Network Capital Projects - Project Description

(Estimated Cost is the anticipated project cashflow, with medium commissioning dates, that will be incurred in the next regulatory period. It is shown in $2008.)

Project Title	Albury- Mulwala Lines – Trip Scheme		
Project No	6380	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.6 m

Albury and ANM substations are supplied via a 132 kV network from Jindera 330/132 kV substation. Country Energy's Mulwala substation is supplied from Albury. Country Energy also plans to establish a Finley – Mulwala 132 kV line to provide a backup supply to Mulwala.

The ANM and Albury load is approaching the capacity of the Jindera – Albury – ANM network.

To relieve this limitation it is planned to install a tripping scheme at Albury to transfer the Mulwala load to Finley if required. When the limitation re-emerges a 132 kV capacitor will be installed at Albury to reduce the reactive loading on the 132 kV lines.

Project Title	Armidale 330kV SVC Control Replacement		
Project No	6242	**Commissioning Date**	2015
Category	Replacement	**Estimated Cost (2009/14)**	$ 0.9m

The Armidale SVC provides support to the supply to the northern NSW loads and is an integral part of the power transfer capability between NSW and Queensland.

There is a need to replace the SVC control hardware and software components.

Project Title	Armidale- Coffs Harbour 96C 132kV Line upgrade		
Project No	5990	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 13.1m

Following commissioning of Coffs Harbour 330/132kV Substation, the capability of the transmission network supplying the NSW North Coast is limited by the thermal rating of the Armidale – Coffs Harbour 132kV Transmission Line, for an outage of the Armidale – Coffs Harbour 330kV Transmission Line.

By around 2010, it is expected that it will no longer be possible to manage this limitation by importation of power from Queensland via Directlink.

It is expected that the 132kV transmission line between Armidale and Coffs Harbour will need to be uprated.

Project Title	Bamarang 330kV establishment		
Project No	6275	**Commissioning Date**	2014
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 47.6m

Supply to the majority of the South Coast is supported via an extended 132kV network owned by Integral Energy and Country Energy, which is supplied from Dapto 330/132kV Substation. The loading is approaching the capacity of the 132kV network.

To provide additional capacity to meet the growing load, it is expected that a new 330/132kV substation will be established in the Nowra area. This substation may be located at Bamarang.

Project Title	Bannaby- South Creek 500kV lines & substation		
Project No	5567	**Commissioning Date**	2014
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 393.8m

Due to the growing load in the Newcastle- Sydney- Wollongong area, new line reinforcement is required.

Two new double circuit 500kV transmission lines are proposed between Bannaby and the Sydney area, and between the Hunter Valley and Eraring, as part of the long-term strategy to progressively develop a 500kV network supplying the Newcastle – Sydney – Wollongong area. While the load growth in the Newcastle – Sydney – Wollongong load corridor is expected to be partially offset by potential gas turbine generation development, it is not expected to be able to be fully contained in the long-term.

Based on current planning proposals, a 500kV transmission line is required between Bannaby and Sydney by 2013/14. Should power station development proceed in the Hunter Valley area, it is possible that the Hunter Valley – Eraring line development would take precedence. Hence preliminary planning work is being undertaken on both projects to cover all potential future generation developments.

Project Title	Beaconsfield West 132kV GIS Replacement		
Project No	6378	**Commissioning Date**	2013
Category	Replacement/ Easement	**Estimated Cost (2009/14)**	$ 48.1 m

The gas insulated switchgear at Beaconsfield West 330/132kV substation is approaching the end of its serviceable life and is required to be replaced in the near future.

It is expected that its replacement will be staged as there is insufficient space to establish a complete new busbar. New sections of 132kV busbar are to be established and EnergyAustralia will progressively reconnect cables to them. Once sufficient cables have been reconnected the remaining sections of the new busbar will be established.

Project Title	Beaconsfield West 132kV Capacitor Bank		
Project No	6096	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 6.8 m

The 41 Sydney South – Beaconsfield West 330 kV cable is a key component of the network supplying the inner metropolitan area. Under critical contingencies its capacity can be exceeded due to high reactive power flows.

Consequently it is planned to install a 132 kV capacitor at Beaconsfield West to reduce the reactive loading on the cable.

Project Title	Beaconsfield West 330kV 3rd Transformer		
Project No	5818	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 13.1 m

TransGrid and EnergyAustralia have jointly identified a number of projects to increase the capacity of the network supplying the southern and inner metropolitan areas of Sydney.

Amongst those is provision of a third 375 MVA 330/132kV transformer at Beaconsfield West. Installation of that transformer will allow the full capacity of the Sydney South – Beaconsfield West 330kV cable to continue to be utilised should a transformer at Beaconsfield West be out of service.

Project Title	Beaconsfield West 330kV Substation busbar		
Project No	6263	**Commissioning Date**	2017
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 36.3 m

The Sydney inner metropolitan area is supplied via a 330 kV and 132 kV network from Sydney North, Sydney South, Beaconsfield West and Haymarket 330/132 kV substations. The load is approaching the capability of this network.

Consequently it is planned to establish a 330/132 kV substation at Chullora and to establish a 330 kV busbar at Beaconsfield West to provide for additional 330 kV cable connections.

Project Title	Beryl 132kV Substation 2 x 66kV switchbays		
Project No	6157	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.9 m

Country Energy's Dunedoo and Coonabarabran substations are supplied via a radial 66kV line from Beryl.

To meet its licence requirements, Country Energy plans to construct a second 66kV line from Beryl to Dunedoo and has requested that TransGrid to provide a 66kV line switchbay at Beryl 132/66kV susbstation.

Project Title	Broken Hill SVC Upgrade		
Project No	6460	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 10.4 m

The two Broken Hill SVCs provide support to the supply to Broken Hill and act together with SVCs at Kerang and Horsham in Victoria in supporting the power transfer between NSW and Victoria and the power transfer over Murraylink between western Victoria and South Australia.

There is a need to replace the SVC control system, valves and other components.

Project Title	Burrinjuck 132kV substation rebuild		
Project No	6167	**Commissioning Date**	2015
Category	Replacement/ Easement	**Estimated Cost (2009/14)**	$ 4.9 m

Burrinjuck substation provides a supply to Burrinjuck village and the hydro generation.

The Burrinjuck 132kV switchyard is approaching the end of its serviceable life and is to be replaced in the near future.

Project Title	Cable 41 Reactor Replacement		
Project No	9032	**Commissioning Date**	2011
Category	Replacement	**Estimated Cost (2009/14)**	$ 6.1 m

TransGrid has identified the need to replace the existing 330kV shunt reactor on Cable 41 at Sydney South due to its condition.

The shunt reactor is to be replaced with another 150 MVAr unit. Provision has also been made to replace the existing series reactor on Cable 41 with one having a higher impedance, in order to rebalance power flows on the cable and the underlying 132kV system.

