



Energy Networks Australia

Guide to Australia's Energy Networks

Fast Facts

**918,000
km**

The Australian electricity network extends about 918,000 km and could circle the equator 23 times

Gas is delivered to customers through more than 96,000 km of gas networks throughout Australia

**>96,000
km**

Energy networks manage more than 11 million electricity customer connections and five million gas connections to Australian homes and businesses

**16
million**

**99.95%
reliability**

Energy networks provide customers with an exceptionally reliable power service, adapting in real time to millions of changing demand and supply signals

About 28,000 energy network employees provide essential frontline and supporting services to customers 24 hours a day, 365 days a year

**28,000
employees**



**6
billion**

Australia's gas infrastructure can store the same amount of energy as **6 billion Powerwall batteries**.

Australia's Energy Networks

What are energy networks?

Australia's energy networks comprise the transmission towers, substations, poles, wires and pipes which supply gas and electricity to almost every household and business in the country.

This vital infrastructure is owned and managed by a mix of private and government-owned organisations which are responsible for the security and reliability of Australia's energy supplies.

The networks of Western Australia and the Northern Territory are isolated from the rest of the country, but even so, the electricity grid on the east coast (which forms the National Electricity Market) is one of the largest interconnected electricity networks in the world.



Evolution of energy networks

The National Electricity Market (NEM) was created following the formal adoption by the Council of Australian Governments of a national competition policy in 1995. Full operation started December 1998.

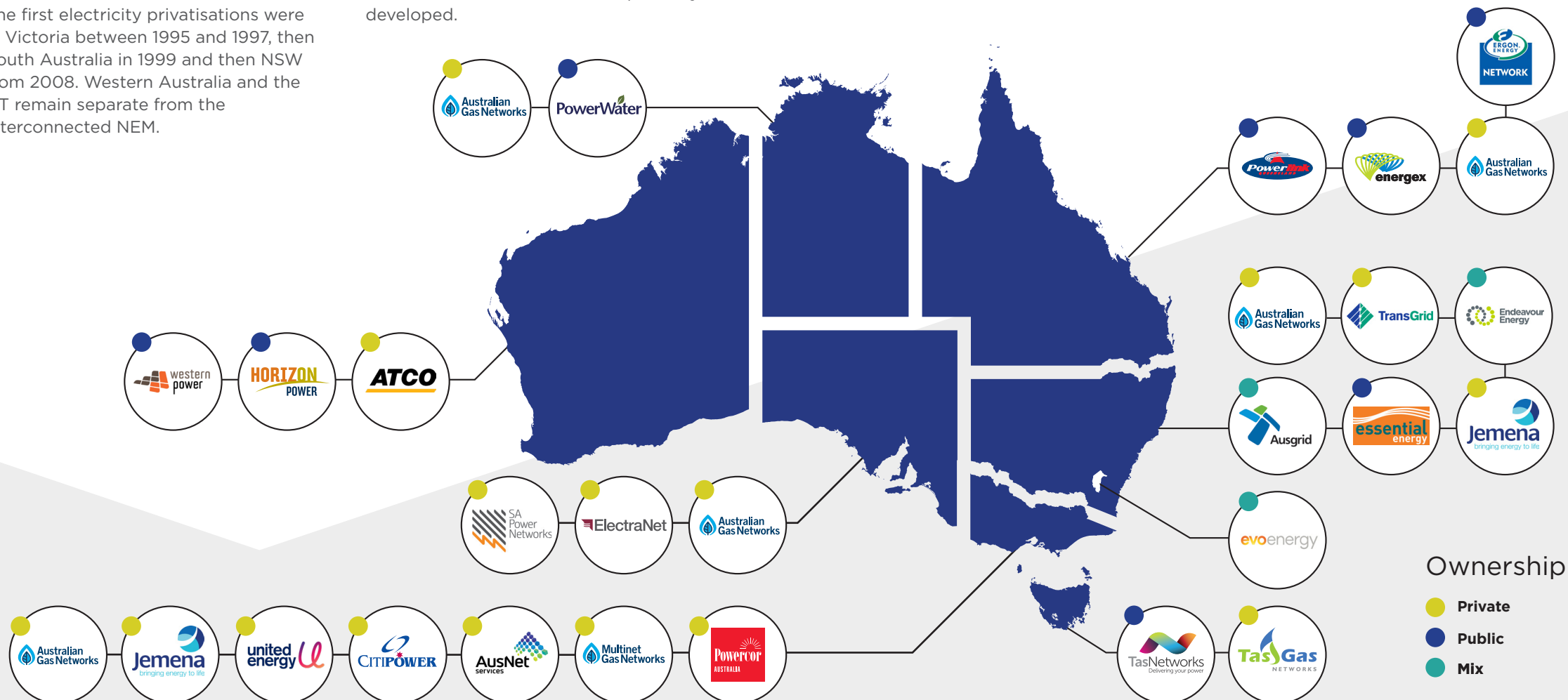
The previously vertically integrated generation, transmission, distribution and retail functions were separated. The generation and retail sectors transitioned to competitive markets and the transmission and distribution businesses became regulated *natural monopolies.

