AER electricity wholesale performance monitoring

NSW electricity market advice

December 2017

AUSTRALIAN ENERGY REGULATOR

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Executive Summary

Average wholesale electricity prices in NSW through 2017 have been significantly higher than historic levels. While high prices in the National Electricity Market (NEM) are not unprecedented, the price outcomes experienced in NSW are different to those witnessed previously. Historically we have typically seen high average prices that are driven by a limited number of extreme price events. The high average prices we have observed in NSW beyond the summer period have been sustained and have not been driven by extreme price events.

In this environment, the Minister for Environment and Energy requested that the AER monitor the NSW wholesale market for features or generator behaviours that may be detrimental to effective competition and provide advice to the Council of Australian Governments (COAG) Energy Council on any factors affecting the efficient functioning of the NSW market by November 2017. The Minister highlighted that the Australian Government is keen to ensure that where high wholesale prices do occur, they are justified by legitimate market circumstances and are not a result of inappropriate exercise of market power.

The AER's analysis shows that the higher prices reflect a shift in the offer behaviour of NSW generators since October 2016. This involves a 'step change' whereby generation capacity that was being offered at lower prices ($0-50/MWh) is now being offered at higher prices ($50-150/MWh). This change in offer behaviour has been sustained - it has been an enduring feature of the NSW market since October 2016.

We have identified a number of contributing factors to this change in generator offer behaviour.

Fuel issues

NSW generators' coal costs have increased. Coal prices have risen in recent times, which has particularly affected the costs of generators who are purchasing coal under short-term contracts.

In addition to increases in the price of coal, all NSW coal fired generators have had, or are continuing to have, problems with coal supply. Transport issues and delivery shortfalls in particular have affected coal supply.

The issues with coal supply contributed to falling coal stockpiles. Generators appear to be managing the risk that they would not have sufficient coal to generate over the summer period.

At the same time, the increase in gas prices is affecting the costs of the three NSW gas fired generators.

These market circumstances explain, at least in part, the higher offer prices we have observed in NSW.

Other factors

There are, however, a range of other issues that may be affecting the competitiveness of the NSW market.

Five large generators dominate the market in NSW. Markets with a limited number of large players are likely to be less competitive than markets with more competitors. While we have not seen the sorts of opportunistic bidding we would traditionally associate with the exercise of market power in electricity markets (such as rebidding capacity into extreme high prices), there does appear to be reduced competitive constraints on the major participants in NSW at present.

The closure of Hazelwood power station is having an impact. Interconnector flows into NSW from Victoria have decreased, lessening the ability of imports from Victoria's cheaper brown coal generation to act as a constraint on generators in NSW. While there have been more imports to NSW from Queensland, it is not clear whether these imports provide the same competitive constraint on the offers of coal generators in NSW as the cheaper cost brown coal generators in Victoria.

The increase in gas prices has also affected the ability of gas plant to act as a constraint on the pricing of coal plant in NSW. In any event, common ownership of coal and gas generation in NSW may affect the ability of gas plant to act as a constraint on coal generation in NSW.

In the case of hydro plant, Snowy Hydro in 2017 has adjusted its offers to ensure sufficient supply is available for the summer peak. This means that it has not been a constraint on NSW coal generators' offers, outside of peak periods.

Assessing the effectiveness of competition

Some of the issues that have contributed to the recent high generator offers in NSW are showing signs of improvement. Notably, concerns over coal supply appear to be easing, which may explain why some generators have recently adjusted their offers into lower prices.

However, our review has identified a number of factors that need to be considered over a longer period to make an informed assessment of the effectiveness of competition in the NSW market. Market structure, the extent of barriers to entry, the role of interconnection with adjoining regions and the constraints on generators provided by gas and hydro plant are all issues that have the potential to affect the ongoing efficient and competitive operation of the NSW wholesale electricity market. Analysis of these factors over a longer period is required to reach any definitive conclusions about the effectiveness of competition in the NSW wholesale market.

The AER was given a new role to report into the effectiveness of wholesale market competition in the NEM, with our first report due in December 2018. In this report, we will provide the COAG Energy Council with updated analysis of the NSW market, including in relation to these longer term issues and generator offer behaviour. We will provide advice earlier if our monitoring suggests a problem.

1 Background

1.1 The request

On 8 September 2017, the Federal Minister for Environment and Energy requested the AER monitor the NSW electricity market for features or behaviours that may be detrimental to effective competition (attachment A). The Minister requested that the AER provide advice to the COAG Energy Council on any factors affecting the efficient functioning of the market by November 2017.

The Minister highlighted that the Australian Government is keen to ensure that where high wholesale prices do occur, they are justified by legitimate market circumstances and not a result of inappropriate exercise of market power.

The request followed reports in *The Australian* that NSW coal-fired generators had pushed up electricity prices through aggressive and opportunistic pricing and that this was adding around $30–35/MWh to spot prices.[1] The article was based on a report by Schneider Electric.

1.2 The AER's roles

The AER has a range of market monitoring functions under the National Electricity Law and Rules. Following amendments to the Law in December 2016, the AER is required to monitor the wholesale market on a regular and systematic basis and report on its performance. In particular, we are required to identify and analyse whether:

- there is 'effective competition' within the wholesale market or there are features of the market that may be detrimental to effective competition
- there are features of the market that may compromise the efficient functioning of the market.

We are required to publish reports at least every two years (first report due December 2018). The Rules give us the discretion to provide advice to the COAG Energy Council on the performance of the wholesale electricity market as issues arise.

This builds on our existing roles of monitoring compliance and reporting on high price events.

1.3 Our approach

Given the short timeframe to report our findings to the COAG Energy Council, we have focused on identifying and explaining the factors that have led to high prices in the NSW in 2017.

An assessment of whether the market is effectively competitive or functioning efficiently requires a longer term assessment considering a range of data analysis, performance

[1] The Australian - 29 Aug 2017, "AGL, Origin bidding up power spot price, says Schneider", The Australian - 10 Sep 2017 " Frydenberg push for power generation cost probe"

measures and information. We have included some limited analysis of structural features of the market that could impede competition. We will examine these factors more closely in 2018 as part of our broader performance monitoring functions.

We have examined publicly available information on prices, supply and demand conditions, interconnector flows, generator market shares and offer behaviour in NSW.

Our analysis of offer behaviour focused on the major NSW coal, gas and hydro generators. We requested information from these generators to better understand the context in which these businesses operate. We examined their operating costs, access to fuel and the impact of measures in preparation for the summer 2017–18.

While we have powers to acquire non-public information under the Electricity Law, given the condensed nature of the review we requested information from these generators on a voluntary basis. All participants cooperated.

Participants provided key data and information on the operation of their power stations as well as internal supporting documents (such as Board or Risk Committee papers regarding changes in operating costs and/or bidding strategies). This material was provided confidentially and includes highly sensitive market information.

1.4 Structure of this report

This report sets out our findings and forms our advice to the COAG Energy Council. It is structured as follows:

- Chapter 2 provides an overview of the NSW region, highlighting the fuel mix, interconnection, the number and size of participants and investment conditions.
- Chapter 3 summarises market outcomes in NSW.
- Chapter 4 provides an overview of the changes in generators' offers and the reasons for those changes.
- Chapter 5 sets out our findings.

2 Market overview—NSW

The NEM is the wholesale electricity market covering eastern and southern Australia (box 2.1). The NEM connects five regions - Queensland, NSW, Victoria, South Australia and Tasmania - via high voltage transmission links. NSW is dominated by black coal generation. Five large participants control the majority of generation capacity.

Box 2.1 NEM market design

The NEM is a wholesale spot market into which generators sell electricity. The Australian Energy Market Operator (AEMO) schedules the generators with the lowest generator offers to meet demand every five minutes. The cheapest bids are selected first, and then progressively more expensive bids until enough electricity can be dispatched to meet demand every five minutes.

Participants are free to offer their capacity at any level within the price floor (-$1000/MWh) and the price cap ($14 200/MWh). There is no requirement that participants' offers reflect their costs and participants will take into account a range of factors when offering capacity including costs, contract obligations they may have with retailers or their own retail load.

The highest priced offer needed to meet demand sets the price every 5 minutes (dispatch price). The settlement price (spot price) paid to generators is the average of the dispatch prices over 30 minutes for each region in the NEM. All successfully dispatched bidders are paid at this price regardless of the price at which they offered capacity. Generally participants have some control over the level they are dispatched by adjusting their offers or withdrawing capacity from the market.

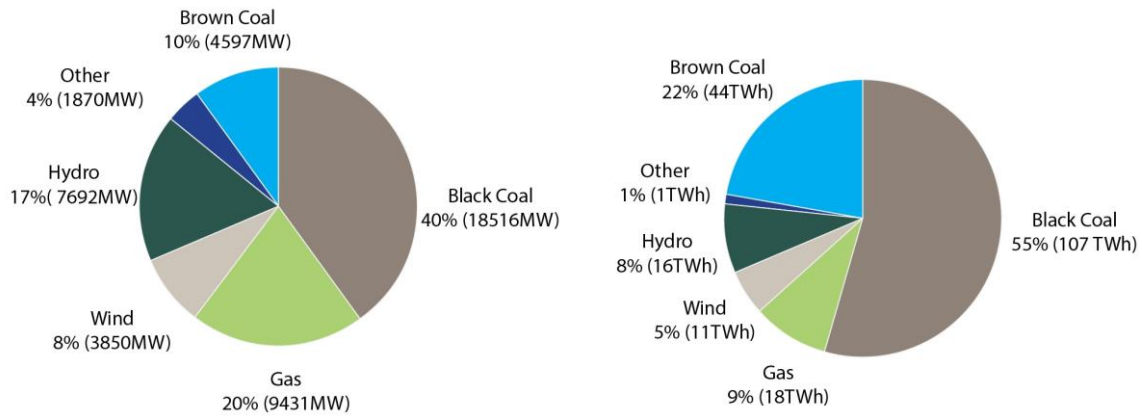
The NEM is an 'energy only' market in that generators are only paid for the energy they produce. The market design allows prices to increase or decrease in response to supply and demand conditions. High prices provide a market signal for new investment. Vice versa, if demand decreases relative to supply, this will put downward pressure on prices which in turn should prompt high cost generators to exit the market.

This differs from 'capacity' markets, such as the Western Australian market, where participants are paid both for the energy they produce and the capacity they provide to the market. Unlike the NEM, capacity markets often require participants to bid physical output into the market at the cost of production, while separate capacity payments are designed to support new investment.

2.1 Coal the dominant fuel source

Coal fired generation is the dominant supply technology across the NEM (Figure 2.1). Black and brown coal account for around 50 per cent of registered capacity in the NEM and 77 per cent of output in 2016–17.

Figure 2.1 Generator capacity and output in the NEM, by fuel source



Notes: Figures are for generators that are registered with AEMO. Capacity shares are based on summer ratings as reported to AEMO. The brown coal capacity figure is adjusted to account for the closure of the Hazelwood power station in March 2017. The brown coal output figures include the output of the Hazelwood power station until it closed in March 2017. Shares may not add to 100 due to rounding.

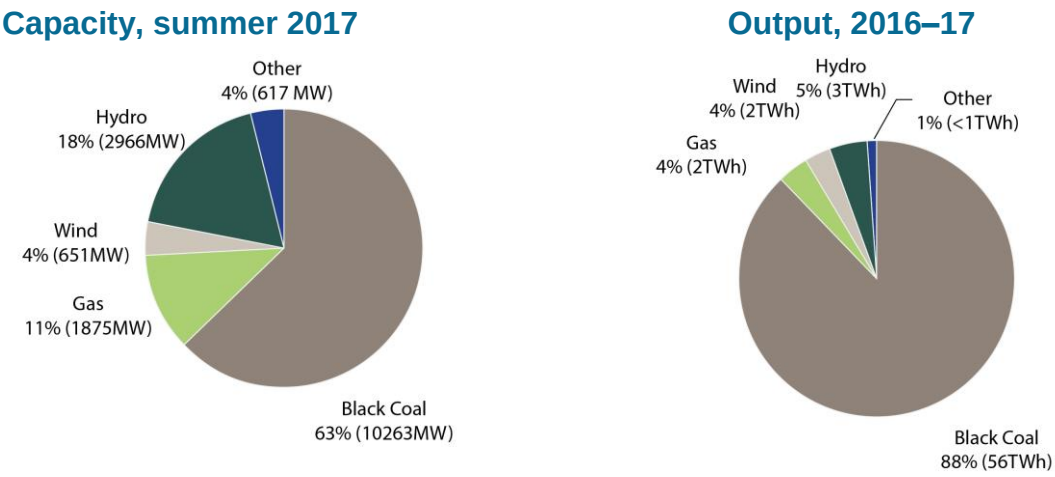
Source: AEMO; AER

Coal generation is even more significant in NSW. There are five black coal power stations with a combined capacity of around 10 260 MW or 63 per cent of installed summer capacity (Figure 2.2). The combined output of these stations in 2016–17 was 56 TWh or around 88 per cent of total generation in NSW.

