

Electricity spot prices above $5000/MWh

Queensland,
14 January 2017

10 March 2017

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Amendment Record

|  |  |  |
| --- | --- | --- |
| Version | Date | Pages |
| 1 version for publication | 10 March 2017 | 27 |
|  |  |  |

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# Introduction

The AER is required to publish a report whenever the electricity spot price exceeds $5000/MWh.[[1]](#footnote-1) The report:

* describes the significant factors contributing to the spot price exceeding $5000/MWh, including withdrawal of generation capacity and network availability;
* assesses whether rebidding contributed to the spot price exceeding $5000/MWh;
* identifies the marginal scheduled generating units; and
* identifies all units with offers for the trading interval equal to or greater than $5000/MWh and compares these dispatch offers to relevant dispatch offers in previous trading intervals.

# Summary

On Saturday 14 January 2017, the spot price for electricity in Queensland exceeded $5000/MWh for four 30-minute trading intervals. The price reached $12 642/MWh, $8595/MWh, $9127/MWh and $10 417/MWh for the 4.30 pm, 5 pm, 5.30 pm and 7 pm trading intervals respectively. Prices over $12 500/MWh were forecast twelve hours ahead for the 4.30 pm and 5 pm trading intervals.

14 January was the sixth consecutive day of temperatures above 30 degrees, with the temperature in Brisbane reaching 35 degrees, slightly above forecast. Maximum demand during the high-price periods was close to forecast and reached around 8664 MW at 5.30 pm, a record for weekend demand[[2]](#footnote-2).

In the four hours leading up to the high price period, around 150 MW of generation was rebid unavailable, primarily due to the impact of the high temperatures. Most of this generation capacity was offered at low prices. Demand was around 200 MW lower than forecast which, in part, offset the impact of the reduction in capacity.

AEMO also produces a series of price forecast sensitivities that show potential price outcomes in response to a range of levels of demand changes. For a majority of the afternoon, these sensitivity forecasts showed that an increase in demand of 100 MW would result in the price exceeding $12 500/MWh. A decrease of 100 MW of available generation or if generators rebid capacity from low prices to high prices would have a similar result.

Over 200 MW of capacity was rebid from low to high prices for each high priced period, which contributed to the price outcomes.

As a result prices on the day varied significantly whenever there were relatively small changes in demand, repricing of capacity through rebidding or reductions in generator capacity due to the effects of high temperature.

# Analysis

Table 1 shows the actual and forecast spot price, demand and generator availability for each high priced trading interval. The spot price in Queensland exceeded $5000/MWh for the 4.30 pm, 5 pm, 5.30 pm and 7 pm trading intervals (in bold). Other trading intervals associated with the same period are included in this report as they breached our reporting threshold and were caused by similar reasons.

The table shows high prices were forecast twelve hours ahead for the 4.30 pm and 5 pm trading intervals. The 5.30 pm and 7 pm trading intervals were not forecast either twelve or four hours ahead. For a majority of the time, forecast price sensitivities, published by AEMO, showed that a 100 MW change in demand, availability or rebidding from low to high prices would result in the price exceeding $12 500/MWh.[[3]](#footnote-3)

Demand was close to forecast and set a new weekend record maximum demand. Generator available capacity in Queensland was slightly lower than forecast and given the price sensitives this reduction contributed to higher prices.

