# 13 – 19 November 2016

## Introduction

The AER is required to publish the reasons for significant variations between forecast and actual price and is responsible for monitoring activity and behaviour in the National Electricity Market. The Electricity Report forms an important part of this work. The report contains information on significant price variations, movements in the contract market, together with analysis of spot market outcomes and rebidding behaviour. By monitoring activity in these markets, the AER is able to keep up to date with market conditions and identify compliance issues.

## Spot market prices

Figure 1 shows the spot prices that occurred in each region during the week 13 – 19 November 2016. The spot price in New South Wales reached $11 700/MWh on 18 November triggering our NER reporting obligations. This report will be released before 18 January 2017.

### Figure 1: Spot price by region ($/MWh)

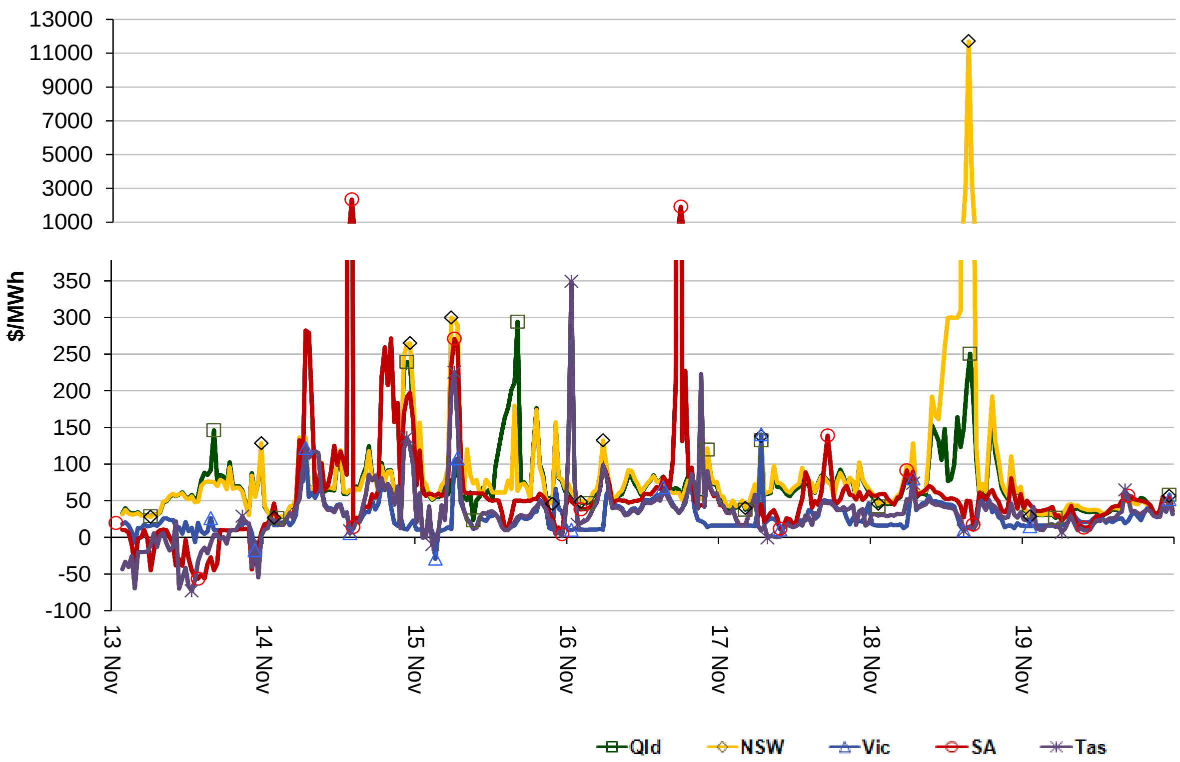
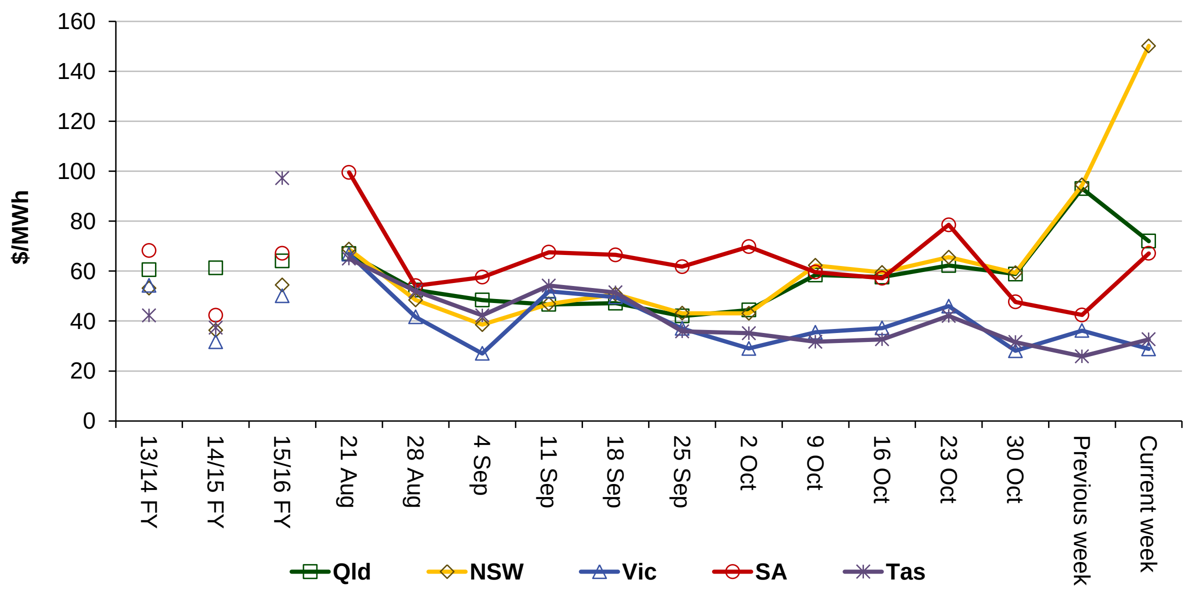



Figure 2 shows the volume weighted average (VWA) prices for the current week (with prices shown in Table 1) and the preceding 12 weeks, as well as the VWA price over the previous 3 financial years.

