



# Q&A: THE SOUTH AUSTRALIAN ENERGY MARKET

Over the past few years, the South Australian market has experienced large increases in wholesale electricity prices. This has impacted on the costs of electricity for South Australian industrial and residential customers, and has raised questions about the state's high levels of renewable energy.

## IS THERE AN ENERGY CRISIS IN SOUTH AUSTRALIA?

Not really - the challenges in South Australia have been coming for a while. In 2015 South Australia saw a sharp increase in baseload wholesale prices compared to other eastern states when the owners of the Northern power station announced in October 2015 that it would close in May 2016. There were further spikes in the price of wholesale electricity, which was the result of several factors:

1. Constraints on the main interconnector between South Australia and Victoria, which has now been upgraded;
2. Periods of very low wind generation;
3. A cold winter increasing demand; and,
4. Severe storms, which damaged transmission and distribution electricity assets and caused state-wide blackouts.

The remaining gas generators in South Australia needed to increase output substantially to meet demand. While they had contracted some gas to generate power, they needed to buy extra gas quickly to ensure adequate supply. They therefore bought gas on the spot market, which is more expensive, and this increased the already higher wholesale prices in South Australia.



## Does the increase in electricity prices have anything to do with renewables?

South Australia is a constrained grid. It can rely on around 25 per cent of its maximum demand from electricity imported from Victoria, and the rest has to be supplied from inside the state.

Over the past decade successive state governments have actively encouraged the uptake and investment of wind and rooftop solar photovoltaic (PV) technologies. Around 32 per cent of South Australian households have solar PV systems, and the state has the highest wind power capacity in Australia. Almost 50 per cent of South Australia's electricity generation is supplied by wind and solar, which is very high by global standards.

The key characteristic of renewable technologies is that they are intermittent in nature. They generate when it is windy and sunny, but they do not have a significant impact on the overall system.

As the levels of renewables increased in South Australia, they began to affect the viability of the existing fleet of thermal (gas and coal) generators. When the wind blew strongly, the wind turbines would generate large amounts of electricity, meaning many of the thermal generators had to turn down or switch off. This reduced greenhouse emissions and it also began to affect the viability of the thermal generators.

Many of the larger and older thermal generators were designed to run all or most of the time. It was expensive and inefficient to turn them on and off to adjust to the increasing levels of intermittent generation from renewables, so they began to close. Playford power station was mothballed in 2012 and its permanent closure was announced in October 2015. Northern power station ceased production in May 2016. The effect of these closures was to reduce supply without any material change in demand. The scarcity resulted in an increase in the baseload wholesale price for electricity.

Northern and Playford were old power stations that were reliant on a declining fuel source, so they may have closed in the near future. However before renewables and other carbon abatement policies, this would have signaled for a new plant to be built to replace them.

## CAN RENEWABLES REPLACE COAL AND GAS?

Intermittent technologies like wind and solar can only partially replace coal and gas. Intermittent technologies are not a like-for-like replacement for dispatchable generators like gas, coal and hydro because:

- **They cannot be guaranteed to turn on at times when they are most needed, like cold snaps and heat waves.** This means a backup or dependable alternate source needs to be found. In the case of South Australia, relying on Victoria for back up may be increasingly risky, when some of Victoria's older brown coal power stations close. The Australian Energy Market Operator (AEMO) is forecasting declining flows into South Australia after 2019 in anticipation of this.

- **Current wind farms and solar are not able to provide power quality services, in particular the ability to manage the frequency of the electricity grid.** It is essential for the safe operation of the grid that voltage and frequency are managed inside prescribed narrow ranges (around the optimum levels of 230 volts, 50 Hz, respectively). To date we have used large thermal generators to do this, but in the future there will be times when there will be very little firm generation available to supply these services.

