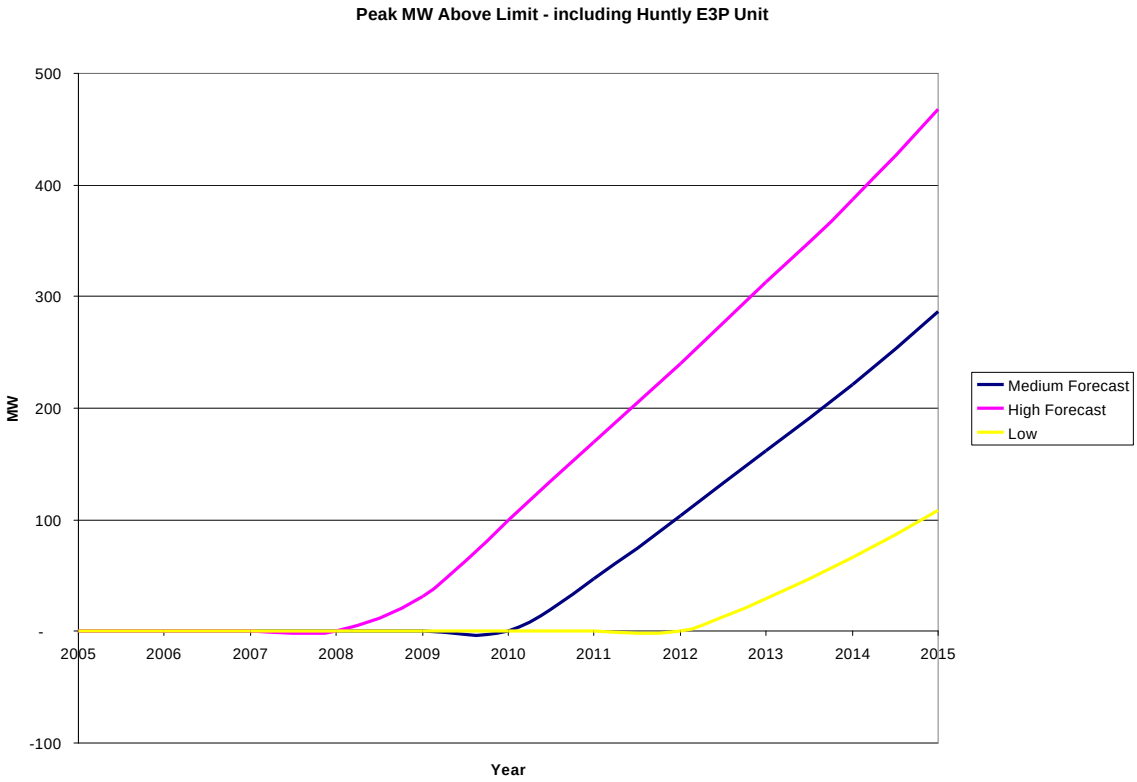

Figure 5: Peak demand exceeding transmission capacity limit for Auckland and North Isthmus Regions 2005-15

