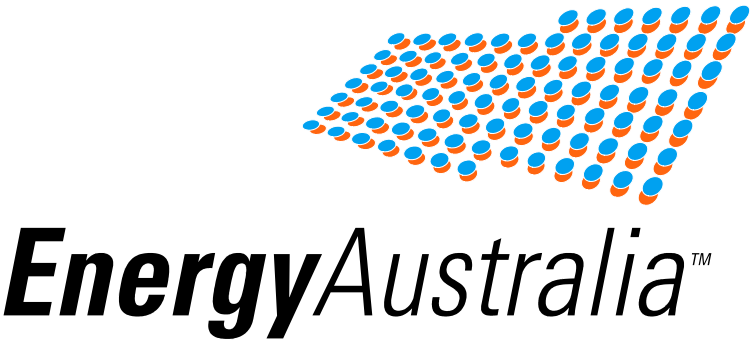
Transmission
Annual Planning Report
2005



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1. EXECUTIVE SUMMARY

EnergyAustralia operates 132kV and 66kV transmission networks that provide support to TransGrid's network. From 1st February 2000 parts of EnergyAustralia's system became transmission assets and consequently EnergyAustralia became both a Transmission Network Service Provider (TNSP) and a Distribution Network Service Provider (DNSP).

The Annual Planning report provides information about the transmission network to Code Participants and interested parties. It includes information on the demand forecasts, the existing electricity system, future constraints, committed developments, and potential network developments.

EnergyAustralia is currently undertaking joint planning with both TransGrid and other DNSPs to identify augmentation options for the number of future constraints highlighted in this document. EnergyAustralia expects to initiate consultation processes for a number of constraints over the next 12 months, so that corrective action can be taken within the necessary timeframe.

None of the constraints, which may require corrective action involving a new small network asset, would require such corrective action in the 2005-6 financial year. Accordingly, EnergyAustralia cannot apply the Regulatory test to any proposed new small network assets. Thus no details of the rankings and regulatory test to new small network assets are included in this year's report.

None of the constraints or projects contained in the following report has a material inter-network impact.

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2. INTRODUCTION

EnergyAustralia operates 132kV and 66kV transmission networks that provide support to TransGrid's network. Until 1st February 2000 EnergyAustralia's entire network was classified as a distribution network for the purposes of the National Electricity Code (NEC). From 1st February 2000 parts of EnergyAustralia's system became transmission assets and consequently EnergyAustralia became both a Transmission Network Service Provider (TNSP) and a Distribution Network Service Provider (DNSP).

As a TNSP, EnergyAustralia is required to carry out an annual planning review with DNSP's connected to its transmission system in accordance with Clause 5.6.2 of the NEC. EnergyAustralia as a DNSP is involved in annual planning reviews with both its own transmission business and TransGrid. Where the necessity for augmentation or extension is identified in this review, joint planning must be undertaken to determine plans that can be considered by code participants and interested parties.

The Annual Planning report provides information about the transmission network to Code Participants and interested parties. It includes information on the demand forecasts, the existing electricity system, future constraints, committed developments, and potential network developments.

EnergyAustralia is currently undertaking joint planning with both TransGrid and other DNSPs to identify augmentation options for the number of future constraints highlighted in this document. EnergyAustralia expects to initiate consultation processes for a number of highlighted constraints over the next 12 months, so that corrective action can be taken within the necessary timeframe.

All the augmentation projects described in this report are reliability projects. None of the projects contained in the following report have a material inter-network impact.

This Annual Planning Report sets out the results of EnergyAustralia's annual planning review. It aims to provide information to interested parties to:

- Formulate and propose options on the future developments of the Transmission network
- Highlight locations that may benefit from demand side management (DSM) and local generation initiatives

2. 1. PLANNING PROCESS

The National Electricity Code sets out the planning process and consultation requirements in chapter 5.6. This includes requirements on forecasting, annual reviews, regulatory tests and consultations.

EnergyAustralia's own Network Management Plan provides the framework to ensure an adequate, reliable, and safe supply of electricity of appropriate quality.

This Network Management Plan documents the objectives, strategies and initiatives developed for the management of EnergyAustralia's transmission (and distribution) systems. It does this by providing;

- A description of the asset investment and management strategies, principal procedures, processes and standards used to manage EnergyAustralia's network
- A description of initiatives to improve existing strategies- particularly demand management and reliability improvements that complement EnergyAustralia's submissions to IPART and ACCC
- Details on how EnergyAustralia complies with the Codes, Standards and Guidelines nominated by the Department of Energy, Utilities, and Sustainability (DEUS).

A copy of the Network Management Plan is available on EnergyAustralia's website at *http://www.energy.com.au/energy/ea.nsf/Content/Network+Network+and+Safety+Plans*

The main inputs to the planning process are:

- The forecast of electricity demand
- Review of network capacity and utilisation
- Planning criteria and indicators
- Condition assessments
- Analysis of loadflows on the transmission network
- TransGrid planning review

3. FORECAST

EnergyAustralia has a well developed set of forecasting processes that are consistent with national industry practices.

These provide a 10 year forecast of peak demand. EnergyAustralia transmission forecasts are developed in conjunction with the distribution forecasts. Sources for the forecast include actual loads from historical data and zone forecasts provided from DNSPs, which are aggregated and diversified, based on historical diversification factors. The forecasts indicate that continued demand growth is expected to continue throughout the network.

Forecast loads on EnergyAustralia's transmission network are tabulated below. They have been grouped into 3 geographical regions for convenience. The regions are Sydney Metropolitan area, Central Coast area and the Hunter region.