### Figure 2: Volume weighted average spot price by region ($/MWh)




### Table 1: Volume weighted average spot prices by region ($/MWh)

| Region | Qld | NSW | Vic | SA | Tas |
|---|---|---|---|---|---|
| Current week | 72 | 150 | 29 | 67 | 33 |
| 15-16 financial YTD | 43 | 44 | 38 | 62 | 47 |
| 16-17 financial YTD | 57 | 63 | 46 | 111 | 48 |

Longer-term statistics tracking average spot market prices are available on the AER website.

## Spot market price forecast variations

The AER is required under the National Electricity Rules to determine whether there is a significant variation between the forecast spot price published by the Australian Energy Market Operator (AEMO) and the actual spot price and, if there is a variation, state why the AER considers the significant price variation occurred. It is not unusual for there to be significant variations as demand forecasts vary and participants react to changing market conditions. A key focus is whether the actual price differs significantly from the forecast price either four or 12 hours ahead. These timeframes have been chosen as indicative of the time frames within which different technology types may be able to commit (intermediate plant within four hours and slow start plant within 12 hours).

There were 278 trading intervals throughout the week where actual prices varied significantly from forecasts. This compares to the weekly average in 2015 of 133 counts and the average in 2014 of 71. Reasons for the variations for this week are summarised in Table 2. Based on AER analysis, the table summarises (as a percentage) the number of times when the actual price differs significantly from the forecast price four or 12 hours ahead and the major reason for that variation. The reasons are classified as availability (which means that there is a change in the total quantity or price offered for generation), demand forecast inaccuracy, changes to network capability or as a combination of factors (when there is not one dominant reason). An instance where both four and 12 hour ahead forecasts differ significantly from the actual price will be counted as two variations.

**Table 2: Reasons for variations between forecast and actual prices**

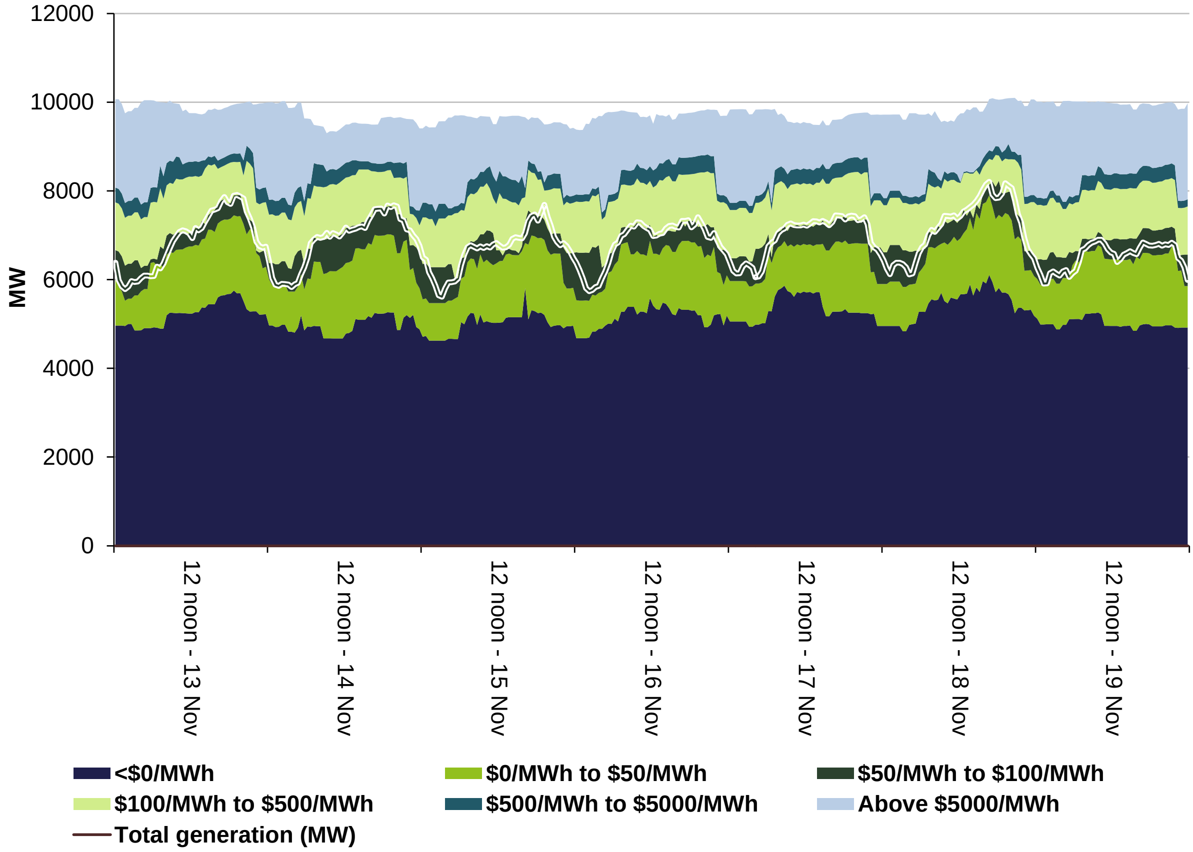
| | Availability | Demand | Network | Combination |
|---|---|---|---|---|
| % of total above forecast | 11 | 33 | 0 | 3 |
| % of total below forecast | 26 | 19 | 0 | 7 |

Note: Due to rounding, the total may not be 100 per cent.

