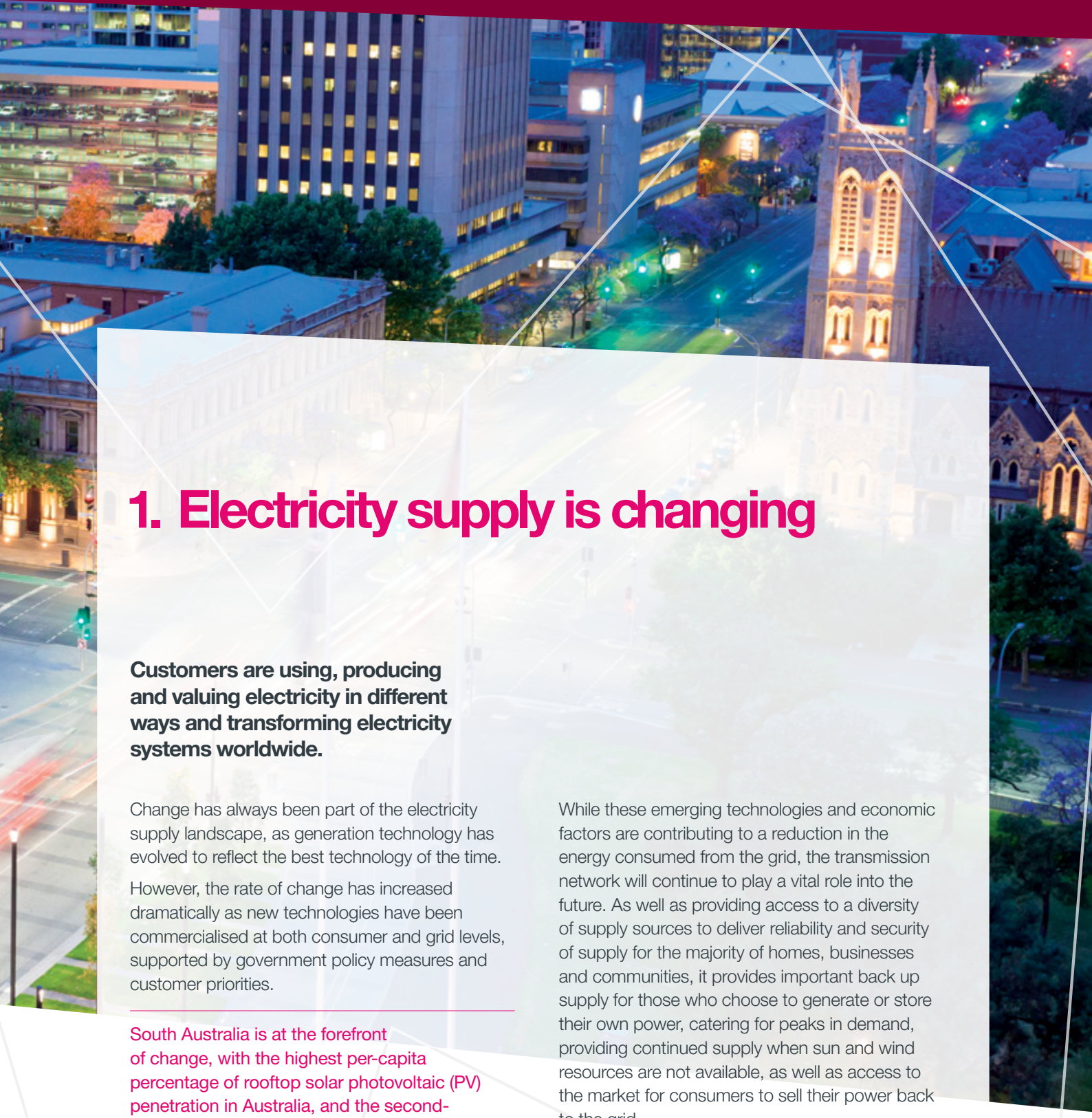
NETWORK VISION

ElectraNet // September 2016

ElectraNet

Contents



1. Electricity supply is changing

Customers are using, producing and valuing electricity in different ways and transforming electricity systems worldwide.

Change has always been part of the electricity supply landscape, as generation technology has evolved to reflect the best technology of the time.

However, the rate of change has increased dramatically as new technologies have been commercialised at both consumer and grid levels, supported by government policy measures and customer priorities.

