



# **Electricity spot prices above \$5000/MWh**

**Queensland, 15 January 2015**

March 2015

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AER Reference: 56685 / D15/33560

#### Amendment Record

Version	Date	Pages
1	17/3/2015	Original 32

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# 1 Introduction

The AER is required to publish a report whenever the electricity spot price exceeds \$5000/MWh.<sup>1</sup> 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.

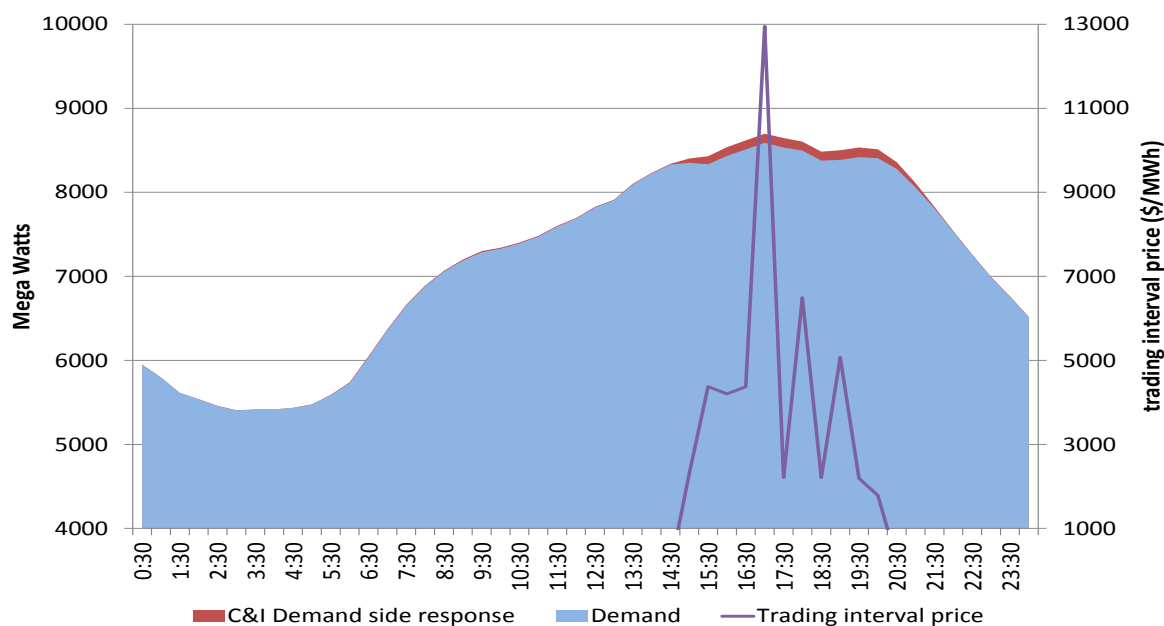
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<sup>1</sup> This requirement is set out in clause 3.13.7 (d) of the National Electricity Rules.

## 2 Summary

On Thursday 15 January 2015 the spot price in Queensland reached \$12 950/MWh at 5 pm, \$6493/MWh at 6 pm and \$5076/MWh at 7 pm, as shown in Figure 1. These high prices were not forecast in pre-dispatch.

**Figure 1: Demand, demand side response and spot price**



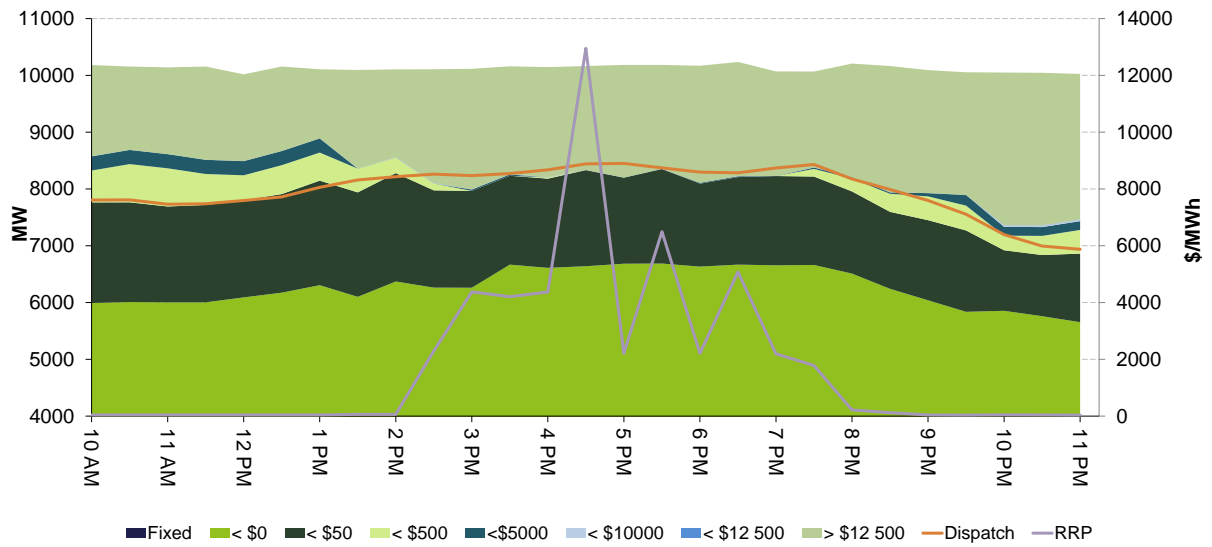
On the day, the temperature in Brisbane reached 37 degrees, exceeding the forecast temperature of 32 degrees. Relative humidity, which contributes to demand in Queensland, was also high. These conditions led to high demand, reaching 8561 MW at 5 pm (coinciding with the highest spot price of the day), below record maximum demand in Queensland of 8933 MW<sup>2</sup>.

Forecast and actual high prices elicited a demand side response from commercial and industrial customers, as shown by the red area in Figure 1.

While high levels of demand contributed to the high prices, the key underlying driver was supply conditions brought about by participant rebidding. Around 8600 MW of initial offers was priced below \$500/MWh for the afternoon period. Prior to the high price trading intervals, around 8000 MW of capacity was offered at prices under \$50/MWh and close to 1000 MW was available at prices between \$50/MWh and \$2000/MWh. Participant rebidding before dispatch moved the majority of available capacity priced between \$50/MWh and \$2000/MWh for the period between 3 pm and 8 pm to price bands under \$50/MWh or close to the market price cap of \$13 500/MWh, as shown in Figure 2.

<sup>2</sup> Reached in summer 2009/10.

**Figure 2: Closing bids for the Queensland region**



### 3 Analysis

Table 1 lists actual and forecast spot price, demand and availability for each high price<sup>3</sup> trading interval. The spot price exceeded \$5000/MWh for the 5 pm, 6 pm and 7 pm trading intervals. The dispatch price in each dispatch interval during the 5 pm trading interval was \$12 950/MWh. The dispatch price was \$12 950/MWh for the 5.35 pm, 5.40 pm and 5.45 pm dispatch intervals resulting in a \$6493/MWh spot price at 6 pm. Two dispatch intervals at \$12 950/MWh and three intervals at \$1501/MWh resulted in the spot price reaching \$5076/MWh at 7 pm.

Actual demand was less than forecast four hours ahead for the 3 pm to 4.30 pm trading intervals inclusive, and greater than forecast from 5 pm to 8 pm inclusive (ranging from 33 MW to 191 MW). Of the trading intervals where the spot price exceeded \$5000/MWh, actual availability was greater than forecast four hours ahead for the 6 pm and 7 pm trading intervals and around 100 MW less forecast for the 5 pm trading interval.

