Investing for Future Generations

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EnergyAustralia is embarking on one of Australia’s biggest infrastructure programs over the next five years as we begin to renew and replace Australia’s largest network of electricity substations, poles and wires.

This $8 billion network upgrade creates a number of major challenges, but also a range of opportunities to create a smarter, faster and more reliable electricity network.

This is no longer a network of the future. It’s fast becoming the network of today.

Expert crews have already rolled out 800 kilometres of new fibre optic cables, installed hundreds of communication switches and deployed carrier-grade Internet Protocol technology to connect 200 major substations on our network.

We are now embarking on a large project to install more than 12,000 smart sensors in substations throughout suburban streets, to help blackouts to become shorter and less frequent.

This large scale infrastructure program will mean many parts of our electricity network that were built when our economy was expanding in the late 1960s and early 1970s will be rebuilt.

We plan to build 49 new zone substations, replace 1,263 panels of 11,000 volt switch gear and replace 155 km of 33,000 volt cable and 141 km of 132,000 volt cable.

We plan to improve reliability at the lower end of our network too over the next five years – with $2.2 billion marked for the low voltage 11,000 volt network on streets throughout Sydney, the Hunter and the Central Coast.

This network renewal will also create stable and long term careers for a new generation of electrical workers. In fact more than 1,000 apprentices and graduates are expected to join our ranks over the next five years to help build and maintain this network for many years to come.

The Federal Government’s Carbon Pollution Reduction Scheme is predicted to help reduce electricity used in homes and businesses throughout the country. We have factored this reduction into our plans.
However, while overall electricity use is expected to decrease, it is, of course, peak demand that drives the need for infrastructure. This peak energy use is being driven by population growth, economic growth and also increasing use of air conditioners in our homes and businesses. We estimate that about 58,000 air conditioners will be installed in homes throughout our network area every year. By 2014, we expect more than three quarters of all homes on our network to have an air conditioner.

A typical air conditioner increases household peak demand by about 2 kilowatts on hot days – that’s the same as switching on 20 standard televisions all at once. When all these air conditioners are switched on at once it can create high demand on the electricity grid. This plan delivers the investment needed to meet that extra demand.

We are also targeting increased peak demand through a system of pricing incentives and demand management projects that will help make the energy network more efficient and help people to use less electricity. No energy business in Australia does more in demand management and energy efficiency than EnergyAustralia.

Finally, we aim to deliver this electricity network plan in a way that respects the community we work in. We build community feedback into our projects and aim to protect the local environments where we operate.

Yours sincerely

George Maltabarow
Managing Director
About EnergyAustralia

EnergyAustralia is one of the largest energy suppliers in the country with more than 100 years experience in providing a safe and reliable supply of electricity. We operate the largest electricity network in the country, uniquely comprised of both transmission and distribution systems that supply electricity to more than three million people in Sydney, the Central Coast and the Hunter Region.

Our electricity network includes more than 49,000km of both overhead and underground powerlines, 41 subtransmission substations, 177 zone substations and 29,974 distribution substations. Together this electrical equipment supplies 1.6 million customer connections.

This network serves a wide range of communities from rural towns, rugged mountain communities and regional centres to the Sydney CBD and the Homebush Olympic site. It is powering key industries across these regions including mining, manufacturing, oil refining, shipping, engineering and agriculture.

The performance of our network has remained stable over many years, with a safe power supply available 99.98 per cent of the time. We have maintained our performance despite undergoing rapid periods of growth to keep pace with development, meeting demand and renewing our assets.

And with demand for power continuing to grow, particularly on our summer peak days, we are working to maintain this reliable supply by delivering an $8 billion capital program.

EnergyAustralia is committed to fulfilling our Duty of Care, complying with legislation and licence conditions, maintaining asset integrity, improving reliability over time and meeting the demand for about 17,000 new network customer connections each year.

At a glance
- In 2008/09 our electricity network distributed more than 30,000 GWh of electricity to homes and businesses.
- This is about 51 per cent of all the electricity consumed in NSW.
- It was delivered via 4,570km of 132,000 volt, 66,000 volt high voltage transmission lines, 17,361km of high voltage distribution lines; and 27,615km of low voltage distribution lines.
- More than 3,500 front line workers help to maintain and upgrade our electricity network, including more than 640 apprentices and engineering graduates.
- EnergyAustralia is the single largest employer of apprentices in NSW.
About six kilometres of underground tunnel carrying high voltage transmission cables will be created to form a ring, picking up new and upgraded substations. Committed projects and the new CityGrid Project make up the $1 billion investment.

### Five Year Capital Budget 2009-2014

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Our program is at the forefront of efforts by the electricity industry worldwide to overlay smart technologies across existing networks to create a smart grid.

EnergyAustralia is rolling out a $170 million intelligent network program to create a smarter, more reliable electricity network to deliver greater services to customers.

In three years, we have rolled out a next generation communications platform, uniquely designed for our utility business.

We have installed 800 kilometres of new fibre optic cables which underpins the core functions of control and security of the electricity network.

We have also fitted hundreds of communication switches and deployed carrier-grade Internet Protocol (IP) technology to connect 200 major substations on our network.

The new telecommunications platform provides greater information about equipment to field and office staff, allowing better decision-making and early fault detection and repair.

Another milestone in our intelligent network program is the installation of a trial communications network across six EnergyAustralia sites in the greater Newcastle area.

This telecommunications network is the crucial ‘last-mile’ for an intelligent network as it connects all parts of the network with two-way communications, including smart meters and other smart devices.

Two-way communications is the key to providing greater information and services to customers, including online monitoring of energy use and remote control of appliances.

This year we are extending our intelligent network rollout by installing sensors in 12,000 suburban substations.

This will give our engineers and technicians an instant picture of how that part of the network is performing. The sensors will allow us to detect faults before they occur, find and fix any faults quickly, and connect more renewable energy to our network in the future.

This level of monitoring and control will make our network more intelligent so we can provide a better power supply to customers.

We have also launched a $10 million partnership with Sydney University and Newcastle University over five years to lead smart grid development in Australia and train the next generation of engineers.

At a glance

- A new communications platform has been built across the network.
- More than 800 kilometres of fibre optic cable has been installed connecting more than 200 substations.
- 12,000 smart sensors are being installed across the network to collect data.
- A two-way communications network using WiMax technology has been trialled in the Hunter.
- $10 million partnership established with Sydney and Newcastle Universities to lead smart grid development.
A greener grid that has fewer and shorter power interruptions is a step closer thanks to EnergyAustralia’s intelligent network program.

We are progressively transforming our network to make it smarter, greener, and more reliable.

As part of this staged program, we are installing more than 12,000 smart sensors in distribution substations over the next five years to give us greater information about how the electricity network is performing.

These smart sensors will allow us to locate faults more efficiently and help to reduce the length of power interruptions to households.

They will also give us key planning information such as how much electrical load is running through the substation, when it needs maintenance and when it needs to be replaced.

This information will allow preventative maintenance to be better targeted, helping to prevent outages in the first place.

These sensors will also allow us to connect more renewable energy to the grid, including wind, solar and plug-in electric cars. Adding these key elements will help us de-carbonise the grid in coming years.

Field operations will also be made more efficient by the sensors because field staff will be able to access a range of information immediately by logging into that substation using a laptop computer.

The sensors are being rolled out suburb by suburb, street by street across Sydney, the Central Coast and the Hunter.

We will be able to see what’s happening on the network in every street, in every suburb, every minute of the day.

This level of monitoring and control will make our network more intelligent so we can provide a more reliable power supply to customers.

We’re proud to be a world leader in the field of intelligent networks. These smart grids are the key to a low carbon future and a better power supply. And that’s what we commit to deliver to the community.
More than 175,000 of our customers are now using smart meters that help deliver cost reflective, time based pricing for their electricity. We are installing these smart meters in all new and upgraded connections, which means we no longer install the old style electricity meter.

Our customers can now also volunteer to have a smart meter installed in their premises.

Smart meters measure how much electricity is used every 30 minutes compared to older style meters that measure how much power is used every three months.

This means customers with smart meters are able to pay different rates for electricity based on when it is used. This time based pricing system is known as Time of Use.

More changes across a larger group of customers are required to help better manage peak electricity demand.

It's an important pricing signal and long term network demand management tool.

New communications technology has been trialled through a roll out of advanced smart meters. More than 7,000 of these meters have been installed on our network, helping us to test new services like remote meter reading, remote connection and disconnection, online access to your electricity consumption and bill, options for “Off Peak” control of hot water and other applications, even management of your own power supply such as rooftop solar.

Our advanced metering infrastructure trial will help inform a case for a further roll out of smart meters and time of use pricing across electricity networks Australia wide.

Smart meter facts

- We expect to invest more than $93 million over the next five years installing new electronic smart meters.
- 76 per cent of customers with smart meters are paying less for their electricity costs compared to traditional meter rates.
- An average home with a smart meter uses about 26 per cent of its power in the off peak period, about 56 per cent in the shoulder period and 22 per cent in the peak.
- 71 per cent of customers think that time based pricing is a fairer system.
- 83 per cent of customers said they were more aware of their electricity consumption using time based pricing.
- 72% of customers said they were actively making changes to their electricity usage.

Smart meters and Time of Use pricing are a way of evening out this dramatically peaky electricity consumption pattern and help make our electricity system more efficient.

New electronic smart meters hold the key to a range of new services to households and businesses while allowing price signals to help make the electricity network more efficient.
Anthony and Kate Callaghan had a smart meter installed two years ago and they haven’t looked back. The household of four is now saving about $250 a quarter on their electricity costs by following a few simple steps.

“It was a simple re-education exercise,” Mr Callaghan said.

“We looked at which appliances we could use in off peak periods without giving up our creature comforts.”

“Most of our appliances have timers so we program them to start after 10pm. The dishwasher, the washing machine, the dryer and the pool pump all operate in the off peak period – it hasn’t inconvenienced us at all.”

Smart meters measure how much electricity is used every thirty minutes, compared to standard meters that provide a cumulative total of electricity use over a three month period.

This means customers can pay different rates for electricity based on when they use it. It’s called time based pricing or Time of Use.

Analysis of 32,000 residential customers on time based pricing shows that on average these customers are saving $64 a year on their electricity bills. In fact three quarters of these customers were paying less on time of use pricing.

And businesses are now also starting to seize the benefits of the smart meters.

With a 218-berth marina, a four-storey clubhouse, restaurants, offices and workshops, the Royal Motor Yacht Club would have had to pay more than $160,000 a year in energy bills before its smart meter was switched on.

With the smart meter now ticking over, the club is saving about $60,000 a year in electricity costs.

“We’re open from 8am to 10pm on 365 days of the year – we don’t even close on Christmas Day – so we have considerable running costs,” Royal Yacht Club General Manager Karen Baldwin said.

“But once we got our smart meter installed we discovered that we were using about 37 per cent of our electricity in off peak times.

“This means the price we pay for electricity in this period is a lot cheaper. We’re not just saving money but we’re now more aware of our electricity use and more aware of the potential to save by switching other electricity use outside peak times.”
Managing demand

Reducing energy use in peak times can benefit everyone – including us. Customers can save money, the environment can benefit from reduced greenhouse gas emissions and the power supply remains reliable and affordable.

EnergyAustralia undertakes demand management investigations whenever planning for expansions to electrical infrastructure costing more than $1 million. We balance the need to boost capacity with our ability to reduce demand. The goal is to find the lowest cost and most reliable long term solution.

These investigations have helped defer more than $135 million in capital spending on the electricity network over the past four years.

Over the past 12 months alone our Demand Management team completed 42 Demand Management tests and nine full investigations.

EnergyAustralia investigates a range of innovative demand management solutions including:

- Developing agreements with energy users to interrupt or reduce loads during peak periods
- Using generators or co-generators on customer premises
- Facilitating installation of customer power factor correction equipment
- Installation of energy efficient appliances that lower power demand – like CFLs
- Changing some electrical loads to other fuels like natural gas

Even the off peak hot water you use is an important part of managing demand for power on the electricity network. Off Peak hot water or load control has been a feature in many homes since the 1950s. A signal sent over the electricity network automatically switches hot water units off and on at pre-determined times.

More than 500,000 households across the EnergyAustralia Network use Off Peak hot water and collectively they help to switch more than 300 Megawatts of electricity outside peak times. This means less capacity needs to be built into our electricity network.

EnergyAustralia also argued successfully for the introduction of a special demand management innovation fund. This fund will see $1 million a year invested in innovative research and development in demand management across the EnergyAustralia network until 2014.