Table 1: Actual and forecast spot price, demand and available capacity

| Trading interval | 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 |
| 1.30 pm | 2381 | 274 | 262 | 8105 | 8140 | 7915 | 10 773 | 10 942 | 11 052 |
| 2.00 pm | 255 | 274 | 262 | 8113 | 8320 | 8043 | 10 787 | 10 942 | 11 052 |
| 2.30 pm | 2412 | 254 | 262 | 8140 | 8430 | 8177 | 10 831 | 11 009 | 11 064 |
| 3.00 pm | 2277 | 150 | 262 | 8291 | 8510 | 8294 | 10 719 | 10 997 | 11 064 |
| 3.30 pm | 2453 | 150 | 310 | 8360 | 8543 | 8441 | 10 680 | 11 034 | 11 064 |
| 4.00 pm | 2448 | 329 | 2150 | 8473 | 8646 | 8546 | 10 804 | 10 989 | 11 064 |
| **4.30 pm** | **12 642** | **2150** | **13 800** | **8559** | **8770** | **8717** | **10 787** | **10 989** | **11 064** |
| **5.00 pm** | **8595** | **12 519** | **13 800** | **8588** | **8873** | **8784** | **10 802** | **10 989** | **11 104** |
| **5.30 pm** | **9127** | **2150** | **2150** | **8664** | **8794** | **8682** | **10 812** | **10 967** | **11 104** |
| 6.00 pm | 2376 | 150 | 2150 | 8547 | 8607 | 8617 | 10 810 | 10 947 | 11 106 |
| 6.30 pm | 4209 | 99 | 2150 | 8468 | 8417 | 8580 | 10 835 | 10 851 | 11 112 |
| **7.00 pm** | **10 417** | **99** | **2150** | **8470** | **8355** | **8573** | **10 838** | **10 822** | **11 115** |
| 7.30 pm | 474 | 99 | 300 | 8542 | 8389 | 8671 | 10 868 | 10 829 | 11 154 |
| 8.00 pm | 2398 | 99 | 13 800 | 8535 | 8335 | 8563 | 10 892 | 10 857 | 10 982 |
| 8.30 pm | 518 | 254 | 1406 | 8468 | 8219 | 8405 | 10 915 | 10 870 | 10 921 |

## Sensitivities, Rebidding and the Supply Curve

This section discusses changes to the generator offered prices and capacity and market demand conditions relevant to the high price periods.

### Price sensitivities

Figure 1 compares the actual spot price in Queensland (solid orange line), the four hour price forecast if demand increased by 100 MW (blue dashed line) and if demand decreased by 100 MW (dashed red line). These price sensitivities are published by AEMO at the same time as forecast prices and provide an indicator of price outcomes to market change.

Figure 1: Four hours ahead Queensland price sensitivities, considering a 100 MW change



Figure 1 shows that conditions in Queensland could be volatile; an increase or decrease of 100 MW, as a result of small changes in market availability, rebids or demand would significantly impact on price after midday. On the day, the Queensland region saw a reduction of low priced available capacity and rebidding capacity from low to high prices (increasing the price) and a lower demand forecast (reducing the price).

### Rebidding

There was significant rebidding of capacity from low to high prices which contributed to the high price trading intervals.

While the rebids did not set price, the removal of lower priced capacity meant that generation had to be met by higher priced capacity.

Within four hours of dispatch a number of participants rebid, which either removed capacity or shifted capacity from low to high prices and reduced the amount of cheaper priced capacity available.

Figure 2 summarises the changes in generation made available to the market by generator rebids submitted within four hours of dispatch and effective for the trading intervals with a spot price above $5000/MWh. Areas above the horizontal axis represent capacity rebid from low to high prices (striped blocks) or capacity added in (solid blocks). Areas below the axis represent capacity rebid from high to low prices (striped blocks) and capacity removed (solid blocks).

Figure 2: Rebidding to high/low prices and capacity removed/added, by trading interval



To understand the graph, take the example for the 4.30 pm trading interval:

* CS Energy (Gladstone) rebid 120 MW of capacity (striped green) from low to high prices
* Stanwell (Tarong) rebid 90 MW of capacity (striped dark blue) from low to high prices.
* Callide (Callide C) rebid 106 MW of capacity (striped pink) from low to high prices.
* Alinta Energy (Braemar A) rebid 7 MW of capacity (striped light purple) from low to high prices
* Arrow Energy (Braemar 2) rebid 5 MW of capacity (striped brown) from low to high prices
* ERM Power (Oakey) rebid 50 MW of capacity (striped light blue) from high to low prices
* Millmerran (Millmerran) removed 90 MW of capacity (solid light red)
* CS Energy (Kogan Creek) removed 65 MW of capacity (solid light orange)
* CS Energy (Callide B) removed 35 MW of capacity (solid light purple)
* ERM Power (Oakey) removed 10 MW of capacity (solid orange)

Under the Rules if a rebid is made within the late rebidding period the AER may ask participants to provide contemporaneous records of the reasons for the rebid.