Hydro and gas generation also have a significant presence in NSW, accounting for 18 per cent and 11 per cent of installed capacity respectively. The combined output of the hydro and gas generators was around 9 per cent of total output in 2016–17. Typically, hydro and gas generators have lower output than coal generators of the same size. This is because hydro output is limited by water availability and gas has a higher fuel cost than coal, meaning that hydro and gas plant do not run as often as coal plant.

Wind and solar have progressively increased their presence in the NEM in recent years, but remain a small proportion of the market in NSW.

Figure 2.2 Generator capacity and output in NSW, by fuel source



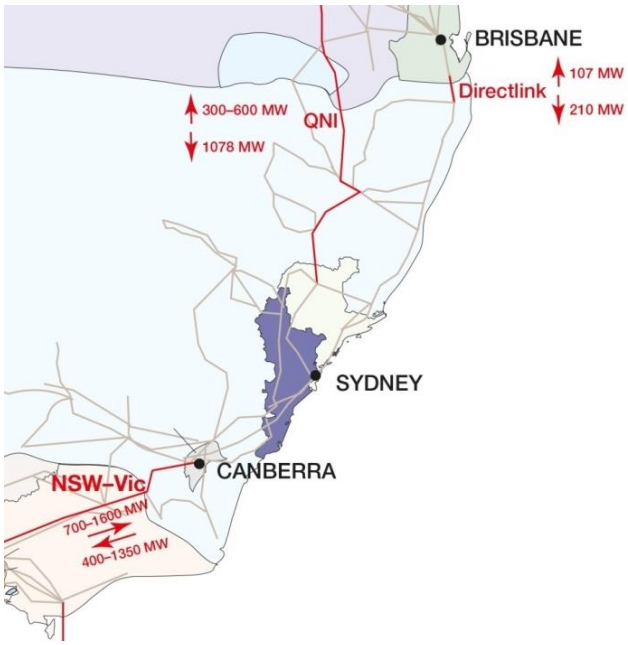
Notes: Figures are for generators that are registered with AEMO. Capacity shares are based on summer ratings as reported to AEMO. Shares may not add to 100 due to rounding.

Source: AEMO; AER

2.2 Interconnection with neighbouring regions

The NSW region is connected to Victoria and Queensland by three transmission interconnectors (Figure 2.3). The ability of generators in one NEM region to supply consumers in another region is limited by the capacity of the transmission network connecting the regions. The real time capacity of the interconnectors changes depending on the direction of flow and any constraints that limit flow to manage system security. NSW has historically been a net electricity importer, sourcing around 10 per cent of its demand from other regions in 2016–17.

Figure 2.3 Interconnectors joining NSW to neighbouring regions



Source: AER

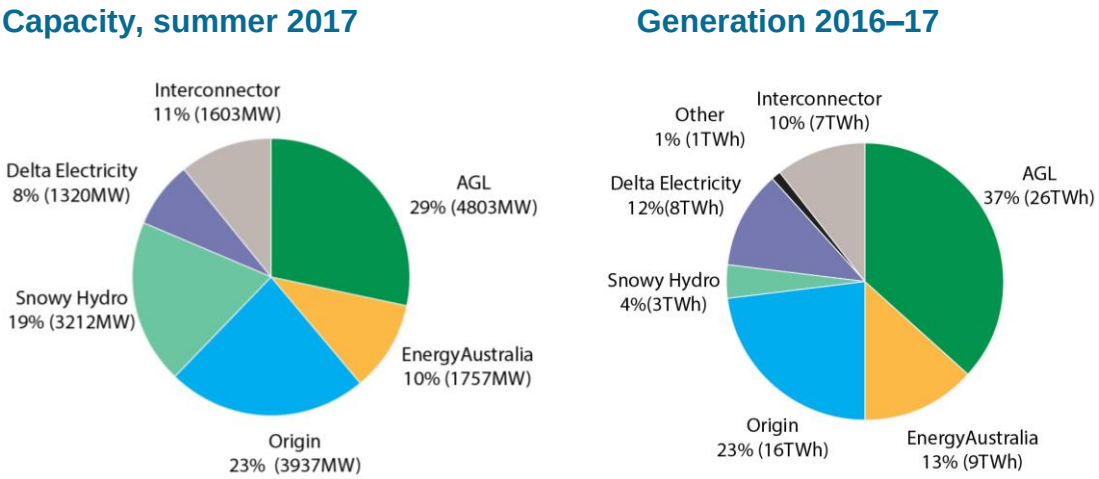
2.3 Five large participants dominate the market

The number and size of participants in an electricity market affects the opportunities and incentives for generators to exercise market power. A market dominated by a small number of large generators—especially if interconnection is limited—is likely to be less competitive than a market with more generators. However, the number and size of participants alone does not determine whether market power has been, or will be, exercised.

NSW is dominated by a few large, vertically integrated participants. Most generators are owned or controlled by one of five participants. The black coal power stations are owned by AGL Energy (Liddell, Bayswater), Origin Energy (Eraring), EnergyAustralia (Mt Piper) and Sunset Power International (operated as Delta Electricity) (Vales Point), while Snowy Hydro owns the vast majority of the hydroelectric generators (Tumut, Upper Tumut, Guthega, Blowering, and Murray[2]). The larger gas fired stations are owned by Origin Energy (Uranquinty), Snowy Hydro (Colongra) and EnergyAustralia (Tallawarra). A significant proportion of solar and wind generators are under power purchase agreements with AGL Energy, EnergyAustralia and Origin Energy. Attachment B includes summary information on the generators of the major participants in NSW.

Together AGL Energy, Origin Energy and Snowy Hydro control around 70 per cent of capacity while EnergyAustralia and Delta Electricity control a further 18 per cent combined (Figure 2.4).

Figure 2.4 Generator market share, NSW



Note: Capacity shares are based on summer availability for 31 January 2017 as reported to AEMO except, wind which is adjusted for an average contribution factor. Capacity interconnector market share is based on actual flows into the region for that year where price difference between neighbouring region is greater than $10. Generation market share for the interconnector is actual net flows.

Source: AEMO; AER

NSW also has a very high degree of vertical integration. AGL Energy, Origin Energy, and EnergyAustralia are the three big retailers, supplying 90 per cent of small retail electricity

2 Murray is located in the state of NSW, but within the Victorian NEM region

customers in NSW[3] and controlling a significant proportion of generation capacity. Snowy Hydro also has a retail presence, supplying around 4 per cent of NSW retail electricity customers.

2.4 Recent investment activity

Since 2012, three coal fired generators with a combined 1744 MW capacity have been retired in NSW.[4] Additionally AGL Energy has scheduled to retire the 2000 MW Liddell power station in 2022.

There has been limited new investment in NSW over the same period, mostly in small scale wind or solar plants of less than 200 MW.[5] The last investment in baseload generation in NSW was a 240 MW upgrade to Origin Energy's Eraring power station completed in 2012. ENGIE, Origin Energy and AGL Energy, which own large coal-fired generators across the NEM, have announced they do not intend to further invest in new conventional coal assets.[6]

The experience in NSW is consistent with a broader trend across the NEM. A flattening out of electricity demand since 2008, along with government incentives to invest in renewable plant resulted in an oversupply of generation capacity for several years. [7] In response, significant capacity was permanently or temporarily removed from the market, particularly aging coal generation plant. The largest closure was the 1600 MW Victorian Hazelwood power station[8] which was retired in March 2017.

In response to a rise in intermittent generation and the retirement of baseload coal generators, the Australian Government, in 2017, has indicated its support for the proposed Snowy Hydro 2.0 project – a 2000 MW pumped hydro project in NSW that would store energy for the provision of quick start dispatchable energy. Snowy Hydro has stated that the feasibility study for Snowy Hydro 2.0 will be completed in December 2017 and if it proceeds construction would take about six years.[9] Snowy Hydro 2.0 will be located in the NSW region of the NEM.

3 AER, *State of the energy market*, May 2017, p. 142.

4 The 600 MW Munmorah power station was retired in July 2012, the 1000 MW Wallerawang C power station was retired in NSW in 2015 following the mothballing of 500MW in January 2013 and 500MW in April 2014, the 144 MW Redbank coal-fired generator was closed in 2014.

5 See AER, *State of the energy market*, May 2017, p. 39.

6 *Independent Review into the Future Security of the National Electricity Market*, Commonwealth of Australia June 2017, p. 97.

7 See AER, *State of the energy market*, May 2017, pp. 39–40.

8 Hazelwood power station began operation in 1964.

9 http://www.snowyhydro.com.au/our-scheme/snowy20/frequently-asked-questions/

3 Market outcomes over 2017

Average spot prices in NSW have been above historical levels across 2017. Of particular note is that prices remained high even after the summer. Prices in the second and third quarters of 2017 are significantly higher than those seen in previous years. These high prices have occurred despite relatively stable demand conditions.

3.1 High prices across the NEM

Average spot prices increased across the NEM in 2017. While high prices in the NEM are not unprecedented (and have been higher than those now), the 2017 price increases differ as they were sustained throughout the year and are occurring simultaneously across the NEM (Table 3.1).

Table 3.1 Quarterly volume weighted average spot prices ($/MWh)

		QLD	NSW	VIC	SA	TAS
2015	Q1	107	35	28	40	39
2015	Q2	32	37	32	48	34
2015	Q3	45	46	39	69	38
2015	Q4	43	45	43	59	80
2015	***Ave***	***57***	***41***	***36***	***54***	***48***
2016	Q1	89	46	50	54	174
2016	Q2	77	81	69	87	114
2016	Q3	54	56	53	133	55
2016	Q4	66	66	35	75	38
2016	***Ave***	***72***	***62***	***52***	***87***	***95***
2017	Q1	194	135	85	160	99
2017	Q2	87	94	107	118	114
2017	Q3	82	95	103	102	97
2017 YTD	***Ave***	***109***	***97***	***87***	***117***	***101***

Source: AEMO; AER

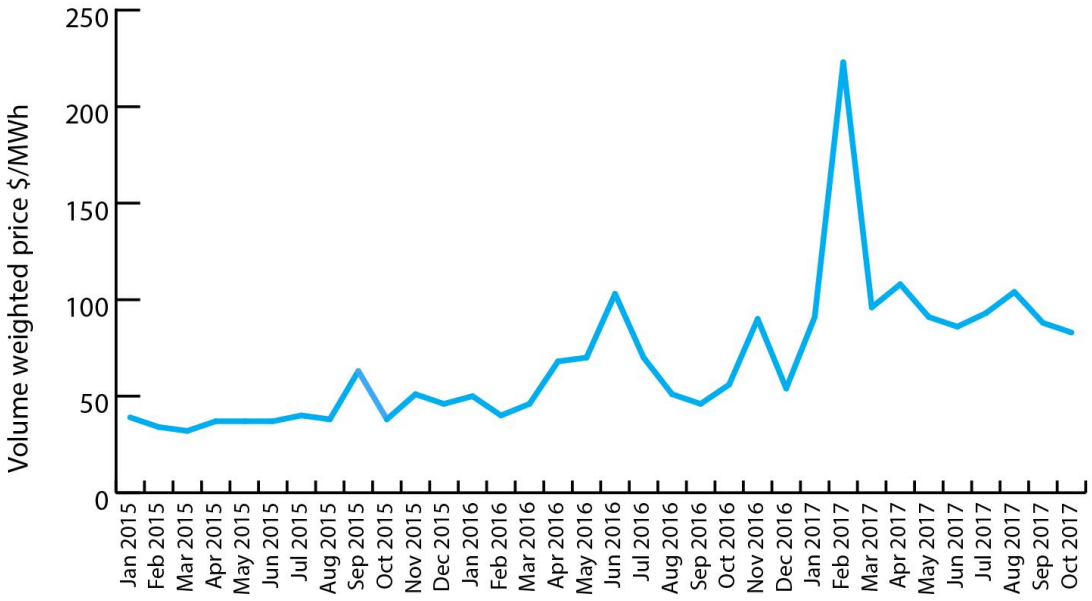
3.2 NSW spot electricity prices

Average spot prices through 2017 have been particularly high in NSW compared to historical levels. Average monthly prices increased significantly through the summer (Figure 3.1). These prices were largely driven by extreme price events with spot prices exceeding $5000/MWh three times in February 2017.[10] A range of factors contributed, including high temperatures for consecutive days, technical difficulties causing plant unavailability, import constraints and market intervention by AEMO.

