Electricity spot prices above $5000/MWh

Queensland, 14 January 2017

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AUSTRALIAN ENERGY REGULATOR

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Amendment Record

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1 Introduction

The AER is required to publish a report whenever the electricity spot price exceeds $5000/MWh.[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.

[1] This requirement is set out in clause 3.13.7 (d) of the National Electricity Rules.

2 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].

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.

[2] Maximum demand in this case refers to total demand see section 3.2

3 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]

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

[3] Price sensitivities outcomes are published at: http://www.nemweb.com.au/REPORTS/CURRENT/Predispatch_Sensitivities/

3.1 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.

3.1.1 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

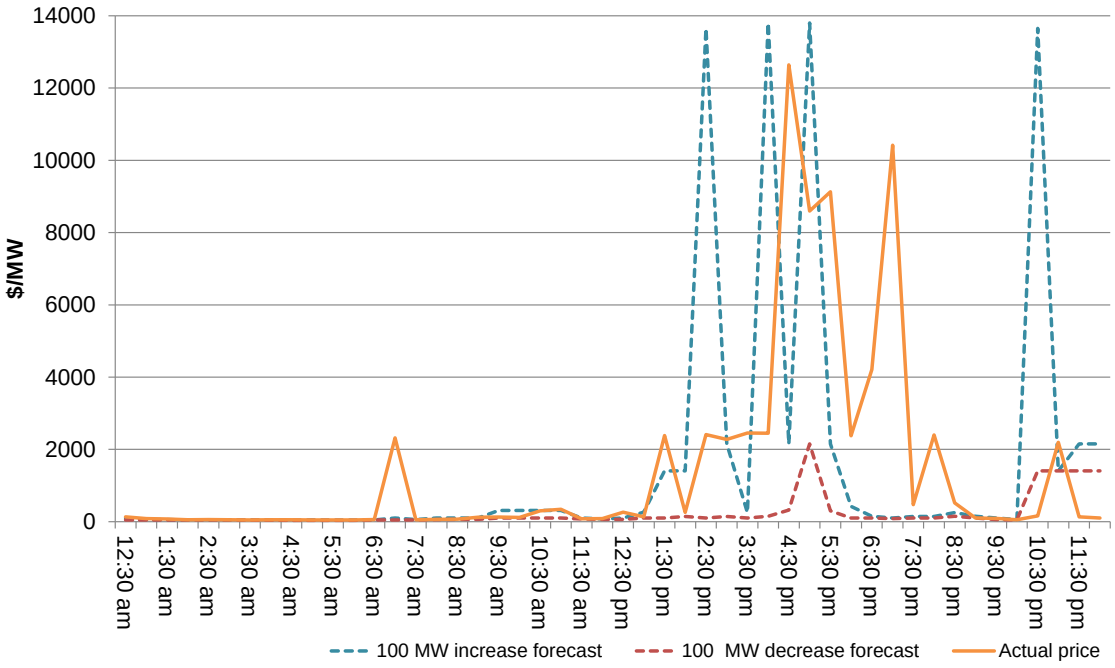


Figure 1 shows that conditions in Queensland could be volatile; an increase or decrease of 100 MW, as a result of small changes in market availability, rebids or demand would significantly impact on price after midday. On the day, the Queensland region saw a reduction of low priced available capacity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

