



APPLICATION NOTICE

DEVELOPMENT OF GWAWLEY BAY ZONE SUBSTATION

13th March 2009

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EXECUTIVE SUMMARY

This Application Notice has been prepared to provide a basis for EnergyAustralia to consult with affected registered participants and interested parties on the potential options for the development of the electricity supply network in the Gwawley Bay area.

To ensure a safe and reliable electricity supply for existing customers and new developments in the area, an integrated strategy is required to:

- Replace or retire aging equipment in zone substations over the next decade.
- Provide additional supply system capacity to meet projected load growth.

EnergyAustralia has conducted an economic analysis of the potential options to identify a preferred option which satisfies the regulatory test as set out by the Australian Energy Regulator (AER). The 'Regulatory Test' is a methodology that assesses the economic prudence of a network investment.

This paper is presented in the following sections:

Section 1 of the paper provides a description of the load area and the context of the Application Notice within the regulatory approval process.

Section 2 describes the limitations affecting the supply network in the area and the need for augmentation of the supply to the area. The objectively measurable service standard (planning criterion), against which the need and effectiveness of augmentation options are to be assessed, is also presented.

Section 3 presents the options to address the issues affecting the supply network including non-network options. Five feasible augmentation options based on technical and economic performance are described:

- | | |
|------------|---|
| Option 1: | Gwawley Bay 132/11kV conversion (new UG connection) |
| Option 2a: | Gwawley Bay 132/11kV conversion (new OH connection) & Caringbah 2nd 33kV feeder from Port Hacking STS |
| Option 2b: | Gwawley Bay 132/11kV conversion (new OH connection) & Caringbah 2nd 33kV feeder from Kurnell STS |
| Option 3a: | Hybrid Gwawley Bay 132/33/11kV zone substation & Caringbah 2nd 33kV feeder from Port Hacking STS |
| Option 3b: | Hybrid Gwawley Bay 132/33/11kV zone substation & Caringbah 2nd 33kV feeder from Kurnell STS |

Section 4 presents the results of a preliminary application of the regulatory test and the options are ranked.

Section 5 concludes that the preferred option is Option 1: Gwawley Bay 132/11kV conversion (new underground connection). This option includes the conversion of the existing 33/11kV Gwawley Bay zone substation to 132/11kV operation and development of a new 132kV underground feeder from Port Hacking STS. The conclusion was made in accordance with the Regulatory Test to meet EnergyAustralia's reliability standard.

The total capital cost of this work is estimated to be \$25.9M and is expected to be commissioned in 2011*.

* 2011 is the default commissioning date based on system capacity needs. It is likely that the supply option proposed will be deferred by at least 1 year due to Demand Management.

1. INTRODUCTION

1.1. Purpose and Scope

This Application Notice has been prepared to provide a basis for EnergyAustralia to consult with Registered Participants and interested parties. It sets out potential options for the development of electricity supply in the Gwawley Bay load area.

It includes:

- A discussion of the supply system limitations identified by EnergyAustralia. From this, feasible options have been identified for the replacement and augmentation of network infrastructure in the area.
- A discussion of the service standard that has been adopted for planning purposes.
- A description of potential options which have been identified for development of the electricity supply in the area.
- A detailed preliminary cost effectiveness analysis in Net Present Cost (NPC) of each of these options, carried out in accordance with the requirements of the Regulatory Test.

1.2. Electricity Supply Network

The Sutherland network supply area, which includes the Gwawley Bay load area, extends from the Kurnell peninsula in the north-east, along the southern side of Botany Bay and the Georges River, south as far as Waterfall and west towards the coast. The network in Sutherland serves a mixture of residential, commercial and industrial loads and is supplied from TransGrid's Bulk Supply Point (BSP) at Sydney South via two double circuit 132kV tower lines.

The area includes two subtransmission substations at Kurnell and Port Hacking which supplies seven 33/11kV zone substations together with three 132/11kV zones as can be seen in figure 1 below:

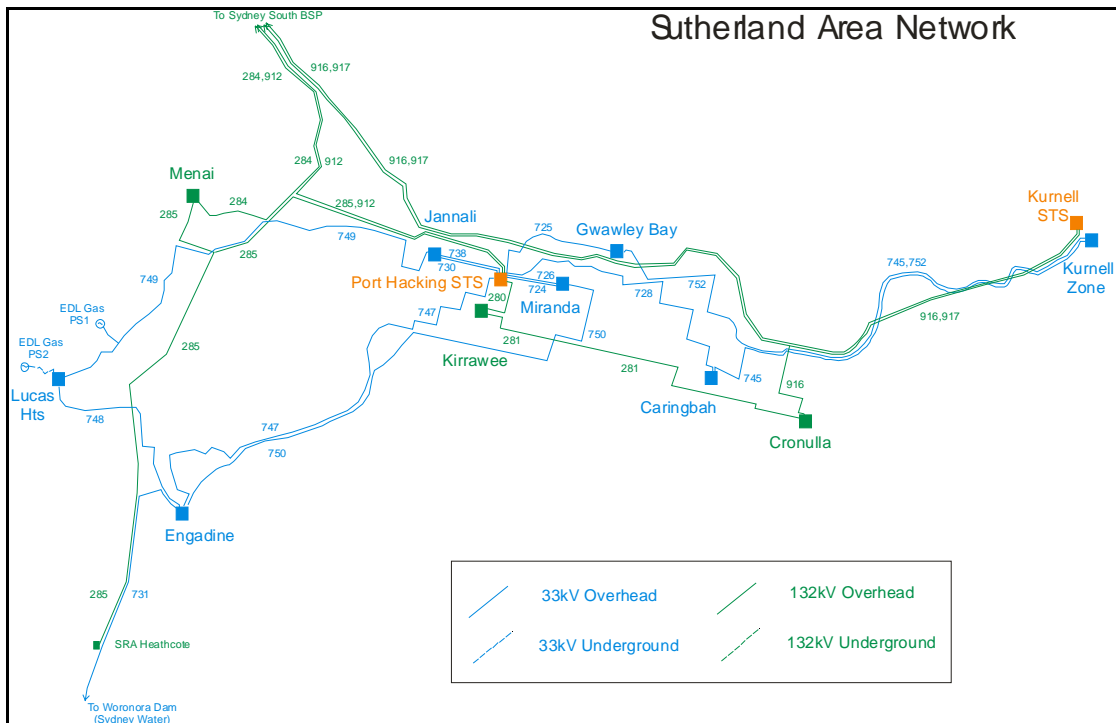


Figure 1: Sutherland supply area 33kV and 132kV geoschematic

Gwawley Bay 33/11kV zone substation is located in the central portion of the Sutherland supply area and provides supply to parts of the following suburbs: Caringbah, Kangaroo Point, Miranda, Sylvania, Sylvania Waters and Taren Point.