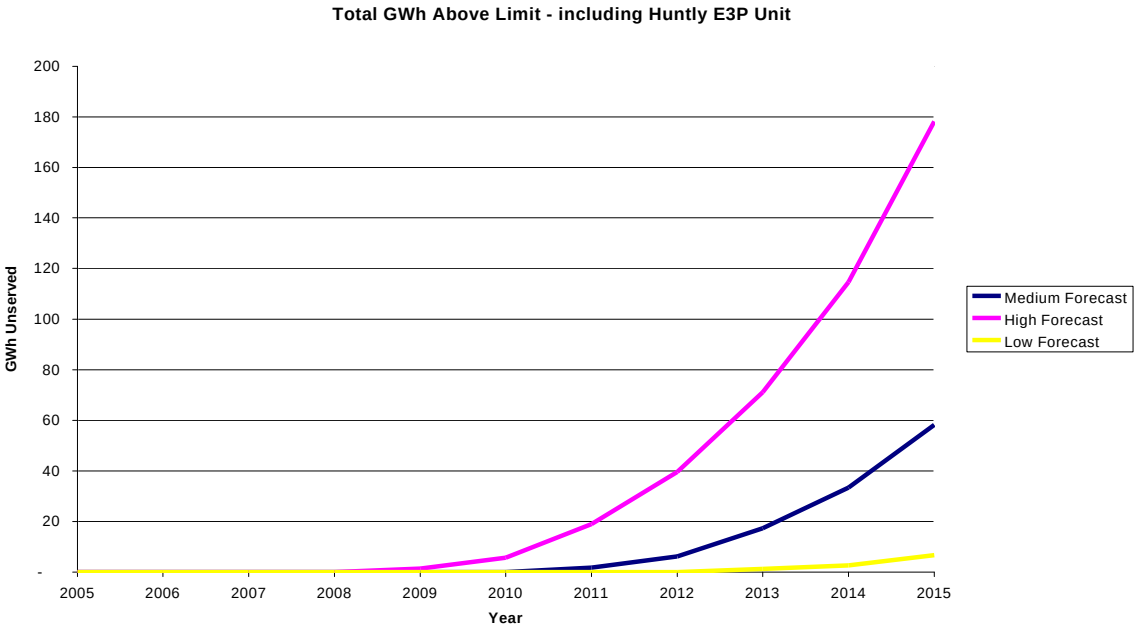

Figure 6: Unserved energy due to demand curtailment in Auckland and North Isthmus Regions 2005-15

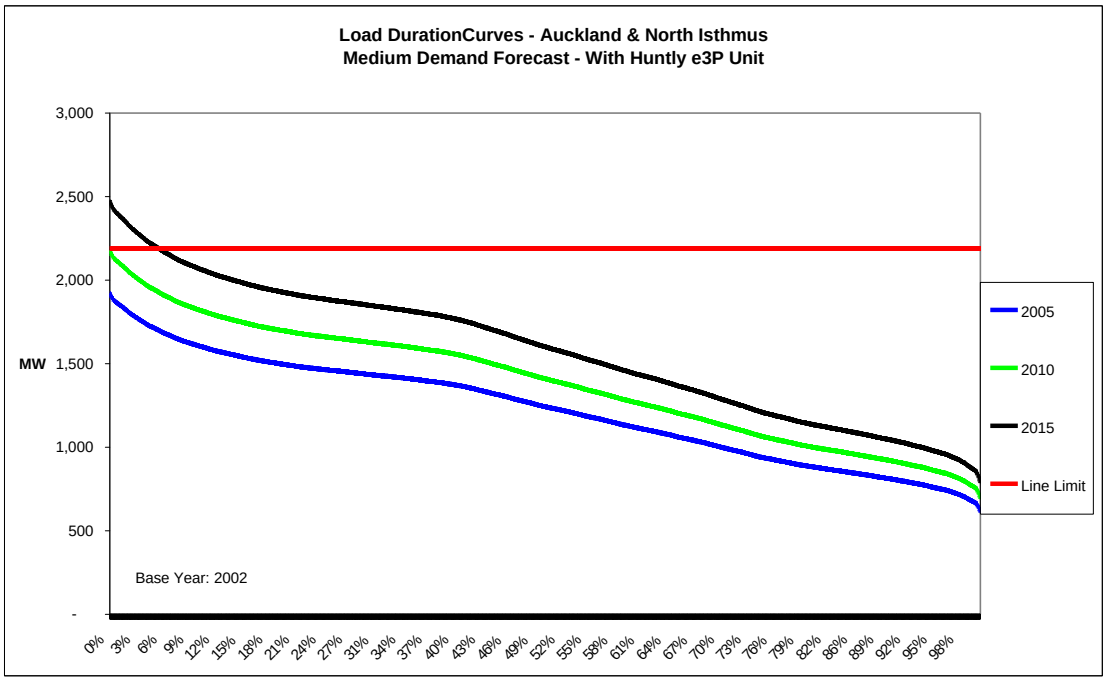

Figure 7: Auckland and North Isthmus Load Duration Curves versus transmission capacity 2005/10/15

The graph above shows the 2005, 2010 and 2015 load duration curves with the N-1 limit for the combined region.