Project Title	Canberra 132kV Capacitor Banks (4^{th} bank)		
Project No	6381	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.7 m

The NSW import capability from the south is partly determined by voltage support at Canberra.

A new 4^{th} 132 kV 120 Mvar capacitor bank is required at Canberra.

Project Title	Canberra 132kV Capacitor Bank No.1		
Project No	6152	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 3.0 m

The NSW import capability from the south is partly determined by voltage support at Canberra.

Additional capacitor support is required at Canberra by expanding an existing 132 kV 80 Mvar capacitor bank to 120 Mvar as part of a refurbishment of the bank.

Project Title	Canberra 330kV Capacitor Banks 200MVAr		
Project No	6383	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 4.3 m

The NSW import capability from the south is partly determined by voltage support at Canberra.

A new 330 kV 200 MVAr capacitor bank is required at Canberra.

Project Title	Canberra 330kV No.2 Transformer		
Project No	5620	**Commissioning Date**	2014
Category	Replacement	**Estimated Cost (2009/14)**	$ 8.2 m

The existing #2 transformer at Canberra is approaching the end of its serviceable life and is to be replaced.

Project Title	Canberra 330kV Substation Tunnel Board		
Project No	6025	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$3.5m

A need has been identified to develop practical large-scale protection relay upgrade to cater for the efficient replacement of large quantities of ageing protection and control equipment.

One of the strategies is to implement tunnel board replacements in substation control rooms. Canberra substation has been selected as a trial site for the replacement.

The scope of this tunnel board upgrade is to replace the 330kV feeder protection and controls.

Project Title	Chullora 330kV Substation Establishment		
Project No	5995	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 67.1 m

The inner metropolitan area of Sydney is supplied via a 132kV transmission network originating from 330kV substations at Sydney North (Dural), Sydney South (Picnic Point), Beaconsfield West, and Haymarket.

To meet the load growth in this area, it is expected that in the medium term a 330kV cable from Holroyd supplying a new 330/132kV substation in the Chullora/Potts Hill area would be established.

Project Title	Coffs Harbour 132kV Transformer		
Project No	9045	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 6.2 m

The Coffs Harbour's load is approaching the capacity of 132/66kV substation.

Consequently, it is planned to replace the two existing 60 MVA transformers by 120 MVA units.

Project Title	Coffs Harbour 330kV Substation 2nd Transformer		
Project No	5999	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 10.8 m

Coffs Harbour 330/132kV substation has a single 375 MVA transformer. If that transformer is out of service, low voltages can occur in the Coffs Harbour area.

Consequently it is planned to install another transformer.

Project Title	Coffs Harbour 66kV Cap Bank No.3 Replacement		
Project No	6193	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 1.2 m

The No.3 66kV MVAr capacitor bank at Coffs Harbour 132/66kV substation is approaching the end of its serviceable life and is required to be replaced in the near future.

Project Title	Coffs Harbour- Kempsey 132kV Conversion		
Project No	9127	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 13 m

To meet the growing load on the mid North Coast, it is planned to convert the Coffs harbour- Kempsey 66kV circuit to 132kV operation. .

Project Title	Communications (various projects)		
Project No	Various	**Commissioning Date**	Various
Category	Augmentation/ Replacement/ Easement	**Estimated Cost (2009/14)**	$ 81.6 m

Not all of TransGrid's substations have SCADA facilities. Also some substations have SCADA facilities and/or associated communications systems which are approaching the end of their serviceable lives.

TransGrid's communication system requires ongoing development to meet the changing needs of the National Electricity Market and TransGrid's needs. Replacement and upgrading of some existing equipment is required to maintain its serviceability.

Project Title	Cooma 132kV bay		
Project No	5131	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.7 m

The Bega area is supplied via Country Energy's Cooma – Bega 132 kV line with a limited capacity backup supply from Country Energy's lower voltage network.

Country Energy plans to construct a second 132kV line from Cooma to Bega. It will be necessary to establish a new 132kV switchbay at Cooma to connect that line.

Project Title	Cooma 132kV Substation replacement & new bay		
Project No	6194	**Commissioning Date**	2014
Category	Replacement/ Easement	**Estimated Cost (2009/14)**	$ 43.4 m

Cooma Substation was established in 1954 with most of the plant approaching the end of serviceable life.

It is envisaged that the substation will need to be replaced on a nearby site towards the end of the next regulatory period.

Project Title	Cowra 132kV Substation Transformer		
Project No	5616	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 7.2 m

The load at Cowra Substation is highest in summer with a summer growth rate of around 2.4% per annum.

It is proposed to replace the existing 30MVA transformers with larger 60MVA transformers to provide the additional capacity necessary to meet the forecast load.

Project Title	Dapto Line Switchbay & Fault level		
Project No	9090	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.9 m

To accommodate gradually increasing fault levels it is necessary to upgrade the fault capability of Dapto 330/132 kV substation. Some equipment which may otherwise limit the capacity of the Dapto – Sydney South 330 kV line is also being replaced as part of this project.

Project Title	Dapto- Sydney South 330kV line rehabilitation		
Project No	6021	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 12.4 m

The Sydney South - Dapto 330kV Transmission Line was constructed in 1962 and is now 46 years old. The line is located in a coastal environment which means it is exposed to a high degree of corrosion. The structures are already exhibiting advanced corrosion of nuts and bolts, some members and fittings.

This project involves structural and refurbishment work on the transmission line that will extend the useful life of the line by 25 years.

Project Title	Darlington Point- Colleambelly 132kV line duplication		
Project No	6182	**Commissioning Date**	2015
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 3.2 m

Country Energy plans to install capacitors within its network in the Coleambally area to manage voltage conditions on outage of a critical line.

This is expected to be adequate until around summer 2013/14. It will be necessary to establish a second Darlington Point – Coleambally line.

Project Title	Dumaresq- Lismore 330kV line		
Project No	9094 & 9095	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 187.5 m

The Far North Coast is supplied by a single 330kV transmission line between Armidale and Lismore, together with an underlying 132kV network. It is anticipated that, with growing demand in the area, voltage and line loading limitations will increase.

To overcome this in the medium to long term, it is planned to construct an additional 330kV transmission line from Dumaresq to Lismore.

Project Title	Eraring & Kemps Creek 500kV Substation Transformer radiator		
Project No	6108	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.1 m

The existing 500/330 kV single phase transformers are rated at 400 MVA. The single phase transformers to be installed for the western 500 kV conversion project are to be rated at 500 MVA.

In order that the existing two spare single phase spare transformers (located at Eraring and at Kemps Creek) will be able to be utilised as spares for the expanded population of 500/300 kV transformers across the state it is necessary to fit new radiators.

