

Electricity spot prices above $5000/MWh

Queensland, 2 February 2017

03 April 2017

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Amendment Record

|  |  |  |
| --- | --- | --- |
| Version | Date | Pages |
| Final report | 03/04/2017 | 26 |
|  |  |  |

Contents

[1 Introduction 4](#_Toc478985831)

[2 Summary 5](#_Toc478985832)

[3 Analysis 6](#_Toc478985833)

[3.1 Supply and Demand 7](#_Toc478985834)

[3.1.1 Forecast and actual closing bids and supply 7](#_Toc478985835)

[3.1.2 Demand 10](#_Toc478985836)

[3.1.3 Network Availability 11](#_Toc478985837)

[3.2 Pricing observations 12](#_Toc478985838)

[Appendix A: Significant Rebids 15](#_Toc478985839)

[Appendix B: Price setter 21](#_Toc478985840)

[Appendix C: Closing bids 23](#_Toc478985841)

# 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 2 February 2017 spot prices in Queensland were volatile from early afternoon to late evening, reaching $6456/MWh at 5 pm and $13 400/MWh at 5.30 pm.

Temperatures in Queensland were high for several days in the lead up to the high price events. On the day, the maximum temperature in Brisbane reached 33 degrees, resulting in high demand for electricity.

Forecasts prepared by the market operator (AEMO) predicted there would be sufficient supplies of electricity available to comfortably meet demand. AEMO’s forecasts also indicated that spot prices would exceed $13 400/MWh for extended periods from mid to late afternoon. This was because cheaper imports of electricity from neighbouring states were predicted to be limited and high priced supply would need to be used to meet the high demand for electricity.

Many of the predicted high prices did not occur because demand for electricity was lower than anticipated and generators shifted their offers into low prices. Rebidding of capacity by generators during the day from low to high prices (which can put upward pressure on prices), did not contribute to the spot price exceeding $5000/MWh on this occasion.

# Analysis

AEMO collates information about expected or forecast demand, network capability and offers from market generators that comprise mega-watt (MW) capacities, in a series of price bands and what they can generate in total (availability), to calculate dispatch instructions for every five minute dispatch interval. AEMO publishes aggregated dispatch information with varying degrees of granularity, including five minute and 30 minute updates, to enable market participants to adjust their positions as market conditions change.

AEMO publishes regular forecasts of market outcomes including its own assessment of the demand for electricity in each region of the market. At a half hourly resolution, these forecasts provide participants with regional spot prices, demand and total available generation for the remainder of the day. On this occasion, forecasts for Queensland, four and 12 hours prior, over-estimated the regional demand by around 300MW. It also shows that spot prices were anticipated to be much higher than that which actually occurred and could be quite variable. Notably, only the 5 pm and 5.30 pm spot prices exceeded $5000/MWh and the 5.30 pm spot price was close to its forecast.

Table 1 shows for Queensland, the actual and forecast wholesale price, known as the spot price, electricity demand and generator availability for each trading interval from 1.30 pm to 7.30 pm. The spot price exceeded $5000/MWh, which is the threshold for the AER to produce this report, for the 5 pm and 5.30 pm trading interval (in bold) reaching $6456/MWh and $13 400/MWh respectively. The analysis extends to other trading intervals as they are relevant to the conditions that occurred in the afternoon of 2 February 2017 and how these conditions resulted in periods of sustained high prices.

In the 5 pm and 5.30 pm intervals, available capacity was up to 200 MW lower than forecast four hours ahead with a majority of this capacity priced below $100/MWh.

