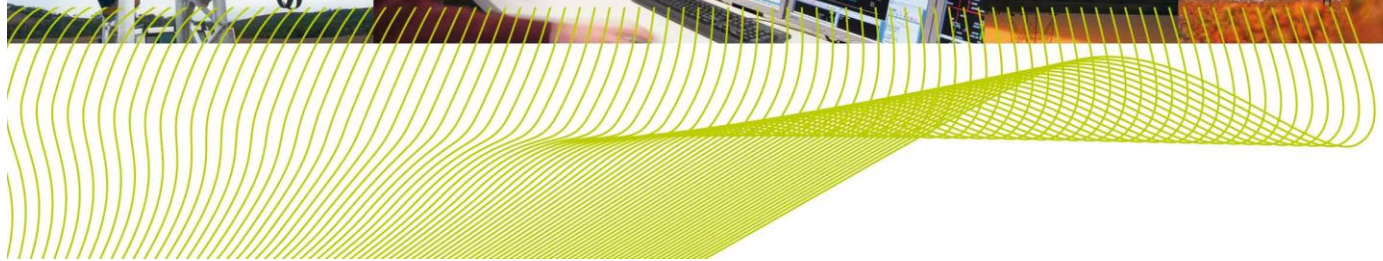




# Network 2035 Vision

April 2012



## **ElectraNet Corporate Headquarters**

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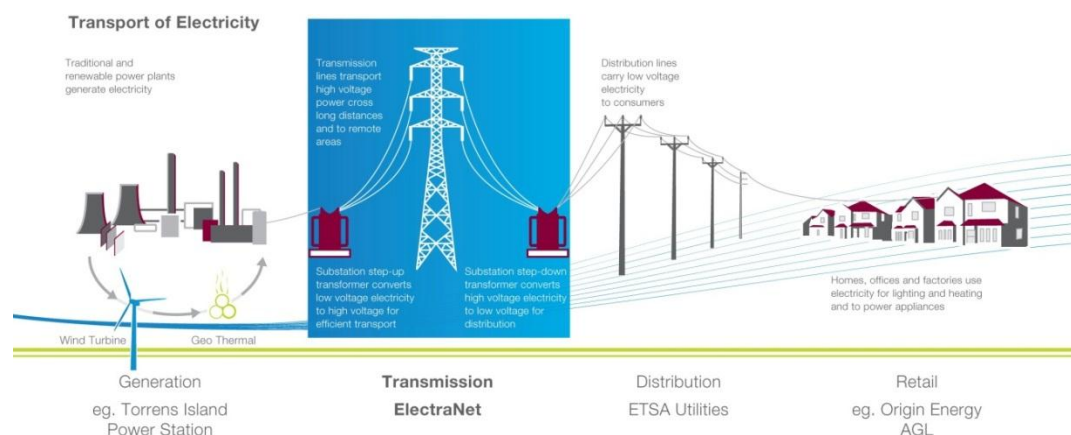
## Purpose of this document

ElectraNet’s Network 2035 Vision is a collaborative document that sets out a framework for the development and operation of South Australia’s electricity transmission network over the next twenty-five years. It builds on consultation undertaken with stakeholders in 2011.

ElectraNet is committed to maintaining strong relationships with all its stakeholders, from customers through to regulators. Their input into this Vision has been greatly valued, and their ongoing guidance will assist us to make the best decisions for South Australia’s transmission network.

## What is a transmission service business?

ElectraNet<sup>1</sup> is the principal Transmission Network Service Provider (TNSP) in South Australia. It owns and manages the regulated high-voltage electricity transmission network and operates in Australia’s National Electricity Market. Its core business is to build, operate and maintain the electricity transmission ‘highways’ that transport electricity from generators and interconnectors to distribution networks and large industrial customers, as illustrated below. Transmission cost is less than 10% of the retail electricity bill for households.



## Regulation of electricity transmission

ElectraNet is a regulated business. It works with South Australian and national regulators, and the Australian Energy Market Operator (AEMO) to ensure its operations are economically efficient and meet National Electricity Market standards. Table 1 details the key bodies and their function in relation to the transmission network.

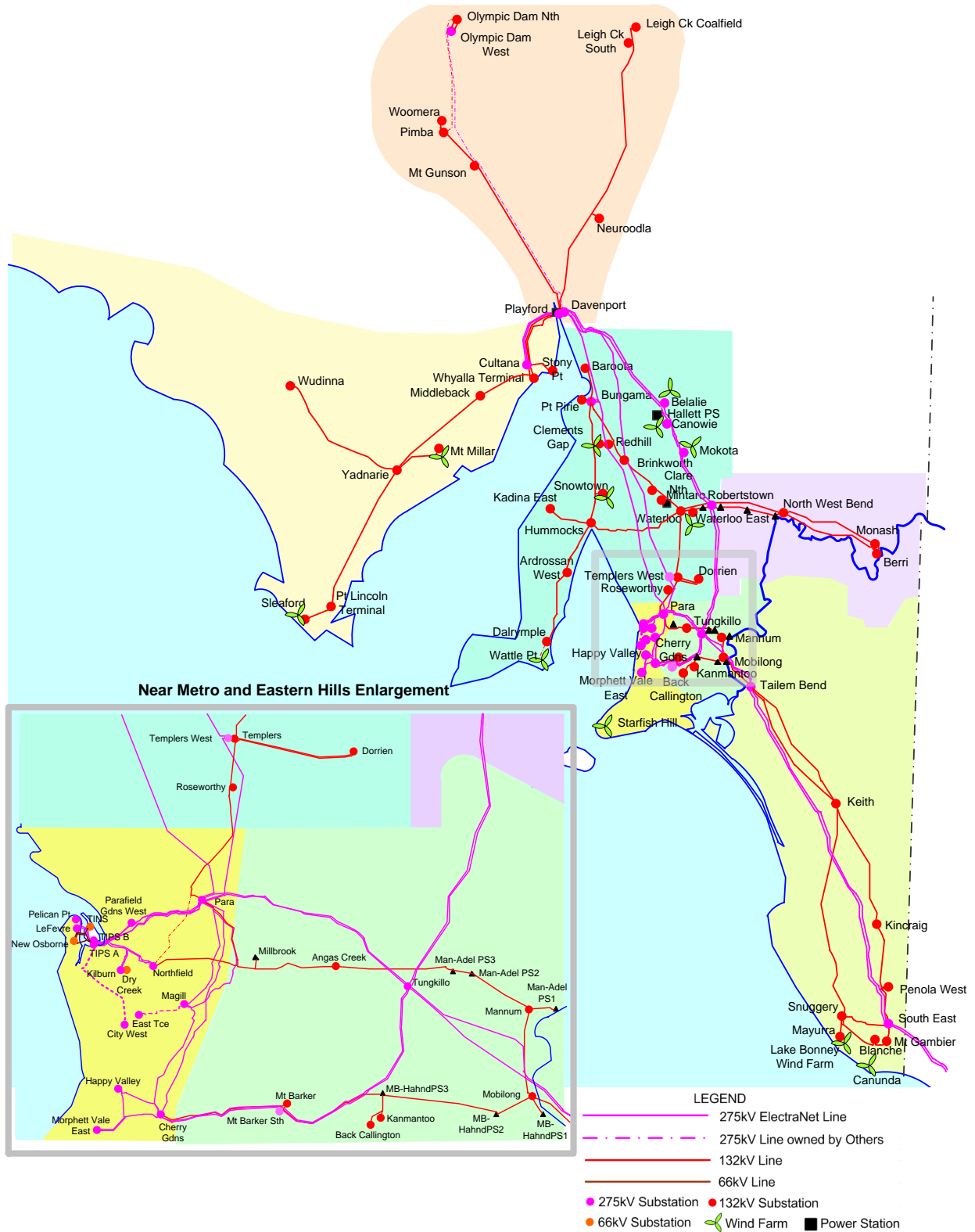
**Table 1: Key roles in transmission**

Organisation	Key role in transmission
Australian Energy Market Commission (AEMC)	Administers the National Electricity Rules (Rules) governing the operation of the National Electricity Market including the provision of transmission services.
Australian Energy Regulator (AER)	Sets total transmission service revenue every five years in accordance with the Rules and enforces compliance with the Rules.
Essential Services Commission of South Australia (ESCOSA)	Administers transmission licences and issues the SA Electricity Transmission Code including network reliability standards.
Australian Energy Market Operator (AEMO)	Responsible for the physical and financial operation of the National Electricity Market, security of national electricity supply and national transmission planning.

<sup>1</sup> More information about ElectraNet is available at [www.electranet.com.au](http://www.electranet.com.au). For information on the role of ElectraNet and other transmission businesses in the overall electricity supply chain refer to *An Introduction to Australia’s National Electricity Market*, available at [www.aemo.com.au](http://www.aemo.com.au).