Transmission into North Isthmus (Otahuhu to Henderson)

Based on forecast demand and committed generation and transmission projects, supply problems into the North Isthmus are likely to be experienced from 2010 under a medium demand growth scenario and will increase in severity as demand continues to increase. The table below details the likely shortfall in energy in GWh and peak demand in MW unable to be supplied without new investment. The capacity limit is 830 MW based on the following assumptions:

- Regional power factor at 0.982
- All transmission circuits and capacitors in service
- The following key generators dispatched, as below[10]:

Huntly (4 units)	1000 MW
Huntly P40	40 MW
Huntly E3P	300 MW
Southdown	116 MW
Glenbrook	50 MW
Otahuhu B	324 MW
Otahuhu A	66 Mvar
Total Waikato River Gen	880 MW

[10] The generation assumptions used for voltage stability purposes may be less than the installed/available generation listed earlier, to better reflect actual operating configurations at any one time.

The capacity and energy shortfall is based on maintaining N-1 security levels into the North Isthmus region. The critical contingency is the loss of the Otahuhu B Combined Cycle Gas Turbine unit leading to voltage collapse in the area. The consequences of voltage collapse would be a partial or total loss of supply to the North Isthmus region. The loss of one Henderson-Otahuhu 220 kV circuit may also lead to voltage collapse in the area, but at a later date than the Otahuhu B outage. The consequences of voltage collapse would be a partial or total loss of supply to the North Isthmus region.

Year	Additional energy requirement range (from low to high demand) above the current maximum secure network capacity (GWh)	Additional peak demand requirement range (from low to high demand) above the current maximum secure network capacity. (MW)
2005	0	0
2006	0	0
2007	0	0
2008	0	0
2009	0	0
2010	0-3	0-12
2011	0-9	0-37
2012	0-23	0-62
2013	0-41	10-88
2014	1-66	28-114
2015	3-102	46-141

Table 4: Electricity Shortfalls for North Isthmus Region 2005-15

The table assumes only committed generation including the recently confirmed generation project by Genesis (E3P at Huntly). The following two graphs represent the results in the table according to high, medium and low demand growth.

