



FINAL REPORT

TOMAREE PENINSULA 11kV NETWORK CAPACITY

3 November 2008

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EXECUTIVE SUMMARY

This paper has been prepared to report on the proposed development of the electricity supply network in the Tomaree Peninsula load area in accordance with Clause 5.6.2 (h) of the National Electricity Rules (the Rules). The work proposed by this report is classified as a new small distribution asset.

A Distribution Network Service Provider is not required to consult on a new small network asset. Accordingly, EnergyAustralia has not previously consulted on this project.

To provide a safe and reliable electricity supply for existing customers and provide capacity for future loads, EnergyAustralia is faced with a primary need to provide additional supply system capacity to meet forecasted load demands. The provision of additional capacity is required to meet network performance requirements set by EnergyAustralia in accordance with Schedule 5.1 of the Rules.

This report covers the following issues:

Section 1 of the paper provides a background of the Tomaree Peninsula supply area and describes the proposed development in relation to the National Electricity Rules (the Rules).

Section 2 describes the issues associated with the forecast loading and voltage constraints on the 11kV feeders supplied from Nelson Bay zone. The concept of service standard, as implemented by EnergyAustralia is discussed.

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

- Option 1 – Two new feeders to Nelson Bay and Taylors Beach
- Option 2 – Two new feeders to Nelson Bay and Salamander Bay

Section 4 demonstrates a cost analysis of the options presented in Section 3.

Section 5 concludes the selected option is Option 1 – Two new feeders to Nelson Bay and Taylors Beach.

The conclusion to construct Option 1 is made on the basis that it is the least cost option in accordance with the regulatory test to provide increased future capacity and to meet EnergyAustralia's reliability standard. The estimated capital cost for this option is \$1.8 million and the completion date is anticipated to be September 2009.

1. BACKGROUND

This Final Report has been prepared to advise on development work that is proposed to be carried out on the 11kV network supplying the Tomaree Peninsula area to maintain the 11kV network within reliability standards. The information provided includes:

- A discussion of emerging supply system limitations identified by EnergyAustralia that have lead to the necessity for augmentation of the distribution network in the area.
- A discussion of the service standard that has been adopted for planning purposes.
- Descriptions of options for development of the electricity supply in the area.
- Details of the outcomes of cost effectiveness analysis for the options that have been considered.

Tomaree Peninsula area, which incorporates the suburbs of Anna Bay, Bobs Farm, Fingal Bay, Nelson Bay, Salamander Bay, Shoal Bay, Soldiers Point, and Taylors Beach, is currently supplied by Nelson Bay zone substation.

The 11kV network that supplies the Tomaree Peninsula does not currently meet the design planning criteria. A new Tomaree zone substation on Stockton Rd, Nelson Bay is proposed to provide a long term solution to address these issues¹ and is anticipated to be completed by summer 2010/11. In the interim period prior to completion of the new Tomaree zone substation, reinforcement of the Tomaree Peninsula 11kV network is required until the new Tomaree zone is constructed.

Below is a geographic diagram of the Port Stephens network area.