While average prices subsequently eased, they have remained significantly higher than in previous years. Average monthly prices since March have ranged between $83–108/MWh compared to $32–63/MWh in 2015.

These high average prices occurred despite little volatility in prices. There were no extreme price events in NSW of spot prices over $5000/MWh after February 2017 and only two instances of spot prices exceeding $300/MWh since March 2017.

Figure 3.1 Monthly volume weighted average prices NSW



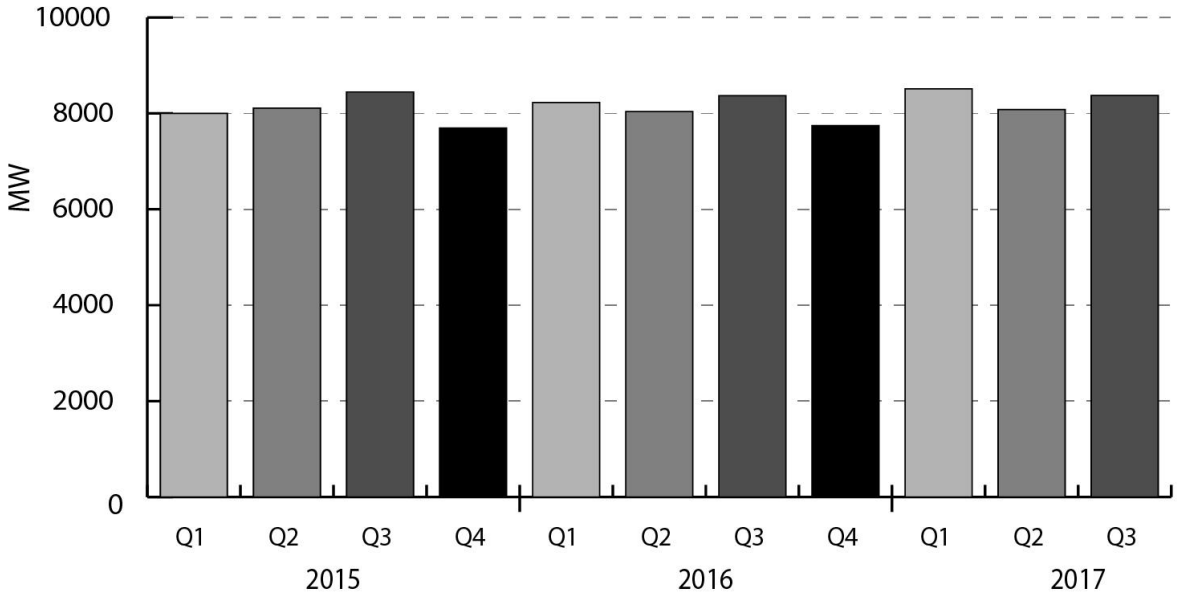
Source: AEMO; AER

3.3 Supply and demand conditions

Increased demand is often a factor that drives higher electricity prices. However, average electricity demand in NSW remained relatively stable in 2017 and consistent with levels experienced over the same period in previous years (Figure 3.2). This suggests that supply conditions rather than changes in demand drove higher prices after the summer 2016–17.

10 See price reports from 6, 9 and 10 February 2017, www.aer.gov.au/publications

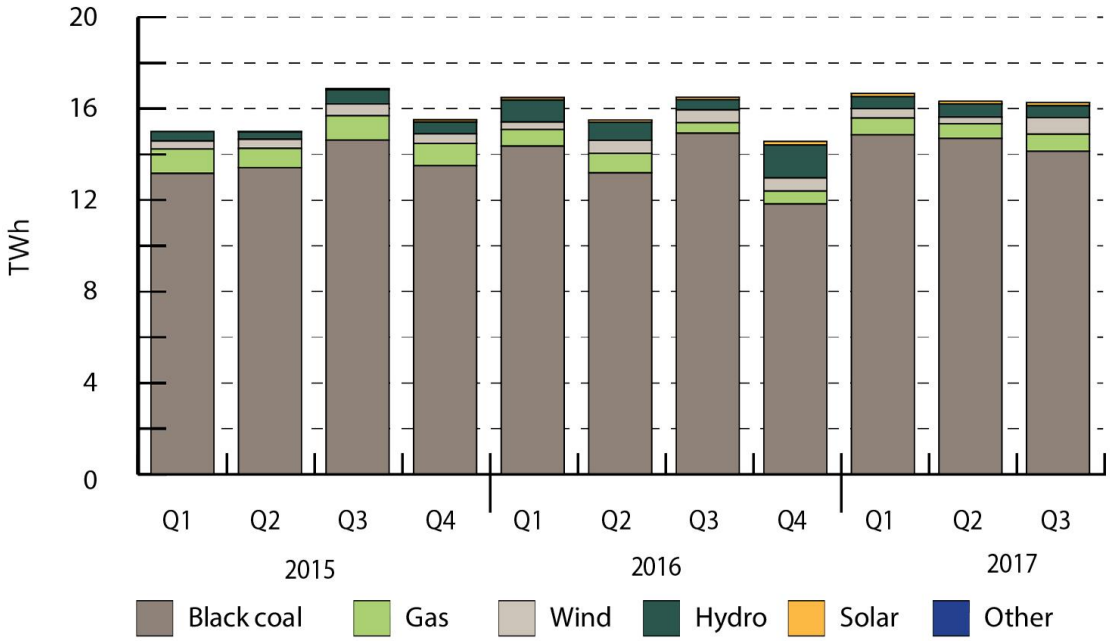
Figure 3.2 Average demand NSW, by calendar quarter



Source: AEMO; AER

The output of NSW generators was at similar levels in 2017 as previous years (Figure 3.3). However, there was significant variation between the output of individual participants, with some generating at higher levels than in previous years, notably Origin's Eraring power station. Attachment B includes summary information on the generator output of each major participant in NSW.

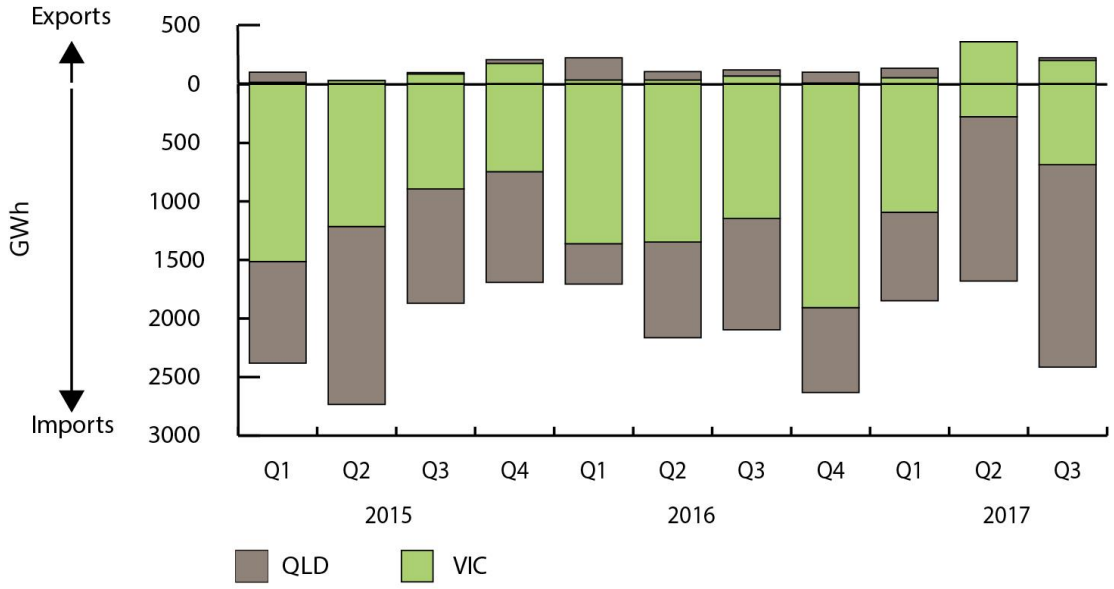
Figure 3.3 NSW energy by fuel source, by calendar quarter



Source: AEMO; AER

NSW has had reduced access to cheaper brown coal generation from Victoria following the closure of the Hazelwood power station in March 2017 (the end of quarter one). Figure 3.4 shows that in quarters two and three of 2017, there has been less imports from Victoria (green bars below the line) and more imports from Queensland (grey bars below the line) into NSW. This coincided with the closure of Hazelwood power station at the end of quarter one. While overall NSW continues to be a significant net importer of electricity, exports from NSW into Victoria have also increased in quarters two and three (green bars above the line).

Figure 3.4 NSW interconnector imports and exports



Source: AEMO; AER

4 Changes in generator offers

NSW generators offered more capacity at higher prices in 2017. There has been a 'step change' whereby generation capacity that was being offered at lower prices ($0-50/MWh) is now being offered at higher prices ($50-150/MWh). This change in offer behaviour has been sustained - it has been an enduring feature of the NSW market throughout 2017.

There are a number of factors that explain, at least in part, the higher offer prices we have observed in NSW, in particular increases in underlying fuel costs (particularly coal) and coal supply issues. There are, however, a range of other issues that may be affecting the competitiveness of the NSW market, such as the change in competitive dynamics, particularly since the closure of the Hazelwood power station.

4.1 Opportunistic bidding

There are certain types of opportunistic bidding commonly associated with the exercise of market power in electricity markets. These include physically withholding capacity from the market and shifting capacity into extreme prices, particularly close to dispatch. In the past year we have not identified instances where this has significantly affected NSW average price outcomes:

- Generators did not appear to physically withhold capacity from the market. The capacity offered to the market has remained fairly constant except for the outages shown in Figure 4.1.
- Whilst NSW generators offered increased capacity at higher prices in 2017, we did not observe instances of participants shifting capacity to extremely high prices (for example at the market price cap), which could indicate economic withholding.
- NSW generators did not significantly rebid capacity from low to high prices close to dispatch. This type of behaviour can limit the ability of other generators to respond to price signals competitively.
- We did not detect false or misleading rebidding.[11]
- We did not identify any instances in 2017 where Snowy Hydro's bidding constrained the Victoria – NSW interconnector affecting price outcomes in NSW.[12]

4.2 NSW capacity offered at higher prices

Since October 2016 generators have been offering a larger proportion of their capacity into the market at higher prices. This involves a 'step change' where capacity that was offered at lower prices ($0-50/MWh) is increasingly being offered at prices between $50-150/MWh, rather than at extreme prices (such as close to the market price cap).

