

Electricity prices above \$5,000/MWh

Queensland,
20 December 2021

March 2022

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1 Obligation

The Australian Energy Regulator (AER) regulates energy markets and networks under national legislation and rules in eastern and southern Australia (known as the National Energy Market), as well as networks in the Northern Territory. Its functions include:

- monitoring wholesale electricity and gas markets to ensure energy businesses comply with the legislation and rules, and taking enforcement action where necessary;
- setting the amount of revenue that network businesses can recover from customers for using networks (electricity poles and wires and gas pipelines) that transport energy;
- regulating retail energy markets in Queensland, New South Wales, South Australia, Tasmania (electricity only), and the ACT;
- operating the Energy Made Easy website, which provides a retail price comparator and other information for energy consumers;
- publishing information on the performance of energy markets, including the annual State of the energy market report and biennial effective competition report, to assist stakeholders and the wider community.

The AER is required to publish a report whenever the electricity 30-minute price¹ exceeds \$5,000 per megawatt hour (\$/MWh) in accordance with clause 3.13.7(d) of the National Electricity Rules.

The report:

- describes the significant factors contributing to the 30-minute price exceeding \$5,000/MWh, including withdrawal of generation capacity and network availability;
- assesses whether rebidding contributed to the 30-minute price exceeding \$5,000/MWh;
- identifies the marginal scheduled generating units; and
- identifies all units with offers for the trading intervals equal to or greater than \$5,000/MWh and compares these dispatch offers to relevant dispatch offers in previous trading intervals.

These reports are designed to examine market events and circumstances that contributed to wholesale market price outcomes and are not an indicator of potential compliance issues or enforcement action.

¹ From 1 October 2021, clause 3.13.7 of the NER was amended for 5-minute settlement. Under 5-minute settlement, a trading interval is now comprised of a 5-minute period and the spot price is the price for a trading interval. The 30-minute price is the average of 6 trading intervals and is calculated the same way as previously under 30-minute settlement.

2 Summary

On 20 December 2021 the wholesale price of electricity in Queensland reached \$10,035/MWh, \$8,602/MWh and \$12,043/MWh for the 6 pm, 6.30 pm and 7 pm 30-minute periods respectively. Prices were forecast to be above \$5,000/MWh from the first price forecast published the day before.

The main drivers of the high price were:

- High demand, which peaked at 9,146 MW– the highest up to that point of the summer.
- Limited access to low-priced capacity due to generator outages and reduced generator availability:
 - 1,600 MW of generation capacity was unavailable
 - Baseload generators were operating below their registered capacity, leading to a further 615 MW of capacity being unavailable.
 - Falling solar generation further reduced the available supply of low-priced generation for the evening peak demand
- A system normal constraint limited imports from NSW on the Queensland-New South Wales Interconnector (QNI), further limiting Queensland's access to low-priced generation.

While only around 12% of available generation capacity was priced above \$5,000/MWh some of this capacity was required to be dispatched.

Rebidding from low to high prices did not contribute to the high prices.

3 Analysis

3.1 Overview of actual and expected conditions

The Queensland 30-minute price for 6 pm, 6.30 pm and 7 pm on 20 December 2021 reached \$10,035/MWh, \$8,602/MWh and \$12,043/MWh respectively. Table 1 compares actual and forecast 30-minute prices, demand and availability:

- Prices above \$5,000/MWh were forecast to occur for 6 consecutive 30-minute intervals, from 5.30 pm to 8.00 pm but only eventuated at 6 pm to 7 pm intervals.²
- Availability during the high-priced intervals was up to 313 MW lower than forecast lower than forecast 1 hour prior. This was a result of baseload generators removing capacity and unplanned outages.
- Demand was high and close to forecast.

Table 1: Actual and forecast 30-minute price, demand and available capacity

30 min period	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	1 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast
5.30 pm	1,099	12,885	13,000	9,063	9,081	8,879	10,168	10,529	10,516
6 pm	10,035	10,128	15,100	9,081	9,128	8,958	9,993	10,306	10,291
6.30 pm	8,602	10,128	15,100	8,940	8,998	8,856	10,047	10,106	10,048
7 pm	12,043	15,100	15,100	9,020	8,954	8,837	9,976	9,990	9,998
7.30 pm	3,073	15,100	13,000	8,867	8,896	8,786	10,043	10,023	10,021
8 pm	567	15,100	12,885	8,707	8,760	8,639	10,063	10,040	10,064

3.2 High temperatures drove high demand

Queensland demand was the highest up to that point during the summer, reaching 9,146 MW. This was driven by warm temperatures, which reached 33°C in Brisbane³ – the highest since 4 October 2021 in what had been a mild summer.⁴

Sensitivity reports published throughout the day indicated that demand would have to fall by up to 500 MW for the 30-minute price to be below \$5,000/MWh.