3. 1. SYDNEY METROPOLITAN AREA

3.1.1. Winter Peak Demand (MW) by Substation

Transmission Substation Loads

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bunnerong	264.0	255.3	253.8	250.2	250.1	248.5	248.5	248.4	248.4	248.3	248.2
Campbell St	14.2	24.1	24.5	25.0	31.8	32.4	33.0	33.7	34.3	34.9	35.6
Canterbury	164.0	168.2	171.0	173.9	176.8	179.7	182.7	185.8	188.9	192.0	195.2
Drummoyne	48.7	51.7	54.4	57.1	60.0	63.0	66.2	69.6	73.1	76.8	80.7
Green Square	0.0	0.0	9.5	20.4	23.9	23.9	24.0	24.1	24.1	24.2	24.3
Homebush Bay	34.2	39.0	36.2	38.1	40.0	42.1	44.2	46.5	48.8	51.3	53.9
Macquarie Park	49.2	48.9	45.7	47.9	50.1	52.4	54.9	57.4	60.1	62.9	65.9
Marrickville	53.5	51.7	51.5	51.3	51.1	50.9	50.8	50.6	50.4	50.2	50.1
Meadowbank	61.9	64.6	75.6	78.2	78.0	77.8	77.7	77.5	77.3	77.1	77.0
Peakhurst	253.9	238.4	244.8	254.4	261.4	264.7	268.1	271.5	275.0	278.4	282.0
Pyrmont	75.0	80.8	80.7	80.7	38.3	35.8	35.8	35.8	35.8	35.8	35.8
Rozelle	13.0	17.5	17.6	17.8	17.9	18.0	18.1	18.2	18.4	18.5	18.6
St. Peters	63.0	62.1	60.3	58.5	59.3	60.1	60.9	61.7	62.5	63.3	64.2

Distribution Loads Connected to EA's 132kV Transmission Network

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Burwood	69.1	71.9	75.1	78.4	81.9	85.6	89.4	93.4	97.5	101.9	106.4
City Central	91.5	98.8	108.6	114.7	117.5	118.6	119.5	119.7	123.0	116.0	115.6
City North	0.0	0.0	0.0	0.0	43.8	46.0	45.9	78.4	80.6	102.7	102.4
City South	125.9	135.4	138.2	133.4	135.9	136.8	139.0	129.3	132.0	132.4	132.0
Clovelly	62.9	60.1	61.4	62.6	63.9	65.2	66.6	68.0	69.4	70.8	72.3
Dalley Street	118.1	119.7	118.0	123.4	125.6	128.2	134.4	123.5	123.1	120.3	120.0
Darling Harbour	41.7	45.2	47.7	50.2	52.9	55.8	58.8	62.0	65.3	68.8	72.5
Double Bay	54.4	54.8	56.8	55.6	55.7	55.8	55.9	56.0	56.1	56.2	56.3
Flemington	57.4	62.4	66.4	67.4	68.4	69.5	70.6	71.7	72.8	73.9	75.1
Homebush	99.0	103.4	110.9	113.7	116.6	119.6	122.7	125.8	129.1	132.4	135.8
Strathfield	51.0	55.6	56.9	58.1	50.5	51.6	52.7	53.9	55.1	56.3	57.6
Surry Hills	230.0	226.8	227.2	227.6	221.2	221.5	221.9	222.3	222.7	223.1	223.5
Zetland	81.2	82.7	94.0	95.7	100.0	101.8	103.6	105.4	107.3	109.2	111.2

3.1.2. Summer Peak Demand (MW) by Substation

Transmission Substation Loads

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bunnerong	249.0	234.8	230.0	227.6	239.3	237.4	237.4	237.3	237.3	237.3	237.3
Campbell St	0.0	33.2	33.5	33.9	40.5	40.8	41.2	41.6	42.0	42.4	42.8
Canterbury	139.0	151.2	155.9	160.6	165.6	170.6	175.8	181.2	186.8	192.5	198.4
Drummoyne	40.2	43.4	45.6	47.9	50.3	52.8	55.4	58.2	61.1	64.2	67.4
Green Square	0.0	0.0	13.8	29.6	34.2	34.3	34.4	34.5	34.5	34.6	34.7
Homebush Bay	37.8	44.7	42.5	44.6	46.9	49.2	51.7	54.3	57.0	59.9	62.9
Macquarie Park	47.8	49.3	44.8	46.9	49.0	51.3	53.6	56.1	58.7	61.4	64.2
Marrickville	52.6	57.0	56.8	56.6	56.4	56.1	55.9	55.7	55.5	55.2	55.0
Meadowbank	53.7	56.4	65.9	70.0	69.8	69.6	69.5	69.3	69.1	68.9	68.7
Peakhurst	208.0	216.1	226.7	239.7	251.5	260.3	269.5	279.0	288.8	298.9	309.4
Pyrmont	88.0	96.6	99.8	100.0	46.1	43.2	43.3	43.4	43.5	43.6	43.7
Rozelle	22.0	23.2	23.8	24.4	25.1	25.7	26.4	27.1	27.8	28.5	29.3
St. Peters	66.5	70.7	68.2	65.7	66.6	67.4	68.3	69.2	70.1	71.0	71.9

Distribution Loads Connected to EA's 132kV Transmission Network

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Burwood	66.2	68.3	71.3	74.4	77.7	81.1	84.7	88.4	92.3	96.4	100.6
City Central	124.5	134.5	147.7	156.0	159.7	161.0	162.2	162.4	166.8	157.2	156.7
City North	0.0	0.0	0.0	0.0	54.1	56.8	56.6	96.7	99.3	126.6	126.1
City South	155.8	167.4	170.8	164.9	167.9	168.9	171.6	159.5	162.8	163.2	162.6
Clovelly	56.7	54.5	55.6	56.7	57.9	59.0	60.2	61.4	62.7	63.9	65.2
Dalley Street	147.6	149.5	147.4	154.0	156.7	159.9	167.6	153.8	153.2	149.8	149.2
Darling Harbour	40.1	41.0	43.2	45.5	48.0	50.5	53.2	56.1	59.1	62.2	65.5
Double Bay	51.6	51.0	53.1	53.2	53.2	53.3	53.4	53.4	53.5	53.6	53.6
Flemington	54.6	61.4	63.6	64.6	65.6	66.5	67.5	68.6	69.6	70.6	71.7
Homebush	96.0	117.1	127.2	132.8	138.6	144.7	151.1	157.8	164.7	172.0	179.6
Strathfield	56.0	61.9	64.7	66.6	60.2	62.0	63.9	65.8	67.7	69.8	71.8
Surry Hills	253.0	218.8	220.5	223.1	218.3	220.8	223.3	225.9	228.5	231.1	233.8
Zetland	79.9	81.4	83.5	84.0	87.7	89.3	90.8	92.4	94.0	95.6	97.3