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**Figure 1: South Australian Transmission Network**

## Executive Summary

ElectraNet understands the unique role it plays in South Australia as the private owner, manager and operator of the State's high-voltage electricity transmission network. We are committed to ensuring all of our stakeholders are engaged in the future development and operation of the network.

This Network 2035 Vision is a collaborative document that sets out a framework for the development and operation of South Australia's electricity transmission network over the next twenty-five years.

All South Australians benefit from the electricity transmission network. The network provides energy security and enables suppliers to compete, placing downward pressure on electricity prices to support economic development and community prosperity. An efficient transmission network means regional areas can continue to grow and industry development projects can proceed. The network supports the development of less emission intensive energy through the connection of new generators to the National Electricity Market.

Given the challenges ahead, the next 25 years will not be 'business as usual'. We have commissioned research that has identified a range of change drivers impacting on the future development and use of the transmission network to meet the increasing needs of the community and industry. Our Vision for the network in 2035 sets out the following four objectives to ensure the network meets South Australia's needs in an increasingly dynamic and changing environment:

1. **Ensure safe, secure, reliable supply** - A safe, secure and reliable network focused on resilience against natural disasters and extreme weather events that assures both community safety and secure electricity supply for South Australia.
2. **Deliver transmission services at lowest long-run cost** - Continued delivery of lowest long-run cost network services by intelligent network planning and use of smart grid technology to increase network asset utilisation. We will manage input cost pressures and work with others to seek ways to reduce the growing gap between base-load and peak power demand.
3. **Support South Australia's economic development** - Economically efficient network investment that supports South Australia's development. We will align our plans with industry development and continue to explore opportunities for more interstate interconnection to increase price competition in the local electricity market.
4. **Support development of lower emission energy sources** - A network to support the continued development of South Australia's low emission energy resources by providing the link between remote generation sources and major load centres.

These objectives are supported by a set of Guiding Principles that will frame our decision-making in all aspects of network operations and customer relations.

At the core of these principles is a commitment to consultation with our customers, market and regulatory stakeholders and the broader community to continually improve our long-term planning for the network.

Our Network 2035 Vision, and the consultations that preceded it, provide a foundation for ongoing engagement and for the future of South Australia's electricity transmission network.

# 1. Introduction

ElectraNet understands the unique role it plays in South Australia as the private owner, manager and operator of the State’s high-voltage electricity transmission network.

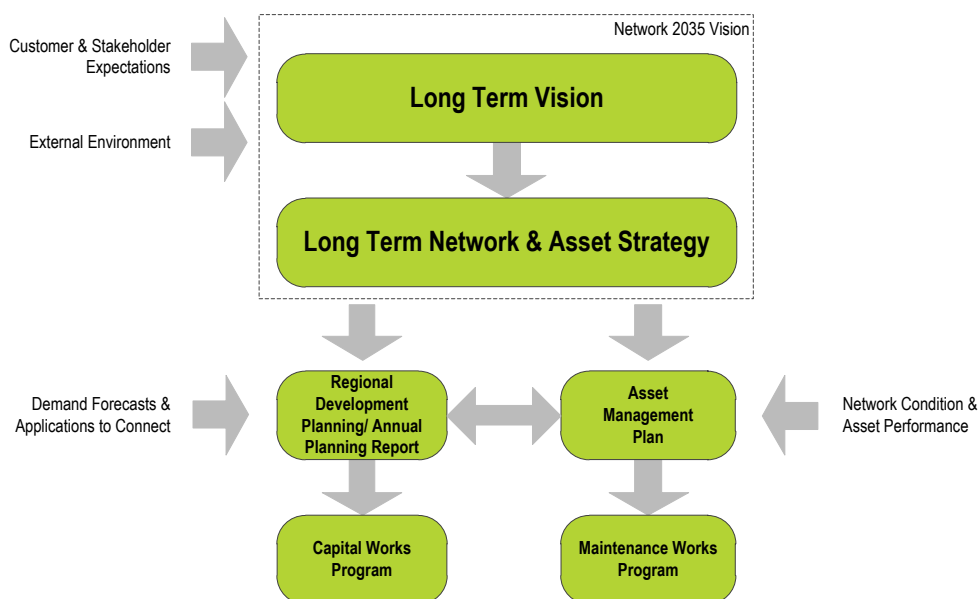
Our Network 2035 Vision has been developed to inform our stakeholders about the challenges and objectives for the development and operation of the electricity transmission network over the next 25 years.

Following an extensive drafting process, which included actively seeking feedback from our stakeholders in the final quarter of 2011, we now have a Vision that will shape our future development and operation of the network.

The structure of this document is as follows:

- Sections 2 and 3 outline the importance and context of South Australia’s electricity transmission network.
- Sections 4 to 8 outline the challenges and opportunities associated with achieving the Vision and objectives.
- Section 9 outlines a set of Guiding Principles that will guide our decision-making in an increasingly dynamic and changing environment.

The relationship between our Network 2035 Vision and our network planning and operational activities is represented in Figure 2 below. The Vision and associated objectives and guiding principles drive integrated decision making on the long-term management and development of the network at all levels. More detailed information on our network plans can be found in our Annual Planning Reports and consultation reports for network investments subject to the Regulatory Investment Test for Transmission (RIT-T)<sup>2</sup>.



**Figure 2: Network 2035 Vision – Strategic Framework**

<sup>2</sup> Available at [www.electranet.com.au](http://www.electranet.com.au).

## **2. All South Australians benefit from the transmission network**

South Australia's electricity transmission network is a strategic asset that underpins the State's economic and regional development. It comprises approximately 5,600 kilometres of transmission lines connecting over 80 high-voltage substations and covers a service area of approximately 200,000 square kilometres, with a total asset value is \$1.5 billion<sup>3</sup>. The importance of the network to South Australia shapes the way we manage, operate and invest in it.

### The network provides reliability and security of supply

The network links multiple power generators to multiple load centres and connects the State to the rest of the National Electricity Market. The security this provides can be seen on the hottest days in summer, when transmission assets work at their limits as large amounts of electricity are imported from interstate to meet South Australia's power demand. At other times, the network carries electricity exports interstate.

The network also plays a vital role in the State's water security by supplying power to SA Water pumping stations along the River Murray.

### The network facilitates sourcing of least cost electricity

The electricity transmission network enables competition in the National Electricity Market operated by AEMO. Electricity retailers can buy power from competing generators to constrain the price of electricity even when supply is short.

### The network supports economic development and community prosperity

An efficient and reliable electricity transmission network is one of the reasons South Australians can enjoy a high level of prosperity and quality of life. All South Australians rely on the safety, quality and cost-efficiency of our services.

The network supports economic development and employment in remote and regional areas by transporting electricity over long distances across South Australia. Without it, many regional locations would have to resort to more costly on-site local power generation. Many regional industry projects would not proceed without direct access to the transmission network.

### The network supports development of lower emission energy sources

South Australia has some of the best low emission energy resources in Australia, mostly in remote locations. Wind power is already a major industry and development of geothermal power is a promising longer-term prospect. The transmission network connects these and other generators to the National Electricity Market.

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<sup>3</sup> Source: AER Transmission Network Service Providers Electricity Performance Report for 2009-10, January 2012, [www.aer.gov.au](http://www.aer.gov.au)

### 3. The next 25 years will not be ‘business as usual’

Predictions of the future 25 years from now are inherently uncertain. We commissioned research into possible long-term scenarios to develop our network Vision in consultation with a number of our key stakeholders<sup>4</sup> and we continue to monitor emerging trends and developments. This research shows that four change drivers in particular are likely to have a strong influence on the development of the transmission network over the long-term:

- Government policy response to climate change (notably the introduction of a national carbon tax and emissions trading regime)
- Increased demand created by mining-related investment
- Technological change in transmission, power generation and patterns of end-use
- National standards and regulatory reform in energy markets.

These are addressed in turn below. In addition, a number of further factors were identified that can be grouped into the two broad themes of:

- (a) climate change mitigation and adaptation; and
- (b) the implications of increased operating costs resulting from competition for skilled workers and rising commodity prices.

ElectraNet must confront these challenges, while continuing to ensure that the performance and reliability of the network is maintained.

#### Climate change policy responses are changing the shape of the power industry

Australia’s response to climate change will drive many long-term fundamental changes in the power industry. Transmission networks must respond to these anticipated changes. The two dominant influences on a transmission network are the location of its major electricity loads and power sources, and the rate of growth in peak power demand. The level of interconnection between regions is also important.

The *Clean Energy Act 2011* provides the basis for introducing a price on carbon as a precursor to a fully operational emissions trading system. This and related national and state renewable energy facilitation schemes affect decisions about the location and type of major generation plant, which in turn drive investment in new transmission links.