### Supply Curve

This section examines actual and forecast supply curves that existed as a result of the rebidding outlined in section 3.1.2 for the 4.30 pm trading interval (when the spot price reached its maximum for the day of $12 642/MWh). Supply curves provide a visual representation of the generation capacity available with respect to the price the capacity is being offered at.

Figure 3 shows the actual supply curve for the 4.30 pm trading interval (denoted by the solid green line), the supply curve forecast four hours ahead (denoted by the solid red line). The supply curves were derived by summing the available capacity in each price band for all generators in Queensland.

Also shown is Queensland demand less imports (denoted by the dashed lines), that is the effective target output from the generators in the region. The interception of the effective demand line and the supply curves provides an indication of the regional price.

Figure 3: Forecast and actual supply curves for 4.30 pm



Figure 3 shows the effect of rebidding and removal of capacity on the supply curve by the shift in the supply curve to the left of that forecast four hours earlier. Demand did not materially change from that forecast four hours ahead (the two dashed lines are almost on top of each other). The forecast price went from around $2200/MWh (where the red forecast supply curve and forecast effective demand intersect) to the price cap (where the green supply curve and effective demand intersect).

The graph shows that with such a steep supply curve any small increase in demand, change in flows or a reduction in generator availability would lead to large changes in price.

Appendix B details the generators involved in setting the price during the high-price periods, and how that price was determined by the market systems. The closing bids for all participants in Queensland with capacity priced at or above $5000/MWh for the high-price periods are set out in Appendix C.

## Demand

The maximum temperature in Brisbane was 35 degrees, slightly above the forecast prepared by the Bureau of Meteorology. This was the sixth consecutive day of temperatures above 30 degrees. While these temperature conditions resulted in high levels of demand, it was short of record levels and less than the 10% probability of exceedance maximum demand expected in the AEMO National Electricity Forecasting Report.[[4]](#footnote-4)

AEMO uses a range of demand definitions for different purposes - the two discussed in this report are total demand and native demand.[[5]](#footnote-5) Total demand is used by the national electricity market dispatch engine when determining price and is the demand against which generator targets for scheduled and semi-scheduled are calculated. The industry statistics published by the AER on its website refers to native demand which includes non-scheduled and exempt generation as the measure of record demand as it is best reflects actual consumption in a region.[[6]](#footnote-6)

Maximum total demand for the day reached 8664 MW at 5.30 pm. The record maximum total demand for Queensland is 9097 MW recorded on 1 February 2016. The maximum native demand on the day was 8824 MW at 5.30 pm, record native demand of 9260 MW was recorded on 1 February 2016. Electricity demand related to the extraction of coal seam gas over the last few years has gown materially in Queensland and is estimated, at this stage, to be in the order of 620 MW.[[7]](#footnote-7)

Figure 4 shows actual total demand (blue line) and forecast total demand (red line), prepared four hours before dispatch. The graph also shows the highest recorded total demand (green line).

Figure 4: Actual and forecast demand



The light shaded sections of the graph highlight the trading intervals where the spot price exceeded $5000/MWh. As can be seen, actual total demand was close to forecast.

Figure 5 shows 5-minute demand and price over the high price period. The figure shows that, consistent with the vertical supply curve discussed in section 3.1.2, small increases in 5-minute demand coincided with increases in the 5-minute dispatch price. We understand there are a number of large industrial customers in Queensland that respond to high actual and forecast prices by reducing their electricity consumption. Once these customers have reduced their demand in response to a price it may take some time to restart their process and they may also elect to suspend their operation for longer periods rather than repeated start and stop cycles. This may account for some of the demand variability shown in the 5 minute demand in Figure 5.

Figure 5 Queensland 5-minute price and demand graph



## Network Availability

Net imports into Queensland were limited to around 150 MW, 450-500 MW lower than the nominal limit of 600 MW, during the time of high prices and were close to forecast.