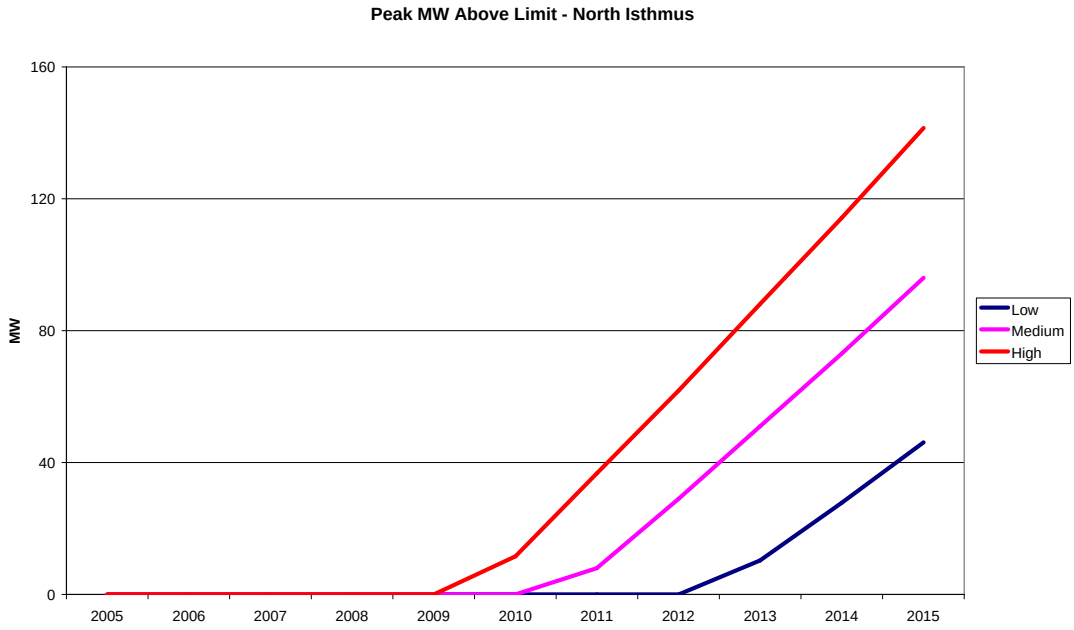

Figure 8: Peak demand exceeding transmission capacity limit for North Isthmus Region 2005-15

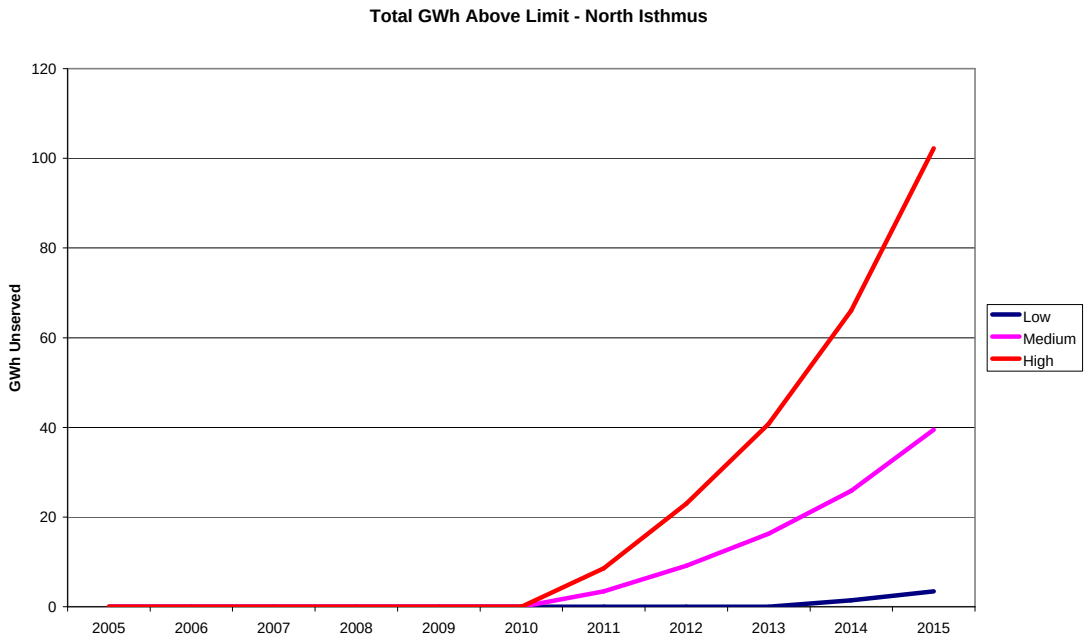

Figure 9: Unserved energy due to demand curtailment in North Isthmus Region 2005-15

