

# Electricity prices above \$5,000/MWh

10 January 2022, South Australia

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 price<sup>1</sup> 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.

<sup>1</sup> 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 10 January 2022 the 30-minute wholesale electricity price in South Australia reached \$11,489/MWh at 12.30 pm. The price was not forecast.

The high price was primarily due to the following factors:

- A constraint on the Heywood interconnector restricted imports from Victoria, which limited South Australia's access to low-priced capacity.
- Demand was higher than forecast due to a reduction in rooftop solar generation and high temperatures.
- Available capacity was lower than forecast, in part due to a fall in wind and solar generation.

During the high-price interval, around 42% of available capacity in South Australia was offered above \$5,000/MWh. However, the volume of high-priced capacity required to meet the generation target was between 16 MW and 195 MW.

Market participants rebidding capacity did not contribute to this event.

## 3 Analysis

### 3.1 Overview of actual and expected conditions

The South Australia 30-minute wholesale electricity price was \$11,489/MWh at 12.30 pm on 10 January 2022. High prices were not forecast until about 10 minutes before the start of the 30-minute interval.

Table 1 compares actual and forecast 30-minute prices, demand and availability in South Australia for 12.30 pm. Our general observations are:

- Demand was 159 MW higher than the forecast 1 hour prior, due to a decline in rooftop solar generation and high temperatures.
- Availability was 162 MW lower than the forecast 1 hour prior, due to a decline in solar and wind generation.

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

30-minute 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
12.30 pm	11,489	349	1,022	1,559	1,400	1,420	2,351	2,513	2,562

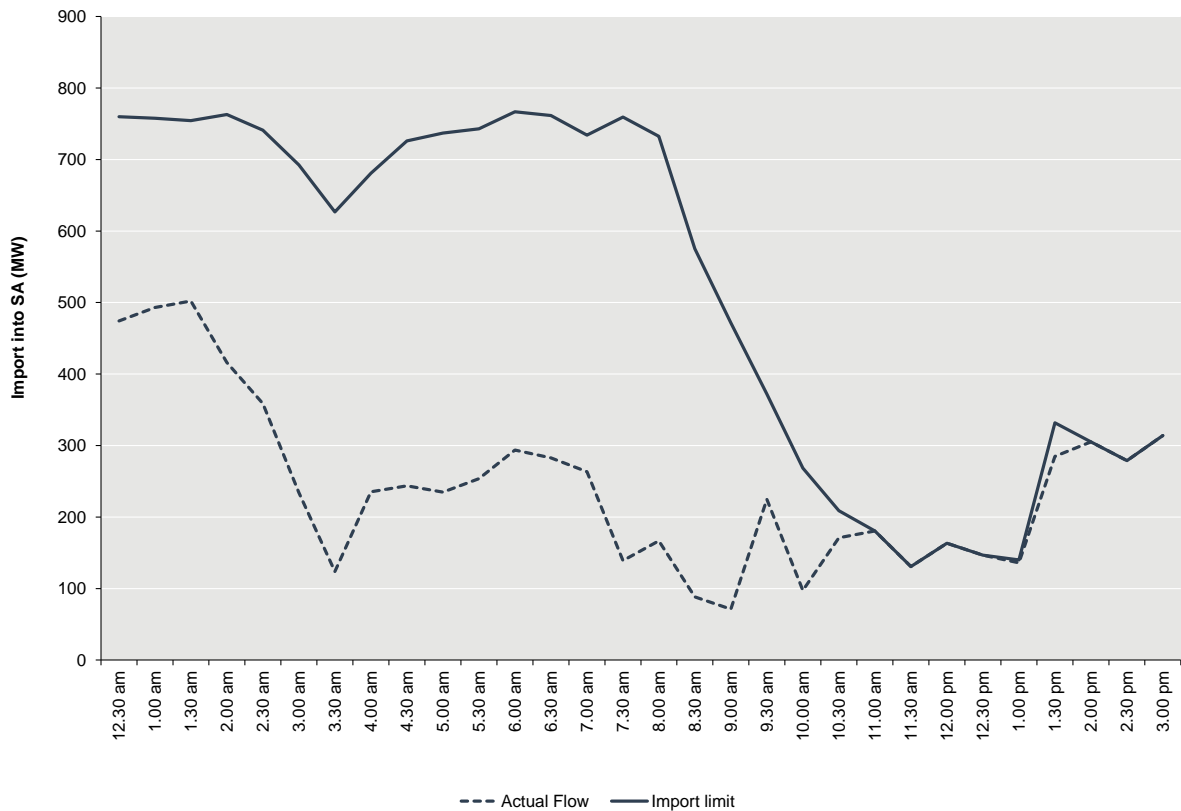
High prices can often occur when demand is underestimated and availability is overestimated. The sensitivities published 30-minutes before the 12.30 pm 30-minute interval indicated that an 100 MW increase in demand (or equivalent loss of low-priced capacity) would lead to prices exceeding \$5,000/MWh.