Table 2 shows the net import limit and the actual imports into Queensland from New South Wales.

Table 2: Actual and forecast network capability

| Trading interval | Imports (MW) | Import limit (MW) |
| --- | --- | --- |
|  | Actual | 4 hr forecast | 12 hr forecast | Actual | 4 hr forecast | 12 hr forecast |
| 1.30 pm | 126 | 157 | 138 | 151 | 157 | 138 |
| 2 pm | 137 | 133 | 137 | 149 | 133 | 137 |
| 2.30 pm | 20 | 102 | 129 | 129 | 102 | 129 |
| 3 pm | 36 | 151 | 128 | 115 | 151 | 128 |
| 3.30 pm | 57 | 131 | 121 | 112 | 131 | 121 |
| 4 pm | 104 | 116 | 92 | 150 | 116 | 92 |
| **4.30 pm** | **166** | **124** | **93** | **166** | **124** | **93** |
| **5 pm** | **147** | **115** | **92** | **147** | **115** | **92** |
| **5.30 pm** | **138** | **103** | **95** | **138** | **103** | **95** |
| 6 pm | 88 | 97 | 97 | 144 | 97 | 97 |
| 6.30 pm | 106 | 117 | 105 | 142 | 117 | 105 |
| **7 pm** | **157** | **152** | **110** | **157** | **152** | **110** |
| 7.30 pm | 160 | 218 | 131 | 160 | 218 | 131 |
| 8 pm | 136 | 235 | 154 | 174 | 235 | 154 |
| 8.30 pm | 158 | 239 | 197 | 162 | 239 | 197 |

Net Imports into Queensland were limited to around 150 MW by system normal constraints.

Constraints on the New South Wales interconnector (QNI) designed to avoid the overload of the Liddell to Muswellbrook line and potential voltage collapse in northern New South Wales on the loss of the largest generator in Queensland (in this case Kogan Creek Power Station), were limited to around 250 MW.

Constraints on Terranora were forcing flow into New South Wales at around 100 MW for the duration of high prices. The flow from Queensland to New South Wales was counter to the prices in those regions.

Australian Energy Regulator

March 2017

Appendix A: Significant Rebids

The rebidding tables highlight the relevant rebids submitted by generators that impacted on market outcomes during the time of high prices. It details the time the rebid was submitted and used by the dispatch process, the capacity involved, the change in the price of the capacity was being offered and the rebid reason.

Table 3: Significant rebids for 4.30 pm

| Submit time | Time effective | Participant | Station | Capacity rebid(MW) | Price from($/MWh) | Price to ($/MWh) | Rebid reason |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 12.47 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1246P ambient conditions-vacuum unloading-SL |
| 12.51 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1250P ambient conditions-vacuum unloading-SL |
| 1.11 pm |  | CS Energy | Kogan Creek | -25 | 14 | N/A | 1311P technical issues-boiler o2 stability limit-SL |
| 1.15 pm |  | CS Energy | Kogan Creek | -10 | 14 | N/A | 1315P technical issues-FD fan limited-SL |
| 1.40 pm |  | CS Energy | Kogan Creek | -30 | 14 | N/A | 1339P technical issues-boiler o2 stability limit-SL |
| 1.50 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:49 P: condensate polisher inlet temperature |
| 1.51 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:51 P: condensate polisher inlet temperature |
| 1.56 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1355P ambient conditions-vacuum unloading-SL |
| 2.02 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:02 P: condensate polisher inlet temperature |
| 2.04 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:03 P: condensate polisher inlet temperature |
| 2.07 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:07 P: condensate polisher inlet temperature |
| 2.28 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:28 P: plant limitation, condensate |
| 2.45 pm |  | Arrow Energy | Braemar 2 | 155 | 2150 | 14 000 | 1429P unscheduled unit outage - SL |
| 2.48 pm |  | Stanwell Corporation | Tarong | 90 | <61 | 14 000 | 1447A material change qld generation: mt stuart online |
| 3.17 pm |  | Callide Power Trading | Callide C | 106 | -1000 | 14 000 | 1516A MPC in P5MIN RRP SL |
| 3.18 pm |  | Arrow Energy | Braemar 2 | 135 | 14 000 | <85 | 1516P revised outage schedule: early RTS - fire alarm reset SL |
| 3.47 pm |  | CS Energy | Callide B | -5 | 17 | N/A | 1547P ambient conditions-vacuum unloading-SL |
| 3.52 pm |  | CS Energy | Gladstone | 120 | <295 | 14 000 | 1551A dispatch price $172.53 lower than 5MIN forecast-of $12518.69-SL |
| 3.59 pm | 4.10 pm | Alinta Energy | Braemar A | 7 | 75 | 14 000 | 1550~P~revise unit output based on ambient conditions and gas linepack management~ |
| 4.01 pm | 4.10 pm | ERM Power | Oakey | 50 | 12 519 | -1000 | A 1600 1600 increase in qld RRP FOR 1605: $13,650.01 DISPATCH@1600 VS $299.45 PD5@1550 |
| 4.03 pm | 4.10 pm | Arrow Energy | Braemar 2 | 15 | >13 641 | -1000 | 1600A qld price higher than forecast SL |
| 4.07 pm | 4.15 pm | ERM Power | Oakey | -10 | -1000 | N/A | P 1606 1605 ambient conditions - match bid to expected unit output |