South Australia is at the forefront of change, with the highest per-capita percentage of rooftop solar photovoltaic (PV) penetration in Australia, and the second-largest wind-to-load ratio in the world.

The mix of generation in the market continues to evolve to accommodate these new technologies, and the impacts will be felt throughout the electricity supply system, as storage technologies mature and become more accessible at all levels, and enable further choice for electricity customers.

While these emerging technologies and economic factors are contributing to a reduction in the energy consumed from the grid, the transmission network will continue to play a vital role into the future. As well as providing access to a diversity of supply sources to deliver reliability and security of supply for the majority of homes, businesses and communities, it provides important back up supply for those who choose to generate or store their own power, catering for peaks in demand, providing continued supply when sun and wind resources are not available, as well as access to the market for consumers to sell their power back to the grid.

The transmission network must continue to evolve to meet customers' changing needs, respond to the challenges and opportunities of new technologies and supply options available on both a small and large scale, and support the ongoing transformation of the state's economy, to ensure it continues to power South Australia into the future.

ElectraNet

2. South Australia's transmission network

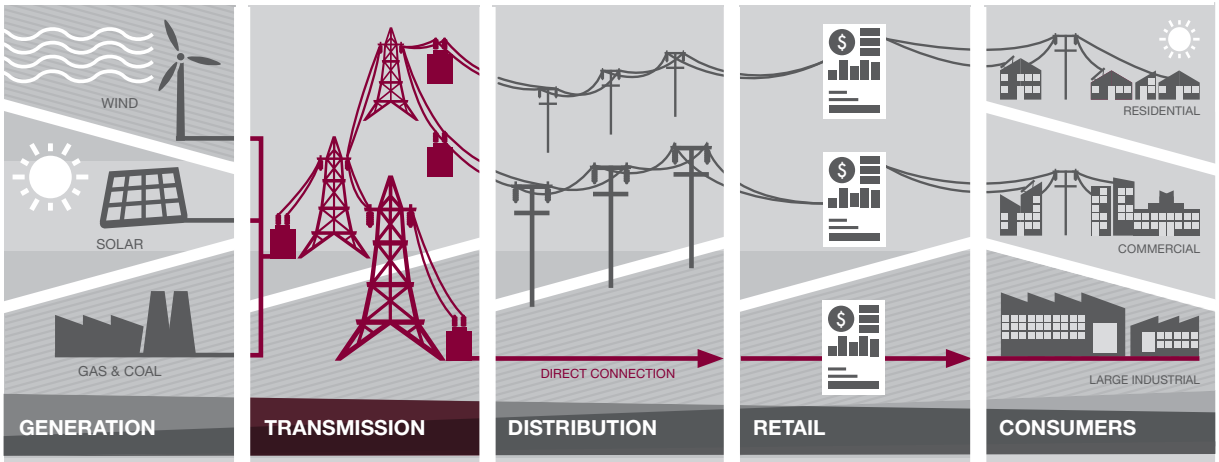
As the owner and operator of South Australia's high-voltage electricity transmission network, our role is to deliver safe, affordable and reliable transmission services to power people's lives.

Our network safely transports electricity over long distances from traditional and renewable generators - both local and interstate - to where it is needed, to power homes, businesses and communities across metropolitan, regional and remote areas connected to the network.

The transmission network covers an area of over 200,000 square kilometres and is made up of over 5,600 circuit kilometres of transmission lines and cables that operate at voltages of 275 kV, 132 kV and 66 kV, as well as 91 high-voltage substations with modern centralised monitoring, control and switching facilities.

While only a small part of the cost - less than 10% of the average household bill - the transmission network plays a big role in the supply of electricity.

How electricity gets to you



GENERATION

Electricity is generated from traditional and renewable energy sources such as wind, solar, gas and coal.

TRANSMISSION

Electricity enters ElectraNet's network where it is converted to higher voltages, for efficient long-distance transport to cities and towns around South Australia. The voltage is then lowered so it can enter the distribution network or be supplied directly to some large industrial customers.

DISTRIBUTION

The distribution network, operated in South Australia by SA Power Networks, transports low-voltage electricity to residential and commercial customers.

