



FINAL REPORT

TOMAGO STS AND BERESFIELD STS 33KV CAPACITOR INSTALLATION

22 October 2008

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EXECUTIVE SUMMARY

This paper has been prepared to report on the proposed project to address an identified capacity constraint on the 132kV network supplying Tomago and Beresfield sub-transmission substations in accordance with Clause 5.6.6(h) of the National Electricity Rules. The proposed option is classified as a new small transmission network assets under the National Electricity Rules.

The National Electricity Rules do not require a Distribution Network Service Provider to consult on an option that would result in a new small network asset. Accordingly, EnergyAustralia has not previously consulted on this project.

This report covers the following issues:

Section 1 provides a background of the Hunter region supply area and describes the constraint on the 132kV feeder network supplying Tomago and Beresfield subtransmission substations.

Section 2 describes the issues associated with the increase in the subtransmission substation loading and the projected load forecast. The concept of service standard, as implemented by EnergyAustralia, is discussed.

Section 3 describes the options that were considered, including Demand Management.

Section 4 states that as only one feasible option was available no application of the Regulatory Test was performed.

Section 5 concludes the only feasible option is the installation of 33kV capacitors at both Tomago and Beresfield subtransmission substation.

The estimated capital cost is \$2.45 Million and the anticipated date for completion is late November 2008.

1 BACKGROUND

1.1 Purpose and Scope

This Final Report has been prepared to advise on the installation of 33kV capacitors at both Tomago and Beresfield subtransmission substations (STS) due to the forecast system constraint in summer 2008/09. The information provided includes:

- A discussion of emerging supply system limitations identified by EnergyAustralia.
- A discussion of the service standard that has been adopted for planning purposes.
- A description of options considered to address the emerging supply system limitations.

1.2 National Electricity Rules Requirements

The requirements of the National Electricity Rules (the Rules) for new asset proposals are outlined in Clause 5.6 and depend on the cost, purpose and function of the new asset.

Tomago STS and Beresfield STS are classified as transmission assets under the Rules. Specifically, Clause 5.6.6 requires that, where analysis indicates that any relevant technical limits of a transmission system will be exceeded, that the Network Service Provider must:

- notify any affected Registered Participants and interested parties of these limitations and of the expected time for corrective action and;
- consult with affected Participants and interested parties on the possible options to address the projected limitations of the relevant distribution system.

A Network Service Provider does not need to consult on a network option that would result in a new small transmission network asset, or for options that do not augment the system.

EnergyAustralia has previously provided notification of the projected limitation at Tomago STS and Beresfield STS in the Transmission Annual Planning Report 2008. Only one feasible option for addressing the limitations was identified. The proposed option is considered a new small transmission network asset as it involves an expenditure of less than \$10 million.

The proposed augmentation has been necessitated by the need to meet the service standards described in Section 2 and has therefore been treated as a reliability driven augmentation for the purposes of the Regulatory Test; however, as only a single option was available, the least cost test was not performed.

The Rules require EnergyAustralia to assess whether a proposed new small transmission network asset is reasonably likely to have a material inter-network impact. Joint planning between EnergyAustralia and TransGrid, has determined that the proposed augmentation as described in Section 3 does not impose power transfer constraints or adverse impacts on the quality of supply to adjoining transmission networks.

1.3 Existing Supply Arrangements

The Hunter region is supplied from Newcastle Bulk Supply Point (BSP) and Waratah West Bulk Supply Point (BSP) via a 132kV interconnected network. The northern portion of this 132kV network supplies Kurri, Beresfield and Tomago STS as well as direct connection to some industrial customers. It also provides approximately 170MVA to Country Energy.

The Tomago/Beresfield 132kV network is presently very highly utilised and a number of loading constraints exist on the 132kV network within this area. Ongoing joint planning between EnergyAustralia, TransGrid and Country Energy has established a project to construct a new 330/132kV BSP at Tomago as a medium to long term strategy to address this issue (refer to *Final Report Development of Electricity Supply to the Newcastle Area*, published on 13 December 2007). The works are expected to be completed prior to Summer 2011/12 with commissioning staged such that two transformers and the majority of the 132kV connections would be available for operation by Summer 2009/10.

Figure 1 depicts the Lower Hunter Region 132kV Network.