Table 4: Significant energy rebids for 5pm

| Submit time | Time effective | Participant | Station | Capacity rebid(MW) | Price from($/MWh) | Price to ($/MWh) | Rebid reason |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1.11 pm |  | CS Energy | Kogan Creek | -25 | 14 | N/A | 1311P technical issues-boiler o2 stability limit-SL |
| 1.15 pm |  | CS Energy | Kogan Creek | -10 | 14 | N/A | 1315P technical issues-fd fan limited-SL |
| 1.40 pm |  | CS Energy | Kogan Creek | -30 | 14 | N/A | 1339P technical issues-boiler o2 stability limit-SL |
| 1.50 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:49 P: condensate polisher inlet temperature |
| 1.51 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:51 P: condensate polisher inlet temperature |
| 1.56 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1355P ambient conditions-vacuum unloading-SL |
| 2.02 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:02 P: condensate polisher inlet temperature |
| 2.04 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:03 P: condensate polisher inlet temperature |
| 2.07 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:07 P: condensate polisher inlet temperature |
| 2.28 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:28 P: plant limitation, condensate |
| 2.45 pm |  | Arrow Energy | Braemar 2 | 155 | 2150 | 14 000 | 1429P unscheduled unit outage - SL |
| 3.17 pm |  | Callide Power Trading | Callide C | 106 | -1000 | 14 000 | 1516A MPC IN P5MIN RRP SL |
| 3.18 pm |  | Arrow Energy | Braemar 2 | 135 | 14 000 | <85 | 1516P revised outage schedule: early RTS - fire alarm reset SL |
| 3.47 pm |  | CS Energy | Callide B | -5 | 17 | N/A | 1547P ambient conditions-vacuum unloading-SL |
| 3.59 pm |  | Alinta Energy | Braemar A | 6 | 75 | 14 000 | 1550~P~revise unit output based on ambient conditions and gas linepack management~ |
| 4.18 pm |  | CS Energy | Gladstone | 120 | <295 | 14 000 | 1618A dispatch price lower than 30min forecast-SL |
| 4.26 pm | 4.35 pm | Arrow Energy | Braemar 2 | 15 | 13 641 | -1000 | 1625A variance between 5 min and 30 min PD 17:30 TI SL |
| 4.31 pm | 4.40 pm | CS Energy | Gladstone | 30 | <60 | 14 000 | 1631P portfolio rearrangement due to-KPP MILL RTS-SL |
| 4.31 pm | 4.40 pm | CS Energy | Kogan Creek | 20 | N/A | 14 | 1630P MILL RTS-SL |
| 4.36 pm | 4.45 pm | ERM Power | Oakey | 40 | 12 519 | -1000 | A 1635 1635 decrease in qld dispatchable generation for 1640: 8,441MW DISPATCH@1635 VS 8,660MW PD5@1555 |
| 4.42 pm | 4.50 pm | Callide Power Trading | Callide C | 50 | 14 000 | -1000 | 1639F maximising output at MPC SL |
| 4.52 pm | 5.00 pm | CS Energy | Kogan Creek | 10 | N/A | 14 | 1650P technical issues-boiler o2 limit improvement-SL |