Higher electricity prices will also influence how consumers in South Australia and elsewhere use electricity. Any significant change in demand patterns will require us to adjust our network investment plans. At the same time, the ever-increasing presence of distributed electricity sources (e.g. photovoltaic cells) may at times reduce demand for power from the grid. However, unless there is a consistent reduction in peak demand levels, this will lead to lower network utilisation and increased variability and spikes (‘peakiness’) in overall electricity demand.

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<sup>4</sup> Nova Systems, ElectraNet 2035 Future Study, March 2011.



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Mining project investments are likely to present challenges for network development

Further development of the State's mining sector will significantly influence our network investment plans. The State's economy is poised to benefit from a potential mining boom, and it is crucial that the transmission network is well planned to accommodate these larger scale connections.

The growth in the mining sector could potentially smooth the load pattern in South Australia. By lifting the demand for base-load power, large mines could improve our network utilisation and reduce the 'peakiness' of South Australia's total demand. On the other hand, the combined effect of multiple geographically-spread projects could extend the network over an even wider service area, creating a challenge to ensure continued economically sound levels of network investment and utilisation.

New technology is likely to change how electricity is generated, used and stored

Technological change will influence the network directly (e.g. smart grid technology) and indirectly (e.g. new forms of electricity generation and end-use and possible large scale and local energy storage). Any widespread shift to electric vehicles will change both the load pattern and the overall consumption of electricity. Their uptake may smooth out load peaks if they are charged over-night, but this is still to be confirmed in practice. One of the challenges is to plan for the uncertain impact of these new technologies on the network.

National standards and regulatory reform in energy markets must build long-term certainty

Continued reform of the National Electricity Market and the creation of national standards have been central to electricity market development over the past decade. This can create challenges and uncertainties in the short-term as the industry adapts to these changes. However, provided these reforms promote efficiency and investor certainty, it is clear that markets and electricity consumers will all benefit in the long-term. Businesses and consumers will have more certainty around standards and price, while market participants will have greater certainty in investment decisions and the operation of their businesses.

## 4. Our vision for the network in 2035

In updating our long-term Vision, we were conscious of the need to reflect the changing environment both we and our customers face – key features of which were outlined in the previous section.

As noted earlier, this Vision will shape our long-term planning strategy and will inform our 2012 revenue proposal to the AER for the next regulatory period. It was crucial, therefore, that we consulted with stakeholders in developing this document.

We therefore:

- Asked a wide range of our major stakeholders what they would most desire to be different about ElectraNet and the transmission network. This was undertaken as part of the research we commissioned into long-term challenges.
- Worked with AEMO and other industry stakeholders on major long-term (to 2030) scenario planning studies for national energy supply to understand the range of possible outcomes for South Australia and the options for possible augmentation of our interstate transmission links.
- Sought stakeholder feedback on a consultation version of this document to further refine our Vision to make it more relevant to our stakeholders.

This document replaces ElectraNet's Network 2025 Vision published in 2007, which has guided us over the past five years and enabled us to deliver improved value for money, service, reliability, and the network capacity to meet South Australia's growing electricity demand. ElectraNet's key achievements in fulfilling the commitments we made in this Vision are outlined in Box 1 below.

### **Box 1: Delivering on the Network 2025 Vision...**

In our role as owner, operator and manager of most of South Australia's electricity transmission network, ElectraNet works to ensure the needs of its customers, the South Australian community and participants in the National Electricity Market, are met. To do this, we have:

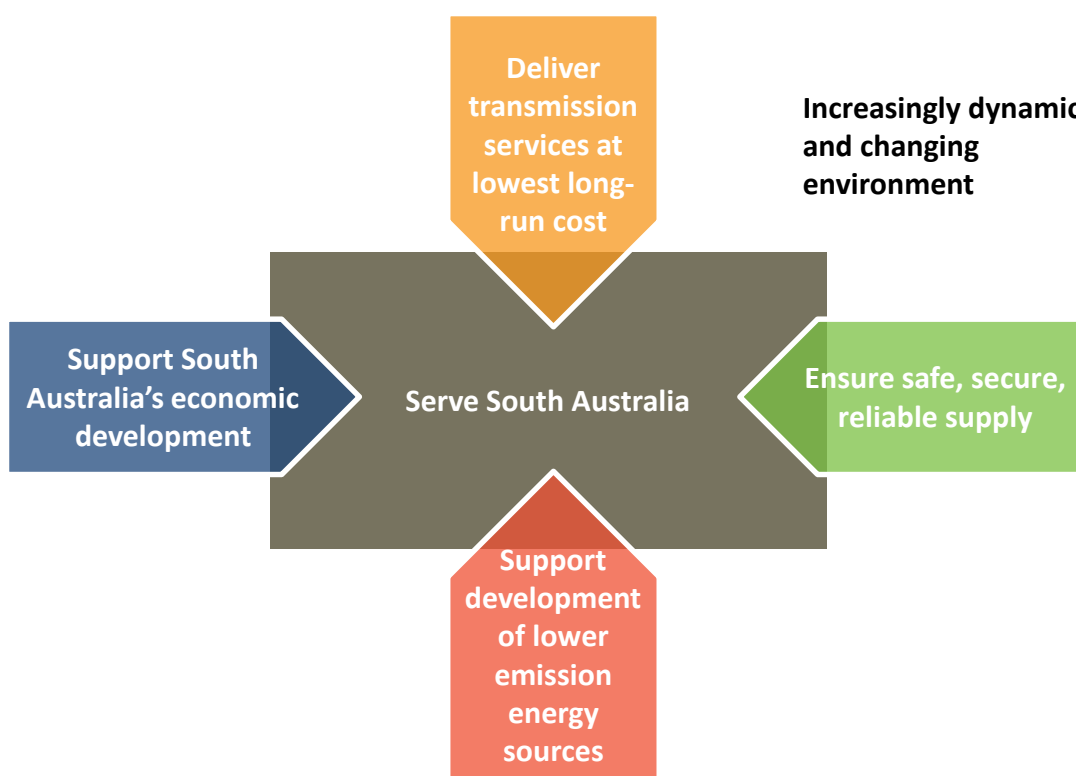
- Connected almost 1,000 MW of new generation to the South Australian network and helped the State become an international leader in low emission energy, with total capacity installed and under construction now exceeding 1,200 MW.
- Supported a 46% increase in South Australia's annual electricity exports.
- Maintained reliability and security of supply to our customers.
- Accelerated our implementation of new technology to improve value for money in our services (e.g. IEC61850 enabling 'smart grid' systems).
- Engaged with communities to minimise the potential effects on them of transmission network development projects.

Our Vision is for a network that serves South Australia’s needs to 2035

We have identified four clear objectives for the development of South Australia’s transmission network through to 2035:

1. Ensure safe, secure, reliable supply
2. Deliver transmission services at lowest long-run cost
3. Support South Australia’s economic development
4. Support development of lower emission energy sources

These objectives support ElectraNet’s central purpose to deliver reliable and value for money electricity transmission services to support a sustainable and prosperous South Australian community, as depicted in Figure 3 below.



**Figure 3: Our four objectives for the transmission network to 2035**

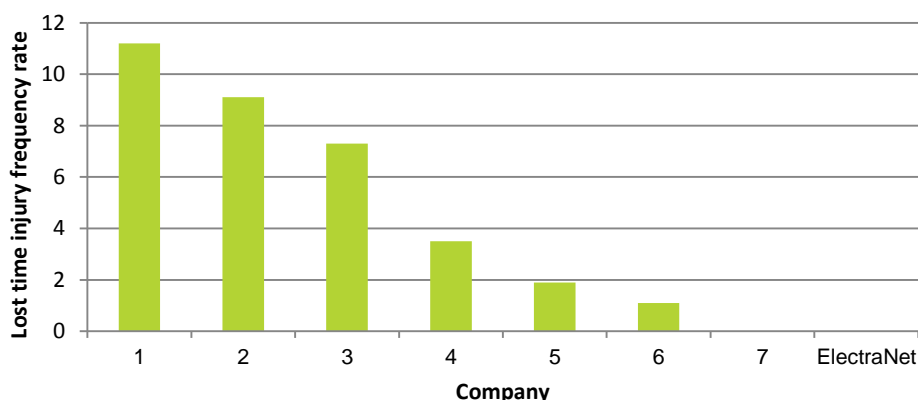
These objectives are discussed in turn in the following sections.

## 5. Objective 1: Ensure safe, secure and reliable supply

ElectraNet is serious about the safety of South Australia’s transmission network. High-voltage electricity is inherently dangerous and safety remains our primary goal as we address stakeholder needs for reliable, value-for-money supply.