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 | 1733 | 2150 | 421 | 8178 | 8491 | 8485 | 10842 | 11027 | 11122 |
| 2 pm | 164 | 2150 | 2150 | 8340 | 8602 | 8619 | 10706 | 11002 | 11122 |
| 2.30 pm | 102 | 2150 | 2150 | 8515 | 8740 | 8758 | 10872 | 11057 | 11042 |
| 3 pm | 121 | 2150 | 2150 | 8593 | 8845 | 8842 | 10643 | 11037 | 11042 |
| 3.30 pm | 2376 | 13 400 | 13 400 | 8657 | 8963 | 8959 | 10 672 | 11 006 | 11 041 |
| 4 pm | 190 | 13 641 | 13 641 | 8714 | 9110 | 9102 | 10 620 | 10 982 | 11 042 |
| 4.30 pm | 2315 | 14 000 | 14 000 | 8871 | 9233 | 9209 | 10 850 | 10 964 | 11 047 |
| **5 pm** | **6456** | **14 000** | **14 000** | **8996** | **9290** | **9285** | **10 855** | **10 989** | **11 047** |
| **5.30 pm** | **13 400** | **13 400** | **14 000** | **8971** | **9238** | **9244** | **10 758** | **10 961** | **11 017** |
| 6 pm | 2191 | 13 400 | 13 900 | 8868 | 9164 | 9203 | 10 769 | 10 828 | 11 023 |
| 6.30 pm | 694 | 103 | 13 641 | 8804 | 8970 | 9105 | 10 763 | 10 892 | 11 032 |
| 7 pm | 2184 | 150 | 13 641 | 8845 | 9027 | 9152 | 10 793 | 10 882 | 11 027 |
| 7.30 pm | 1785 | 13 400 | 13 900 | 8800 | 9120 | 9183 | 10 817 | 10 875 | 11 026 |

## Supply and Demand

Participants in the National Electricity Market (NEM) are free to choose the amount of electricity or capacity (MW) they offer for each of their generators for dispatch into the market and the price they are prepared to accept ($/MWh) for the energy produced. A participant’s offer comprises 10 MW and price pairs. AEMO aggregates all generator offers from lowest price to highest price and dispatches that generation in order to meet its own forecast of the demand for electricity in a region every 5 minute of the day, taking into account the transfer capability of the network.

This section discusses changes to the offered prices, capacity. It also shows how accurately AEMO predicted the demand conditions relevant to the high price periods.

### Forecast and actual closing bids and supply

This section examines the forecast information that was available four and 12 hours in advance of the events versus the actual generator offers at the time of dispatch (closing bids) and, demand, dispatch and prices.

A trading interval is defined as the 30 minutes preceding the quoted time. Every half hour, AEMO provides a 30 minute resolution forecast, for the remainder of the day, which provides participants with an indicator of their expected generation and the forecast spot price against forecast demand. Actual market dispatch occurs on a five minute basis and consequently five minute dispatch prices, generation levels and demand are reported. All actual 30 minute data for a trading interval, including pricing and generation are calculated from the average of six five minute dispatch intervals.

Each generator is obliged to provide an initial offer to AEMO by midday the preceding day. Figure 1 shows the cumulative initial offers for generators in Queensland aggregated by price against the conditions forecast at the time. The figure provides an overall picture, looking 12 hours ahead, of the forecast market outcomes across the day. Specifically, it shows the aggregated initial offers for Queensland generators (stacked area), the total Queensland generator dispatch (orange line) and spot price (purple line) that would have occurred to satisfy the forecast demand (blue line)

Figure 1: 12 hours ahead forecast generator offers, spot prices, dispatch and demand



The spot price forecast in Queensland in Figure 1 was close to $14 000/MWh from 3 pm to 8 pm because the dispatch system anticipated that generators with offer prices greater than $12 500 would be required to satisfy the level of forecast demand.

From 5 pm to 8 pm the initial offers show that there was almost no capacity priced between $500/MWh and $5000/MWh (the narrow dark blue region of the area chart) and no capacity priced between $5000/MWh and $12 500/MWh.

Figure 2 shows the cumulative offers for generators in Queensland that were in place at the time of actual dispatch, also known as closing bids, at a five minute resolution. Generators may change their offers to suit their changing economic or physical position as the day unfolds. Generators change their offers by submitting rebids. The figure shows, for Queensland, the dispatch price (purple line), demand (blue line), total local generation dispatch (orange line) and the 30 minute spot price (dashed purple line).

Figure 2: Closing bids, prices, dispatch and demand



By comparing Figure 1 and Figure 2, the actual spot price was lower than the forecast spot price, 12 hours ahead, in all intervals from 3 pm to 8 pm although the spot price for 5 pm and 5.30 pm trading intervals still exceeded $5000/MWh. Rebidding reduced the amount of capacity priced between $500/MWh and $12 500/MWh such that, depending on circumstances, the price could change significantly in response to minor changes to demand or supply.