3.1.2 Rebidding

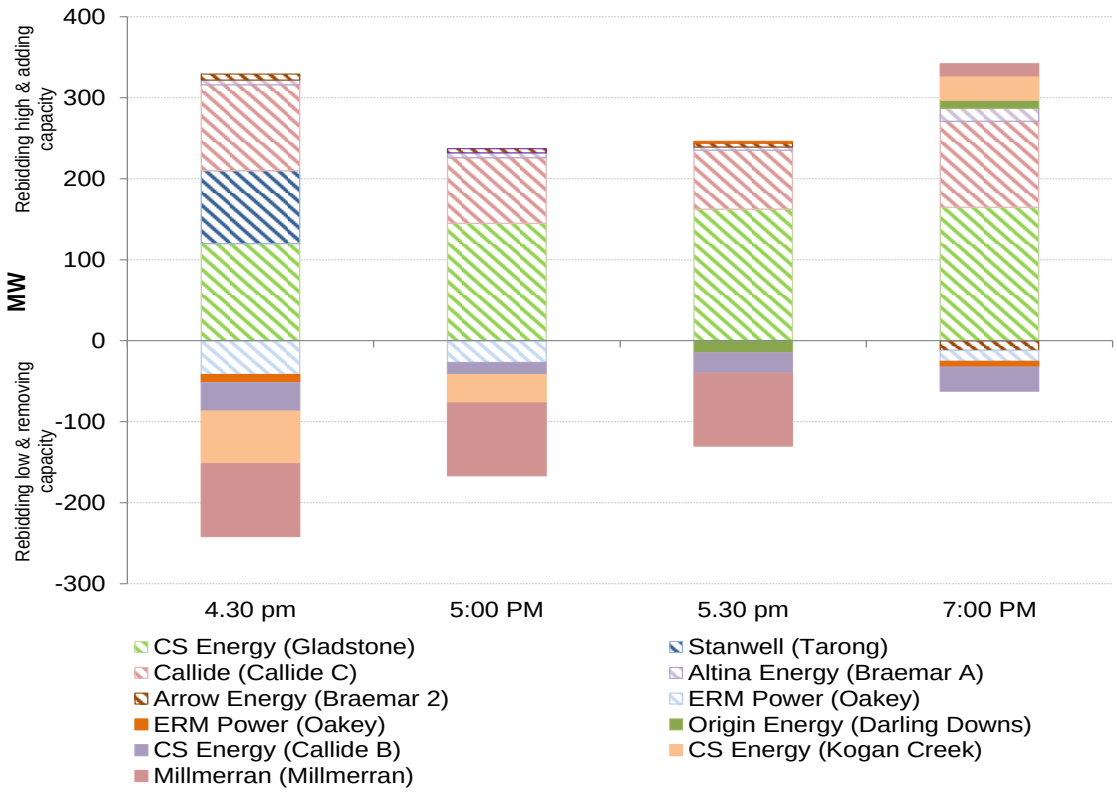
There was significant rebidding of capacity from low to high prices which contributed to the high price trading intervals.

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.

3.1.3 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

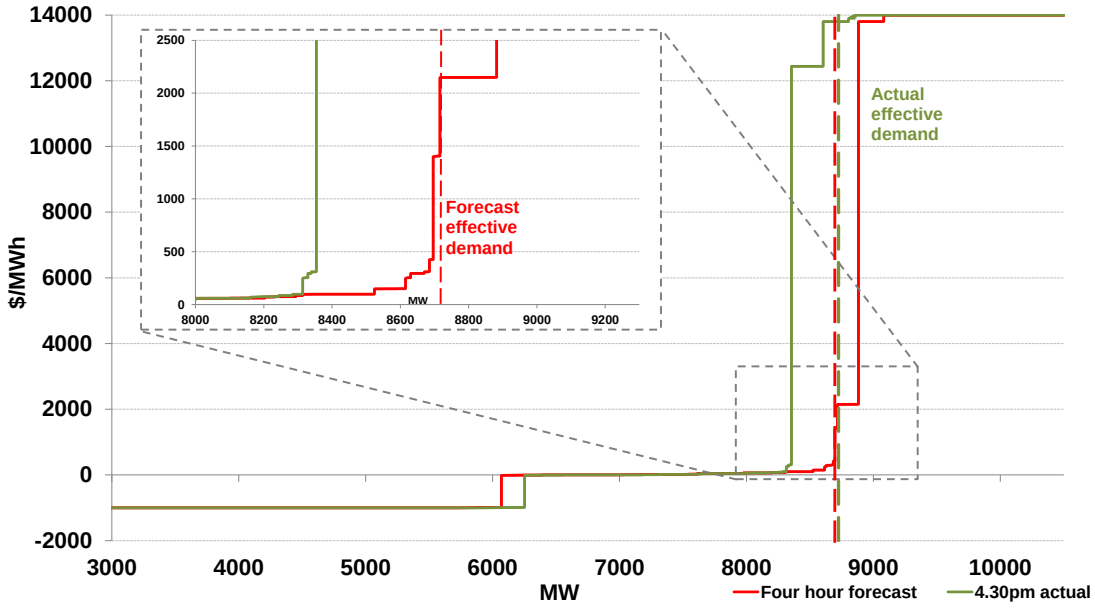


Figure 3 shows the effect of rebidding and removal of capacity on the supply curve by the shift in the supply curve to the left of that forecast four hours earlier. Demand did not materially change from that forecast four hours ahead (the two dashed lines are almost on top of each other). The forecast 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.