Table 1 also shows that none of the high prices were forecast four hours ahead or twelve hours ahead. Prices forecast twelve hours ahead were higher than forecast four hours ahead as a result of participants rebidding into lower prices between the time frames.

The analysis in section 3.1 shows that rebidding by participants created supply conditions such that small variations in demand had the potential to lead to large variations in price.

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

Time	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
3 pm	2291	86	300	8324	8331	8346	10 106	10 162	10 211
3.30 pm	4376	96	300	8320	8405	8408	10 112	10 160	10 214
4 pm	4204	96	300	8424	8461	8452	10 153	10 177	10 213
4.30 pm	4372	150	300	8484	8504	8484	10 150	10 192	10 196
5 pm	12950	96	300	8561	8528	8523	10 149	10 245	10 163
5.30 pm	2214	95	300	8497	8440	8418	10 188	10 179	10 182
6 pm	6493	53	300	8443	8320	8302	10 116	10 029	10 172
6.30 pm	2208	39	86	8360	8169	8135	10 186	10 047	10 172
7 pm	5076	44	94	8363	8241	8194	10 205	10 060	10 179
7.30 pm	2192	39	94	8399	8319	8259	10 063	10 209	10 185

<sup>3</sup> The weekly report from 11 to 17 January 2015 stated that we would investigate all of these prices as part of this report.

Time	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
8 pm	1784	41	86	8381	8263	8221	10 072	10 191	10 173

### 3.1 Supply and demand

This section discusses supply and demand conditions on the day.

#### 3.1.1 Rebidding

Appendix A contains all significant rebids that contributed to the high prices. Figure 3 graphically summarises significant rebids made (in most cases) within four hours of dispatch and which were effective during the high price periods. The green areas represent capacity rebid from low prices to high prices for each trading interval. The hatched areas represent capacity rebid during the trading interval (i.e. late rebidding). The blue areas represent (generally low-price) capacity withdrawn for each trading interval.

**Figure 3: Rebidding to high prices and capacity withdrawn, by trading interval**

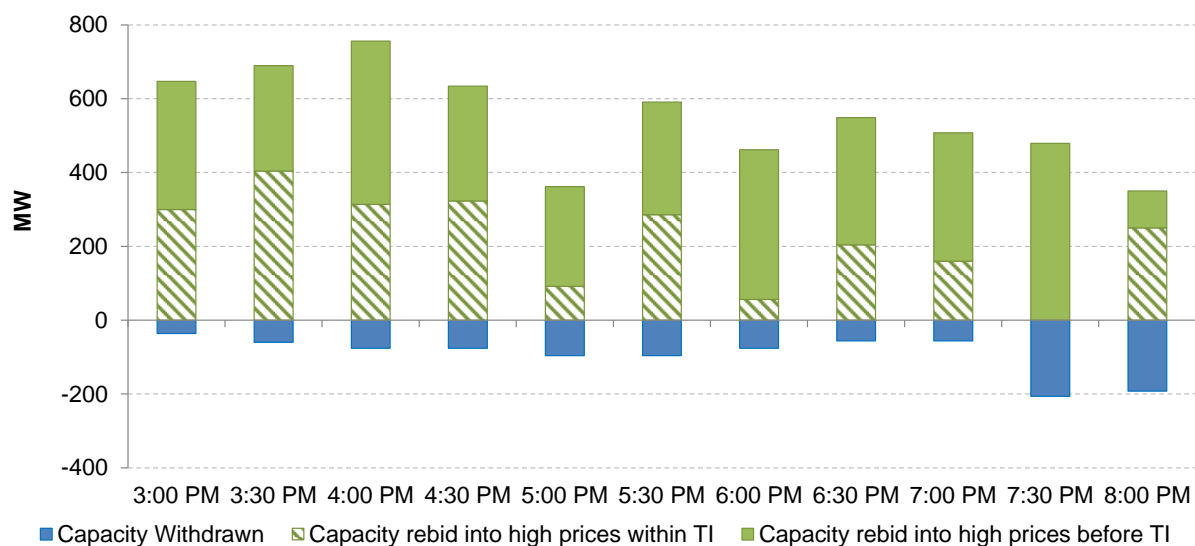


Figure 3 shows that, with the exception of the 7.30 pm trading interval, rebidding within trading intervals contributed to the high prices. CS Energy and Origin Energy were responsible for the majority of the late rebidding, with CS Energy rebidding up to 300 MW and Origin Energy rebidding up to 154 MW within the trading interval.

#### 3.1.2 Supply curve

This section examines actual and forecast supply curves that existed as a result of the rebidding in section 3.1.1 for the 5 pm trading interval, when the spot price reached the maximum for the day of \$12 950/MWh.



Figure 4 shows the actual supply curve for the 5 pm trading interval (denoted by the solid green line), the supply curve forecast 12 hours ahead (i.e. 5 am, denoted by the solid blue line), and the supply curve forecast 4 hours ahead (i.e. 1 pm, 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 actual demand less imports, and forecast demand less forecast imports 12 and 4 hours ahead. Represented as vertical dotted lines, they follow the same colour convention as the supply curves.

**Figure 4: Forecast and actual supply curves**

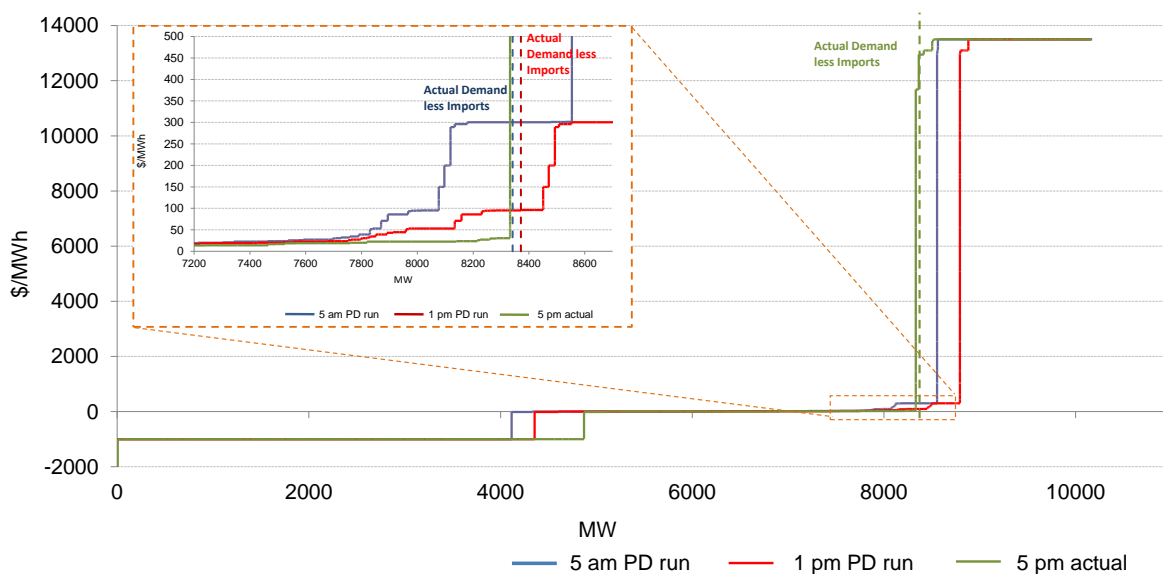


Figure 4 shows that from 12 hours head to 4 hours ahead rebidding caused the forecast supply curve to shift to the right. As shown in Table 1, this saw the forecast price fall from \$300/MWh 12 hours ahead, to \$96/MWh four hours ahead.