Facts and figures

- 42 demand management screening tests have been completed over the past 12 months on proposed projects costing more than $1 million.
- Over the past four years, demand management projects have reduced costs by about $17 million.
- More than one million customers are paying for electricity under our inclining block tariffs – the strongest pricing incentive to use less electricity in the country.
- Almost 180,000 customers are paying for electricity under Time of Use pricing.
- About 300 MW of electricity is shifted to off peak times each day in winter via Off Peak Hot Water systems.
- About five co-generation projects are being rolled out or planned for the Sydney and North Sydney CBD areas.
Most power generators today transmit energy over vast distances to the customers who use the power. A large, gas-powered generation system inside a North Sydney skyscraper, however, is supplying the building’s power – as well as reducing demand on the local power network. The generation system – sometimes called a trigeneration plant – has two gas engines and is embedded in the network.

When fired up, they produce 75 per cent of the building’s electricity needs, and the waste heat is used to drive two absorption chillers for cooling.

The power and cooling all comes from a single gas source.

The generator will operate for 15 hours every working day, during peak and shoulder periods – when the demand for power is at its highest. This provides network support during the afternoon period on business days by reducing demand on EnergyAustralia’s network. EnergyAustralia’s expert crews worked closely with the building management to make sure the unit was safely connected to the electricity network.

“It will help reduce load at the subtransmission substation that supplies North Sydney over summer,” Manager of Demand Management Neil Gordon said.

“The generator is directly connected to our substation located in the building’s basement and extra steps were taken to connect the generation system with the network to ensure safety and reliability.”

As the largest generation plant of its kind inside a commercial building in Australia, it will achieve a 50 per cent reduction in greenhouse gas emissions. This will save up to 10,000 tonnes of carbon emissions each year. Embedded generation projects like this may become a common part of electricity networks of the future – where local generation mix with larger scale plant via local and transmission networks.

Similar projects are being planned or rolled out in four Sydney CBD sites.
At EnergyAustralia, we believe that becoming more energy efficient is a simple first step for us all to reduce greenhouse gas emissions and reduce our impact on the environment.

It also means we can rely on our current energy infrastructure rather than spend millions of dollars on new power lines and substations. So your savings are our savings.

Our research shows that bad household habits in using electrical appliances is adding about $300 million a year to electricity costs across NSW and pushing up annual greenhouse emissions by 2.5 million tonnes.

That's why we deliver tailor made energy efficiency education campaigns designed to give practical advice to households. Over the past 12 months we have delivered energy efficiency handbooks for heating, solar pv systems and pool pumps. We have built a $4 million state-of-the-art Energy Efficiency Centre to be used by schools as part of their environmental programs and for tradespeople as a hands-on demonstration showcase.

The Energy Efficiency Centre was awarded the NSW Government Green Globe Award in the Public Sector Energy Category.

Expert advice has even been translated into 11 different languages to help train bi-lingual educators spread the word on energy efficiency.

We back up these education campaigns with action based initiatives that bring about guaranteed energy savings. Projects to convert electric systems to gas, heat pump or solar systems have the greatest potential to save energy, reduce greenhouse emissions and reduce energy costs.

In one project alone, EnergyAustralia partnered with Jemena to convert 130 electric hot water systems to gas hot water systems – saving an estimated 330 tonnes of CO₂ emissions every year. Older style fridges can guzzle as much as 13 per cent of a typical household's electricity consumption so they too are an obvious energy efficiency target.

EnergyAustralia partnered with Fisher & Paykel and the Toukley Neighbourhood Centre to replace 300 old second fridges for low income households. The program helped deliver 324 tonnes of annual CO₂ savings as well as reducing household bills by almost $40,000 a year. Likewise, $150 rebates for 950 quieter pool pumps were issued to customers to help them run their pool pumps outside peak times – this means they can save money and help make the electricity network more efficient.

At a glance

- A winter heating guide has been delivered to 5,000 low income households to help cut heating costs.
- More than 250,000 packs of energy efficiency stickers were delivered to households to help advise on simple energy efficiency advice.
- More than 100,000 swimming pool efficiency guides were sent to pool shops to advice on steps for running pool pumps more efficiently.
- More than 330,000 incandescent light bulbs were replaced with energy efficient CFLs in 22,000 homes.
- More than 7,000 Department of Housing homes were fitted out with energy and water saving devices – including CFLs, efficient shower heads and aqualocs under a joint program between EnergyAustralia and the NSW Department of Housing.
More than 1,500 energy guzzling light bulbs are being replaced with lower energy lights under a pilot energy efficient program targeted at small businesses in a boutique shopping strip in Sydney’s North Shore.

Almost 40 small business owners in Cammeray have been offered energy efficiency fit outs along with a full review of their energy use as part of a campaign to uncover energy reductions for small business. Restaurants to real estate agents and clothing shops have all taken part in the trial, with businesses tipped to save an average of about $420 on their annual electricity bills and about 3.1 tonnes of greenhouse gas emissions each year.

Households have benefited from numerous energy efficiency campaigns from EnergyAustralia – including light bulbs replacements, hot water change overs, pool pump rebates and old fridge retirements. However, small business hasn’t reaped the same rewards.

This program is the first of several planned to benefit small business. Our energy efficiency team conceived the pilot program and received assistance from the Department of Environment Climate Change and Water NSW and the Cammeray Chamber of Commerce.

In total the trial will save enough energy to power 17 households for a year and save 119,000 kilograms of greenhouse gas emissions.

Lighting is one of the biggest energy users in business and can account for more than 50 per cent of total energy use.

For Credo Café that will mean a saving of about $2,500 a year and 21.1 tonnes of CO2 emissions, that’s the equivalent of taking about seven small cars off the road.

The shop had 120 down lights which were fitted with new, more energy efficient lamps and electronic transformers. And with longer life bulbs, replacements will be less frequent resulting in lower maintenance costs and fewer bulb failures.

Once the pilot is assessed we hope it can be rolled out.
Investing in our electricity network

EnergyAustralia will invest more than $1 billion each year to upgrade and renew the electricity network, boost supply during peak summer days and improve reliability.

Over the next five years one of Australia’s largest infrastructure programs will be rolled out across our electricity network. More than $8 billion in total will be invested across our 49,000 kilometres of wires and 30,000 substations. Much of this electricity network was built when our economy was expanding in the late 1960s and early 1970s. It is now time for this infrastructure to be renewed, upgraded and replaced.

We’re also seeing the peak demand for power increasing across our electricity network, driven mainly by population growth, economic growth and an increasing use of air conditioners. With an estimated 58,000 air conditioners being installed throughout our network area every year, we expect more than three quarters of all homes on our network to have an air conditioner by 2014.

To address these needs we plan to spend $4.3 billion on more than 300 major projects across the network. This includes investment in large sub-transmission substations and zone substations and the sub-transmission and transmission cables that connect them.

The distribution network takes energy from the sub-transmission network via the street level network to homes and businesses. More than $2.2 billion will also be invested in this part of our network over the next five years. This includes more than $700 million in the low voltage wires that line our streets, almost $500 million on distribution substations that sit along side them and $950 million for upgrades to our 11,000 volt cables.

These programs will ensure that our network continues to operate safely and reliably.

An extra $500 million will also be invested to help connect the growing number of customers to the distribution network over this five year period.

At a glance

- Our capital works program is one of the largest infrastructure programs in Australia.
- We plan to invest $8 billion in the electricity network over the next five years.
- This includes $1 billion to help build high tech communication networks, depots and training facilities, and specialist equipment such as elevated working platforms.
- We plan to replace or upgrade 2,300km of cables, 6,745 distribution centres, 4,623 switches, 900 circuit breakers, 669 distribution transformers and 25,000 electricity poles.
- We plan to build 49 new zone substations.
EnergyAustralia has a strong tradition of investing in its people. Our engineering graduate program has been running since 1957 and we’ve been training apprentices since 1910. Over the past 10 years we have recruited and trained more than 1,000 apprentices and graduates. It’s these recruits who are delivering our plans to renew and rebuild our electricity network from the ground up. But the work doesn’t stop with this crew. Over the next five years we plan to employ another 1,000 graduates and apprentices.

Our electricity network of the future will be in their hands too. These new workers will gain valuable experience in a variety of fields throughout the business with many destined to become industry leaders. EnergyAustralia offers graduates a two-year rotational program with the choice of over 50 positions in electrical engineering. They can work in sections like Asset Management, Contract Management, Construction, Design, Demand Management, High Voltage Testing, Project Management and many more.

To further foster the engineering industry, EnergyAustralia has joined forces with Sydney University to fund a Chair in Power Engineering. The sponsorship of the Chair ensures power engineering remains a focus at Sydney University and that more students will choose electrical engineering as a lifelong career. Our skilled workforce is the backbone of EnergyAustralia so it’s important that graduates and future employees have the right skill base and knowledge. It’s a contribution that all employers should make to their industry.

Joining our engineering graduates is a crew of more than 600 apprentices who are working across all levels of the electricity network. These recruits are taught to work safely, while gaining high levels of technical proficiency and invaluable on the job experience.

They join our other field staff in delivering a 24 hour response to storms and other incidents throughout our electricity network. They are being trained as line workers, cable jointers, substation technicians and motor mechanics. Together they make EnergyAustralia the single largest employer of apprentices in NSW.
Lighting the streets

Street lighting is a vital community asset that keeps the community safe and secure.

EnergyAustralia services about 250,000 street lights on behalf of 41 local councils across our network, including a 24 hour enquiry and complaint handling operations and the dispatch of crews to repair faults.

We plan to invest about $70 million on maintenance of street lighting assets over the next five years.

As well as 24 hour fault reporting and repairs, EnergyAustralia has a number of street light improvement measures to keep the lights along our roads and streets on when we need them.

This includes the systematic replacement of lamps in every street light every 30 months as a pre-emptive measure. We also proactively replace the intelligent sensors that turn the lights on and off, and have night time patrols on some major traffic roads.

Our crews are also transferring the power supply for street lights to the low voltage network.

Repair times across Sydney, the Central Coast and Hunter have been cut as a result of our targeted campaign to inspect, replace and repair the local lighting network.

The NSW Public Lighting Code requires most street light notifications to be repaired in eight days on average – our average repair time has fallen to less than half this target.

EnergyAustralia has introduced energy efficient lighting as a standard for all its street lights.

Existing lights will be phased out and our default, energy efficient luminaires will be used when existing luminaires need replacing.

For lights that grace the streets of many homes across our area, EnergyAustralia offers councils a choice of energy efficient light.

The standard is the new generation compact fluorescent, or CFL. Using half the energy of the most common street light, it directs all light onto the road – outperforming older style lights that spill 30 per cent of its light into the night sky.

The alternative choice, the T5, consumes less power than the previous generation street light to keep the streets safe and secure.

At a glance

- There are more than 250,000 street lights across the EnergyAustralia network.
- We plan to invest about $14 million each year on monitoring, maintaining and repairing our public lighting network.
- Repair times for street light faults is less than half the NSW target of eight days.
- EnergyAustralia has introduced energy efficient lighting as a standard for all its street lights.
- EnergyAustralia’s standard light for residential roads is a compact fluorescent light.
- Lights maintained by EnergyAustralia that are not working can be reported on 1800 044 808 or at our website www.energy.com.au.
When day turns to night, more than 5,000 compact fluorescent lamps are quietly lighting our streets using half the energy compared to the standard street light.

And now this quiet achiever is in line to replace another 50,000 under performing, 1970s style street lights across our network.

The old ‘Twin 20’ street light has graced public streets throughout NSW since the 1970s, but its time has come thanks to a new generation of energy efficient luminaires.

The ‘Twin 20’ fluorescents were devouring increasing maintenance costs, while new lighting technology coming onto the market was offering better greenhouse savings than current technology.

Now local councils are able to choose either one of two lights to have installed on streets throughout their area. The lights are manufactured by two companies located in Sydney’s west and on the NSW Central Coast.

The first of those lights is a compact fluorescent light offered by EnergyAustralia with either a 32W or 42W low energy consumption lamp. It delivers the same amount of white light, needed on residential streets, using half the amount of power as the previous standard street light. This energy efficient CFL is now also EnergyAustralia’s lamp of choice when replacing any old or broken street lights.

The second light is a tubular fluorescent light with two 68 lamps. As well as being energy efficient, the new lights significantly reduce the amount of light spilled into the night sky.

These lights will help make our roads and communities safer using half the energy and stay lit for longer – a smarter choice whichever way you look at it.
Driving reliability – meeting our customer’s expectations

A safe and reliable supply of electricity is central to the everyday decisions we make and the future planning of our network.

Our reliability team analyses outages on our electricity network to help build a detailed profile of where and when outage may occur. Upgrade works are then tailored to these areas with a range of cutting edge techniques used to reduce, avoid and prevent blackouts.

Ten separate projects targeted at reliability hot spots are now being delivered across our electricity network – they range from Meadowbank and Pennant Hills in the north and Wyong and West Gosford in the Central Coast. They are part of the reason why we are on track to reduce both the frequency and duration of outages in areas that need it most.

Targeted vegetation management is also an important part of improving our performance and is being rolled out to boost reliability in suburbs with dense bushland.

About 70 per cent of interruptions on the electricity network occur at the distribution level – much of which was built when our economy was expanding in the late 1960s and early 1970s.