² High prices for the 6pm to 7 pm 30-min intervals were forecast from the first published forecasts on the previous day.

³ Bureau of Meteorology, daily weather observations
<http://www.bom.gov.au/climate/dwo/202112/html/IDCJDW4019.202112.shtml>

⁴ Bureau of Meteorology, 'Greater Brisbane in November 2021: a very wet month; cooler than usual days overall',
<http://www.bom.gov.au/climate/current/month/qld/archive/202111.brisbane.shtml>

3.3 Reduced access to low-priced capacity

Outages and reduced capacity offered

Around 2,200 MW of capacity was unavailable on the evening. This included around 1,600 MW of outages, while a further 615 MW was unavailable due to generators offering less than their registered capacity (Table 2).

Most of the reduced capacity was known and related to Callide B, Callide C, and Gladstone. In addition, Stanwell's Tarong units were offered at reduced capacity due to 'coal management'.

However, in some cases, available capacity was removed on the day. For example:

- CleanCo's Swanbank unit removed 350 MW of capacity at 11.24 am due to a 'plant trip'. This unit is expected to return to service in September 2022.
- CS Energy's Callide B unit 2 removed 50 MW of capacity at 5.40 pm due to an 'emissions limit'.
- Alinta Energy's Braemar 3 unit failed to start at 4.53 pm removing 172 MW of capacity. This unit did not return to service until the 6.05 pm 5-minute interval.

Most of this capacity was priced below \$5,000/MWh.

Table 2: Significant generation that was unavailable

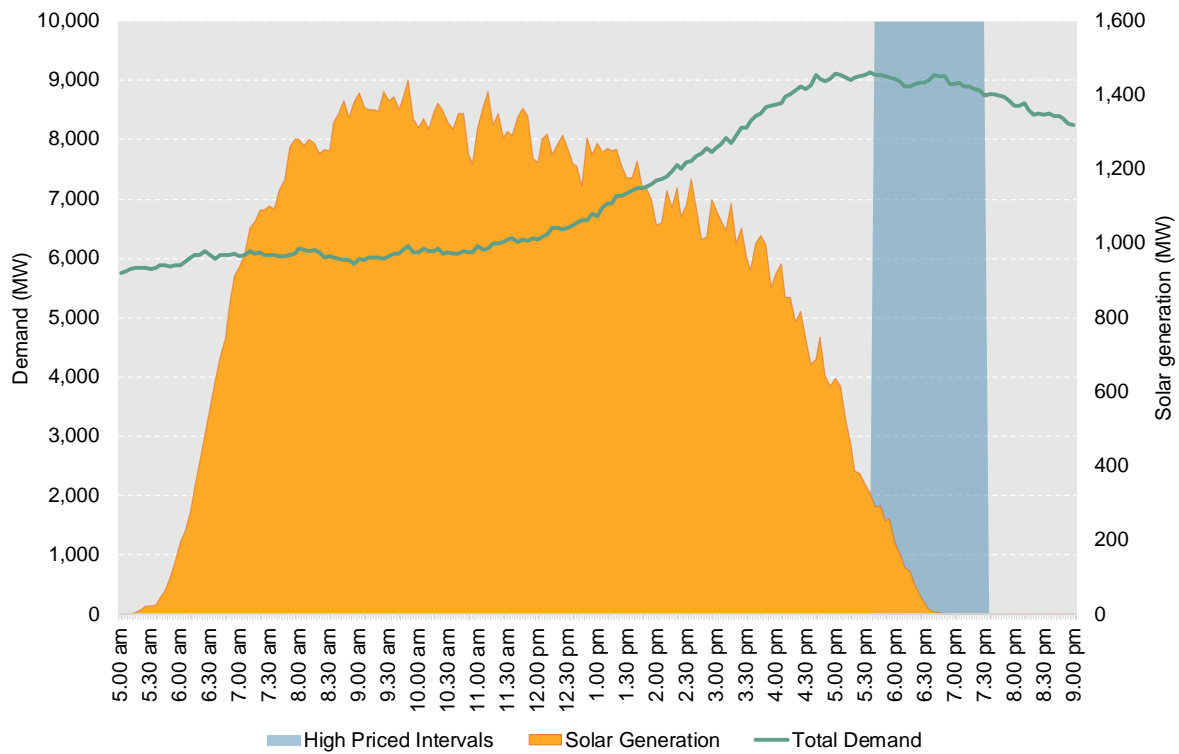
Participant	Station	Unit	Registered capacity (MW)	Max avail 6 pm (MW)	Unavailable (MW)	Reason
CS Energy	Callide B	CALL_B_1	350	0	350	Known – reduced capacity due to unit coming offline on 17 December 2021.
CS Energy	Callide B	CALL_B_2	350	210	140	Known – reduced capacity due to emissions limit.
Callide Power Trading	Callide C	CPP_4	420	0	420	Known – offline since significant failure on 25 May 2021.
CS Energy	Gladstone	GSTONE1	280	0	280	Known – offline since 15 July due to an unplanned outage.
Stanwell Corporation	Stanwell	STAN-2	365	310	55	Known – reduced capacity due to coal management.
Stanwell	Tarong	TARONG#1	350	195	155	Known – reduced capacity due to coal management.
Stanwell	Tarong	TARONG#2	350	295	55	Known – reduced capacity due to coal management.
Stanwell	Tarong	TARONG#3	350	195	155	Known – reduced capacity due to coal management.