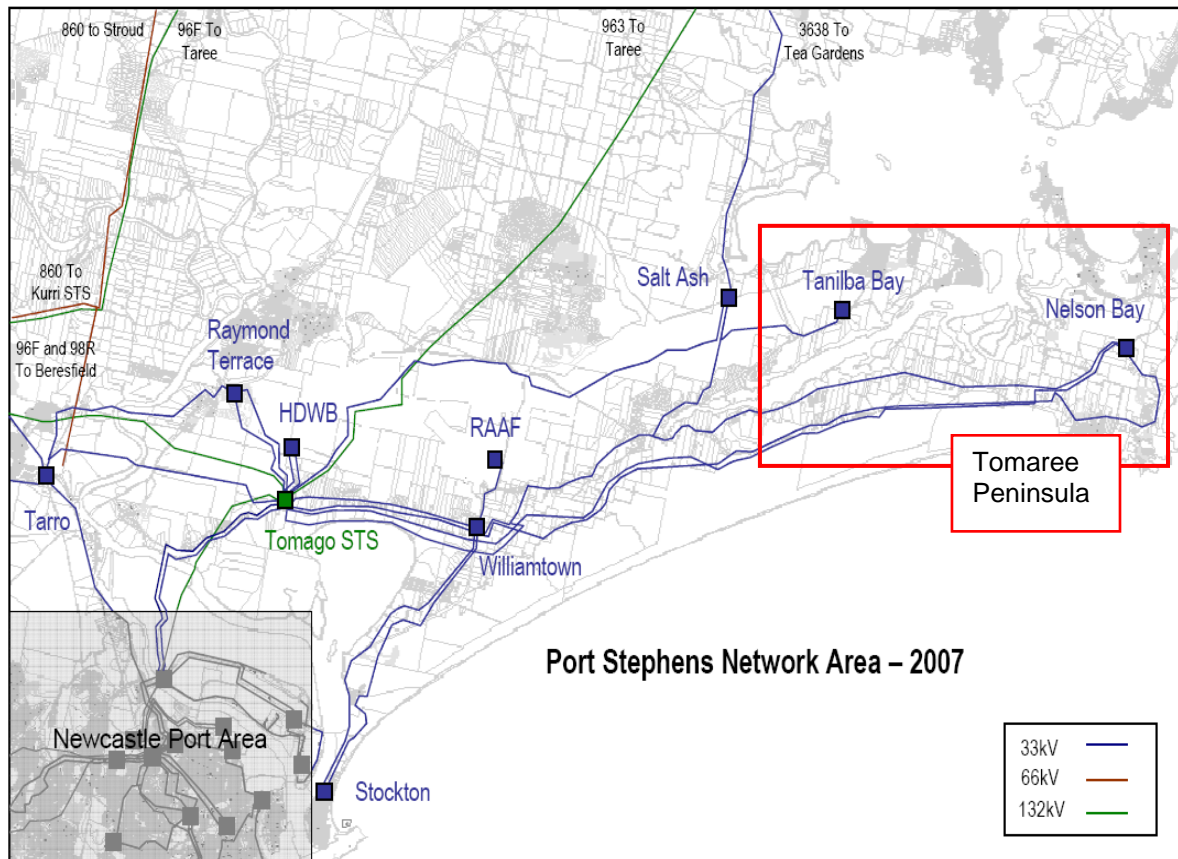


Figure 1: Current Configuration in the Port Stephens Load Area

¹ A consultation paper discussing this project was previously issued in November 2007

1.1. TYPE OF AUGMENTATION

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

The 11kV network supplying Tomaree Peninsula load area is classified as a distribution system by the Rules. The Rules (clauses 5.6.2(e) and (f)) require that, where analysis indicates that any relevant technical limits of a distribution system will be exceeded, that the Distribution Network Service Provider (DNSP) must notify any affected Registered Participants 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 be a small network asset, or for options that do not augment the system.

Each of the options considered under Section 4 are considered new small distribution network assets as they involve a network augmentation with expenditure less than \$10 million. A DNSP is not required to consult of a project that is a new small distribution asset and accordingly no consultation paper was issued in regards to this project.

The new capacity provided by 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. Consequently, EnergyAustralia has used a least cost test to examine the options identified to address projected system limitations.

2. ISSUES

2.1. Applied Service Standard

The service standards that are applicable to a consideration of supply constraints affecting the Tomaree Peninsula supply area are summarised below:

2.1.1. 11kV Distribution Network

The planning criteria applied to 11kV networks are determined by the type of load it supplies.

For feeders supplying urban areas, switch-able interconnection to adjacent feeders is required to enable restoration following an unplanned failure of a single network element (i.e. N-1 conditions). Recovery of load is determined by the time required to perform manual switching of load in the field and is expected to take less than 4 hours. Under normal system conditions, the expected demand is to be no more than 80% of the feeder thermal capacity.

For non-urban areas, recovery of load is based on best practice repair times for an asset in that location.

EnergyAustralia may choose to provide a higher level of reliability in order to comply with the reliability standards specified in Schedules 2 and 3 of the Licence Conditions.

For 11kV networks, voltage drops of up to 5% are regarded as satisfactory. Higher voltage drops are permissible provided that the network connection provided to low voltage customers is within the limits specified in Australian Standard AS2926.

2.2. Description of Network Constraints

2.2.1. Tomaree Peninsula 11kV Network

The proposed new Tomaree zone substation is anticipated to achieve Design Planning Criteria compliance from November 2010. In the interim period prior to its completion, a number of 11kV feeders supplying the Tomaree Peninsula area will not meet the required service standards.

The table below shows the forecast for the feeder with highest utilisation for the next two years, with all network elements in service.