Particularly important to why the actual price for the 5 pm trading interval was much higher at \$12 950/MWh than the 4 hour forecast price of \$96/MWh is the shape of the actual supply curve. The inset in Figure 4 shows the effect rebidding within four hours of dispatch had on the shape of the supply curve. As a result of rebidding, there was no capacity left between \$50/MWh and \$10 000/MWh. A significant amount of this capacity (250 MW) was shifted into higher price bands by CS Energy at Wivenhoe and Gladstone. The rebid reasons were generally related to constraints binding on the QNI interconnector.

The figure shows that as a result of the rebidding, the supply curve was practically vertical around the level of actual demand less imports (denoted by the solid green and dotted green lines, respectively).

### 3.1.3 Demand

On 15 January 2015, the temperature in Brisbane reached 37 degrees, exceeding the forecast temperature of 32 degrees. Relative humidity, which contributes to demand in Queensland, was also high.

Figure 5 shows (as does Table 1) that demand for the 5 pm trading interval was forecast to reach 8528 MW four hours ahead (purple dotted line) and 8523 MW twelve hours ahead (blue dotted line). Figure 5 also shows that demand for the 5 pm trading interval was forecast to be 8522 MW half an hour ahead of dispatch (green dotted line). Actual demand (red solid line) for the 5 pm trading interval reached 8561 MW, which was the maximum for the day.

According to data provided by AEMO, commercial and industrial customer demand fell by about 100 MW from 3 pm to 3.30 pm, in response to high prices. Commercial and industrial demand returned to previous levels from 8 pm, following a fall in prices. The solid blue line in Figure 5 shows what demand would have been had the commercial and industrial demand not reduced in response to high prices. As these customers are non-scheduled their response at any point in time is not incorporated in AEMO’s demand forecasts. The figure shows that had these customers not reduced their demand, the demand forecast error half an hour ahead would have been over 140 MW rather than 40 MW.

**Figure 5: Actual and forecast demand**

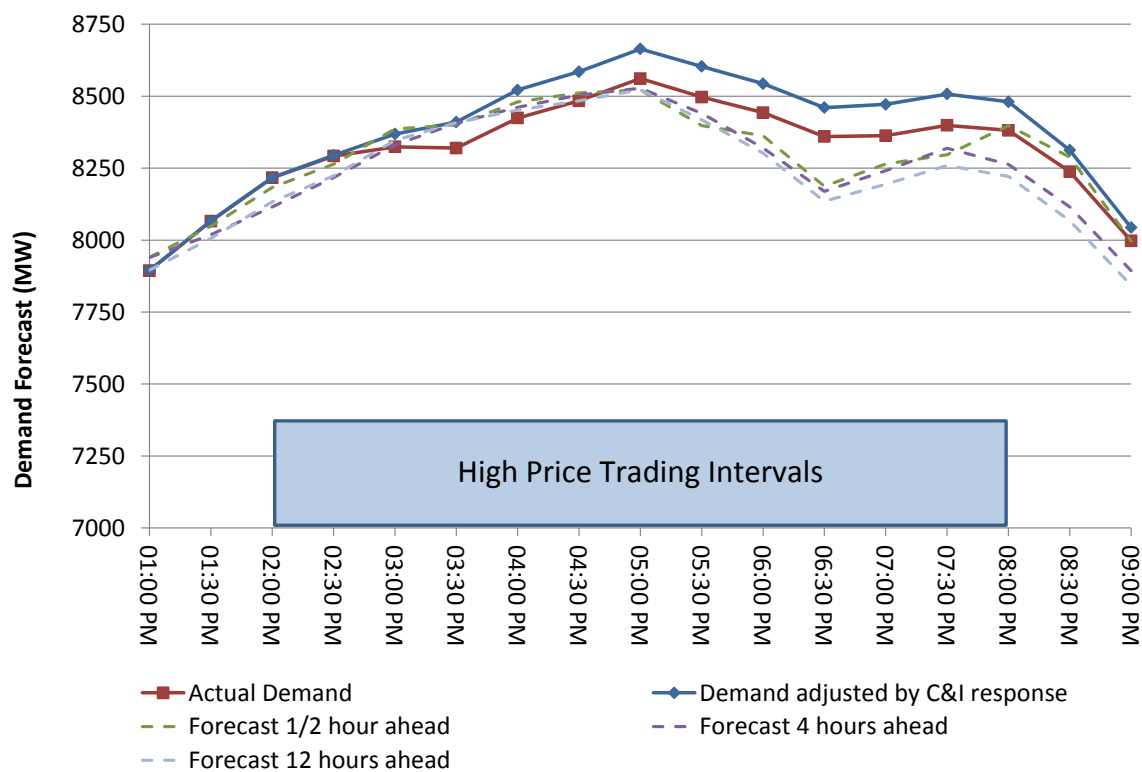
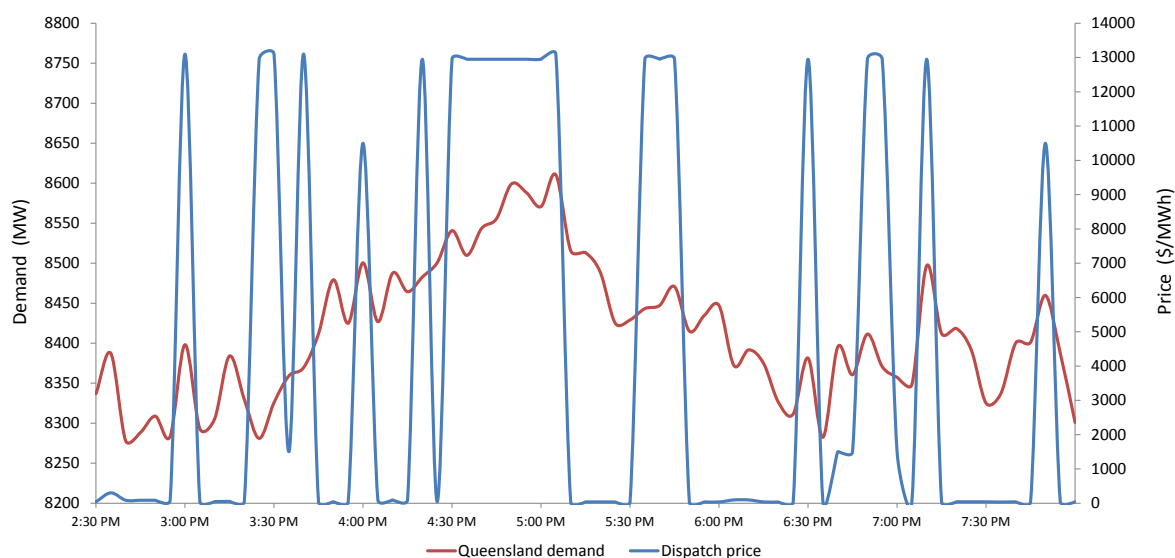


Figure 6 shows 5-minute demand and (volatile) prices over the high price period. The figure shows that, with the almost vertical supply curve, small increases in 5-minute demand coincided with increases in price.

**Figure 6: Queensland 5-minute price and demand graph**



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 Network Availability

Table 2 shows the net import limit into Queensland from New South Wales was in the order of 350 MW lower than the nominal limit of 600 MW during the time of high prices.

