



FINAL REPORT

WYONG ZONE SUBSTATION 11KV PANEL 19 FEEDER DEVELOPMENT

25th June 2009

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EXECUTIVE SUMMARY

This paper has been prepared to report on upgrade work that is proposed to develop the electricity supply network in the Wyong zone substation (ZS) load area in accordance with Clause 5.6.2 (h) of the National Electricity Rules.

There are forecast capacity issues on the 11kV feeder from Wyong ZS panel 19. To ensure a safe and reliable electricity supply for existing customers, EnergyAustralia is providing additional capacity to restore the licence compliance of this distribution network and to meet forecast 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 provides a background of the Wyong ZS and the need for augmentation.

Section 2 describes the capacity issues on the Wyong ZS 11kV distribution network. The concept of service standard, as implemented by EnergyAustralia, is discussed.

Section 3 describes the proposed augmentation in relation to the National Electricity Rules (the Rules). The proposed development on the Wyong ZS distribution network is classified as a distribution system asset by the Rules, and the proposed development is classified as a small network asset as the proposed investment involves expenditure of less than \$10 million.

Section 4 describes the options that were considered:

- Demand Management,
- Option 1 – New 11kV Feeder Route 1,
- Option 2 – New 11kV Feeder Route 2, and
- Option 3 – New 11kV Feeder Route 3.

Section 5 presents the results of an economic analysis of the options (base case) and a sensitivity analysis on a selection of key variables.

Section 6 concludes that the preferred option is Option 1 – New 11kV Feeder Route 1.

EnergyAustralia's recommended action is Option 1 and this option involves installing a new 11kV feeder, up-rating limiting 11kV overhead feeder sections and reconfiguring the network in order to address the capacity issues on the Wyong ZS distribution network. The estimated capital cost for this option is \$2.87M with a Net Present Cost (NPC) of \$2.80M. The proposed project is planned to be completed in early 2010.

1. BACKGROUND

1.1. Introduction

This Final Report has been prepared to advise on the upgrade work that is proposed to be carried out in the Wyong zone substation load area. The information provided in this Final Report includes:

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

Wyong 132/11kV zone substation (ZS) is located in the southern part of the Upper Central Coast network area. The ZS has 132kV connection with TransGrid’s Tuggerah bulk supply point (BSP) and Munmorah BSP. Wyong ZS is equipped with one 45MVA and one 50MVA transformers. The geographical overview of the Wyong ZS load area is shown in Figure 1 below.