## Generation and bidding patterns

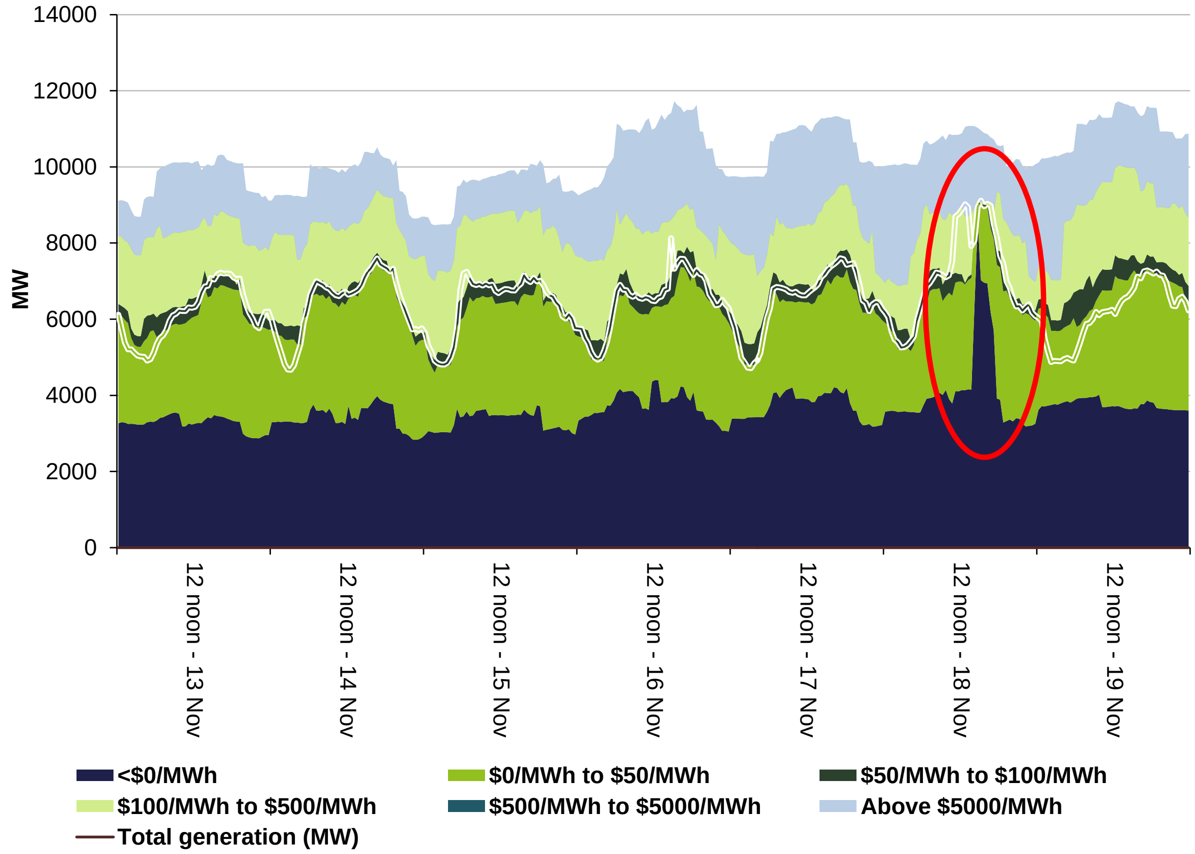
The AER reviews generator bidding as part of its market monitoring to better understand the drivers behind price variations. Figure 3 to Figure 7 show the total generation dispatched and the amounts of capacity offered within certain price bands for each 30 minute trading interval in each region.