Project Title	Glen Innes- Inverell 132kV line		
Project No	9098	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 9.7 m

The Inverell area is supplied primarily by a 132kV transmission line from Armidale. On outage of this transmission line, Inverell is supplied from Tamworth via Narrabri and Moree, a distance of over 400 km. The capacity of this system is limited by unacceptably low voltages on outage of critical transmission lines at times of high demand.

A number of banks of capacitors have been installed at Inverell, Moree and Narrabri over the years to manage voltage conditions on this 132kV network.

In the medium term, load growth in the Inverell area is expected to result in the capacity of the network being exceeded. To address this limitation, it is proposed to construct a 132kV transmission line between Glen Innes and Inverell, which would improve security of supply to both Inverell and Glen Innes.

Project Title	Griffith 132kV Substation Transformers Replacement		
Project No	6175	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$ 6.6 m

Two of the 45 MVA 132/33kV transformers at Griffith Substation were manufactured in 1956, and the third transformer was manufactured in 1960. All three transformers are approaching the end of their serviceable lives and are required to be replaced.

They will be replaced by 60 MVA units, i.e., TransGrid's present standard-sized 132/33kV transformer.

Project Title	Griffith 33kV Capacitor Bank No.1 & 2		
Project No	6147	**Commissioning Date**	2010
Category	Security/ Compliance	**Estimated Cost (2009/14)**	$ 1.6 m

The No. 1 and No. 2 33 kV capacitor banks at Griffith contain PCBs and are required to be replaced. Consequently it is planned to install two new capacitors of the nearest standard size.

Project Title	Hawkesbury 500kV Substation site acquisition		
Project No	6115	**Commissioning Date**	2012
Category	Easement	**Estimated Cost (2009/14)**	$ 1.0 m

There is a future need for support to the growing northern Sydney area load. A 500/330 kV substation would be established near Vineyard 330/132 kV Substation.

A site must be acquired for the substation development whilst it is still feasible to locate the substation near Vineyard.

Project Title	Hawks Nest 132kV Sub		
Project No	5992	**Commissioning Date**	2011
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 8.5 m

The Hawks Nest/Tea Gardens area is presently supplied via a 33kV network (owned by Country Energy) that originates from Country Energy's Stroud 132/33kV Substation, and EnergyAustralia's 33kV system supplying the Salt Ash area. The thermal capacity and voltage limits of Country Energy's 33kV network have been reached. In addition, EnergyAustralia's 33kV system supplying the Salt Ash area is approaching the limit of its capability. It is therefore necessary to augment the supply system in the Hawks Nest/Tea Gardens area.

It is planned to construct a 132/33kV substation at Hawks Nest.

Project Title	Haymarket Substation EnergyAustralia (EA) 132kV Cables		
Project No	9191	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.2 m

As part of its ongoing development of the 132kV cable network serving the Sydney CBD area, EnergyAustralia plans to connect three additional 132kV cables at Haymarket substation.

This project provides for augmentation works to be undertaken to facilitate connection of the cables.

Project Title	Herons Creek 132kV Substation		
Project No	5588	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 8.7 m

The coastal strip between Laurieton, Lake Cathie, and Port Macquarie is expected to continue to develop. The capacity of Country Energy's existing 33kV system south from Port Macquarie and its existing 66kV system north from Taree are likely to be reached within the next five to ten years.

The proposed options to overcome these limitations is to establish a 132/66kV substation in the Heron's Creek area, supplied from the existing Taree - Port Macquarie 132kV Transmission Line, together with Country Energy's construction of 66kV lines to form connections to its network in the area.

Establishment of a 132/66kV substation would also relieve the loading on the 132/66kV transformers at Taree.

Project Title	Holroyd 330 kV Substation		
Project No	4213	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 108.2 m

The western Metropolitan area is supplied via a 132kV transmission network emanating from 330/132kV substations at Sydney West, Regentville, Liverpool, Ingleburn and Vineyard. Demand in the area has grown markedly over the last five years, due in part to population growth and increasing use of air conditioners.

Additional transformers have been installed at Sydney West and Liverpool. Despite this, it is expected that the constraint imposed by 330/132kV transformer capacity in the area will re-emerge within five years.

To relieve this constraint, an additional 330/132kV substation at Holroyd is expected to be required.

Project Title	Holroyd- Sydney West 330kV Line		
Project No	4188	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 70.3 m

The western Metropolitan area is supplied via a 132kV transmission network emanating from 330/132kV substations at Sydney West, Regentville, Liverpool, Ingleburn and Vineyard. Demand in the area has grown markedly over the last five years, due in part to population growth and increasing use of air conditioners.

Additional transformers have been installed at Sydney West and Liverpool. Despite this, it is expected that the constraint imposed by 330/132kV transformer capacity in the area will re-emerge.

To relieve this limitation and as part of works to reinforce capacity to the inner metropolitan area it is planned to establish Holroyd 330/132 kV substation. This substation will be supplied from a double circuit 330 kV line which will connect to an existing 330 kV line near Sydney West.

Project Title	Holroyd- Chullora 330 kV Cable		
Project No	6204	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 266.0 m

The inner metropolitan area of Sydney is supplied via a 132kV transmission network emanating from a number of 330kV substations.

To meet the continuing load growth, it is expected that two 330kV cables from Holroyd supplying a new 330/132kV substation in the Chullora / Potts Hill area would be established.

Project Title	Hunter Valley – Central Coast 500kV Lines		
Project No	5568	**Commissioning Date**	2017
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 49.7 m

Due to the growing load in the Newcastle- Sydney- Wollongong area, new line reinforcement is required. Two new double circuit 500kV transmission lines are proposed between Bannaby and the Sydney area, and between the Hunter Valley and Eraring, as part of the long-term strategy to progressively develop a 500kV network in NSW particularly to supply the Newcastle – Sydney – Wollongong area. While the load growth in the Newcastle – Sydney – Wollongong load corridor is expected to be partially offset by potential gas turbine generation development, it is not expected to be able to be fully contained in the long-term.

Based on current planning proposals, a 500kV transmission line is required between Bannaby and Sydney by about 2014 to 2016. Should power station development proceed in the Hunter Valley area, it is possible that the Hunter Valley – Eraring line development would also be required, with a possible completion date from about 2016 to 2017. The Hunter Valley – Eraring line may also take precedence if significant northern power station development eventuated. Hence preliminary planning work is being undertaken on both 500 kV projects to cover all potential future generation developments.

Project Title	Kemps Creek- Liverpool 330kV lines		
Project No	3978	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 36.8 m

The major load centres of Sydney South, Liverpool and Ingleburn as well as the inner Sydney 330 kV substations at Beaconsfield West and Haymarket, are supplied from the 330 kV network at Sydney West, Kemps Creek, Wallerawang and Dapto.

As a result of ongoing load growth there is increasing power flow across the lines supplying the load area. There is an emerging need to reinforce this system.