A range of factors contributed to spot prices being lower than forecast:

* Actual demand was lower than forecast (see section 3.1.2).
* In a majority of those trading intervals where high dispatch prices occurred within the first three dispatch intervals, participants in Queensland rebid significant capacity from high to low prices (increase in bottom green section after a price spike), lowering dispatch prices and hence lowering the trading interval price. On occasions this saw the price fall to the price floor. (see section 3.2).

Electricity demand, during the 5 pm trading interval was lower than forecast 12 hours ahead. The marginal unit (the unit that was setting the price) increased its output to its maximum during the 4.45 pm dispatch interval and could not set price. Under these circumstances output from the next cheapest unlimited generator will set the price, and this resulted in the price increasing to $12 499/MWh and above for the remaining three dispatch intervals in the trading period. There was no significant rebidding of capacity from high to low prices by other participants. It is not unusual for generators to not respond when high prices occur late in a trading interval. Time delays in both lodging and processing rebids into new dispatch instructions may mean that their changes are not effectively recognised in the dispatch process before the end of the trading interval.

For the 5.30 pm trading interval generators did not rebid their capacity to lower prices and the resulting price was close to the high forecast price.

Appendix A contains all significant rebids.

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 reached around 33 degrees as forecast. This was the fourth consecutive day of temperatures above 30 degrees. Maximum total demand for the day reached 8996 MW. This was around 300 MW lower than AEMO anticipated four hours ahead. The lower than expected demand contributed to the actual lower than forecast price.

Figure 3 shows actual total demand (red line) and forecast total demand (red dashed line), four hours before dispatch. The graph also shows the highest recorded total demand (green line).[[2]](#footnote-2)

Figure 3: Actual and forecast total demand



The light shaded section of the graph for the 5 pm and 5.30 pm trading intervals highlights where the spot price was above $5000/MWh. As can be seen, actual total demand was significantly lower than forecast demand 4 hours ahead, leading to lower than forecast high prices.

Figure 4 shows 5-minute demand and price over the high price period. The figure shows that, with such a tight supply and demand curve, small increases in 5-minute demand coincided with increases in price. There was some customer response in reducing demand as a result of the published actual dispatch price, however demand side responses are not captured as part of the dispatch system.

Figure 4: Queensland 5-minute price and demand graph



### Network Availability

Queensland is connected to the rest of the NEM via two transmission connections (interconnectors). The Queensland – New South Wales Interconnector (QNI) consists of two high voltage AC transmission lines between [Armidale](https://en.wikipedia.org/wiki/Armidale%2C_New_South_Wales), in New South Wales and Bulli Creek in Queensland. A second underground DC link (Terranora) allows energy to be transferred from Mullumbimby, New South Wales north to Queensland along the coast. It is through these interconnectors that Queensland can import and or export generation into New South Wales. Limits on the interconnectors are often in place to preserve voltage stability in the power system, these are known as constraints.

Table 2 shows the net import limit and the actual imports into Queensland from New South Wales over the Queensland to New South Wales (QNI) and the Terranora interconnectors.

Table 2: Net 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 | -34 | 163 | 143 | 191 | 163 | 143 |
| 2 pm | 43 | 172 | 141 | 142 | 172 | 141 |
| 2.30 pm | 104 | 177 | 141 | 140 | 177 | 141 |
| 3 pm | 34 | 147 | 123 | 133 | 147 | 123 |
| 3.30 pm | 90 | 110 | 104 | 109 | 110 | 104 |
| 4.00 pm | -15 | 111 | 103 | 85 | 111 | 103 |
| 4.30 pm | -157 | 106 | 103 | 102 | 106 | 103 |
| **5.00 pm** | **37** | **99** | **102** | **88** | **99** | **102** |
| **5.30 pm** | **107** | **86** | **96** | **107** | **86** | **96** |
| 6.00 pm | 88 | 89 | 92 | 115 | 89 | 92 |
| 6.30 pm | 127 | 106 | 106 | 130 | 106 | 106 |
| 7.00 pm | -23 | 118 | 115 | 138 | 118 | 115 |
| 7.30 pm | 55 | 193 | 133 | 160 | 193 | 133 |

The transfer of electricity across the QNI interconnector was limited by constraints to around 200 MW. These network constraints are designed to manage the overloading of the Liddell to Muswellbrook line on the trip of the Liddell to Tamworth line and to avoid voltage collapse in northern New South Wales on the loss of the single largest generation unit in Queensland, Kogan Creek Power Station. These conditions were forecast well in advance.