**Figure 3: Queensland generation and bidding patterns**

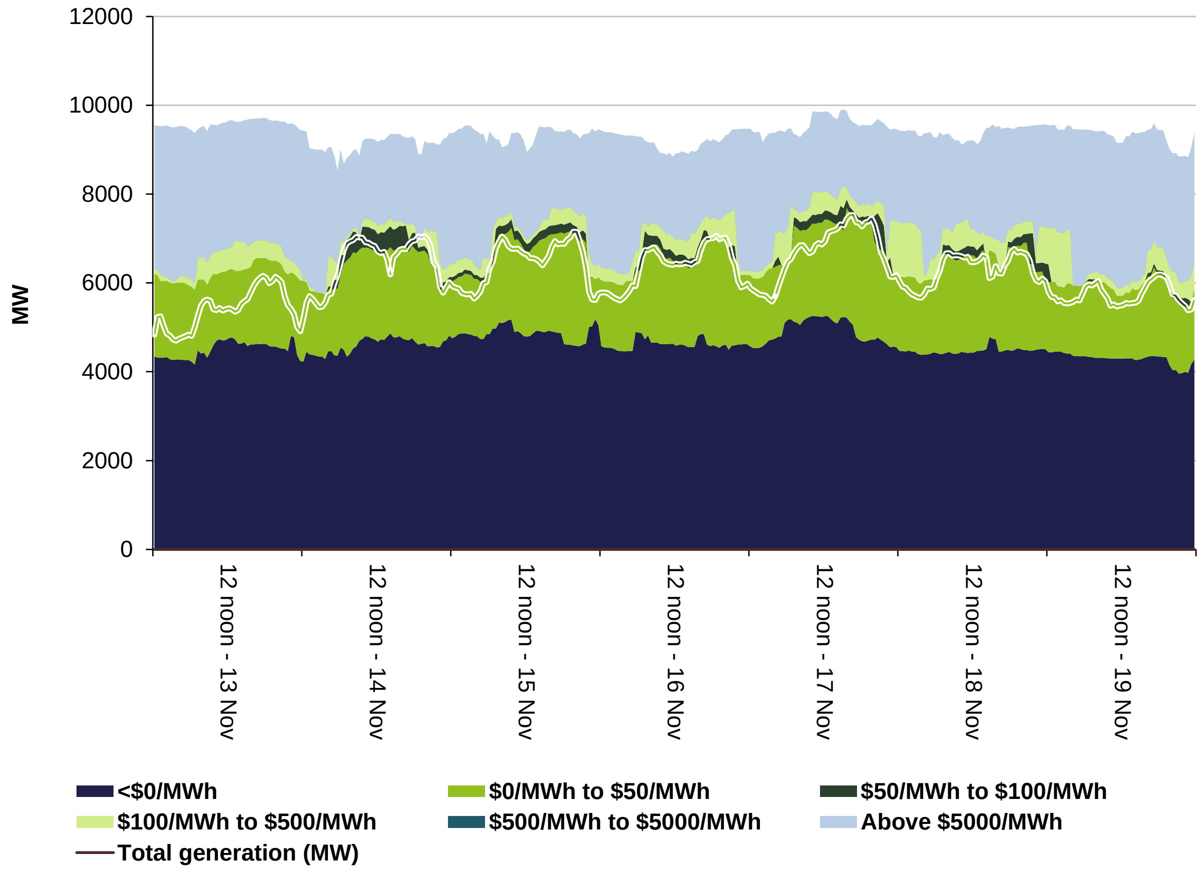



The red ellipse on Figure 4 encompasses the period during which the spot price reached $11 700/MWh. In accordance with clause 3.13.7 of the Electricity Rules, the AER will issue a separate report into the circumstances that led to the spot price exceeding $5000/MWh.

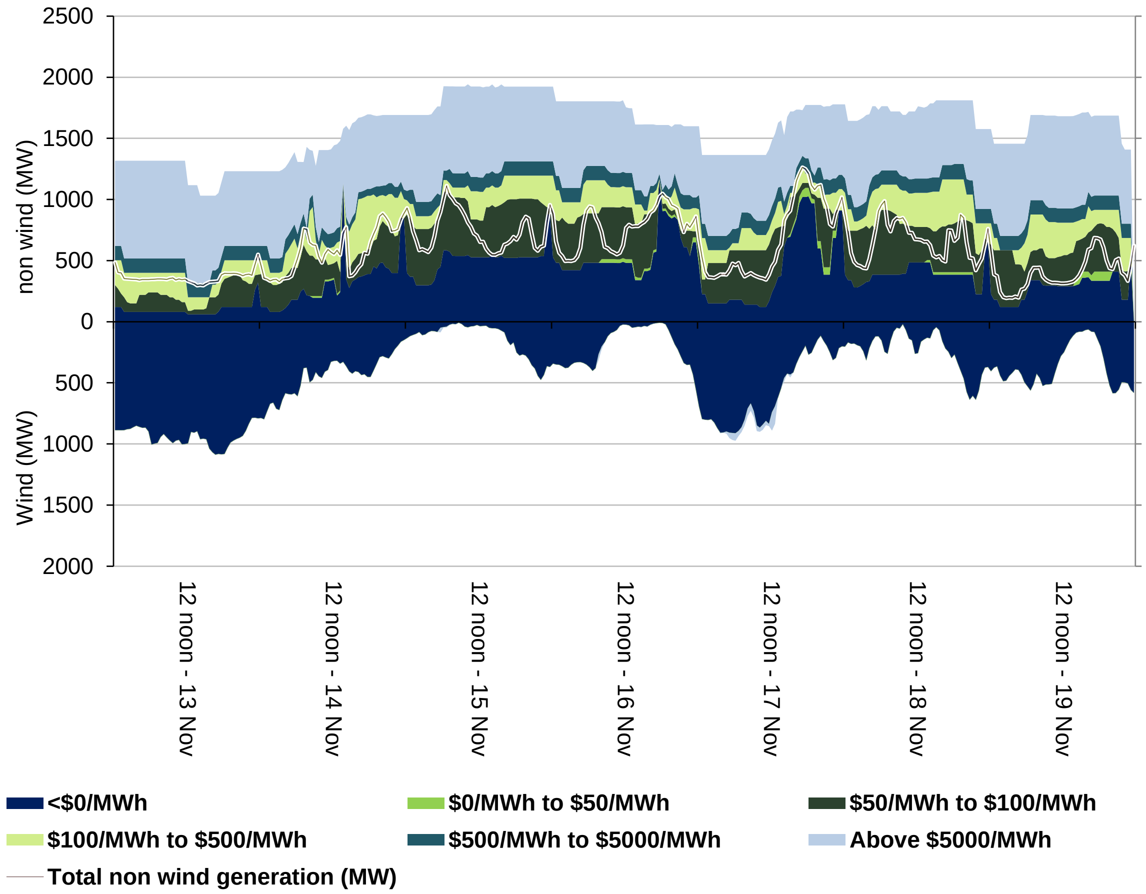
### Figure 4: New South Wales generation and bidding patterns