Table 7: Significant energy rebids for 5.30pm

| Submit time | Time effective | Participant | Station | Capacity rebid(MW) | Price from($/MWh) | Price to ($/MWh) | Rebid reason |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1.40 pm |  | CS Energy | Kogan Creek | -30 | 14 | N/A | 1339P technical issues-boiler o2 stability limit-SL |
| 1.50 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:49 P: condensate polisher inlet temperature |
| 1.51 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:51 P: condensate polisher inlet temperature |
| 1.56 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1355P ambient conditions-vacuum unloading-SL |
| 2.02 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:02 P: condensate polisher inlet temperature |
| 2.04 pm |  | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 14:03 P: condensate polisher inlet temperature |
| 2.07 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:07 P: condensate polisher inlet temperature |
| 2.28 pm |  | Millmerran Energy Trader | Millmerran | -10 | -1000 | N/A | 14:28 P: plant limitation, condensate |
| 2.45 pm |  | Arrow Energy | Braemar 2 | 155 | 2150 | 14 000 | 1429P unscheduled unit outage - SL |
| 3.17 pm |  | Callide Power Trading | Callide C | 106 | -1000 | 14 000 | 1516A MPC IN P5MIN RRP SL |
| 3.18 pm |  | Arrow Energy | Braemar 2 | 135 | 14 000 | <85 | 1516P revised outage schedule: early RTS - fire alarm reset SL |
| 3.37 pm |  | Origin Energy | Darling Downs | -10 | 86 | N/A | 1535P change in avail - ambient conditions SL |
| 3.47 pm |  | CS Energy | Callide B | -5 | 17 | N/A | 1547P ambient conditions-vacuum unloading-SL |
| 3.59 pm |  | Alinta Energy | Braemar A | 4 | 75 | 14 000 | 1550~P~revise unit output based on ambient conditions and gas linepack management~ |
| 4.18 pm |  | CS Energy | Gladstone | 120 | <295 | 14 000 | 1618A dispatch price lower than 30min forecast-SL |
| 4.31 pm |  | CS Energy | Gladstone | 30 | <60 | 14 000 | 1631P portfolio rearrangement due to-KPP MILL RTS-SL |
| 4.31 pm |  | CS Energy | Kogan Creek | 20 | N/A | 14 | 1630P MILL RTS-SL |
| 4.52 pm |  | CS Energy | Kogan Creek | 10 | N/A | 14 | 1650P technical issues-boiler o2 limit improvement-SL |
| 5.07 pm | 5.15 pm | Callide Power Trading | Callide C | 50 | 14 000 | -1000 | 1706A demand higher than 5MIN PD SL |
| 5.14 pm | 5.20 pm | CS Energy | Gladstone | 15 | <60 | 14 000 | 1712A change in qld demand 1700HRS 8584MW TO 1710HRS AT 8808MW-SL |
| 5.17 pm | 5.25 pm | CS Energy | Callide B | -10 | 17 | N/A | 1717P ambient conditions-vacuum unloading-SL |