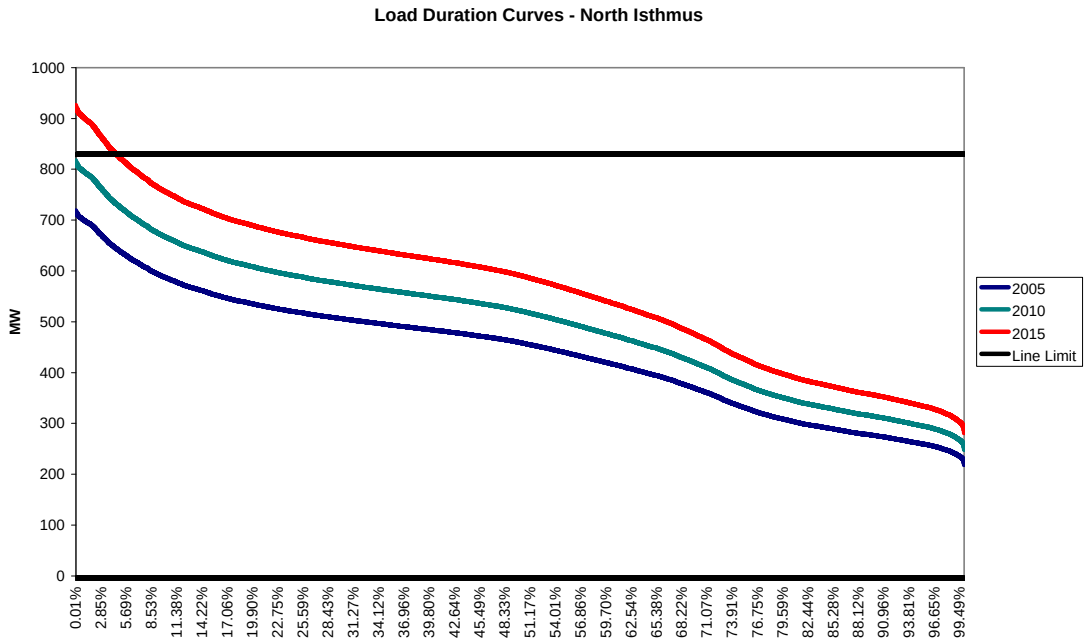

Figure 10: Load duration curves 2005-15 with N-1 Limit for the North Isthmus

The graph above shows the 2005, 2010 and 2015 load duration curves with the N-1 voltage stability limit for the North Isthmus region.

2.6 Result Sensitivity

Seasonal Impacts

The constraints in the Auckland region from 2010 are likely to be more pressing in winter than summer, although the gap between summer and winter peaks for this region is closing. The system will be at or close to capacity for limited periods at peak times - in the morning and evening during winter. In summer, the system will be under more pressure due to the risk of voltage collapse during afternoon peak times and on those occasions when major generation plant at Otahuhu and Huntly is out of service.[11]

Generator Availability

The level of constraint in the Auckland region is also sensitive to the market bidding strategies of local generators. These may be influenced by factors other than the cost of generation, such as the market behaviour of other generators, the commercial contract market, and the potential establishment of new local generation.

The power system analysis assumes that all key generation plant in the region is available and dispatched during peak demand periods. The worst case scenario is if Otahuhu B is forced out of service for prolonged periods during winter. If this was the case then there would be a substantial risk of demand curtailment during the peak demand periods prior to 2010.

The other scenario of concern is during summer if Otahuhu B is out of service and if Huntly generation is limited due to river heating constraints. Under this scenario, there is also a possibility of demand curtailment to maintain voltage stability limits during peak summer demand periods.

Demand Assumptions

A medium demand growth forecast has been used for the analysis in this report, which is Transpower's view of the likely outcome. If, however, a high demand scenario eventuated, the timetable for new investment would be 2009. Alternatively a low demand growth scenario would see this date extended until 2012. Transpower will closely monitor actual demand growth between now and the end of the decade. In the event that it became apparent that high demand growth was occurring, Transpower would work with industry participants to implement initiatives to maintain supply security.

Transmission Asset Availability

The analysis assumes that all key transmission assets are in service at the time of peak demand. This includes all transmission circuits supplying the Auckland and Northland regions and all reactive power plant including capacitor banks and the synchronous condensers contracted by the system operator for voltage support in this region. If any of these assets are out of service during peak demand periods then there is a real risk of some demand curtailment in the region during peak demand periods in winter.

[11] It is assumed that planned outage windows for Otahuhu and Huntly generating stations would occur over summer, as has occurred in the past.