The low voltage poles and wires that span our streets will not be overlooked amongst our significant capital works injection of 320 large scale projects that will renew, improve and expand the electricity network.

Crews are installing low voltage Aerial Bundled Cable to improve both reliability and amenity of streetscapes.

About 50 kilometres of low voltage mains will be replaced each year for the next five years, with bare mains converted to covered conductors along sections that need it most.

Aerial Bundled Cable wraps the four low voltage overhead wires, which are strung between poles along suburban streets, into one single insulated cable.

They are tidier than traditional wires, require less tree trimming and are more resilient during extreme storm conditions.

Our power crews work throughout the electricity network to help deliver a safe and reliable supply of electricity.

We’ve set an ambitious target to deliver a reliable network with electricity supply available 99.98 per cent of the time and are working hard every day to meet that target.

At a glance

- An annual $20 million vegetation management program to prevent trees coming into contact with powerlines.
- Work is underway on numerous capital works projects to boost reliability in suburbs in Sydney, the Central Coast and Hunter.
- An investment of $4.6 million will be spent each year to replace about 50 kilometres of low voltage mains a year, including replacing bare mains with covered conductors in targeted sections.
- These projects include installation of new covered conductors, isolation devices and fault protection devices to improve reliability.
- The overhead wires connecting more than 110,000 homes to Australia’s biggest electricity network will be replaced under a plan to cut outages and improve community safety.
More than 2,000 homes and businesses set amongst bushland and hilly terrain in Sydney’s northern districts will soon benefit from targeted investment designed to enhance the reliability of their power supply.

The $2 million reliability boost will slash the number and duration of outages by targeting powerlines that travel through gullies of dense bushland.

An 11,000 volt powerline that straddles a gully and supplies homes in parts of Beecroft and Cheltenham will be removed and new underground cables will replace it along suburban streets, removing the risk of interference from trees.

Due to the number of supply interruptions caused by trees and animals coming into contact with powerlines, parts of the local overhead network most at risk will also be replaced with covered conductors – boosting their resilience during storms.

Helicopters will be called in as part of upgrade works to access areas where our powerlines travel through steep valleys that are thick with bushland vegetation.

An additional benefit of the upgrade is the reduction of bushfire risk, an important task even for a city-based electricity distributor.

New timber power poles and cross arms will also be used where required and all underground to overhead connection points will be covered.

This will leave the local electricity network refreshed with the latest tools to enhance the reliability of power supplied to local homes and businesses.
Forty metres below Sydney’s busy streets (at the tunnel’s lowest point), a team of expert electricians, cable installers and cable jointers are working to secure tomorrow’s power supply.

The 1.7 kilometre City West Cable Tunnel has been completed by EnergyAustralia crews with the help of a 110-tonne tunnel boring machine. The tunnel will be the backbone of power supply to the northern part of the CBD.

Forty cable workers have completed installation of about 20 kilometres of cables that are being connected by a team of six cable jointers.

During excavation of the 1600 metre section of the tunnel:
- The tunnel boring machine (TBM) consumed 730Mwhr of GreenPower – that’s enough power to light up the Sydney Harbour Bridge for an entire year.
- 64,000 tonnes of crushed rock were disposed of.
- The water treatment plant handled 55 million litres of water.
- 9,390 concrete segments manufactured in Newcastle and delivered by truck, were used to construct the tunnel lining.
- Hydraulic oil from the tunnel boring machine will be recycled as diesel and other petroleum secondary products.

The $120 million cable tunnel will contain 132,000 volt cables linking the new City North zone substation with a bulk supply point at Haymarket.

The $120 million City North Zone Substation is due to be commissioned in 2010, making it the largest electrical substation the city has ever seen. It will be eight stories high and house thirteen 132,000 volt circuit breakers, ninety-two 11,000 volt circuit breakers, five 50 MVA transformers fed by five 132,000 volt cables with capacity for four more high voltage cables.

It is part of the $1 billion CityGrid plan to reinforce the power supply to Sydney’s CBD. The Sydney CityGrid project will include a combination of new and upgraded cable tunnels, substations and electricity cables powering the network.

When complete the Sydney CityGrid will create a ring beneath the CBD connecting the City West Cable Tunnel and City South Cable Tunnel. It will make the city’s transmission network the most secure of any city in the country.
Our investment in electricity infrastructure extends to all corners of our distribution network. We have summarised this investment on a regional basis for major projects that have been completed recently, are in development and that we are committed to.

It is our five year blueprint for our electricity network and is based on our analysis of growth in demand for power and an assessment of how our electricity network can meet that demand. It also includes an assessment of the need to renew and replace assets.

- **Committed projects** includes work that is underway but has not yet been commissioned.

- **In development projects** are those where demand management investigations and detailed development, community consultation and regulatory approvals are underway.

Information is current as at September 2009 and the regional maps include projects over $10 million but do not include network-wide replacement projects. For ease of reading, while feeder upgrade projects on our network may be detailed within the regional sections they may not appear on the regional maps.

EnergyAustralia’s major infrastructure projects are all supported by a community consultation process that is regarded as a benchmark for the electricity industry. The process provides opportunities to listen to the community and seek joint solutions throughout the planning process.
Regional network investment

Sydney CBD

Region: Sydney City

Load Growth per year: ★ 2.2 per cent or 14MVA ★ 2.2 per cent or 11MVA

Planned regional investment 2009-2014: $964 million

Highlights: New substations for City North, Belmore Park and Riley Street
Our Five Year Network Plan: 2009—2014

Committed Projects
- 2005-2010 – City North zone substation conversion and associated 132kV feeders
- 2007-2010 – City West cable tunnel
- 2007-2013 – City South transformer replacement
- 2008-2012 – Belmore Park new zone substation associated 132kV feeders

Projects in Development
- 2008-2014 – Dalley Street equipment replacement
- 2009-2015 – New City East zone substation
- 2010-2011 – Haymarket to Beaconsfield West new feeder
- 2010-2014 – 11kV Load transfers to improve substation security
- 2010-2014 – City East cable tunnel
- 2011-2012 – City South cable tunnel extension from Surry Hills STS to Riley Street STSS
- 2011-2014 – Riley Street new sub-transmission switching station

Overview
The Sydney CBD region extends from Circular Quay in the north, west to Darling Harbour, east to Woolloomooloo and south to Haymarket. The network is supplied at 132kV from Haymarket bulk supply point (BSP) and at 33kV from Pyrmont STS and Surry Hills STS. It serves the important business district with around 45 per cent of Sydney’s total office space, 38,000 residents, high rise commercial and residential buildings, extensive retail areas and major rail stations.

New residential developments and hotel accommodation, together with an increase in demand for office space is expected to drive the increased growth in Sydney’s CBD.

The Sydney CBD region is currently supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Central ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>City South ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Dalley St ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>City East ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>City North ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply
EnergyAustralia is planning major works in the CBD to increase the security of supply from its 132/11kV substations. Planned works include the installation of additional zone substation capacity at the new City North and Belmore Park substations and significant expansion of the CBD 11kV network. These initiatives will ensure compliance with EnergyAustralia’s revised design planning criteria.

In conjunction with these reliability initiatives, EnergyAustralia proposes to continue with the replacement of 33kV substations in the CBD. The proposed program of works provides an integrated strategy which will provide increased reliability.

Committed Projects
- 2005-2010 City North zone substation conversion
  Work is underway to replace the existing City North zone substation with a new 132/11kV zone substation and associated 132kV and 11kV connections.
- 2007-2010 City West cable tunnel
  Construction of new 1.7km transmission cable tunnel to supply the new City North zone substation.
- 2007-2013 Committed 06/08 City South transformer replacement
  It is proposed to undertake the staged replacement of transformers at this location to increase capacity.
- 2008-2012 Committed 05/09 Belmore Park new zone substation
  The southern CBD precinct requires additional capacity to enable the security of supply from existing 132/11kV substations to be improved. A new 132/11kV zone substation and associated 132kV feeders will be constructed in the vicinity of Belmore Park.

Projects in Development
- 2008-2014 Dalley Street equipment replacement
  It is proposed to continue the refurbishment of this facility through the staged replacement of 11kV switchgear.
- 2009-2015 New City East zone substation
  The existing City East zone substation is approaching time for replacement. The plan is to replace this substation with a new 132/11kV zone substation in the north eastern part of the CBD.
- 2010-2011 Haymarket to Beaconsfield West new feeder
  This project is required to provide additional capacity to comply with joint reliability criteria. The most likely option is to install a new 132kV feeder between Haymarket BSP and Beaconsfield West BSP.
- 2010-2014 11kV Load transfers to improve substation security and address zone substation loading
  An extensive program of load transfers will be required in the 2010-2014 period to increase the security of supply at existing substations.
- 2010-2014 City East cable tunnel
  A new 3.2km transmission cable tunnel to supply City East, retire oil filled 132kV cables and complete the 132kV network in the CBD.
- 2011-2012 City South cable tunnel extension
  Proposed development of the 132kV network in the CBD and eastern suburbs to supply the proposed Rose Bay and Belmore Park substations requires increased 132kV connections between the CBD and eastern suburbs. To facilitate these connections and provide for future development in the area it is proposed to extend the southern CBD cable tunnel to the site of the proposed Riley Street 132kV busbar.
- 2011-2014 Surry Hills STS (Riley Street)
  Proposed development includes new 132kV switchgear that will provide connection for the new City East zone substation and enable retirement of some 132kV cables approaching retirement.
Regional network investment

Eastern Suburbs Region

Region: Sydney City

Load Growth per year: ★ 2.2 per cent or 28MVA ★ 1.6 per cent or 20MVA

Planned regional investment 2009-2014: $963 million

Highlights: New 132kV feeders between Bunnerong and Kurnell; New substations at Kingsford, Port Botany, Rose Bay and Waverley
Our Five Year Network Plan: 2009—2014

Committed Projects
- 2006-2010 – Kingsford new zone substation
- 2007-2010 – Bunnerong to Kurnell new feeders
- 2008-2010 – Port Botany new zone substation
- 2009-2013 – Rose Bay zone substation replacement

Projects in Development
- 2008-2013 – Marrickville zone substation equipment upgrade
- 2008-2013 – St Peters zone substation equipment upgrade
- 2010-2011 – Green Square zone substation upgrade
- 2011-2013 – Peakhurst/Bunnerong/Beaconsfield West feeder replacement
- 2012-2014 – Waverley zone substation replacement
- 2013-2014 – Green Square to Beaconsfield West new feeder

Overview
The Eastern Suburbs region is bounded by Surry Hills in the north-west, Port Jackson in the north, Botany Bay in the south, the coastline in the east and west as far as Marrickville. The network is supplied at 132kV from Beaconsfield West BSP, Bunnerong STS and Haymarket BSP and supplies a multitude of large customers at high voltage. It is now time to renew and replace some of these assets. The region generally has a forecast of low growth. There are, however, pockets of high growth around Zetland/Green Square from new commercial and residential developments. There are also large spot loads in Mascot/Botany from industrial developments as state and local governments implement urban renewal programs and expand transportation services.

The Eastern Suburbs region is currently supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunnerong North STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Surry Hills STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Campbell St ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Clovelly ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Double Bay ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Green Square ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Maroubra ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Marrickville ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>St Peters ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Zetland ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Botany ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Darlinghurst ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Graving Dock ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Mascot ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Matraville ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Paddington ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Randwick ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Rose Bay ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Surry Hills ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Waverley ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Alexandria ZS</td>
<td>33/5</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply
It is now time to start planning to renew some assets in this region. Similarly, as the planning for potential major spot loads is finalised, additional capacity requirements will be addressed either in conjunction with equipment replacement or as new developments. The replacement of the Canterbury to Bunnerong 132kV sub-transmission feeders 908/909 with new 132kV feeders between Bunnerong and Kurnell will also generate infrastructure activity in the region.

Committed Projects
2006-2010
Kingsford new zone substation
The existing Randwick 33/11kV zone substation and feeders are approaching the time for renewal. Work is underway to construct a new Kingsford 132/11kV zone substation and feeders followed by the retirement of the existing 33kV infrastructure.

2007-2010
Bunnerong to Kurnell new feeders
The existing 132kV feeders 908/909 between Canterbury STS and Bunnerong STS are approaching the time for renewal. Work is underway to install new larger capacity 132kV feeders between Kurnell STS and Bunnerong STS followed by the retirement of the existing Canterbury to Bunnerong cables.

2008-2010
Port Botany new zone substation
The existing port facilities at Port Botany are undergoing a major expansion. Additional infrastructure is needed in the area to meet the anticipated demand. Work is underway to construct a new 33/11kV zone substation in the area.