Table 8: Significant energy rebids for 7pm

| Submit time | Time effective | Participant | Station | Capacity rebid(MW) | Price from($/MWh) | Price to ($/MWh) | Rebid reason |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 3.17 pm |  | Callide Power Trading | Callide C | 106 | -1000 | 14 000 | 1516A MPC IN P5MIN RRP SL |
| 4.31 pm |  | CS Energy | Kogan Creek | 20 | N/A | 14 | 1630P MILL RTS-SL |
| 4.52 pm |  | CS Energy | Kogan Creek | 10 | N/A | 14 | 1650P technical issues-boiler o2 limit improvement-SL |
| 5.14 pm |  | CS Energy | Gladstone | 165 | <295 | 14 000 | 1712A change in qld demand 1700HRS 8584MW TO 1710HRS AT 8808MW-SL |
| 5.17 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1717P ambient conditions-vacuum unloading-SL |
| 5.32 pm |  | CS Energy | Callide B | -10 | 17 | N/A | 1731P ambient conditions-vacuum unloading-SL |
| 5.33 pm |  | Millmerran Energy Trader | Millmerran | 10 | N/A | -1000 | 17:32 P: condensate polisher inlet temperature improved |
| 5.36 pm |  | CS Energy | Callide B | -5 | 17 | N/A | 1736P ambient conditions-vacuum unloading-SL |
| 5.38 pm |  | Millmerran Energy Trader | Millmerran | 10 | N/A | -1000 | 17:37 P: plant limitation, condensate |
| 5.52 pm |  | Origin Energy | Darling Downs | 10 | N/A | 86 | 1750P change in avail - ambient conditions SL |
| 6.04 pm |  | Alinta Energy | Braemar A | 13 | <310 | 14 000 | 1800~a~change in qld 5PD 18:05 $254.12 TO $149.99 SL~ |
| 6.08 pm |  | Origin Energy | Darling Downs | 15 | N/A | 86 | 1805P change in avail - ambient conditions SL |
| 6.24 pm | 6.35 pm | Millmerran Energy Trader | Millmerran | -5 | -1000 | N/A | 18:23 P: plant limitation, condensate |
| 6.36 pm | 6.45 pm | ERM Power | Oakey | 20 | 12 519 | -1000 | A 1835 1835 increase in qld RRP FOR 1900: $12,440.02 PD5@1835 VS $299.25 PD5@1820 |

Appendix B: Price setter

The following table identifies for the trading intervals in which the spot price exceeded $5000/MWh, each five minute dispatch interval price and the generating units involved in setting the energy price. This information is published by AEMO.[[8]](#footnote-8) The 30-minute spot price is the average of the six dispatch interval prices.

Table 5: Price setter for the 4.30 pm trading interval

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **DI** | **Dispatch Price ($/MWh)** | **Participant** | **Unit** | **Service** | **Offer price ($/MWh)** | **Marginal change** | **Contribution** |
| 16:05 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13 650.01 | 0.31 | $4231.50 |
| 16:10 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:15 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:20 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:25 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:30 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| **Spot price** | **$12 642/MWh** |  |  |  |  |

Table 6: Price setter for 5 pm trading interval

| **DI** | **Dispatch Price ($/MWh)** | **Participant** | **Unit** | **Service** | **Offer price ($/MWh)** | **Marginal change** | **Contribution** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 16:35 | $299.65 | CS Energy | GSTONE3 | Energy | $295.00 | 1.00 | $295.00 |
|  |  | CS Energy | GSTONE3 | Raise reg | $2.75 | -1.00 | -$2.75 |
|  |  | AGL Energy | BW04 | Raise reg | $7.40 | 1.00 | $7.40 |
| 16:40 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13650.01 | 0.31 | $4231.50 |
| 16:45 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12440.02 | 0.31 | $3856.41 |
| 16:50 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:55 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
|  |  | CS Energy | GSTONE3 | Raise reg | $2.75 | -1.00 | -$2.75 |
|  |  | AGL Energy | BW04 | Raise reg | $7.40 | 1.00 | $7.40 |
| 16:40 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13 650.01 | 0.31 | $4231.50 |
| 16:45 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:50 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 16:55 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 17:00 | $299.25 | CS Energy | GSTONE3 | Energy | $295.00 | 1.00 | $295.00 |
|  |  | CS Energy | GSTONE3 | Raise reg | $2.75 | -1.00 | -$2.75 |
|  |  | Delta Electricity | VP5 | Raise reg | $7.00 | 1.00 | $7.00 |
| **Spot price** | **$8595/MWh** |  |  |  |  |