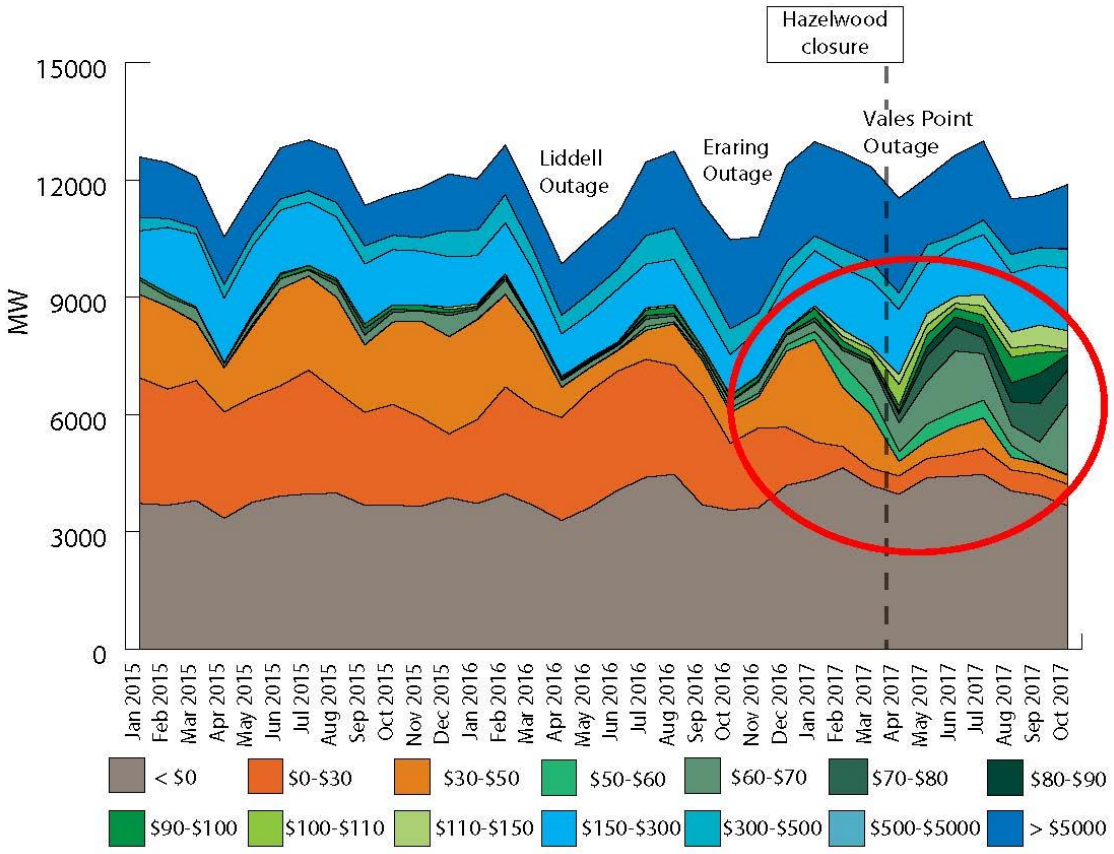
11 This conduct is prohibited under section 3.8.22A of the National Electricity Rules

12 There was an event in November 2016, where prices were influenced by this type of behaviour. See AER, *Electricity spot prices above $5000/MWh New South Wales, 18 November 2016* https://www.aer.gov.au/system/files/Prices%20above%205000%20MWh%20-%2018%20November%202016%20%28NSW%29.pdf

AEMO publishes participants' offers for each day the following day. Figure 4.1 shows the monthly average volume of offers within certain price thresholds for all NSW generators, with the lowest priced capacity at the bottom and the highest priced capacity at the top.

While generators continue to offer roughly one third of capacity into the market at less than zero (grey band), capacity offers between $0-50/MWh have reduced (as indicated by the narrowing of the orange bands). Generators have shifted this capacity to price offers ranging $50-150/MWh (green bands). The capacity offered above $5000/MWh did not affect average prices in 2017 beyond the summer because this capacity was not required to meet demand.

Figure 4.1 Monthly average capacity offered by NSW generators, by price



Source: AEMO; AER

Analysis of each individual participant's offer behaviour suggests that while they have all moved capacity to higher prices the movements have been to different prices and at different times. This suggests that the changes were based on the individual participants' circumstances and did not involve co-ordinated behaviour. Attachment B includes information on each participant's offers. In summary:

- AGL decreased the amount of capacity offered between $0-30/MWh from November 2016. It offered this capacity at increasingly higher prices through 2017, peaking at around $90-100/MWh in August 2017. More recently, it offered this capacity at lower prices, around $50-70/MWh.

- From December 2016 through to March 2017 the capacity that Origin previously offered between $0-30/MWh was offered between $30-50/MWh. From April 2017 much of this capacity was offered at even higher prices, peaking in October 2017 at $60-90/MWh.
- From February 2017 EnergyAustralia reduced the capacity it offered between $30-50/MWh, offering it instead at $50-70/MWh. By August 2017 it offered this capacity between $70-90/MWh. More recently it offered this capacity at lower prices, around $50-70/MWh.
- In January 2017 capacity that Delta previously offered between $0-30/MWh was offered between $30-50/MWh. Delta also offered more capacity at $60-150/MWh during 2017.
- From January 2017 capacity that Snowy Hydro previously offered from $0-30/MWh was offered at higher prices, including between $150-300/MWh.

4.3 Reasons for increased offers

Several factors have contributed to higher offers from NSW generators. Fuel costs have increased for both coal and gas generators contributing to higher offers from generators. Coal generators have also faced falling coal stockpiles and appear to be managing their stockpiles to manage the risk that they do not have sufficient coal to generate over the summer period.

4.3.1 Coal costs

Coal prices

Generators typically source coal under a range of short and long term contracts. Generally, prices negotiated under short term contracts are likely to align more closely with the prevailing international coal spot price. Generators may also be exposed to rising coal prices under longer term contracts if prices under these contracts are benchmarked against international coal prices or if contract renegotiations coincide with rising coal prices.

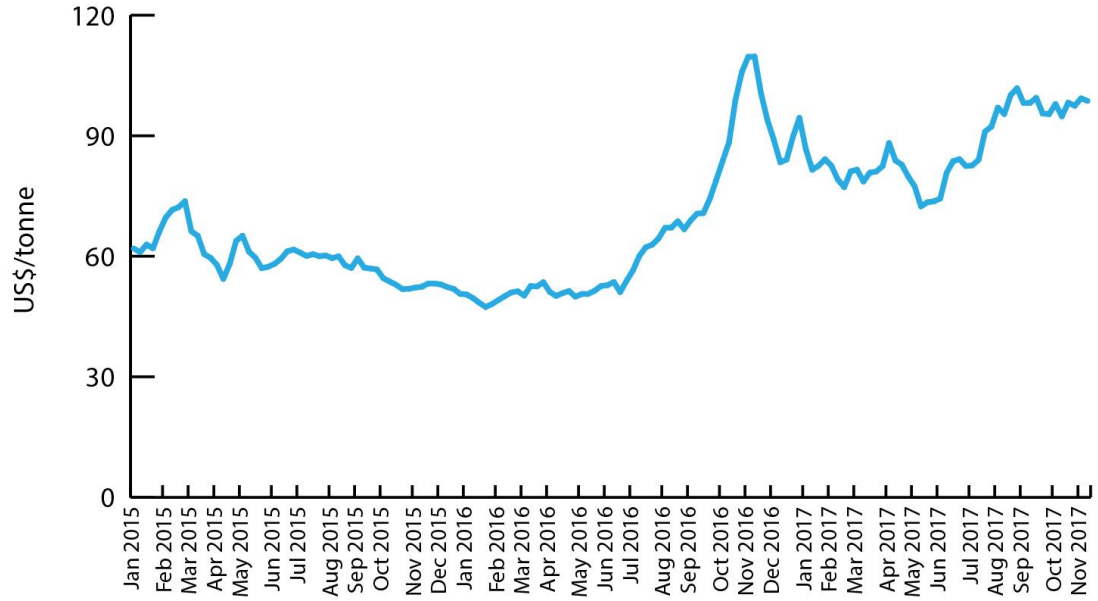
Strong Chinese demand (following Chinese domestic production restrictions) contributed to rising international prices for thermal coal in 2016 and 2017.[13] The globalCOAL Newcastle coal price[14] increased around 36 per cent last year. The December 2016 and March 2017 prices sat around A$110 per tonne (approximately $47/MWh), compared to the 2015–16 average of A$71 per tonne (approximately $30/MWh). Since August 2017 the globalCOAL Newcastle coal price has hovered around A$130 per tonne (approximately $55/MWh). However, globalCOAL's assessment of forward coal prices indicates that coal prices are expected to moderate to around A$115 per tonne by the fourth quarter of 2018.[15]

13 Office of the Chief Economist, *Resources and Energy Quarterly*, June 2017, p. 45.

14 The globalCOAL Newcastle coal price index is a reference price for spot thermal coal at Newcastle Port in NSW. The globalCOAL methodology is available at https://www.globalcoal.com/coalprices/newcindexmethodology.cfm

15 globalCOALhttp://www.global.com

Figure 4.2 Newcastle thermal coal index



Notes: Data is for the globalCOAL NEWC Index

Source: globalCOAL www.globalcoal.com

Our review has confirmed that the NSW generators coal costs are increasing, particularly under short term contracts. However, the increase in coal costs alone does not fully account for the increase in generators' offers.

Coal supply

In addition to higher fuel prices, coal generators have had a range of concerns around managing fuel stockpiles in 2017. Confidential information coal generators provided to the AER during our review confirmed statements in the media that stockpiles were significantly lower than historic levels. A number of factors contributed to this, with each generator facing a unique set of issues.

While not all generators had higher energy output over 2017 compared to previous years, information we obtained confirmed that the output of the NSW black coal generators was either higher than in previous years or above forecast (or both). Some generators attributed this to the closure of Hazelwood power station and to periods of unexpectedly high NSW demand last summer.

Many generators sought to supplement their reduced stockpiles using higher priced short term contracts. However stockpiles did not recover. Increased international demand and domestic demand for coal put pressure on coal rail distribution systems. Generators that depend on rail for coal deliveries experienced lower than forecast coal deliveries due to a range of rail network and haulage problems (including rail network congestion, infrastructure failures and industrial action).

Several generators also experienced problems related to their coal suppliers. This included technical issues with the output at various mines and in some cases industrial action. Some generators faced significant issues with future coal supplies which may have affected their

generation strategy across 2017. The most notable was EnergyAustralia's Mt Piper power station. Up until October, there was considerable uncertainty regarding the future of the only coal mine supplying the Mt Piper due to planning and environmental litigation[16].

These factors in 2017 led to generators managing the risk that they would not have sufficient coal to generate over the summer period.

4.3.2 Gas costs

Gas prices across the east coast have risen steeply over the past few years. The introduction of LNG exports from Queensland linked domestic gas prices to the international market and increased uncertainty regarding the availability of future gas supply to the domestic market. AEMO identified an expected shortfall in gas in 2018 and 2019.[17] In October the Federal Government announced it had reached an agreement with gas exporters to increase supply to the domestic market.[18] This means the Federal Government may not impose export restrictions under the Australian Domestic Gas Security Mechanism for 2018.