The reinforcement of supply will require a new double circuit 330 kV transmission line between Kemps Creek and Liverpool 330/132kV Substation. The line would be initially operated as a single circuit line.

Project Title	Kemps Creek 330kV SVC Control Replacement		
Project No	6213	**Commissioning Date**	2011
Category	Replacement	**Estimated Cost (2009/14)**	$ 16.3 m

The Kemps Creek SVC provides control of the transient stability performance of the interconnected system.

There is a need to replace the SVC controls, valves and other components.

Project Title	Kempsey 66kV Transformers Replacement		
Project No	6415	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 6.0 m

The Kempsey 132/33/66kV Substation provides supply to the city of Kempsey and its surrounding areas. The substation presently has two 30 MVA 132/33kV transformers and two 66/33kV transformers.

The condition of the 66/33kV transformers indicates that they are approaching the end of serviceable life and require replacement.

Project Title	Kempsey- Pt Macquarie 132kV Line		
Project No	9129	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 14.7 m

The capacity of the 132kV system supplying Port Macquarie is presently limited by unacceptably low voltages at Port Macquarie. To date, this contingency has been managed by installation of capacitors. Installation of additional capacitors is of marginal benefit as the reactive loads at each location are already more than fully compensated.

Over recent years, load growth in the Port Macquarie area has been significantly above the level for the State overall. Above average growth is expected to continue.

The most suitable transmission option to overcome this constraint is to construct an additional transmission line between Kempsey and Port Macquarie area.

Project Title	Koolkhan 132kV 3rd Transformer		
Project No	9246	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 3.5 m

Koolkhan 132/66 kV substation has two 60 MVA transformers. Based on Country Energy's most recent load forecast, the firm capacity of the existing transformers will be exceeded by summer 2008/09.

To accommodate the growing load a third 60 MVA transformer is to be installed.

Project Title	Liddell 330kV Sub No.84 line connection		
Project No	6102	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.9 m

Due to ongoing load growth in Northern NSW, there is a need to improve the reliability of the connection of no. 84 line.

The Tamworth No. 84 line is connected at Liddell with a single switchbay. It is necessary to install a second switchbay to control the line.

Project Title	Lismore 132kV Substation line switchbay		
Project No	6431	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.5 m

Country Energy's casino substation is supplied via a tee connection to the Tenterfield – Lismore 132 kV line with a limited capacity backup at 66 kV from Country Energy's Lismore 132/66 kV substation.

To meet its licence obligations Country Energy plans to construct a 132 kV line to Casino to replace the 66 kV backup. To reduce the length of line required, that line would be connected to the 330/132 kV substation.

Consequently a new line switchbay is required.

Project Title	Manildra- Parkes 132kV line		
Project No	9123	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 21.4 m

The Cowra / Forbes / Parkes area is supplied via an extended 132 kV network between Yass and Wellington 330/132 kV substations. If the Wellington – Parkes 132 kV line is out of service low voltages can occur at Parkes and Forbes and the 999 Yass – Cowra 132 kV line can be overloaded.

To overcome this limitation a 132 kV line from Manildra to Parkes is to be built.

Project Title	Molong 132kV Substation Transformer replacement & 2nd Transformer		
Project No	6172 & 6176	**Commissioning Date**	2012
Category	Augmentation/ Replacement	**Estimated Cost (2009/14)**	$ 6.3 m

Monlong 132/66kV substation has a single 30 MVA 132/66kV transformer which is approaching the end of its serviceable life.

It is planned to install switchgear to allow the system spare transformer to be placed in service and to then remove the existing in service transformer and replace it with a transformer relocated from Tamworth.

Project Title	Munmorah & Vales Point 330kV upgrade		
Project No	9135	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.6 m

It is necessary to upgrade the plant in the Munmorah 330kV Switchyard and the Vales Point 330kV Switchyard due to increased short-circuit levels.

Project Title	Munmorah 132kV Substation new busbar		
Project No	6272	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 10.4 m

EnergyAustralia is progressively replacing parts of its 33 kV network on the Central Coast with higher capacity 132 kV networks. As part of this program, EnergyAustralia plans to construct 132 kV lines to supply its new Lake Munmorah 132 kV substation from Vales Point and Munmorah 330/132 kV substations.

To connect these new lines new 132 kV busbars will be required at each of those 330/132 kV substations.

Project Title	Munyang 132kV Substation Transformer Replacement		
Project No	5998	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 10.6 m

Munyang 132kV Substation is located in a highly environmentally sensitive area alongside the Snowy River, and the consequences of any oil spill would be damaging to the environment. The existing oil containment systems do not meet current standards and there is limited opportunity to upgrade these systems due to limitations in space. Given the sensitivity of the location, the concerns regarding the containment system design and the ongoing deterioration in condition of the transformers, action is required to reduce the current risk level.

Replacement of the oil filled transformers with gas insulated units will alleviate the risk of contamination of the adjoining land and waterway.

Project Title	Murray 330kV Substation Transformer		
Project No	6294	**Commissioning Date**	2015
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 2.3 m

Murray 330/132 kV substation has two 40 MVA transformers.

As these transformers do not have sufficient capacity to supply the Jindabyne pumps and Munyang substation, it is planned to install an additional 200 MVA 330/132 kV transformer.

Project Title	Murray- Guthega 132kV line upgrade		
Project No	6293	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 13.7 m

The Murray – Guthega 132 kV line normally supplies Guthega power station and the Jindabyne pumps. It also provides the backup supply for Munyang 132/33 kV substation. A recent aerial laser survey showed that works are required to restore satisfactory conductor clearances.

As the line is predominately within the Kosciusko National Park and access to the structures is limited, it is planned to uprate the line to meet longer term requirements as part of the remedial works.

Project Title	Nabiac 132kV Substation Establishment		
Project No	5738	**Commissioning Date**	2011
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 7.8 m

Country Energy's 66kV system supplying the Forster/Tuncurry area from Taree is approaching the limit of its capability. In addition, the Taree 66kV load is approaching the firm capacity of the 132/66kV transformers.

Establishment of a 132/66kV substation in the Nabiac area, together with construction of sections of a new 66kV line by Country Energy, will relieve both these limitations.

Project Title	Narrabri 132kV Sub Transformer No1 & 3		
Project No	6177	**Commissioning Date**	2011
Category	Replacement	**Estimated Cost (2009/14)**	$ 2.9 m

The 132/66kV transformers at Narrabri Substation are approaching the end of their serviceable lives.

Replacement of the transformers is envisaged to take place.

Project Title	Newcastle 330kV Substation 132kV switchbay		
Project No	6274	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.1 m

To meet growing load in the Argenton area of Newcastle, EnergyAustralia plans to construct a new 132 kV line from Newcastle 330/132 kV substation to its Argenton substation.

A new 132 kV line switchbay will be required at Newcastle to connect this line.