Constraints on Terranora were forcing around 100 MW of flow into New South Wales for the duration of trading intervals priced above $5000/MWh, slightly higher than forecast.

During the time of the high prices, imports into Queensland on these interconnectors were limited to a maximum of around 100 MW. The ability to transfer electricity from neighbouring regions of the NEM was significantly constrained due to limitations in the network. These limitations prevented other cheaper sources of electricity from competing with generation in Queensland and remaining local demand had to be met by local generation.

## **Pricing observations**

Table 3 below examines the trading intervals with at least one 5-minute dispatch interval priced above $10 000/MWh. It shows the opening amount of capacity offered by participants priced less than $5000/MWh in each trading interval, the change in available low priced capacity due to rebidding within the trading interval, the change in demand and the net change in imports into Queensland over the interconnectors.

Table 3: Changes in capacity, demand and imports by trading interval priced above $10 000/MWh

| **Trading interval** | **Dispatch interval** | **Spot Price ($/MWh)** | **Dispatch price ($/MWh)** | **Opening capacity priced < $5000/MWh(MW)** | **Change in available capacity priced < $5000/MWh (MW)** | **Change in demand (MW)** | **Net change in imports (MW)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1.30 pm | 1.05 pm | 1733 | 13 400 | 8420 | -364 | 9 | 35 |
|   | 1.10 pm |   | 0 |   | 632 | -180 | -174 |
|   | 1.15 pm |   | -1 |   | -70 | 57 | 10 |
|   | 1.20 pm |   | -1000 |   | 434 | 34 | -15 |
|   | 1.25 pm |   | -1000 |   | -315 | -104 | -130 |
|   | 1.30 pm |   | -1000 |   | 0 | -3 | -51 |
| 3.30 pm | 3.05 pm | 2376 | 141 | 8918 | 0 | 4 | 36 |
|   | 3.10 pm |   | 150 |   | -226 | -68 | 29 |
|   | 3.15 pm |   | 199 |   | 25 | 120 | -8 |
|   | 3.20 pm |   | 167 |   | -25 | -74 | -60 |
|   | 3.25 pm |   | 199 |   | -15 | 129 | 72 |
|   | 3.30 pm |   | 13 400 |   | -134 | -51 | 3 |
| 4.30 pm | 4.05 pm | 2315 | 150 | 8591 | 0 | -65 | 15 |
|   | 4.10 pm |   | 13 400 |   | 5 | 109 | -8 |
|   | 4.15 pm |   | 104 |   | 590 | -105 | -122 |
|   | 4.20 pm |   | 95 |   | 227 | 40 | -111 |
|   | 4.25 pm |   | 71 |   | 207 | 22 | -302 |
|   | 4.30 pm |   | 70 |   | 8 | 63 | -58 |
| **5.00 pm** | **4.35 pm** | **6456** | **86** | **8838** | **0** | **57** | **372** |
|  | **4.40 pm** |  | **101** |  | **4** | **50** | **136** |
|  | **4.45 pm** |  | **150** |  | **0** | **-61** | **62** |
|  | **4.50 pm** |  | **12 499** |  | **0** | **-1** | **8** |
|  | **4.55 pm** |  | **12 499** |  | **-15** | **-17** | **19** |
|  | **5.00 pm** |  | **13 400** |  | **-25** | **21** | **-14** |
| **5.30 pm** | **5.05 pm** | **13 400** | **13 400** | **8780** | **-180** | **-22** | **9** |
|  | **5.10 pm** |  | **13 400** |  | **0** | **13** | **1** |
|  | **5.15 pm** |  | **13 400** |  | **-28** | **41** | **37** |
|  | **5.20 pm** |  | **13 400** |  | **10** | **-10** | **-12** |
|  | **5.25 pm** |  | **13 400** |  | **0** | **-69** | **-27** |
|  | **5.30 pm** |  | **13 400** |  | **0** | **-39** | **-8** |
| 6.00 pm | 5.35 pm | 2191 | 101 | 8922 | 50 | -10 | -33 |
|   | 5.40 pm |   | 150 |   | -20 | -6 | 35 |
|   | 5.45 pm |   | 150 |   | -60 | -36 | 25 |
|   | 5.50 pm |   | 150 |   | 0 | 13 | 8 |
|   | 5.55 pm |   | 12 499 |   | -10 | 74 | -7 |
|   | 6.00 pm |   | 98 |   | 0 | -166 | -81 |
| 7.00 pm | 6.35 pm | 2184 | 150 | 8914 | 6 | -11 | -5 |
|   | 6.40 pm |   | 199 |   | -75 | 21 | -18 |
|   | 6.45 pm |   | 12 499 |   | -46 | 80 | 28 |
|   | 6.50 pm |   | 103 |   | 0 | -120 | -91 |
|   | 6.55 pm |   | 82 |   | 680 | -39 | -212 |
|   | 7.00 pm |   | 71 |   | 102 | -38 | -271 |
| 7.30 pm | 7.05 pm | 1785 | 106 | 8744 | 0 | 49 | 447 |
|   | 7.10 pm |   | 150 |   | 0 | 2 | 121 |
|   | 7.15 pm |   | 12 442 |   | 20 | 93 | 19 |
|   | 7.20 pm |   | 14 |   | 752 | -88 | -156 |
|   | 7.25 pm |   | -1000 |   | 90 | -64 | -3 |
|   | 7.30 pm |   | -1000 |   | 160 | -36 | 0 |