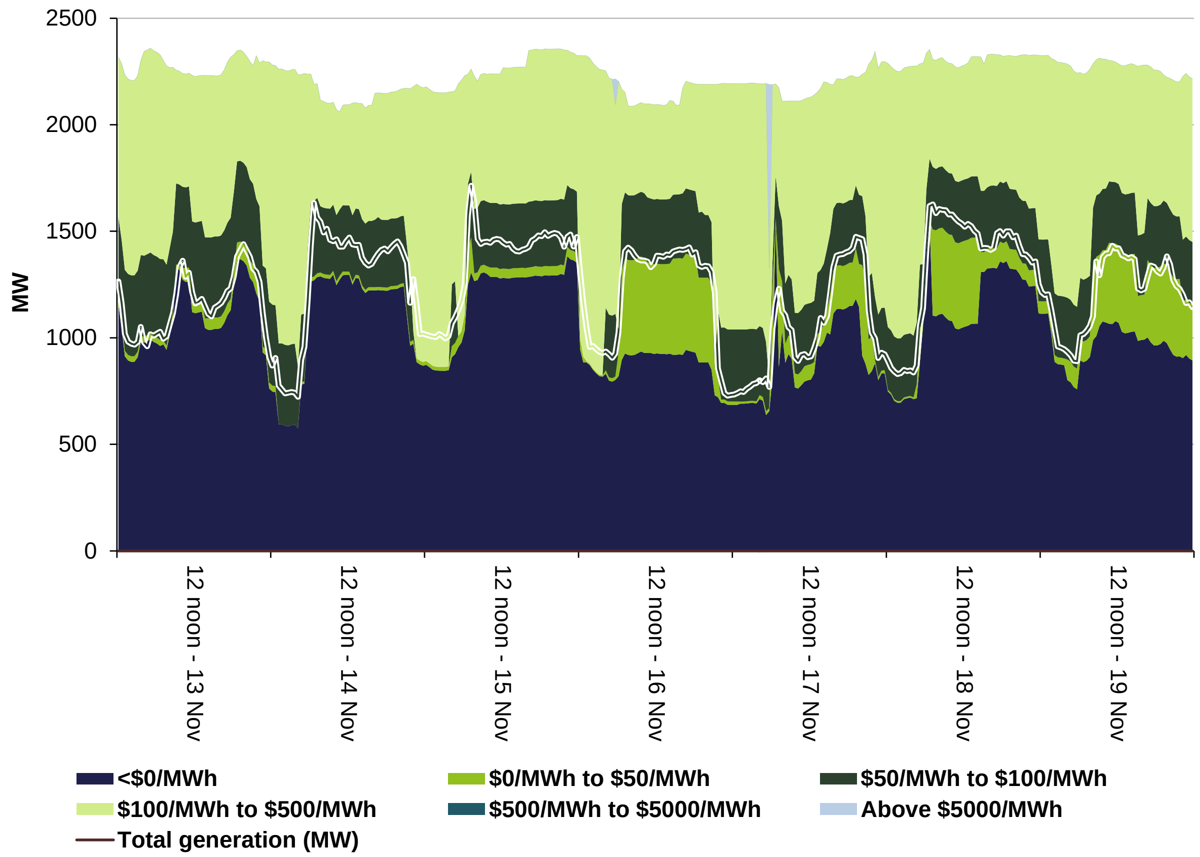

### Figure 5: Victoria generation and bidding patterns



## Figure 6: South Australia generation and bidding patterns




## Figure 7: Tasmania generation and bidding patterns



## Frequency control ancillary services markets

Frequency control ancillary services (FCAS) are required to maintain the frequency of the power system within the frequency operating standards. Raise and lower regulation services are used to address small fluctuations in frequency, while raise and lower contingency services are used to address larger frequency deviations. There are six contingency services:

- fast services, which arrest a frequency deviation within the first 6 seconds of a contingent event (raise and lower 6 second)
- slow services, which stabilise frequency deviations within 60 seconds of the event (raise and lower 60 second)
- delayed services, which return the frequency to the normal operating band within 5 minutes (raise and lower 5 minute) at which time the five minute dispatch process will take effect.

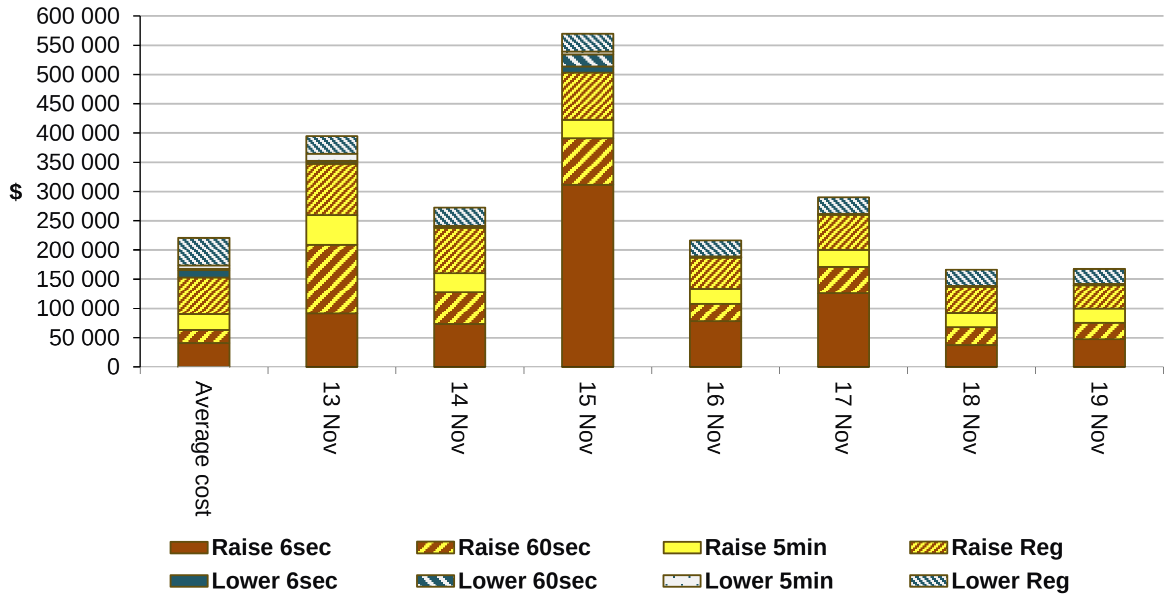
The Electricity Rules stipulate that generators pay for raise contingency services and customers pay for lower contingency services. Regulation services are paid for on a “causer pays” basis determined every four weeks by AEMO.