Recent bushfires in South Australia and Victoria have put the spotlight on safety systems and practices so the community is protected from fires started by power lines. Climate change is anticipated to make this challenge greater over the long-term. We will continue to work to minimise the potential for such failures to occur through sound asset management and vegetation clearance practices.

Safety is the goal that guides everything we do. We constantly work to ensure the right systems, training and equipment are used to protect the safety of our employees and contractors. Though our benchmark studies indicate our performance is excellent (see Figure 4), we will continue our vigilance and commitment to make sure it remains that way.



**Figure 4: Industry safety performance benchmark comparisons 2009-2010<sup>5</sup>**

We establish and maintain physical security on all our facilities to prevent unauthorised access and the safety and security risks such intrusion may involve. We also support national authorities in their work to protect Australia’s critical infrastructure.

ElectraNet will continue to actively manage all the risks of running a large transmission network, especially safety. We use a systematic program of training and risk management to ensure that we deliver safe, reliable power to the community.

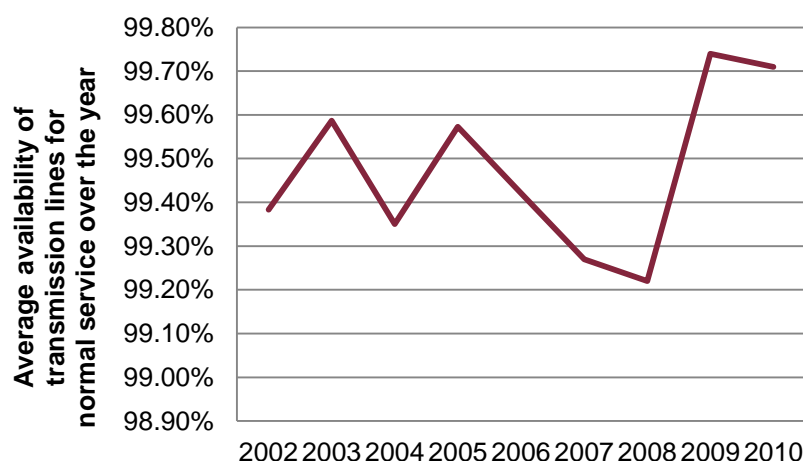
After safety, our core commitment is that supply outages caused by transmission network problems are infrequent and rectified as soon as possible – this is managed in accordance with standards set out in the South Australian Electricity Transmission Code<sup>6</sup>. Our main network is planned so the loss of a single transmission asset (due to an equipment fault or external interference such as a lightning strike) is covered by spare capacity. This ensures that customer impact is minimised and generators’ market access is maintained.

<sup>5</sup> Energy Supply Association of Australia Occupational Health Report 2009-10 (data includes contractor performance). [www.esaa.com.au](http://www.esaa.com.au)

<sup>6</sup> ESCOSA, Electricity Transmission Code (Section 2), July 2011, pp. 2-12 [www.escosa.sa.gov.au](http://www.escosa.sa.gov.au)

When a transmission network problem does result in a supply outage, the impact can be widespread, not just local. Hence, our targets are much more demanding. Consequently, most supply outages that retail electricity customers see are caused by local problems on distribution networks – in South Australia, customer supply outages average 180 customer-minutes per year<sup>7</sup>. Of this, transmission outages account for less than 5%.

We operate our network under a national regulatory incentive scheme that applies financial penalties and incentives to our performance against a demanding set of targets, including individual transmission line availability higher than 99.5%. Our performance in recent years (Figure 5) has been close to or better than target and we will continue to work to improve it over the long-term.



**Figure 5: Transmission line availability 2002-2010**

The impact of major transmission events on customers is measured by the AER (Figure 6). Again, we are maintaining performance through a period of strong demand growth, numerous generation connections and extreme weather events that impact on line availability.



**Figure 6: Significant supply interruption events 2002-2010 (>0.2 system minutes)**

<sup>7</sup> Source: 2009/10 Annual Performance Report, South Australian Energy Supply Industry, ESCOSA, November 2010.

There can be substantial financial and economic impacts if customers cannot be supplied from our network or if generators cannot reach the market because of transmission network failures. We plan and build our network in accordance with network planning criteria defined by the South Australian Electricity Transmission Code and National Electricity Rules<sup>8</sup> and we use economic assessment processes for all major projects so the network is reliable without being over-built.

A loss of security of supply can lead to very prolonged shut-down of industry and rolling supply restrictions as well as suspension of competitive electricity markets. The social and economic disruption in these situations can be on a vastly different scale to the instances of load shedding and supply outages of a few hours that South Australia has experienced in recent years.

The risk of such events continues to be mitigated in Australia by the national power grid. Long before today's National Electricity Market, when multiple generators failed at Liddell Power Station causing prolonged electricity shortages in 1981, New South Wales relied heavily for months on imports from Snowy Hydro and Victoria. More recently, Tasmania has relied on substantial energy imports via Basslink when water storage inflows fell to record low levels during the Millennium drought.

We will continue to work with AEMO to ensure adequate network capacity to support security of supply for South Australia, i.e. to ensure South Australia always has access to sufficient power generation to meet its needs. Our two interconnections with Victoria allow this to be managed by AEMO as part of the National Electricity Market. These provide South Australia with 660 MW of import and 580MW of export capacity. At 4:30 pm on 31 January 2011, when South Australia's electricity demand peaked at 3,433 MW, 470 MW of this was imported into the State.

By 2035, it is possible that as demand grows, additional interconnections using new routes may be economically justified, depending on the pattern of future generation development within South Australia and other States. However, in the near term, it is more likely the capacity of existing ones will be augmented.

#### We will continue to focus on resilience against natural disasters

Major fires, floods and earthquakes can all affect transmission networks and disrupt power supply to large areas.

Recent floods in Victoria, New South Wales and Queensland have generated some commentary on the resilience of electricity supply to natural disasters. In January 2011, a single high voltage transmission substation in northern Victoria that supplies a major part of that State was surrounded by floodwaters and only kept in service by a hastily constructed levee around the site. In the Brisbane floods, high rise buildings with supply substations in basements were uninhabitable for long periods.

The South Australian transmission network was damaged by fire in both the Ash Wednesday bushfires of February 1983, and more recent Eyre Peninsula fires of January 2006. On 4 December 2002, fires North and South of Sydney caused 61 trips of 500 kV and 330 kV lines over a period of nine hours and came within minutes of shutting down all supply to central Sydney. In January 2007, fires in Victoria cut links to New South Wales and 700,000 customers lost supply for hours in extreme heat.

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<sup>8</sup> The Electricity Transmission Code is available at [www.escosa.sa.gov.au](http://www.escosa.sa.gov.au) and the National Electricity Rules are available at [www.aemc.gov.au](http://www.aemc.gov.au)

We actively collaborate with other Australian transmission businesses through our membership of Grid Australia<sup>9</sup> to ensure we fully understand the lessons of such experiences and improve the design of our network to make it ever more secure and resilient to the potential effects of a natural disaster.

In some cases, the very high potential economic cost of supply outages demands special consideration. A prime example of our commitment to secure reliable supply is our recent \$180 million investment in the installation of a second high-voltage power source for the Adelaide CBD, commissioned in December 2011.

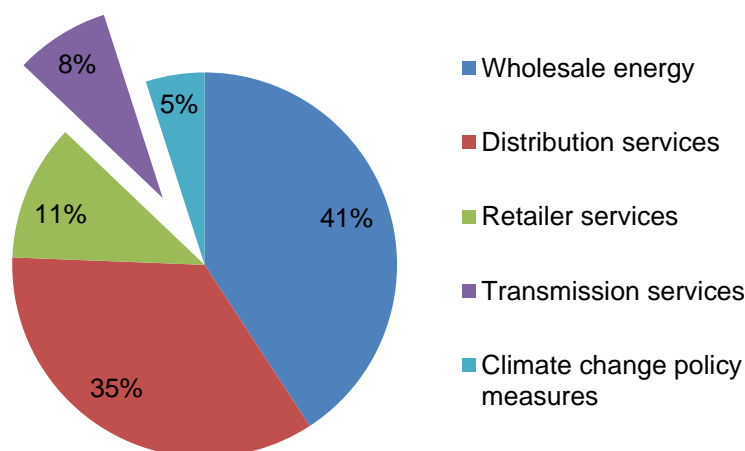
## 6. Objective 2: Deliver transmission services at lowest long-run cost

ElectraNet is committed to ensuring that our electricity transmission services are delivered at lowest long-run cost to our customers, communities and industries that depend on electricity. We consult regularly with our stakeholders and receive feedback on what is important to them. Our objectives for the network to 2035 as set out in Figure 3 reflect these stakeholder views.

The other side of the lowest long-run cost challenge is our transmission service pricing.

