

MYTHBUSTING: ELECTRICITY PRICES IN SOUTH AUSTRALIA



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Mythbusting: Electricity prices in South Australia.



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Key Findings

1 South Australia is a global leader in renewable energy and is much further ahead than the other states in reducing emissions to tackle climate change.

- › The state is on track to reach its target of 50% renewable electricity by 2025.
- › The state's transition away from fossil fuels, particularly coal, is consistent with action needed to avoid catastrophic climate change and ensure the survival of the Great Barrier Reef.

2 Recent short-term increases in South Australia's wholesale power prices have been driven primarily by a reliance on expensive gas for power and a lack of competition amongst power generators.

- › Average electricity prices have been historically higher in South Australia due to the state's more expensive fossil fuel options and lower electricity market competition.
- › Recent events, including very cold weather, work on the interconnector that restricted supply from Victoria and gas prices at almost four times the usual level, put the two main electricity generators in South Australia in an extraordinarily powerful position to increase prices.
- › Without South Australia's high level of renewables, the state's reliance on expensive gas would be even greater.
- › Queensland (with less than 5% renewable electricity) has until recently experienced similarly high prices to South Australia (with more than 40% renewable electricity).
- › In the past year in particular, all eastern states have experienced similar short-term price patterns over many months, even though New South Wales, Victoria and Queensland generation is overwhelmingly coal based. This is further evidence that the cause of price rises is due to a range of industry factors rather than renewable energy.

3 Renewable energy has dramatically reduced electricity price spikes in South Australia.

- › Electricity price spikes (periods where prices exceeded \$5,000/MWh) have fallen significantly across the National Electricity Market as the proportion of renewable energy has increased but especially in South Australia.
- › For comparison, in 2008, South Australia experienced more than 50 price peaks compared to one price peak in 2015.

4 The key to reducing electricity prices in South Australia is reducing the state's reliance on expensive gas through increased competition and a smarter, more connected electricity grid.

- › Improved competition in the electricity market could be achieved by reducing the time intervals set for spot price (wholesale electricity price for a given time period) settlements from half-hour blocks to five-minute blocks.
- › Developing alternative reserve capacity such as large-scale and distributed energy storage would reduce exposure to short-term price exploitation when wind and solar supply are low.
- › Increased interconnection with the eastern states would expand supply options and increase competition with South Australian gas fuelled power plants.
- › AEMO and ElectraNet (2016) have been jointly working together to plan for and accommodate and manage higher levels of wind and solar PV in South Australia.

Introduction

In recent months, there have been a number of inaccurate media stories linking high electricity prices in South Australia with the state's high proportion of wind and solar generation (For example, Australian Financial Review 2016; The Advertiser 2016a; The Australian 2016).

While the complexities and technical aspects of the electricity system can be difficult to fully understand (even for those in the sector!), we hope this explainer provides some clear answers on what is happening with electricity prices in South Australia and why other factors such as high gas prices, limited connection with the eastern states and lack of competition in South Australia's electricity market are primarily to blame.

This explainer provides some clear answers on what is happening with electricity prices in South Australia.

1. South Australia's Renewable Energy Success Story

After a decade of consistent state policy support and increasing renewable energy targets, South Australia has transitioned its electricity system from one almost entirely reliant on coal and gas to one where more than 40% of its power is produced from the wind and sun (Clean Energy Council 2016).

Through its consistent support for renewable energy over a decade, South Australia has attracted around \$7 billion dollars in investment, with nearly half flowing to regional areas (Clean Energy Council 2016). In 2015, the renewable energy industry provided nearly 1,000 direct full-time jobs in South Australia (ABS 2016).

South Australia's support for renewable energy is attracting new, innovative industries to establish within the state, such as:

- › Redflow, an Australian-designed battery storage company competing with the likes of Tesla. The company has established a battery testing laboratory in Adelaide, employing about 50 workers (The Advertiser 2016b).
- › Sundrop Farms located outside of Port Augusta and growing 10,000 tonnes of truss-tomatoes annually for Coles supermarkets. Sundrop Farm's Tomatoes are grown using solar thermal power used to heat the greenhouses and to produce fresh water (from desalinated sea water). The company employs nearly 200 people (The Advertiser 2015).

South Australia is now regarded as a leader in renewable energy, both internationally and among Australian states.