Project Title	Newcastle 330kV Substation bus coupling		
Project No	6106	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.3 m

There is potential for bushfires and other events to cause the outage of multiple circuits feeding some of the major 330 kV substations in NSW. Generally the coupling of the 330 kV buses at some substations has been arranged through duplicated line switchbays and hence there is potential for loss of the bus coupling and consequent significant supply interruption.

It is necessary to install a bus coupling circuit breaker within the Newcastle 330 kV switchyard.

Project Title	Newcastle 330kV Substation Transformer Replacement		
Project No	5622	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$18.9 m

The existing banks of single phase transformers at Newcastle Substation are around 35 years old.

It is expected that as they reach the end of their serviceable lives, it will be necessary to replace them.

Project Title	Orange 132kV Substation Augmentation		
Project No	9139	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.0 m

Orange 132/66kV Substation was established in 1954. The three 30 MVA 132/66kV transformers are over 50 years old and approaching the end of their serviceable lives.

It is planned to replace them with two larger capacity units.

Project Title	Orange North 132kV Substation Establishment		
Project No	6394	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 37.6 m

Orange 132/66kV Substation supplies a total load of over 130MW. Provision of a 132kV bus section switchbay is appropriate for a load of this magnitude.

In addition, with increasing load at Orange within the next few years an outage of the 132kV transmission line to Wellington and Mount Piper during peak load periods will result in unacceptably low voltages at Orange. This limitation can best be addressed by looping the transmission line into Orange. This will require short lengths of new 132kV transmission line and a new switchbay at Orange.

The existing Orange Substation site is very constrained and unable to accommodate additional 132kV switchbays.

It is planned to establish a new substation at Orange North, to provide the necessary additional switchbays.

Project Title	Points on wave 330kV Capacitor Bank Replacement		
Project No	5886	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 5.7 m

Switching a capacitor into service can result in large voltage “dips” (until it charges, the capacitor behaves like a fault).

To be able to meet NER quality of supply requirements, it is planned to install point on wave circuit breakers on capacitor banks which presently do not have them (where suitable circuit breakers are available).

Project Title	Protection & Metering - Reactive Metering		
Project No	5605	**Commissioning Date**	2015
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.7 m

Not all TransGrid substations which supply customers have reactive power metering. To comply with NER requirements is planned to progressively install reactive power metering at those sites which presently do not have it. This project will provide reactive power metering at a number of high priority sites.

Project Title	Protection & Metering - Under-frequency Relay Replacement		
Project No	6155	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.2 m

The NER requires NSPs to provide facilities for under-frequency load shedding. Some TransGrid substations have electro-mechanical relays which cannot be set with the required precision.

Consequently it is planned to replace these relays.

Project Title	Port Macquarie 132kV Sub 2x33kV bays		
Project No	6156	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.8 m

Country Energy plans to establish a Sovereign Hills 33/11 kV substation to supply the Sovereign Hills development.

Country Energy has requested that TransGrid provide two 33 kV line switchbays at Port Macquarie 132/33 kV substation.

Project Title	Pt Macquarie 33kV Capacitor Banks No. 1 Replacement		
Project No	6195	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$ 1.5 m

The No.1 33 kV capacitor at Port Macquarie is approaching the end of its serviceable life and it is planned to replace it with a larger capacitor.

Project Title	Quality Supply Monitoring (various)		
Project No	6117	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 14.4 m

The NER requires standards of quality of supply to be met and there is a need to install adequate monitoring.

Quality of supply monitoring is to be progressively installed across TransGrid substations.

Project Title	Queanbeyan 132kV Substation		
Project No	9172	**Commissioning Date**	2010
Category	Replacement	**Estimated Cost (2009/14)**	$ 22.9 m

A significant proportion of the existing high voltage and secondary systems equipment at Queanbeyan Substation is approaching the end of its serviceable life. The substation is an important component of the supply to the local area.

It is proposed that the substation be rebuilt.

Project Title	Real time rating		
Project No	6235	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.5 m

There is potential to maximise the available line rating to maintain supply to the growing NSW loads and to meet the needs of market participants across the interconnected system. Real time line rating monitors, communications and associated rating systems are to be installed on twelve critical NSW lines.

Project Title	Regentville 132kV Capacitor Banks 80MVAr		
Project No	6258	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.6 m

The load in the Newcastle – Sydney – Wollongong load corridor is growing and there is an ongoing need for reactive support.

A new 132 kV 80 MVAr capacitor bank is required at Regentville.

Project Title	SCADA Replacement & Augmentation (various projects)		
Project No	9048 a & 6255 a	**Commissioning Date**	Various
Category	Augmentation/ Replacement	**Estimated Cost (2009/14)**	22.8 m

The Supervisory Control and Data Acquisition (SCADA) upgrade project will provide enhanced disaster recovery, integration of Energy Management System (EMS) power system simulation applications to replace an existing stand-alone EMS, and upgraded data concentrator hardware to interface to the new substation automation systems.

The National Electricity Rules require that control, monitoring and metering devices be installed in each substation connected to the high voltage network. There are nineteen existing 132kV substations that are not connected to TransGrid's SCADA system. The replacement of the Data Acquisition and Control (DAC) system with the ABB SCADA system has removed a previous limitation on the capacity to connect additional substations. The availability of suitable communication channels to these 132kV substations has been a limiting factor in the establishment of compliant SCADA services.

Project Title	Snowy Assets Rehabilitation – Murray Switching Station		
Project No	9179	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.1 m

The transmission assets developed in conjunction with construction of the Snowy scheme were transferred from SMHEA to TransGrid in mid 2002. Most of these assets are now more than 40 years old and are in various stages of a rehabilitation program commenced by the SMHEA some years ago.

This project aims to achieve increased fault current and load current capability at Murray Substation.

Project Title	Snowy Assets Rehabilitation – Upper Tumut Switching Station		
Project No	9180	**Commissioning Date**	2011
Category	Replacement	**Estimated Cost (2009/14)**	$ 8.6 m

The transmission assets developed in conjunction with construction of the Snowy scheme were transferred from SMHEA to TransGrid in mid 2002. Most of these assets are now more than 40 years old and are in various stages of a rehabilitation program commenced by the SMHEA some years ago.

Switchgear replacement is required at Upper Tumut Substation to complete the rehabilitation program.

Project Title	Snowy- Yass/ Canberra 330kV Lines upgrade		
Project No	5562	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 34.0 m

This project covers the uprating of 330kV transmission lines connecting Snowy to Yass/Canberra. It will provide greater import capability from Snowy to help meet the growing NSW load.

Project Title	Stroud- Taree 132kV Lines (330kV Construction)		
Project No	6008	**Commissioning Date**	2016
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 27.1 m

A number of developments are proposed to reinforce the transmission system supplying the Tomago/Beresfield area and the lower Mid North Coast. The developments include establishment of a 330/132kV substation at Tomago, reconstruction of part of the Kurri – Stroud 66kV Transmission Line between the Tarro area and Stroud as a double circuit 132kV line, construction of a 330kV outlet from Tomago to the Tarro area, and construction of a Stroud – Taree 132kV line.