From Table 3, we observe changes in a range of factors that affected dispatch prices. Examples of these are discussed below:

1. Rebidding capacity from low to high prices - This behaviour steepens the supply curve and can often mean that higher priced capacity is required to be dispatched in order to meet demand. The high price of the 1.05 pm dispatch interval can be attributed to this behaviour, where Callide and Alinta rebid 364 MW of generation capacity to $13 400/MWh and above.
2. Rebidding of capacity from high to low priced bands in response to a high dispatch price - It is not unusual for generators to seek to increase revenue by rebidding capacity to low price bands to facilitate higher dispatch levels during the high priced trading interval, for example in the 1.30 pm trading interval. The 1.05 pm dispatch price reached $13 400/MWh, meaning the 1.30 pm spot price was guaranteed to be at least $1400/MWh. By the second dispatch interval, 632 MW of capacity was moved by eight participants from high to low prices, this can be seen in Figure 2 by the increase in the bottom green section after a price spike. See Appendix A for details on these rebids.
3. An increase in demand - At 4.10 pm demand increased by 109 MW, without a significant increase in imports from neighbouring regions or in low priced generation, the price reached $13 400/MWh for one dispatch interval.
4. A decrease in demand – At 6 pm demand decreased by 166 MW, following a high price of $12 499/MWh, most likely due to a demand side response. These types of demand side responses are not captured as part of the dispatch system. There was no rebidding of capacity and the price fell to $98/MWh.
5. Failure to respond – At 4.50 pm the dispatch price reached $12 499/MWh following this price there was little capacity rebid from high to low prices by Queensland participants. There was also no significant decrease in demand or increase in imports into Queensland. Consequently, the price remained above $12 500/MWh for nine dispatch intervals. It was these consecutive high priced dispatch intervals that led to the spot price exceeding $5000/MWh for two trading intervals.

Australian Energy Regulator

April 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.