#### 3.1.1 Energy imports into South Australia were curbed

South Australia's net import limit fell significantly throughout the morning on 10 January and was restricted to 146 MW during the high-price period. This was caused by a constraint on the Heywood interconnector which curtailed imports into South Australia and, between 11.30 am and 1 pm, forced exports into Victoria. AEMO invoked the constraint after there were equipment outages on substations connected to the Heywood interconnector.

As a result, South Australia's import limit declined by 586 MW between 8 am and 12.30 pm (Figure 1), meaning there was no room to import additional cheap capacity from other regions.

**Figure 1: South Australia's net import limit**



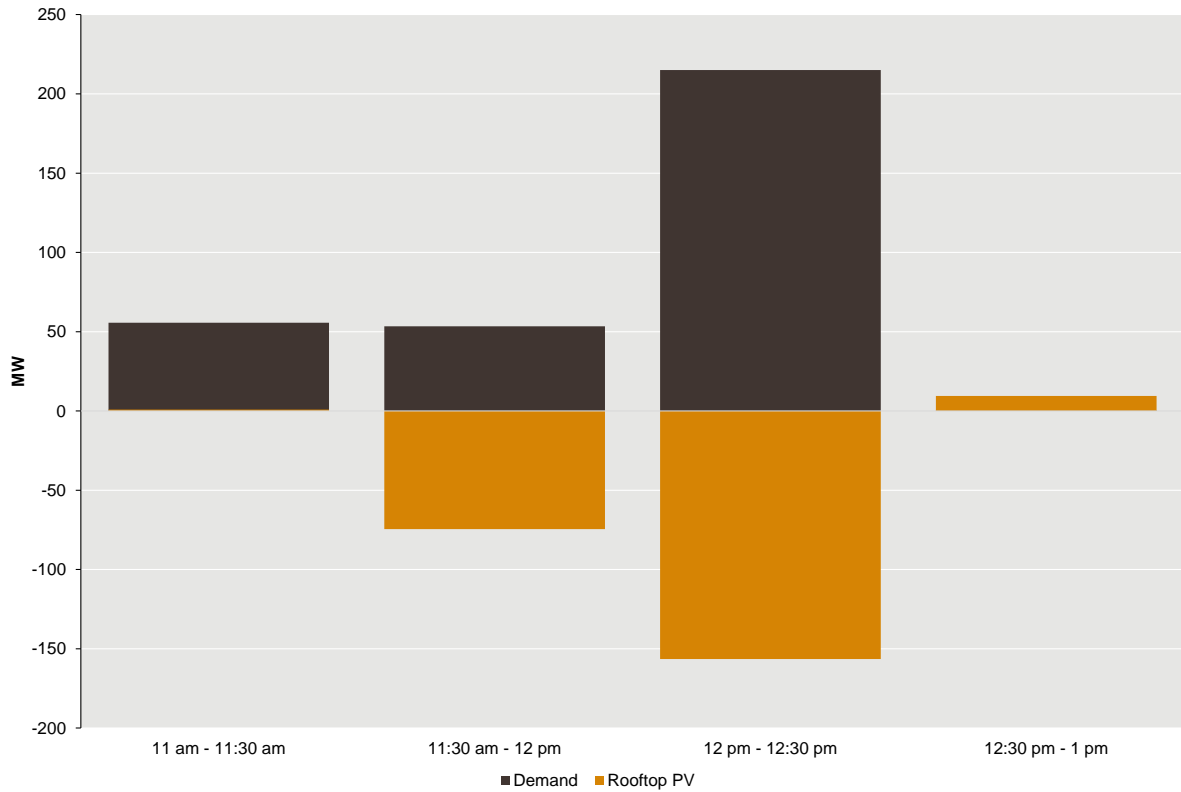
Note: The net import limit is calculated as the import limit of the Murraylink and Heywood interconnectors combined.