In the longer term it is expected that a 330kV line from Tomago to the Taree/Port Macquarie area will be required. Construction of that line would be staged, with sections being initially operated at 132kV. In particular, the section between Stroud and the Taree area would initially operate at 132kV to provide an additional 132kV circuit to Taree from the south.

The works include construction of a section of 330kV line between Stroud and a site north of Taree suitable for later establishment of a 330/132kV substation, together with a 132kV switching station to connect that line to the existing 132kV network in the Taree area.

Project Title	Sydney Area 330kV Capacitor Bank 200MVAr		
Project No	6384	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 4.7 m

The load in the Newcastle – Sydney – Wollongong load corridor is growing and there is an ongoing need for reactive support.

A new 330 kV 200 MVAr capacitor bank is required in the Sydney area.

Project Title	Sydney East 330kV Substation No.4 Transformer		
Project No	5889	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 11.5 m

Sydney East 330/132 kV substation has three 400 MVA banks of single phase transformers. The load is approaching the firm transformer capacity.

Consequently it is planned to install a fourth transformer (a 375 MVA three phase unit).

Project Title	Sydney North 132kV Capacitor Banks No.1&2 Replacement		
Project No	6200	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$ 5.6 m

The No. 1 and No. 2 132 kV 120 MVAr capacitors at Sydney North 330/132 kV substation are approaching the end of their serviceable lives.

Consequently it is planned to replace with new capacitors.

Project Title	Sydney North 330kV Control Room Replacement		
Project No	6214	**Commissioning Date**	2015
Category	Replacement	**Estimated Cost (2009/14)**	$ 16.4 m

Sydney North 330/132kV substation was established in 1963 and is one of a number of key substations located in the Sydney Metropolitan area. This substation is a point of supply to EnergyAustralia and Integral Energy, as well as providing bussing of 330kV transmission lines.

The control room is nearing the end of its serviceable life and requires replacement.

Project Title	Sydney South 330kV Transformer No.1 & 2		
Project No	9216	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 5.0 m

The inner metropolitan area of Sydney is supplied via a 132kV transmission network emanating from 330kV substations at Sydney North (Dural), Sydney South (Picnic Point), Beaconsfield West and Haymarket.

Sydney South has two 375 MVA transformers and four 250 MVA transformers. To accommodate the growing load, two of the 250 MVA transformers are in the process of being replaced.

Project Title	Sydney South 330kV bus coupling circuit breaker		
Project No	6103	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.3 m

There is potential for bushfires and other events to cause the outage of multiple circuits feeding some of the major 330 kV substations in NSW. Generally the coupling of the 330 kV buses at some substations has been arranged through duplicated line switchbays and hence there is potential for loss of the bus coupling and consequent significant supply interruption.

It is necessary to install a bus coupling circuit breaker within the Sydney South 330 kV switchyard.

Project Title	Sydney South 330kV No 3 & 4 Transformer		
Project No	9217	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 8.4 m

The inner metropolitan area of Sydney is supplied via a 132kV transmission network emanating from 330kV substations at Sydney North (Dural), Sydney South (Picnic Point), Beaconsfield West and Haymarket.

Sydney South has two 375 MVA transformers and four 250 MVA transformers. Two of the 250 MVA transformers are in the process of being replaced.

To meet the load growth in southern and inner metropolitan areas in the short term, it is planned to replace the two remaining 250 MVA transformers by 375 MVA units over the next few years.

Project Title	Sydney West 132kV Capacitor Banks No.1 Replacement		
Project No	6201	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 3.5 m

The No. 1 132 kV capacitor at Sydney West is approaching the end of its serviceable life.

Consequently it is planned to replace a new 160 MVAr capacitor.

Project Title	Sydney West 132kV new line bays		
Project No	6222	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.0 m

Integral Energy has requested two additional 132 kV connection points at Sydney West 330/132 kV substation. The new connections will be utilised to form ring supplies to the growing local industrial loads.

The works include provision of two 132kV connection points at Sydney West 330/132 kV substation. This would be achieved by the construction of two (2) 132kV line bays.

Project Title	Sydney West 330kV bus coupling circuit breaker		
Project No	6105	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.3 m

There is potential for bushfires and other events to cause the outage of multiple circuits feeding some of the major 330 kV substations in NSW. Generally the coupling of the 330 kV buses at some substations has been arranged through duplicated line switchbays and hence there is potential for loss of the bus coupling and consequent significant supply interruption.

It is necessary to install a bus coupling circuit breaker within the Sydney West 330 kV switchyard.

Project Title	Sydney Area Capacitor Banks 200MVAr (No.1 & 2)		
Project No	6241 & 6384	**Commissioning Date**	2013 & 2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 9.2 m

The load in the Newcastle – Sydney – Wollongong load corridor is growing and there is an ongoing need for reactive support.

New 200 MVAr capacitor banks are required in the Sydney area.

Project Title	Sydney Area Capacitor Banks 80MVAr		
Project No	6388	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.6 m

The load in the Newcastle – Sydney – Wollongong load corridor is growing and there is an ongoing need for reactive support.

A new 132 kV 80 MVAr capacitor bank is required in the Sydney area.

Project Title	Sydney North 330kV Substation No.5 Transformer		
Project No	5950	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 12.3 m

Load supplied from Sydney North 330/132kV Substation is growing.

It is proposed to install a fifth 330/132kV transformer, rearrange transformer connections and provide additional 132kV transmission line switchbays for Integral Energy and EnergyAustralia.

Project Title	Tamworth 132kV Substation 2 x 66kV bays		
Project No	6161	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.3 m

Country Energy's Currabubula, Werris Creek, Quirindi, Caroona, Spring Ridge and Colly Blue substations are supplied via a radial 66 kV line from Tamworth.

To meet its licence requirements, Country Energy plans to construct a second 66 kV line from Tamworth to Quirindi and has requested that TransGrid provide a 66 kV line switchbay at Tamworth 132/66 kV substation.

Project Title	Tamworth 132kV Substation Transformer Replacement		
Project No	5890	**Commissioning Date**	2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 18.9 m

Tamworth 132/66kV Substation has three transformers. Country Energy is installing capacitors within its network to help reduce the transformer loading. Nonetheless, based on the most recent forecast, the loading is expected to exceed the firm transformer rating by summer 2011/12.

Consequently, it is planned to replace two of the existing transformers by larger (120 MVA) units.

Project Title	Tamworth- Armidale 330kV SVC		
Project No	6098	**Commissioning Date**	2016
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.8 m

The load growth in the northern system coupled with the declining capability for Queensland to support the northern NSW system drives the need for augmentation to the voltage control capability in northern NSW.