Significant rebids for 1.30 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 12.58 pm | 1.05 pm | Callide Power Trading | Callide C | 226 | -1000 | 14 000 | 1257A DISPATYCH PRICE 420 ABOVE P5MIN RRP SL |
| 12.58 pm | 1.05 pm | Alinta | Braemar A | 138 | 45 | 13 400 | 1255~A~CHANGE IN 5PD $2150 V $395.69~ |
| 1.01 pm | 1.10 pm | Alinta | Braemar A | 137 | 13 400 | -1000 | 1300~A~DISPATCH $13400 ~ |
| 1.01 pm | 1.10 pm | Millmerran Energy Trader | Millmerran | 55 | 14 000 | -1000 | 13:05 A QLD RRP DS DI 13:05 VALUE 13400 VS P5 RUN 12:55 DI 13:05 VALUE 2150 SL |
| 1.02 pm | 1.10 pm | Origin Energy | Mt Stuart | 70 | 13 450 | -1000 | 1300A UNFORECAST PRICE SPIKE $13.399.91 @ 1305 DI SL |
| 1.02 pm | 1.10 pm | Arrow Energy | Braemar 2 | 395 | <14 000 | -1000 | 1302A QLD PRICE HIGHER THAN FORECAST SL |
| 1.03 pm | 1.10 pm | Callide Power Trading | Callide C | 226 | 14 000 | -1000 | 1302A QLD RRP DS DI 13:05 VS P5 RUN 12:55 DI 13:05 SL |
| 1.11 pm | 1.20 pm | Stanwell | Stanwell and Tarong | 470 | 14 000 | -1000 | 1310A PRICE HIGHER THAN FORECAST - SL |
| 1.12 pm | 1.30 pm | AGL | Yabulu | 11 | -992 | n/a | 1310~P~020 REDUCTION IN AVAIL CAP~206 UNEXP AMBIENT TEMP EFFECTS |
| 1.14 pm | 1.25 pm | RTA Yarwun | Yarwun | 155 | -990 | n/a | GAS SUPPLY LIMITATIONS |
| 1.16 pm | 1.25 pm | Origin | Darling Downs | 10 | -1000 | n/a | 1315P CHANGE IN AVAIL - HIGH BACK PRESSURE SL |
| 1.18 pm | 1.25 pm | Stanwell | Tarong | 150 | -1000 | >13 900 | 1317F AVOID MARGINAL DISPATCH AT TPS AND MGT DUE TO HIGH PRICES SL |

Significant rebids for 3.30 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 3.03 pm | 3.10 pm | Callide Power Trading | Callide C | 226 | -1000 | 14 000 | 1503A QLD RRP P5 RUN 15:00 DI 15:30 VS P5 RUN 14:55 DI 15:30 SL |
| 3.21 pm | 3.30 pm | Alinta Energy | Braemar A | 134 | 45 | 13 400 | 1510~A~CHANGE IN PRICE 5PD AT DI 15:25: $167.32 VS $2,150.30 |

Significant rebids for 4.30 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 4.06 pm | 4.15 pm | Stanwell | Stanwell, Tarong | 590 | >13 400 | -1000 | 1606A QLD RRP SL |
| 4.12 pm | 4.20 pm | Callide Power Trading | Callide C | 226 | 14 000 | -1000 | 1612A QLD RRP DS DI 16:15 104 VS P5 RUN 16:05 13400 SL |
| 4.18 pm | 4.25 pm | CS Energy | Gladstone | 100 | 14 000 | 45 | 1617P PORTFOLIO REARRANGEMENT DUE TO-CALLIDE RESTRICTIONS-SL |
| 4.18 pm | 4.25 pm | Origin | Darling Downs | 5 | n/a | 70 | 1615P CHANGE IN AVAIL - AMBIENT CONDITIONS SL |
| 4.18 pm | 4.25 pm | Origin | Mt Stuart | 92 | 12 499 | -1000 | 1617A CONSTRAINT MANAGEMENT - N>>N-NIL\_\_3\_OPENED SL |

Significant rebids for 5 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 1.05 pm |  | Millmerran Energy Trader | Millmerran | -30 | -1000 | N/A | 13:04 P: condensate polisher inlet temperature |
| 1.11 pm |  | Millmerran Energy Trader | Millmerran | -15 | -1000 | N/A | 13:10 P: condensate polisher inlet temperature |
| 1.12 pm |  | AGL Energy | Yabulu | -11 | <150 | N/A | 1310~P~020 reduction in avail cap~206 unexp ambient temp effects |
| 1.16 pm |  | Origin Energy | Darling Downs | -10 | 70 | N/A | 1315P change in avail - high back pressure sl |
| 1.47 pm |  | Millmerran Energy Trader | Millmerran | -15 | -1000 | N/A | 13:43 p: condensate polisher inlet temperature |
| 1.49 pm |  | Millmerran Energy Trader | Millmerran | -25 | -1000 | N/A | 13:49 P: condensate polisher inlet temperature |
| 1.55 pm |  | CS Energy | Kogan Creek | -10 | 14 | N/A | 1354P ambient conditions-sl |
| 2.04 pm |  | Origin Energy | Darling Downs | -15 | 70 | N/A | 1403P change in avail - ambient conditions sl |
| 2.41 pm |  | CS Energy | Callide B | -20 | 17 | N/A | 1441P condenser vacuum limits- |
| 2.47 pm |  | Origin Energy | Darling Downs | -10 | 70 | N/A | 1445P change in avail - ambient conditions sl |
| 3.12 pm |  | Millmerran Energy Trader | Millmerran | -15 | -1000 | N/A | 15:12 P: condensate polisher inlet temperature |
| 3.17 pm |  | CS Energy | Kogan Creek | -15 | 14 | N/A | 1517 P technical issues-id fan limits-sl |
| 3.45 pm |  | Origin Energy | Darling Downs | -10 | 70 | N/A | 1545P change in avail - ambient conditions SL |
| 4.12 pm |  | Callide Power Trading | Callide C | 100 | -1000 | 14 000 | 1612A Qld RRP DS DI 16:15 104 vs P5 run 16:05 13400 sl |
| 4.18 pm |  | CS Energy | Gladstone | 100 | 14 000 | <45 | 1617P portfolio rearrangement due to-callide restrictions-sl |