RETAIL

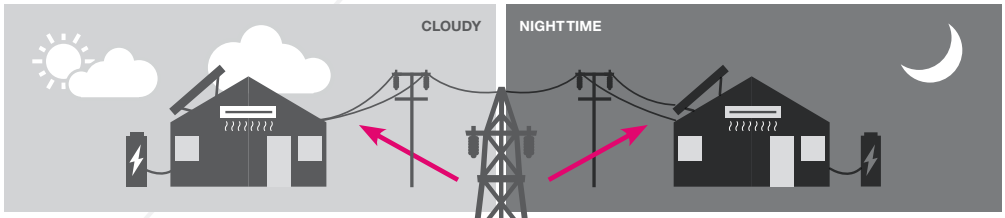
Retailers are the primary point of contact for residential and commercial customers. They coordinate connections and manage billing and payments.

CONSUMERS

The traditional flow of electricity supply is changing. Around one in five South Australian homes now combines the electricity they draw from the network with power generated by rooftop solar panels, and also contributes surplus electricity back to the network.

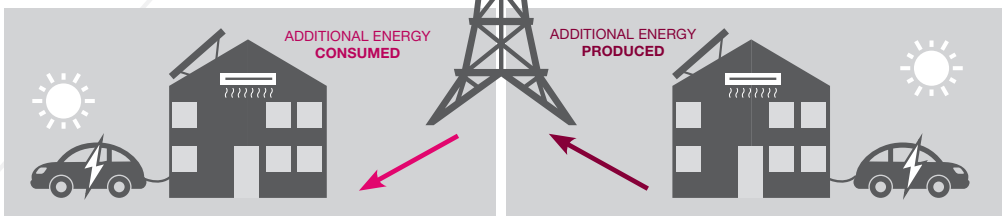
BACK UP SERVICES...

To provide reliable power at night or when it is cloudy.



AND MARKET ACCESS...

Enabling consumers to sell their power into the grid.



PLUS...

Startup power services supporting appliances like air conditioners which increase energy load by up to 4 or 5 times when they start.

Balancing services that instantaneously adapt to the customers' changing demand throughout the day – which can be difficult for a rooftop solar system that isn't connected to the grid.

Power quality services that protect the safe and reliable operation of home and business appliances.

As well as moving power to where it is needed, the grid:

- **provides security and reliability of supply** over the short and long-term by providing access to a diverse range of supply sources across the interconnected regions, allowing the sharing of reserves, and the export and import of power as needed
- **facilitates market competition** between competing generation sources to keep downward pressure on wholesale energy costs
- **provides grid benefits** to customers such as start-up power services for appliances which draw large loads when powering up, balancing services to meet the needs of fluctuating loads throughout the day, and power quality services to protect the stable operation of the grid and safe operation of appliances
- **provides 24/7 back up supply** for those customers generating or storing their own power, to meet peaks in demand and provide continued supply when on-site generation sources are not available
- **offers continuous market access** for customers to sell their power back to the grid, and avoids the need to overbuild on-site generation to achieve self-sufficiency while spilling surplus generation

3. Developing a vision for the future network

ElectraNet has taken a collaborative approach to developing the Network Vision, seeking to understand and involve stakeholders to ensure the outcome is built on a set of shared directions and priorities.

3.1 Engaging stakeholders

The key steps involved in developing the vision have been:

Developing and publishing a Network Vision discussion paper

ElectraNet's initial thinking was published in a comprehensive discussion paper in December 2015.

The thinking behind the discussion paper was explored and refined through a series of workshops that brought together a wide cross-section of disciplines and experiences from across our business. This process was guided by external consultants who ensured the most up-to-date data was used to shape the underlying assumptions and scenarios.

The resulting discussion paper provided detail on the change drivers impacting on the transmission network such as economic growth, energy prices, technological developments, environmental policy and customers preferences. It also explained the assumptions which informed modelling for a number of different plausible future scenarios, and outlined the directions and priorities which had emerged throughout the process.

The discussion paper was published on our website, with stakeholders invited to provide feedback by phone, email or a custom electronic form. Feedback was received from a range of stakeholders. An item in the Australian Energy Market Operator's (AEMO) regular e-newsletter also promoted the Network Vision discussion paper to market participants around the country.

To view the discussion paper, visit electranet.com.au.

Holding a Transmission Network Stakeholder Forum

The Network Vision discussion paper was presented at our Transmission Network Stakeholder Forum in December 2015.