**Table 2: Actual and forecast network capability**

Time	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
3 pm	-201	-164	-180	-201	-164	-180
3.30 pm	-230	-162	-181	-230	-162	-181
4 pm	-198	-164	-182	-231	-164	-182
4.30 pm	-235	-165	-186	-236	-165	-186
5 pm	-219	-182	-187	-219	-182	-187
5.30 pm	-172	-186	-192	-221	-186	-192
6 pm	-170	-182	-194	-215	-182	-194
6.30 pm	-189	-174	-202	-232	-174	-202

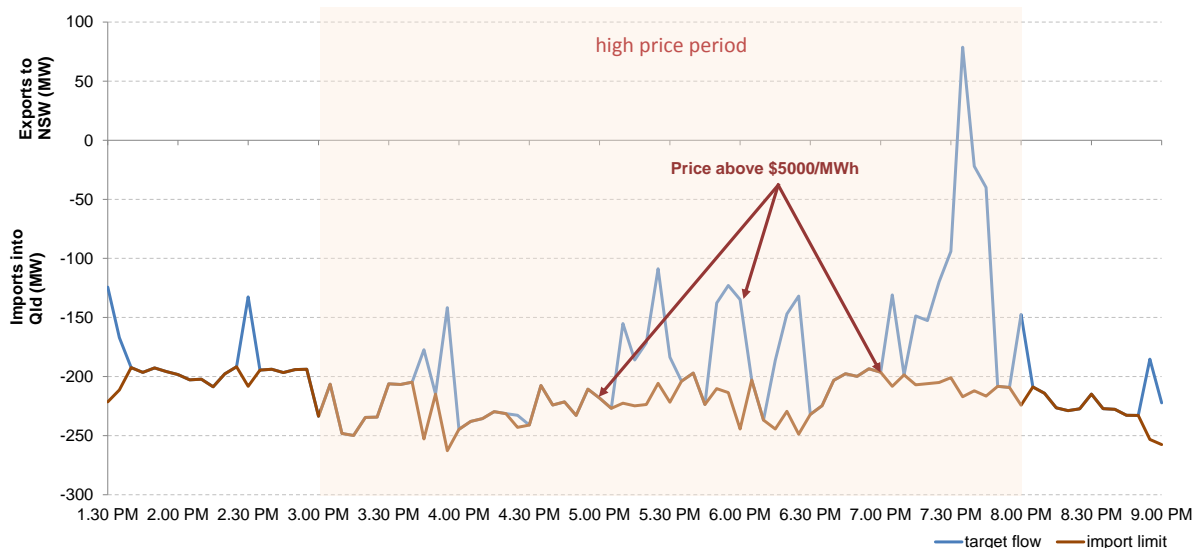
Time	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
7 pm	-202	-181	-206	-202	-181	-206
7.30 pm	-141	-164	-207	-204	-275	-207
8 pm	-91	-186	-191	-215	-263	-191

Imports across the Queensland to New South Wales interconnector (QNI) were limited to a maximum of 250 MW by system normal constraints. These constraints manage the overloading of the Liddell to Muswellbrook line on the trip of the Liddell to Tamworth line and are designed to avoid voltage collapse in Queensland on the loss of the largest generator in Queensland. At the time of high prices CS Energy’s Kogan Creek unit was the largest operating unit, at 700 MW.

Flows into Queensland across the Terranora interconnector were limited to around 10 MW during the time of high prices and did not exceed 20 MW when dispatch prices spiked. Terranora has been partially out of service since August 2013 due to faulty cables, which has reduced its maximum import limit to around 30 MW. The interconnector is scheduled to return to service in mid-2015, which should return its nominal limit to around 110 MW.

Figure 7 shows the net import limit, and net target flows into Queensland on a 5-minute basis. Interconnectors were operating close to, or at their limits, and close to forecast during the time of high prices.

**Figure 7: 5-minute net import limit and target flows**



**Australian Energy Regulator**

**March 2015**

## 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 amount of capacity involved and the change in the price of the capacity was being offered. The reason submitted at the time of the rebid is also included.

### Significant Rebids for 3 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
11.07 am	Millmerran	Millmerran	53	7	Price cap	11:06 A change in QLD PD demand sensitivities -SL
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - NMQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.47 pm	Origin	Mt Stuart	244	<96	Price cap	1344A inc QLD dem – 5PD 8275MW > 30PD 8166MW @1400 SL
1.50 pm	CS Energy	Gladstone, Wivenhoe	90	<45	Price cap	1349A interconnector constraint- binding-SL
2.05 pm	CS Energy	Gladstone	80	<95	Price cap	1429A interconnector constraint-QNI binding and Oakey and Braema
2.29 pm (effective from 2.40 pm)	CS Energy	Gladstone, Wivenhoe	170	Price cap	<299	1429A interconnector constraint-QNI binding and Oakey and Braema
2.39 pm (effective from 2.50 pm)	CS Energy	Gladstone, Wivenhoe	310	<300	Price cap	1437A constraint-QNI binding plus other units increasing-SL
2.51 pm (effective from 3 pm)	CS Energy	Gladstone	80	<45	Price cap	1451A constraint-QNI binding plus other units increasing-SL
<b>Total capacity rebid from low to high prices</b>			<b>647</b>			

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
<b>Capacity Withdrawn</b>			<b>36</b>			

### Significant Rebids for 3.30 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^Q_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-24	0	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	302	13 499	1304P fuel management::change MW distrib.
1.16 pm	ERM Power	Oakey	20	302	13 499	1316P fuel management::change MW distrib.
1.50 pm	CS Energy	Gladstone, Wivenhoe	90	<44	Price cap	1348A interconnector constraint- binding-SL
2.05 pm	CS Energy	Gladstone	80	<93	Price cap	1403A interconnector constraint-QNI binding and yabulu increasin
2.53 pm	Arrow	Braemar 2	42	<285	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
2.53 pm	Origin	Mt Stuart	154	<96	Price cap	1450A constraint management – N^Q_NIL_B1 SL
2.56 pm (effective from 3.05 pm)	ERM Power	Oakey	19	13 499	0	1456F material change in market conditions::change MW distrib.

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
2.59 pm (effective from 3.10 pm)	CS Energy	Gladstone	140	<290	Price cap	1459A interconnector constraint-QNI-SL
3.02 pm (effective from 3.10 pm)	ERM Power	Oakey	19	0	13 499	1502F change in PD: fcast price dec.:change MW distrib.
3.10 pm (effective from 3.20 pm)	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm (effective from 3.20 pm)	Callide	Callide C	26	Price floor	Price cap	1505A RRP above PD
3.18 pm (effective from 3.25 pm)	Origin	Mt Stuart	90	53	12 950	1515A constraint management – N^MQ_NIL_B1 SL
3.19 pm (effective from 3.30 pm)	CS Energy	Gladstone	80	<44	Price cap	1519A interconnector constraint-QNI-SL
<b>Total capacity rebid from low to high prices</b>			<b>690</b>			
<b>Capacity Withdrawn</b>			<b>60</b>			

### Significant Rebids for 4 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-40	0	N/A	1253P unit rts revised-SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management::change MW distrib.
1.16 pm	ERM Power	Oakey	20	286	13 499	1316P fuel management ::change MW distrib.
1.50 pm	CS Energy	Gladstone, Wivenhoe	90	<44	Price cap	1348A interconnector constraint- binding-SL
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.05 pm	CS Energy	Gladstone	80	<93	Price cap	1403A interconnector constraint-QNI binding and Yabulu increasin
2.53 pm	Arrow	Braemar 2	42	<285	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
2.53 pm	Origin	Mt Stuart	154	<96	Price cap	1450A constraint management – N <sup>MQ</sup> _NIL_B1 SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	26	Price floor	Price cap	1505A RRP above PD
3.21 pm	CS Energy	Gladstone	140	<290	Price cap	1519A interconnector constraint-QNI-SL
3.28 pm (effective from 3.35 pm)	ERM Power	Oakey	40	13 499	<0	1526F change in pd: fcast price inc::change MW distrib.
3.38 pm (effective from 3.45 pm)	Origin	Mt Stuart	154	Price cap	<53	1535A unforecast mpc spike SL
3.50 pm (effective from 4 pm)	CS Energy	Gladstone	80	22	Price cap	1549A interconnector constraint-QNI binding – other units increa



Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.51 pm (effective from 4 pm)	Callide	Callide C	40	Price floor	Price cap	1548A RRP below PD – SL
<b>Total capacity rebid from low to high prices</b>			<b>756</b>			
<b>Capacity Withdrawn</b>			<b>76</b>			

### Significant Rebids for 4.30 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-40	0	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management::change MW distrib.
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.50 pm	CS Energy	Gladstone	160	Price cap	<44	1349A interconnector constraint- binding-SL
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.05 pm	CS Energy	Gladstone	80	<93	Price cap	1403A interconnector constraint-QNI binding and yabulu increasin
2.53 pm	Arrow	Braemar 2	42	<285	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.11 pm	Callide	Callide C	26	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
3.38 pm	CS Energy	Wivenhoe	250	15	Price cap	1528A interconnector constraint-QNI binding with prices above \$1
3.44 pm and 3.46 pm	CS Energy	Gladstone	140	<290	Price cap	1524A maintain dispatch margin-SL
3.57 pm (effective from 4.05 pm)	ERM Power	Oakey	42	12850	436	1556F change in pd: fcast price inc::change mw distrib.
4.09 pm (effective from 4.20 pm)	ERM Power	Oakey	22	436	12850	1608F change in pd: fcast price inc::change mw distrib.
4.11 pm (effective from 4.20 pm)	Origin	Mt Stuart	84	<96	12 950	1608A constraint management – NMQ_NIL_B1 SL
4.14 pm (effective from 4.25 pm)	ERM Power	Oakey	22	12850	Price floor	1614F change in pd: fcast price inc::change mw distrib.
4.17 pm (effective from 4.25 pm)	Arrow	Braemar 2	33	13 500	29	1615A QLD price higher than forecast SL
4.20 pm (effective from 4 pm)	CS Energy	Gladstone	120	22	Price cap	1617A interconnector constraint-QNI binding – other units increa
<b>Total capacity rebid from low to high prices</b>			<b>634</b>			
<b>Capacity Withdrawn</b>			<b>76</b>			

## Significant Rebids for 5 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^Q_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-40	0	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management::change MW distrib.
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.53 pm	Arrow	Braemar 2	42	<285	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	0	13 499	1516P ambient conditions ::change MW distrib.
3.38 pm	CS Energy	Wivenhoe	250	15	Price cap	1528A interconnector constraint-QNI binding with prices above \$1
4.01 pm	CS Energy	Gladstone	-20	0	N/A	1601P plant not following target rebid it match load-SL
4.11 pm	Origin	Mt Stuart	84	<96	12 950	1608A constraint management – N^Q_NIL_B1 SL
4.17 pm	ERM Power	Oakey	42	13 499	<458	1617F change in PD: fcast price inc::change MW distrib.
4.21 pm	Arrow	Braemar 2	33	Price cap	31	1615A change in 5min PD: QLD price increase SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
4.25 pm (effective from 4.35 pm)	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.26 pm (effective from 4.35 pm)	CS Energy	Gladstone	60	<296	Price cap	1626A interconnector constraint-QNI binding other units increa
4.28 pm (effective from 4.35 pm)	ERM Power	Oakey	22	458	13 499	1627P ambient conditions ::change MW distrib.
<b>Total capacity rebid from low to high prices</b>			<b>362</b>			
<b>Capacity Withdrawn</b>			<b>96</b>			

### Significant Rebids for 5.30 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-40	0	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management:: change MW distrib.
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.53 pm	Arrow	Braemar 2	42	<301	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
3.38 pm	CS Energy	Wivenhoe	250	15	Price cap	1528A interconnector constraint-QNI binding with prices above \$1
4.01 pm	CS Energy	Gladstone	-20	0	N/A	1601P plant not following target rebid it match load-SL
4.17 pm	ERM Power	Oakey	42	13 499	<458	1617F change in PD: fcast price inc::change MW distrib.
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.28 pm	ERM Power	Oakey	22	458	13 499	1627P ambient conditions ::change MW distrib.
4.48 pm	Origin	Mt Stuart	54	<96	12 950	1641A inc QLD dem – 5PD 8512MW > 30PD 8398MW @ 1730 SL
4.54 pm (effective from 5.05 pm)	CS Energy	Gladstone	60	<296	Price cap	1653A interconnector constraint-QNI binding-SL
5.02 pm (effective from 5.10 pm)	Arrow	Braemar 2	36	Price Cap	31	1700A QLD price higher than forecast SL
5.07 pm (effective from 5.15 pm)	CS Energy	Gladstone	40	22	Price cap	1706A interconnector constraint-QNI almost binding-SL
5.15 pm (effective from 5.25 pm)	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm (effective from 5.30 pm)	Callide	Callide C	10	Price floor	Price cap	1717A change PD demand sensitivities – SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
5.21 pm (effective from 5.30 pm)	CS Energy	Gladstone	120	22	Price cap	1720A interconnector constraint-QNI almost binding - SL
<b>Total capacity rebid from low to high prices</b>			<b>591</b>			
<b>Capacity Withdrawn</b>			<b>96</b>			

### Significant Rebids for 6 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-20	0	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management:: change MW distrib.
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.53 pm	Arrow	Braemar 2	42	<285	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.38 pm	CS Energy	Wivenhoe	250	15	Price cap	1528A interconnector constraint-QNI binding with prices above \$1
4.01 pm	CS Energy	Gladstone	-20	0	N/A	1601P plant not following target rebid it match load-SL
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.27 pm	Callide	Callide C	20	Price cap	Price floor	1627A RRP above PD - SL
4.48 pm	Origin	Mt Stuart	84	<96	12 950	1641A inc QLD dem – 5PD 8512MW > 30PD 8398MW @ 1730 SL
5.15 pm	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm	CS Energy	Gladstone	75	<296	Price cap	1715A interconnector constraint-QNI almost binding -SL
5.22	ERM Power	Oakey	24	13 499	Price floor	1721F material change in market conditions ::change MW distrib
5.36 pm (effective from 5.45 pm)	Callide	Callide C	20	Price cap	Price floor	1735A RRP above PD
5.37 pm (effective from 5.45 pm)	Arrow Energy	Braemar 2	36	Price cap	31	1736A QLD price higher than forecast SL
<b>Total capacity rebid from low to high prices</b>			<b>462</b>			
<b>Capacity Withdrawn</b>			<b>76</b>			

### Significant Rebids for 6.30 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^Q_NIL_B1 SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-170	<13 500	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management:: change MW distrib.
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.53 pm	Arrow	Braemar 2	42	<301	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.27 pm	Callide	Callide C	20	Price cap	Price floor	1627A RRP above PD - SL
4.48 pm	Origin	Mt Stuart	84	<96	12 950	1641A inc QLD dem – 5PD 8512MW > 30PD 8398MW @ 1730 SL
5.15 pm	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm	Callide	Callide C	10	Price cap	Price cap	1717A change PD demand sensitivities – SL
5.38 pm	CS Energy	Wivenhoe	250	15	Price cap	1737A interconnector constraint-QQNI binding-SL
5.40 pm	CS Energy	Gladstone	170	N/A	<13 500	1740P unit offline revised-SL
5.49 pm	Callide	Callide C	-20	<15	N/A	1749P PA fan max



Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
6.06 pm (effective from 6.15 pm)	CS Energy	Gladstone	100	<296	Price cap	1806A interconnector constraint-QNI binding-SL
6.09 pm (effective from 6.15 pm)	ERM Power	Oakey	24	13 499	Price floor	1808F material change in market conditions ::change MW distrib.
6.13 pm (effective from 6.20 pm)	CS Energy	Gladstone	-30	0	N/A	1813P unit ramping rebid to match-scada-SL
6.20 pm (effective from 6.30 pm)	CS Energy	Gladstone	80	22	Price cap	1820A interconnector constraint-close to binding-SL
6.22 pm (effective from 6.30 pm)	Millmerran	Millmerran	30	7	Price cap	18:20 A change in 5min PD flow – SL
<b>Total capacity rebid from low to high prices</b>			<b>549</b>			
<b>Capacity Withdrawn</b>			<b>56</b>			

### Significant Rebids for 7 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - NMQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.53 pm	CS Energy	Gladstone	-170	<13 500	N/A	1253P unit rts revised-SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
1.04 pm	ERM Power	Oakey	20	300	13 499	1304P fuel management:: change MW distrib.

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
1.16 pm	ERM Power	Oakey	20	300	13 499	1316P fuel management ::change MW distrib.
1.59 pm	ERM Power	Oakey	40	13 499	<0	1358P fuel management ::change MW distrib
2.53 pm	Arrow	Braemar 2	39	<301	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.27 pm	Callide	Callide C	20	Price cap	Price floor	1627A RRP above PD - SL
4.48 pm	Origin	Mt Stuart	84	<96	12 950	1641A inc QLD dem – 5PD 8512MW > 30PD 8398MW @ 1730 SL
5.15 pm	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm	Callide	Callide C	10	Price cap	Price cap	1717A change PD demand sensitivities – SL
5.40 pm	CS Energy	Gladstone	170	N/A	<13 500	1740P unit offline revised-SL
5.49 pm	Callide	Callide C	-20	<15	N/A	1749P PA fan max
6.09 pm	ERM Power	Oakey	24	13 499	Price floor	1808F material change in market conditions ::change MW distrib.
6.22 pm	Millmerran	Millmerran	30	7	Price cap	18:20 A change in 5min PD flow – SL
6.28 pm	CS Energy	Wivenhoe	250	15	Price cap	1827A interconnector constraint-QNI binding-SL
6.34 pm (effective from 6.45 pm)	CS Energy	Gladstone	100	<296	Price cap	1833A interconnector constraint-QNI binding-SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
6.41 pm (effective from 6.50 pm)	Callide	Callide C	20	Price floor	Price cap	1839A change in 5min PD QNI flow - SL
6.53 pm (effective from 7 pm)	CS Energy	Gladstone	40	N/A	0	1852P unit ramping rebid to match-rts-SL
<b>Total capacity rebid from low to high prices</b>			<b>508</b>			
<b>Capacity Withdrawn</b>			<b>56</b>			

### Significant Rebids for 7.30 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
2.53 pm	Arrow	Braemar 2	36	<301	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
4.01 pm	CS Energy	Gladstone	-170	<=Price cap	N/A	1601P plant not following target rebid it match load-SL
4.12 pm	Arrow	Braemar 2	15	<142	Price cap	1611P ambient conditions: adjust bid for prevailing conditions
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
4.27 pm	Callide	Callide C	20	Price cap	Price floor	1627A RRP above PD - SL
5.15 pm	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm	Callide	Callide C	10	Price cap	Price cap	1717A change PD demand sensitivities – SL
5.40 pm	CS Energy	Gladstone	20	N/A	0	1740P unit offline revised-SL
5.49 pm	Callide	Callide C	-20	<15	N/A	1749P PA fan max
6.02 pm	Origin	Mt Stuart	84	<96	12 950	1755A inc QLD dem – 5PD 8376MW > 30PD 8187MW @ 1830 SL
6.22 pm	Millmerran	Millmerran	30	7	Price cap	18:20 A change in 5min PD flow – SL
6.41 pm	Callide	Callide C	20	Price floor	Price cap	1839A change in 5min PD QNI flow – SL
6.53 pm	CS Energy	Gladstone, Wivenhoe	325	<296	Price cap	1849F interconnector constraint-QNI binding-SL
<b>Total capacity rebid from low to high prices</b>			<b>479</b>			
<b>Capacity Withdrawn</b>			<b>206</b>			

### Significant Rebids for 8 pm Trading interval

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
12.48 pm	Origin	Mt Stuart	120	Price cap	<96	1245A constraint management - N^MQ_NIL_B1 SL
12.52 pm	Origin	Mt Stuart	-18	96	N/A	1250P change in avail - ambient conditions SL
12.56 pm	Origin	Mt Stuart	-18	96	N/A	1255P plant conditions – ambient temp SL
2.53 pm	Arrow	Braemar 2	33	<301	Price cap	1450A change in 5min PD: QLD demand lower than 30 min PD SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.10 pm	Millmerran	Millmerran	30	7	Price cap	15:04 A RRP above PD
3.11 pm	Callide	Callide C	36	Price floor	Price cap	1505A RRP above PD
3.17 pm	ERM Power	Oakey	23	<302	13 499	1516P ambient conditions ::change MW distrib.
4.12 pm	Arrow	Braemar 2	18	<1501	Price cap	1611P ambient conditions: adjust bid for prevailing conditions
4.25 pm	Millmerran	Millmerran	10	7	Price cap	16:25 A RRP above PD
4.27 pm	Callide	Callide C	20	Price cap	Price floor	1627A RRP above PD - SL
5.15 pm	Millmerran	Millmerran	20	7	Price cap	17:14 A change in 5min PD QNI flow – SL
5.19 pm	Callide	Callide C	10	Price cap	Price cap	1717A change PD demand sensitivities – SL
5.40 pm	CS Energy	Gladstone	40	N/A	0	1740P unit offline revised-SL
5.49 pm	Callide	Callide C	-26	<Price cap	N/A	1749P PA fan max
6.02 pm	Origin	Mt Stuart	84	<96	12 950	1755A inc QLD dem – 5PD 8376MW > 30PD 8187MW @ 1830 SL
6.13 pm	CS Energy	Gladstone	-170	<=Price cap	N/A	1813P unit ramping rebid to match-scada-SL
6.22 pm	Millmerran	Millmerran	30	7	Price cap	18:20 A change in 5min PD flow – SL
6.41 pm	Callide	Callide C	20	Price floor	Price cap	1839A change in 5min PD QNI flow – SL
6.55 pm	Millmerran	Millmerran	30	Price cap	7	18:55 A change in AEMO 5min PD QNI flow SL
7.05 pm	ERM Power	Oakey	24	13 499	0	1904F material change in market conditions ::change MW distrib.
7.42 pm (effective from 7.50 pm)	CS Energy	Wivenhoe	250	15	Price cap	1941F avoid uneconomic dispatch-SL

Submit time	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
<b>Total capacity rebid from low to high prices</b>			<b>350</b>			
<b>Capacity Withdrawn</b>			<b>192</b>			

## Appendix B Price setter

The following table identifies for the trading interval 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.<sup>4</sup> The 30-minute spot price is the average of the six dispatch interval prices.