2009-2013
Rose Bay zone substation replacement
The existing Rose Bay 33/11kV zone substation and feeders are approaching the time for renewal. Work is underway to construct a new Rose Bay 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.
Projects in Development

2008-2013
Marrickville zone substation equipment upgrade
The existing Marrickville zone substation requires additional operating equipment to increase supply reliability from the substation. The most likely option is to install 132kV ring main circuit breakers at Marrickville.

2008-2013
St Peters zone substation equipment upgrade
The existing St Peters zone substation requires additional operating equipment to increase supply reliability from the substation. The most likely option is to install 132kV ring main circuit breakers at St Peters.

2010-2011
Green Square zone substation upgrade
The area supplied from Green Square substation is experiencing sustained growth. Additional infrastructure is required to meet this increased demand. The most likely option is to install an additional transformer.

2011-2013
Peakhurst/Bunnerong/Beaconsfield West feeder replacement
The existing 132kV feeders 91L and 91M/1 which connect Peakhurst STS to Bunnerong STS and Beaconsfield West BSP are approaching the time for renewal. The most likely option is to install a new 132kV feeder from Canterbury STS to Beaconsfield West BSP and a new 132kV feeder from Peakhurst STS to Beaconsfield West BSP.

2012-2014
Waverley zone substation replacement
The existing Waverley 33/11kV zone substation is approaching the time for renewal. The most likely option is to construct a new Waverley 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2013-2014
Green Square to Beaconsfield West new feeder
Under certain network events, the Inner Sydney Metropolitan transmission system requires additional capacity to comply with joint reliability criteria. The most likely option is to install a new 132kV feeder between Green Square ZS and Beaconsfield West BSP.
Regional network investment

### Inner City Region

**Region: Sydney City**

**Load Growth per year:**
- ✽ 2.4 per cent or 3.4MVA
- ❄ 1.5 per cent or 1.4MVA

**Planned regional investment 2009-2014:** $307 million

**Highlights:** Upgraded substations at Camperdown and Darling Harbour

<table>
<thead>
<tr>
<th>Project</th>
<th>Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rozelle to Pyrmont/ City Central part feeder replacement</td>
<td>2006-10</td>
</tr>
<tr>
<td>Blackwattle Bay zone substation retirement</td>
<td>2011-13</td>
</tr>
<tr>
<td>Darling Harbour zone substation upgrade</td>
<td>2011-12</td>
</tr>
<tr>
<td>Camperdown zone substation equipment replacement</td>
<td>2008-12</td>
</tr>
</tbody>
</table>

- Project committed
- Project in development
Committed Projects

- 2006-2010 – Rozelle to Pyrmont/City Central part feeder replacement
- 2008-2012 – Camperdown zone substation equipment replacement

Projects in Development

- 2011-2012 – Darling Harbour zone substation upgrade
- 2011-2013 – Blackwattle Bay zone substation retirement

Overview

The Inner City region is bounded by Pyrmont in the north, Darling Harbour in the east, Camperdown in the south and Blackwattle Bay in the west.

The Inner City region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrmont STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Darling Harbour ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Blackwattle Bay ZS</td>
<td>33/5</td>
</tr>
<tr>
<td>Camperdown ZS</td>
<td>33/5</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply

It’s now time to begin planning the renewal of some assets in this region. Additional capacity requirements will be addressed either in conjunction with equipment replacement or as new developments.

Committed Projects

2006-2010
Rozelle to Pyrmont/City Central part feeder replacement

The 132kV feeders 90V/3 (Rozelle STS to City Central ZS) and 90W/4 (Rozelle STS to Pyrmont STS) contain sections of oil-filled cable which has been progressively replaced over the years. Work is underway to replace the remaining oil-filled cable sections of both feeders.

2008-2012
Camperdown zone substation equipment replacement

Camperdown zone substation is one of the remaining substations on the network supporting the 5kV distribution voltage. It is proposed to bring Camperdown in line with current design standards by replacing the existing 5kV distribution equipment with 11kV equipment in a staged process.

Projects in Development

2011-2012
Darling Harbour zone substation upgrade

The retirement of Blackwattle Bay is conditional upon the transfer of the load to the adjoining Darling Harbour zone substation. To allow this to occur, additional capacity is required at Darling Harbour. The most likely option is to install an additional 132/11kV transformer and associated infrastructure.

2011-2013
Blackwattle Bay zone substation retirement

Blackwattle Bay zone substation is another of the remaining substations on the network supporting the 5kV distribution voltage. It is proposed to transfer load to the neighbouring Darling Harbour zone substation and retire the existing 5kV infrastructure.
Regional network investment

St George Region

Region: Sydney South

Load Growth per year: ⭐ 1.9 per cent or 5.2MVA ❄ 2.0 per cent or 6.6MVA

Planned regional investment 2009-2014: $312 million

Highlights: New substations at Kogarah and Hurstville North
Committed Projects
- 2005-2009 – Kogarah new zone substation and associated 132kV feeder
- 2008-2012 – Mortdale zone substation equipment and feeder replacement
- 2009-2014 – Riverwood zone substation 33kV feeder replacement

Projects in Development
- 2010-2013 – Hurstville North zone substation replacement
- 2011-2012 – Sans Souci zone substation equipment replacement
- 2012-2013 – Riverwood zone substation equipment replacement

Overview
The St George region extends from Arncliffe in the north to Sans Souci in the south and west to Riverwood. The St George load area comprises eight zone substations all supplied from Peakhurst STS.

Recent high rates of growth have occurred due to a large number of high-density residential developments and are forecast to continue. Key growth areas include the Hurstville shopping district, Arncliffe and generally along the rail corridor.

The majority of substations are supplied by underground 33kV gas pressure cables. It’s now time to begin plans to renew and replace these cables.

The St George region is currently supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peakhurst STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Arncliffe ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Blakehurst ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Carlton ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Hurstville North ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Mortdale ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Riverwood ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Rockdale ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Sans Souci ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply
The area is experiencing sustained load growth and action is required to ensure Peakhurst STS can continue to meet this demand. As there is little opportunity to upgrade substation capacity in isolation, the region strategy is a combination of 132kV development and 33kV refurbishment and replacement works.

Opportunities to implement viable demand management initiatives are also incorporated into strategies for the area.

Committed Projects
2005-2009
Kogarah new zone substation
The existing Carlton 33/11kV zone substation is approaching the time for renewal and additional capacity is required in the St George area. Work is underway to construct a new 132/11kV zone substation and feeders in the Kogarah area followed by the retirement of the existing 33kV infrastructure.

2008-2012
Mortdale zone substation equipment and feeder replacement
Some equipment and 33kV feeders at the existing Mortdale 33/11kV zone substation are approaching the time for renewal and additional capacity is required. Work is underway to replace the existing 11kV switchgear and the existing 33kV feeders between Peakhurst STS and Mortdale zone substation.

2009-2010
Riverwood zone substation feeder replacement
The 33kV feeders to the existing Riverwood 33/11kV zone substation are approaching the time for renewal and additional capacity is required. Work is underway to initially replace the existing 33kV switchgear and the existing 33kV feeders between Peakhurst STS and Riverwood zone substation. A third 33kV feeder will be installed between Peakhurst STS and Riverwood zone substation to provide increased capacity.

Projects in Development
2010-2014
Hurstville North zone substation replacement
The existing Hurstville North 33/11kV zone substation and feeders are approaching the time for renewal and additional capacity is required. The most likely option is to construct a new Hurstville North 132/11kV zone substation and feeders in the area following the retirement of the existing 33kV infrastructure.

2011-2012
Sans Souci zone substation equipment replacement
Some equipment at the existing Sans Souci 33/11kV zone substation is approaching the time for renewal and the 33kV busbar height does not meet current standards. The most likely option is to replace the 33kV switchgear in conjunction with addressing the busbar height.

2012-2013
Riverwood zone substation equipment replacement
Some equipment at the existing Riverwood 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the 11kV switchgear.
Regional network investment

Sutherland Region

Region: Sydney South
Load Growth per year: ⚫ 1.4 per cent or 5.5MVA ⚪ 1.8 per cent or 7.5MVA
Planned regional investment 2009-2014: $408 million
Highlights: New substation at Kurnell, upgraded substations at Engadine, Gwawley Bay and Kirrawee
Sydney South Region: Substation Voltage (kV)

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kurnell STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Port Hacking STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Cronulla ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Kirrawee ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Menai ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Caringbah ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Engadine ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Gwawley Bay ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Jannali ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Kurnell ZS</td>
<td>33/11 &amp; 33/6.3</td>
</tr>
<tr>
<td>Lucas Heights ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Miranda ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Projects in Development

- **2010 – Jannali zone substation equipment replacement**
- **2009-2012 – Gwawley Bay zone substation conversion**
- **2010-2013 – Kurnell zone substation replacement**
- **2010-2011 – Sydney South to Kurnell feeder refurbishment**
- **2010-2013 – Cronulla zone substation upgrade**
- **2010-2012 – Engadine zone substation conversion**
- **2012-2013 – Port Hacking zone substation equipment replacement**
- **2011-2013 – Kirrawee zone substation upgrade**

Overview

The Sutherland region extends from the Kurnell Peninsula in the northeast, along the southern Botany Bay coastline along the Georges River, then south as far as Waterfall and west towards the coast.

The network is supplied from TransGrid’s Sydney South Substation. It is also time to renew and replace some assets in this area. This network region also contains two Landfill Gas Generator sites connected to the 33kV supply system near Lucas Heights.

The area is experiencing sustained load growth due to industrial growth in the Kurnell Peninsula and along the main transport corridor, along with medium density housing and redevelopment throughout the rest of the area.

The Sutherland region is supplied from the following substations:

Committed Projects

- **2007-2010 – Kurnell sub-transmission substation upgrade**

Maintaining a Reliable Supply

Initiatives are planned to manage increasing load at a number of zone substations in the area including load transfers to utilise spare capacity. Further, it will be necessary to provide additional zone substation capacity to supply the large number of developments which are proposed for the Kurnell peninsula.

Committed Projects

- **2007-2010 Kurnell sub-transmission substation upgrade**

Projects in Development

- **2010 Jannali zone substation equipment replacement**

Some equipment at the existing Jannili 33/11kV zone substation is approaching the time for renewal. Work is underway to replace the existing 33kV switchgear.

- **2009-2011 Gwawley Bay zone substation conversion**

The area supplied by the Gwawley Bay zone substation is experiencing sustained load growth. Additional infrastructure is needed in the area to boost capacity. The most likely option is the conversion of Gwawley Bay to a 132/11kV substation.

- **2010 Kurnell zone substation replacement**

The existing Kurnell 33/11kV zone substation is approaching the time for renewal and additional capacity is required. The most likely option is to construct a new Kurnell 132/11kV zone substation in the area followed by the retirement of the existing 33kV infrastructure.

- **2010-2011 Sydney South to Kurnell feeder refurbishment**

The existing overhead 132kV feeders 916/917 between Sydney South BSP and Kurnell STS are approaching the time for renewal due to adverse affects from the marine environment. The most likely option is to replace the corroded structural tower members and conductor.

- **2010-2013 Cronulla zone substation upgrade**

The area supplied by Cronulla zone substation is experiencing sustained growth and it is likely that load will be transferred from Caringbah. Additional infrastructure will be required to supply these expected load increases. The most likely option is to install an additional 132/11kV transformer and associated infrastructure.

- **2010-2012 Engadine zone substation conversion**

The existing Engadine 33/11kV zone substation is approaching the time for renewal and additional capacity is required. The most likely option is the conversion of Engadine to a 132/11kV substation.

- **2012-2013 Port Hacking zone substation equipment replacement**

Some substation equipment at the existing Port Hacking 132/33kV sub-transmission substation is approaching the time for renewal and the 33kV busbar height does not meet current standards. The most likely option is to replace the 33kV switchgear in conjunction with addressing busbar height.

- **2009-2012 Kurnell zone substation replacement**

The existing Kurnell 33/11kV zone substation is approaching the time for renewal and additional capacity is required. The most likely option is to replace the 33kV switchgear in conjunction with addressing busbar height.