The total cost of FCAS on the mainland for the week was $1 542 000 or around half a per cent of energy turnover on the mainland.

The total cost of FCAS in Tasmania for the week was $534 500 or around 9 per cent of energy turnover in Tasmania.

Figure 8 shows the daily breakdown of cost for each FCAS for the NEM, as well as the average cost since the beginning of the previous financial year.

### Figure 8: Daily frequency control ancillary service cost




In Tasmania on 15 November 2016, the price of raise 6 second services increased above $5000/MW four separate times across the day due to the co-optimisation of the FCAS and energy markets.

# Detailed market analysis of significant price events

## Queensland

There were two occasions where the spot price in Queensland was greater than three times the Queensland weekly average price of $93/MWh and above $250/MWh.

### Tuesday, 15 November

### Table 3: Price, Demand and Availability

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 4.30 pm | 294.15 | 76.86 | 54.67 | 6717 | 7043 | 7059 | 9660 | 9659 | 10 042 |

Conditions at the time saw demand around 330 MW less than that forecast four hours ahead and available capacity was close to forecast.

At 4.20 pm demand increased by 165 MW, with no capacity priced between $400/MWh and $1400/MWh and a voltage stability constraint limiting generation on Kogan Creek and imports into Queensland, the price increased to $1400/MWh for one dispatch interval.

### Friday, 18 November

### Table 4: Price, Demand and Availability

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 4 pm | 250.50 | 90.03 | 199.99 | 6731 | 6656 | 6645 | 9789 | 9909 | 9750 |

Conditions at the time saw demand 75 MW higher than forecast and available capacity was 120 MW less than forecast four hours ahead.

This event coincided with a high price event in New South Wales. A constraint optimising flows from Victoria into New South Wales and from Queensland into New South Wales on QNI and Terranora interconnectors exporting was binding for much of the day. This contributed to demand in Queensland being met from generation priced at $260/MWh for 5 dispatch intervals.

## New South Wales

There were four occasions where the spot price in New South Wales was greater than three times the New South Wales weekly average price of $150/MWh and above $250/MWh.

### Friday, 18 November

**Table 5: Price, Demand and Availability**

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 3 pm | 2942.11 | 299.80 | 299.60 | 10 075 | 9956 | 9707 | 11 029 | 10 939 | 10 962 |
| 3.30 pm | 11 700.63 | 299.80 | 299.80 | 10 246 | 10 095 | 9858 | 10 999 | 10 976 | 10 996 |
| 4 pm | 3259.13 | 299.80 | 299.80 | 10 276 | 10 233 | 10 016 | 10 938 | 10 942 | 10 966 |
| 4.30 pm | 587.87 | 13 800.00 | 299.80 | 10 236 | 10 350 | 10 041 | 10 904 | 10 932 | 10 939 |

Across a series of rebids, participants shifted capacity from low to high prices while other participants rebid almost 3000 MW of capacity to the price floor, which caused a system normal constraint to bind. As a result, flow on the Vic – NSW interconnector went from importing 749 MW into New South Wales at 2.20 pm (when the constraint started to bind) to importing just 52 MW at the time of the first high price dispatch interval at 3.05 pm. This resulted in the dispatch price being above $1000/MWh for a majority of the time of high prices and close to the price cap on seven occasions resulting in one trading interval of $11 700/MWh at 3.30 pm.

In accordance with clause 3.13.7 of the Electricity Rules, the AER will issue a separate report into the circumstances that led to the spot price exceeding $5000/MWh. The high priced trading intervals that coincided with our reporting trigger will also be discussed in the $5000/MWh report.

## South Australia

There were eight occasions where the spot price in South Australia was greater than three times the South Australia weekly average price of $67/MWh and above $250/MWh.

On 11 November there was an unplanned outage of the Murraylink interconnector, which returned to service on 16 November. There was also a constraint managing the Rate of Change of Frequency on the Heywood interconnector (invoked in response to the Black System event in South Australia on 28 September 2016) which limited flows on the Heywood interconnector and forced generation on in South Australia to provide inertia.

### Monday, 14 November

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 7 am | 282.14 | 97.04 | 59.99 | 1358 | 1274 | 1251 | 1912 | 1912 | 1930 |
| 7.30 am | 279.09 | 124.62 | 79.99 | 1460 | 1336 | 1316 | 1707 | 1890 | 1910 |

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 2 pm | 2342.76 | 65.47 | 58.49 | 1227 | 1126 | 1095 | 1872 | 2033 | 1945 |
| 7.30 pm | 259.29 | 101.74 | 59.99 | 1477 | 1444 | 1420 | 2032 | 2134 | 2072 |
| 8.30 pm | 271.34 | 128.79 | 59.99 | 1518 | 1466 | 1473 | 1972 | 2068 | 2028 |

For the 7 am and 7.30 am prices there was only a small amount of capacity priced between $125/MWh and the price cap. This meant any small change to demand or supply could lead to potentially material price variation. At 7.20 am, with generation trapped in FCAS or at their max avail, a small increase in demand caused the dispatch price to reach $500/MWh. The price remained around $300/MWh until 7.50 am.

For the 2 pm trading interval, conditions at the time saw demand around 100 MW greater than forecast four hours ahead and available capacity was around 160 MW lower than forecast four hours ahead. At 1.35 pm, a combination of a small increase in demand, the V^S_NIL_SA_RECLASS constraint binding, (this constraint limits wind generation from four wind farms north of Adelaide following the September 28 black system in South Australia) and cheaper priced generation ramp rate limited, saw the dispatch price increased to $14 000/MWh. In response to the high price, large amounts of capacity were rebid to the price floor. This saw the price decrease to under $80/MWh for the remainder of the trading interval.