South Australia actually ranks second in the world (after Iowa, United States) for per capita wind and solar capacity. South Australia's wind and solar capacity per person is higher than many jurisdictions famous for their renewable energy like Denmark, Germany and Texas in the United States (Australian Energy Council 2016).

Per capita wind and solar capacity

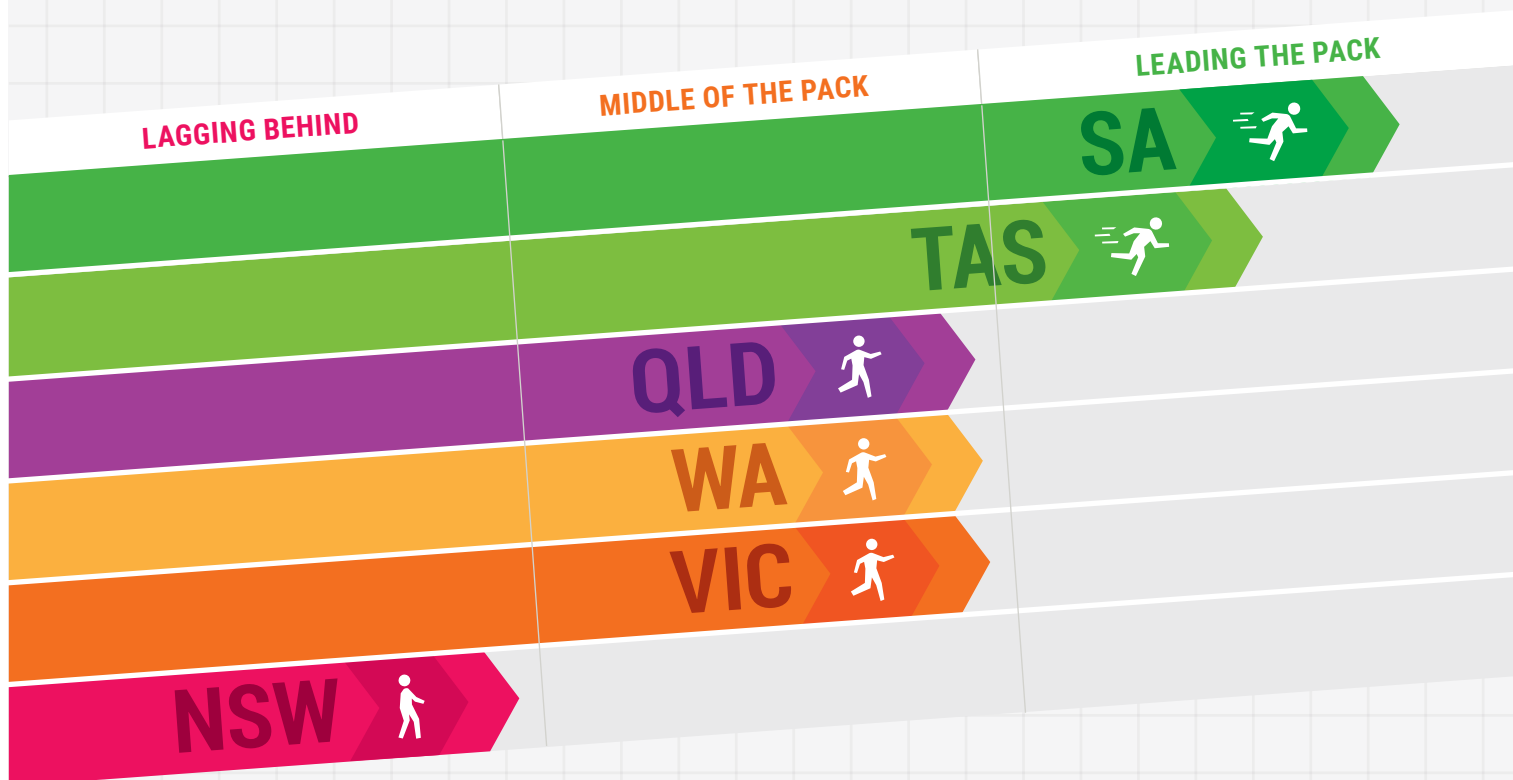
- › Iowa - 1.83 kW (#1)
- › South Australia - 1.24 kW (#2)
- › Denmark - 0.97 kW
- › Germany - 0.95 kW
- › Texas - 0.53 kW

Source: Australian Energy Council 2016.

In Australia, South Australia leads the other states on renewable energy policy and performance across a range of measures (Climate Council 2016; Figure 1).