3.2 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]

AEMO uses a range of demand definitions for different purposes - the two discussed in this report are total demand and native demand.[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]

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]

4 https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/2016-National-Electricity-Forecasting-Report-NEFR.pdf

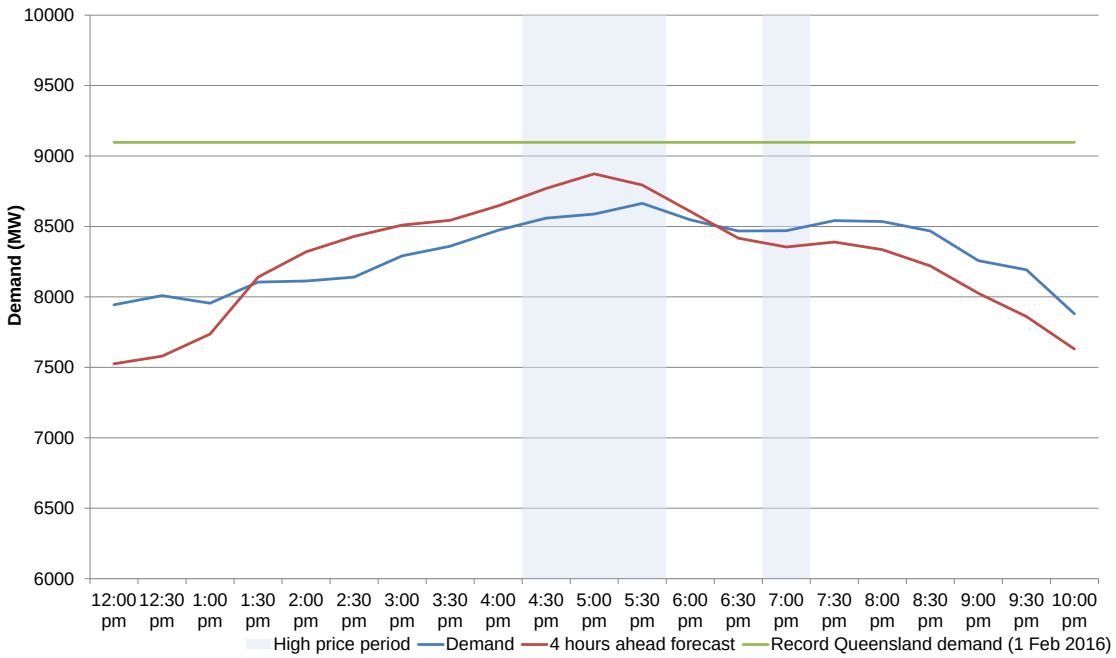
5 See AEMO demand definition document https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/2016/Demand-terms-in-EMMS-Data-Model_Final.pdf

6 http://www.aer.gov.au/industry-information/industry-statistics

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.

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).