The NSW gas generators have a range of different arrangements for sourcing gas. While not all gas generators will necessarily always source their gas directly from the Sydney Short Term Trading Market (STTM), prices on the Sydney STTM are a general indicator of the extent of increases in generators' gas costs. Prices on the Sydney STTM more than doubled the year to March 2017 (Figure 4.3). Prices have eased more recently and are currently around $7.50/GJ

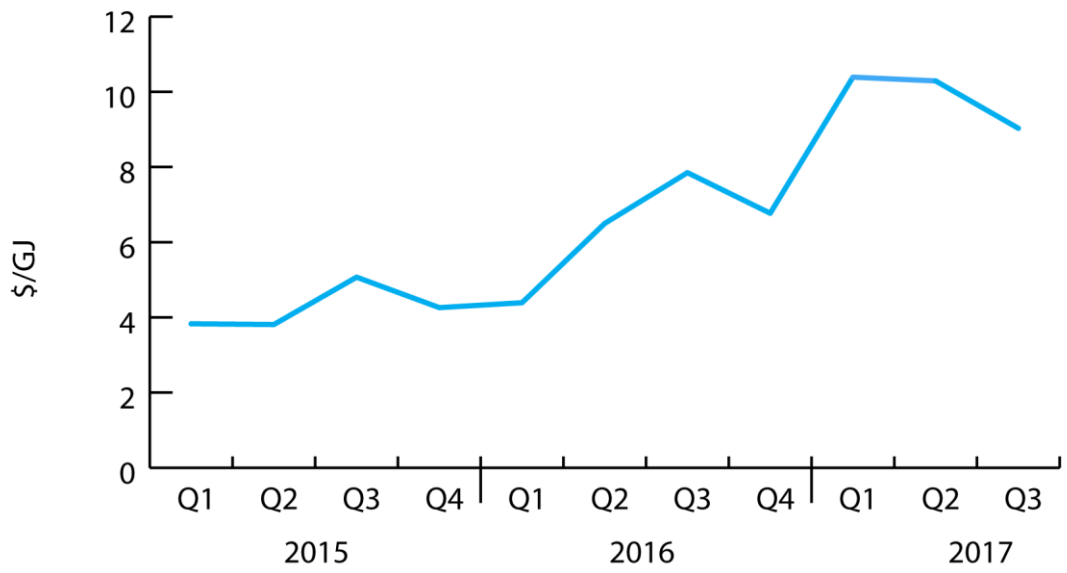
Gas generators provided confidential information to the AER on their gas costs. Our analysis of this information confirms that gas costs for the NSW gas fired generators increased from mid-2016. The increase in offers for these generators was broadly consistent with changes in underlying gas costs.

16 The NSW Government subsequently passed legislation that intended to ensure that the Springvale mine could continue to supply the Mount Piper power station: New South Wales, Parliamentary Debates, Legislative Council, 11 October 2017, (The Hon. Don Harwin)

17 AEMO, Gas Statement of Opportunities 2017, March 2017 and September 2017 update.

18 Minister for Environment and Energy, Media release: http://www.environment.gov.au/minister/frydenberg/media-releases/mr20171026.html

Figure 4.3 Average daily Sydney STTM gas price by quarter



Notes: Average daily ex ante gas prices by quarter

Source: AEMO; AER

4.3.3 Water costs

It is more difficult to analyse the underlying causes of changes in offers of hydro plant. While hydro generators do not have to pay an explicit purchase price for their primary fuel input (water), they still have implicit fuel cost. Hydro generators generally have limited water in storage and environmental obligation on flows. Given this, hydro generators need to manage water storage levels by limiting how much water they release for electricity generation throughout the year. A hydro generator will determine its implicit fuel cost so that it is able to ensure it will have capacity to generate in the future, particularly over high value summer peak periods.[19]

In practice this means that the implied fuel cost of a hydro generator will depend on a range of factors including storage levels, existing electricity contracts and spot market prices. It also means that a hydro generator's bids into the market will be closely linked to the bids of other generators. As a result, when the bidding levels of coal or gas generators increases, the implied fuel cost of a hydro generator may also increase.

Snowy Hydro provided confidential data to the AER on changes to its implicit fuel costs over the past three years. This data confirmed that Snowy Hydro periodically reviews its medium term implicit fuel cost. Factors it takes into account include environmental flows, water storages, contract levels and the offers of the thermal generators.

19 For more explanation see Darryl R. Biggar and Mohammad Reza Hesamzadeh, *The Economics of Electricity Markets*, IEEE Press and John Wiley & Sons Ltd, 2014, p. 108.

4.3.4 Reduction in competitive constraints

In addition to changes in fuel costs and fuel supply, NSW coal generators appear to be facing less competitive constraints than previously. This may also be contributing to NSW generators' higher price offers and the sustained increase in NSW average spot prices in 2017.

The closure of the Hazelwood power station in March 2017 has affected market outcomes in 2017. Hazelwood was a 1600 MW station located in the Victorian region and provided cheap baseload capacity to the NEM. As noted in section 3.3 interconnector flows into NSW from Victoria have decreased since Hazelwood closed. The closure of Hazelwood has reduced the competitive constraint on baseload generators in NSW. As the reduction is due to the closure of a baseload generator, this change is primarily the lessening of a competitive constraint on NSW coal generators. While other coal-fired generators have been retired in the NEM in recent years these generators had a lower capacity than Hazelwood.

While there have been more imports to NSW from Queensland, it is not clear whether these imports, primarily sourced from Queensland black coal generators, provide the same competitive constraint on the offers of coal generators in NSW as we have traditionally seen from the cheaper cost brown coal generators in Victoria.

Coal generators will typically offer their capacity into the NEM at prices which are significantly lower than prices offered by gas and hydro generators. At other times coal generators will offer their capacity at higher prices, and in closer competition with gas and hydro generators. On these occasions gas and hydro generators will provide a competitive constraint on coal generator pricing decisions. This competitive constraint has however lessened as gas and hydro generators have increased their offer prices due to increased fuel and opportunity costs. This lessening of competitive constraint is likely to be a factor behind the increased prices offered by NSW coal generators in particular.

Hydro generator pricing decisions can also be constrained by the prices offered by gas generators. As a result the rise in gas prices, and the lessening of the competitive constraint provided by gas, has also increased hydro offers.

5 AER findings

As highlighted in section 3.2, average wholesale prices in NSW since last summer have been higher than historic levels. While periods of high prices in the NEM are not unprecedented, the price outcomes we are currently experiencing are significantly different to those witnessed previously.

Traditionally we have seen high average prices driven by a limited number of extreme price events. This was the case in NSW last summer, with three spot price events over $5000/MWh in February, driven by a number of factors including high demand on extreme weather days.

However, in recent months, while average prices in NSW have come down from their summer peaks, they remain higher than we have traditionally observed. Average monthly prices have hovered around $80-110/MWh for every month since summer compared to around $30-65/MWh in previous years. These prices have been sustained and are not being driven by extreme price events.

We have been particularly keen to understand the drivers of the high prices in these 'off-peak' months. In the course of our review of generators' offers we did not find evidence to suggest that prices were being driven by behaviour that we would traditionally associate with the exercise of market power in electricity markets, such as rebidding significant capacity at prices near the price cap close to dispatch. Rather the key trend we have observed in NSW since October 2016 is a 'step change' where capacity that was offered at lower prices ($0-$50/MWh) is increasingly being offered at prices between $50-$150/MWh.

We have identified a number of reasons for this change in generator offer behaviour.

5.1 Fuel issues

In a market dominated by black coal generation, as is the case in NSW, conditions in coal markets will affect generator offers. Coal prices have increased which has particularly affected the costs of generators who are purchasing coal under short-term contracts. Further, all NSW coal fired generators have had, or are continuing to have, problems with coal supply. These issues contributed to falling coal stockpiles and appear to increase the risk that coal generators would not have adequate coal to generate over the upcoming summer.

At the same time, the increase in gas prices affected the costs of the three gas fired generators.

These market circumstances explain, at least in part, the higher offer prices we have observed in NSW.

5.2 Other issues

There are, however, a range of other issues that may be affecting the competitiveness of the NSW market.

The number and size of participants affects the opportunities and incentives for market participants to exercise market power. As highlighted in section 2.3, five generators dominate the wholesale market in NSW. These participants also have a significant retail presence in NSW and across the NEM. This makes the NSW market more susceptible to outcomes that are not competitive than markets that have numerous competitors.

As noted above the closure of Hazelwood is having an impact in NSW. Interconnector flows into NSW from Victoria have decreased since the closure of Hazelwood, lessening the ability of cheaper brown coal generation imports from Victoria to act as a constraint on generators in NSW. While there have been more imports to NSW from Queensland, it is not clear these imports provide the same competitive constraint on offers of NSW generators as imports from generators in Victoria.

The increase in gas prices also means that the competitive constraint of gas plant on the offers of coal generators has lessened. In the case of hydro plant, Snowy Hydro has adjusted its offers to ensure sufficient supply is available for the summer peak. This means that hydro plant has not been a constraint on NSW coal generation, outside of peak summer demand periods.

5.3 Assessing the effectiveness of competition

While we did not find evidence to suggest that prices were being driven by behaviour that we would traditionally associate with the exercise of market power in electricity markets, there are features of the NSW market that likely provide participants with the opportunity to exercise market power and potentially abuse this market power. However in order to verify this, we need a longer period of time than what was given to us to conduct this review.

Some of the issues that have contributed to high generator offers in NSW appear to be improving. Notably concerns over coal supply appear to be easing.[20] As coal supply issues were a driver of price increases in 2017, then to the extent these issues improve we would expect generator offers to adjust downwards if the market is effectively competitive. We have observed that some generators have revised their offers downwards in more recent months (although they are still higher than historic levels).

However, there are a number of factors that need to be considered over a longer period to make an informed assessment of the effectiveness of competition in the NSW market. For example understanding barriers to entry can be important to understanding whether a market has effective competition as the entry, or potential entry, of new participants can provide an important source of competitive constraint on incumbents.[21] In assessing whether there is effective competition, the NEL requires us to have regard to whether barriers to entry into the market are sufficiently low so that a substantial degree of market power may only be held on a temporary basis.

This report has identified other factors which may influence market efficiency or effective competition in NSW. Market structure, the role of interconnection with adjoining regions and

20 For example, uncertainty around the future of the Springvale mine was resolved with the NSW government passing legislation so that the Springvale mine could continue to supply the Mount Piper power station.

21 ACCC, *Merger Guidelines*, November 2008, p. 38.

the constraints on coal generators provided by gas and hydro plant are all issues that have the potential to affect the efficient and competitive operation of the NSW wholesale electricity market. Analysis of these factors over a longer period is required to reach any definitive conclusions about the effectiveness of competition in the NSW wholesale market.

The AER was given a new role to report into the effectiveness of wholesale market competition in the NEM, with our first report due in December 2018. In this report, we will provide the COAG Energy Council with updated analysis of the NSW market, including in relation to these structural factors and generator bidding behaviour.

Attachment A—Minister Frydenberg request

THE HON JOSH FRYDENBERG MP
MINISTER FOR THE ENVIRONMENT AND ENERGY

Ms Paula Conboy
Australian Energy Regulator
GPO Box 520
Melbourne VIC 3001

Dear Ms Conboy

I am writing to you regarding recent concerning media reports about the bidding behaviour of NSW black coal generators in the national electricity market.

As you will be aware, there have been a number of recent media reports suggesting NSW power generators are bidding in a manner that is adding costs in the order of $30 to $35 per megawatt hour to spot prices.

The Australian Government is keen to ensure that, where high wholesale prices do occur, they are justified by legitimate market circumstances and are not a result of the inappropriate exercise of market power. I note generators have claimed that these higher prices reflect, at least in part, the challenges in sourcing and transporting additional generator fuel.

Consistent with this, I ask that the AER use its wholesale market monitoring powers to monitor the NSW electricity market for features or generator behaviours that may be detrimental to effective competition. I ask that you provide advice to the COAG Energy Council, as appropriate, on any factors impacting on the efficient functioning of the market by November 2017.

Should you require any further information in regards to this request, please contact James O'Toole, Assistant Secretary, Department of the Environment and Energy on 02 6275 9023.