11kV feeders	Limit	2008/09	2009/10
Highest Feeder Utilisation - All network elements in service	100%	115%	122%

The table below shows the forecast voltage expressed as percentage of nominal voltage for the feeder with lowest 11kV voltage for the next two years, with all network elements in service.

11kV feeders	Limit	2008/09	2009/10
Lowest Feeder Voltages - All network elements in service	0.95	0.935	0.926

3. OPTIONS CONSIDERED

Two feasible supply options have been considered to address these issues in addition to Demand Management. Both options were expected to be delivered by September 2009 and will allow re-distribution of load such that:

- 11kV feeders utilisations will be maintained within planning limits
- 11kV feeder voltages will be maintained within planning limits

With all elements in service until 2010/11, when the new Tomaree zone substation will achieve full compliance with the design planning criteria for the 11kV network supplying the Tomaree Peninsula. This is in line with the requirement to be as compliant as practicable with the licence requirements by 1 June 2014.

3.1. Option 1 – Two new feeders to Nelson Bay and Taylors Beach

This option involves the installation of two new feeders from Nelson Bay zone substation to feeders Nelson Bay and Taylors Beach to create two new distribution connections to Nelson Bay zone. This option includes the construction of approximately 2.5km of distribution mains and the rearrangement of the existing 11kV busbar. The new feeders are compatible with the future development of Tomaree zone.

The total estimated capital cost of this option is \$1.8M. The Net Present Cost (NPC) is \$1.7M.

3.2. Option 2 – Two new feeders to Nelson Bay and Salamander Bay

This option involves the installation of two new feeders from Nelson Bay zone to feeders Nelson Bay and to Salamander Bay to create two new distribution connections to Nelson Bay zone. This option includes the construction of approximately 5.5km of distribution mains as well as rearrangement of the existing 11kV busbar. The Salamander Bay feeder is likely to become unnecessary after the completion of Tomaree zone substation.

Option 2 is expected to have a longer construction time than Option 1. The total estimated capital cost of this option is \$2.7M. The Net Present Cost (NPC) is \$2.5M.

3.3. Demand Management

An assessment of Demand Management opportunities in the Tomaree Peninsula area was carried out in August 2007. The demand reduction that would be required to defer the need for the project is high and the resulting cost savings would be quite low. Therefore it is not reasonable to expect that demand management can avoid or defer the proposed 11kV distribution development in a cost-effective manner.

4. ANALYSIS OF OPTIONS

4.1. Base Case Analysis

The results of the base case economic analysis are summarised in table 3 below using the base discount rate of 8.5%.

Options	NPC (\$M) *	Capital Cost (\$M)
Option 1: Two new feeders to Nelson Bay and Taylors Beach	1.68	1.83
Option 2: Two new feeders to Nelson Bay and Salamander Bay	2.47	2.70

* The net present cost includes operation and maintenance cost

Refer to Appendix A for further details of the base case economic analysis.

Under the base case condition, Option 1 is the least cost option.

4.2. Sensitivity Analysis

The NPC results for variations in discount factor and capital cost are shown in table 4 below:

Scenario	NPC	
	Option 1 (\$M)	Option 2 (\$M)
7% discount factor	1.73	2.55
10% discount factor	1.63	2.40
25% decrease in capital cost	1.26	1.86
25% increase in capital cost	2.10	3.09

Option 1 is the least cost option under all analysed sensitivity scenarios.

5. CONCLUSION

EnergyAustralia's intended action is to construct Option 1 on the basis that it is the least cost option for all analysed scenarios. It also has the shortest construction time and is in line with the long term strategy of Tomaree zone substation development.

All works are anticipated to be completed by September 2009.

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 and industrial action.

6. APPENDIX A – ECONOMIC ANALYSIS OF BASE CASE

WACC = 0.085

Option 1 – Two new feeders to Nelson Bay and Taylors Beach

Actions	NPV (\$M)	CAPEX (\$M)	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Total estimated capital cost	1.56	1.83	0.00	0.04	1.80							
Operation & Maintenance	0.12		0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	1.68	1.83										

Option 2 – Two new feeders to Nelson Bay and Salamander Bay

Actions	NPV (\$M)	CAPEX (\$M)	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
Total estimated capital cost	2.30	2.70	0.00	0.05	2.65							
Operation & Maintenance	0.18		0.00	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Total	2.47	2.70										

1) All costs are quoted in 2007/08 real dollars. Year 07/08 refers to 2007/08.