3. 2. CENTRAL COAST REGION

3.2.1. Winter Peak Demand (MW) by Substation

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Charmhaven	29.2	37.8	43.2	48.9	52.4	56.1	60.1	64.4	68.9	73.8	79.0
Gosford 66kV	135.0	129.9	133.4	137.0	140.6	144.4	148.2	152.2	156.2	160.4	164.7
Ourimbah	131.0	126.1	120.3	122.9	125.5	128.1	130.8	133.5	136.4	139.2	142.2
Somersby	13.0	17.4	18.1	18.7	19.4	20.1	20.9	21.7	22.5	23.3	24.2
West Gosford	38.7	50.5	52.8	53.7	54.6	55.5	56.5	57.4	58.4	59.3	60.3
Wyong	28.8	33.0	34.3	34.9	35.4	36.0	36.6	37.3	37.9	38.5	39.1

3.2.2. Summer Peak Demand (MW) by Substation

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Charmhaven	27.6	32.0	36.7	41.8	47.2	50.5	54.1	57.9	62.0	66.3	71.0
Gosford 66kV	120.0	115.4	124.9	133.8	141.3	149.2	157.6	166.4	175.8	185.6	196.0
Ourimbah	97.0	105.4	107.0	111.1	115.3	119.7	124.3	129.0	133.9	139.0	144.3
Somersby	13.2	16.2	22.2	23.0	23.8	24.7	25.6	26.5	27.5	28.5	29.5
West Gosford	42.9	56.2	58.1	60.0	64.7	65.7	66.8	67.9	69.0	70.1	71.2
Wyong	27.5	34.5	35.8	36.4	37.0	37.6	38.2	38.8	39.5	40.1	40.8

3. 3. HUNTER REGION

3.3.1. Winter Peak Demand (MW) by Substation

Transmission Substation Loads

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Beresfield	0.0	31.8	56.1	57.6	59.7	62.6	65.5	68.8	72.5	76.5	80.9
Kurri	135.24	100.1	99.37	101.2	104.3	106.9	104.7	107.3	110.1	112.9	115.8
Tomago	160.74	120.5	99.36	102.6	106	109.6	74.07	75.76	77.55	79.43	81.31
West Wallsend	0	0	0	0	0	5.3	10.1	13.5	14.04	14.49	17.73
Non-EA Load[1]		462.3	464.7	467.2	469.7	472.2	474.8	477.4	480.1	482.8	485.5

Distribution Loads Connected to EA's 132kV Transmission Network

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tomaree	0	0	0	0	0	0	40.8	42.11	43.62	45.03	46.62

3.3.2. Summer Peak Demand (MW) by Substation

Transmission Substation Loads

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Beresfield	0	41.4	81.88	86.48	92	97.52	104.9	111.3	119.6	127.9	137.1
Kurri	145.35	113.05	117.3	127.5	127.5	133.5	135.2	142	149.6	157.3	164.9
Tomago	133.2	129.6	101.7	107.1	112.5	117.9	86.4	90	93.6	98.1	102.6
West Wallsend	0	0	0	0	0	0	10.8	13.5	14.4	15.3	18.9
Non-EA Load		430	433	435.7	438.4	441.1	443.9	446.8	449.8	452.7	455.8

Distribution Loads Connected to EA's 132kV Transmission Network

STS / Zone	2004 Actual	2005 Forecast	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tomaree	0	0	0	0	0	0	40.8	42.11	43.62	45.03	46.62

[1] This includes HV customers and Country Energy load that is supplied from EnergyAustralia's transmission system in the Newcastle area.

4. COMMITTED DEVELOPMENTS

The following projects are committed projects, which are presently under construction.

4.1.1. 2003-2005 – Connection of 132kV Cables to TransGrid's Haymarket Substation -$55m

This project was initiated due to the constraint that a failure of TransGrid's cable 41 and any one of thirty other 132kV elements, would result in the transmission system to the inner metropolitan area of Sydney being unable to supply peak summer load.

The rearrangements and extensions of EnergyAustralia's system, which are required to complete 132kV connections to TransGrid's Haymarket substation, are still in progress.

The regulatory test for this project was published in February 2000.

4.1.2. 2005-6 Establishment of a new connection point Green Square Zone Substation to replace Alexandria (distribution) Zone Substation- $24m

EnergyAustralia's Distribution business has identified the need to replace an existing 33/11kV zone substation at Alexandria and associated 33kV cables, with a new substation known as Green Square. This new substation will form a new connection point between EnergyAustralia's distribution and transmission networks.

Construction of this substation is presently in progress.

The regulatory test for this project was published in April 2004.

5. EMERGING CONSTRAINTS

The National Electricity Code requires the annual planning report to set out 'a forecast of constraints and inability to meet the network performance requirements set out in schedule 5.1 or relevant legislation or regulations of a participating jurisdiction over 1, 3 and 5 years.' In addition, clause 5.6.2(e) of the code requires that affected code participants be notified of technical limits of the transmission system and when those limits would be exceeded, either in normal conditions or following the contingencies specified in schedule 5.1 of the code. This report has been prepared to meet those requirements.

The following table indicates the transmission system constraints highlighted in this report.