Yours sincerely

JOSH FRYDENBERG

Parliament House Canberra ACT 2600 Telephone (02) 6277 7920

Attachment B—Participant information

AGL

Generation fleet

Table 1 AGL NSW generator capacity, 2017

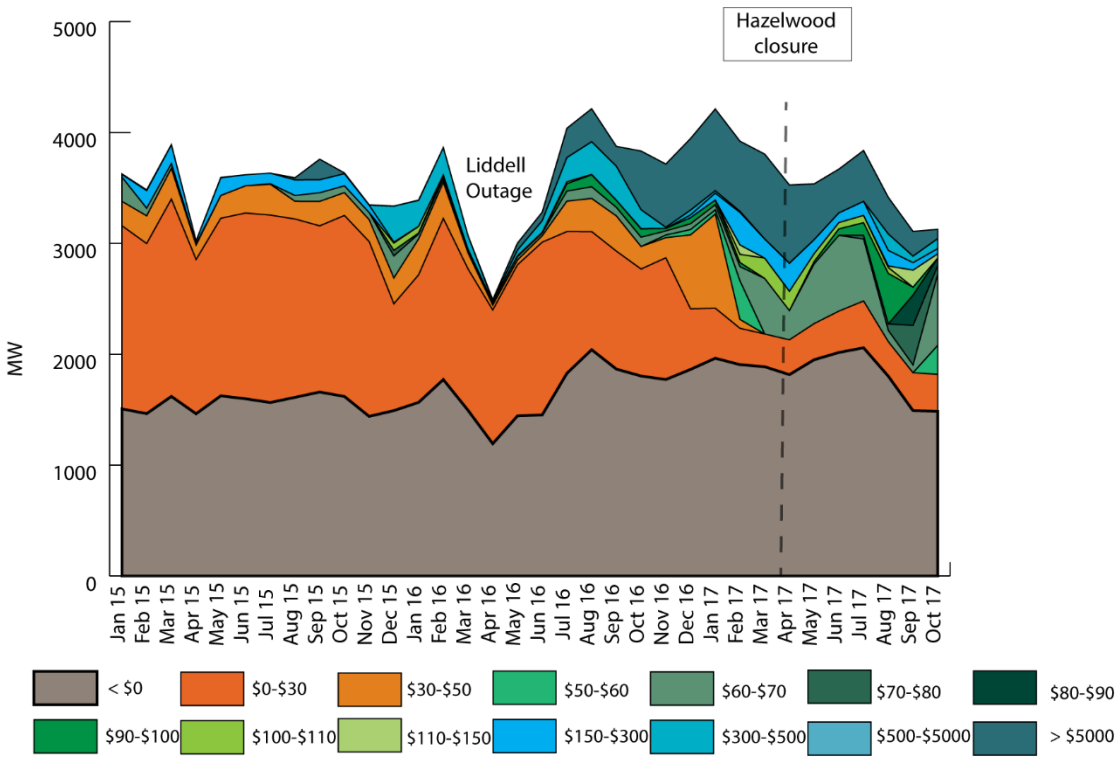
Power station	Capacity (MW)	Fuel type
Bayswater	2700	Black Coal
Liddell	2020	Black Coal
Hunter Valley	44	Fuel Oil
PPAs with intermittent generation	155	Solar

Notes: Summer capacity for 2016-17 as reported to AEMO

Source AEMO; AER

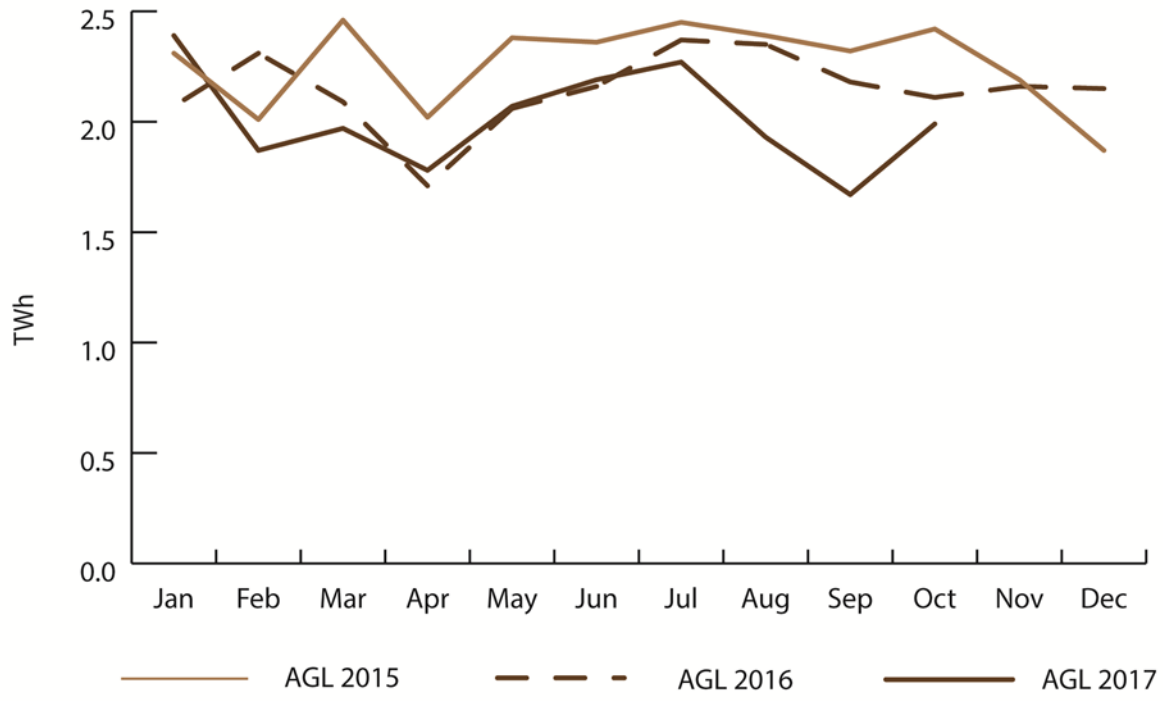
Changes in offers and coal generation

Figure 1 AGL monthly average offered capacity, by price



Source AEMO; AER

Figure 2 AGL monthly NSW coal generation, TWh



Source AEMO; AER

Origin Energy

Generation fleet

Table 2 Origin NSW generator capacity, 2017

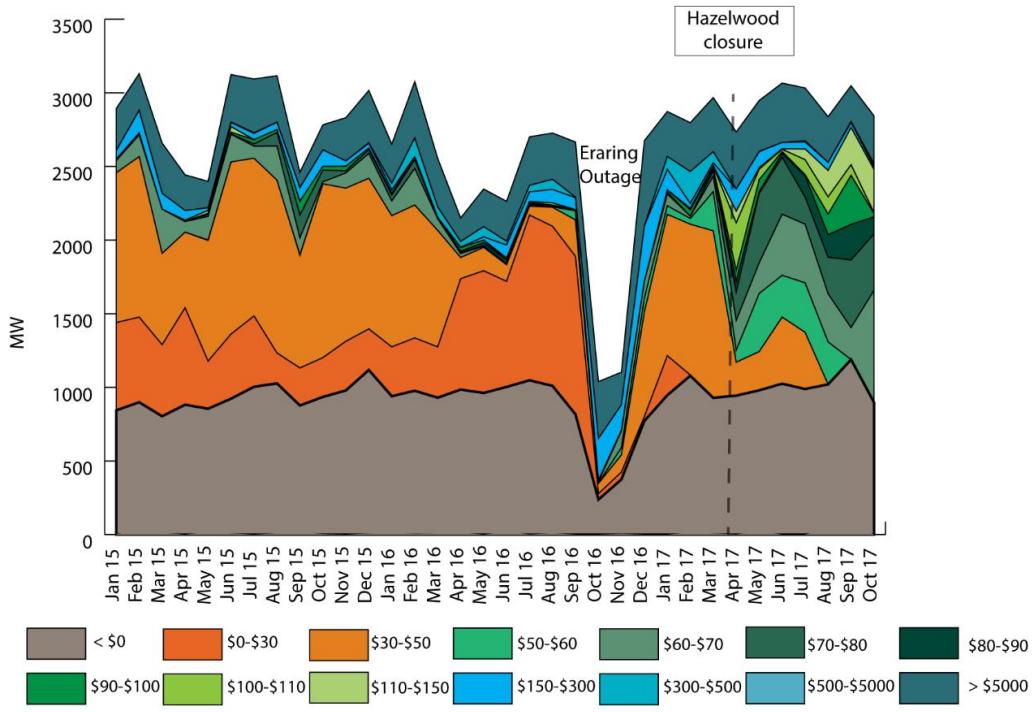
Power station	Capacity (MW)	Fuel type
Eraring	2880	Black Coal
Uranquinty	640	Gas
Shoalhaven	240	Hydro
Eraring	42	Diesel
Smithfield	162	Gas
PPAs with intermittent generation	86	Wind/Solar

Note: Summer capacity for 2016-17 as reported to AEMO. Origin had a PPA with Smithfield until July 31 2017.

Source AEMO; AER

Changes in offers

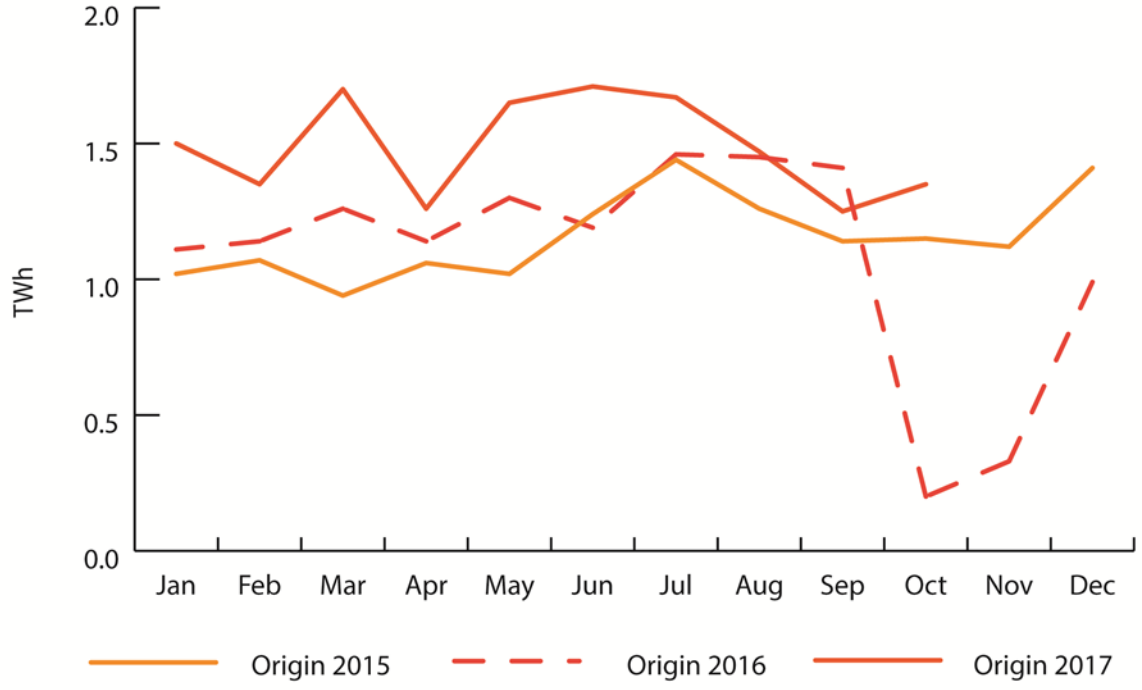
Figure 3 Origin Energy monthly average offered capacity, by price