- **2011-2013 Kirrawee zone substation upgrade**

The area supplied by the Kirrawee zone substation is experiencing sustained load growth. The most likely option is the installation of two 132/11kV transformers and two additional groups of 11 kV switchgear.
Canterbury-Bankstown Region

Region: Sydney South

Load Growth per year: ⭐ 1.4 per cent or 7.7MVA ❄ 1.0 per cent or 6.2MVA

Planned regional investment 2009-2014: $567 million

Highlights: New zone substations at Bankstown and Potts Hill

Regional network investment
Overview
The Canterbury-Bankstown region extends from Leightonfield in the north-west, south to Revesby and east as far as Dulwich Hill. Growth is generally stable, apart from the Chullora area where large industrial development continues. Canterbury sub-transmission substation serves a load area which had previously been stagnant however growth has been picking up over recent times. Large load increases have occurred recently as a result of load transfers and infrastructure developments. The Canterbury-Bankstown region is supplied from the following substations:

Substation | Voltage (kV) |
--- | --- |
Bankstown STS | 132/33 |
Canterbury STS | 132/33 |
Chullora STSS | 132 |
Greenacre Park ZS | 132/11 |
Milperra ZS | 132/11 |
Revesby ZS | 132/11 |
Sefton ZS | 132/11 |
Bass Hill ZS | 33/11 |
Campsie ZS | 33/11 |
Dulwich Hill ZS | 33/11 |
Enfield ZS | 33/11 |
Leightonfield ZS | 33/11 |
Padstow ZS | 33/11 |
Punchbowl ZS | 33/11 |

Committed Projects
- 2009-2010 – Bankstown new zone substation
- 2009-2012 – Potts Hill new zone substation

Projects in Development
- 2011-2012 – Bankstown sub-transmission substation equipment replacement
- 2011-2012 – Canterbury sub-transmission substation equipment replacement
- 2011-2012 – Campsie zone substation uprate
- 2011-2014 – Enfield zone substation replacement
- 2009-2011 – Leightonfield zone substation equipment replacement
- 2012-2013 – Punchbowl zone substation equipment and 33kV feeder replacement
- 2013-2014 – Bass Hill zone substation equipment replacement
- 2013-2014 – Dulwich Hill zone substation equipment replacement
- 2013-2014 – Greenacre Park zone substation equipment replacement

Maintaining a Reliable Supply
It’s now time to begin planning the renewal of some assets in this region. Additional capacity requirements will be addressed either in conjunction with equipment replacement or as new developments.

Committed Projects
- 2009-2011
  Bankstown new zone substation
  The existing Padstow 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to relieve capacity constraints at Bankstown STS. Work is underway to construct a new Bankstown 132/11kV zone substation in the area followed by the replacement of the existing 33kV infrastructure.
- 2009-2010
  Potts Hill new zone substation
  EnergyAustralia has identified a need to improve the reliability of supply from Greenacre Park zone substation. Work is underway to construct a new Potts Hill 132/11kV zone substation followed by the transfer of load from Greenacre Park to Potts Hill. A demand management project has been implemented to reduce demand at Greenacre Park zone in Summer 2009/10. Further projects are planned until the Potts Hill substation is completed.

Projects in Development
- 2011-2012
  Bankstown sub-transmission substation equipment replacement
  Some equipment at the existing Bankstown 132/33kV sub-transmission substation is approaching the time for renewal. The most likely option is to replace the existing 33kV switchgear.
- 2011-2012
  Canterbury sub-transmission substation equipment replacement
  Some equipment at the existing Canterbury 132/33kV sub-transmission substation is approaching the time for renewal. The most likely option is to replace the existing 33kV switchgear and 132kV switchgear.
- 2011-2012
  Campsie zone substation uprate
  Additional capacity is required to meet demand growth in the Campsie area. The most likely option is to install an additional transformer.
2011-2014
Enfield zone substation replacement
The 33kV feeders supplying Enfield zone substation are approaching the time for renewal and additional infrastructure is required to boost capacity at Enfield zone substation and Canterbury STS. The most likely option is to replace the existing Enfield zone substation with a new 132/11kV substation.

2009-2011
Leightonfield zone substation equipment replacement
Some equipment at the existing Leightonfield 33/kV zone substation is approaching time for renewal and the 33kV busbar height does not meet current standards. The most likely option is to replace the 33kV switchgear in conjunction with addressing the busbar height.

2012-2013
Punchbowl zone substation equipment and 33kV feeder replacement
Some equipment and 33kV feeders at the existing Punchbowl 33/11kV zone substation are approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear, one transformer and the 33kV feeders from Bankstown STS.

2013-2014
Bass Hill zone substation equipment replacement
Some equipment at the existing Bass Hill 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.

2013-2014
Dulwich Hill zone substation equipment replacement
Some equipment at the existing Dulwich Hill 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.

2013-2014
Greenacre Park zone substation equipment replacement
Some equipment at the existing Greenacre Park 132/11kV zone is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.
Regional network investment

Inner-West Sydney Region

Region: Sydney South

Load Growth per year: ★ 2.3 per cent or 13MVA ♦ 1.1 per cent or 6.2MVA

Planned regional investment 2009-2014: $418 million

Highlights: Three new zone substations at Sydney Olympic Park, Rhodes and Croydon + conversions and upgrades at Homebush, Leichhardt, Drummoyne and Homebush Bay
Committed Projects

- 2005-2010 – Homebush sub-transmission substation replacement
- 2009-2010 – Concord zone substation feeder replacement

Projects in Development

- 2009-2011 – Drummoyne zone substation upgrade
- 2009-2011 – Homebush sub-transmission substation upgrade
- 2010-2013 – Sydney Olympic Park new zone substation
- 2010-2012 – Rookwood bulk supply point new connections
- 2011-2013 – Leichhardt zone substation conversion
- 2012-2013 – Mason Park to Rozelle feeder replacement
- 2012-2014 – Five Dock zone substation replacement (Croydon new zone substation)
- 2012-2014 – Rhodes new zone substation

Overview

The Inner-West Sydney region extends from Homebush Bay in the north, east to Rozelle and Leichhardt and west as far as Auburn. The area is divided by parts of the harbour and the Parramatta River, with Parramatta Road running through the southern part of the area.

Suburbs across the Inner West region have experienced steady growth in recent years, with the most significant demand coming from luxury high rise apartments along the foreshores.

The Inner West Sydney region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homebush STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Mason Park STSS</td>
<td>132</td>
</tr>
<tr>
<td>Rozelle STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Strathfield STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Burwood ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Drummoyne ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Flemington ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Homebush Bay ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Auburn ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Concord ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Five Dock ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Leichhardt ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Lidcombe ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply

The majority of projects in this region involve upgrading existing infrastructure and providing a subsequent increase in capacity.

Committed Projects

2005-2010
Homebush sub-transmission substation replacement
The existing Homebush 132/33kV sub-transmission substation building and equipment is approaching the time for renewal and the fault rating does not meet current standards. Work is underway to construct a new 132/33kV facility in the area followed by the retirement of the existing infrastructure.

2009-2010
Concord zone substation feeder replacement
The existing 33kV feeders between Homebush STS and Concord are approaching the time for renewal and additional infrastructure is required to boost capacity at Concord. Work is underway to replace these 33kV feeders.
Projects in Development

2009-2011
Drummoyne zone substation upgrade
The area supplied by Drummoyne zone substation is experiencing sustained growth and additional infrastructure is needed to boost capacity. The most likely option is to install an additional 132/11kV transformer and associated infrastructure.

2009-2011
Homebush sub-transmission substation upgrade
The area supplied by Homebush sub-transmission substation is experiencing sustained growth and additional infrastructure is needed to boost capacity. The most likely option is to install an additional 132/33kV transformer and associated infrastructure.

2010-2012
Sydney Olympic Park new zone substation
The Sydney Olympic Park precinct and neighbouring areas are experiencing high load growth due to substantial new developments. Additional infrastructure is needed in the area to meet the anticipated demand. The most likely option is to construct a new 132/11kV zone substation in the area.

2010-2012
Rookwood bulk supply point new connections
The Inner Sydney Metropolitan transmission system requires additional infrastructure to boost capacity in the area. The most likely option is for TransGrid to construct a new 330/132kV bulk supply point at Rookwood. In conjunction with this option, EnergyAustralia would be responsible for providing connections to the BSP and undertaking the necessary augmentation works on our network.

2011-2013
Leichhardt zone substation conversion
The existing 33kV feeders to Leichhardt zone substation are approaching the time for renewal. The most likely option is to convert Leichhardt substation to 132kV supply from the proposed replacement for feeder 900. The existing 33kV infrastructure will then be retired.

2012-2013
Mason Park to Rozelle feeder replacement
The existing 132kV feeder 900 between Mason Park switching station and Rozelle sub-transmission substation is approaching the time for renewal. In addition, the fault rating does not meet current requirements and the route includes a number of submarine crossings. The most likely option is to install a new 132kV feeder between Mason Park and Rozelle via an alternate route.

2012-2014
Five Dock zone substation replacement
The existing Five Dock 33/11kV zone substation equipment and feeders are approaching the time for renewal. The most likely option is to construct a new 132/11kV zone substation at Croydon supplied from the proposed replacement for 900 feeder, followed by the retirement of the existing 33kV infrastructure.

2012-2014
Rhodes new zone substation
The Rhodes peninsula is experiencing continued load growth due to substantial new developments. Additional infrastructure is needed in the area to meet the anticipated demand. The most likely option is to construct a new Rhodes 132/11kV zone substation and 132kV feeders in the area.
Our Five Year Network Plan: 2009—2014

Regional network investment

North Sydney zone conversion (2011-14)

Ku-ring-gai STS equipment replacement (2013-14)

Lindfield to Willoughby feeder replacement (2013-14)

Lindfield to Castle Cove feeder replacement (2012-13)

Lindfield Terminal Station (2011-12)

Royal North Shore Hospital new zone substation (2009-11)

North Sydney zone substation equipment replacement (2010-11)

North Sydney zone substation conversion (2011-14)

Turramurra substation 33kV feeder replacement (2009-10)

Turramurra zone substation equipment replacement (2009-11)

St Ives zone substation upgrade and feeder replacement (2011-12)

Willoughby to Mosman new feeders (2013-14)

Crows Nest zone substation conversion (2009-12)

Load Growth per year: ★ 1.3 per cent or 6.5MVA ☄ 1.2 per cent or 7.3MVA

Planned regional investment 2009-2014: $617 million

Highlights: New substation at Royal North Shore Hospital and North Sydney; Substation upgrades at Crows Nest, Lindfield and St Ives
Committed Projects

- 2009-2011 – Royal North Shore Hospital new zone substation
- 2009-2010 – Turramurra zone substation 33kV feeder replacement
- 2009-2011 – Turramurra zone substation equipment replacement
- 2009-2012 – Willoughby STS refurbishment

Projects in Development

- 2009-2012 – Crows Nest zone substation conversion
- 2010-2011 – North Sydney zone substation equipment replacement
- 2010-2012 – Lindfield zone substation equipment and feeder replacement
- 2011-2012 – St Ives zone substation upgrade and feeder replacement
- 2011-2012 – Lindfield Terminal Station
- 2011-2014 – North Sydney zone conversion
- 2012-2013 – Lindfield to Castle Cove feeder replacement
- 2013-2014 – Ku-ring-gai subtransmission substation equipment replacement
- 2013-2014 – Lindfield to Willoughby feeder replacement
- 2013-2014 – Willoughby to Mosman new feeders

Overview

The North Shore region extends from St Ives in the north as far as North Sydney in the south, east to Mosman and west to Turramurra, through Pymble and Chatswood. The Pacific Highway and the North Shore and Western railway line run through the area.

The Chatswood-Crows Nest area continues to experience growth from ongoing residential and commercial development, but also major infrastructure projects such as the Chatswood-Epping Rail Link.

The North Shore region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ku-ring-gai STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Willoughby STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Castle Cove ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Mosman ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Chatswood ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Crows Nest ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Gore Hill ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Lindfield ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>North Sydney ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Pymble ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>St Ives ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Turramurra ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply

It’s now time to begin planning the renewal of some assets in this region. Additional capacity requirements will be addressed either in conjunction with equipment replacement or as new developments.

Committed Projects

2009-2010
Royal North Shore Hospital new zone substation
A major redevelopment of Royal North Shore Hospital site is proposed. Additional infrastructure is needed in the area to meet the anticipated demand. The work is underway to construct a new 132/11kV zone substation on the Hospital site.

A demand management project has been implemented to reduce demand on Willoughby STS in Summer 2009/10. Further projects are planned until the Royal North Shore Hospital substation is completed.

2009-2010
Turramurra zone substation 33kV feeder replacement
The 33kV feeders to the existing Turramurra 33/11kV zone substation are approaching the time for renewal. Work is underway to replace the 33kV feeders from Ku-ring-gai STS.

2009-2011
Turramurra zone substation equipment replacement
Some equipment at the existing Turramurra 33/11kV zone substation are approaching the time for renewal. The selected option is to replace the existing 11kV switchgear in a new building.
Projects in Development

2009-2012
Crows Nest zone substation conversion
The 33kV feeders to the existing Crows Nest 33/11kV zone substation are approaching the time for renewal. The selected option is to convert Crows Nest zone substation to 132kV operation and install new 132kV feeders from Willoughby STS, followed by the retirement of the existing 33kV infrastructure.

2010-2011
North Sydney zone substation equipment replacement
Some equipment at the existing North Sydney 33/11kV zone substation is approaching the time for renewal. The selected option is to replace the existing 11kV switchgear.

2010-2012
Lindfield zone substation equipment and feeder replacement
Some equipment and 33kV feeders at the existing Lindfield 33/11kV zone substation are approaching the time for renewal. The selected option is to replace the existing 11kV switchgear and the 33kV feeders from Ku-ring-gai STS.