Emerging Constraints on EnergyAustralia's Transmission Network

Region	Limitation	1 year	3 year	5 year	APR
Sydney Inner Metropolitan	Failure of feeder 41 or 42 with other network element results in overloading		2006-09		5.1.2
Peakhurst	Transformer capacity		2007		5.1.3
Drummoyne	Transformer capacity		2008		5.1.4
Central Coast	132kV network thermal capacity		2008		5.2.1
Ourimbah	Transformer capacity		2008		5.2.1
West Gosford	Transformer capacity			2010	5.2.2
Lower Hunter 132kV system	132kV network thermal capacity		2007		5.3.1
Kurri	Transformer capacity		2007		5.3.2

5. 1. EMERGING RELIABILITY LIMITATIONS IN THE SYDNEY METROPOLITAN AREA

The 132kV supply to the inner metropolitan area is provided by an interconnected 132kV network linking TransGrid's 330/132kV substations at Beaconsfield West, Haymarket Sydney North and Sydney South. Total load supplied by this system is approximately 3000MW.

Much of EnergyAustralia's 132kV system is comprised of underground cables. The majority of this infrastructure was installed about 25 years ago and some important system elements are more than 40 years old. Isolated parts of the cable system require replacement in the short term. It is anticipated that some major cables may require retirement/replacement within the next decade.

The following diagram indicates the coverage of EnergyAustralia's 132kV assets. However only part of the 132kV network indicated is classed as Transmission assets in terms of this report.

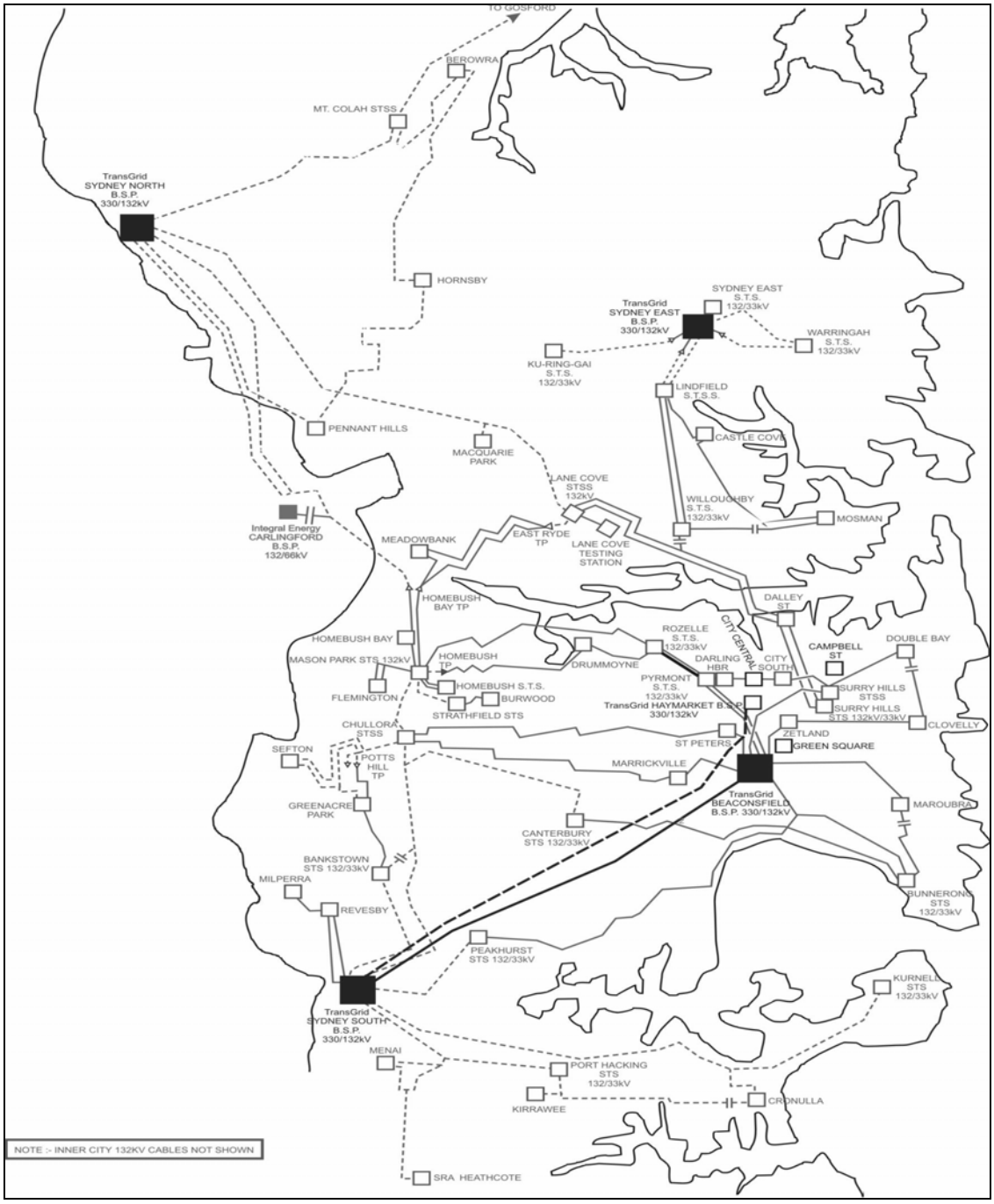

Diagram 1: The Sydney Metropolitan area 132kV network. This displays EnergyAustralia's 132kV transmission and distribution feeders along with key TransGrid feeders.

5.1.1. 2008 Replacement of Feeders 908 and 909

Issue (Replacement driven)

Feeders 908 and 909 are gas filled cables running between Canterbury and Bunnerong. These cables were commissioned in 1956.

Refurbishment of many of the joints on this cable was carried out in the late 1990's following a number of extended outages on these circuits. Further failure of this circuit occurred in late 2002, which resulted in the circuit being out of service for more than 3 months. The cable has again failed and was out of service at the time this report was published. The replacement of these circuits is scheduled for 2008.

Options

Possible options for the replacement of these cables are:
1. Two new cables running between Kurnell and Bunnerong- $45m
2. Replace with two new cables from Canterbury to Bunnerong- $60m

Work is presently in progress to assess these options.
Whilst this project is driven by the need to replace ageing cables, it is likely the new circuits will also provide an increase in capacity over the existing cables. The incremental cost of increased capacity is expected to be about $5m.