Participant	Station	Unit	Registered capacity (MW)	Max avail 6 pm (MW)	Unavailable (MW)	Reason
Stanwell	Tarong	TARONG#4	350	295	55	Known – reduced capacity due to coal management.
Alinta Energy	Braemar A	BRAEMAR3	168	0	168	Unplanned – unit failed to start. Unit returned at 6.05 pm.
CleanCo	Swanbank	SWAN_E	350	0	350	Unplanned – offline due to plant trip.
Total					2,183	

Falling output from solar generation

The high prices also coincided with falling solar generation in the region, which further reduced the available supply of low-priced capacity. At the times of high prices there was between 0 MW and 292 MW of solar generation available, down from 1,441 MW earlier in the day (Figure 1).

Figure 1: Falling solar generation coincides with high priced intervals



3.4 Reduced access to low-priced imports from NSW

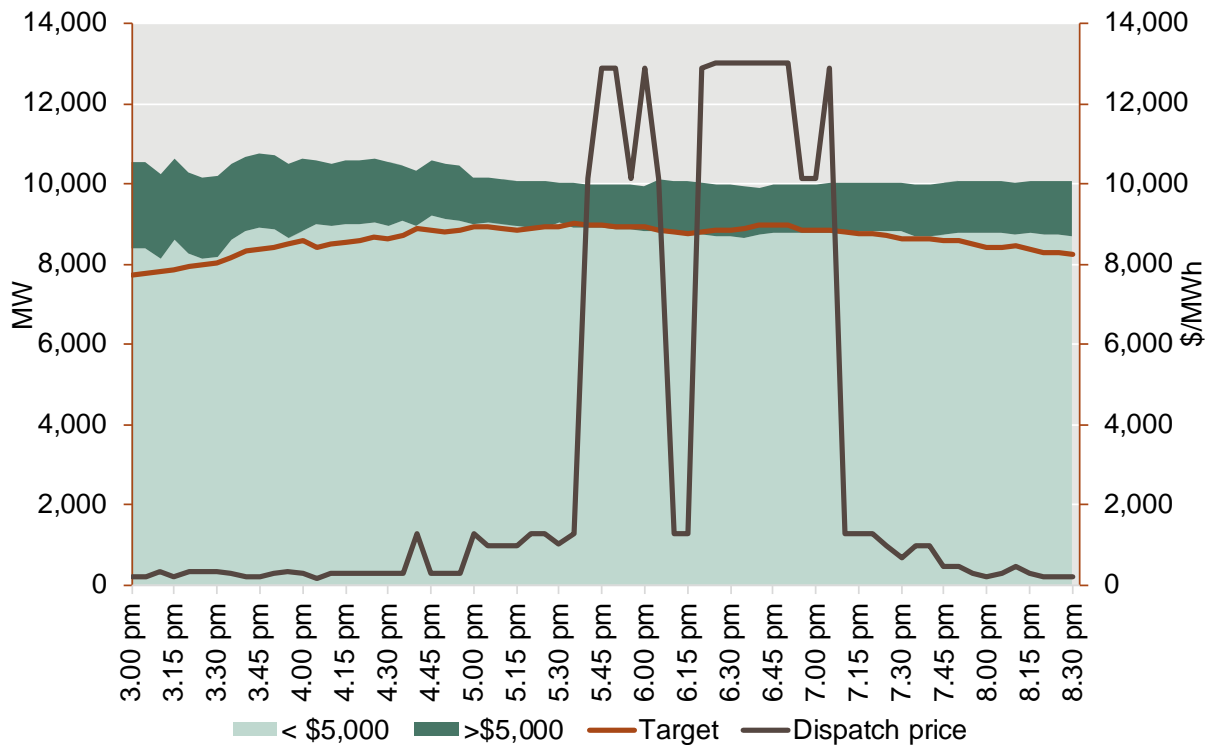
A system normal constraint limited access to cheap imports from NSW at the time of the high price event in Queensland. System normal constraints reflect network limits when there are no outages. They are always in place but their impact on transfer capacity may fluctuate according to system conditions.