This event brought together participants representing major electricity customers, consumer representative groups, regulatory planning and governance bodies, and other network businesses.

The forum worked through the directions and priorities outlined in the discussion paper during interactive group sessions, led by an independent facilitator.

Attendees had direct access to ElectraNet executives and openly shared feedback on the day and through written submissions after the event.

Engaging with the Consumer Advisory Panel

ElectraNet's independently facilitated Consumer Advisory Panel received presentations on the Network Vision discussion paper to facilitate group activities and feedback.

The panel brings together a broad group of organisations that represent electricity customers across residential, commercial and industrial segments, as well as interest groups advocating for primary producers and landholders, the local government sector, environmental conservation and social services.

The panel has also undertaken extensive work to prioritise the key issues affecting customers, which should be understood and considered by ElectraNet in its planning processes.

Holding a regional stakeholder workshop

A workshop was conducted in the Riverland region, with eight large distribution network customers and local industry representatives who have previously been actively involved in other industry customer engagement programs, to become better informed about issues affecting this segment and how the wider electricity supply chain is shaping their priorities.

Conducting stakeholder in-depth interviews

ElectraNet completed in-depth interviews with direct-connect customers, major electricity customers not directly connected to our network, and customer and business representative groups.

These interviews provided an opportunity to explore the detail behind the stakeholders' priorities and perceptions around the current and future role of the transmission network, technology, pricing and service reliability. The interviews were jointly conducted by ElectraNet staff and an independent consultant, to promote free and open discussion.

3.2 Reflecting on feedback

The feedback gathered throughout this process has been summarised into the following key insights which have three common themes: affordability, reliability and choice.

Overarching insight

1. Customers want lower, more stable and transparent electricity costs.

Customer experience

2. Customers who deal directly with ElectraNet are generally satisfied with the service they receive.

3. Indirect customers and stakeholders are seeking to increase their relationship with ElectraNet as opposed to working through SA Power Networks.

Role of the grid

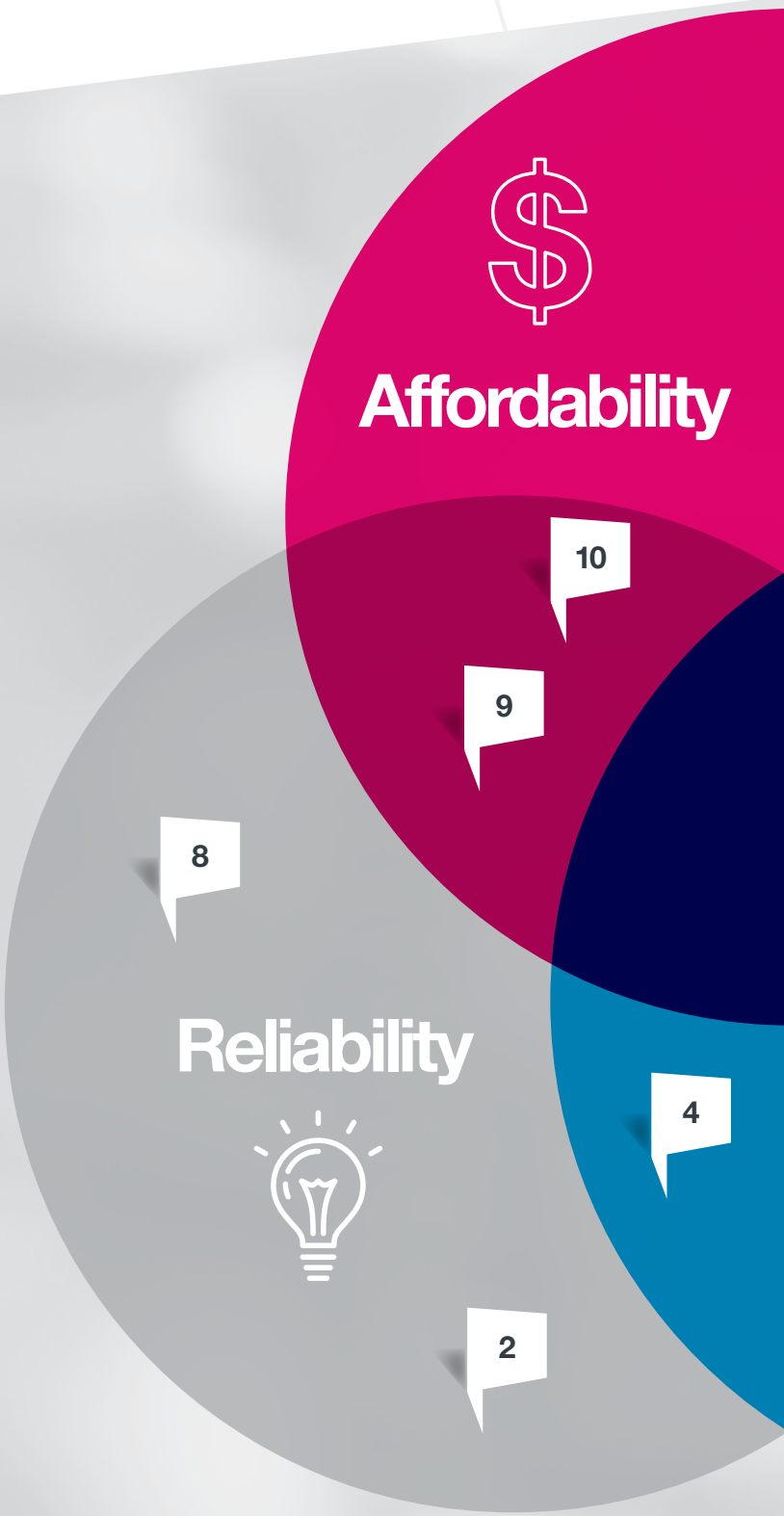
4. The transmission network will continue to play an important role in the future by facilitating the integration of renewable energy generation and ensuring customers receive a reliable and stable supply.