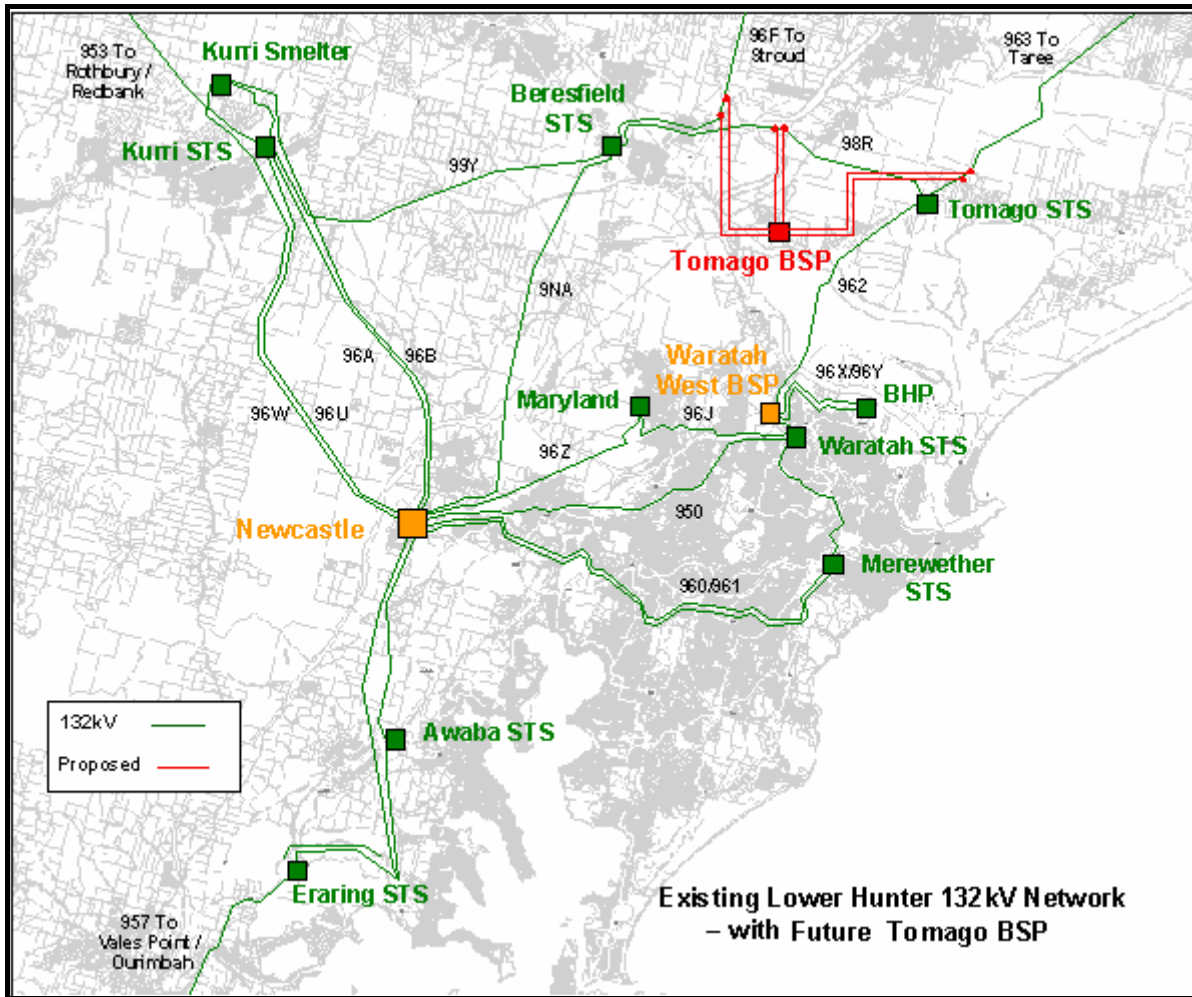


Figure 1 – Lower Hunter Region 132kV Network

2 ISSUES

2.1 Service Standards

The service standards that are applicable to a consideration of supply constraints affecting the Hunter Region are summarised below:

Network Elements

The minimum requirement for any network element is that, with all elements in service, the thermal capacity is required to meet at least 115% of forecast demand. The requirements described in the following sections are additional to this requirement.

Subtransmission Substations

For a failure of a single critical element (i.e. N-1 conditions) within a subtransmission substation, the forecast demand is not to exceed the thermal capacity. Recovery of load should be within one minute.