THE AUSTRALIAN RENEWABLE ENERGY RACE:

2016 SCORE CARD



State	NSW	VIC	WA	QLD	TAS	SA
Overall Score	D	C	C	C	B	A
Renewable Electricity	6%	10%	13%	7%	95%	40%
Large-scale Renewables (excl hydro) Per Capita (kW/cap)	0.14	0.23	0.23	0.24	0.62	0.88
Households with Solar PV	14.1%	14.2%	22.5%	29.6%	12.1%	28.8%
Renewable Electricity Targets	-	At least 20% by 2020	-	50% by 2030	-	50% by 2025

Figure 1: South Australia leads the other states on renewable energy. Source: Climate Council 2016.

2. Action on Climate Change Requires a Transition from Fossil Fuels to Renewable Energy

South Australia plans to continue to increase its share of renewable energy to reach 50% of its electricity supply by 2025 (for example, Figure 2).

The renewable target is a step towards the state's longer term goal to achieve net zero emissions by 2050 (Government of South Australia 2016a). Greenhouse gas emissions per unit of electricity from South Australia's electricity supply have been steadily declining and are now 26% lower than other mainland states (Australian Government 2015; Table 1).

Table 1: Mainland states' emissions intensity of electricity supply.

State	Emissions factor kg CO ₂ -e-/kWh
New South Wales	0.84
Victoria	1.12
Queensland	0.79
Western Australia	0.76
South Australia	0.56

Source: Australian Government 2015.



Figure 2: Wind farm near Millicent, South Australia.

The path that South Australia has set out is not arbitrary, but is consistent with action needed to avoid catastrophic climate change.

At the recent Paris Climate Conference, world leaders committed to work together to tackle climate change. The Paris Agreement is a universal agreement involving over 190 countries around the world (including Australia) to limit temperature increase to well below 2°C above pre-industrial levels.

With almost 1°C of warming in Australia we have already witnessed adverse consequences. The incidence of extreme temperatures has increased markedly over the last 50 years, while heatwaves have become hotter, are lasting longer and occur more often (CSIRO and BoM 2015). Climate

change – driven mainly by the burning of coal, oil and gas – has caused extreme ocean temperatures, making the devastating bleaching event on the Great Barrier Reef this year at least 175 times more likely (CoECSS 2016). Australia has a critical role to play in the global effort to reduce fossil fuel emissions and protect significant natural places like the Great Barrier Reef.

Research indicates that for Australia to achieve emission reductions consistent with limiting global temperature rise below 2°C, Australia needs to source a minimum of 50% of its power from renewable sources by 2030 and source all power from zero or extremely low emissions sources by 2050 (ClimateWorks 2014).

3. So Why are South Australian Electricity Prices Currently Higher than Other States?

Recently, a number of media reports have linked high wholesale electricity prices (average and spot prices) in South Australia with the state's high proportion of renewables. The spot price is the price of electricity on the wholesale market for a given time-period, in the National Electricity Market spot prices are set for each half hourly interval (EEX 2016).

Electricity generated by coal, gas, and renewable power stations is sold into the wholesale electricity spot market (in intervals of 30 minutes). Prices for electricity on the spot market can be extremely volatile depending on:

- › supply and demand (prices are higher when demand for electricity approaches available supply)
- › type of demand (whether consistent or "peaky") - South Australia has the "peakiest" demand in the National Electricity Market due to high airconditioner loads in summer and winter)
- › generator shut downs (can be planned for maintenance or unplanned)
- › fuel commodity prices
- › competitive bidding behavior of "gentailers" (companies operating both electricity generation and retail businesses), their retail market and wholesale hedging positions
- › weather (EEX 2016).



Figure 3: Solar rooftops in Melrose, South Australia.

High spot prices in the wholesale electricity market can impact directly on large commercial and industrial users if they haven't got a contract in place. Large electricity users can reduce the risk of being exposed to short-term price spikes by negotiating forward contracts for electricity.

Average prices for wholesale electricity are calculated by averaging the spot prices over longer timeframe, such as a year.

Households and small businesses are less exposed to wholesale electricity price fluctuations as they usually have longer-term contracts in place with electricity retailers and as wholesale electricity prices make up less than half of the retail price (network costs such as poles and wires make up about half of the retail price) (AEMC 2015).