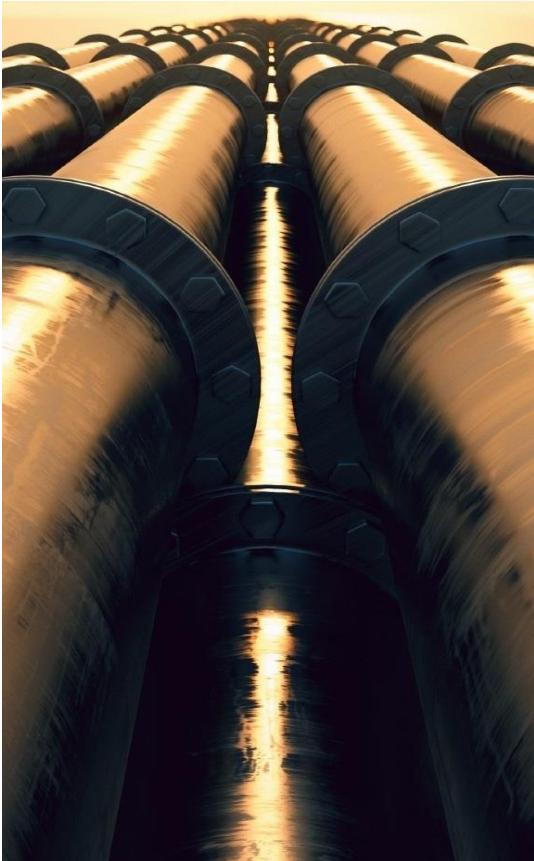
There are a range of solutions to these challenges, which will add additional cost to the operation of the network. Given uncertainties about how supply and demand may evolve in the future, the best value approach is likely to involve using markets to uncover the most efficient solutions.



### Should we stop building renewable energy?

No - renewable energy plays an important part in our energy system now, and will be an important technology to help meet our greenhouse emissions targets.

We will need more renewable energy as we reduce emissions, given that other very low/zero emissions technologies are either currently unapproved (nuclear) or have not been proven up at sufficient scale (fossil fuel plant with carbon capture and storage). The challenges in South Australia are not a renewables problem as much as they are a planning and policy problem.



## Are rising gas prices the main driver of South Australia's higher electricity prices?

Gas prices only partly play a role in the state's higher electricity prices. South Australia is now more reliant on gas, at a time when gas prices are relatively high. This will continue to influence the cost of electricity in South Australia. Baseload wholesale prices increased months before a spike in spot gas prices. Gas will be a contributing factor but is not the only factor.

## DO RENEWABLES LOWER ELECTRICITY PRICES?

Renewables do not lower electricity prices. Electricity is a commodity market where supply and demand has to continually match. It is a complex process that has been improved by the creation of a National Electricity Market (NEM) in the 1990s. Broadly, there are two markets for electricity and two prices – the spot price and the contract price:

- Electricity cannot be stored, so the NEM trades continuously as a 'spot' market. Prices can fluctuate within a day, season and year; the primary effect of these price fluctuations is to signal the need for more or less generation, both in the short run, by switching existing plant on and off, and in the longer term, by signalling the need for new investment or exit of existing plant.
- Due to the market's fluctuating prices, around 80 per cent of electricity is bought and sold in futures contracts, mostly by large electricity users (industrial customers, retailers) buying from generators. This helps both generators and retailers to manage the risk of fluctuating wholesale prices, which in turn, is cheaper for the customer.

In practice, only firm generation plant (conventional power stations including hydro) can sell electricity futures. An intermittent generator cannot safely sell futures contracts because it does not know if it will be generating at a time when power prices are high.

In South Australia the contract price increased with the closure of baseload capacity in the state, which accounts for most of the cost of electricity. Periods of high wind and/or sunshine can lower the spot price in the state, while still evenings tends to see the price increase. If retailers and large electricity users have contracted out their expected loads, then the spot price functions as a balancing mechanism, so any savings have only a marginal effect on the overall cost, which is primarily driven by contract prices.



## IS THERE A SOLUTION?

The challenges in South Australia reflect the challenges we face across Australia. With the exception of Western Australia and the Northern Territory, Australia operates a national electricity market, and decisions made in one state often impact on others.

As we continue to reduce the greenhouse emissions of the system, we will be using more low and zero emissions technologies, and operating the system differently to the way we have operated in the past. This requires clear thinking and careful planning to ensure the transition occurs at the lowest cost and with continued high reliability.

The past and future challenges in South Australia could have been avoided or minimised with better planning and a national approach to energy and climate policy. For example, in the short term, it may have been useful to find a way to keep the Northern Power station on line until the interconnector upgrade was completed and the winter peak was over. While in the longer term, a continuing moratorium on new gas fields in the Gippsland Basin and the closure of some brown coal power stations could exacerbate already challenging conditions in places like South Australia. Renewable energy is not enough on their own, or without careful planning and co-ordination at the national level.