Table 7: Price setter for 5.30 pm trading interval

| **DI** | **Dispatch Price ($/MWh)** | **Participant** | **Unit** | **Service** | **Offer price ($/MWh)** | **Marginal change** | **Contribution** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 17:05 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13 650.01 | 0.31 | $4231.50 |
| 17:10 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13 650.01 | 0.31 | $4231.50 |
| 17:15 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.50 | $6825.01 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.50 | $6825.01 |
| 17:20 | $86.01 | Origin Energy | DDPS1 | Energy | $86.01 | 1.00 | $86.01 |
| 17:25 | $13 650.01 | Origin Energy | MSTUART1 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART2 | Energy | $13 650.01 | 0.34 | $4641.00 |
|  |  | Origin Energy | MSTUART3 | Energy | $13 650.01 | 0.31 | $4231.50 |
| 17:30 | $74.74 | Braemar Power Projects | BRAEMAR1 | Energy | $74.74 | 0.36 | $26.91 |
|  |  | Braemar Power Projects | BRAEMAR2 | Energy | $74.74 | 0.32 | $23.92 |
|  |  | Braemar Power Projects | BRAEMAR3 | Energy | $74.74 | 0.32 | $23.92 |
| **Spot price** | **$9127/MWh** |  |  |  |  |

Table 8: Price setter for 7 pm trading interval

| **DI** | **Dispatch Price ($/MWh)** | **Participant** | **Unit** | **Service** | **Offer price ($/MWh)** | **Marginal change** | **Contribution** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 18:35 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 18:40 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 18:45 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 18:50 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 18:55 | $12 440.02 | Origin Energy | MSTUART1 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 440.02 | 0.34 | $4229.61 |
|  |  | Origin Energy | MSTUART3 | Energy | $12 440.02 | 0.31 | $3856.41 |
| 19:00 | $301.63 | CS Energy | GSTONE3 | Energy | $295.00 | 1.00 | $295.00 |
|  |  | CS Energy | GSTONE3 | Raise reg | $0.77 | -1.00 | -$0.77 |
|  |  | AGL Energy | BW03 | Raise reg | $7.40 | 1.00 | $7.40 |
| **Spot price** | **$10 417/MWh** |  |  |  |  |

Appendix C: Closing bids

Figures C1 to C6 highlight the half hour closing bids for participants in Queensland with significant capacity priced at or above $5000/MWh during the periods in which the spot price exceeded $5000/MWh. They also show generation output and the spot price.

Figure C1 – Alinta Energy (Braemar A) closing bid prices, dispatch and spot price



Figure C2 – Arrow Energy (Braemar 2) closing bid prices, dispatch and spot price



Figure C3 – Callide Power Trading (Callide C) closing bid prices, dispatch and spot price



Figure C4 – CS Energy (Callide B, Gladstone, Kogan Creek, Wivenhoe) closing bid prices, dispatch and spot price



Figure C5 – Origin Energy (Darling Downs, Mt Stuart, Roma) closing bid prices, dispatch and spot price



Figure C6 – Stanwell (Barron Gorge, Kareeya, Mackay GT, Stanwell, Tarong, Tarong North) closing bid prices, dispatch and spot price



1. This requirement is set out in clause 3.13.7 (d) of the National Electricity Rules. [↑](#footnote-ref-1)
2. Maximum demand in this case refers to total demand see section 3.2 [↑](#footnote-ref-2)
3. Price sensitivities outcomes are published at: <http://www.nemweb.com.au/REPORTS/CURRENT/Predispatch_Sensitivities/> [↑](#footnote-ref-3)
4. <https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf> [↑](#footnote-ref-4)
5. See AEMO demand definition document <https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/2016/Demand-terms-in-EMMS-Data-Model_Final.pdf> [↑](#footnote-ref-5)
6. <http://www.aer.gov.au/industry-information/industry-statistics> [↑](#footnote-ref-6)
7. While the actual demand from the CSG plant is confidential a rough examination of the change in demand since 1 January 2014 reveals an average growth of around 620 MW which is consistent with the AEMOs 2016 National Electricity Forecasting Report. [↑](#footnote-ref-7)
8. Details on how the price is determined can be found at [www.aemo.com.au](http://www.aemo.com.au) [↑](#footnote-ref-8)