### Queensland – 5 pm

Time	Dispatch Price	Participant	Unit	Service	Marginal change	Contribution
16:35	\$12 950.00	Origin Energy	MSTUART1	Energy	0.36	\$4662.00
		Origin Energy	MSTUART2	Energy	0.36	\$4662.00
		Origin Energy	MSTUART3	Energy	0.28	\$3626.00
16:40	\$12 950.00	Origin Energy	MSTUART1	Energy	0.36	\$4662.00
		Origin Energy	MSTUART2	Energy	0.36	\$4662.00
		Origin Energy	MSTUART3	Energy	0.28	\$3626.00
16:45	\$12 950.00	Origin Energy	MSTUART1	Energy	0.36	\$4662.00
		Origin Energy	MSTUART2	Energy	0.36	\$4662.00
		Origin Energy	MSTUART3	Energy	0.28	\$3626.00
16:50	\$12 950.00	Origin Energy	MSTUART1	Energy	0.50	\$6475.00
		Origin Energy	MSTUART2	Energy	0.50	\$6475.00
16:55	\$12 950.00	Origin Energy	MSTUART1	Energy	0.50	\$6475.00
		Origin Energy	MSTUART2	Energy	0.50	\$6475.00
17:00	\$12 950.00	Origin Energy	MSTUART1	Energy	0.33	\$4273.50
		Origin Energy	MSTUART2	Energy	0.33	\$4273.50
		Origin Energy	MSTUART3	Energy	0.33	\$4273.50
<b>Spot Price</b>	<b>\$12 950/MWh</b>					

<sup>4</sup> Details on how the price is determined can be found at [www.aemo.com.au](http://www.aemo.com.au)

## Queensland – 6 pm

Time	Dispatch Price	Participant	Unit	Service	Marginal change	Contribution
17:35	\$12 950.00	Origin Energy	MSTUART1	Energy	0.50	\$6475.00
		Origin Energy	MSTUART2	Energy	0.50	\$6475.00
17:40	\$12 950.00	Origin Energy	MSTUART1	Energy	0.33	\$4273.50
		Origin Energy	MSTUART2	Energy	0.33	\$4273.50
		Origin Energy	MSTUART3	Energy	0.33	\$4273.50
17:45	\$12 950.00	Origin Energy	MSTUART1	Energy	0.33	\$4273.50
		Origin Energy	MSTUART2	Energy	0.33	\$4273.50
		Origin Energy	MSTUART3	Energy	0.33	\$4273.50
17:50	\$36.87	Snowy Hydro	UPPTUMUT	Energy	1.12	\$36.75
17:55	\$36.59	Snowy Hydro	UPPTUMUT	Energy	1.12	\$36.75
18:00	\$36.35	Eraring Energy	ER03	Energy	1.12	\$36.77
<b>Spot Price</b>		<b>\$6493/MWh</b>				

## Queensland – 7 pm

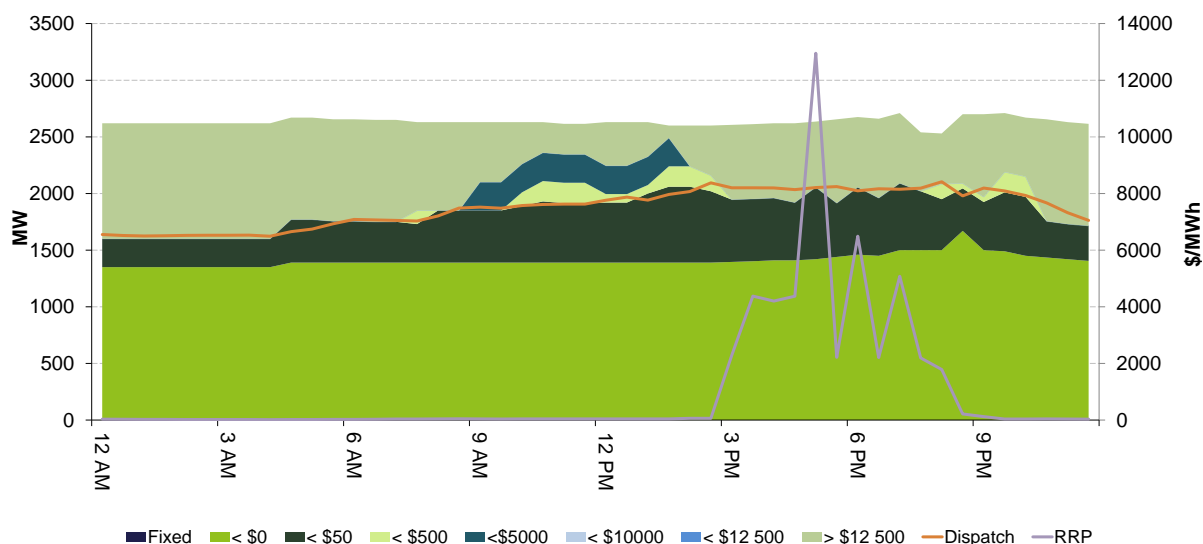
Time	Dispatch Price	Participant	Unit	Service	Marginal change	Contribution
18:35	\$52.90	CS Energy	GSTONE2	Energy	0.50	\$26.45
		CS Energy	GSTONE4	Energy	0.50	\$26.45
18:40	\$1501.02	Arrow	BRAEMAR6	Energy	1.00	\$1501.02
18:45	\$1501.02	Arrow	BRAEMAR6	Energy	1.00	\$1501.02
18:50	\$12 950.00	Origin Energy	MSTUART1	Energy	0.33	\$4273.50
18:55	\$12 950.00	Origin Energy	MSTUART1	Energy	0.33	\$4273.50
		Origin Energy	MSTUART2	Energy	0.33	\$4273.50
		Origin Energy	MSTUART3	Energy	0.33	\$4273.50
19:00	\$1501.01	Arrow	BRAEMAR5	Energy	1.00	\$1501.01
<b>Spot Price</b>		<b>\$5076/MWh</b>				



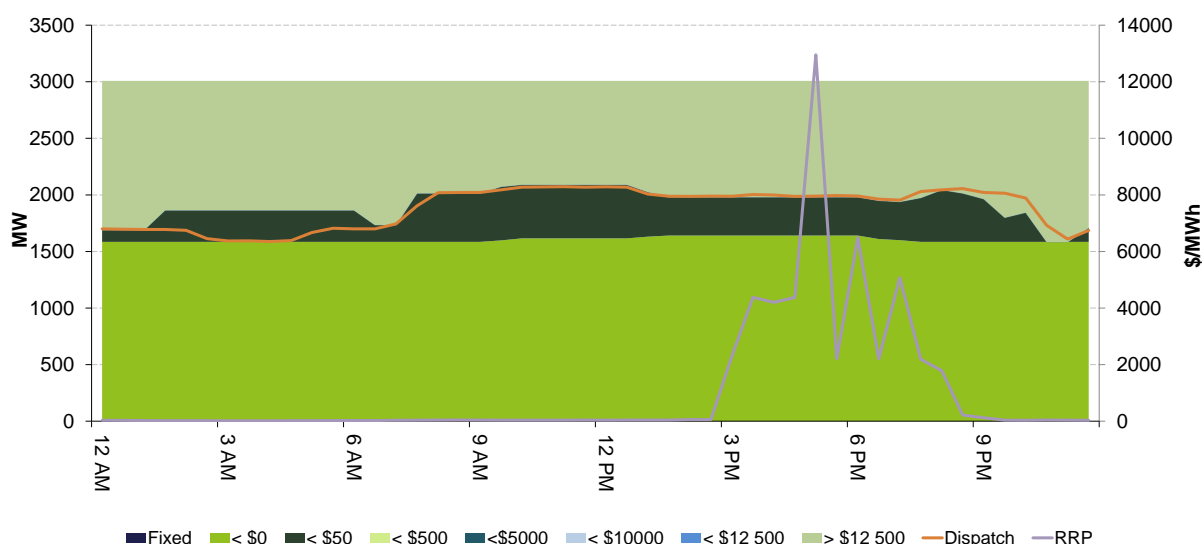
## Appendix C Closing bids

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.