A number of issues exist at Gwawley Bay zone, namely:

1.3. National Electricity Rules Requirements

The existing Gwawley Bay 33/11kV zone substation and its associated 11kV distribution network are presently classified as distribution system assets by the Rules. However, following completion of the conversion of Gwawley Bay to 132/11kV operation under the requirements of Option 1, the new Gwawley Bay 132/11kV substation will become connected in parallel with the transmission network and hence, Gwawley Bay will be regarded as a transmission asset by the Rules.

The Rules (clauses 5.6.2 (e) and (f)) requires that, where analysis indicates that any relevant technical limits of a transmission system will be exceeded, that the Transmission Network Service Provider must notify any affected Registered Participants of these limitations and the expected time for corrective action and consult with affected Registered Participants and interested parties on the possible options to address the projected limitations of the relevant distribution system.

The timing of the proposed work is primarily driven by the need to address capacity constraints at Port Hacking STS. EnergyAustralia intends to provide notification of these limits in its AESDR and is consulting with registered participants and interested parties in accordance with the Rules due to the increased capacity which will result from the strategies.

The proposed development strategy for the Gwawley Bay area involves growth-driven expenditure in excess of \$10 million and is regarded by the Rules as a new large network asset.

This paper has been prepared to consult on identified options which satisfy the Regulatory Test and meet the network performance standards set out in Schedule 5.1 of the Rules. The development of options is necessitated solely by the future inability to meet the minimum network performance requirements set out in Schedule 5.1 of the Rules and by EnergyAustralia Licence conditions. Limb (a) of the Regulatory Test must be applied to determine the option that satisfies the Regulatory Test. Under limb (a) of the Regulatory Test, the option which meets the test is the one that minimises the present value of costs compared with a number of alternative options in the majority of reasonable scenarios.

EnergyAustralia is consulting separately over the community aspects of the proposed development.

1.4. Joint Planning

EnergyAustralia and TransGrid have jointly planned the 330kV and 132kV networks supplying the Sydney Metropolitan area for many years.

EnergyAustralia has identified the network limitations outlined in section 2 that give rise to a need for network augmentations. Where solutions involve augmentation of the 132 kV network, these options were joint planned with TransGrid.

1.5. Material Inter-network Impact

The rules require an assessment of whether a proposed new large transmission network asset is reasonably likely to have a material inter-network impact.

EnergyAustralia and TransGrid have 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. IDENTIFICATION OF NEED FOR AUGMENTATION

2.1. Applied Service Standard

Distribution Network Service Providers (DNSPs), such as EnergyAustralia, are required to follow the service standards specified in the "*Design, Reliability and Performance Licence Condition for Distribution Network Service Providers*", issued by the Minister for Energy and dated 1 December 2007. The service standards specified in this document that are applicable to a consideration of supply constraints affecting the Gwawley Bay area are summarised below:

2.1.1. 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.

2.1.2. Zone Substations and Subtransmission Network

2.1.2.1. Overhead Subtransmission Line and Zone Substations

For a failure of a single critical element (i.e. N - 1 conditions) within zone substations supplying greater than 10MVA of load and 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.

2.1.2.2. Underground Subtransmission Cables

For an underground subtransmission cable the forecast demand must not exceed the thermal capacity of any underground section at any time under N - 1 conditions.