5.1.2. Sydney Inner Metropolitan System

Constraint

Failure of either cable 41 or cable 42 and any of thirty other critical circuits or transformers would result in parts of the remaining network to become overloaded. Action will be required between 2006-2009 to avoid overloading the interconnected 132kV system supplying this area.

Options

Joint planning (with TransGrid) to alleviate this constraint is presently in progress. Some of the possible options include:

1. Optimisation of power flows in the network through the installation of series reactors and/or phase shifting transformers.
2. Reinforcing the 132kV interconnected network
3. Local generation
4. Establishment of an additional TransGrid 330/132kV substation
5. Demand Management (DM) solutions and non network options

In the short to medium term, optimisation of power flows by EnergyAustralia in conjunction with increased transformer capacity by TransGrid at Sydney South is anticipated to be the most cost effective network solution. This will involve a program of minor works.

In the longer term it is anticipated that TransGrid will need to establish a new 330/132kV substation in the Homebush/Chullora area. In conjunction with this work, modification and augmentation of EnergyAustralia's system will be required. The costs will vary with the adopted strategy. EnergyAustralia costs are anticipated to be in the region of $30-40m over 5 years.

Possibilities that significant network expenditure associated with this project could be deferred through DM or contracting with large co-generators for network support will be investigated.

5.1.3. 2007 Peakhurst STS Transformer Capacity

Constraint

Load in the St George area has been growing rapidly in recent years. A large number of high density residential and commercial developments have occurred and are planned for the future. Peakhurst STS supplies an area covering Oatley to Sans Souci and Rockdale areas. Current forecasts indicate Peakhurst will be constrained in winter 2007.

Discussions with EnergyAustralia DNSP indicate large growth in the region has also resulted in high loading on the distribution network in the St George area.

Options

Joint planning (with EnergyAustralia DNSP) has been initiated to consider a strategy for the St George area including demand management alternatives.

In the short term it is planned to address loading summer loading issues through the use of increased power factor correction on the distribution system.

Possible options in the medium term are:

1. Load reductions via a distribution network solution
2. Establishment of new connection point (see Section 6.1.3).

The most likely option will be a new connection point. This will be a new large network asset. The cost of possible distribution or transmission options will be around $20m

It is expected that the regulatory test for this asset will be published in 2005.

A review of non-network options is also in progress.

5.1.4. 2008 Drummoyne 132/11kV Zone Substation Transformer Capacity

Constraint

Urban renewal has resulted in increasing amounts of medium/high density residential development in the Drummoyne/Concord area. Load increases associated with these developments are forecast to result in the loading at Drummoyne substation exceeding

acceptable risk levels in 2008. Distribution substations in the area around Drummoyne are also becoming constrained.

Options

Joint planning (with EnergyAustralia DNSP) has been initiated to consider a strategy for the Drummoyne/Concord area including demand management alternatives and non-network options.

Possible options are:

1. Load reductions via a distribution network solution
2. Installation of an additional transformer and 11kV switchgear at an estimated cost of $4.5m. If implemented, this would be a new small network asset and it is anticipated that the regulatory test would be published in 2006.

5.1.5. 2009 Reconfiguration of Feeder 926 (to address distribution system constraint)

Constraint

The 132kV distribution feeder network that supplies the Pennant Hills-Hornsby area is expected to be constrained during feeder outages at times of peak summer load from 2009.

Options

Joint planning to address this issue has been initiated (by EnergyAustralia DNSP). Possible network options include:

- Installation of a 132kV feeder between Sydney North and Pennant Hills. This distribution feeder would be approximately 12km long and would consist of overhead and underground feeder sections.

- Reconductoring approximately 11.5km of feeder 926 along the existing double circuit towerline and utilising one side of the towerline and approximately 1km of new construction for a new 132kV distribution feeder to connect Sydney North substation to Pennant Hills. This may involve the use of low sag conductors to minimise the need to replace the current tower structures.

If implemented the transmission portion of this work is anticipated to be a new small transmission asset.

A review of non-network options is also in progress.

5. 2. EMERGING RELIABILITY LIMITATIONS IN THE CENTRAL COAST AREA

Central Coast 132kV is normally supplied from TransGrid's Sydney East, Munmorah, Vales Point and Tuggerah Substations. TransGrid's Tuggerah and Munmorah substations have only a single transformer.