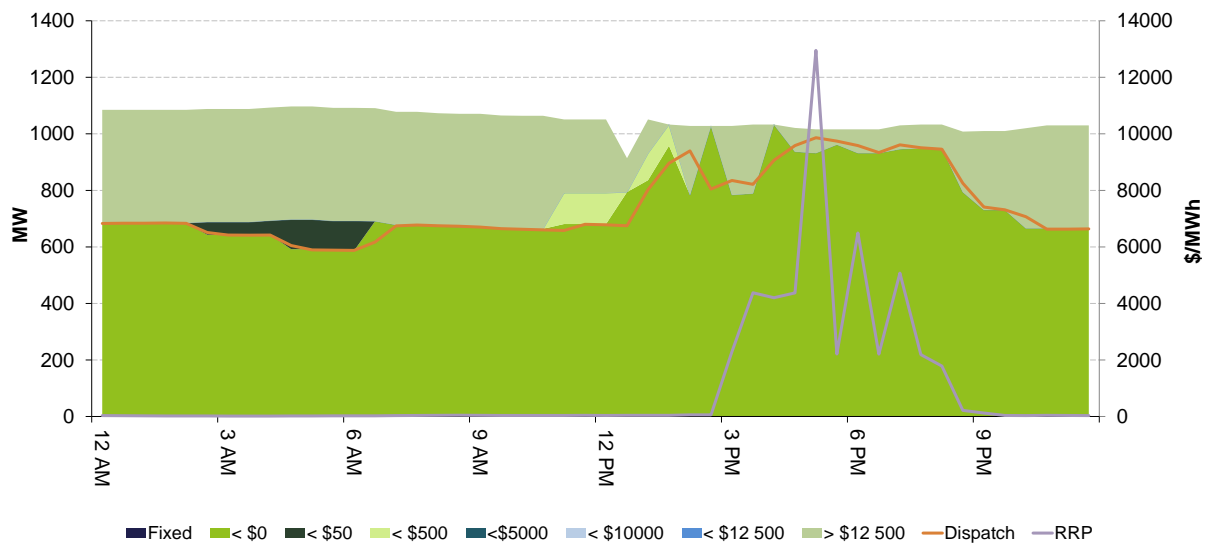
**Figure C1 - CS Energy (Callide B, Gladstone, Kogan Creek, Wivenhoe) closing bid prices, dispatch and spot price**



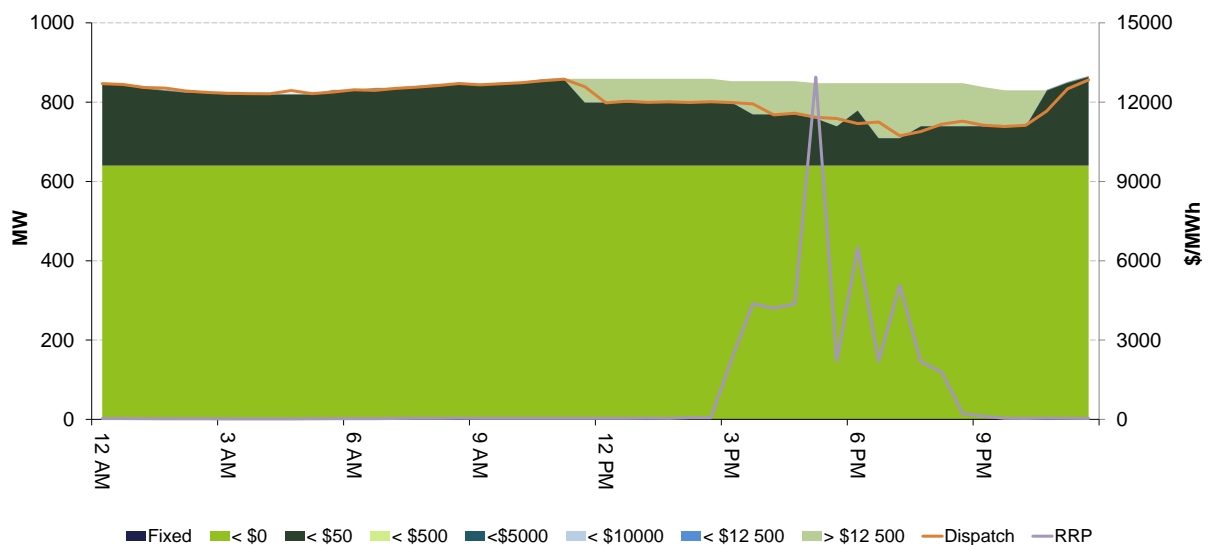
**Figure C2 - Stanwell (Barron Gorge, Kareeya, Mackay, Stanwell, Tarong, Tarong North) closing bid prices, dispatch and spot price**



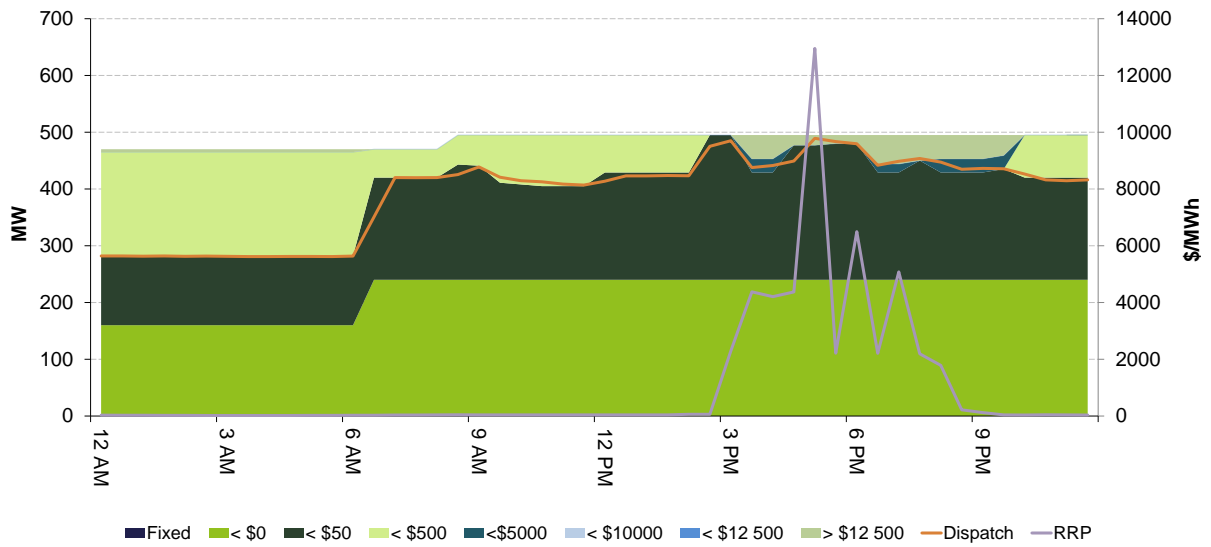
**Figure C3 - Origin (Darling Downs, Mt Stuart, Roma) closing bid prices, dispatch and spot price**



**Figure C4 - Millmerran (Millmerran) closing bid prices, dispatch and spot price**



**Figure C5 - Arrow (Braemar 2) closing bid prices, dispatch and spot price**



**Figure C6 - ERM (Oakey) closing bid prices, dispatch and spot price**