2.1. Description of Network Constraints

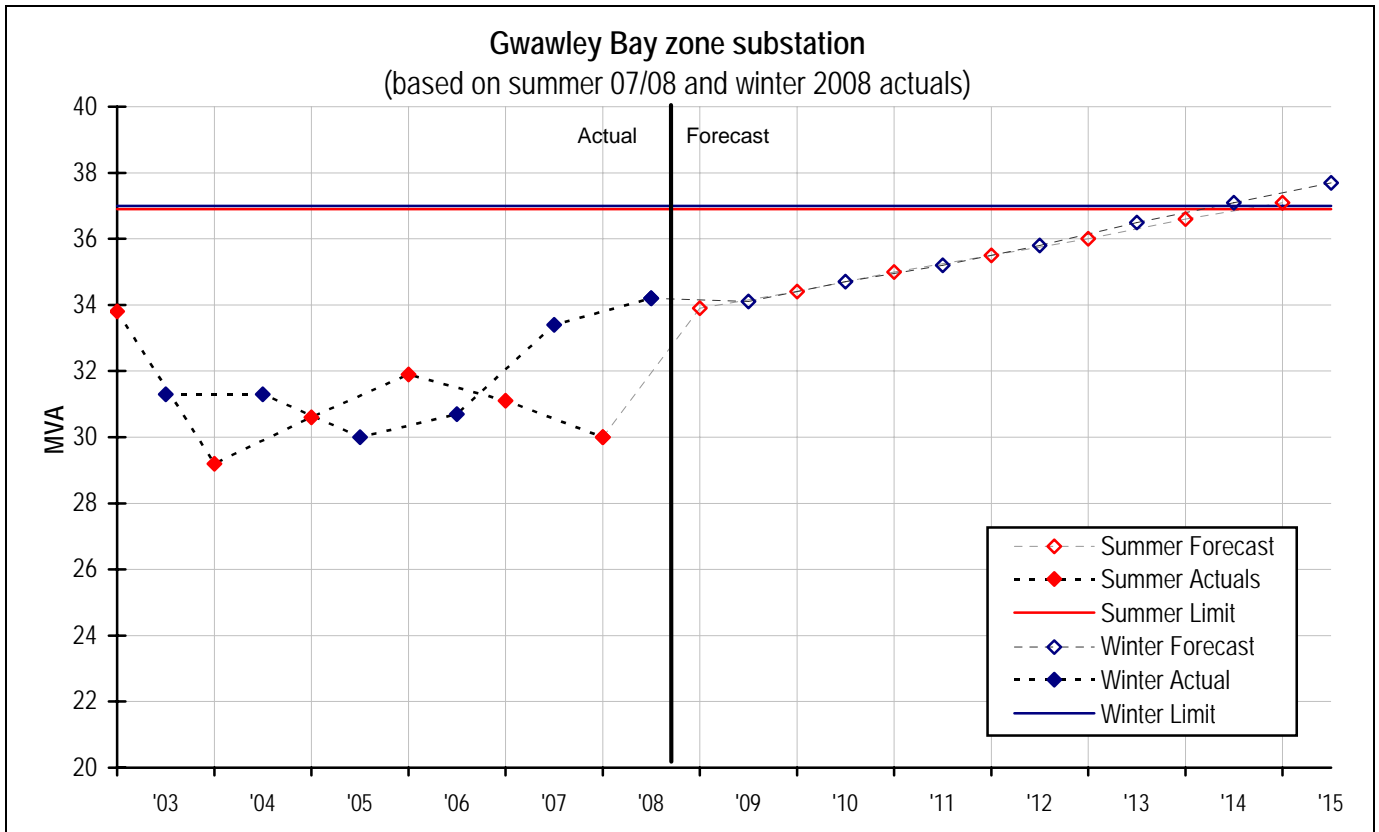
2.1.1. Load Forecast

EnergyAustralia has previously published details of its load forecasts and the timing of loads exceeding technical limits of the system in its Annual Electricity System Development Review. The load forecast includes committed spot loads and normal levels of load growth. The timing of the constraint for each zone substation is summarised below and is based on the forecast projected from the summer 2007/08 and winter 2008 actual loads.

2.2.1. Capacity Issues

Gwawley Bay 33/11kV Zone Substation

Gwawley Bay has a licence capacity of 36.9MVA in summer and 37.0MVA in winter, limited by the RD rating of the normal 33kV overhead supply provided by feeder 725 from Port Hacking STS. The peak load forecast for summer and winter at Gwawley Bay is shown below:

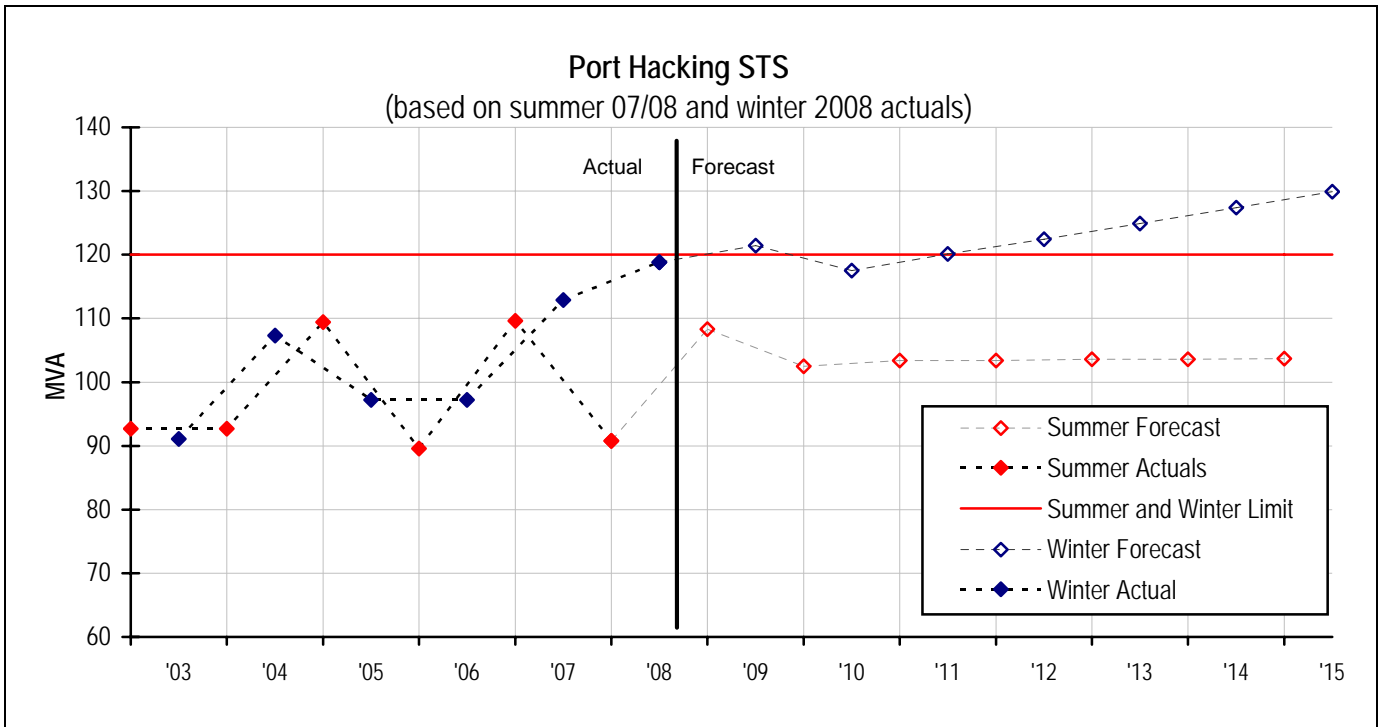


	Actual						Forecast						
SUMMER	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15
Load	33.8	29.2	30.6	31.9	31.1	30.0	33.9	34.4	35.0	35.5	36.0	36.6	37.1
Limit	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9	36.9
WINTER	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Load	31.3	31.3	30.0	30.7	33.4	34.2	34.1	34.7	35.2	35.8	36.5	37.1	37.7
Limit	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0

Peak load at Gwawley Bay is not forecast to exceed licence capacity until winter 2014.