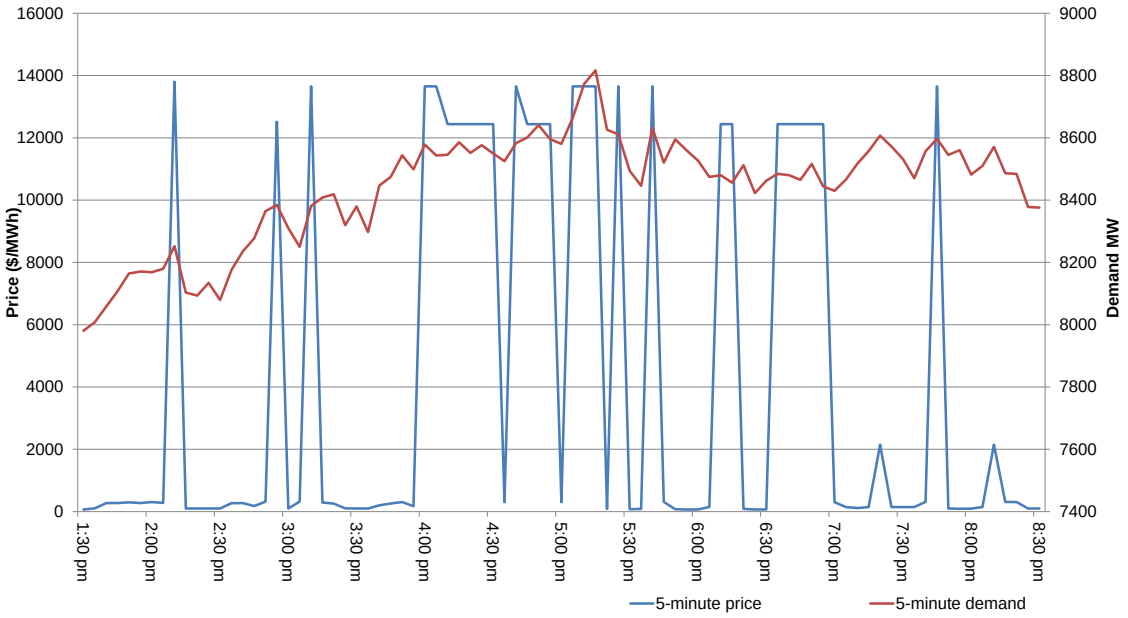
Figure 4: Actual and forecast demand



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 3.1.3, 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



3.3 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**

Trading interval	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
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

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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

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
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

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
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

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
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

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
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

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
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] 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

[8] Details on how the price is determined can be found at www.aemo.com.au

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
		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

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
		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

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
		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