### How we meet the challenge of lowest long-run cost transmission service pricing

Our transmission service prices make up less than 10% of the total price of electricity paid by residential electricity customers in South Australia (see Figure 7).

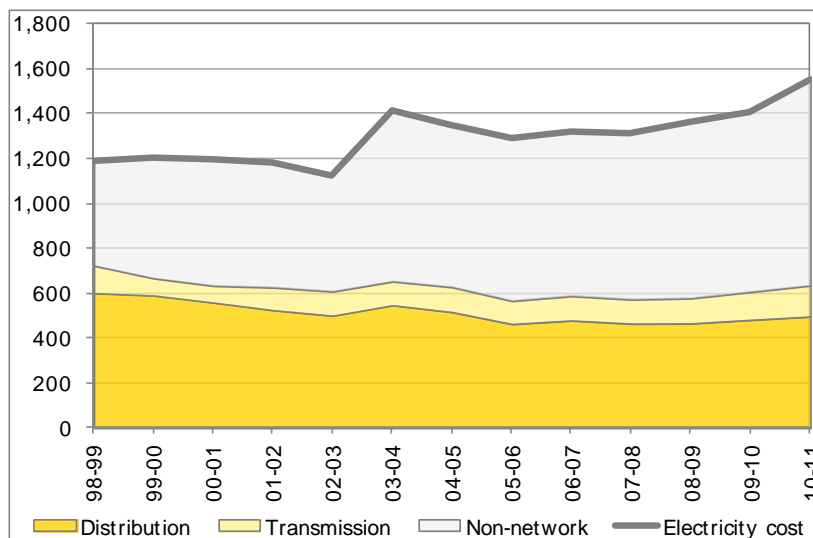


**Figure 7: Components of South Australian residential retail electricity price<sup>10</sup>**

<sup>9</sup> Further information is available at: <http://www.gridaustralia.com.au/>

<sup>10</sup> Source: AEMC 2010, Future Possible Retail Electricity Price Movements: 1 July 2010 to 30 June 2013, Final Report, Figure 3.6 South Australia - Future possible residential electricity prices over 2009/10 to 2012/13, 30 November 2010 [www.aemc.gov.au](http://www.aemc.gov.au)

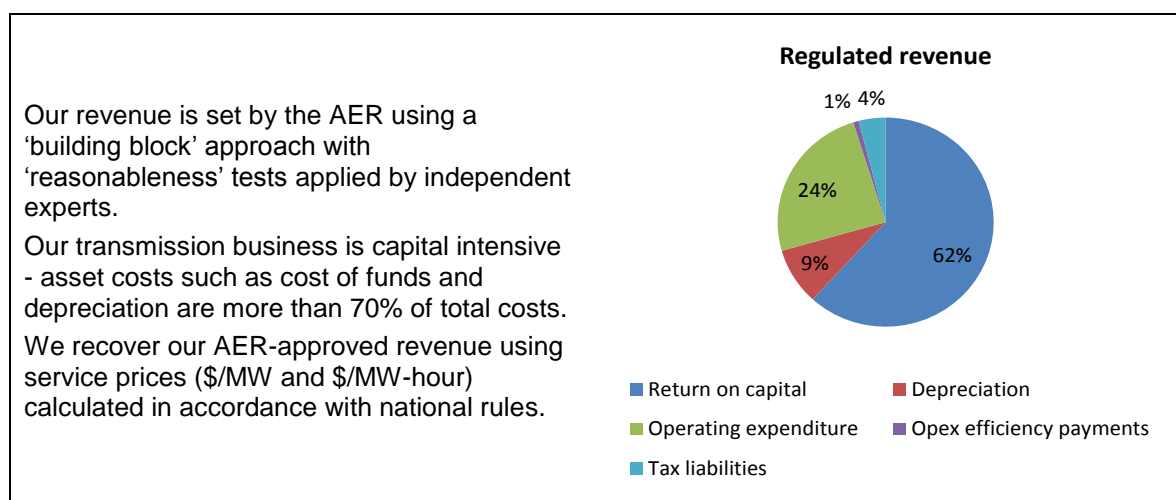
Despite the upward trend in power prices over recent years, transmission costs as a proportion of electricity costs have fallen over the period 1998-99 and 2010-11 (Figure 8).



**Figure 8: South Australian electricity costs 1998-99 to 2010-11 (\$ per customer, real 2010)<sup>11</sup>**

Nevertheless, we recognise retail electricity prices are currently rising at an accelerated rate right across Australia and we constantly seek options to meet electricity demand in the most economic manner possible. We also look to constantly improve operating efficiency, manage our service standards and invest strategically to grow network capacity in response to customer demand in an economically efficient manner to keep transmission prices down.

The processes that drive transmission service prices are tightly regulated and may not be well understood. These processes are summarised in Figure 9.



**Figure 9: Our costs, revenue and prices – how they are managed and regulated<sup>12</sup>**

<sup>11</sup> Source: Ernst & Young, December 2011, South Australia domestic electricity prices 1998-2010: The contribution of network costs, Figure 4.

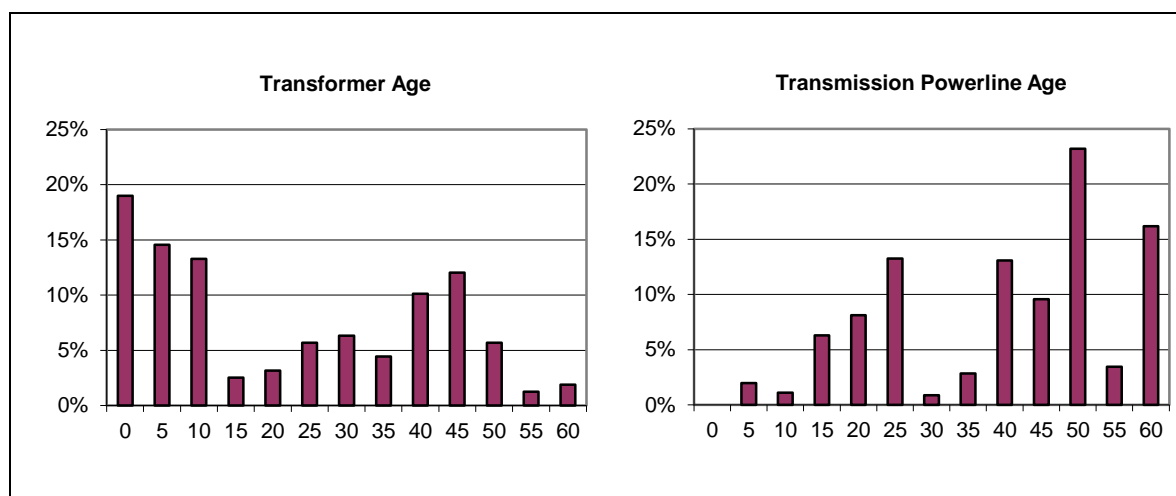
<sup>12</sup> Source: ElectraNet Transmission Determination: 2008-09 to 2012-13, Australian Energy Regulator, 11 April 2008



Many factors outside our direct control drive an increasing trend in transmission costs. The information in the remainder of this section outlines some of these factors and our pricing challenges.

We must continue to move quickly to keep up with the need for asset replacement

Replacement of ageing assets affects transmission service prices. Even after reduction in maintenance costs is taken into account, the increase in asset value drives increased cost of funds and increased depreciation. Many of our transmission network assets are now well beyond their normal service life (the average age of our lines is 40 years) and we manage them carefully to contain increases in maintenance costs and risks to network performance. Eventually we will have no option but to replace them.



**Figure 10: South Australia's transmission network asset age profile**

ElectraNet will continue to make prudent investments in the refurbishment and replacement of ageing network assets. We do not replace assets simply because they are old. Investment decisions are based on a detailed knowledge of asset condition and performance, which tend to deteriorate as assets near the end of their life cycle. Combined with our ongoing advancements in operation and maintenance, this approach has so far kept pace with the challenge of ageing infrastructure assets, but has not eliminated it.

More assets will be replaced in future years so we can continue to meet our customers' need for service reliability and increased network capacity:

- We make very careful decisions on asset replacement investment, looking at all options such as more advanced operation and maintenance practices, before we finally proceed. We have invested in advanced and sophisticated asset condition monitoring systems to ensure our decisions on assets are fully informed (see Box 2).
- We strive to combine essential refurbishment / replacement work with capacity augmentation projects wherever possible to benefit from economies of scale and save overhead costs.
- We work closely with South Australia's distribution network service provider ETSA Utilities through the joint planning process to plan and implement connection point upgrades between our two networks in a coordinated manner to maximise the cost effectiveness of our investments.

The age profile of the transmission network means this challenge will continue to drive a lot of capital investment for an extended period.