Port Hacking STS

Port Hacking STS has a firm capacity of 120MVA in both summer and winter and its peak load forecast is shown below:



	Actual						Forecast						
	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15
SUMMER													
Load	92.7	92.7	109.4	89.6	109.6	90.8	108.3	102.5	103.4	103.4	103.6	103.6	103.7
Limit	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
WINTER	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Load	91.1	107.3	97.2	97.2	112.9	118.8	121.4	117.5	120.1	122.4	124.9	127.4	129.9
Limit	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0

Loading at Port Hacking STS is winter critical and the substation is forecast to be loaded above its N - 1 capacity in winter 2009 before load relief is achieved via load transfers from Jannali to Kirrawee in 2009/10. This load transfer has been included above.

Following this transfer, winter peak loading is again expected to exceed N - 1 capacity at Port Hacking in winter 2011.

2.2.2. Asset Condition Issues

Gwawley Bay 33/11kV Zone Substation

The following asset condition issues exist at Gwawley Bay zone:

- The 11kV circuit breakers at Gwawley Bay date from 1972 and have been prioritised for replacement in the short term due to age; and
- Three 33kV circuit breakers are bulk oil type and are at the end of their service life and require replacement by 2012.

3. OPTIONS

The development strategy for the Gwawley Bay load area is driven by the need to:

- Provide sufficient capacity to maintain loading at Gwawley Bay zone substation and Port Hacking STS within licence conditions and to meet forecast load growth for the medium term;
- Address condition issues associated with the 33kV circuit breakers at Gwawley Bay zone; and
- Address condition issues associated with the 11kV circuit breakers at Gwawley Bay zone.

The Sutherland supply area was previously analysed which formed part of the recent 2009 to 2014 Regulatory Submission. The conversion of Gwawley Bay to 132/11kV operation was a common project across all supply strategies that were analysed.

Consideration of alternative supply options must consider the future requirement to provide the 2nd 33kV circuit for Caringbah zone, given the existing supply arrangement (normal supply from Kurnell and backup from Port Hacking), potential retirement of 33kV infrastructure at Kurnell STS and timing requirements associated with the future Cronulla ZS upgrade and feeder 912/284 reconductoring.

Three "base" options are available for the 132kV connection of Gwawley Bay (all options assume one 132kV supply is provided by tee connection from feeder 917):

- Option 1 - UG supply: Development of new 132kV UG feeder from Port Hacking STS;
- Option 2 - OH supply: Reconductoring of existing 33kV feeder 725 to 132kV operation; and
- Option 3 - Hybrid supply: Development of Gwawley Bay as 132/33/11kV hybrid substation.

There are numerous permutations of supply strategies available given the future Caringbah, Kurnell STS and feeder 912 works. Accordingly, there are 5 supply options that have been identified to address the above issues which are presented in the table below:

Gwawley Bay Options Matrix						
OPTION	GWAWLEY BAY 132kV SUPPLY	GWAWLEY BAY BUSBAR (Y / N)	CARINGBAH 2ND 33kV FDR	FEEDER 912 UPGRADE	CRONULLA UPGRADE	LT CARINGBAH TO CRONULLA (8MVA)
1	UG	Y	Port Hacking	2027	2012	2030+
2a	OH	Y	Port Hacking	2027	2012	2030+
2b			Kurnell	2029	2012	2015
3a	Hybrid	N	Port Hacking	2016	2012	2030+
3b			Kurnell	2022	2012	2015

Economic analysis of these options can be found in Appendix A

These options are described in the following sections.

3.1. Consideration of Demand Management

A Demand Management investigation to determine the feasibility of deferring the Gwawley Bay development through DM methods was first initiated in 2006. A revised Demand Management investigation was initiated in January 2009 to cater for a more detailed project scope and revised load forecast.