Provision has been made to support the required system augmentation with a second SVC at Armidale, based on a range of load growth and generation planting scenarios which takes into account the potential for generation development in northern NSW.

Project Title	Tamworth- Gunnedah 875 132kV line		
Project No	9227	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.1 m

The 132kV network supplying Gunnedah, Narrabri, Moree and Inverell 132kV Substations is more than 500km long. Its capability is limited by unacceptably low voltages at these substations on outages of critical 132kV transmission lines.

It is planned to increase 132kV transmission line capacity by the reconstruction of the existing Tamworth - Gunnedah 66kV transmission line as a 132kV transmission line.

Project Title	Taree 33kV Substation line bay		
Project No	6432	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.4 m

Country Energy's Coopernook and Harrington substations are supplied from a single 33 kV line from Taree 132/66/33 kV substation. To meet its licence conditions Country Energy plans to build a section of 33 kV line to provide a separate supply to each substation.

Consequently a 33 kV line switchbay is required at Taree.

Project Title	Taree Control Room		
Project No	9206	**Commissioning Date**	2010
Category	Replacement	**Estimated Cost (2009/14)**	$ 6.5 m

This project comprises new building extensions, replacement of protection, metering, control and communication equipment, as well as associated switchyard secondary cabling at Taree 132/66/33kV Substation as this equipment is approaching the end of its serviceable life.

Project Title	Taree- Pt Macquarie 132kV lines		
Project No	6006	**Commissioning Date**	2018
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 0.4 m

There is presently a single circuit 132 kV line between Taree and Port Macquarie. As part of reinforcements to the network supplying the Mid North Coast it is planned to establish a 330/132 kV substation at a site to the north of Taree.

To provide robust 132 kV connections from that substation to the two major load centres on the Mid North Coast (Taree and Port Macquarie) it is planned to reconstruct the existing single circuit line as a higher capacity double circuit line.

Project Title	Tarro- Stroud 132kV Lines		
Project No	5860	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 51.5 m

The NSW Mid North Coast is supplied via a 132 kV network between Armidale, Coffs Harbour, Waratah West and Newcastle 330/132 kV substations. Two 132 kV lines, 96F Beresfield – Stroud and 963 Tomago – Taree provide the supply from the Newcastle area. If either of these lines is out of service, the rating of the other can be exceeded and low voltages can occur on the Mid North Coast.

Consequently, it is planned to construct an additional 132 kV line from the Newcastle area. This project covers the section of that line between the Tarro area and Stroud.

Project Title	Tomago 330kV Transformer and 3rd Transformer		
Project No	9230 & 6266	**Commissioning Date**	2010 & 2013
Category	Augmentation	**Estimated Cost (2009/14)**	$ 24.3 m

There is a need in the medium term to provide additional 330/132kV transformer capacity, to the Newcastle area. Also, the loading on EnergyAustralia's 132kV system in the Lower Hunter, which supplies both EnergyAustralia and Country Energy, has reached the stage where reinforcement of EnergyAustralia's 132kV network is required.

This project comprises major augmentation of the existing Tomago 330kV Switching Station (which supplies the Tomago smelter), involving the design and installation of two 330/132kV transformers and a number of 132kV line bays, and provision for the addition of a third transformer.

The third 330/132kV transformer is required by summer 2012/13 to meet expected growing load in the area and on the Mid North Coast.

Project Title	Tomago to Tarro area 330kV Lines		
Project No	6259	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 13.7 m

The NSW Mid North Coast is supplied via a 132 kV network between Armidale, Coffs Harbour, Waratah West and Newcastle 330/132 kV substations. Two 132 kV lines, 96F Beresfield – Stroud and 963 Tomago – Taree, provide the supply from the Newcastle area. If either of these lines is out of service, the rating of the other can be exceeded and low voltages can occur on the Mid North Coast.

Consequently, it is planned to construct an additional 132 kV line from the Newcastle area. This project covers the section of that line between the Tomago and the Tarro area. To meet longer term requirements it is to be of 330 kV construction.

Project Title	Tomago- Brandy Hill tee 132kV lines		
Project No	6304	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 1.9 m

To meet growing load in the Seaham area EnergyAustralia plans to establish a Brandy Hill 132/11 kV substation. That substation would be supplied via a new section of double circuit 132 kV line tee connected to the Tomago – Stroud double circuit line.

This project covers provision of the section of double circuit line between Brandy Hill and the tee points.

Project Title	Trip Scheme- System Protection Scheme		
Project No	6113	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.3 m

Multiple contingencies on the NSW 330 kV and 500 kV system could lead to widespread loss of supply and disruption to the interconnected system.

A System Protection Scheme is to be installed that will shed load at strategic locations following the outage of multiple circuits.

Project Title	Tumut 132kV Substation 66kV switchbay		
Project No	6162	**Commissioning Date**	2014
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.3 m

Country Energy's Batlow, Adelong and Tumbarumba substations are supplied via a radial 66kV line from Tumut.

To meet its license requirements, Country Energy plans to construct a second 66kV line from Tumut to Batlow and has requested that TransGrid provide a 66kV line switchbay at Tumut 132/66kV substation.

Project Title	Vales Point 132kV Sub new busbar		
Project No	6271	**Commissioning Date**	2012
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 6.9 m

EnergyAustralia is progressively replacing parts of its 33 kV network on the Central Coast with higher capacity 132 kV networks. As part of this program, EnergyAustralia plans to construct 132 kV lines to supply its new Lake Munmorah 132 kV substation from Vales Point and Munmorah 330/132 kV substations.

To connect these new lines new 132 kV busbars will be required at each of those 330/132 kV substations.

Project Title	Vineyard 132kV Substation 2 new line bays		
Project No	6223	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.1 m

To accommodate developments in the Vineyard area Integral Energy plans to establish additional 132 kV substations.

Two additional 132 kV line switchbays are required at Vineyard 330/132 kV substation to connect Integral Energy's new 132 kV lines.

Project Title	Vineyard 330kV No.3 Transformer		
Project No	6316	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 12.8 m

Integral Energy plans to supply additional load in the North West Sector of Sydney via expansion of the 132 kV system supplied from Vineyard 330/132 kV substation.

To accommodate the increased load a third 330/132 kV transformer will be required at Vineyard.

Project Title	Wagga 330kV Transformer		
Project No	9256	**Commissioning Date**	2010
Category	Security/ Compliance	**Estimated Cost (2009/14)**	$ 6.9 m

The two existing Wagga 330/132kV transformers need to be replaced as they contain PCBs.

The transformer will be replaced with new 375 MVA transformers.

Project Title	Wagga North 132kV Substation		
Project No	9257	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 0.7 m

Wagga 132/66 kV substation has three 60 MVA transformers and the load exceeds the firm transformer capacity. To overcome this limitation and to allow Country Energy to rearrange its unconventional 66 kV network in the Wagga area a new Wagga North 132/66 kV substation is to be established.