**Box 2: Asset Condition Assessment**

ElectraNet manages, maintains and develops South Australia’s extensive transmission network based on the best available information on the current condition and performance of these assets.

In recent years, ElectraNet has implemented a systematic process for collecting, recording and analysing detailed information on the condition of these assets as a normal part of routine maintenance practices through a sophisticated condition and risk based coding system.

This unique system is providing a wealth of information on the current state of the network, and enables better decisions to be made on the maintenance, refurbishment and replacement of assets in order to manage risk, maintain reliable supplies and minimise the overall life cycle cost of the assets.

Peak power demand drives investment and it is rising faster than total consumption

Because we must maintain reliable supply even at times of peak power demand, we invest to meet growth in peak power demand, rather than growth in overall energy consumption.

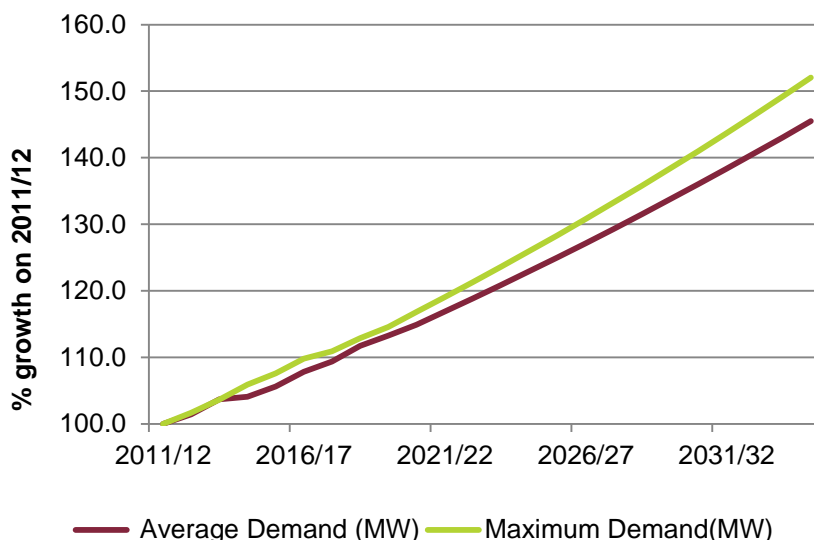
South Australia has very ‘peaky’ demand (see Figure 11) as measured by maximum power demand relative to average consumption levels. With the State’s hot summers and widespread use of air conditioning and our lower level of heavy manufacturing industry (such as smelters), the transmission network must have the capacity to supply very large peak electricity demands, despite much lower average demand for much of the year.



**Figure 11: Comparative ratio of peak to average electricity demand across Australia<sup>13</sup>**

Not only does South Australia have the ‘peakiest’ demand of all the States, it is projected to become even more so (see Figure 12).

<sup>13</sup> Source: AER Transmission Network Service Providers Electricity Performance Report for 2008-09, December 2010

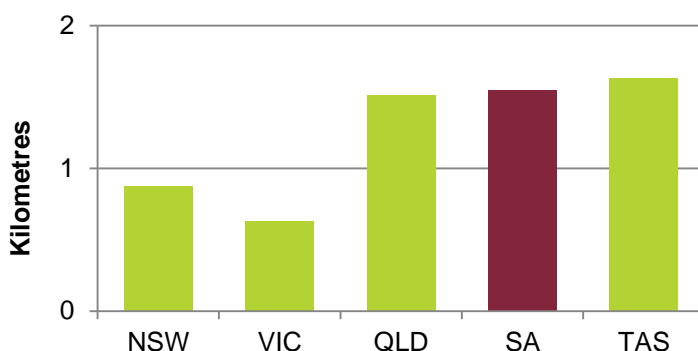


**Figure 12: Projected SA peak power demand and annual electricity consumption<sup>14</sup>**

For significant (non-summer) periods of the year the transmission network has a lot of excess capacity, i.e. it is under-utilised. The reality for all transmission businesses is that higher asset utilisation is the most direct path to lower prices. So to deliver value-for-money to South Australian customers, we will need to continue to manage the special challenges presented by the State’s ‘peaky’ demand pattern over the period to 2035 and look for opportunities and incentives for customers to improve asset utilisation. Growth in base-load demand from the mining sector may also help improve the State’s load profile.

South Australia’s electricity demand is spread across a wide geographic area

South Australia’s population and load centres are spread over 200,000 square kilometres of land area and require more power line investment per unit of peak demand serviced than many other areas of Australia. South Australia shares this challenge with Queensland and Tasmania, while Victoria and New South Wales enjoy greater geographic concentration of demand.



**Figure 13: Length of transmission line in km required to supply each MW of peak demand<sup>15</sup>**

<sup>14</sup> Source: ElectraNet SA Annual Planning Report 2011 maximum demand forecasts to 2020/21 and AEMO SA Supply Demand Outlook 2011 energy projections to 2020/21, extrapolated to 2035 assuming 1.9% annual growth in maximum demand and 1.7% annual growth in average demand.

<sup>15</sup> Source: Source: AER Transmission Network Service Providers Electricity Performance Report for 2008-09, December 2010 [www.aer.gov.au](http://www.aer.gov.au)



**Figure 14: Comparative electricity transmitted per \$1m of regulated assets<sup>16</sup>**

The peakiness of power demand and geographic spread of South Australia’s electricity market have obvious implications for transmission service prices. These factors mean that efficient service prices in South Australia will be relatively higher than in other areas of Australia. Ultimately, network utilisation determines the cost we must recover for each MW-hour of energy we supply, i.e. our transmission service price.

We will continue to adopt smart grid technology to improve asset utilisation

The amount of power a transmission network asset (e.g. a power line or transformer) can carry is generally limited by the heat that the electric current produces and the cooling capacity that can be applied. Because much of the transmission network is designed to preserve supply when any one element fails, as required by the reliability standards, not all of the assets are fully utilised even at times of peak power demand, since capacity must generally be reserved to maintain supply should failures occur.

ElectraNet is a national leader in the adoption of the recent IEC61850 ‘smarter grid’ standard (see Box 3). This standard sets out ways to link embedded intelligent devices and provide more sophisticated responses to manage the network if problems occur. Use of such smarter enabling technologies can ultimately allow existing assets to carry more power at peak times, increase network utilisation and defer network augmentation investment. Over time, this will mitigate effects on transmission asset utilisation of the trend over recent years of ever-increasing peakiness of demand, and will allow some price pressures to be eased.

<sup>16</sup> Source: AER Transmission Network Service Providers Electricity Performance Report for 2008-09, December 2010 [www.aer.gov.au](http://www.aer.gov.au)

### Box 3: Deployment of Smart Technology

ElectraNet is the first transmission operator in Australia to adopt the new international IEC 61850 design standard for electrical substation automation.

ElectraNet trialed and implemented the technology successfully at a purpose-built test facility at its Keswick premises. This facility was then successfully deployed to the new Clare North substation which was energised in December 2010 and has been operating successfully since. Based on the success of the Clare North substation implementation, the technology was deployed successfully to the Kadina East substation redevelopment which was energised in June 2011. The technology is now being deployed to further substation developments such as Ardrossan, Whyalla and Cultana.

The successful implementation of this technology has enabled newer, smarter technologies to be integrated into our substation design, construction and operations processes, to ultimately improve network performance.

### Input cost pressures continue

Like many of our customers, we are exposed to the current prolonged spike in the prices of many of the commodity materials we use (mostly metal products) and the cost of our funds following recovery from the Global Financial Crisis (see Figure 15). We have seen unit cost increases of 300% and above over the past seven years in most of our key inputs. Shortages of skilled labour in a tightening and competitive labour market are also a challenge.

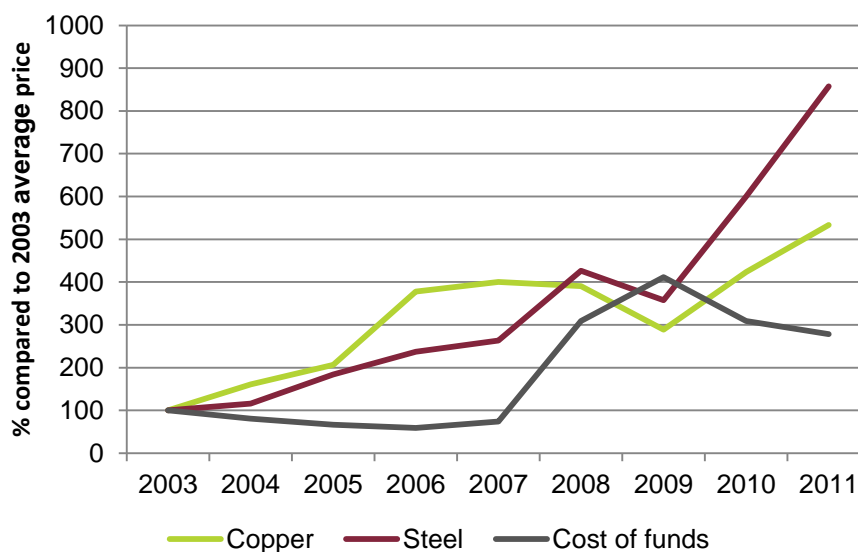


Figure 15: Input cost trends since 2003<sup>17</sup>

We continue to manage input costs by exerting competitive pressure on all our suppliers. However, when it comes to containing transmission service prices, a key focus must continue to be improving energy consumption patterns to increase higher network utilisation.