### 3.1.2 Demand was higher than forecast

Demand in South Australia rose throughout the morning, from 1,097 MW at 10 am to 1,559 MW at 12.30 pm. Higher demand was due to a sharp decline in rooftop solar generation and high temperatures.

From 11.30 am to 12.30 pm, rooftop solar generation fell by roughly 230 MW. This drove an increase in NEM demand as households had to source their energy from grid generation rather than rooftop solar. The most notable change happened between 12 pm and 12.30 pm, when rooftop solar output fell by around 160 MW and demand increased by 215 MW (Figure 2).

**Figure 2: Demand and rooftop solar change over 30-minute periods**



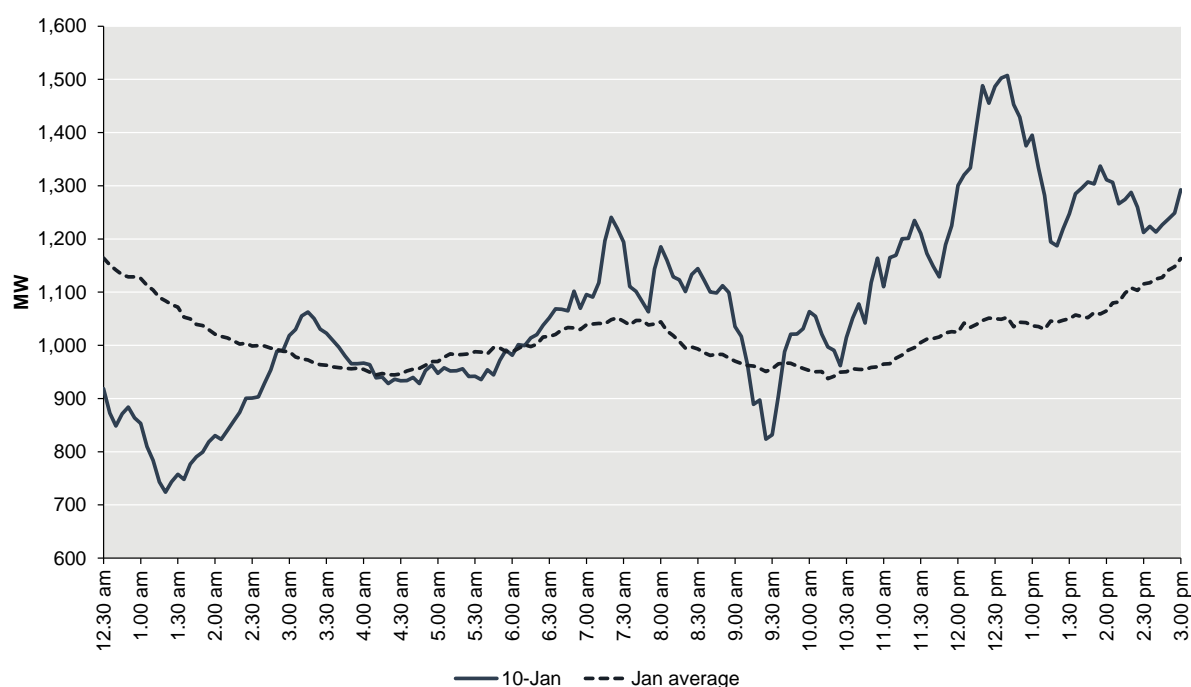
Note: Rooftop generation data is sourced from AEMO.<sup>2</sup>

Demand was also affected by hot weather through the increased use of air conditioners. Temperatures went as high as 37°C, with 10 January being one of the hottest days in the month.<sup>3</sup> High demand and constraints on the Heywood interconnector, discussed above, meant from 10.30 am onwards, the local generation target in South Australia was higher than the average throughout January (Figure 3). This meant more expensive capacity was dispatched.

<sup>2</sup> Data obtained from AEMO Market Data [NEMWEB](#).