Source AEMO; AER

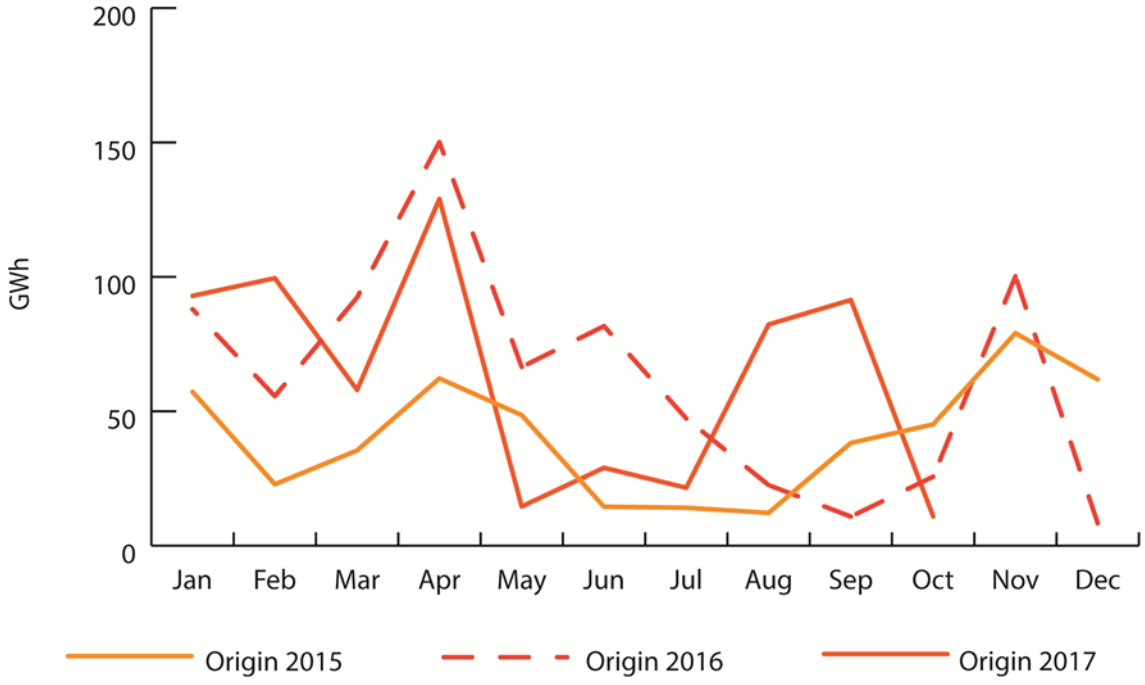
Generation output

Figure 4 Origin Energy monthly NSW coal generation, TWh



Source AEMO; AER

Figure 5 Origin Energy monthly NSW gas generation, GWh



Source AEMO; AER

EnergyAustralia

Generation fleet

Table 3 EnergyAustralia NSW generator capacity, 2017

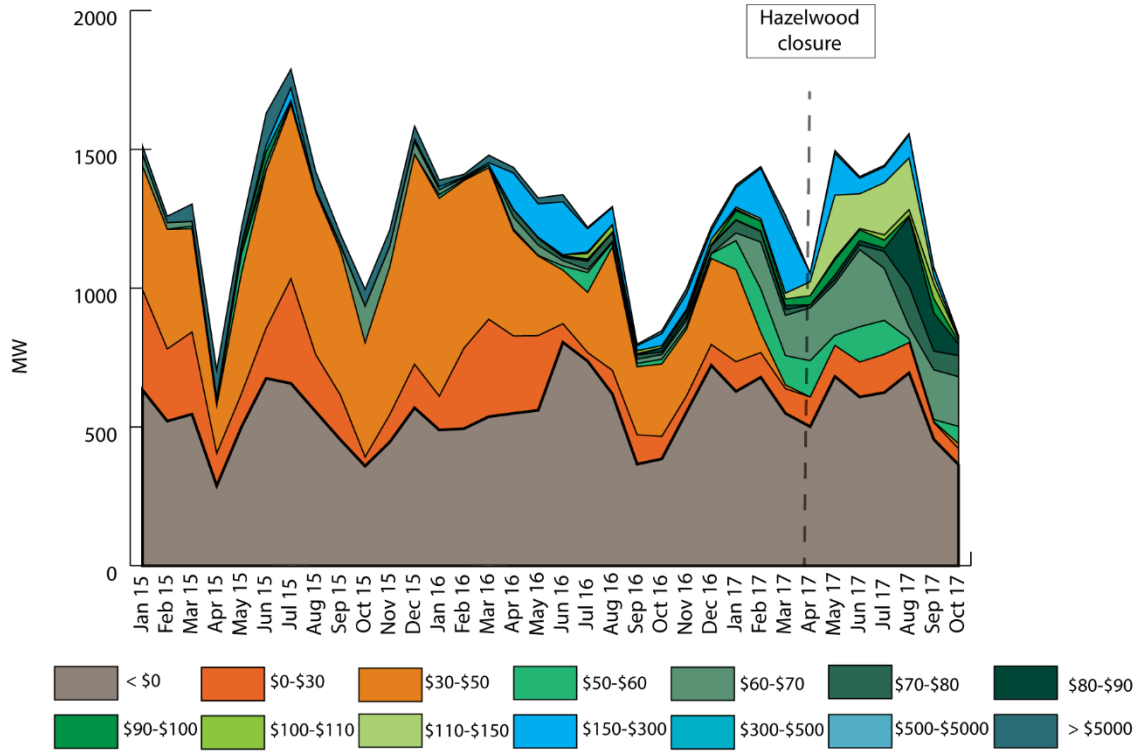
Power station	Capacity (MW)	Fuel type
Mt Piper	1330	Black Coal
Tallawarra	415	Gas
PPAs with intermittent generation	386	Wind

Notes Summer capacity for 2016-17 as reported to AEMO.

Source AEMO; AER

Changes in offers

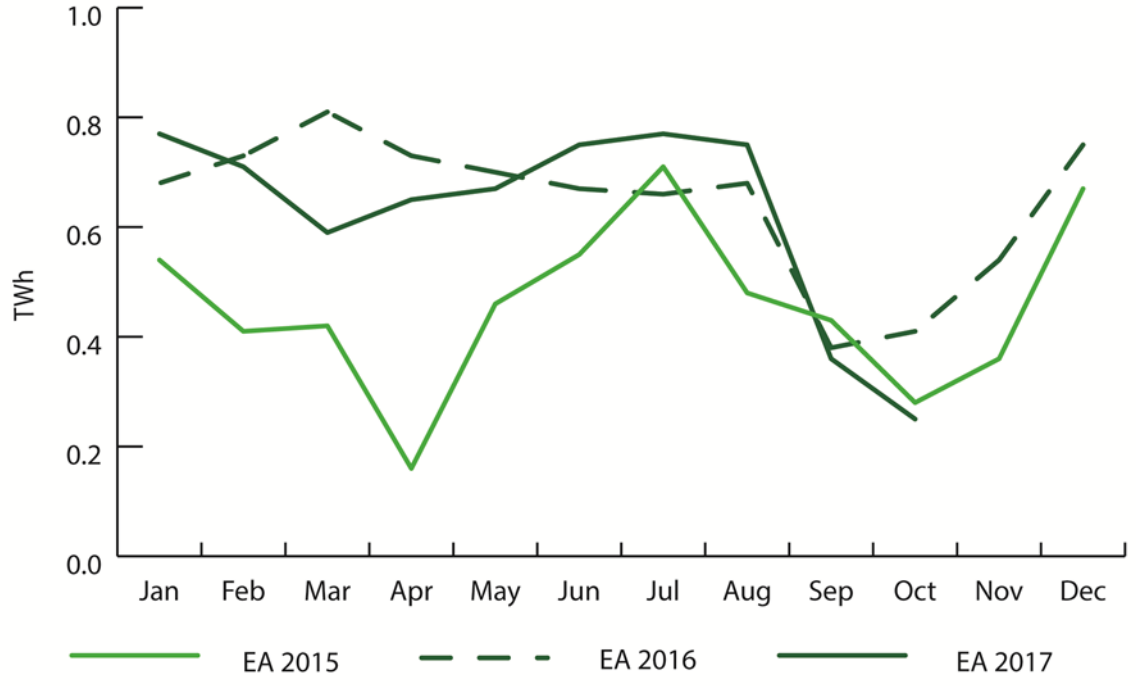
Figure 6 EnergyAustralia monthly average offered capacity, by price



Source AEMO; AER

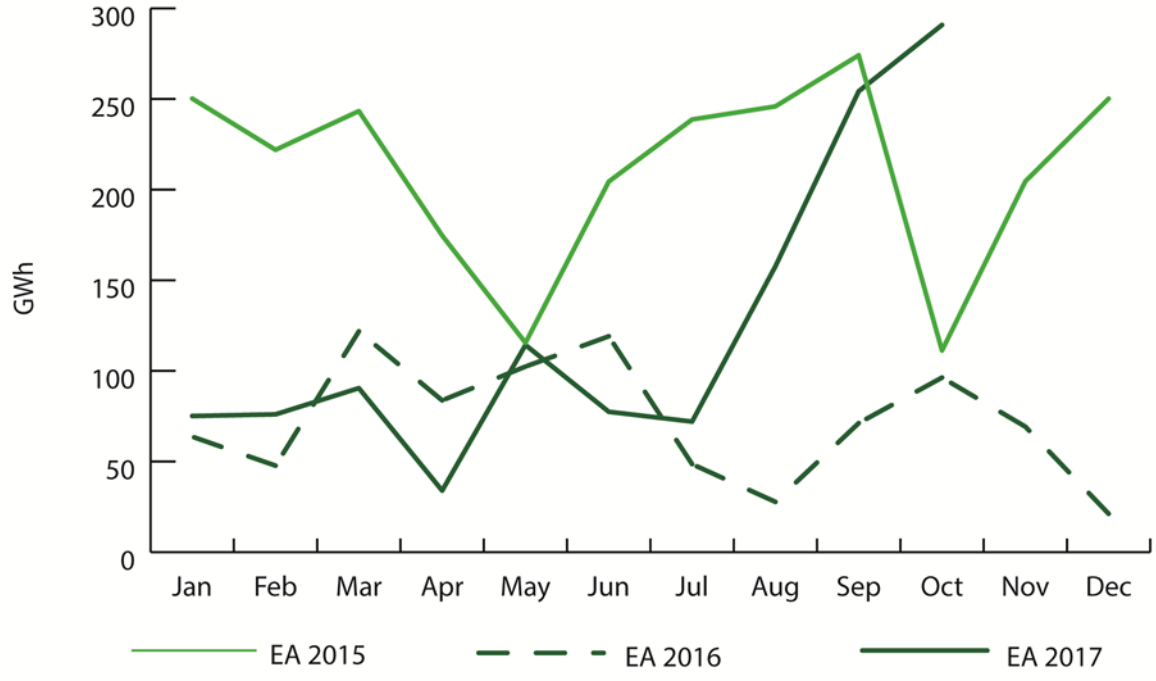
Generation output

Figure 7 EnergyAustralia monthly NSW coal generation, TWh



Source AEMO; AER

Figure 8 EnergyAustralia monthly NSW gas generation, GWh



Source AEMO; AER

Delta Electricity

Generation fleet

Table 4 Delta Electricity NSW generator capacity, 2017

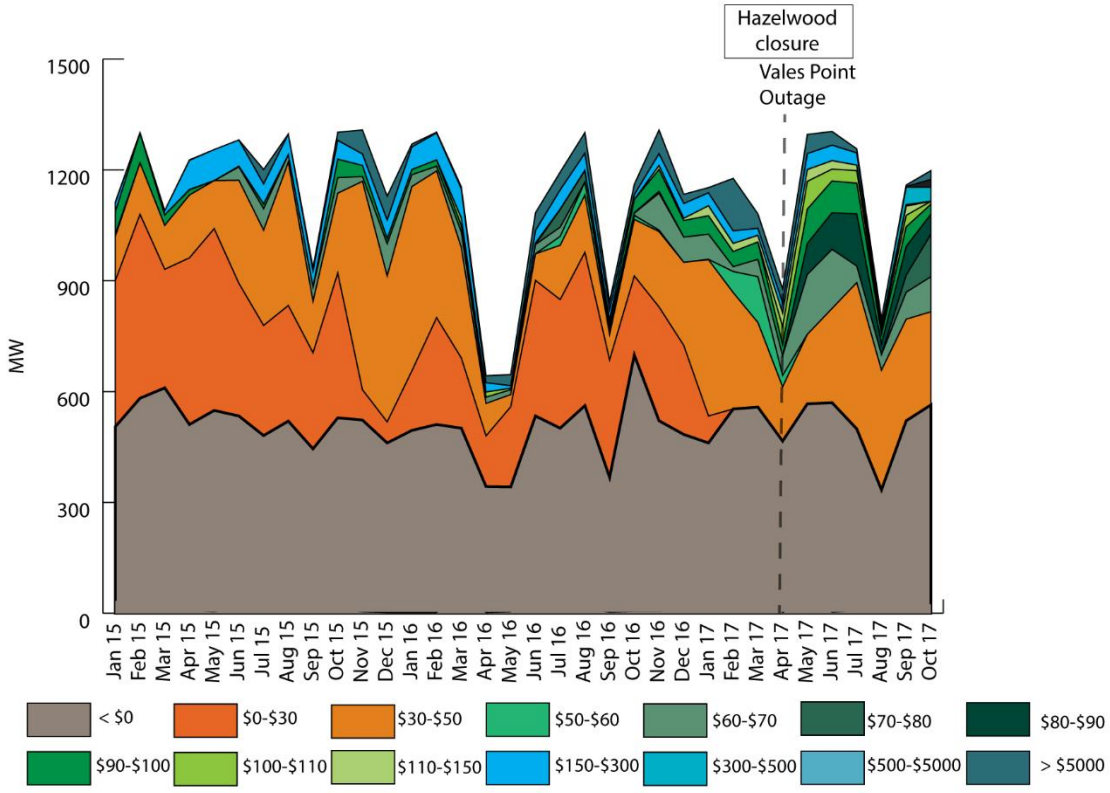
Power station	Capacity (MW)	Fuel type
Vales Point	1320	Black Coal

Notes Summer capacity for 2016-17 as reported to AEMO.