<sup>17</sup> Source: The Nous Group – analysis of ANZ commodity prices forecasts and Westpac BBB debt margins.

## 7. Objective 3: Support South Australia's economic development

South Australia's social and economic well-being is strongly enhanced by competitively priced, safe, reliable and secure electricity supply. In efficiently serving the needs of electricity consumers, we understand the important role the transmission network also plays in facilitating the growth and prosperity of the South Australian community. South Australia's transmission network was first connected to Victoria on 1 March 1990 and since then the network has also become an integral and increasingly important part of the national power grid to support national competition and energy security.

### The transmission network supports South Australia's economic development

ElectraNet uses strict planning criteria to decide on major augmentation or replacement projects. Two criteria must be satisfied:

1. *Net economic benefits* – This test is defined by the AER to ensure that transmission investments deliver real economic benefits. Benefits can flow from removal of constraints on access to low cost power generation, improved competition, reduced power losses, etc. A typical example is the joint application of this test by ElectraNet and AEMO to an upgrade of the Heywood Interconnector between South Australia and Victoria.
2. *Supply reliability standards* – We comply with specific reliability criteria to assess the need for some types of investment, e.g. if the load on a major substation can no longer be supplied with one transformer out of service or one power-line out of service, we must identify the lowest cost option to ensure continuity of supply in such circumstances. These supply reliability standards are set by ESCOSA using economic analysis on advice from AEMO and then established as deterministic planning standards in South Australia's Electricity Transmission Code.<sup>18</sup>

Assessment against these criteria defines our forward program of capital works. Unless one or both of these criteria are satisfied, a project cannot be funded by our regulated cost-recovery process. This process also requires consideration of non-network options, in order to arrive at the least cost economic solution. This framework safeguards customers from over-investment in the network, and ensures we achieve an optimum balance between network investments and alternative options so our service prices represent best value for transmission customers (see Box 4).

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<sup>18</sup> The Electricity Transmission Code is available at [www.escosa.sa.gov.au](http://www.escosa.sa.gov.au)

**Box 4: Port Lincoln Network Support Arrangement**

ElectraNet continues to explore and adopt non-network alternatives wherever economical and practical to meet the growing power needs of South Australia. To address emerging network limitations on the Eyre Peninsula and meet continuing load growth, ElectraNet contracted with a generator at Port Lincoln to install a third turbine to provide additional supply of 23MW. The generator was connected in November 2010.

This solution provides non-network capacity at times of peak load and during network outages, and delivers a level of supply consistent with the reliability standards of the South Australian Electricity Transmission Code.

This solution has deferred for a number of years the need for a much more extensive transmission line project at a potential cost of over \$200 million. It provides ongoing supply reliability, while reducing transmission costs for customers in South Australia.

Over the past three years, a new national transmission planning function has been established in AEMO and Australia's first National Transmission Network Development Plan (NTNDP) was published in December 2010. We fully support the new planning processes which focus on major national grid power flows, and we continue to perform our traditional planning role for local network capacity to meet demand growth.

The new NTNDP indicates that by 2035, our transmission network may undergo profound transformation. Some long term scenarios require new high capacity transmission lines (tentatively termed NEM-link) extending the length of Australia's eastern seaboard into South Australia and including a second link to Tasmania (Figure 16).



**Figure 16: Possible NEM-link projects**

Even without a major transformation like NEM-link, other long term scenarios in the NTNDP indicate augmentation of existing interconnections with Victoria, reinforcement of transmission links to the Eyre Peninsula and links to new centres of low emission power generation in the north of the State. ElectraNet will continue to work with stakeholders to assess the feasibility of strategic network developments to promote economic development in South Australia, including the possibility of augmenting existing or investing in new interconnectors (see below).

### We align our planning with the requirements of industry development

ElectraNet has an important role in supporting the development of South Australia by providing for the transport of energy to facilitate major projects and the growth of local communities. ElectraNet will continue to work closely with our stakeholders to ensure our program of investment is synchronised with major resource development projects so they can access energy markets in time to meet their needs.

As part of this approach, we strive to align our network investment planning cycle with the lead times of major mining projects. There are a number of major mining projects currently being considered or soon to be started in regional and remote South Australia. These projects will require large amounts of electricity which might best be met by augmentation or extension of the transmission network.

ElectraNet is proactively planning its network investment to meet our customers' likely demand for increased network capacity. This is very challenging, as mining projects have long development lead times but tend to proceed rapidly once the decision to invest is made. On the other hand, network investments involve extensive planning processes and community consultation along power line routes so construction lead times can still be lengthy even after a decision to proceed. ElectraNet remains committed to aligning its investment program with the needs of major development projects.

To this end, we work closely with Government agencies and peak industry bodies such as the Resources and Energy Infrastructure Council (RESIC) to identify potential future electricity demands and develop infrastructure solutions to facilitate resource driven development in South Australia.

### South Australia's total electricity demand will continue to grow and the network must grow to meet it

On present trends, South Australia's underlying electricity energy consumption in 2035 may be around 50% higher than today and the State's 2035/36 peak power demand may be 60% higher, excluding the potential for major new transmission loads<sup>19</sup>. Even without major development projects, significant transmission investment will, therefore, be required over the next 25 years simply to supply South Australia's growing demand for electricity. This typically includes local works such as additional transformers, additional capacitors (for voltage support at times of peak power demand) new lines and upgrades to existing power lines.

Each year, we publish our Annual Planning Report<sup>20</sup> which lists all the network limitations and potential solutions we have identified in our planning studies. We also work with AEMO to support its publication of a complementary document, the South Australia Supply and Demand Outlook<sup>21</sup>. Together, these documents establish a sound basis for our long term planning to meet demand growth.

### Our interconnection with Victoria puts competitive price pressure on generators

South Australia's transmission network, which can carry Victorian power from the south-east corner of the State to major load centres like Adelaide, as well as power from wind generators on the Eyre Peninsula to Victoria, plays an important role in ensuring power prices in South Australia remain competitive. Similarly, the export of low emission power into the national grid puts competitive pressure on alternative sources interstate.

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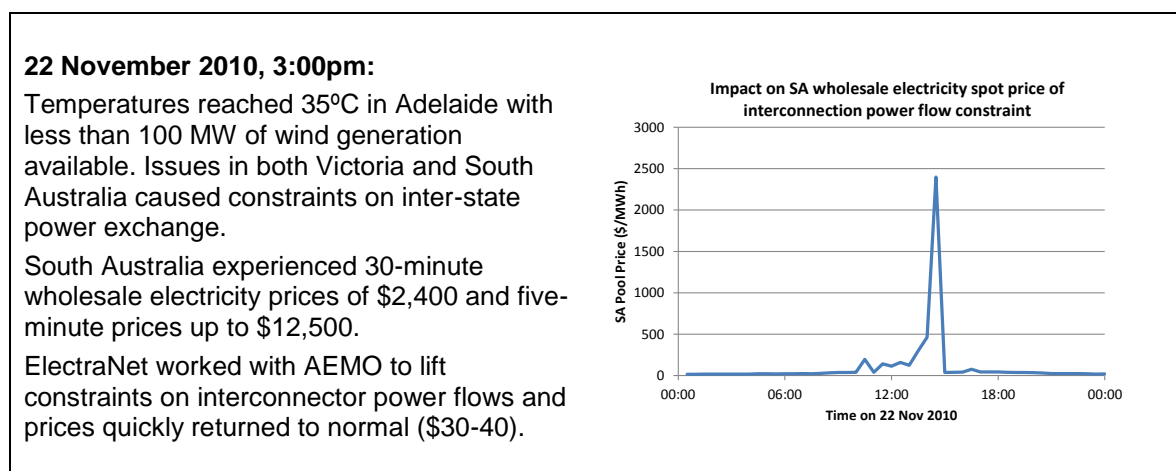
<sup>19</sup> Source: SA Annual Planning Report 2011 forecasts to 2020/21, extrapolated to 2035 assuming 1.9% annual growth in maximum demand and 1.7% annual growth in average demand.