Over the 7.30 pm and 8.30 pm trading intervals, demand was between 33 MW and 52 MW higher than forecast. The V^S_NIL_SA_RECLASS constraint again limited local wind generation, hence small changes in demand resulted dispatch prices between $300/MWh and $500/MWh for a majority of the time.

### Tuesday, 15 November

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 6.30 am | 271.00 | 223.92 | 91.85 | 1457 | 1348 | 1301 | 1974 | 1987 | 2049 |
| 7 am | 262.52 | 242.10 | 214.96 | 1560 | 1445 | 1398 | 1974 | 1980 | 2043 |

The 6.30 am and 7 am prices were close to forecast.

### Wednesday, 16 November

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 6 pm | 1909.80 | 299.69 | 59.99 | 1556 | 1480 | 1453 | 1618 | 1638 | 1822 |

Conditions at the time saw demand 76 MW higher than that forecast four hours ahead. Over the half hour period, wind output was below 50 MW, Murraylink was not in service and Heywood was importing at its nominal maximum. At 5.50 pm there was only around 100 MW of capacity priced between $299/MWh and $10 400/MW and a number of generators at their max avail. A small increase in demand which had to be met by high priced generation saw the dispatch price increase to $10 549/MWh. Rebidding of large amounts of generation to the price floor, effective from 5.55 pm, saw the price decrease to around $36/MWh and remain there for the rest of the trading interval.

## Tasmania

There was one occasion where the spot price in Tasmania was greater than three times the Tasmania weekly average price of $33/MWh and above $250/MWh.

**Wednesday, 16 November**

| Time | Price ($/MWh) | | | Demand (MW) | | | Availability (MW) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 1 am | 349.11 | 29.38 | 25.14 | 978 | 961 | 944 | 2324 | 2328 | 2323 |

Conditions at the time saw demand and availability close to that forecast four hours ahead.

A constraint managing an outage in New South Wales was forcing flow across Basslink from Tasmania into Victoria. At 12.23 pm, effective from 12.30 pm, Hydro Tasmania rebid 350 MW of generation from less than $122/MWh to $349/MWh. With much of the local generation trapped or stranded in FCAS, demand could only be met with higher priced generation. This saw the price stay around $350/MWh for the entire trading interval.

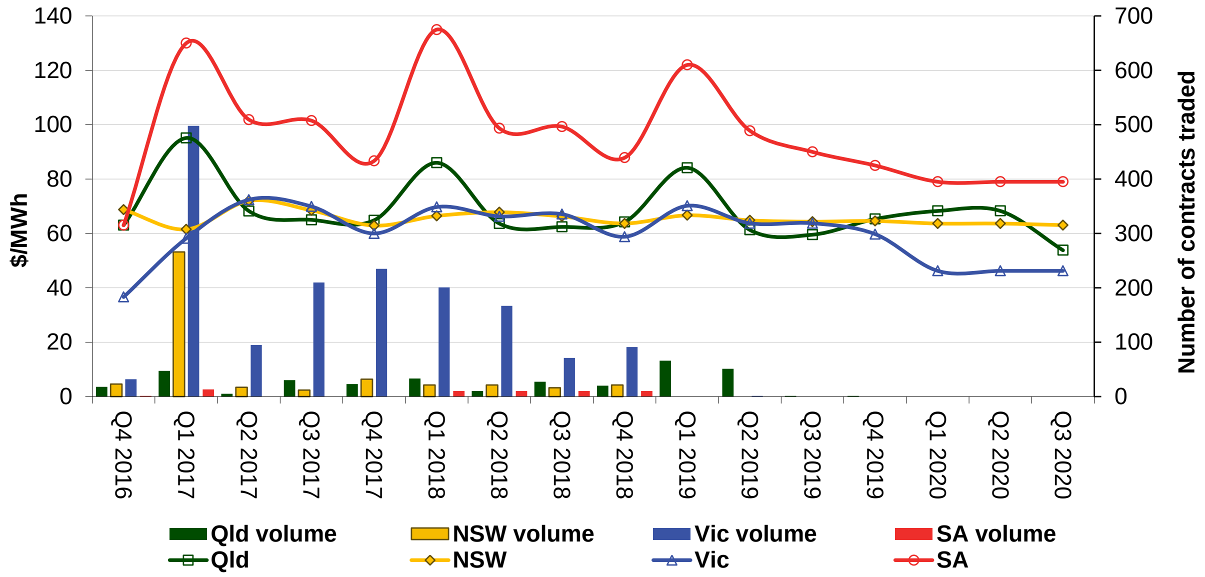
### Table 6: Relevant rebidding in Tasmania for the 1 am trading interval

| Submitted time | Time effective | Participant | Station | Rebid (MW) | From (($/MWh ) | To (($/MWh ) | Rebid reason |
|---|---|---|---|---|---|---|---|
| 12.23 am | 12.30 am | Hydro Tasmania | Gordon | 350 | <122 | 349 | 0020A CONSTRAINT IN TRANSMISSION DIFFERENT FROM EXPECTED |

## Financial markets

Figure 9 shows for all mainland regions the prices for base contracts (and total traded quantities for the week) for each quarter for the next four financial years. There was a material number of trades recorded during the week across all jurisdictions but most notably in Victoria. Since the announcement of the retirement of Hazelwood Power Station in Victoria which will occur in early 2017, Q2 2017 contract prices have increased on trade in all regions.