Households and small-businesses are installing solar panels to reduce their electricity costs. South Australia (together with Queensland) leads the nation in the take-up of rooftop solar with panels on nearly 30% of households. In March 2016, nearly 200,000 solar systems had been installed in South Australia (Australian PV Institute 2016; Clean Energy Regulator 2016; Figure 3).

4. Average Prices

Over decades, South Australia's wholesale electricity prices have been consistently higher than the other states, and are not driven by increasing penetration of wind and solar:

- › Historically South Australia's higher prices were due to its reliance on gas, low quality coal and lack of competition between electricity generators. This continues to be the case.
- › Currently, South Australia's higher prices are due to reliance on much more expensive gas (with prices driven by international gas prices and lack of domestic market competition) and the lack of competition between gas fuelled power stations (which are controlled by AGL and Origin) (Saddler and Campbell 2016).

While electricity prices have been consistently higher in South Australia, this is unrelated to South Australia's increasing proportion of wind generation:

- › All states have experienced similar price movements over time regardless of their share of renewable energy (New South Wales (7.7% renewable electricity in 2015), Queensland (4.4% in 2015) and Victoria (12.1% in 2015) (Clean Energy Council 2016; Saddler and Campbell 2016).
- › Current average electricity prices in South Australia are lower than they were in 2013 and in 2008 when the state's share of wind and solar in the electricity supply was lower.
- › Over the last few years until recent events in South Australia, Queensland (with less than 5% renewable electricity) has experienced similarly high prices to South Australia (with more than 40% renewable electricity). However high Queensland prices have received less media attention.
- › All states have seen average prices in the past 12 months at levels around those that existed when the carbon tax was in place (Saddler and Campbell 2016; Figure 4).

Average electricity prices have been historically higher in South Australia compared to the other states due to its reliance on gas and lack of competition among the gentailers.