Project Title	Wagga Town 132kV No.2 Transformer Replacement		
Project No	6379	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 3.8 m

The No. 2 transformer at Wagga 132/66 kV substation is approaching the end of its serviceable life and is to be replaced by a new 60 MVA transformer.

Project Title	Wallerawang 132kV Switchyard rebuild		
Project No	6208	**Commissioning Date**	2012
Category	Replacement/ Easement	**Estimated Cost (2009/14)**	$ 18.9 m

The 132kV busbar and switchbays at Wallerawang 132/66kV Substation are approaching the end of their serviceable lives. They are to be replaced with a new busbar and switchbay.

Project Title	Wallerawang- Orange 944 132kV line rebuild		
Project No	6183	**Commissioning Date**	2013
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 46.9 m

Wallerawang – Orange 132kV Transmission Line was constructed in 1957 from natural round poles and is reaching the end of its life. The conductor has suffered from vibration damage over the years and there are a number of significant poles required to be replaced due to age and rot.

As one of the older lines on the system, this transmission line will require a rebuild (replacement of poles and conductor) to continue its effective service.

Project Title	Wallerawang No.1 & 2 Transformer		
Project No	5625	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 19.0 m

The existing 330/132kV transformers are around 30 years old. They are also a non-standard size and design.

It is presently anticipated that they may need to be replaced by around 2010 before increasing loading precludes their replacement without first installing an additional transformer.

Project Title	Waratah West 330kV Substation 2nd Transformer & line conversion		
Project No	6001	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 18.2 m

To meet the growing load in the Beresfield/ Tomago area and the lower Mid North Coast. It is planned to establish Tomago 330/132kv substation and to convert the 330kV transmission line from Newcastle to Waratah West, which presently operates at 132kV, to operate at 330kV.

Associated with this work, it will be necessary to provide a second 330/132kV transformer at Waratah West.

Project Title	Wellington 132kV Cap Bank No2 Replacement		
Project No	6197	**Commissioning Date**	2012
Category	Replacement	**Estimated Cost (2009/14)**	$ 4.3 m

The two 20 MVAr 132 kV capacitors at Wellington 330/132 kV substation are approaching the end of their serviceable lives.

Consequently it is planned to replace them with a single 40 MVAr capacitor.

Project Title	Wellington 132kV Substation new line bay		
Project No	6212	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.0 m

Country Energy's 132 kV network which supplies the Dubbo / Nyngan / Cobar area is approaching the limit of its capacity. Country Energy plans to construct an additional 132 kV line from Wellington to the Narromine area.

A new 132 kV line switchbay is required at Wellington 330/132 kV substation to connect this line.

Project Title	Wellington 330kV Shunt Reactor		
Project No	9263	**Commissioning Date**	2010
Category	Replacement	**Estimated Cost (2009/14)**	$ 2.9 m

This project is part of the works associated with the Wollar-Wellington 330kV development.

Project Title	Western 500kV development		
Project No	9270 a	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 77.6 m

The Bayswater – Mt Piper – Marulan transmission system has been constructed at 500kV but presently operates at 330kV. This project is to upgrade this network to 500kV operation without the need for new transmission line development. The aim of the project is to upgrade the power supply capability to the Newcastle – Sydney – Wollongong load corridor by diverting power around the heavily-loaded parts of the 330kV system that supply these major load centres.

The current capital works consist of the following major components:

- Construction of 500kV switchyards and installation of 500/330kV transformers at Bayswater Power Station and Mount Piper Power Station.
- Construction of new 500/330kV substations at Bannaby and at Wollar.
- Uprating of switchgear in the Wallerawang 330kV switchyard to meet increased fault level requirements.

Project Title	Williamsdale 330kV Sub		
Project No	9276 a	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 31.1 m

Canberra 330/132kV Substation is located to the northwest of Canberra. The capacity of the substation is expected to be adequate over a five-year planning period. However, the substation is not well located to efficiently supply newly identified urban growth areas south east of Canberra. In addition, the ACT jurisdiction has requested stricter reliability standards that require diversified supply to the region.

It is planned to establish a 330/132kV substation in the Williamsdale area, and also to loop the two existing 132kV transmission lines into the new substation.

Project Title	Williamsdale 132kV line bay		
Project No	6174	**Commissioning Date**	2012
Category	Augmentation	**Estimated Cost (2009/14)**	$ 1.9 m

Country Energy has requested two additional 132kV connection points at Williamsdale to supply the proposed development of the Tralee/Googong area.

This project covers provision of two 132kV line switchbays at Williamsdale Substation.

Project Title	Wollar-Wellington 330kV Development		
Project No	9286	**Commissioning Date**	2010
Category	Augmentation	**Estimated Cost (2009/14)**	$ 6.4 m

The Wellington and Central West area of NSW is currently supplied through a single circuit 330kV transmission line from Mount Piper to Wellington, and a supporting network of 132kV transmission lines and substations. Reinforcement of this system is required to provide a more secure supply as the load increases.

The construction of a new single circuit 330kV transmission line from Wollar to Wellington Substation will meet this requirement.

Environmental approval under the NSW Environmental Planning and Assessment Act was granted in April 2007 for this project. A contract for the construction of the transmission line has been placed, and detailed design and construction planning is underway.

Project Title	Yanco 132kV Substation Transformer Replacement		
Project No	5618	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$ 7.6 m

The load at Yanco 132/33kV substation is approaching the capacity of the two existing 45 MVA transformers.

It is planned to replace them with 60 MVA units.

Project Title	Yass 132kV Capacitor Banks		
Project No	6382	**Commissioning Date**	2011
Category	Augmentation	**Estimated Cost (2009/14)**	$ 2.3 m

Reactive power support is required at Yass/ Canberra to manage the increasing area load and to enable any improvement to the NSW import capability from the south.

Consequently, a new 132kV Capacitor Bank at Yass substation would be required.

Project Title	Yass 132kV Substation Transformer Replacement		
Project No	5619	**Commissioning Date**	2013
Category	Replacement	**Estimated Cost (2009/14)**	$ 3.1 m

The existing 30 MVA 132/66kV transformer at Yass is approaching the end of its serviceable life. It is to be replaced by a transformer released from Queanbeyan.

Project Title	Yass- Cowra 999 132kV lines		
Project No	5559	**Commissioning Date**	2017
Category	Augmentation/ Easement	**Estimated Cost (2009/14)**	$ 1.0 m

The 999 Yass – Cowra 132 kV line was constructed in the late 1950s and was designed for a lower conductor operating temperature than the other lines supplying the Cowra / Forbes / Parkes area.

The rating of this line presently limits the capacity of this network.

Consequently it is planned to uprate 999 line.