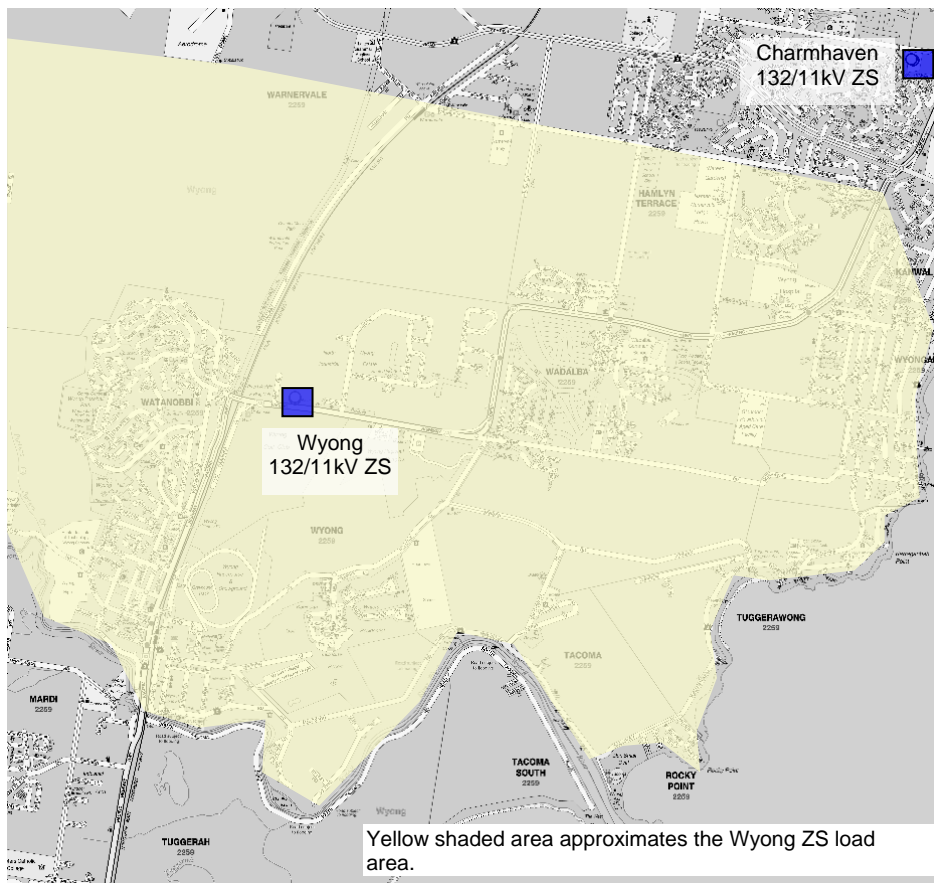


Figure 1 – Geographical overview of Wyong ZS load area

2. ISSUES

2.1. Licence Conditions

The service standards that are applicable to a consideration of supply constraints affecting the Wyong zone substation load area are summarised below:

Applicable to all 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.

11kV Distribution Network

For a distribution feeder in urban¹ area, the expected demand is to be no more than 80% of feeder thermal capacity (under system normal operating conditions), with switchable interconnection to adjacent feeders to enable restoration following an unplanned failure of a single network element (i.e. N-1 conditions). The 11kV network where in a number of feeders forms an interrelated system, the limits apply to the average loading of the feeders within the one system. The customer interruption time following an outage is expected to be less than four hours.

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. Capacity Issues

The 11kV distribution feeder from panel 19 of Wyong ZS has peak utilisation of greater than 100% in normal state. In addition, under contingency situations at times of peak load, the load supplied on this feeder cannot be adequately restored within the EnergyAustralia's service standard. Therefore, this feeder does not fully comply with the licence condition and is required to be addressed.

3. TYPE OF AUGMENTATION

Wyong ZS is classified as a distribution system asset by the National Electricity Rules (the Rules).

The Rules require that, where analysis indicates that any relevant technical limits of a distribution system will be exceeded, the Distribution Network Service Provider (DNSP) must notify any affected Registered Participants and interested parties of these limitations and the expected time for corrective action. Further, the DNSP must consult with affected Registered 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 new small network asset, or for options that do not augment the system.

The proposed development strategy for the Wyong ZS distribution network involves the expenditure of less than \$10M and hence the proposed strategy is considered as a new small distribution network asset.

A Distribution Network Service Provider is not required to consult on a project that is a new small distribution asset and hence 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,

¹ Urban, for EnergyAustralia, means an area where the majority of land is zoned for residential and/or commercial and/or industrial use within a town or city type of area which is contiguous with other similar town or city areas with an aggregated population of at least 5,000 people.

EnergyAustralia has used a least cost test to examine the options identified to address projected system limitations.

4. OPTIONS CONSIDERED

The development strategy for the Wyong ZS load area is driven by the need to address the capacity issues on the 11kV distribution network. The following section describes options to address these issues.

4.1. Demand Management

An investigation of Demand Management opportunities in the Wyong ZS load area was carried out in February 2009. In order to defer the proposed supply side solution by one year, the required demand reduction is 0.8MVA in Summer 2009/10. This represents 9.5% of the overall load on the feeder which is moderate. However, the demand reduction required for the limiting sections of the feeder is approximately 24% of the existing load which is high. In addition, there are no large customer loads that could potentially provide a considerable reduction. The cost saving from a one year deferral is \$323/kVA, which is moderate.

Considering the relatively high demand reduction required from the limiting sections and the limited available timeframe to develop demand management options, it is not considered reasonable to expect that the proposed supply side solution can be cost effectively deferred by implementing demand management strategies. Therefore, demand management is not a viable option in this instance.

4.2. Supply Side Options

All supply side options considered involve installation of a new 11kV feeder from Wyong ZS and up-rating of the limiting sections of the existing overhead feeders. The difference between the three supply side options is the route of the new feeder and the required length of the overhead feeder sections to be up-rated.

4.2.1. Option 1: New 11kV Feeder Route 1

This option involves installing a new 11kV feeder (approximately 2.7km) from Wyong ZS, replacement of 11kV overhead lines (approximately 2.7km), and network reconfiguration.

The present average utilisation and forecast utilisation of the interconnected panel 19 and proposed panel 14R feeders after the implementation of the Option 1 is shown in Table 1 below.

System Normal State	Average utilisation of interconnected Pa 19 and proposed Pa 14R feeders	
	Present network	After Option 1
Present utilisation	>100%	54%
Forecast utilisation – 6 years	>100%	57%

The estimated capital cost for this option is \$2.87M.