2011-2012
St Ives zone substation upgrade and feeder replacement
The existing 33kV feeders between Ku-ring-gai STS and St Ives zone substation are approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to replace the 33kV feeders and install an additional 33/11kV transformer and associated infrastructure.

2011-2012
Lindfield Terminal Station
Some equipment at our Lindfield Terminal Station is approaching time for retirement. The most likely option is to extend the existing building and install new 123kV Gas Insulated Switch gear and associated equipment.

2011-2014
North Sydney zone conversion
The 33kV feeders supplying the existing North Sydney 33kV zone substation are approaching the time for renewal. The most likely option is to replace the existing substation with a new 132kV substation connected to the new 132kV feeders installed from the proposed Crows Nest substation.

2012-2013
Lindfield to Castle Cove feeder replacement
The existing 132kV feeders 925/3 and 9E4/3 between Lindfield STSS and Castle Cove are approaching the time for renewal. The most likely option is to replace these 132kV feeders.

2013-2014
Ku-ring-gai sub-transmission substation equipment replacement
Some equipment at the existing Ku-ring-gai 132/33kV sub-transmission substation is approaching the time for renewal and the 33kV busbar height does not meet current standards. The most likely option is to replace the 33kV switchgear in conjunction with addressing the busbar height.

2013-2014
Lindfield to Willoughby feeder replacement
The existing 132kV feeders 9E3 and 9E4/2 between Lindfield STSS and Willoughby STS are approaching the time for renewal. The most likely option is to replace these 132kV feeders.

2013-2014
Willoughby to Mosman new feeders
The existing 132kV feeders 925/4 and 9E4/4 between Castle Cove and Mosman are approaching the time for renewal. The most likely option is to install new 132kV feeders between Willoughby and Mosman.
Regional network investment

Northern Beaches Region

Region: Sydney North

Load Growth per year: ♦ 2.2 per cent or 6.5MVA ♠ 2.1 per cent or 7.9MVA

Planned regional investment 2009-2014: $301 million

Highlights: New substation at Balgowlah North; Substation upgrades at Brookvale and North Head

- Sydney East to Terry Hills new feeder (2007-10)
- Brookvale zone substation and feeder upgrade (2007-10)
- Manly zone substation equipment replacement (2011-12)
- Balgowlah zone substation replacement (2009-11)
- North Head zone substation equipment replacement (2012-13)
Our Five Year Network Plan: 2009—2014

Sydney North

Committed Projects

- 2007-2010 – Sydney East to Terrey Hills new feeder
- 2007-2010 – Brookvale zone substation and feeder upgrade
- 2009-2011 – Balgowlah zone substation replacement

Projects in Development

- 2011-2012 – Manly zone substation equipment replacement
- 2012-2013 – North Head zone substation equipment replacement

Overview

The Northern Beaches region extends west to Belrose, east towards the coast at Dee Why, north to Palm Beach and as far south as North Head. Energy demand has been growing due to residential development, particularly medium density housing around Collaroy and Narrabeen and high density constructions in the Warriewood Valley, together with commercial expansion around Terrey Hills.

The Northern Beaches region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney East STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Warringah STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Balgowlah ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Beacon Hill ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Belrose ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Brookvale ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Careel Bay ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Dee Why West ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Harbord ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Killarney ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Manly ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Mona Vale ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Narrabeen ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Newport ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>North Head ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Terrey Hills ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply

The majority of projects in this region involve either replacing existing equipment or providing additional capacity.

Committed Projects

2007-2010

Sydney East to Terrey Hills new feeder

The area supplied by Terrey Hills zone substation is experiencing sustained growth and additional infrastructure is needed to boost capacity on the sub-transmission system. Work is underway to install an additional 33kV feeder to Terrey Hills.

A demand management project was implemented in Winter 2009 to reduce demand on the 33kV feeder network prior to completion of the new feeder.

2007-2010

Brookvale zone substation and feeder upgrade

The area supplied by Brookvale zone substation is experiencing sustained growth and additional infrastructure is needed to boost capacity on the sub-transmission system. Work is underway to install two new 33kV feeders between Warringah STS and Brookvale and carry out associated works.

A demand management project was implemented in Winter 2009 to reduce demand on Warringah STS prior to completion of the Balgowlah substation.

2009-2011

Balgowlah zone substation replacement

The existing Balgowlah 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity. Work is underway to construct a new Balgowlah 132/11, 33/11kV hybrid zone substation and associated 132kV feeder in the area followed by the retirement of the existing 33kV infrastructure.

Projects in Development

2011-2012

Manly zone substation equipment replacement

Some equipment at the existing Manly 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 33kV switchgear.

2012-2013

North Head zone substation equipment replacement

Some equipment at the existing North Head 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 33kV switchgear.
Regional network investment

North West Region

Region: Sydney North

Load Growth per year: ★ 1.4 per cent or 2.7MVA ✽ 1.7 per cent or 4.2MVA

Planned regional investment 2009-2014: $100 million

Highlights: New substation at Galston

![Map showing Galston new zone substation (2006-10)](image)
Committed Projects

• 2006-2010 – Galston new zone substation and associated 132kV development

Overview

The North West region includes the area from Sydney North bulk supply point (BSP) in the north, north-east to Berowra and south to Pennant Hills. The area is relatively geographically isolated, bordering Ku-ring-gai Chase National Park and other bushland and includes the Sydney to Newcastle Freeway and the Pacific Highway.

This region has experienced rapid growth from detached residential development, high density residential development and significant commercial expansion.

The North West region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berowra ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Hornsby ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Pennant Hills ZS</td>
<td>132/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply

The work underway in this region involves the provision of additional capacity.

Committed Projects

2006-2010

Galston new zone substation

The Galston area is experiencing sustained growth and additional infrastructure is needed to boost capacity on the 11kV system. Work is underway to construct a new Galston 132/11kV zone substation and 132kV feeders in the area.
Regional network investment

Northern Districts Region

Region: Sydney North

Load Growth per year:
- 1.1 per cent or 4.3MVA
- 1.1 per cent or 2.5MVA

Planned regional investment 2009-2014: $207 million

Highlights: New substation at Top Ryde; substation upgrades at Hunters Hill and Epping
**Committed Projects**
- 2006-2011 – Top Ryde new zone substation
- 2009-2011 – Hunters Hill zone substation equipment replacement

**Projects in Development**
- 2011 – North Ryde zone substation retirement
- 2012-2013 – Epping zone substation equipment replacement

**Overview**
The Northern Districts region extends east from Integral Energy’s boundary to Epping, across Macquarie Park and south as far as Hunters Hill and Meadowbank. This region has experienced rapid growth, particularly residential growth in the Cherrybrook area and commercial growth in the Macquarie Park area.

The Northern Districts region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macquarie Park ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Meadowbank ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Epping ZS</td>
<td>66/11</td>
</tr>
<tr>
<td>Hunters Hill ZS</td>
<td>66/11</td>
</tr>
<tr>
<td>North Ryde ZS</td>
<td>66/11</td>
</tr>
</tbody>
</table>

**Maintaining a Reliable Supply**
The majority of projects in this region involve either replacing existing equipment or providing additional capacity. A planned major retail development in the area will also drive the advancement of new infrastructure.

**Committed Projects**

2006-2011
Top Ryde new zone substation
The existing retail facilities at Top Ryde are undergoing a major expansion. Additional infrastructure is needed in the area to meet the anticipated demand. Work is underway to construct a new 132/11kV zone substation and feeders in the area.

2009-2011
Hunters Hill zone substation equipment replacement
Some substation equipment at the existing Hunters Hill 66/11kV zone substation is approaching the time for renewal. Work is underway to refurbish the building and replace the existing 66kV and 11kV switchgear.

**Projects in Development**

2011
North Ryde zone substation retirement
Equipment at North Ryde zone substation is approaching the time for renewal. The most likely option is to transfer load to the proposed Top Ryde zone substation and retire North Ryde substation.

2012-2013
Epping zone substation equipment replacement
Some equipment at the existing Epping 66/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.
Regional network investment

Central Coast Region

Region: Central Coast
Load Growth per year: 3.5 per cent or 21.5MVA 2.3 per cent or 13.5MVA
Planned regional investment 2009-2014: $613 million
Highlights: New substations at Empire Bay, Wamberal and Warnervale; Substation upgrades at Lake Munmorah, Long Jetty and Ourimbah
Overview
The Central Coast region covers the Wyong and Gosford local government areas. The Wyong area includes the area north of Tuggerah BSP, as far as Vales Point in the north, east to the coast and west as far as Wyong as well as Tuggerah Lakes and Lake Munmorah. The Gosford area covers the area south of Tuggerah BSP, as far as Umina in the south, east to Long Jetty and the coast, and west as far as Peats Ridge.

The Central Coast continues to be one of the fastest growing regions within the network area. The conversion of holiday cottages to permanent residences, residential expansion through land releases, the introduction of light industrial and the coal mining industry have all added to this load growth.

Projects in Development

- 2010-2011 – Avoca zone substation equipment replacement
- 2010-2012 – Empire Bay new zone substation
- 2010-2012 – Warnervale new zone substation
- 2011-2014 – Lisarow zone substation replacement
- 2012-2013 – Peats Ridge and Umina zone substations equipment replacement
- 2012-2013 – Vales Point zone substation equipment replacement
- 2013-2014 – Berkeley Vale zone substation upgrade
- 2013-2014 – Charmhaven zone substation upgrade

Committed Projects

- 2005-2011 – Ourimbah sub-transmission substation equipment replacement
- 2005-2009 – Wamberal new zone substation and associated 132kV feeders
- 2008-2010 – Long Jetty zone substation conversion
- 2009-2013 – Lake Munmorah new zone substation and associated 132kV feeders

Projects in Development

- 2010-2011 – Avoca zone substation equipment replacement
- 2010-2012 – Empire Bay new zone substation
- 2010-2012 – Warnervale new zone substation
- 2011-2014 – Lisarow zone substation replacement
- 2012-2013 – Peats Ridge and Umina zone substations equipment replacement
- 2012-2013 – Vales Point zone substation equipment replacement
- 2013-2014 – Berkeley Vale zone substation upgrade
- 2013-2014 – Charmhaven zone substation upgrade

Committed Projects

- 2005-2011 – Ourimbah sub-transmission substation equipment replacement
  The existing Ourimbah 132/66/33kV sub-transmission substation equipment is approaching the time for renewal and the fault capacity does not meet current standards. Work is underway to replace the existing switchgear and transformers.
- 2005-2009 – Wamberal new zone substation
  The Avoca/Erina area is experiencing continued and sustained development. Additional infrastructure is needed in the area to boost capacity on the sub-transmission system. Work is underway to construct a new 132/66/11kV zone substation and feeders in the area.
- 2008-2010 – Long Jetty zone substation conversion
  The area supplied by the existing Long Jetty 33/11kV zone substation is experiencing sustained load growth. Additional infrastructure is needed in the area to boost capacity on the sub-transmission system. Work is underway to convert Long Jetty to a 66/11kV substation.
- 2009-2013 – Lake Munmorah zone substation conversion
  The existing Lake Munmorah 33/11kV zone substation equipment is approaching the time for renewal. In addition, the 33kV busbar height does not meet current standards and additional infrastructure is required to relieve capacity constraints. Work is underway to construct a new Lake Munmorah 33/11kV zone substation to replace the 33kV substation on the existing site and upgrade the associated feeders.

Maintaining a Reliable Supply
Anticipated high load growth will place additional pressure on the existing infrastructure. It is for this reason that the majority of the projects either upgrade existing infrastructure or add new infrastructure.
2010-2012
Empire Bay new zone substation
Additional infrastructure is needed to meet anticipated load growth in the Empire Bay area. The most likely option is to construct a new Empire Bay 66/11kV zone substation and feeders in the area.

2010-2012
Warnervale new zone substation
The Warnervale area is experiencing continued load growth due to substantial new developments. Additional infrastructure is needed in the area to meet the anticipated demand. The most likely option is to construct a new Warnervale 132/11kV zone substation and 132kV feeders in the area.

2011-2014
Lisarow zone substation replacement
The area supplied by the existing Lisarow 33/11kV zone substation is experiencing sustained load growth. Additional infrastructure is needed in the area to boost capacity on the sub-transmission system at Lisarow. The most likely option is to construct a new Lisarow 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2012-2013
Peats Ridge and Umina zone substations equipment replacement
Some equipment at the existing Peats Ridge 33/11kV and Umina 66/11kV zone substations are approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.

2012-2013
Vales Point zone substation equipment replacement
Some equipment at the existing Vales Point 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.

2013-2014
Berkeley Vale zone substation upgrade
The area supplied by Berkeley Vale zone substation is experiencing sustained growth and additional infrastructure is needed to boost capacity. The most likely option is to install an additional 132/11kV transformer, 132kV busbar and associated infrastructure.