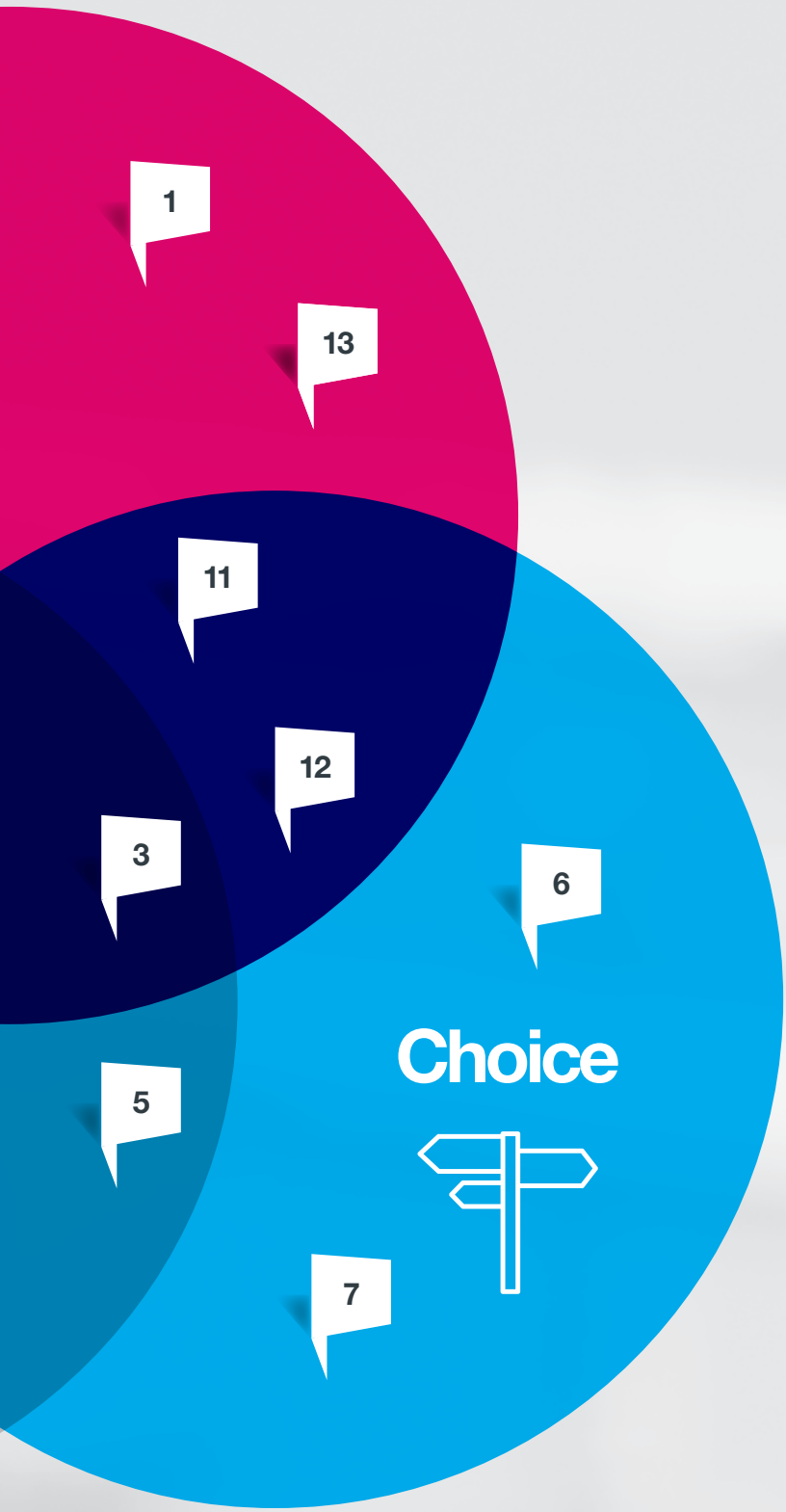
5. The transmission network will need to adapt to meet the needs of South Australia as distributed generation levels and storage solutions increase.