The first electricity privatisations were in Victoria between 1995 and 1997, then South Australia in 1999 and then NSW from 2008. Western Australia and the NT remain separate from the interconnected NEM.

Gas networks have a long history of serving Australians. The origins of gas distribution networks date back some 150 years to the gas distribution networks of the former South Australian and Brisbane Gas companies, and the Gas and Fuel Corporation of Victoria.

Australia's gas distribution networks in South Australia, Victoria, Western Australia and Queensland were privatised by their respective state governments in 1993, 1997, 2000 and 2006.

The main gas networks across NSW, Tasmania and the ACT were all privately developed.



Ownership Structures

- There are 22 electricity and gas network businesses in Australia with a mix of public and private ownership.
- 100 per cent privately owned electricity networks: Victoria, South Australia
- 100 per cent government owned electricity networks: Tasmania, Western Australia, Northern Territory and Queensland
- In NSW, one electricity network is privately owned, two are 50.4 per cent privately owned and one is fully government owned. The Australian Capital Territory's electricity network is a joint public and privately owned entity.
- Australia's gas distribution providers are all privately owned, with the exception of the ACT's, which is half government owned.

* Network businesses are natural monopolies because the scale and nature of the infrastructure precludes competitors from replicating it – it wouldn't make sense for a business to duplicate transmission towers or gas pipes. Electricity transmission and distribution, water and gas pipes generally fall into this category. This is why these businesses are regulated.

Network Regulation

Energy networks are natural monopolies subject to strict economic regulation. In most cases, they are governed by the National Electricity Rules which are made by the Australian Energy Market Commission under the National Electricity Laws. All major Australian gas networks are governed by National Gas Rules.

The revenue most energy networks are allowed to earn (and therefore the prices they charge) is governed by the Australian Energy Regulator and is set every five years. Western Australia has a similar structure regulated by its Economic Regulation Authority.

This is known as incentive-based regulation, because if businesses are able to make efficiencies and reduce costs below their allowed revenue, they can keep the savings for a period of time. Consumers benefit from this, because the regulator then uses the new information gained in one period to set tougher benchmarks and lower allowed revenues for the next. Thus the savings made by the businesses put downward pressure on consumer prices.