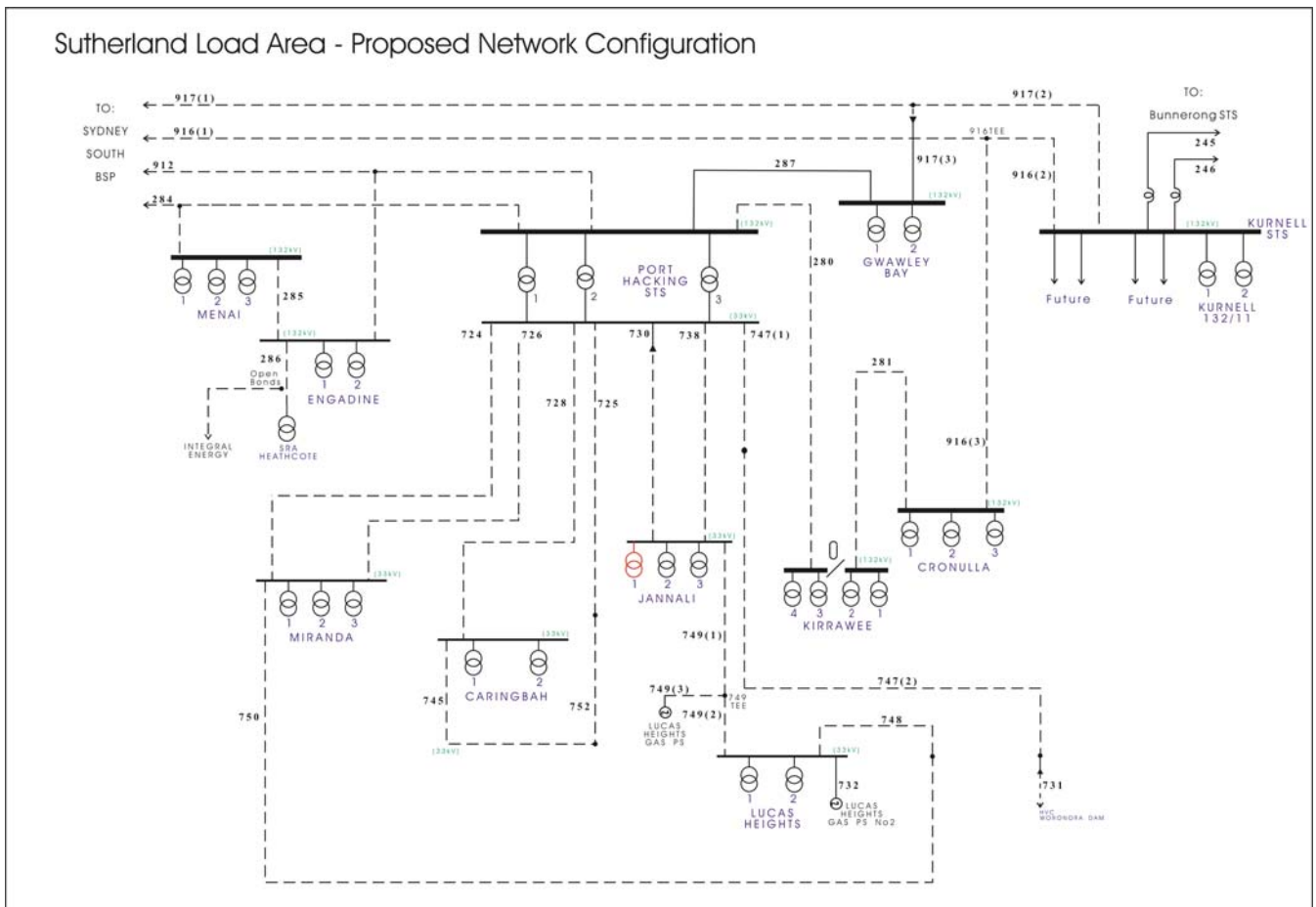
In order to defer the proposed investment by one year, a demand reduction of 0.1MVA would need to be implemented at Port Hacking STS before winter 2011. Subsequent one year deferrals beyond winter 2012 require an incremental winter demand reduction of 2.5MVA per year.

Due to the small amount of DM required, it is considered reasonable to expect that a deferral of at least one year is achievable. Implementation of the Demand Management solution will be incorporated into the development of the proposed supply option.

3.2. Option 1: New 132kV UG Feeder from Port Hacking STS

Option 1 involves a full 132/11kV conversion of the existing Gwawley Bay zone substation with 132kV connections to be provided by a tee connection from feeder 917 (Sydney South BSP to Kurnell STS) and a new 132kV underground feeder from Port Hacking STS. A new 132kV feeder bay is required at Port Hacking STS to accommodate this new Gwawley Bay feeder.

Sutherland Load Area - Proposed Network Configuration



The new Gwawley Bay 132/11kV zone would be equipped with a new 132kV GIS busbar and initially two 37.5MVA transformers.

Following the completion of the Gwawley Bay conversion, subsequent projects under this strategy are:

- 2012 - Augmentation of Cronulla 132/11kV zone - installation of additional transformer and associated 11kV switchgear (accelerated due to revised load forecast);
- 2014 - Caringbah 2nd 33kV feeder - achieved by rebonding of existing 33kV feeders 725, 752 and 745;
- 2027 - Reconductoring of feeder 912 and 284;

The estimated capital cost of the Gwawley Bay component of this strategy is \$25.9M.

The estimated capital cost of this strategy is \$44.3M.

3.3. Option 2a: New 132kV OH Feeder Port Hacking STS & 2nd Caringbah 33kV Feeder from Port Hacking STS

Option 2a involves a full 132/11kV conversion of the existing Gwawley Bay zone substation with 132kV connections to be provided by a tee connection from feeder 917 (Sydney South BSP to Kurnell STS) and a new 132kV overhead feeder from Port Hacking STS. The new 132kV overhead feeder will be achieved via the uprating of the existing 725 33kV circuit that supplies the existing Gwawley Bay 33/11kV zone. A new 132kV feeder bay is required at Port Hacking STS to accommodate this new Gwawley Bay feeder.

The new Gwawley Bay 132/11kV zone would be equipped with a new 132kV GIS busbar and initially two 37.5MVA transformers.

Following the completion of the Gwawley Bay conversion, subsequent projects under this strategy are:

- 2012 - Augmentation of Cronulla 132/11kV zone - installation of additional transformer and associated 11kV switchgear (accelerated due to revised load forecast);
- 2014 - Caringbah 2nd 33kV feeder - achieved by developing a new 33kV underground feeder from Port Hacking STS to the Gwawley Bay site and connection with existing 33kV overhead feeders 752 and 745;

- 2027 - Reconductoring of feeder 912 and 284;

The estimated capital cost of the Gwawley Bay component of this strategy is \$22.1M.

The estimated capital cost of this strategy is \$47.0M.

3.4. Option 2b: New 132kV OH Feeder Port Hacking STS & 2nd Caringbah 33kV Feeder from Kurnell STS

Option 2b involves a full 132/11kV conversion of the existing Gwawley Bay zone substation with 132kV connections to be provided by a tee connection from feeder 917 (Sydney South BSP to Kurnell STS) and a new 132kV overhead feeder from Port Hacking STS. The new 132kV overhead feeder will be achieved via the uprating of the existing 725 33kV circuit that supplies the existing Gwawley Bay 33/11kV zone. A new 132kV feeder bay is required at Port Hacking STS to accommodate this new Gwawley Bay feeder.

The new Gwawley Bay 132/11kV zone would be equipped with a new 132kV GIS busbar and initially two 37.5MVA transformers.