New technology

6. Customers view storage solutions as part of the future of the grid when it becomes economically feasible, however, are unclear on what ElectraNet's role should be.

7. Customers are supportive of ElectraNet exploring demand management initiatives and view incentives as the key to assisting customers change their usage patterns.





Keeping the lights on

8. Customers are satisfied with the current reliability levels of the network.

9. Customers view ElectraNet's approach to Capex and Opex as prudent so long as a risk based approach is adopted and reliability standards continue to be met.

10. Customers believe ElectraNet should employ a cost-benefit approach when considering asset retirement.

Transmission pricing

11. Most customers are unware or confused by transmission pricing structures.

12. Direct-connect customers generally don't support ElectraNet using peak demand as a base for determining charges.

Revenue recovery

13. Customers are unclear as to the best method of recovering depreciation charges for the transmission network.

Further information on the outcomes of our customer engagement program can be found in the Customer Insights Report, published at electranet.com.au.

3.3 Refining the Vision

Based on the feedback we received, we have refined and finalised the Network Vision and the key directions and priorities for the transmission network.

Among these amendments were:

- Highlighting the **importance of the sustainability** of decisions which enable affordability and choice, so they have longevity
- **Better representing customers' desires** to see material price reductions and leadership in influencing this throughout the supply chain
- More strongly acknowledging the importance of **maintaining the security and reliability** of the network as new technologies and renewable generators are integrated into the mix

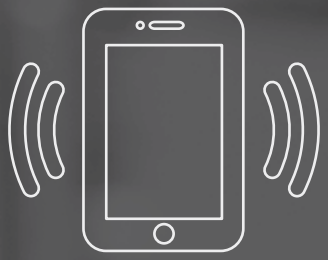
A summary of the detailed outcomes of the consultation and manner in which the feedback has been addressed is also available at electranet.com.au.

4. The Network Vision

ElectraNet's vision for South Australia's transmission network is that it will deliver affordable and reliable power supplies that support customer choices for a sustainable future.

Genuine engagement

With customers, consumers and other stakeholders to ensure transmission services deliver maximum value



New connections

Evolving the network to meet the changing needs of customers and the demands of new technology

Network development

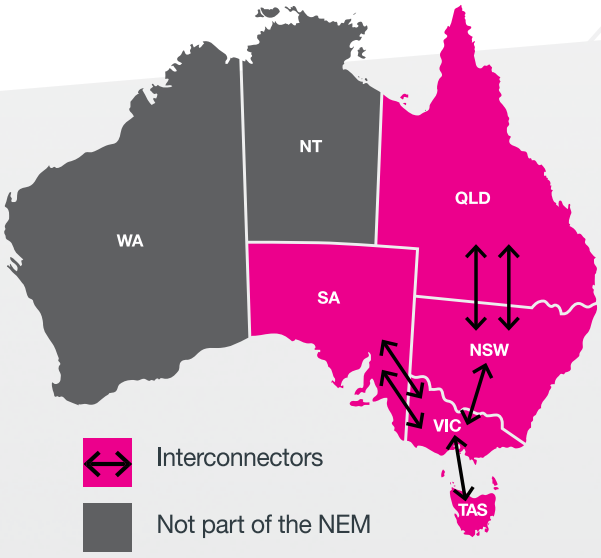
Planning for more complex power quality, dynamic stability and network reliability with the changing generation mix