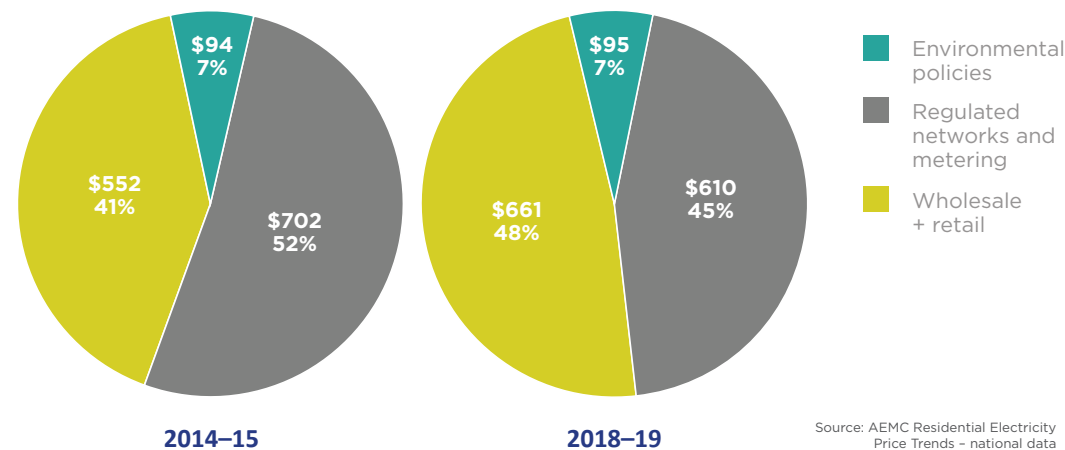
Network Prices

Network prices vary between regions and pay for a vast array of services designed to ensure the safe and reliable supply of energy to households and businesses. The other components of bills are wholesale costs, retail charges and environmental costs.

The services networks provide include maintenance of thousands of kilometres of poles, wires and gas pipes, vegetation management, emergency response, system management to ensure safety, new connections and integration of solar and storage into the grid.

Gas and electricity network prices have been falling across the country since 2015. Average electricity network prices are down more than 13 per cent and gas distribution prices fell 10 per cent between 2015 and 2017 to make up 35 per cent of an average residential gas bill.

National average electricity prices



Electricity Transmission

The interstate transmission network is Australia's electricity superhighway. It is an essential link between power generators and customers, transporting high voltage electricity over long distances.

The transmission network traditionally connected large power generators, such as coal, generally located a long way from where people live and work, to the lower voltage distribution networks in our cities and towns.

Electricity transmission also directly supplies large industrial customers such as mines and paper mills.

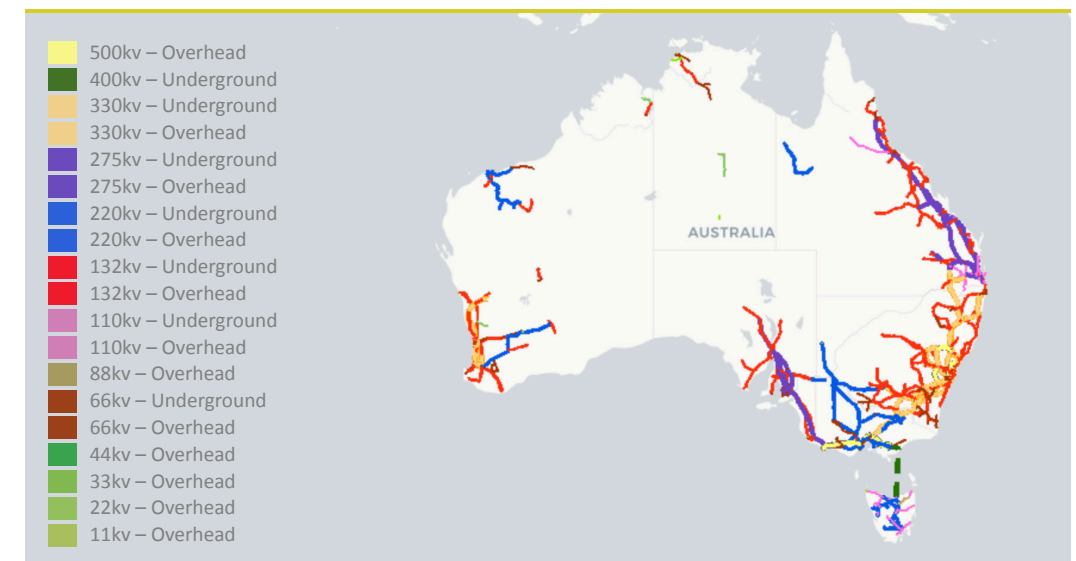
This system has evolved to connect networks between states - Australia's east coast now has the longest interconnected electricity system in the world. This allows the National Electricity Market (NEM) to operate, increasing the stability of our energy system and helping transport the lowest cost generation to customers.