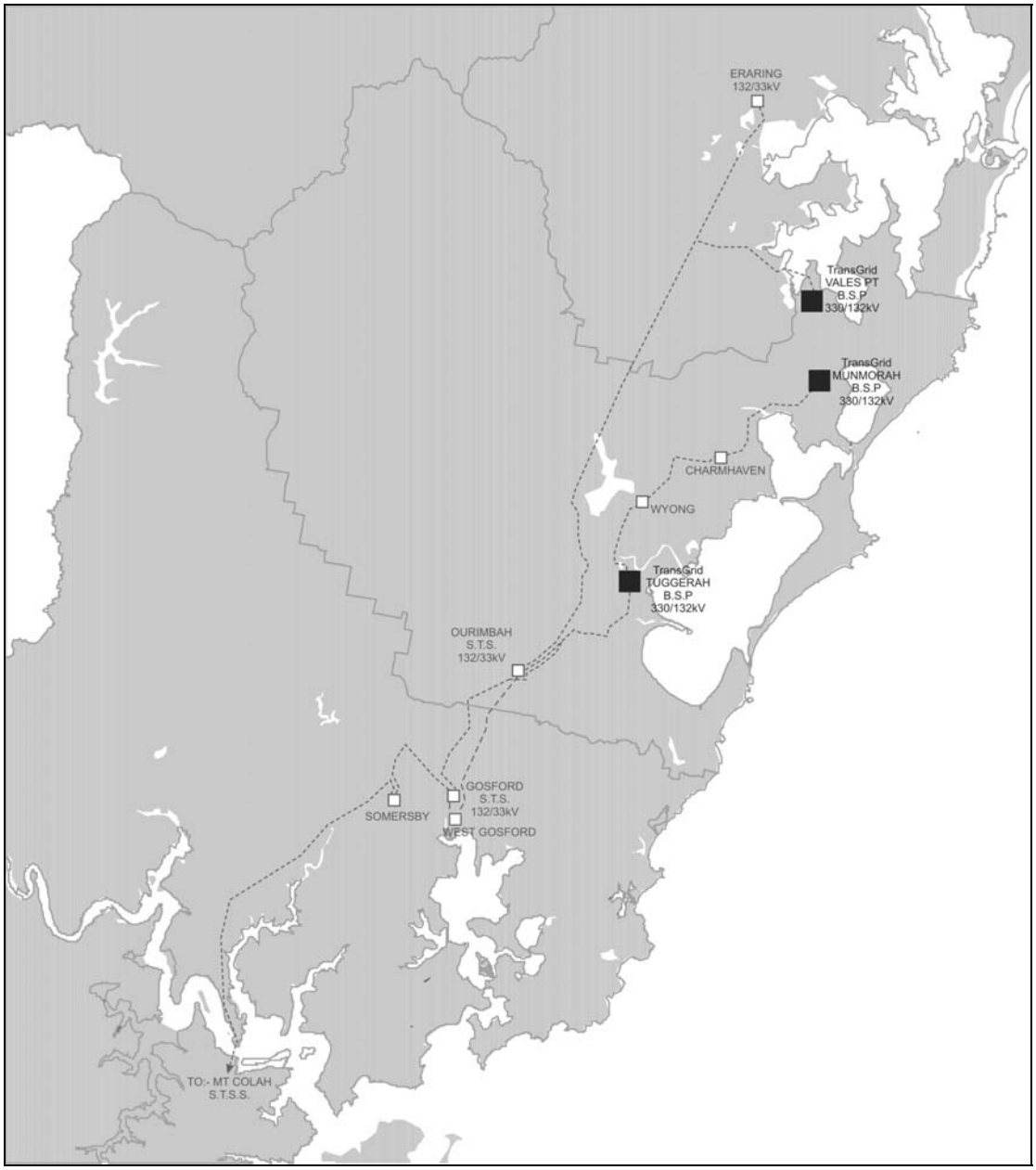

Diagram 2: EnergyAustralia's Central Coast 132kV system.

5.2.1. 132kV Supply to the Lower Central Coast and Loading on Ourimbah Subtransmission substation

Constraint

Loadflow analysis has highlighted that under certain 132kV feeder outages, some of the 132kV feeders that transverse the mid and southern Central Coast region are expected to be constrained over the next 5 years. The worst case scenario is the loss of feeder 958 at times of peak system loads. Under this scenario loading on Ourimbah 132kV busbar is expected to reach capacity in 2008 and feeder 95C is expected to be loaded to capacity in winter 2010.

Loading on Ourimbah substation, (which supplies Berkeley Vale zone substation) is approaching the firm substation rating. Loading is expected to reach the substation firm capacity in 2008 if no action is taken.

Other issues in this area include:

1. Capacity of Berkeley Vale zone which is forecast to exceed firm substation rating and acceptable risk levels in 2007. (This is a DNSP constraint.)
2. Capacity of the 33kV feeders supplying Berkeley Vale zone, which are anticipated to reach their thermal capacity by 2007. (This is a DNSP constraint.)
3. Voltages on the 33kV system at Berkeley Vale are approaching their lower limits during first contingency feeder outages. (This is a DNSP constraint.)
4. Aged equipment at Ourimbah STS. This substation was established in 1959. Most of the equipment in this substation is original and is nearing the end of its life. It is proposed to carry out a major reconstruction of Ourimbah STS between 2006-9. The 132kV busbar rating issues at Ourimbah will be addressed as part of this refurbishment.

Options

Joint planning with EnergyAustralia DNSP has been initiated to consider a strategy for area.

Possible options are:

1. Carry out a distribution augmentation to uprate the existing 33/11kV zone at Berkeley Vale and the associated 33kV network and a transmission augmentation to upgrade Ourimbah transmission substation and construct a new 132kV transmission line from Tuggerah to Ourimbah.
2. Uprate Berkeley Vale to 132/11kV and run a new double circuit 132kV line from Tuggerah. This option would require the construction of a short section of new double line from Tuggerah and the upgrade of Berkeley Vale to 132kV operation using tail-ended transformers. Under this option Berkeley Vale and the new 132kV feeders would be a distribution asset.
3. Uprate Berkeley Vale zone to 132/11kV and run a new single circuit 132kV line from Tuggerah. This would involve the construction of a new single circuit line from Tuggerah and the connection of Berkeley Vale to this new feeder and existing feeder 95C. These connections would require the establishment of a full

132kV busbar at Berkeley Vale. Under these arrangements Berkeley Vale and the new feeder would be transmission assets (a new large network asset).

Options 2 or 3 are the lowest cost options at $15m-$20m. It is anticipated that a consultation paper for this work will be published in 2005.

An extensive analysis of demand management and non-network opportunities in the Berkeley Vale area has been carried out. A demand management investigation was commenced in mid 2001, including a public consultation process. A call for options was advertised on 3 Aug 2001 in local papers and the SMH with a closing date of 30 Sept 2001. A further public forum was held with local businesses and service providers in December 2001. A DM scoping study was finalised in April 2003, identifying possible DM options. Negotiations are in progress with a respondent to the public consultation regarding a proposed industrial co-generation project, which could result in a deferral of the supply option.

Should the upgrading of Berkeley Vale to 132kV operation proceed, loading on the 132kV system and Ourimbah substation will be reduced below the present system rating. However it is expected that the 132kV network will be again constrained by 2012.

Some possible solutions in 2012 may include:

1. Reducing transmission loads via distribution network augmentations or demand management
2. Installation of an additional 132kV feeder from Berkeley Vale to Gosford.
3. Installation of an additional 132kV feeder from Tuggerah to Gosford.