Source AEMO; AER

Changes in offers

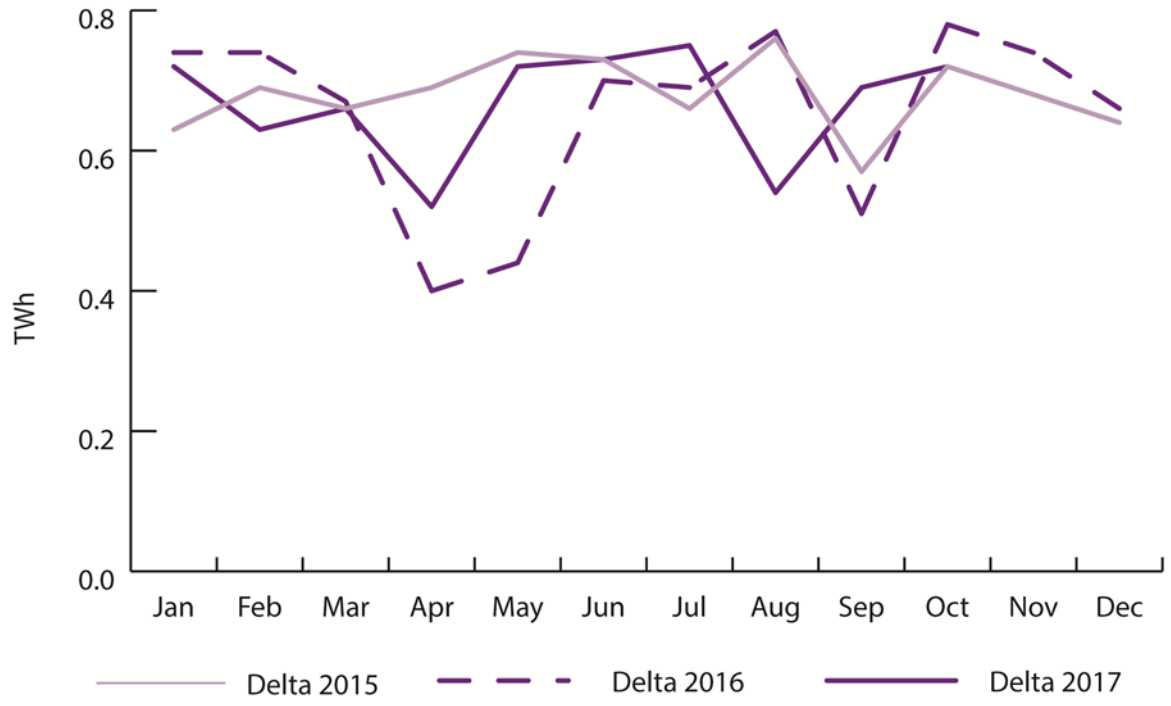
Figure 9 Delta Electricity monthly average offered capacity, by price



Source AEMO; AER

Generation output

Figure 10 Delta Electricity monthly NSW coal generation, TWh



Source AEMO; AER

Snowy Hydro

Generation fleet

Table 5 Snowy Hydro NSW generator capacity, 2017

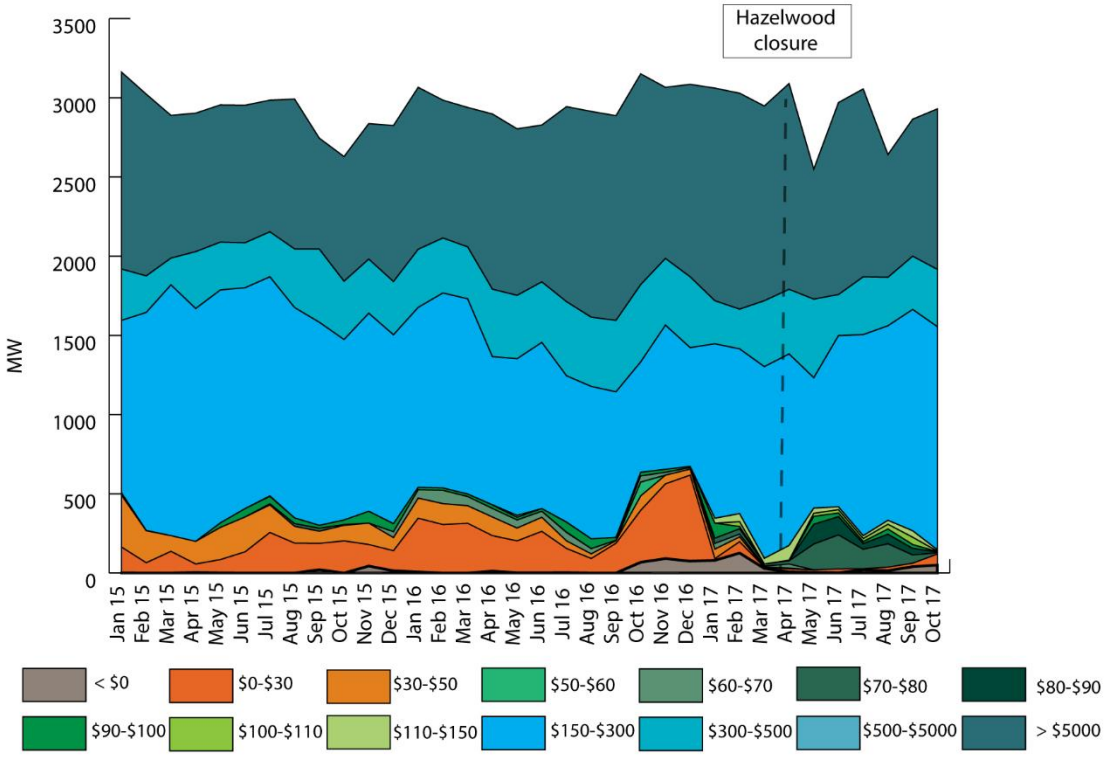
Power station	Capacity (MW)	Fuel type
Upper Tumut	616	Hydro
Tumut	1800	Hydro
Blowering	80	Hydro
Guthega	68	Hydro
Colongra	648	Gas

Notes Summer capacity for 2016-17 as reported to AEMO.

Source AEMO; AER

Changes in offers

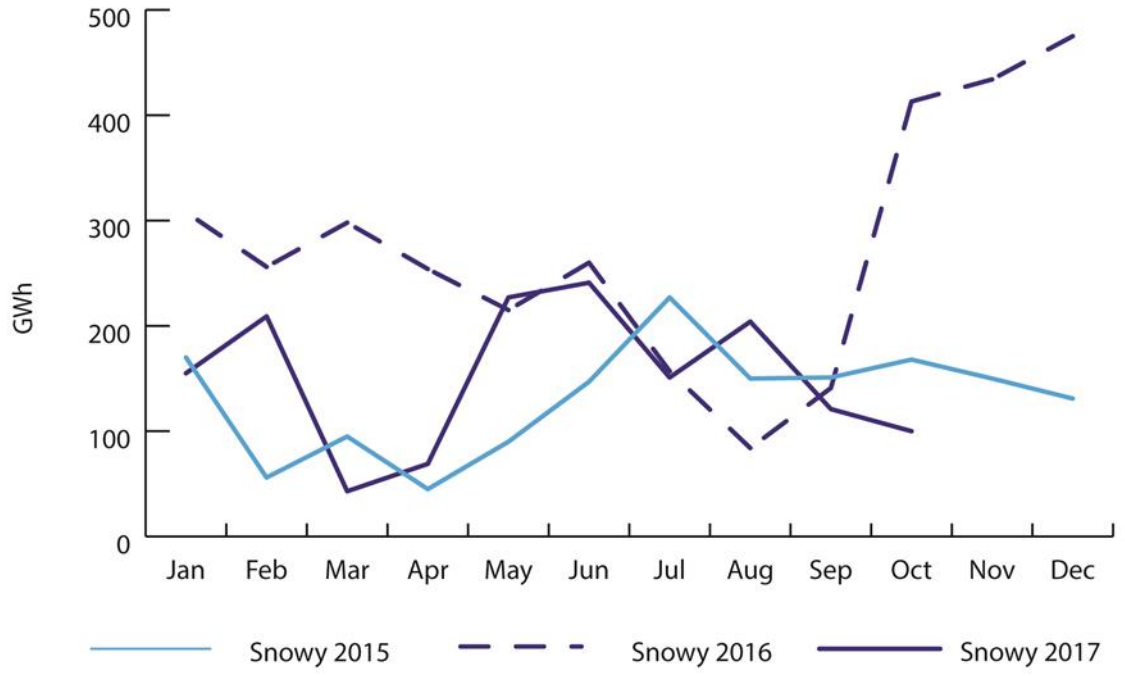
Figure 11 Snowy Hydro monthly average offered capacity, by price



Source AEMO; AER

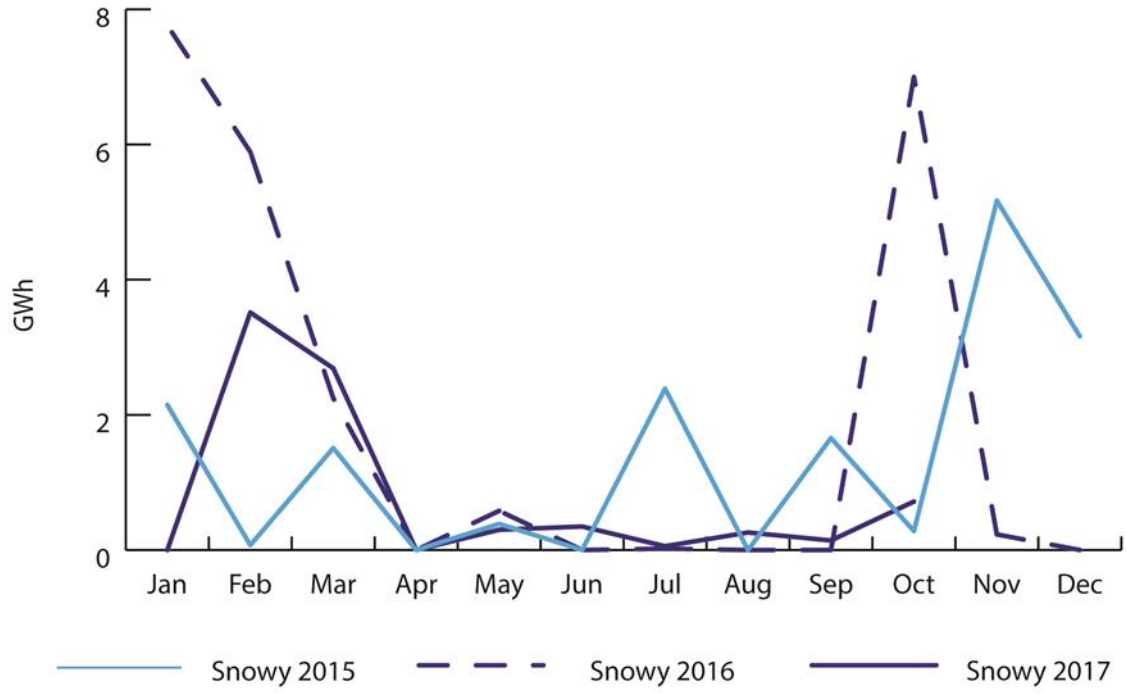
Generation output

Figure 12 Snowy Hydro monthly hydro NSW generation, GWh



Source AEMO; AER

Figure 13 Snowy Hydro monthly Gas NSW generation, GWh



Source AEMO; AER