As ageing coal-fired generation is retired, it will increasingly be replaced by wind and solar in different locations. Stronger transmission networks will be needed to move the power around the system locally and interstate.

Increasing the capacity of existing transmission interconnectors or high voltage lines can lead to more customers accessing cheaper and more reliable electricity.

The Australian Energy Market Operator's *Integrated System Plan* advocates a coordinated approach to the development of transmission infrastructure to support lower emissions generation and meet customer demand.

Australia's transmission networks



The Electricity Transformation

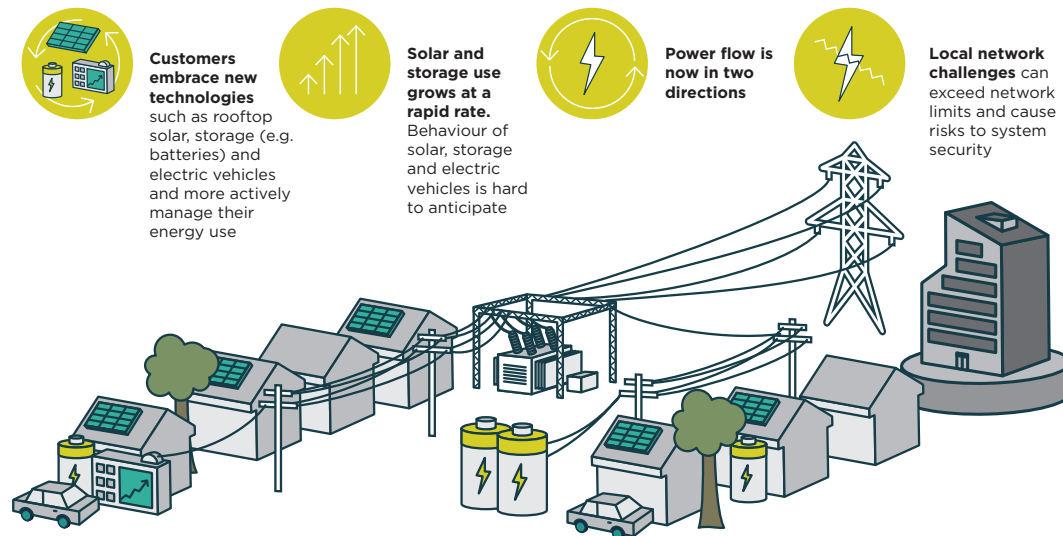
Australia is in the midst of an energy revolution – and it's rapid. What were once networks of poles and wires operating one way electricity supply to a customer are evolving into a two-way system, where consumers can export power to the grid via their own mini generation systems – rooftop solar and, increasingly, batteries.

There has been enormous growth in household solar. In 2008, there were just 14,000 solar PV systems installed on our rooftops. Today, we have more than two million. At a commercial scale, as at the end of 2017, there were more than 50 large-scale wind and solar projects under construction or due to start, representing more than 5,300 MW of new generation.

This rapid technological change poses significant opportunities but also challenges for networks to manage the safe and reliable integration of all these distributed energy resources into the grid.

If properly managed, solar and storage systems can work together as virtual power plants, reducing the need for investment in poles and wires infrastructure, which will ultimately save customers money on power bills. Following the CSIRO/Energy Networks Australia *Electricity Network Transformation Roadmap*, network businesses are developing guidelines and working on significant projects to ensure the opportunities presented by this evolution are maximised.