Significant rebids for 5.30 pm

| **Submit****time** | **Time****effective** | **Participant** | **Station** | **Capacity rebid****(MW)** | **Price from****($/MWh)** | **Price to****($/MWh)** | **rebid reason** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1.55 pm |  | CS Energy | Kogan Creek | -10 | 14 | N/A | 1354P ambient conditions-sl |
| 1.59 pm |  | CS Energy | Gladstone | 30 | N/A | -1000 | 1357P unit offline revised-updated unit ramp down schedule-sl |
| 2.04 pm |  | Origin Energy | Darling Downs | -15 | 70 | N/A | 1403P change in avail - ambient conditions sl |
| 2.47 pm |  | Origin Energy | Darling Downs | -10 | 70 | N/A | 1445P change in avail - ambient conditions sl |
| 3.03 pm |  | Callide Power Trading | Callide C | 226 | -1000 | 14 000 | 1503A Qld RRP P5 RUN 15:00 DI 15:30 VS P5 run 14:55 DI 15:30 SL |
| 4.12 pm |  | Callide Power Trading | Callide C | 126 | 14 000 | -1000 | 1612A Qld RRP DS DI 16:15 104 VS P5 run 16:05 13400 sl |
| 4.16 pm |  | Millmerran Energy Trader | Millmerran | -40 | -1000 | N/A | 16:16 P: condensate polisher inlet temperature |
| 4.19 pm |  | Millmerran Energy Trader | Millmerran | -55 | -1000 | N/A | 16:19 P: condensate polisher inlet temperature |
| 4.54 pm | 5.05 pm | CS Energy | Gladstone | 180 | <99 | 14 000 | 1653P portfolio rearrangement due to-gps2 ramp down to outage-sl |
| 5.06 pm | 5.15 pm | CS Energy | Kogan Creek | -20 | 14 | N/A | 1705P technical issues-id fan issues-sl |

Significant rebids for 7 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 6.32 pm | 6.40 pm | CS Energy | Gladstone | 80 | 60 | 14 000 | 1831A DISPATCH PRICE $149 LOWER THAN 5MIN PD $1,405-SL |
| 6.37 pm | 6.45 pm | Millmerran | Millmerran | 20 | -1000 | 14 000 | 18:40 A QNI export limit ds di 18:40 value 122 vs pd run 18:30 ti 19:00 value 162 sl |
| 6.37 pm | 6.45 pm | Callide Power Trading | Callide C | 26 | -1000 | 14 000 | 1837A north limit QNI decrease not inp5min sl |
| 6.46 pm | 6.55 pm | Stanwell | Stanwell, Tarong | 600 | >13 400 | -1000 | 1844A QLD RRP FOR DI1845 $12499.02 / QNI TRANSMISSON CONSTRAINT |
| 6.47 pm | 6.55 pm | Callide Power Trading | Callide C | 80 | 14 000 | -1000 | 1844A Q RRP DS DI 18:45 VS P5 RUN 18:35 DI 18:45 SL |
| 6.50 pm | 7 pm | Origin Energy | Darling Downs | 10 | N/A | 70 | 1850P CHANGE IN AVAIL - AMBIENT CONDITIONS SL |
| 6.52 pm | 7 pm | Origin Energy | Mt Stuart | 92 | 12 499 | -1000 | 1852A CONSTRAINT MANAGEMENT - N^^Q\_NIL\_B1 SL |