Costs are expected to around $15m for an overhead line depending on the line route and type of construction. There is a strong possibility that urban portions of this feeder may need to be installed underground which will further increase project costs.

5.2.2. 2010 West Gosford Transformer Capacity

Constraint

Current load forecasts indicate this substation will be loaded to above an acceptable level of risk during first contingency outages in 2009-10 summer.

Options

Joint planning with EnergyAustralia DNSP will be initiated in the future to investigate possible network and non-network options.
Identified options include 11kV load transfers to Somersby zone substation or the addition of a third transformer at West Gosford zone substation.

5. 3. EMERGING RELIABILITY LIMITATIONS IN THE LOWER HUNTER AREA

Significant load growth continues for the Lower Hunter particularly in developing fringe areas to the west of Newcastle as well as around Lake Macquarie, Maitland and Port Stephens, due to urban residential development. Changing economic focus for industrial and commercial activity in the region is also contributing to changing spatial loading trends requiring associated supply network re-arrangements. Longer term transmission development requirements are under ongoing joint planning consideration with TransGrid.

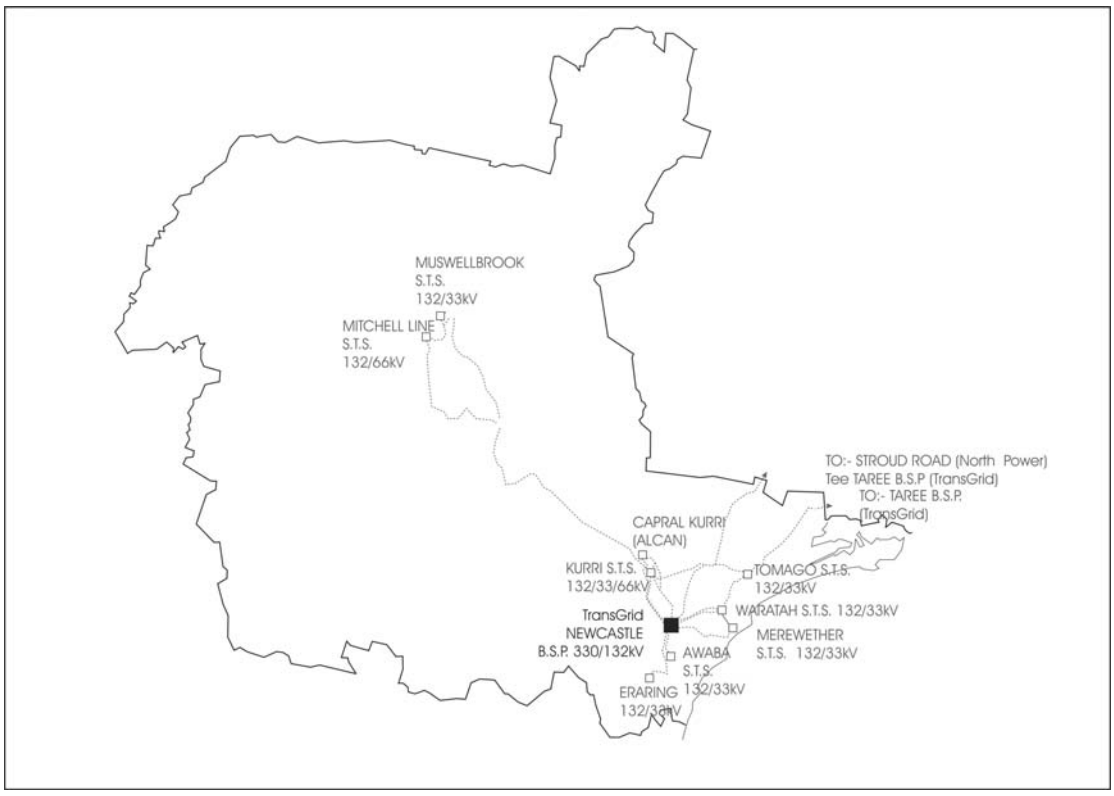

Diagram 3: The Hunter area 132kV network, including 132kV distribution assets.

TransGrid have recently completed installation of a 330/132kV transformer at Waratah West Substation and EnergyAustralia has constructed Beresfield Subtransmission substation. These projects are part of the first stage in the development of the Lower Hunter 132kV Network. The existing Lower Hunter 132kV network is still fully utilised particularly the lines supplying Tomago, Beresfield and CountryEnergy. Further augmentation will be required during the next five years.

In recent months, the security standard for supply to this has been under review. EnergyAustralia believes this issue is one that requires government involvement to set minimum security standards for various sectors of the community. A change in the standards would have a major impact on the development of 132kV supply to the lower Hunter.

5.3.1. 2007 132kV Feeder Capacity in the Tomago/Taree Supply Area

Constraint
By 2007 growing demand will result in four 132kV feeders being loaded to full capacity during various single outage contingency scenarios (with Waratah West as a single transformer).

The installation of an additional transformer at Waratah West, (timing to be confirmed by TransGrid), also impacts this network significantly. Any future 132kV work will consider the needs of a possible zone substation in the West Wallsend area. There are also proposals for large loads at Kooragang that will need to be considered in the longer term.

Options

It is likely that a number of augmentations would be required to remove all of the constraints in this network. Joint Planning (with TransGrid and EnergyAustralia DNSP) has been initiated to look in to the possible options.

Possible options to increase 132kV transmission capacity include:

1. Construction of new 132kV lines: Newcastle – Beresfield and Waratah West – Tomago by EnergyAustralia and the installation of a second 330/132kV transformer by TransGrid at Waratah West.

2. TransGrid to provide 132kV supply to EnergyAustralia from its existing substation at Tomago. EnergyAustralia to make connections from this supply point into its existing network.

Investigations into all of the potential options are presently in progress, this will include non-network options. Cost of construction for the options will be significantly affected by the availability of suitable line routes.

5.3.2. 2007 Kurri 132/33/66kV Substation Transformer Capacity

Constraint
Whilst loading on this substation has been reduced by the commissioning of Beresfield subtransmission substation it is expected that loading will again exceed transformer capacity in 2007. Much of the anticipated increase in load is due to increased reactive losses on the 33kV distribution network supplied from Kurri substation.