3. Assessment of Alternative Solutions

3.1 Assessment Criteria

Transpower will assess submissions received in response to this Request for Information using the criteria set out below, and any other relevant criteria.

Size

Feasible options must be large enough individually or collectively to address the future supply requirements. To address the forecast transmission constraints, this may require up to 100 MW capacity to be supplied from winter 2010. This may be by way of local generation or demand side management. In subsequent years, required capacity would need to increase by an average of 70 MW each year to keep pace with demand growth.

Time of Year

Options must be capable of consistently/reliably meeting peak demand during high demand periods in both summer and winter taking into account the typical daily demand pattern expected in the region with morning and evening peaks.

Meet Forecast Capacity

Proposals will be assessed against the extent to which they meet the forecast capacity shortfalls outlined in earlier sections for each supply issue.

Feasibility

Proposals will be assessed against the extent to which they are able to be implemented by the dates required. This may include consideration of central government legislation (such as the Resource Management Act), and/or local government requirements/bylaws (eg District Plan requirements).

Location (Generation and Demand Side Management)

For generation and Demand Side Management (DSM) solutions, location will be assessed against the requirement to reduce demand on the affected routes into the Auckland and North Isthmus regions. Preferred locations would have grid connection points at or North of Otahuhu. Additional benefits would accrue to grid connection points at or north of Henderson through deferral of transmission work across the Auckland Isthmus. Locations South of Otahuhu may also have some benefit depending on their proximity to Otahuhu substation.

Reliability (Generation)

For generation alternatives, proposals will be assessed against the stated reliability of the generation station. Specifically, any new generation will have to meet the requirements of Part C of the Electricity Governance Rules regarding connection, and be available on demand as alternatives to transmission investment. Alternatives will also be assessed on the reliability of the type of plant and availability of fuel supply, and the mean time to repair the generation plant.

Demand Side Management

Any Demand Side Management initiative must deliver committed demand which can shed on demand but in particular during winter and summer peak periods. Any demand offered as part of demand side initiatives must be separate to any other demand offered as part of system protection schemes such as interruptible load in the Instantaneous Reserves market. The initiative must include a means by which Transpower as the System Operator can verify that the relevant quantity of demand has been shed over the relevant time period.

Timeframe and certainty

Supply to Auckland:
Options to address the forecast supply limitations must be committed to prior to June 2007 - Transpower's last commitment date for its planned transmission solution. Additionally, all options must be fit for purpose and available for service prior to winter 2010.

Supply to North Isthmus:
Options to address the forecast supply limitations into the North Isthmus must be committed prior to March 2006 – Transpower's last commitment date for its planned transmission solution. Additionally, all options must be fit for purpose and available for service prior to winter 2011.

4. Request for Information – Instructions and Conditions

4.1 Instructions for Submissions

Transpower invites submissions in response to this Request for Information from electricity market participants and any other interested parties.

Submissions must be presented in a written form and clearly identify the author of the submission, including the authorised representatives(s) and contact details. To assist in responding to this Request for Information, a standard template is attached as Appendix A. During assessment of submissions, Transpower may contact the authorised representatives(s) of a respondent in order to clarify any aspect of a submission. Any request by a respondent for additional information may be made by contacting the Transpower representative nominated in section 4.3. Transpower reserves the right to notify any details of the clarification or additional information to other participants.

Submissions should include the information highlighted in Appendix A.

Other material that would be relevant in the assessment of the proposed solution may also be included.

4.2 General Conditions

No Contract

This Request for Information is not a tender document. Submissions are requested only for the purposes set out in section 1.4 above. The receipt by Transpower of any submission will not constitute a binding agreement between the submitter and Transpower, or give rise to any obligation other than confidentiality.