A system normal constraint limited cheap imports from NSW to around 100 MW. The nominal capacity of QNI is 300 to 600 MW, when electricity is flowing from NSW to Queensland. The constraint manages flows across QNI so that were the largest unit available in Queensland to trip, the voltage disturbance would be manageable.⁵

3.5 12% of available capacity priced over \$5,000/MWh

Around 1,235 MW, or 12% of available capacity was priced over \$5,000/MWh during the time of the high price event. Much of this capacity was offered by gas peaking plants.

Figure 2: Queensland capacity offered above and below \$5,000/MWh



Note: adjusted for constrained capacity

Given the high demand, reduced generator availability, declining solar generation and limited imports from NSW, some of this high-priced capacity was required to be dispatched leading to 30-minute prices above \$5,000/MWh.

Rebidding capacity did not contribute to high prices.

⁵ p. 3, 'Interconnector Capabilities', AEMO, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Congestion-Information/2017/Interconnector-Capabilities.pdf

Appendix A: Closing bids

Figures A1 to A6 highlight the 5-minute offers for participants in Queensland with capacity priced at or above \$5,000/MWh during the periods in which the 5-minute price exceeded \$5,000/MWh. They also show generation output and the 5-minute price.

Figure A1: Alinta (Braemar A, Collinsville SF and Rugby Run SF) offers, dispatch and dispatch price