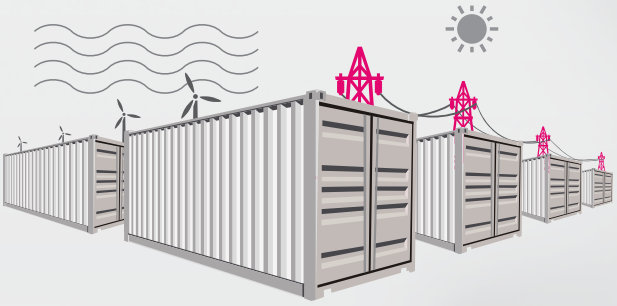
Operations & maintenance

Efficiently maintaining and managing the network through best practice asset management and new technologies such as energy storage

People & organisation

A cultural shift to position the organisation for the network of the future





Greater interconnection

Increased interconnection within the National Electricity Market (NEM) is vital to achieving affordable and reliable electricity supplies, while enabling the increasing choice and long-term sustainability valued and desired by electricity customers.

In South Australia, this will likely be characterised by a new high-capacity interconnection with either New South Wales or Victoria, and ElectraNet is progressing a study to further explore early indicators that it will be economically feasible.

Increased interconnection will facilitate market competition between sources of generation and deliver better prices for customers, by allowing increased access to lower-cost generation at times of peak demand, as well as opening up access to the market for more renewable generation developments. It will also deliver system security benefits which will allow customers to continue to pursue decentralised choices for home-based generation and storage, while enjoying the back-up provided by a stable grid.

Grid-scale storage

Integrating battery storage into the electricity supply chain is the next important step to capitalise on the uptake of environmentally sustainable renewable generation, at both customer and grid levels.

Being able to store large quantities of energy generated by intermittent wind and solar generators may provide commercial benefits by allowing this cheap energy to be used at times when the wind isn't blowing or the sun isn't shining. It may also help manage system security by enabling a fast and controlled release of energy in the event of an unexpected network disturbance.

Along with consortium partners AGL Energy and Advisian, ElectraNet is currently exploring the potential application of an energy storage device within the South Australian transmission network.

4.1 Directions and priorities

The directions and priorities which were explored and amended throughout the development of the Network Vision, are intended to provide detailed guidance on the practical ways we will go about delivering the vision and planning for the future of the network.

1. The transmission network will continue to play an important role into the future to support safe, reliable and affordable electricity supply

Directions

- Customers are seeking material electricity price reductions
- Customers and stakeholders want ongoing and genuine engagement
- Grid maximum demand remains steady
- Grid supplied energy demand remains flat or declining
- The grid needs to be maintained to deliver services efficiently, safely and reliably
- The grid needs to support economic growth and the transition to a low-carbon future
- Maximum demand driven investment is expected to be minimal
- Network utilisation will continue to fall, placing ongoing pressure on unit costs
- The age and condition of the network will be an increasing challenge to manage

Priorities

- Create a sustainable network for the long term by seeking to deliver the most cost effective solutions for customers
- Show leadership in favourably influencing the delivered price of energy
- Build trust by undertaking ongoing, genuine engagement with customers, consumer representatives and other stakeholders
- Focus on efficiently prolonging asset life wherever possible and deferring major replacement while maintaining reliability
- Maintain network reliability as safely and efficiently as possible through a risk-based approach
- Retire assets unlikely to be needed in the future only where economic to do so
- Apply accelerated depreciation on a targeted basis where a clear case exists (e.g. assets no longer required due to generation closures)
- Explore more efficient and transparent pricing arrangements to promote clarity and stability
- Manage any major uncertain network developments (e.g. mining loads) as contingent projects within the regulatory framework