Changes in the current landscape



Renewable Gas - The Hydrogen Story

Natural gas is widely used as an energy source across the economy – from heating Australian homes to domestic and commercial cooking, transport and industrial processes. It is also an essential input for Australia's manufacturing sector, particularly plastics and fertiliser manufacturing. There are more than five million gas connections to households and businesses across Australia.

As outlined in the Energy Networks Australia report *Gas Vision 2050*, over the long-term gas will have its own decarbonisation journey. Renewable gas, such as biogas and hydrogen, has the potential to become a mainstream and complementary energy solution that will use existing energy infrastructure.

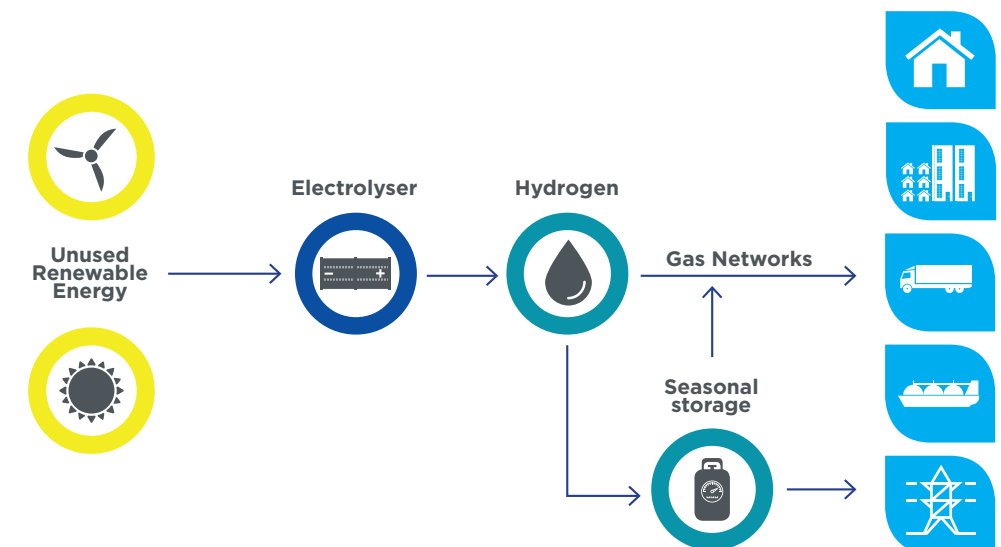
Producing hydrogen from renewable energy does not produce greenhouse gases and is one way of decarbonising the network. Hydrogen can also be produced from natural gas or from coal gasification and, when combined with carbon capture and storage, has the potential to deliver a low cost, low carbon gas.

Hydrogen can be used to complement natural gas in the gas network, providing reserve energy in the same way battery technology does, in a carbon-neutral, secure and cost-effective manner.

Australia's gas pipeline infrastructure is immensely valuable not only as a distributor of energy, but as potential energy storage equal to six billion Tesla PowerWall batteries. Utilising this infrastructure and taking advantage of renewable gas technologies to decarbonise gas offers enormous potential.

Australia's gas businesses are already investing in trialling the role of hydrogen, with pilot projects underway in several states.

Renewable hydrogen pathways



About Us

Energy Networks Australia is the peak national body representing Australia's gas distribution and electricity transmission and distribution companies. Established in its current form in 2004 it has a long history of industry representation, operating under different names over the years to reflect the sector transformation.

With more than 16 million customer connections across the nation, Australia's energy networks provide the final step in the safe, reliable delivery of gas and electricity to virtually every home, business and industry in the country.

Energy Networks Australia Members

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|---|-------------------------------|
| » ATCO Gas Australia Pty | » Evoenergy |
| » Ausgrid | » Horizon Power |
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