Confidentiality

As the submissions may be made public, any commercially sensitive or otherwise confidential material, or material that the submitter does not want to be made public, must be clearly identified. Submitters should be aware that Transpower is subject to the Official Information Act 1982, and may be required to release material where directed by the Office of the Ombudsman. Transpower may also be required to disclosed information pursuant to the Electricity Governance Regulations and Rules. Transpower will endeavour to notify the submitter if it receives any request for disclosure of material identified by the submitter as confidential.

4.3 Timetable for Submissions

Submissions close at 5 pm on 8 November 2004, and should be addressed to:

Guy Waipara
Grid Development Manager
National Grid
Transpower New Zealand
PO Box 1021
Wellington

Contact Details:

Ph 04 495 7026
Fax 04 494 6779
Email guy.waipara@transpower.co.nz

Transpower reserves the right to consider late submissions.

4.4 Assessment and Decision Process

The anticipated timetable is:

Part 1	• Initial Information Request (this paper) • Submissions (responses to this paper)	September 2004 5pm 8 November 2004
Part 2	• Review and analysis. Likely to involve further consultation with EGR participants and interested parties. Additional data may be requested to allow Transpower to carry out the economic assessment process as required by Part F of the EGRs	November - December 2004
Part 3	• Inclusion of report and solution within Transpower's Grid Upgrade Plan.	Early 2005. (Subject to changes in the Electricity Commission's schedule for Part F.)

Please note that this timetable may be subject to change. Submitters will be notified of any change.

Appendix A: Assessment Template

Applicant Details:	*Type of business: Company, Trust, partnership etc. If company, include shareholding and capital details.*
Solution Type	*Type of solution - Demand Side Management, Generation.*
Electricity available on demand (MW) to meet forecast shortfalls	
Construction Start Date:	*Start date required in order to meet the Commissioning Date.*
Construction Time	*Nominated time to order equipment and build the project, (but excluding RMA and regulatory approval).*
Commissioning Date:	*Date the project is to be placed into commercial operation.*
Solution Overview	*If Generator:* • *Generator technology;* • *Generator type;* • *Fuel source;* • *Location.* *If Demand Side Management:* • *Identify size and type of contracted demand available.*

Reliability/ Availability	*If Generator, confirm:* • *Availability details (eg percentage of availability each year);* • *Reliability details eg does it meet Part C of the EGRs. What risk of failure (Forced Outage Rate) and mean time to repair?* *If Demand Side Management:* • *Confirm demand availability; and* • *Confirm demand available not otherwise contracted (eg Instantaneous reserves).*
Cost	*Capital cost for implementing solution. Operating costs. Estimates of fixed and variable service costs.*
Electricity Governance Rules and Regulations	*Solution must be compliant with the Asset Owner requirements of Part C of the EGRs.*

Appendix B: Security Criteria

Transpower's current grid security standards are consistent with the approach applied by most transmission networks throughout the world. The planning criteria used by Transpower adopts N, (N-'k') terminologies to describe the service level for which a system is planned, where 'k' is the number of elements out of service at any one time. These terms are defined as follows:

- (*N) criterion* denotes that the system is planned such that with all transmission facilities in service the system is in a satisfactory state and loads may have to be shed to return to a satisfactory state for a credible contingency event. It could be said that an N security policy results in a system that is not secure against contingent events.
- *(N-'k') criterion* denotes that the system is planned such that with all transmission facilities in service the system is in a secure state and for any 'k' credible contingency event(s) the system moves to a satisfactory state. If any further contingency events were to occur loads may have to be shed to return to a satisfactory state.

The main interconnected transmission system is designed to maintain N-1 security criterion, meaning that the system is in a secure state with all transmission facilities in service and in a satisfactory state under credible contingent events. The single contingencies to be considered under an N-1 criterion for Auckland are:

- loss of a single transmission circuit
- loss of a single generating unit
- loss of a single bus section (for new transmission builds only)
- loss of an interconnecting transformer
- loss of a single shunt connected reactive component, e.g. capacitor bank, SVC

Transpower's detailed grid security standards are documented in "Main transmission System Planning Guideline, April 2004".

Appendix C: Network Configuration