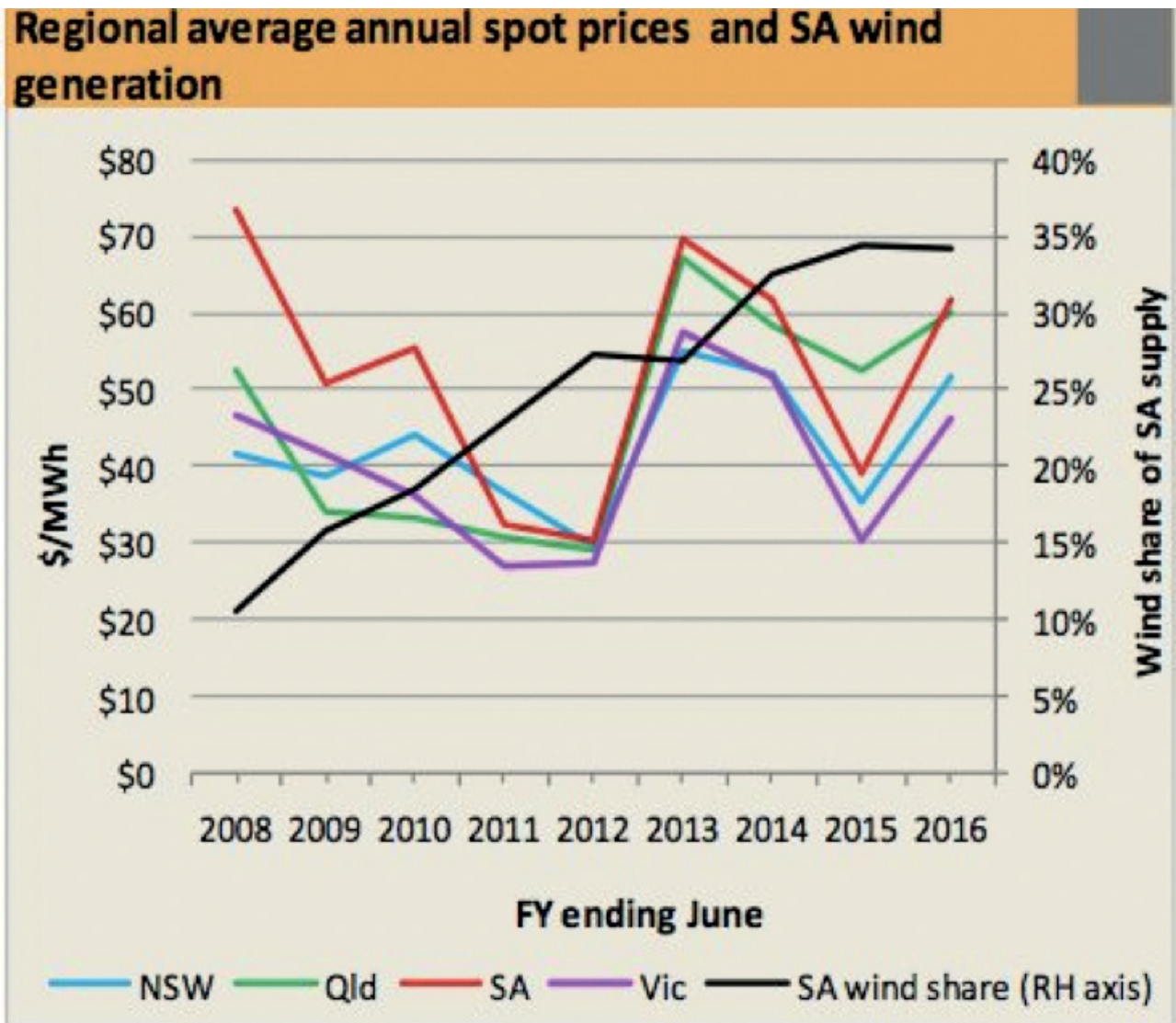


Figure 4: Average annual spot prices for states and South Australian wind generation over time ("pitt&sherry Figure").

Queensland (with less than 5% renewable electricity) has experienced similarly high prices to South Australia (with more than 40% renewable electricity) in recent times.

5. Spot Prices and Price Spikes

Spikes in wholesale electricity prices occur from time to time across Australia. High prices are often caused by a combination of high demand, supply constraints and lack of competition between the large energy gentailers.

While the media coverage has intensified in recent times, the actual number of electricity price spikes (where prices exceeded \$5,000/MWh) have fallen significantly across Queensland, Victoria, New South Wales and Tasmania as the proportion of renewable energy has increased, this is particularly the case in South Australia (Figure 5; RenewEconomy 2016).

Electricity price spikes in South Australia have dramatically decreased as the state's share of renewables has increased over the years, until the recent market dynamics. For comparison, in 2008, South Australia experienced more than 50 price peaks compared to one price peak in 2015 (RenewEconomy 2016).

In the past year in particular, all eastern states have experienced similar short-term price spike patterns over many months, even though New South Wales, Victoria and Queensland generation is overwhelmingly coal based and there is ample surplus capacity. In a competitive market, such behaviour is most unusual.

Electricity price spikes in South Australia have dramatically decreased as the state's share of renewables has increased.