4.2.2. Option 2: New 11kV Feeder Route 2

This option involves installing a new 11kV feeder (approximately 3.3km) from Wyong ZS, up-rating of 11kV overhead lines including a river-crossing (approximately 3.0km), and network reconfiguration. This option would provide benefits similar to those of Option 1.

The estimated capital cost for this option is \$4.20M.

4.2.3. Option 3: New 11kV Feeder Route 3

This option involves installing a new 11kV feeder (approximately 3.5km) from Wyong ZS involving river, railway and RTA road crossings, up-rating of 11kV overhead lines (approximately 2.0km), and network reconfiguration. This option would provide benefits similar to those of Option 1.

The estimated capital cost for this option is \$4.70M.

5. ANALYSIS OF OPTIONS

Economic analysis has been carried out in accordance with the regulatory test promulgated by the ACCC under clause 5.6.5A of the Rules. As indicated in section 1.2 the “reliability limb” of the test was applied. It involves the comparison of options by carrying out a Net Present Cost (NPC) analysis. In this case the option that satisfies the regulatory test is considered to be the one that minimises the NPC of the relevant overall area supply strategy.

A range of parameters has been included in the comparison of options such as variations in discount rate and capital cost. In summary the three options presented are technically and economically comparable given due consideration to all capital and operating costs that are able to be defined and quantified.

5.1. Base Case Analysis

The results of the base case economic analysis are summarised in Table 2 below using a discount rate of 8.5% per annum.

Options	NPC# [\$M]	Capital Cost [\$M]	Ranking
Option 1 – New 11kV Feeder Route 1	2.80	2.87	1
Option 2 – New 11kV Feeder Route 2	4.10	4.20	2
Option 3 – New 11kV Feeder Route 3	4.59	4.70	3

Note: # : NPC also includes operation and maintenance costs.

Refer to Appendix A for further details of base case.

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

5.2. Sensitivity Analysis

Sensitivity Analysis was carried out to consider the impact of various factors. The results of the sensitivity analysis are summarised in Table 3 below.

Sensitivity Scenario		Option 1 [NPC \$M]	Option 2 [NPC \$M]	Option 3 [NPC \$M]
Variation of Discount Rate	7.0%p.a.	2.85	4.17	4.67
	8.5%p.a. (Base Case)	2.80	4.10	4.59
	10%p.a.	2.75	4.03	4.51
Variation in Capital Cost	25% increase	3.50	5.13	5.74
	25% decrease	2.10	3.08	3.44
Load Growth Rate*	25% increase	2.80	4.10	4.59
	25% decrease	2.80	4.10	4.59

Note: * : variation in load growth rate doesn't affect the cost of the options as the network capacity issues already exist.

Option 1 has the lowest NPC under all sensitivity scenarios.

6. CONCLUSION

Option 1 has the lowest NPC under the base case and under all sensitivity scenarios.

EnergyAustralia intends to augment the Wyong ZS 11kV distribution network by installing a new feeder, up-rating limiting overhead feeder sections and reconfiguring the network in order to address the issues discussed in Section 2.

The estimated capital cost for this option is \$2.87M with a NPC of \$2.80M.

The works associated with the Option 1 are forecast to be completed by early 2010. 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.

A. APPENDIX A – ECONOMIC ANALYSIS OF BASE CASE

Base Case Discount Rate = 8.5% p.a. (WACC)

Option 1 – New 11kV Feeder Route 1

Actions	NPC[\$M]	CAPEX[\$M]	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
New feeder + uprate overhead sections + reconfigure network	2.64	2.87	-	2.87	-	-	-	-	-	-	-	-
Operation & Maintenance	0.16	-	-	-	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03
TOTAL	2.80	2.87	0.00	2.87	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Option 2 – New 11kV Feeder Route 2

Actions	NPC[\$M]	CAPEX[\$M]	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
New feeder + uprate overhead sections + reconfigure network	3.87	4.20	-	4.20	-	-	-	-	-	-	-	-
Operation & Maintenance	0.23	-	-	-	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05
TOTAL	4.10	4.20	0.00	4.20	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Option 3 – New 11kV Feeder Route 3

Actions	NPC[\$M]	CAPEX[\$M]	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
New feeder + uprate overhead sections + reconfigure network	4.33	4.70	-	4.70	-	-	-	-	-	-	-	-
Operation & Maintenance	0.26	-	-	-	0.02	0.06	0.06	0.06	0.06	0.06	0.06	0.06
TOTAL	4.59	4.70	0.00	4.70	0.02	0.06	0.06	0.06	0.06	0.06	0.06	0.06

All figures are in 2008/2009 real \$M.