Significant rebids for 7.30 pm

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from ($/MWh) | Price to ($/MWh) | Rebid reason |
| 7.12 pm | 7.20 pm | Origin Energy | Darling Downs | 92 | 12 499 | -1000 | 1910A CONSTRAINT MANAGEMENT - N^^Q\_NIL\_B1 SL |
| 7.13 pm | 7.20 pm | Stanwell | Stanwell, Tarong | 660 | >13 400 | -1000 | 1913A QLD RRP FOR DI1915 @ $12441.92 |
| 7.15 pm | 7.25 pm | Callide Power Trading | Callide C | 80 | 14 000 | -1000 | 1913A A QLD RRP DS DI 19:15 VS P5 RUN 19:05 DI 19:15 SL |
| 7.20 pm | 7.30 pm | CS Energy | Gladstone | 160 | 14 000 | -1000 | 1917A DISPATCH PRICE LOWER THAN 30MIN FORECAST-RRP $13.80 P30 $13399.95-SL |

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.[[3]](#footnote-3) The 30-minute spot price is the average of the six dispatch interval prices.

5 pm trading interval

| DI | Dispatch Price ($/MWh) | Participant | Unit | Service | Offer price ($/MWh) | Marginal change | Contribution |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 4:35 pm | $85.86 | Origin Energy | MORTLK12 | Energy | $75.98 | 1.13 | $85.86 |
| 4:40 pm | $100.64 | Snowy Hydro | MURRAY | Energy | $84.50 | 1.19 | $100.56 |
| 4:45 pm | $149.99 | AGL Hydro | YABULU | Energy | $149.99 | 0.79 | $118.49 |
|  |  | AGL Hydro | YABULU2 | Energy | $149.99 | 0.21 | $31.50 |
| 4:50 pm | $12 499.02 | Origin Energy | MSTUART1 | Energy | $12 499.02 | 0.50 | $6249.51 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 499.02 | 0.50 | $6249.51 |
| 4:55 pm | $12 499.02 | Origin Energy | MSTUART1 | Energy | $12 499.02 | 0.50 | $6249.51 |
|  |  | Origin Energy | MSTUART2 | Energy | $12 499.02 | 0.50 | $6249.51 |
| 5:00 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.20 | $2679.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.20 | $2679.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.20 | $2679.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.20 | $2679.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13 399.95 | 0.20 | $2679.99 |
| **Spot Price** | **$6456/MWh** |  |  |  |  |  |

5.30 pm trading interval

| DI | Dispatch Price ($/MWh) | Participant | Unit | Service | Offer price ($/MWh) | Marginal change | Contribution |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 5:05 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.33 | $4421.98 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.33 | $4421.98 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.33 | $4421.98 |
| 5:10 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-4 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13399.95 | 0.17 | $2277.99 |
| 5:15 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-4 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13 399.95 | 0.17 | $2277.99 |
| 5:20 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-4 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13 399.95 | 0.17 | $2277.99 |
| 5:25 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-4 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13 399.95 | 0.17 | $2277.99 |
| 5:30 pm | $13 399.95 | Stanwell | STAN-1 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-3 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | STAN-4 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#2 | Energy | $13 399.95 | 0.17 | $2277.99 |
|  |  | Stanwell | TARONG#3 | Energy | $13 399.95 | 0.17 | $2277.99 |
| **Spot Price** | **$13 400/MWh** |  |  |  |  |  |

Appendix C: Closing bids

Figures C1 to C5 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 – CS Energy (Callide B, Gladstone, Kogan Creek, Wivenhoe) closing bid prices, dispatch and spot price



Figure C2 - Stanwell (Barron Gorge, Kareeya, Mackay, Stanwell, Tarong, Tarong North) closing bid prices, dispatch and spot price



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



Figure C4 – Arrow Energy (Braemar 2) closing bid prices, dispatch and spot price



**Figure C5 – Origin Energy (Darling Downs, Mount Stuart, Roma) 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. Total Demand is the level of demand used in the National electricity market dispatch engine with generator bids and network constraints to set dispatch prices, dispatch targets and interconnector flows. <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-2)
3. Details on how the price is determined can be found at [www.aemo.com.au](http://www.aemo.com.au) [↑](#footnote-ref-3)