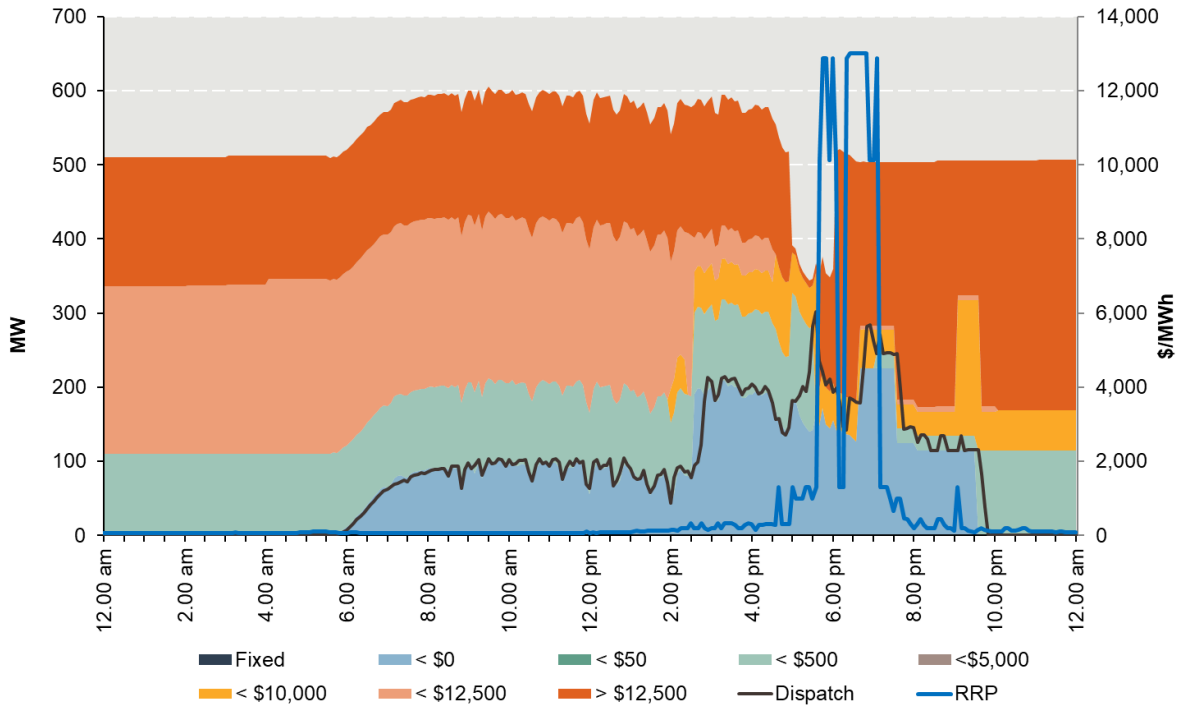


Figure A2: Arrow (Braemar 2) offers, dispatch and dispatch price

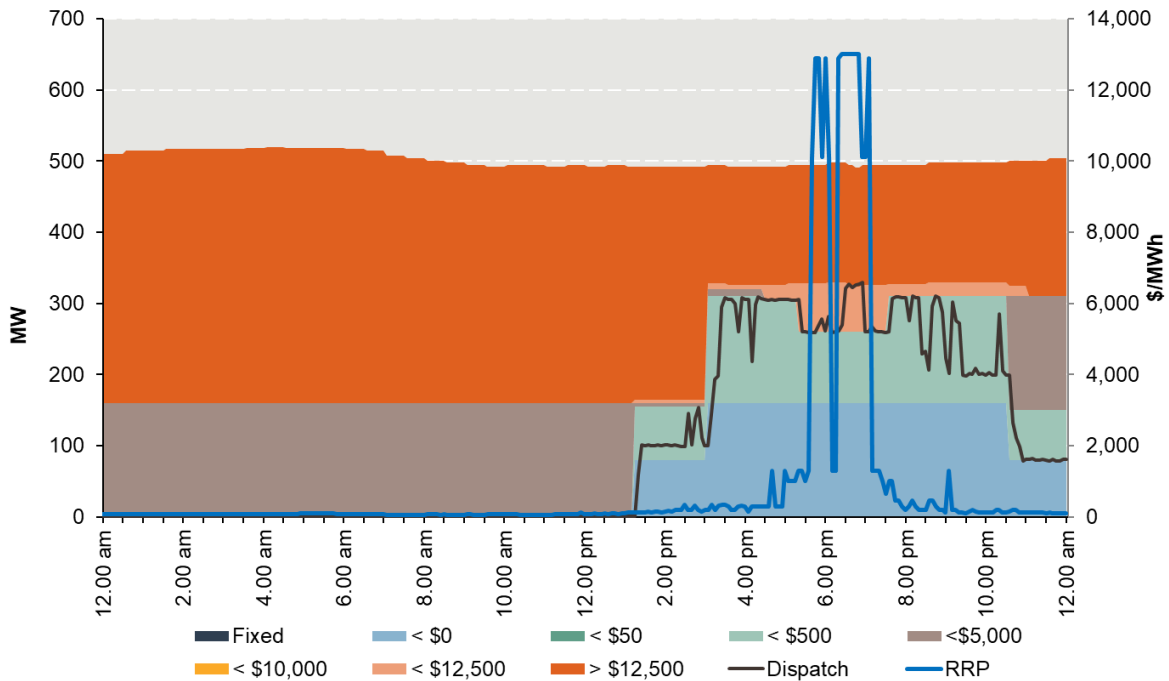


Figure A3: CS Energy (Callide B, Gladstone, Kogan Creek) offers, dispatch and dispatch price