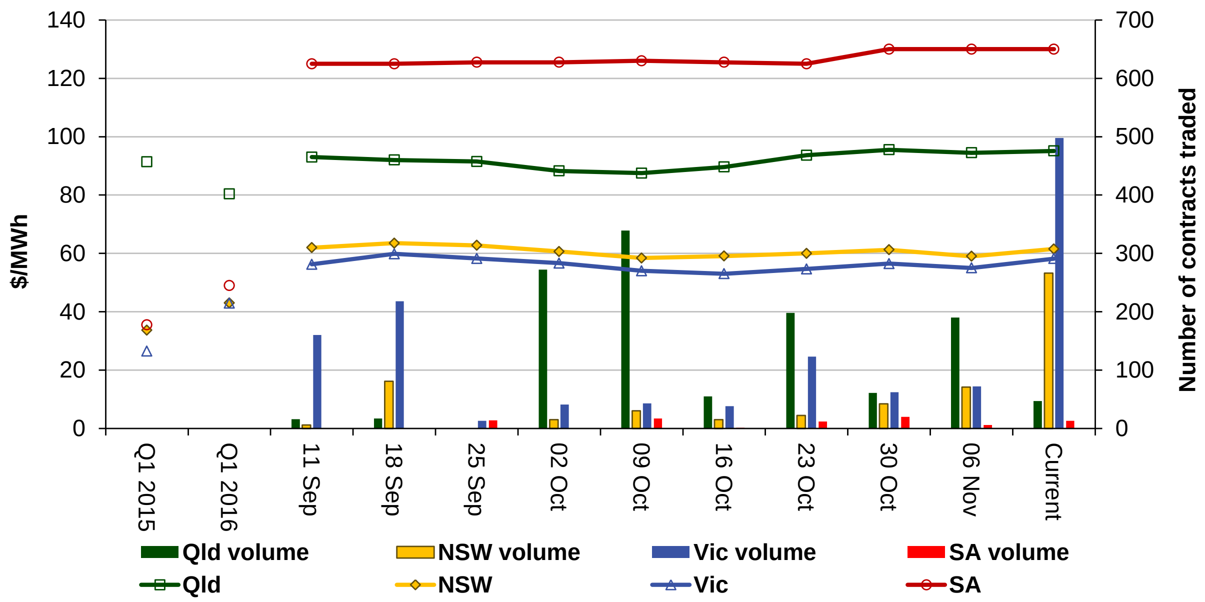
## Figure 9: Quarterly base future prices Q4 2016 – Q3 2020




Source. ASXEnergy.com.au

Figure 10 shows how the price for each regional quarter 1 2017 base contract has changed over the last 10 weeks (as well as the total number of trades each week). The closing quarter 1 2015 and quarter 1 2016 prices are also shown. The AER notes that data for South Australia is less reliable due to very low numbers of trades.

## Figure 10: Price of Q1 2017 base contracts over the past 10 weeks (and the past 2 years)



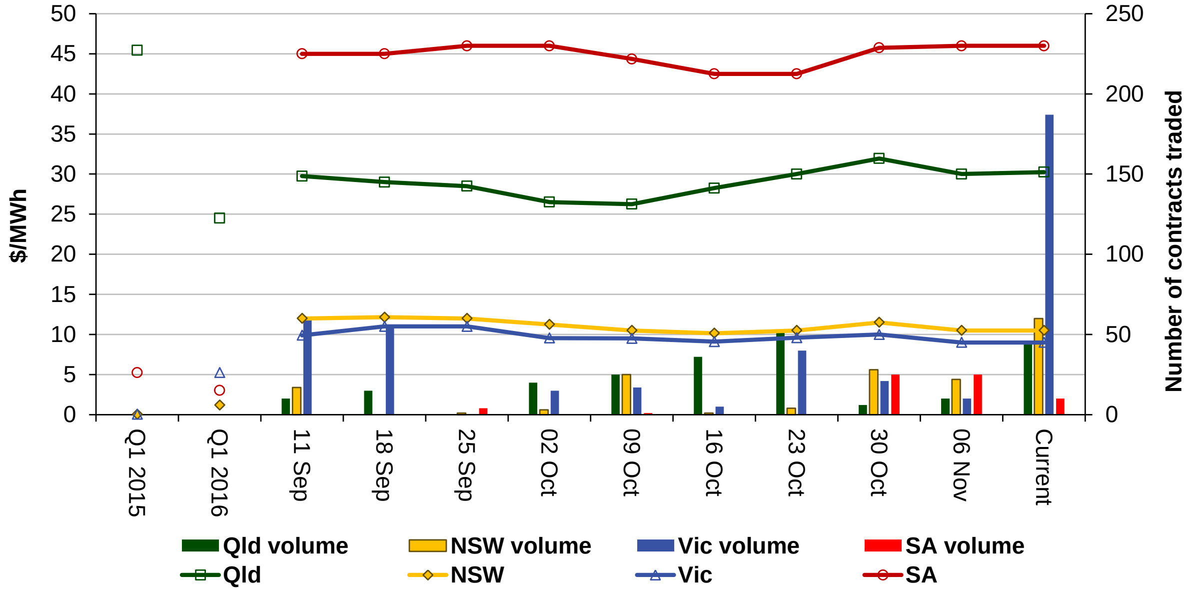

Note. Base contract prices are shown for each of the current week and the previous 9 weeks, with average prices shown for periods 1 and 2 years prior to the current year.

Source. ASXEnergy.com.au

Prices of other financial products (including longer-term price trends) are available in the Industry Statistics section of our website.

Figure 11 shows how the price for each regional Quarter 1 2017 cap contract has changed over the last 10 weeks (as well as the total number of trades each week). The closing quarter 1 2015 and quarter 1 2016 prices are also shown.

## Figure 11: Price of Q1 2017 cap contracts over the past 10 weeks (and the past 2 years)




Source. ASXEnergy.com.au

**Australian Energy Regulator**
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