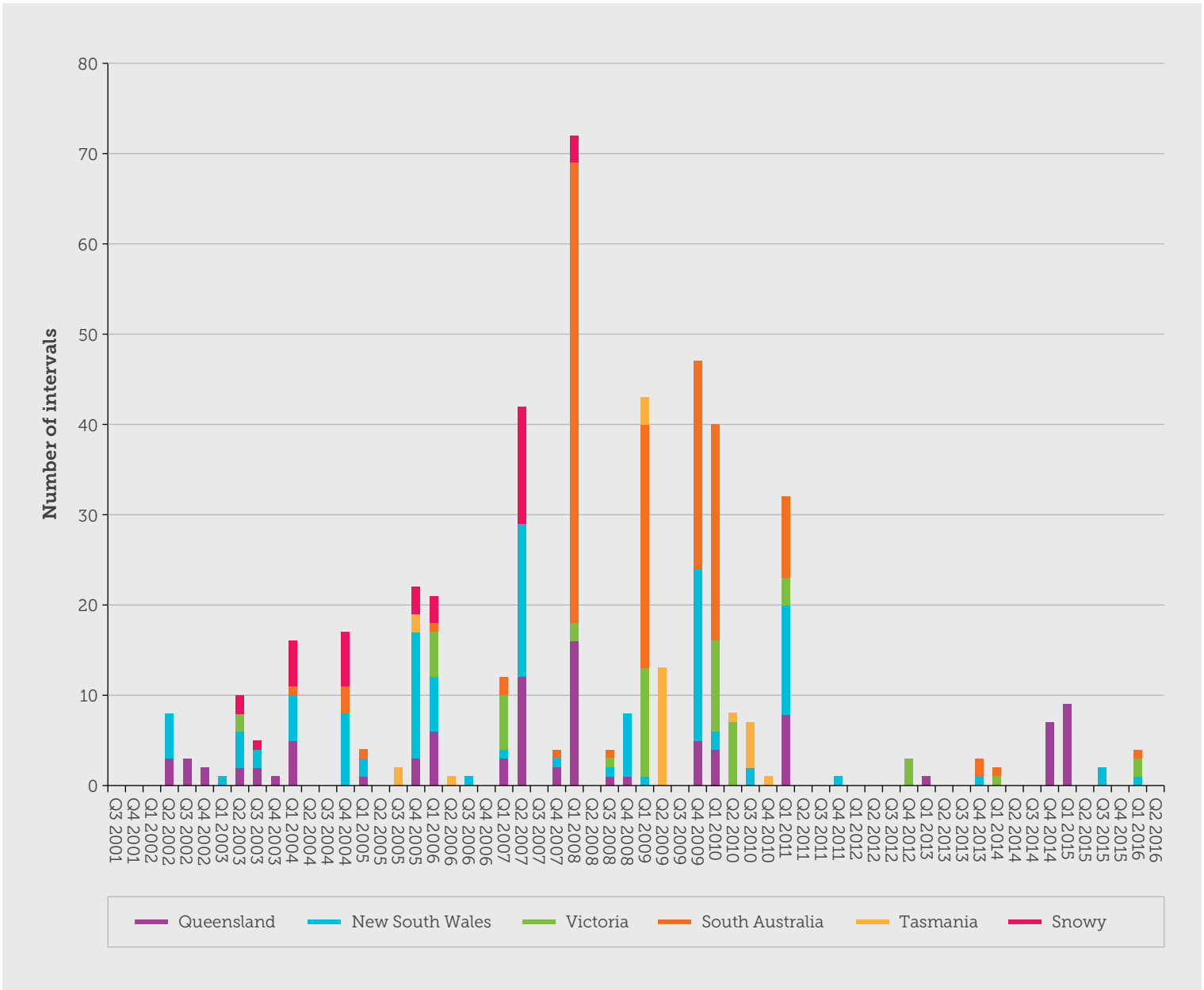


Figure 5: Number of high price events. Source: Adapted from AER; AEMO, Last updated: 15 Jul 2016 - 4:15 pm.

6. What Happened the Week of July 11-15?

A number of recent media reports have focused in on increased prices in South Australia.

The recent high prices were due to:

- › A cold week with wild weather, increasing electricity and gas demand for heating
- › Maintenance on the interconnector which restricted its capacity and thus supply from other states
- › Gas prices at almost four times the usual level. While wind and solar provided a large part of South Australia's power during this period, the restricted capacity of the interconnector meant the state was more reliant than usual on gas to meet the remaining demand (Clean Energy Council 2016).

This combination of events put the gentailers in the state in an extraordinarily powerful position to increase prices.

Media outlets have blamed the rise in electricity cost on renewables, but without South Australia's high level of renewables the state's reliance on expensive gas (such as from Torrens Island Gas Plant, Figure 6) and resultant costs would be even greater.



Figure 6: Torrens Island Gas Plant.

7. Will More Renewable Energy Pose a Problem for South Australia?

The Australian Energy Market Operator is responsible for ensuring secure electricity supply in Australia, with adequate supply to meet demand.

A joint study by AEMO and ElectraNet (South Australia's electricity network operator) on the South Australian situation found:

"South Australia (SA) has some of the highest levels of wind and solar (rooftop photovoltaic (PV)) generation relative to electricity demand of any region in the world, and this is expected to continue to grow in the future."

"under normal operating conditions, the South Australian power system can continue to operate securely and reliably."

"AEMO has not identified any system security challenges that cannot be managed through existing processes and procedures"

AEMO and ElectraNet (2016) have been jointly working together to plan for and accommodate and manage higher levels of wind and solar PV in South Australia.

8. What are Some Ways for South Australia to Reduce Electricity Prices and Avoid Price Spikes in the Future?

The key to reducing electricity prices in South Australia is to reduce the state's reliance on expensive gas and to increase competition.

Options include:

- › Increased interconnection with the eastern states such as the feasibility study flagged by the South Australian Government in its recent budget (Government of South Australia 2016b) to expand supply options and increase competition
- › Improving competition in the electricity market by reducing the time intervals set for spot price settlements from half-hour blocks to five-minute blocks (Saddler and Campbell 2016)
- › Developing alternative reserve capacity (for periods when wind and solar generation is below demand) such as large-scale and distributed energy storage.

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