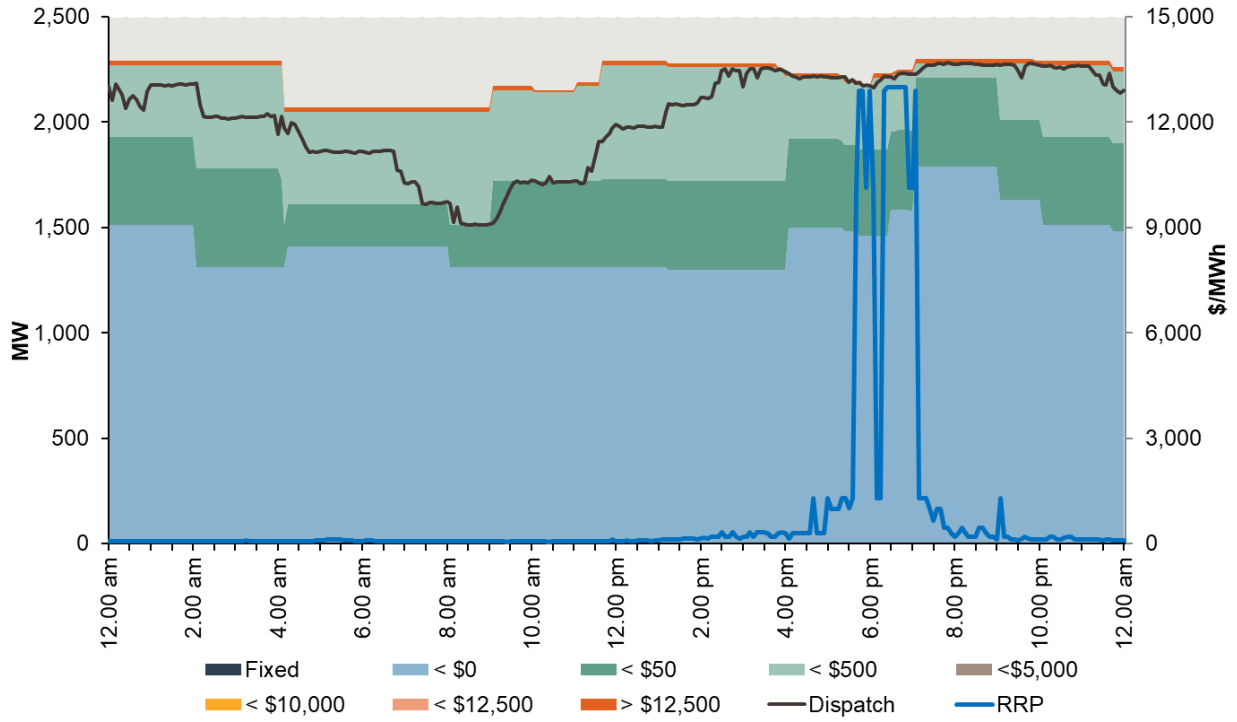


Figure A4: ERM (Oakey) offers, dispatch and dispatch price

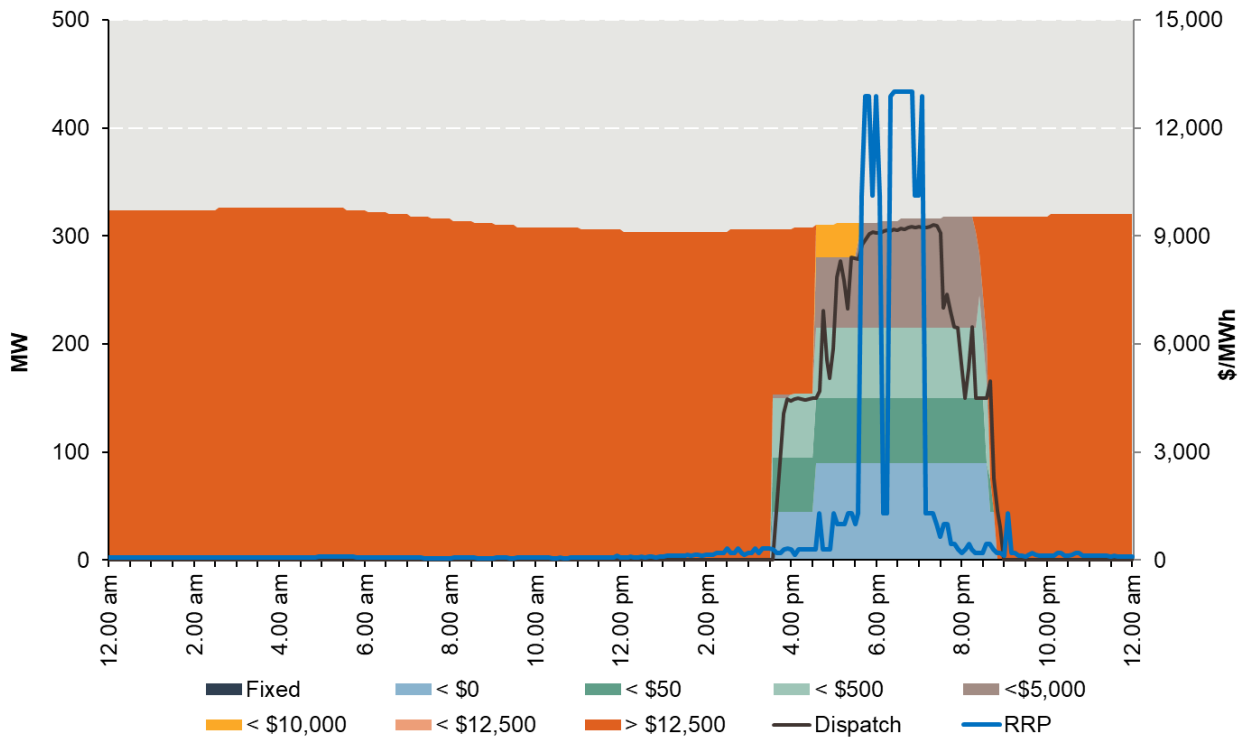


Figure A5: Origin (Darling Downs, Mt Stuart, Roma) offers, dispatch and dispatch price