Options

In the short term it is anticipated that capacity issues at Kurri will be addressed by:

- ❖ Installation of capacitors both at Kurri substation and on EnergyAustralia's distribution system
- ❖ Load transfers on EnergyAustralia's distribution network.

Possible options to uprate Kurri in the medium term include :

1. Installation of a fourth 60MVA transformer
2. Replacing existing 60MVA transformers with 120MVA transformers.

It is anticipated that this work will be carried out in conjunction with the replacement of 33kV switchgear, which present condition assessments indicate will require replacement in 2010-11.

6. PROPOSED NEW CONNECTION POINTS

The National Electricity Code requires the annual planning report to set out 'planning proposals for new connection points'

EnergyAustralia transmission is currently undergoing planning with customers and joint planning with DNSPs, which may involve the establishment of the following new connection points. These connection points are driven by constraints on the DNSPs network, however when the augmentation options are considered in the near future, they may comprise of a mix of Transmission and Distribution augmentations.

Planning proposals for new connection points are in progress at

- Berkeley Vale
- Sydney Airport
- St George
- West Wallsend

6.1.1. 2007 Berkeley Vale Zone Substation

As discussed in section 5.2.1 the establishment of a new transmission connection point at Berkeley Vale is one option being considered to address transmission and distribution constraints on the lower Central Coast.

It is anticipated that a consultation paper for this work will be published in 2005.

Note: As it is uncertain whether this project will be a transmission or distribution asset, forecast load at Berkeley Vale substation has not been separately identified in the forecast in section 3.1.2. Loading at Berkeley Vale is included in the forecast for Ourimbah substation.

6.1.2. 2008- Sydney Airport Supply

Sydney Airport Corporation have requested additional supply capacity to meet the needs of further development of the Airport site. Possible supply options include:

- The installation of additional 33kV cables (10km) from Bunnerong subtransmission substation to the airport. (Distribution system works)
- Establishment of a 132kV connection point to existing 132kV transmission cables running past Sydney Airport. (New Transmission Connection Point)

Investigations have indicated that the establishment of a new connection point is the least cost solution.

Note: As customer negotiations are still in progress and the extent of load transfers to the new connection point are as yet unknown, load forecasts for this potential connection point have not been separately identified in the forecast in Section 3.1.1.

Loading for this new connection point is included in the forecast for Bunnerong substation.

6.1.3. 2008-9 Kogarah Zone Substation

Distribution System Constraint

The St George area has recently experienced high load growth mostly caused by urban consolidation. This load growth has resulted in constraints on the distribution network. Current forecasts indicate approximately 40MVA of additional distribution capacity will be required by 2009. Most of the zone substations in the area are already at, or close to firm capacity. In addition there is a need to replace aging zone substation and subtransmission cables in the area in the short-medium term

Options

Joint planning with EnergyAustralia DNSP is presently in progress. A number of options are being considered. Options include:

- The establishment of a new 132/11kV zone substation in the Beverley Hills area supplied via new 132kV cables from Canterbury subtransmission substation. This would be a new large distribution asset.
- The establishment of a new 132/11kV zone substation at Kogarah supplied from transmission feeder 91L or 91M/1. This would be a new large transmission asset.

The investigations to date have indicated that the lowest cost option is the establishment of a new zone substation at Kogarah. This would allow the retirement of aging 33kV infrastructure in the area and address both distribution loading issues and the constraint forecast for Peakhurst subtransmission substation discussed in Section 5.1.3.

Investigation of non-network options is presently in progress. Consultation over this project is anticipated in 2005.

Note: As the extent of load transfers to this new connection point are presently uncertain, forecast load at Kogarah substation has not been separately identified in the forecast in section 3.1.1. Loading at Kogarah substation is included in the forecast for Peakhurst substation.

6.1.4. 2009 West Wallsend 132/11kV Zone Substation

Distribution System Constraint

Distribution loading in the Edgeworth/Wallsend area will be above the capacity of the distribution system by 2010. Substantial new development is expected around Edgeworth, Esteville and Holmesville, which will require new supply capacity.

Options

Initial joint planning (with EnergyAustralia DNSP) has identified that a possible solution to the distribution constraint in this area would be to establish a new 132/11kV connection point in the Cameron Park industrial area near West Wallsend in 2010. The substation is proposed to be supplied by 132kV feeder 9NA or new feeder development from Beresfield. If found to be the favourable option, this would be a new large network asset. Possible alternatives to this work would be distribution augmentations.

7. CONSULTATION ON NEW NETWORK DEVELOPMENTS

7. 1. NEW LARGE NETWORK ASSETS

Consultation on the following proposed network assets is currently in progress or is proposed in 2005-6.

7.1.1. 2007 Berkeley Vale Zone Substation

As discussed in section 5.2.1 and 6.1.1 the establishment of a new transmission connection point at Berkeley Vale is one option being considered to address transmission and distribution constraints on the lower Central Coast.

7.1.2. 2008-9 Kogarah Zone Substation

The establishment of a new connection point at Kogarah has been identified as the most likely network option to address emerging constraints in EnergyAustralia's transmission and distribution networks in the St George area. This proposal would also allow the retirement of aging distribution infrastructure. Details of this proposal are contained in Section 6.1.3.

7. 2. NEW SMALL NETWORK ASSETS

There are no new small network assets on which construction is proposed to commence in 2005-6.

8. LIST OF ABBREVIATIONS

ACCC: Australian Competition and Consumer Commission

AESDR: Annual Electricity System Development Review

CBD: Central Business District

DEUS: Department of Energy, Utilities and Sustainability

DNSP: Distribution Network Service Provider

DSM : Demand Side Management

HV: High Voltage

IPART: Independent Pricing and Regulatory Tribunal

NEC: National Electricity Code

TNSP: Transmission Network Service Provider

STS: Sub-Transmission Substation