Following the completion of the Gwawley Bay conversion, subsequent projects under this strategy are:

- 2012 - Augmentation of Cronulla 132/11kV zone - installation of additional transformer and associated 11kV switchgear (accelerated due to revised load forecast);
- 2014 - Caringbah 2nd 33kV feeder - achieved by maintaining the existing supply arrangement (ie normal supply from Kurnell STS with backup from Port Hacking). Under this arrangement, the full retirement of the Kurnell 33kV infrastructure is not possible since it is necessary to retain one STS transformer and 33kV circuit breaker at Kurnell to maintain the Caringbah supply;
- 2029 - Reconductoring of feeder 912 and 284;

The estimated capital cost of the Gwawley Bay component of this strategy is \$22.1M.

The estimated capital cost of this strategy is \$42.8M.

3.5. Option 3a - Hybrid Gwawley Bay 132/33/11kV Zone & 2nd Caringbah 33kV Feeder from Port Hacking STS

Option 3a involves the development of Gwawley Bay as a hybrid 132/33/11kV substation. Initially, subtransmission connections will be provided by a tee from feeder 917 for the 132kV supply with the backup 33kV supply via the existing 33kV feeder 725 from Port Hacking STS. The additional 132kV feeder bay is not immediately required at Port Hacking STS under this arrangement.

Full conversion to 132/11kV is not required until 2023+.

Following the completion of the Gwawley Bay conversion, subsequent projects under this strategy are:

- 2012 - Augmentation of Cronulla 132/11kV zone - installation of additional transformer and associated 11kV switchgear (accelerated due to new forecast);
- 2014 - Caringbah 2nd 33kV feeder - achieved by developing a new 33kV underground feeder from Port Hacking STS to the Gwawley Bay site and connection with existing 33kV overhead feeders 752 and 745;
- 2016 - Reconductoring of feeder 912 and 284;

The estimated capital cost of the Gwawley Bay component of this strategy is \$16.3M (initial arrangement only).

The estimated capital cost of this strategy is \$53.5M.

3.6. Option 3b - Hybrid Gwawley Bay 132/33/11kV Zone & 2nd Caringbah 33kV Feeder from Kurnell STS

Option 3b involves the development of Gwawley Bay as a hybrid 132/33/11kV substation. Initially, subtransmission connections will be provided by a tee from feeder 917 for the 132kV supply with the backup 33kV supply via the existing 33kV feeder 725 from Port Hacking STS. The additional 132kV feeder bay is not immediately required at Port Hacking STS under this arrangement.

Full conversion to 132/11kV is not required until 2023+.

Following the completion of the Gwawley Bay conversion, subsequent projects under this strategy are:

- 2012 - Augmentation of Cronulla 132/11kV zone - installation of additional transformer and associated 11kV switchgear (accelerated due to revised load forecast);
- 2014 - Caringbah 2nd 33kV feeder - achieved by maintaining the existing supply arrangement (ie normal supply from Kurnell STS with backup from Port Hacking). Under this arrangement, the full retirement of the Kurnell 33kV infrastructure is not possible since it is necessary to retain one STS transformer and 33kV circuit breaker at Kurnell to maintain the Caringbah supply;
- 2022 - Reconductoring of feeder 912 and 284;

The estimated capital cost of the Gwawley Bay component of this strategy is \$16.3M.

The estimated capital cost of this strategy is \$49.6M.

4. APPLICATION OF THE REGULATORY TEST

A preliminary economic analysis has been carried out using Net Present Cost (NPC) analysis for each of the five options.

The economic analysis incorporates:

- Capital costs;
- Operation and Maintenance (O&M) costs;
- Sensitivities to changing:
 - Discount factor.
 - Contracted Services costs;
 - Labour costs;
 - Materials costs; and
 - Load growth rates.

The unserved energy benefits do not vary materially between options and have thus been excluded from analysis.

4.1. Base Case Analysis

The results of the base case economic analysis using a discount factor of 8.5% are summarised in Table 1 below.

Table 1 - Comparison of Options – Base Case

Option	Description	Capital Cost (\$M)*	NPV of Costs (\$M)*
Option 1	New 132kV UG Feeder from Port Hacking STS	44.3	30.8
Option 2a	New 132kV OH Feeder from Port Hacking STS & 2nd Caringbah 33kV Feeder from Port Hacking STS	47.0	32.4
Option 2b	New 132kV OH Feeder from Port Hacking STS & 2nd Caringbah 33kV Feeder from Kurnell STS	42.8	30.1
Option 3a	Hybrid Gwawley Bay 132/33/11kV Zone & 2nd Caringbah 33kV Feeder from Port Hacking STS	53.5	33.3
Option 3b	Hybrid Gwawley Bay 132/33/11kV Zone & 2nd Caringbah 33kV Feeder from Kurnell STS	49.6	30.3

The analysis above indicates that the NPV of Option 3 is the least cost solution under the base case scenario.

4.2. Sensitivity Analysis

The base case and the range over which sensitivity checks were conducted are shown in Table 2.

Table 2 - Base Case Values and Range of Values Used in Sensitivity Checks

Parameter	Base Case Value	Sensitivity Checks at
Discount Factor	8.5%	7.0% and 10.0%
Contracted services costs	100%	75% and 125%
Labour costs	100%	75% and 125%
Materials costs	100%	75% and 125%
Load growth	100%	75% and 125%*

The results of sensitivity analysis are displayed in Table 3 below.

* Including future works covering the long term strategy for the area.

Variation in annual load growth rate from the base rate.

* Load growth sensitivity checks at +/- 25% of the nominal load growth rate.