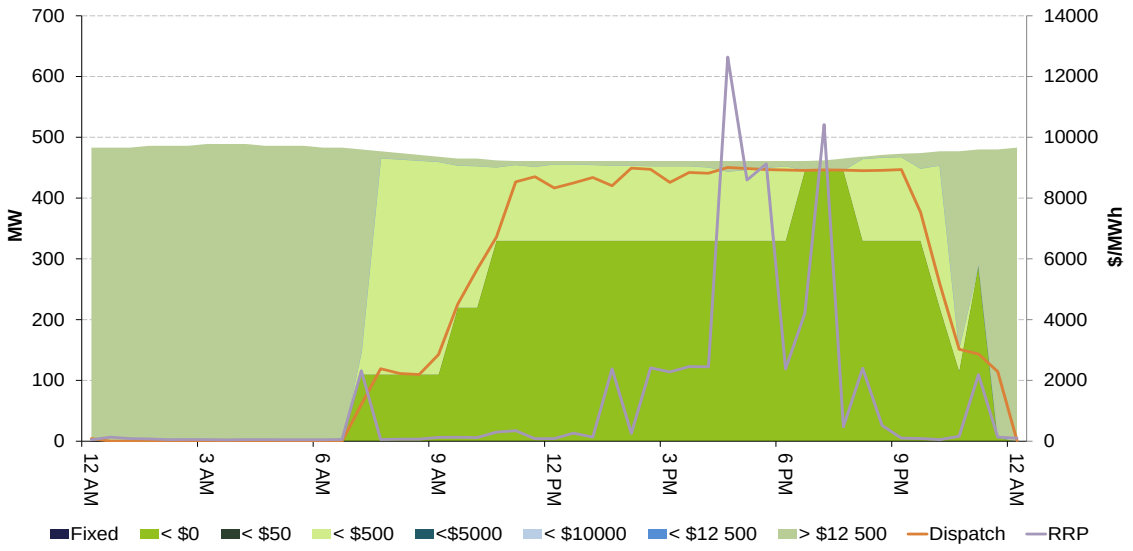

Figure C2 – Arrow Energy (Braemar 2) closing bid prices, dispatch and spot price

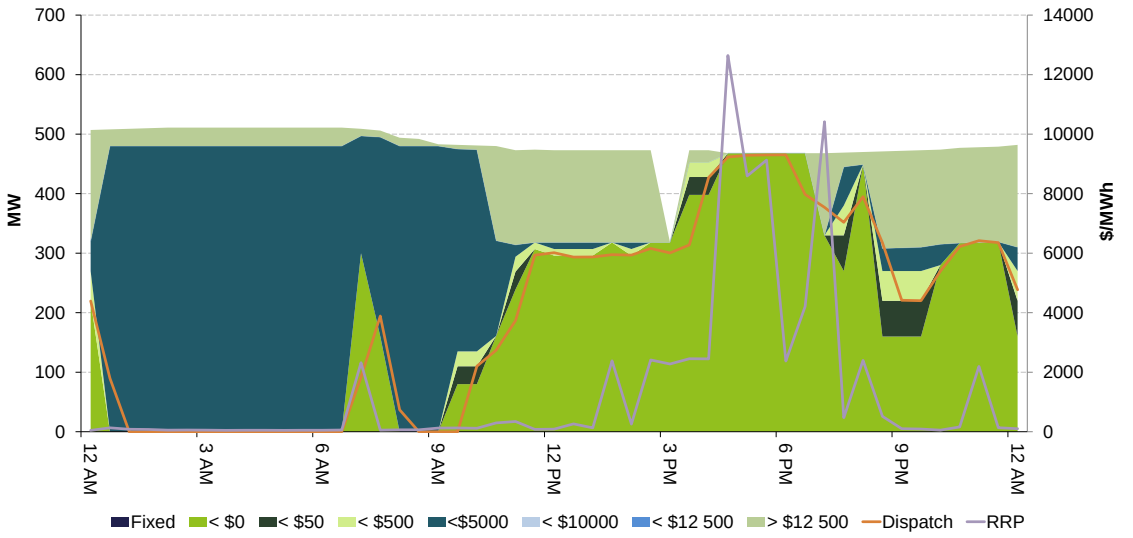

Figure C3 – Callide Power Trading (Callide C) closing bid prices, dispatch and spot price

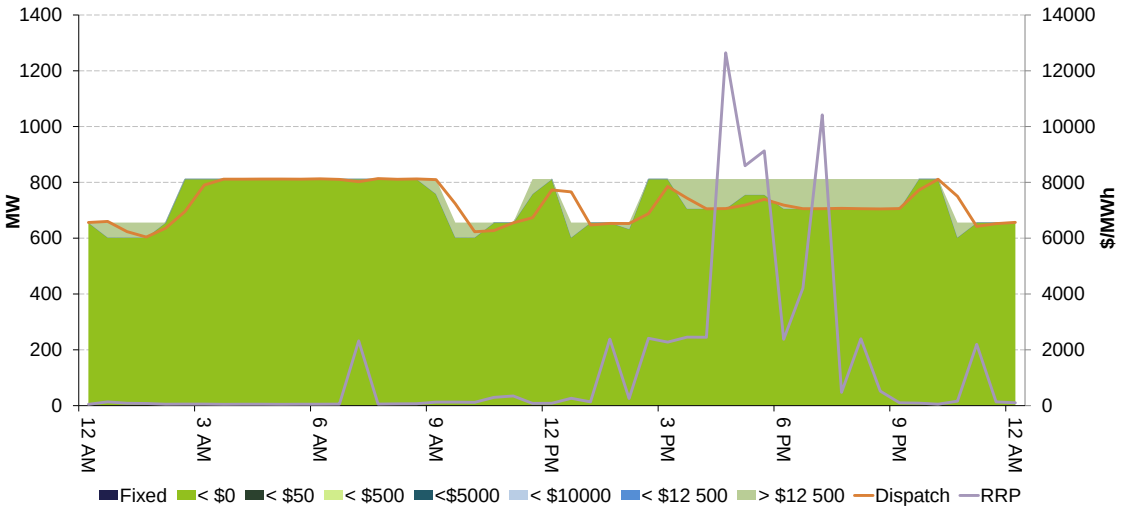

Figure C4 – CS Energy (Callide B, Gladstone, Kogan Creek, Wivenhoe) closing bid prices, dispatch and spot price