2013-2014
Charmhaven zone substation upgrade
The area supplied by Charmhaven zone substation is experiencing sustained growth and additional infrastructure is needed to boost capacity. The most likely option is to install an additional 132/11kV transformer and associated infrastructure.
Regional network investment

Newcastle - Lake Macquarie Region

Region: Hunter and Central Coast
Load Growth per year: ● 2.8 per cent or 16.3MVA ● 1.0 per cent or 5.7MVA
Planned regional investment 2009-2014: $1,163 million
Highlights: New substations at Broadmeadow, Charlestown, Jesmond, Kooragang Island and Rathmines
**Committed Projects**
- 2005-2009 – Argenton new sub-transmission substation
- 2006-2009 – Mayfield West replacement zone substation
- 2006-2010 – Adamstown zone substation replacement
- 2006-2009 – Kooragang Island new sub-transmission substation
- 2009-2010 – Carrington zone substation 33kV feeder replacement
- 2008-2011 – Jesmond replacement zone substation
- 2009-2011 – Rathmines new zone substation

**Projects in Development**
- 2009-2012 – Broadmeadow zone substation replacement
- 2009-2012 – Charlestown zone substation replacement
- 2010-2012 – Newcastle CBD zone substation feeder replacement
- 2011-2012 – Carrington zone substation equipment replacement
- 2011-2013 – Cameron Park new zone substation
- 2011-2013 – Woodrising new zone substation
- 2012-2013 – Eraring sub-transmission substation equipment replacement
- 2012-2013 – Newcastle to Argenton 132kV new feeder
- 2012-2014 – Gateshead and Croudace Bay zone substation upgrades
- 2012 – Waratah sub-transmission substation equipment replacement

**Overview**
The Newcastle-Lake Macquarie region is supplied from three substations: Awaba STS, Beresfield STS, and Eraring STS. Additional substations include Kooragang SS, Maryfield ZS, and others. The region is experiencing significant load growth, particularly in the western areas around Maryland, Cameron Park, and Morisset, where new housing developments are characterised by smaller blocks of land and large air conditioned homes.

In coastal suburbs there has been significant development, with a number of large commercial developments as well as infill development of the remaining vacant land in the Newcastle City area. An increasing number of industrial developments are arising around Newcastle Port including the installation of a new coal loader and an upgrade of the existing coal loader on Kooragang Island. Large portions of industrial land also available in this area for future industrial development.

The Newcastle-Lake Macquarie region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
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<tbody>
<tr>
<td>Awaba STS</td>
<td>132/33</td>
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<tr>
<td>Beresfield STS</td>
<td>132/33</td>
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<tr>
<td>Eraring STS</td>
<td>132/33</td>
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<tr>
<td>Merewether STS</td>
<td>132/33</td>
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<tr>
<td>Waratah STS</td>
<td>132/33</td>
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<tr>
<td>Kooragang SS</td>
<td>33</td>
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<tr>
<td>Maryfield ZS</td>
<td>132/11</td>
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<tr>
<td>Morisset ZS</td>
<td>132/11</td>
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<tr>
<td>Rathmines Temp ZS</td>
<td>132/11</td>
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<tr>
<td>Adamstown ZS</td>
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<tr>
<td>Avondale ZS</td>
<td>33/11</td>
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<tr>
<td>Boolarong ZS</td>
<td>33/11</td>
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<tr>
<td>Broadmeadow ZS</td>
<td>33/11</td>
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<tr>
<td>Cardiff ZS</td>
<td>33/11</td>
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<tr>
<td>Carrington ZS</td>
<td>33/11</td>
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<tr>
<td>Charlestown ZS</td>
<td>33/11</td>
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<tr>
<td>City Main ZS</td>
<td>33/11</td>
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<tr>
<td>Croudace Bay ZS</td>
<td>33/11</td>
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<tr>
<td>Dudley ZS</td>
<td>33/11</td>
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<tr>
<td>Edgeworth ZS</td>
<td>33/11</td>
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<tr>
<td>Gateshead ZS</td>
<td>33/11</td>
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<tr>
<td>Jewells ZS</td>
<td>33/11</td>
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<tr>
<td>Kotara ZS</td>
<td>33/11</td>
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<tr>
<td>Maryfield ZS</td>
<td>33/11</td>
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<tr>
<td>Mt Hutton ZS</td>
<td>33/11</td>
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<tr>
<td>New Lambton ZS</td>
<td>33/11</td>
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<tr>
<td>Pelican ZS</td>
<td>33/11</td>
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<tr>
<td>Shortland ZS</td>
<td>33/11</td>
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<tr>
<td>Swansea ZS</td>
<td>33/11</td>
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<td>Tarro ZS</td>
<td>33/11</td>
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<tr>
<td>Toronto ZS</td>
<td>33/11</td>
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<tr>
<td>Wallsend ZS</td>
<td>33/11</td>
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</tbody>
</table>

**Maintaining a Reliable Supply**
Major works are presently in progress, or are planned, to upgrade capacity across the region. The establishment of new zone substations are proposed in the area to either retire existing infrastructure or provide increased capacity. Power factor in the Lower Hunter is being improved by a significant demand management program.
Committed Projects

2005-2009
Argenton new sub-transmission substation
The existing Awaba 132/33kV sub-transmission substation and Boolaroo 33/11kV zone substation are approaching the time for renewal and additional infrastructure is required to boost capacity at Awaba STS and on the sub-transmission system. Work has been completed to construct a new Argenton 132/33/11kV combined sub-transmission/zone substation and feeders in the area. This will enable the retirement of Boolaroo zone substation.

2006-2009
Mayfield West zone substation replacement
The existing Mayfield 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity at Mayfield and provide for additional customer load. Work is underway to construct a new Mayfield West 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2006-2010
Adamstown zone substation replacement
The existing Adamstown 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity at Adamstown. Work is underway to construct a new Adamstown 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2006-2009
Kooragang Island new sub-transmission substation
The existing Kooragang West 33kV sub-transmission station is approaching the time for renewal and additional infrastructure is required to boost capacity at Waratah STS and provide for additional customer load. Work is underway to construct a new Kooragang Island 132/33kV sub-transmission substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2009-2010
Carrington zone substation 33kV feeder replacement
The existing 33kV oil-filled feeders to Carrington are approaching the time for renewal. These 33kV feeders will be replaced.

2008-2011
Jesmond replacement zone substation
The existing Shortland 33/11kV and Wallsend 33/11kV zone substations are approaching the time for renewal. Work is underway to construct a new 132/11kV zone substation and feeders in the Jesmond area followed by the retirement of the existing 33kV infrastructure.

2009-2011
Rathmines new zone substation
The area supplied by the existing Rathmines Temporary and Toronto 33/11kV zone substations is experiencing sustained load growth and additional infrastructure is needed to boost capacity. Work is underway to construct a new 132/11kV zone substation and feeders in the Rathmines area followed by the retirement of the existing temporary infrastructure at Rathmines.

Projects in Development

2009-2012
Broadmeadow zone substation replacement
The existing Broadmeadow 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to construct a new Broadmeadow 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2009-2012
Charlestown zone substation replacement
The existing Charlestown 33/11kV and Dudley zone substations are approaching the time for renewal and additional infrastructure is required to boost capacity at Charlestown. The most likely option is to construct a new Charlestown 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2010-2012
Newcastle CBD zone substation feeder replacement
The existing 33kV oil-filled feeders 764/770 between Merewether STS and Newcastle CBD are approaching the time for renewal. The most likely option is to replace the 33kV feeders.
2011-2012
Carrington zone substation equipment replacement
Some equipment at the existing Carrington 33/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.

2011-2013
Cameron Park new zone substation
The area supplied by the existing Edgeworth 33/11kV zone substation is experiencing sustained load growth and additional infrastructure is needed to boost capacity. The most likely option is to construct a new 132/11kV zone substation in the Cameron Park area.

2011-2013
Woodrising new zone substation
The existing Toronto 33/11kV zone substation and Awaba 132/33kV sub-transmission substation equipment is approaching the time for renewal. The most likely option is to construct a new 33/11kV zone substation and feeders in the Woodrising area followed by the retirement of the existing Toronto 33kV infrastructure.

2012-2013
Eraring sub-transmission substation equipment replacement
Some equipment at the existing Eraring 132/33kV sub-transmission substation is approaching the time for renewal and the 33kV busbar height does not meet current standards. The most likely option is to replace the 132kV and 33kV switchgear in conjunction with addressing the busbar height.

2012-2013
Newcastle to Argenton new feeder
It is proposed to increase the reliability of 132kV supply to Argenton sub-transmission substation. The most likely option is to construct an additional 132kV feeder from Newcastle BSP to Argenton sub-transmission substation.

2012-2014
Gateshead and Croudace Bay zone substation upgrade
Some equipment at the existing Gateshead and Mt Hutton 33/11kV zone substations are approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to replace the existing 33kV and 11kV switchgear and transformers at Gateshead. Associated works include the installation of an additional 33kV feeder, 33/11kV transformer and associated infrastructure at Croudace Bay followed by the retirement of the existing Mt Hutton 33kV infrastructure.

2012
Waratah sub-transmission substation equipment replacement
Some equipment at the existing Waratah 132/33kV sub-transmission substation is approaching the time for renewal. The most likely option is to replace the existing 132kV switchgear and transformers.
Regional network investment

Port Stephens Region

Region: Hunter

Load Growth per year: ★ 4.4 per cent or 5.2MVA ★ 3.0 per cent or 3.0MVA

Planned regional investment 2009-2014: $191 million

Highlights: New substations at Nelson Bay, Raymond Terrace, Tomaree and Williamtown
Regional Investment: Port Stephens Region (continued)

Committed Projects
- 2007-2011 – Tomago bulk supply point new connections
- 2008-2010 – Williamtown to Nelson Bay feeder extension
- 2008-2010 – Raymond Terrace zone substation replacement
- 2009-2011 – Tanilba Bay zone substation upgrade
- 2009-2012 – Tomago sub-transmission substation equipment replacement
- 2009-2011 – Tomago-Williamtown 33kV feeder
- 2009-2011 – Tomaree new zone substation

Projects in Development
- 2009-2012 – New Tomago zone substation
- 2012-2014 – Nelson Bay new sub-transmission substation (Jessie Road, Anna Bay)
- 2012-2014 – Williamtown zone substation replacement
- 2013-2014 – Tomaree zone 33kV feeder uprate

Overview
The Port Stephens region corresponds approximately with the Port Stephens local government area extending from Nelson Bay and the coastline in the east to Raymond Terrace in the west and from Karuah in the north to Stockton and Tomago in the south.

The Port Stephens area is subject to significant residential, industrial and commercial expansion due to substantial releases of residential and industrial land as well as the increasing popularity of Nelson Bay as a tourist destination.

The Port Stephens region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomago STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Nelson Bay ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Raymond Terrace ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Salt Ash ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Stockton ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Tanilba Bay ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Williamtown ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply
The majority of projects in this region involve either replacing existing equipment or providing additional capacity.

Committed Projects
2007-2011 Tomago bulk supply point new connections
The Lower Hunter transmission system requires additional infrastructure to boost capacity. Work is underway for TransGrid to construct a new 330/132kV bulk supply point at Tomago. In conjunction with this work, EnergyAustralia would provide connections to the BSP and undertake the necessary augmentation works on the network.

2008-2010 Williamtown to Nelson Bay feeder extension
The Nelson Bay area is experiencing sustained growth and additional infrastructure is needed to boost capacity on the sub-transmission system. Work is underway to install a new feeder from Williamtown to Nelson Bay as an extension of feeder 904.

A demand management project has been implemented to reduce demand on the 33kV network in Summer 2009/10. This project will be extended if necessary until the new feeder is fully operational.

2008-2010 Raymond Terrace zone substation replacement
The existing Raymond Terrace 33/11kV zone substation requires additional operating equipment to comply with the revised design planning criteria and the substation is approaching the time for renewal. Work is underway to construct a new Raymond Terrace 33/11kV zone substation in the area followed by the retirement of the existing infrastructure.

2009-2012 Tanilba Bay zone substation upgrade
The existing Salt Ash 33/11kV zone substation equipment is approaching the time for renewal and the existing Tanilba Bay 33/11kV zone substation requires additional equipment to comply with design planning criteria. The most likely option is to install a new feeder, an additional 33/11kV transformer and associated infrastructure at Tanilba Bay followed by the retirement of the existing Salt Ash infrastructure.

2009-2012 Tomago sub-transmission substation equipment replacement
Some equipment at the existing Tomago 132/33kV sub-transmission substation is approaching the time for renewal. Work is to replace the existing 33kV switchgear.

2009-2011 Tomago-Williamtown 33kV feeder
The transmission system servicing the Williamtown area requires additional infrastructure to boost capacity on the system. The most likely option is to install an additional 33kV feeder from Tomago to Williamtown.