<sup>20</sup> Available at: [www.electranet.com.au/network/transmission-planning/annual-planning-report/](http://www.electranet.com.au/network/transmission-planning/annual-planning-report/)

<sup>21</sup> [www.aemo.com.au/planning/SASDO2011/sasdo.html](http://www.aemo.com.au/planning/SASDO2011/sasdo.html) (2011 edition).



A notable feature of the local electricity market in recent years has been that whenever the interconnection with Victoria reaches the limit of its power carrying capacity, the wholesale spot price of electricity in South Australia rises, sometimes to very high levels (Figure 17).



**Figure 17: The effect of constrained interconnection capacity on South Australian wholesale electricity prices**

Higher wholesale electricity prices can be exacerbated by limited local competition in the energy market at times when interconnector power flows are at their limits.

We recognise that interconnection transfer capacity is a significant source of value to South Australia and to the National Electricity Market. We work with AEMO to actively monitor and assess the potential economic benefits of additional interconnection capacity to maximise market benefits, including competition benefits (see Box 5).

**Box 5: Building South Australia’s electricity export capability**

South Australia’s annual power exports across the interconnector with Victoria have increased tenfold from 51GWh to 589GWh over the last 5 years, driven by South Australia’s investment in low emission power generation.

ElectraNet works closely with AEMO to actively monitor and assess the potential economic benefits of additional interconnection capacity to maximise market benefits, including competition benefits. The two organisations recently undertook a joint feasibility study<sup>22</sup> into options to augment interconnector capacity between South Australia and Victoria/New South Wales. It compared five options across a range of long-term scenarios. These included new routes into Victoria via Horsham and into New South Wales via Broken Hill. It indicated that a new high capacity interconnector may be economically viable as early as 2020-25 depending on a range of factors.

A subsequent assessment<sup>23</sup> with AEMO has indicated that an upgrade of the Heywood Interconnector between South Australia and Victoria (by about 200 MW – a 40% increase in link capacity) would deliver positive net market benefits over a wide range of market development scenarios, with optimal timing between 2013 and 2017. ElectraNet and AEMO have now jointly commenced a formal application of the regulatory economic investment test to progress this interconnector development.<sup>24</sup>

<sup>22</sup> See ElectraNet-AEMO Joint Feasibility Study, South Australian Interconnector, February 2011, at [www.electranet.com.au](http://www.electranet.com.au).

<sup>23</sup> South Australian Annual Planning Report available at [www.electranet.com.au](http://www.electranet.com.au).

<sup>24</sup> ElectraNet and AEMO, South Australia - Victoria (Heywood) Interconnector Upgrade: Project Specification Consultation Report, November 2011, available at [www.electranet.com.au](http://www.electranet.com.au).

We support uniform electricity supply practice for major national customers

As a business ElectraNet also supports the development of uniform national standards and practices across the network because it allows network participants and customers to have certainty in the way they interact across Australia.

Some of our larger customers are national companies and we deal with their South Australian business arms. In their relationships with many electricity suppliers across Australia, these customers seek to operate on a more consistently uniform basis. Without diminishing our focus on the needs of South Australia, we actively work to streamline and align our network connection processes with national practice to minimise any potential burden created by any South Australian requirements on our customers.

In some areas such as network operation with high levels of wind power, South Australia is a leader in shaping national practices through our collaborative activities with national market institutions such as the AER, AEMC and AEMO and our active membership of industry bodies such as Grid Australia.

**8. Objective 4: Support development of lower emission energy sources**

ElectraNet provides open access to its network for all connection applicants, and remains technology neutral in the forms of generation it connects to the grid. Given the pattern of new generation investment in the current climate, we are playing an important role in the development of new low emission energy sources and a shift to a clean energy economy (see Box 6).

**Box 6: Low Emission Generation Expansion**

Since publishing its Network 2025 Vision, ElectraNet has connected almost 1,000 MW of new generation to South Australia’s transmission network, the majority of it wind power:

<b>Generator</b>	<b>MW</b>	<b>Energy source</b>
Clements Gap	57	Wind
Brown Hill	95	Wind
Hallett Hill	71	Wind
North Brown Hill	132	Wind
The Bluff	53	Wind
Lake Bonney 2	159	Wind
Lake Bonney 3	39	Wind
Port Lincoln GT3	23	Distillate
Quarantine GT5	100	Gas
Snowtown 1	99	Wind
Waterloo	111	Wind

To achieve this level of connection activity, ElectraNet has streamlined connection processes and practices and worked with other transmission companies to produce a consistent set of Transmission Network Connection Guidelines.

Much of the State’s low emission energy generation is located in remote and regional locations. ElectraNet’s transmission network plays a vital role in getting this green power to South Australian households and to the National Electricity Market in the most cost

effective manner. As carbon pricing starts to have an effect, South Australia’s low emission energy will become increasingly valuable in the National Electricity Market and our interconnection assets will allow this value to be realised for the benefit of all.

We will continue to plan for the possible long term connection of geothermal projects in the far-north of South Australia, though it is possible this energy source may take many years to reach full commercial scale. If and when it does, it could substantially change the carbon profile of the State’s generation portfolio. Major new transmission links will be required to realise this potential.

Long-term studies by AEMO indicate that if South Australian low emission power generation investment continues to grow under the stimulus of a strong national policy response to climate change in the period to 2035, South Australia will progressively become a net exporter of carbon-free power to other states. South Australian net imports each year are already declining, as illustrated by trends in net annual energy inflows to the State (Figure 18).



**Figure 18: Net annual interconnector energy flow to South Australia<sup>25</sup>**

<sup>25</sup> Source: AEMO South Australian Demand and Supply Outlook 2011.

## **9. Our guiding principles**

South Australia's transmission network requires significant investment over the next decade to address the challenges and objectives set out in preceding sections of this Network 2035 Vision.

It will not be simply a matter of doing more of the same. The way our network is designed, operated and priced is likely to change to meet the objectives set out in our long term Vision.

We must work with our stakeholders to manage the challenges of what needs to be built, how and when. We will strengthen our longer-term thinking, better understand what customers value, innovate and work with others.

In our May 2007 Network 2025 Vision we defined a set of guiding principles to guide all our decision making – in all our activities and at all levels. We have reviewed the guiding principles to identify any adjustments we should make in the light of developments in the intervening years. Based on this review, we have strengthened our capability to adapt to an increasingly dynamic and challenging future.

The new Guiding Principles are set out in Table 2 on the following page.

**Table 2: Guiding principles to deliver the Network 2035 Vision**

<b>Our Customers</b>	
<b>Consultation</b>	Consult with our stakeholders, customers and the community in order to continually improve our long term plans in an increasingly dynamic and challenging environment
<b>Responsiveness</b>	Continue to develop a network that is responsive to customer expectations and to meet future environmental challenges
<b>Delivery</b>	Service delivery will be based on innovative and flexible solutions
<b>Price</b>	Deliver reliable transmission services at the lowest long-run cost to customers
<b>Our Network</b>	
<b>Optimisation</b>	Optimise the capacity, flexibility and performance of the network over a 20 year horizon
<b>Performance</b>	Embed quality and performance monitoring; find opportunities for best practice; share information with customers; and work with regulators to set clear and meaningful performance targets
<b>Investment</b>	Align investment with customer demand for transmission services and mandated reliability and quality of service obligations
<b>Technology</b>	Use new technology (including embedded intelligence) to fully utilise the capacity of the existing network and improve value for money
<b>Security</b>	Build physical and network security over the long term
<b>Our Assets</b>	
<b>Plan</b>	Whole of asset thinking, rather than component level; take a broad view to find the least cost option; maximise synergy between new capacity and renewal of existing plant
<b>Design</b>	Design for high performance and value for money; based on standardised components that maximise plant and easement utilisation and exploit the benefits of modern digital technology and secure digital networks
<b>Construct</b>	Work closely with the local community and use modules assembled off-site to minimise local disturbance and overall cost; where possible avoid the complexity risk of brown-field projects by finding simpler greenfield alternatives; buy wisely, leverage common specifications and maximise competitive pressure on suppliers to get best value
<b>Operate</b>	Preserve safety and build security; use remote monitoring and control via secure digital systems for performance and flexibility; identify spare capacity for contingencies
<b>Maintain</b>	Minimise requirements to work on site or take assets out of service

ElectraNet considers that these principles, which are intended to guide our decision making at all levels, will help us to achieve the objectives set out in this Vision document and thereby deliver the network South Australia needs for the future.

## **10. Additional Feedback**

This Vision has been developed with the benefit of a comprehensive consultation process. However, ongoing feedback from stakeholders would be most appreciated.

Please send your comments or feedback electronically or by mail to:

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