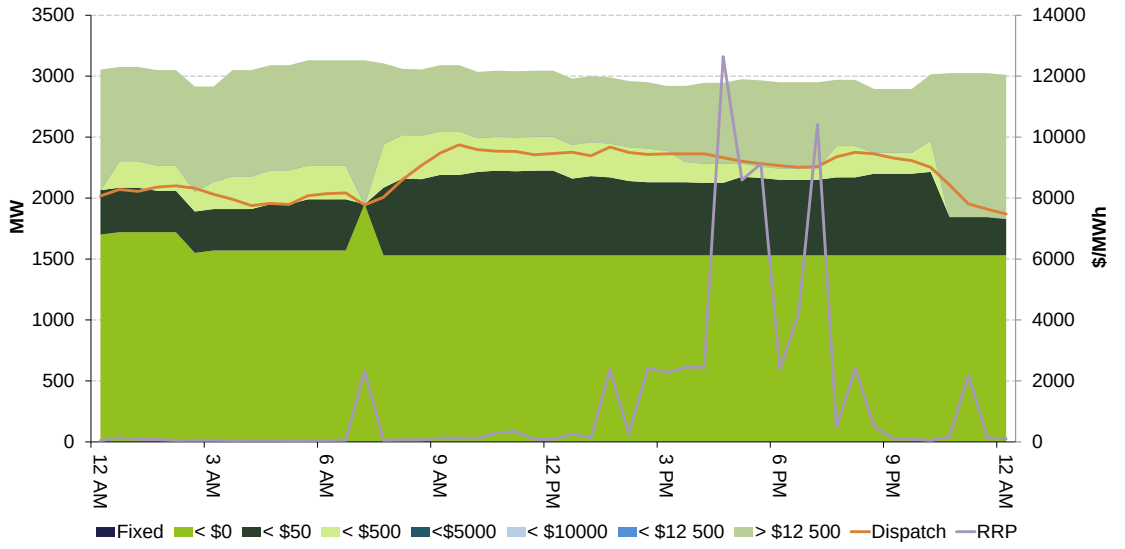

Figure C5 – Origin Energy (Darling Downs, Mt Stuart, Roma) closing bid prices, dispatch and spot price

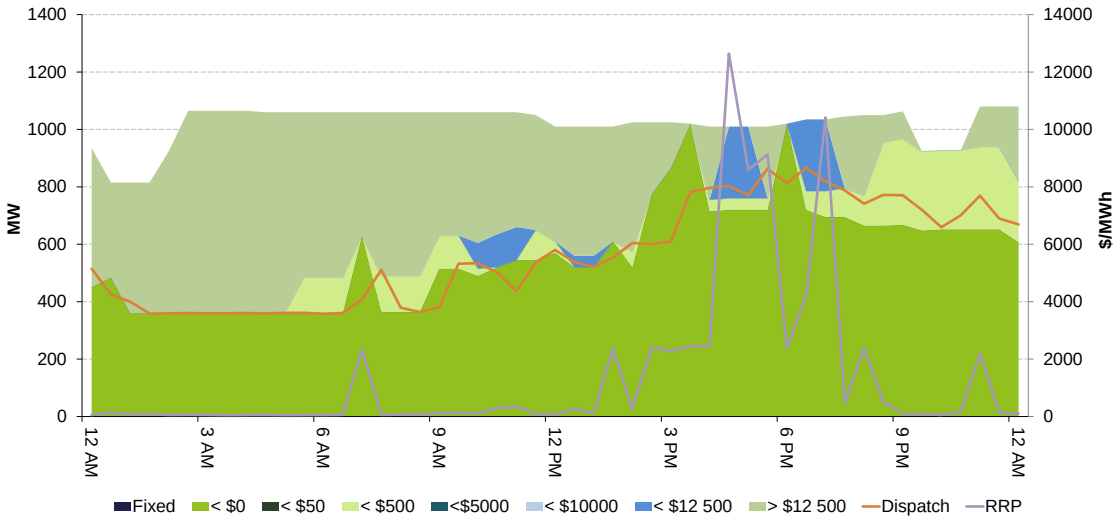

Figure C6 – Stanwell (Barron Gorge, Kareeya, Mackay GT, Stanwell, Tarong, Tarong North) closing bid prices, dispatch and spot price