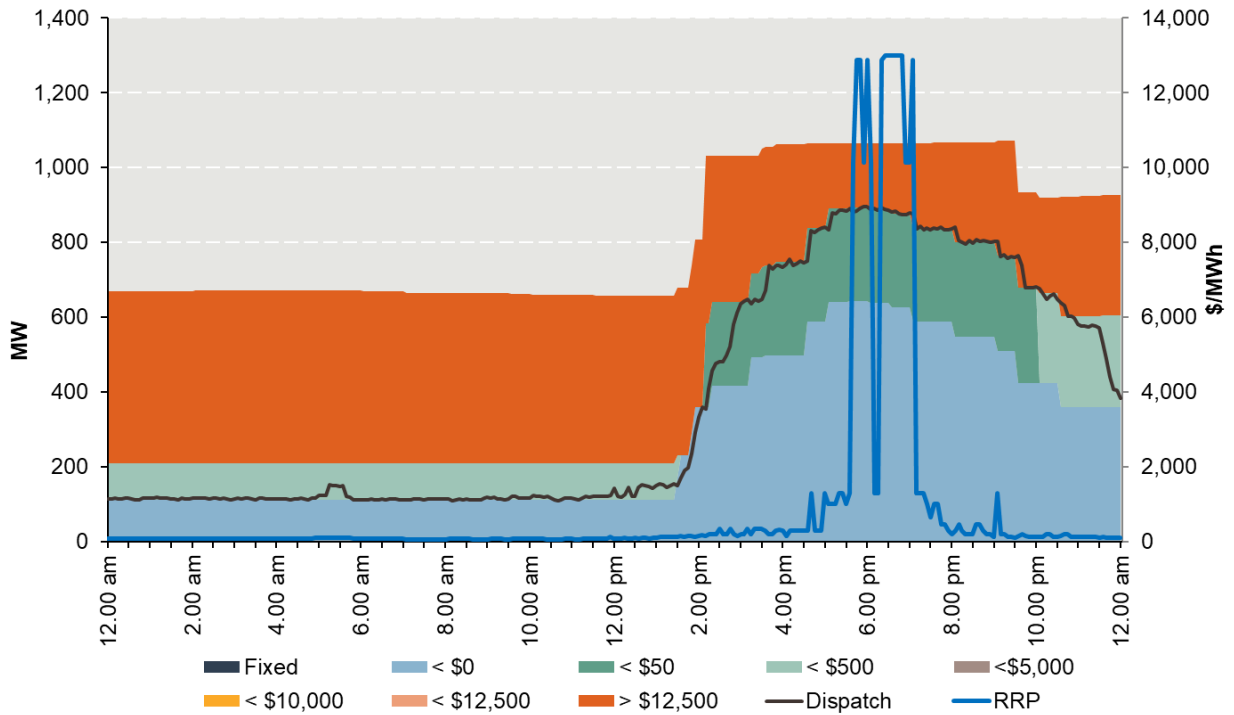
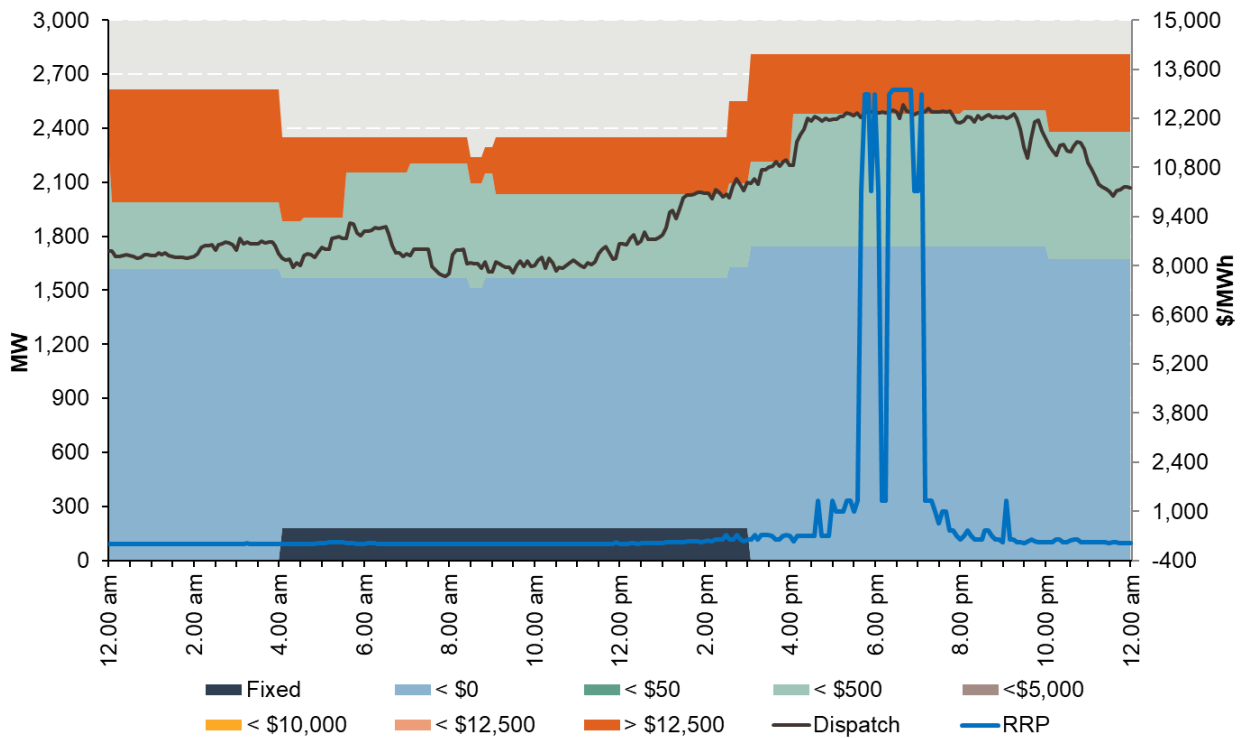