Table 3 - Sensitivity Analysis: Comparison of Options

Scenario	Description	Sensitivity Study - NPV (\$M)					Option 1 % diff from least cost
		Option 1	Option 2a	Option 2b	Option 3a	Option 3b	
		UG from Port Hacking	OH from Port Hacking, Caringbah 2nd fdr from Port Hacking	OH from Port Hacking, Caringbah 2nd fdr from Kurnell	Hybrid, Caringbah from Port Hacking	Hybrid, Caringbah from Kurnell	
1	Base case (real)	30.8	32.4	30.1	33.3	30.3	2.5%
2	Base case (nominal)	32.1	33.6	31.2	34.8	31.5	2.7%
3	7% Discount Factor	33.3	35.2	32.6	36.6	33.5	2.4%
4	10% Discount Factor	28.7	30.1	27.9	30.5	27.6	3.7%
5	-25% contracted services	30.2	31.9	29.8	32.7	30.0	1.2%
6	+25% contracted services	30.9	32.4	30.1	33.3	30.2	2.6%
7	-25% labour	30.2	31.6	29.4	32.4	29.4	2.9%
8	+25% labour	30.3	31.9	29.7	32.9	29.9	2.0%
9	-25% materials	29.7	31.1	28.9	32.1	29.2	2.9%
10	+25% materials	30.1	31.7	29.5	32.7	29.7	2.0%
11	-25% load growth	30.2	31.5	29.2	32.1	29.0	4.0%
12	+25% load growth	30.9	32.5	30.2	33.5	30.5	2.6%

Comparison of Option 1 vs the least cost option under each sensitivity condition has been included in the table above.

Option 2b is the least cost option under the majority of the sensitivity conditions analysed. However, due to the small percentage difference of Option 1 against the least cost option under each condition and the inherent accuracy of planning estimates used in the above analysis (+/- 25% to +/-40%, Option 1, Option 2b and Option 3b are regarded as **equivalent-cost** options.

Option 1 allows an elegant method of developing the 2nd Caringbah 33kV feeder and provides an increase in licence capacity at Caringbah. Furthermore, Option 1 enables the full decommissioning of the 33kV infrastructure at Kurnell STS, as opposed to Options 2b and 3b which require retention of a single 60MVA 132/33kV transformer and installation of a new 33kV circuit breaker to supply a single zone substation. This Kurnell STS transformer would be operated at less than 50% utilisation up until 2025, given the present rate of load growth at Caringbah zone.

5. CONCLUSION

Option 1 is the preferred supply option due to the reasons outlined in section 4.2 above. Accordingly, subject to comments received during consultation, EnergyAustralia favours Option 1 - Conversion of Gwawley Bay to 132/11kV operation and development of a new 132kV underground feeder from Port Hacking STS at an estimated capital cost of \$25.9M.

6. CONTACT DETAILS FOR SUBMISSIONS AND ENQUIRIES

This report recommends the construction of a new large network asset. In accordance with the National Electricity Rules, EnergyAustralia seeks written submission from interested parties on this Application Notice. The closing date for submissions is 30th April 2009.

Submissions or enquires should be directed to:

John Hele

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7. APPENDIX A – ECONOMIC ANALYSIS OF BASE CASE

WACC = 0.085

Option 1 - UG feeder from Port Hacking

Description	NPV	CAPEX	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031		
Gwawley Bay																												
New Gwawley Bay 132/11kV zone + GIS busbar	11.16	15.48	-	-	-	0.43	14.40	0.65																				
Feeder 917 tee to Gwawley Bay	0.99	1.38	-	-	-	0.04	1.26	0.08																				
New 132kV UG feeder PH to Gwawley Bay	5.66	7.84	-	-	-	0.27	7.30	0.27																				
New 132kV feeder bay @ PH STS	0.85	1.18	-	-	-	-	1.09	0.09																				
O&M	1.61		-	-	-	-	-	0.21	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	
Caringbah 2nd 33kV feeder																												
Rebond 725 / 752 / 745 for 2nd Caringbah 33kV feeder	0.04	0.07	-	-	-	-	0.01	0.06																				
O&M	0.00		-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cronulla augmentation																												
Install 3rd Tx @ Cronulla	8.21	11.50	-	-	-	-	9.92	1.58																				
LT 8MVA Caringbah to Cronulla	0.25	1.62	-	-	-	-	-	-																	0.12	1.50		
O&M	0.90		-	-	-	-	-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
Uprate feeder 912																												
Reconductor feeder 912	1.12	5.26	-	-	-	-	-	-																				
O&M	0.03		-	-	-	-	-	-																		0.40	4.86	
			-	-	-	-	-	-																		0.02	0.05	
			-	-	-	-	-	-																		0.05	0.05	
TOTAL	30.83	44.33	-	-	-	0.74	33.97	2.68	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.40	4.86	

2009-14 Reg CAPEX total: 37.45

Option 2a - OH feeder from Port Hacking, Caringbah from Port Hacking

Description	NPV	CAPEX	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031		
Gwawley Bay																												
New Gwawley Bay 132/11kV zone + GIS busbar	11.16	15.48	-	-	-	0.43	14.40	0.65																				
Feeder 917 tee to Gwawley Bay	0.99	1.38	-	-	-	0.04	1.26	0.08																				
Reconductor feeder 725 to 132kV	2.88	4.06	-	-	-	-	3.27	0.79																				
New 132kV feeder bay @ PH STS	0.85	1.18	-	-	-	-	1.09	0.09																				
O&M	1.60		-	-	-	-	-	0.22	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	
Caringbah 2nd 33kV feeder																												
New 33kV UG feeder to G/Bay site + rebond 752 / 745	4.16	6.51	-	-	-	-	3.18	3.33																				
O&M	0.17		-	-	-	-	-	-	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cronulla augmentation																												
Install 3rd Tx @ Cronulla	8.21	11.50	-	-	-	-	9.92	1.58																				
LT 8MVA Caringbah to Cronulla	0.25	1.62	-	-	-	-	-	-																		0.12	1.50	
O&M	1.01		-	-	-	-	-	0.15	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Uprate feeder 912																												
Reconductor feeder 912	1.12	5.26	-	-	-	-	-	-																				
O&M	0.03		-	-	-	-	-	-																			0.40	4.86
			-	-	-	-	-	-																			0.02	0.05
			-	-	-	-	-	-																			0.05	0.05
TOTAL	32.44	46.99	-	-	-	0.47	29.94	6.37	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	4.86	

2009-14 Reg CAPEX total: 40.11

Note: All amounts are quoted in real 2007/08 dollars.