2. The ongoing uptake of distributed energy resources by customers is changing the role of the grid

Directions

- Further significant installation of rooftop solar PV capacity is expected, with periods of zero grid level demand expected within two decades
- The impact of energy storage at a customer level is likely to have limited impact on the grid over the planning horizon
- The uptake and impact of electric vehicles by customers is expected to be modest over the planning horizon
- Distributed energy growth rates are uncertain and will be driven by customer preferences, technology costs and policy support
- Forecasting technology uptake is therefore challenging and scenario planning is important to consider a range of possible futures

Priorities

- Actively monitor and respond to trends, developments and expectations to ensure the grid is ready to meet the needs of customers as distributed energy technology is adopted
- Plan for emerging technologies in order to maintain safe, reliable and secure supply under reasonably foreseeable demand and supply conditions

3. The generation mix is changing, creating new challenges for the secure and reliable operation of the grid

Directions

- The withdrawal of conventional generators is placing greater reliance on wind generators and interconnectors
- The operation of the network is becoming more complex and challenging
- The risk and potential consequences of state-wide outages after rare interconnector separation events is increasing
- The transmission network needs to support the integration of globally high levels of renewable generation to help maintain secure and reliable electricity supply

Priorities

- Develop efficient solutions to maintain a secure and reliable network with less conventional generation
- Investigate further interconnection opportunities which enhance benefits to customers by facilitating market competition, and supporting competitive, secure and stable power supplies, and renewable generation exports

4. New technologies are changing the way some network services can be delivered

Directions

- Storage technology is likely to become economic in the medium term at a grid scale, offering a new potential option to efficiently deliver network and ancillary services
- In a flat demand environment, non-network solutions and new technologies such as storage can offer more economic alternatives to traditional network options
- Ongoing advances in information technology and network control systems provides access to a wealth of 'big data' to inform network decision making

Priorities

- Continue to investigate the application of grid scale energy storage and initially gain experience in the deployment and operation of this emerging technology
- Actively pursue cost effective demand side solutions and innovations in the deployment of non-network solutions and new technology
- Adopt best practice data analytics to improve decision making in asset management and network operation

5. Implementing the Network Vision

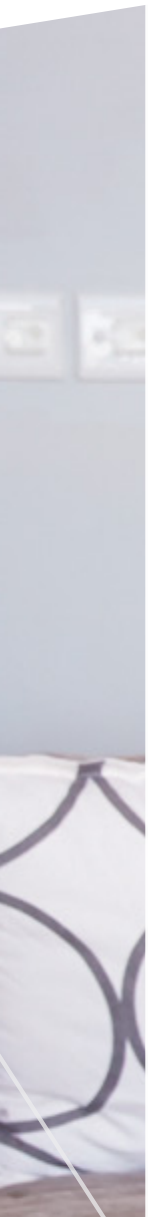
ElectraNet will continue to monitor emerging industry trends and developments and undertake scenario based planning to inform our ongoing decision making, based on the directions and priorities in this Network Vision.

We will also continue to engage with customer representatives and other stakeholders to ensure we understand their experiences, priorities and points of view. We see this as vital to our ability to plan and evolve the transmission network so it delivers greatest value into the future.

If you would like to share your thoughts, feedback or comments on our Network Vision, or feel there's something we need to know about, please contact us:

electranet.com.au
consultation@electranet.com.au
1800 243 853

ElectraNet



Copyright and Disclaimer

The purpose of this document is to provide analysis of change drivers impacting on the South Australian transmission network, what the future might look like over the next 10-20 years, and what the implications are for planning and managing the South Australian transmission network. This document contains certain predictions, estimates and forward looking statements that reflect various assumptions which may or may not prove to be accurate. The document also contains statements about ElectraNet's future plans which may change from time to time.

This document provides general information and is not to be used or relied upon by any party for any other purposes, such as making decisions to invest in further generation, transmission or distribution capacity. Reasonable endeavours have been used to ensure that the information contained in this report is accurate at the time of writing. ElectraNet and its employees, officers, agents and consultants give no warranties and shall have no liability (including liability to any person by reason of negligence or negligent misstatement) for any statements, opinions, information or matter expressed in or implied from this document, except in so far as liability under any statute cannot be excluded.

ElectraNet

ElectraNet

52-55 East Terrace
ADELAIDE

PO Box 7096
Hutt Street Post Office
ADELAIDE SA 5000

T: +61 8 8404 7966
F: +61 8 8404 7104
Toll Free: 1800 243 853
electranet.com.au