Figure A6: Stanwell (Stanwell, Tarong, Tarong North) offers, dispatch and dispatch price



Appendix B: Price setter

The following table identifies for the 6 pm, 6.30 and 7 pm 30-minute periods, each 5-minute price and the generating units involved in setting the energy price. This information is published by AEMO.⁶ The 30-minute price is the average of the six 5-minute intervals.

Table B1: Price setter for 6 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
17:35	\$1,300	CleanCo	W/HOE#1	Energy	\$1,300	1.00	\$1,300
		CleanCo	W/HOE#1	Raise 5 min	\$1	-1.00	-\$1
		Snowy Hydro	TUMUT3	Raise 5 min	\$1	1.00	\$1
17:40	\$10,128	Alinta Energy	BRAEMAR2	Energy	\$10,128	1.00	\$10,128
17:45	\$12,885	Arrow	BRAEMAR5	Energy	\$12,885	0.50	\$6,443
		Arrow	BRAEMAR7	Energy	\$12,885	0.50	\$6,443
17:50	\$12,885	Arrow	BRAEMAR5	Energy	\$12,885	0.50	\$6,443
		Arrow	BRAEMAR7	Energy	\$12,885	0.50	\$6,443
17:55	\$10,128	Alinta Energy	BRAEMAR2	Energy	\$10,128	1.00	\$10,128
18:00	\$12,885	Arrow	BRAEMAR5	Energy	\$12,885	0.50	\$6,443
		Arrow	BRAEMAR7	Energy	\$12,885	0.50	\$6,443
30-minute price		\$10,035/MWh					

Table B2: Price setter for 6.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:05	\$10,128	Alinta	BRAEMAR2	Energy	\$10,128	1.00	\$10,128
18:10	\$1,300	CleanCo	W/HOE#1	Energy	\$1,300	1.00	\$1,300
18:15	\$1,300	CleanCo	W/HOE#1	Energy	\$1,300	1.00	\$1,300
18:20	\$12,885	Arrow	BRAEMAR5	Energy	\$12,885	0.50	\$6,443
		Arrow	BRAEMAR7	Energy	\$12,885	0.50	\$6,443
18:25	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
18:30	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
30-minute price		\$8,602/MWh					

⁶ Details on how the price is determined can be found at https://aemo.com.au/-/media/files/electricity/nem/it-systems-and-change/nemde-queue/nemde_queue_users_guide.pdf?la=en

Table B3: Price setter for 7 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:35	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
18:40	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
18:45	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
18:50	\$13,000	CleanCo	W/HOE#2	Energy	\$13,000	1.00	\$13,000
18:55	\$10,128	Alinta	BRAEMAR2	Energy	\$10,128	1.00	\$10,128
19:00	\$10,128	Alinta	BRAEMAR2	Energy	\$10,128	1.00	\$10,128
30-minute price	\$12,043/MWh						