Option 2b - OH feeder from Port Hacking, Caringbah from Kurnell

Description	NPV	CAPEX	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Gwawley Bay																											
New Gwawley Bay 132/11kV zone + GIS busbar	11.16	15.48	-	-	-	0.43	14.40	0.65																			
Feeder 917 tee to Gwawley Bay	0.99	1.38	-	-	-	0.04	1.26	0.08																			
Reconductor feeder 725 to 132kV	2.88	4.06	-	-	-	-	3.27	0.79																			
New 132kV feeder bay @ PH STS	0.85	1.18	-	-	-	-	1.09	0.09																			
O&M	1.60		-	-	-	-	-	-	0.22	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Caringbah 2nd 33kV feeder																											
Install 1 x 33kV CB @ Kurnell STS for Caringbah 2nd fdr	0.17	0.27	-	-	-	-	-	-	0.27																		
Purchase 132/33kV Tx - Kurnell to Caringbah 2nd 33kV fdr opportunity cost	1.34	2.19	-	-	-	-	-	-	2.19																		
O&M	0.16		-	-	-	-	-	-	-	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cronulla augmentation																											
Install 3rd Tx @ Cronulla	8.21	11.50	-	-	-	-	9.92	1.58																			
LT 8MVA Caringbah to Cronulla	0.74	1.31	-	-	-	-	-	-	-	1.31																	
O&M	0.97		-	-	-	-	-	-	0.14	0.15	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Uprate feeder 912																											
Reconductor feeder 912	0.98	5.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.41	4.97		
O&M	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.05	
TOTAL	30.07	42.75	-	-	-	0.47	29.94	3.19	2.46	1.31	-	-	-	-	-	-	-	-	-	-	-	-	0.41	4.97	-	-	

2009-14 Reg CAPEX total: 36.06

Option 3a - Hybrid Gwawley Bay, Caringbah from Port Hacking

Description	NPV	CAPEX	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Gwawley Bay																											
Hybrid Gwawley Bay 132/33/11kV zone	10.78	14.95	-	-	-	0.43	13.87	0.65																			
Feeder 917 tee to Gwawley Bay	0.99	1.38	-	-	-	0.04	1.26	0.08																			
O&M	1.25		-	-	-	-	-	-	0.19	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Caringbah 2nd 33kV feeder																											
New 33kV UG feeder to G/Bay site + rebond 752 / 745	4.16	6.52	-	-	-	-	-	3.18	3.34																		
O&M	0.17		-	-	-	-	-	-	-	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cronulla augmentation																											
Install 3rd Tx @ Cronulla	8.21	11.50	-	-	-	-	9.92	1.58																			
LT 8MVA Caringbah to Cronulla	0.27	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	1.50		
O&M	0.90		-	-	-	-	-	-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Uprate feeder 912																											
Reconductor feeder 912	2.44	4.66	-	-	-	-	-	-	-	0.35	4.31																
O&M	0.18		-	-	-	-	-	-	-	-	-	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Gwawley Bay hybrid to full 132kV conversion																											
Reconductor feeder 725 to 132kV	1.30	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.62	0.88								
New 132kV feeder bay @ PH STS	0.37	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.15	0.10								
Gwawley Bay hybrid to full 132kV conversion	2.08	7.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.57	0.54								
O&M	0.20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.15	0.15	0.15	0.15	0.15	0.15	
TOTAL	33.32	53.49	-	-	-	0.47	25.05	5.49	3.34	0.35	4.31	-	0.00	0.00	0.00	0.00	0.00	11.34	1.52	-	-	-	-	0.12	1.50	-	

2009-14 Reg CAPEX total: 34.35

Note: All amounts are quoted in real 2007/08 dollars.

Option 3b - Hybrid Gwawley Bay, Caringbah from Kurnell

Description	NPV	CAPEX	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
Gwawley Bay																											
Hybrid Gwawley Bay 132/33/11kV zone	10.78	14.95	-	-	-	0.43	13.87	0.65																			
Feeder 917 tee to Gwawley Bay	0.99	1.38	-	-	-	0.04	1.26	0.08																			
O&M	1.25		-	-	-	-	-	-	0.19	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Caringbah 2nd 33kV feeder																											
Install 1 x 33kV CB @ Kurnell STS for Caringbah 2nd fdr	0.17	0.27	-	-	-	-	-	-	0.27																		
Purchase 132/33kV Tx - Kurnell to Caringbah 2nd 33kV fdr opportunity cost	1.34	2.19	-	-	-	-	-	-	2.19																		
O&M	0.16		-	-	-	-	-	-	-	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cronulla augmentation																											
Install 3rd Tx @ Cronulla	8.21	11.50	-	-	-	-	9.92	1.58																			
LT 8MVA Caringbah to Cronulla	0.81	1.42	-	-	-	-	-	-	0.11	1.31																	
O&M	0.98		-	-	-	-	-	-	0.14	0.15	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Uprate feeder 912																											
Reconductor feeder 912	1.60	4.98	-	-	-	-	-	-	-	-	-	-	-	-	-	0.38	4.6										
O&M	0.09		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Gwawley Bay hybrid to full 132kV conversion																											
Reconductor feeder 725 to 132kV	1.30	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.62	0.88								
New 132kV feeder bay @ PH STS	0.37	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.15	0.1								
Gwawley Bay hybrid to full 132kV conversion	2.08	7.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.57	0.54								
O&M	0.20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.15	0.15	0.15	0.15	0.15	0.15	
TOTAL	30.32	49.55	-	-	-	0.47	25.05	2.31	2.57	1.31	-	-	-	-	-	0.38	4.60	11.34	1.52	-	-	-	-	-	-	-	

2009-14 Reg CAPEX total: 30.40

Note: All amounts are quoted in real 2007/08 dollars.