2009-2011 Tomaree new zone substation
The Nelson Bay area is experiencing sustained growth and the existing Nelson Bay 33/11kV zone substation requires modification to comply with the revised design planning criteria. Work is underway to construct a new Tomaree 33/11kV zone substation in the area.

Projects in Development
2009-2012 New Tomago zone substation
Growth in the Tomago area and planned future releases of land for industrial uses, contributing to increased spot loads, requires the development of a new zone substation in the Tomago area. The most likely option is to develop a new 33kV/11kV zone substation on a site in the vicinity of the Tomago industrial estate.

2012-2014 Nelson Bay new sub-transmission substation (Jessie Road, Anna Bay)
The Nelson Bay area is experiencing sustained growth and additional infrastructure is needed to relieve constraints at Tomago STS and on the sub-transmission system. The most likely option is to construct a new Nelson Bay 132/33kV sub-transmission substation in the area.

2012-2014 Williamtown zone substation replacement
The existing Williamtown 33/11kV zone substation equipment is approaching the time for renewal and additional infrastructure is required to boost the sub-transmission system. The most likely option is to construct a new Williamtown 132/11kV zone substation in the area followed by the retirement of the existing 33kV infrastructure.

2013-2014 Tomaree zone 33kV feeder upgrade
The transmission system to the new Tomaree zone requires additional infrastructure to boost capacity on the system. The most likely option is to reconstruct part of the existing 33kV feeder from the Nelson Bay zone to the Tomaree Zone.
Regional network investment

Cessnock-Maitland Region

Region: Hunter

Load Growth per year: ☉ 3.6 per cent or 9.2MVA ☃ 2.5 per cent or 5MVA

Planned regional investment 2009-2014: $362 million

Highlights: New substations at Brandy Hill, Cessnock, Kurri, Maitland Central and Paxton
Committed Projects
- 2008-2010 – Kurri zone substation replacement
- 2009-2011 – Kurri to Rutherford feeder upgrade
- 2009-2010 – Rutherford zone substation capacity upgrade
- 2009-2012 – Kurri sub-transmission substation equipment replacement
- 2009-2012 – Brandy Hill new zone substation
- 2009-2010 – Thornton zone substation capacity uprate

Projects in Development
- 2010-2013 – Maitland Central zone substation replacement
- 2010-2013 – Paxton zone substation replacement
- 2012-2013 – Cessnock zone substation replacement

Overview
The Cessnock region extends in the north from Rothbury and Allandale, south to Laguna and Quorrobolong and from Kurri Kurri in the east, to Mt View and Pokolbin State Forest in the west. The area is geographically bounded by the Sugarloaf Mountain range in the east as well as the Watagan Mountains and Wollemi National Park to the south.

The Maitland component of the region extends in the north from Luskintyre and Woodville, south to Heddon Greta and Black Hill. The area is traversed from west to east by the Hunter River and the associated flood plains create the north and eastern boundary along with Hexham wetlands to the south.

The Cessnock area continues to grow with winemaking operations being complemented by significant tourism development. The East Maitland area is also experiencing very high growth rates from the major new centre being developed around Thornton-Tarro-Woodberry together with light industrial expansion around Beresfield. Major commercial and residential development is also rapidly expanding to the west of Maitland around Aberglasslyn, Rutherford and Lochinvar.

The Cessnock-Maitland region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beresfield STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Kurri 132 STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Rothbury ZS</td>
<td>132/11</td>
</tr>
<tr>
<td>Cessnock ZS</td>
<td>33/11</td>
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<tr>
<td>East Maitland ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Kurri ZS</td>
<td>33/11</td>
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<tr>
<td>Maitland Central ZS</td>
<td>33/11</td>
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<tr>
<td>Nulkaba ZS</td>
<td>33/11</td>
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<tr>
<td>Paxton ZS</td>
<td>33/11</td>
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<tr>
<td>Rutherford ZS</td>
<td>33/11</td>
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<td>Tarro ZS</td>
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<tr>
<td>Telarah ZS</td>
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<td>Thornton ZS</td>
<td>33/11</td>
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<tr>
<td>Tomalpin ZS</td>
<td>33/11</td>
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<tr>
<td>Wallalong ZS</td>
<td>33/11</td>
</tr>
</tbody>
</table>

Maintaining a Reliable Supply
The majority of projects in this region involve either replacing existing equipment or providing additional capacity.
**Committed Projects**

**2008-2010**
**Kurri zone substation replacement**
The existing Kurri 33/11kV zone substation equipment is approaching the time for renewal and additional infrastructure is required to boost constraints at Kurri zone substation and Kurri STS. Work is underway to construct a new Kurri 132/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

**2009-2011**
**Kurri to Rutherford feeder upgrade**
The Kurri to Rutherford 33kV feeder requires upgrading to boost capacity on the sub-transmission system. The most likely option is to replace a limiting section of the 33kV feeder with a new double circuit line.

**2009-2010**
**Rutherford zone substation capacity upgrade**
Additional infrastructure is required to boost capacity at Rutherford zone substation and on the sub-transmission network supplying Rutherford and Telarah. The most likely option is to upgrade Rutherford zone substation and parts of the 33kV network.

**2009-2012**
**Kurri sub-transmission substation equipment replacement**
Some substation equipment at the existing Kurri 132/33kV sub-transmission substation is approaching the time for renewal. Work is to replace the existing 33kV switchgear.

**2009-2011**
**Brandy Hill new zone substation**
The existing Wallalong 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity at Wallalong and on the sub-transmission system. The most likely option is to construct a new 132/11kV zone substation in the Brandy Hill area followed by the retirement of the existing 33kV infrastructure.

**2009-2010**
**Thornton zone substation capacity uprate**
Additional infrastructure is required to boost capacity at Thornton zone substation. The most likely option is to install an additional transformer at Thornton zone substation.

**Projects in Development**

**2010-2013**
**Maitland Central zone substation replacement**
The existing Maitland Central 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity at Maitland Central, East Maitland and Rutherford. The most likely option is to construct a new Maitland Central 33/11kV zone substation in the area followed by the retirement of the existing 33kV infrastructure.

**2010-2013**
**Paxton zone substation replacement**
The existing Paxton 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to construct a new Paxton zone substation and feeders in the area followed by the retirement of the existing 33kV substation.

**2012-2013**
**Cessnock zone substation replacement**
The existing Cessnock 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to construct a new Cessnock 33/11kV zone substation in the area followed by the retirement of the existing 33kV infrastructure.
Regional network investment

Upper Hunter Region

Region: Hunter

Load Growth per year: ⭐ 1.7 per cent or 4.3MVA ⬤ 0.6 per cent or 1.4MVA

Planned regional investment 2009-2014: $337 million

Highlights: New substations at Aberdeen, Scone, Merriwa and Muswellbrook
Our Five Year Network Plan: 2009—2014

Committed Projects
- 2006-2009 – Scone zone substation replacement and associated 66kV feeders
- 2008-2010 – Singleton sub-transmission substation upgrade

Projects in Development
- 2009-2011 – Aberdeen zone substation replacement
- 2010-2012 – Muswellbrook zone substation conversion and retirement of Muswellbrook STS
- 2011-2013 – Merriwa zone substation replacement
- 2013-2014 – Singleton zone substation equipment replacement

Overview
The Upper Hunter region extends from Wingen in the north, north-east to Glenrock, south-east to Liddell, south to Holbrook, west to Collaroy and north-west to Kars Springs.

Electricity demand is expected to be driven by increased coal production with two new mines and increased investment in current operations, the planned expansion of the Hunter rail capacity to service export markets, and residential demand around Singleton, Scone and Muswellbrook.

The Upper Hunter region is supplied from the following substations:

<table>
<thead>
<tr>
<th>Substation</th>
<th>Voltage (kV)</th>
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<tbody>
<tr>
<td>Mitchell Line STS</td>
<td>132/66</td>
</tr>
<tr>
<td>Muswellbrook STS</td>
<td>132/33</td>
</tr>
<tr>
<td>Denman ZS</td>
<td>66/11</td>
</tr>
<tr>
<td>Mitchell Line ZS</td>
<td>66/11</td>
</tr>
<tr>
<td>Aberdeen ZS</td>
<td>33/11</td>
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<tr>
<td>Baerami ZS</td>
<td>33/11</td>
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<tr>
<td>Merriwa ZS</td>
<td>33/11</td>
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<tr>
<td>Moonan ZS</td>
<td>33/11</td>
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<tr>
<td>Muswellbrook ZS</td>
<td>33/11</td>
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<tr>
<td>Rouchel ZS</td>
<td>33/11</td>
</tr>
<tr>
<td>Scone ZS</td>
<td>33/11</td>
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Maintaining a Reliable Supply
The majority of projects in this region involve either replacing existing equipment or providing additional capacity.

Committed Projects
2006-2009
Scone zone substation replacement
The existing Scone 33/11kV zone substation equipment is approaching the time for renewal. Work is underway to construct a new Scone 66/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2008-2010
Singleton sub-transmission substation upgrade
The Singleton area is experiencing sustained growth and additional infrastructure is needed to boost capacity at Singleton STS. Work is underway to install an additional 132/66kV transformer and associated infrastructure.

Projects in Development
2009-2011
Aberdeen zone substation replacement
The existing Aberdeen 33/11kV zone substation is approaching the time for renewal and additional infrastructure is required to boost capacity. The most likely option is to construct a new Aberdeen 66/11kV zone substation and feeders in the area followed by the retirement of the existing 33kV infrastructure.

2010-2012
Muswellbrook zone substation conversion and retirement of Muswellbrook STS
Muswellbrook STS is approaching the time for renewal. The most likely option is to convert Muswellbrook to a 66/11kV substation which, in conjunction with the replacement of Aberdeen and Scone substations will allow the retirement of Muswellbrook STS. Additional 66kV feeders will also need to be constructed.

2011-2013
Merriwa zone substation replacement
The area supplied by the existing Merriwa 33/11kV zone substation is experiencing load growth and Merriwa substation is approaching the time for renewal. The most likely option is to construct a new Merriwa 33/11kV zone substation in the area followed by the retirement of the existing infrastructure.

2013-2014
Singleton zone substation equipment replacement
Some equipment at the existing Singleton 66/11kV zone substation is approaching the time for renewal. The most likely option is to replace the existing 11kV switchgear.
Transmission network investment

EnergyAustralia is both a Transmission Network Service Provider (TNSP) and a Distribution Network Service Provider (DNSP) in the National Electricity Market. Our transmission network includes 132kV and 66kV assets that are operated in parallel and in support of the TransGrid transmission network.

The Transmission system is not confined to any one region and so we plan our investment on a cross region basis.

**Sydney Metropolitan**
Joint planning is underway with TransGrid to address the development of additional transmission capacity in the Sydney Metropolitan area. The agreed short term options are optimisation of power flows through 330kV cable series reactor replacement in conjunction with increased transformer capacity at Sydney South, Beaconsfield West and Sydney North. This work will be carried out by TransGrid. EnergyAustralia will contribute to increased capacity by replacing the Canterbury to Bunnerong 132kV feeders with new 132kV feeders between Kurnell and Bunnerong.

In the medium term, a new 330/132kV substation in the Chullora area is the most likely option.

A demand management investigation to identify opportunities to defer the need for this upgrade was completed in November 2009. It found that cost-effective opportunities did exist. Procurement and implementation of demand management options is being managed by TransGrid.

The 132kV cables between Lane Cove and Dalley Street are approaching retirement and the most likely option to replace the capacity provided by these feeders is additional 330kV capacity in the inner Sydney area.

**Central Coast**
EnergyAustralia is upgrading the Berkeley Vale zone substation to 132kV and the connection of the new zone substation at Wamberal will help boost capacity on the 132kV network.

To meet the forecasted increasing demand in the Gosford/Ourimbah area, options being considered include installation of additional 132kV feeders between Berkeley Vale and Ourimbah, and Wamberal and Gosford.

The 132kV cables between Lane Cove and Dalley Street are approaching retirement and the most likely option to replace the capacity provided by these feeders is additional 330kV capacity in the inner Sydney area.

**Hunter**
Joint planning with Transgrid has resulted in the establishment of a new 330/132kV substation in the Tomago area. EnergyAustralia is responsible for providing connections to the substation and 132kV upgrade works on its network to transfer load to the new substation.

Investigation of demand management or non-network options to defer network expenditure in this area will continue to be pursued.
Contact details

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Sydney NSW 2000

**For further information regarding projects in your region contact:**

<table>
<thead>
<tr>
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<th>Director – Area Development – Region</th>
<th>Contact Details</th>
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<tbody>
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This document has been prepared and made available by EnergyAustralia to set out the organisation’s current forecast of major capital works projects for its network over the next five years. Some of the forecasts may change over time or may not eventuate. Information is current at September 2009 and based on 2007/08 load forecasts. All monetary figures are on a nominal basis.

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Investing for Future Generations

Our Five Year Network Plan: 2009—2014