Overhead Subtransmission Feeders

For a failure of a single critical element (i.e. N-1 conditions) for overhead subtransmission network, the forecast demand is not to exceed the thermal capacity for more than 1% of the time (i.e. a total aggregate time of 88 hours per annum) up to a maximum of 20% above the thermal capacity. Recovery of load should be within one minute.

Under normal conditions (i.e. N conditions), the thermal capacity is required to meet at least 115% of forecast demand.

2.2 Network Issues

Load flow analysis using forecast peak demands for the relevant areas indicate that some elements of the 132kV network will be loaded above their planning limits under certain failure scenarios. In addition, feeder 962 is forecast to exceed its thermal capacity under normal system conditions in Summer 2008/09.

Table 1 shows the limit and forecast load on the 132kV feeders with all elements in service.

| Table 1: Feeder limits and loads with all elements in service | | | | |
|---|--------------|---|---------------------|---------|
| Feeder | Rating (MVA) | Planning Limit under N conditions (MVA) | Forecast load (MVA) | |
| | | | 2008/09 | 2009/10 |
| 962 | 224 | 195 | 200 | 213 |
| 9NA | 224 | 195 | 162 | 171 |
| 98R | 224 | 195 | 18 | 18 |
| 99Y | 166 | 145 | 51 | 57 |

Table 2 shows the limit and forecast load on the 132kV feeders following a single critical outage.

| Table 2: Feeder limits and loads following a single critical outage (N-1) | | | | |
|---|--------------|---|---------------------|---------|
| Feeder | Rating (MVA) | Planning Limit under N-1 conditions (MVA) | Forecast Load (MVA) | |
| | | | 2008/09 | 2009/10 |
| 962 | 224 | 269 | 272 | 289 |
| 9NA | 224 | 269 | 279 | 300 |
| 98R | 224 | 269 | 227 | 246 |
| 99Y | 166 | 200 | 148 | 163 |

3 OPTIONS CONSIDERED

3.1 Demand Side Management

A Demand Management screening test for Tomago STS and Beresfield STS was carried out in March 2008 and reviewed in May 2008. The demand reduction that would be required to defer the need for the project is significant and the resulting cost savings would be quite low. Taking into consideration these factors, it is not considered reasonable to expect that it would be cost-effective to postpone the supply-side investment by implementing demand management strategies.

3.2 33kV Capacitors

This option involves installation of one 36MVA_r 33kV capacitor at Tomago STS and a separate 36MVA_r 33kV capacitor at Beresfield STS. The capacitor installation will enable compliance in summer 2008/09. (Note: Construction of the Tomago BSP as mentioned in Section 1 will enable compliance in the following years).

Table 3 shows the limit and forecast load on the 132kV feeders after the capacitor installation with all elements in service.

| Table 3: Feeder limits and loads after the capacitor upgrade with all element in service | | | | |
|--|--------------|---|---------------------|---------|
| Feeder | Rating (MVA) | Planning Limit under N conditions (MVA) | Forecast Load (MVA) | |
| | | | 2008/09 | 2009/10 |
| 962 | 224 | 195 | 191 | 202 |
| 9NA | 224 | 195 | 155 | 163 |
| 98R | 224 | 195 | 26 | 27 |
| 99Y | 166 | 145 | 45 | 51 |

Table 4 shows the limit and forecast load on the 132kV feeders after the capacitor installation following a single critical outage

| Table 4: Feeder limits and loads after the capacitor upgrade following a single critical outage | | | | |
|---|--------------|---|---------------------|---------|
| Feeder | Rating (MVA) | Planning Limit under N-1 conditions (MVA) | Forecast Load (MVA) | |
| | | | 2008/09 | 2009/10 |
| 962 | 224 | 269 | 258 | 273 |
| 9NA | 224 | 269 | 268 | 285 |
| 98R | 224 | 269 | 219 | 235 |
| 99Y | 166 | 200 | 148 | 163 |

3.3 Other Options

There is no other feasible option. The capacitor installation is the only feasible option that can be delivered in the required time frame.

4 CONCLUSION

On the basis that it is the only option available to meet the identified need, EnergyAustralia intends to install a new 36MVA_r 33kV capacitor at Tomago STS and a separate new 36MVA_r 33kV capacitor at Beresfield STS. The estimated capital cost is \$2.45 million and the anticipated date for completion is late November 2008.

This service availability date may change if the project is affected by circumstances beyond EnergyAustralia's control, such as changes in the timing of customer load increases or other issues such as delays in the approval process, equipment supply difficulties, unforeseen technical constraints, acts of God, or industrial action.