<sup>3</sup> The temperature was measured at Adelaide (West Terrace / Ngayirdapira), obtained from the [Bureau of Meteorology](#). South Australia, 10 January 2022



**Figure 3: Generation target in South Australia, by time of day**

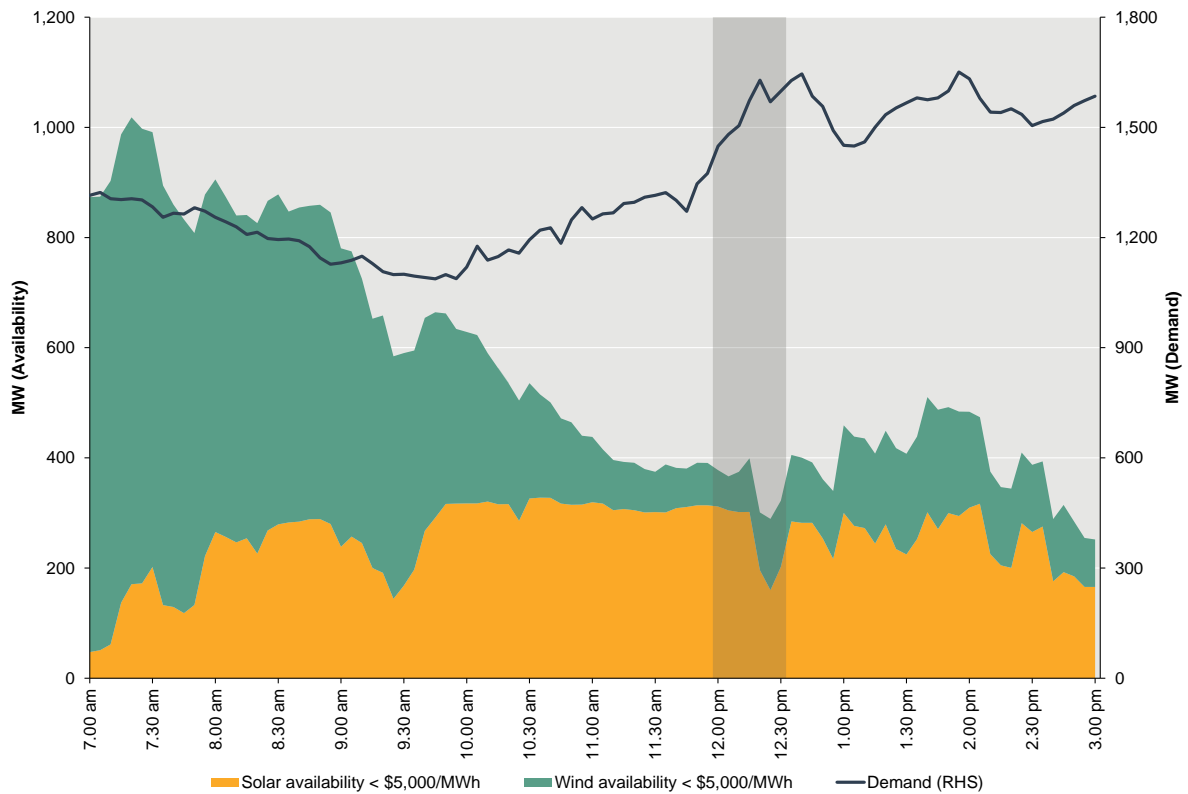
### 3.1.3 Available generation was lower than forecast

Available generation in South Australia was 162 MW lower than the forecast 1 hour prior, which was in part due to solar and wind output dropping off. The change in weather conditions affected rooftop solar and solar grid generation alike. This can likely be attributed to cloud coverage, which if present, can immediately reduce solar irradiance and generation output.

This was compounded by declining wind generation, which began at 8 am and continued until 12 pm when it hit its trough. At 12.30 pm, wind and solar generation combined were roughly 120 MW lower than the pre-dispatch estimate. Because these energy sources are typically priced below \$0/MWh, their decline reduced overall availability and capacity priced below \$5,000/MWh as well (Figure 4).

Certain gas plants also removed high-priced capacity from the market due to network constraints and to avoid uneconomic starts. While these actions did not contribute to the high price, they do partly explain the discrepancy between the forecast and actual available generation. Further information on market participant offers above \$5,000/MWh can be found in *Appendix A: Closing bids*.

**Figure 4: Wind and solar availability**

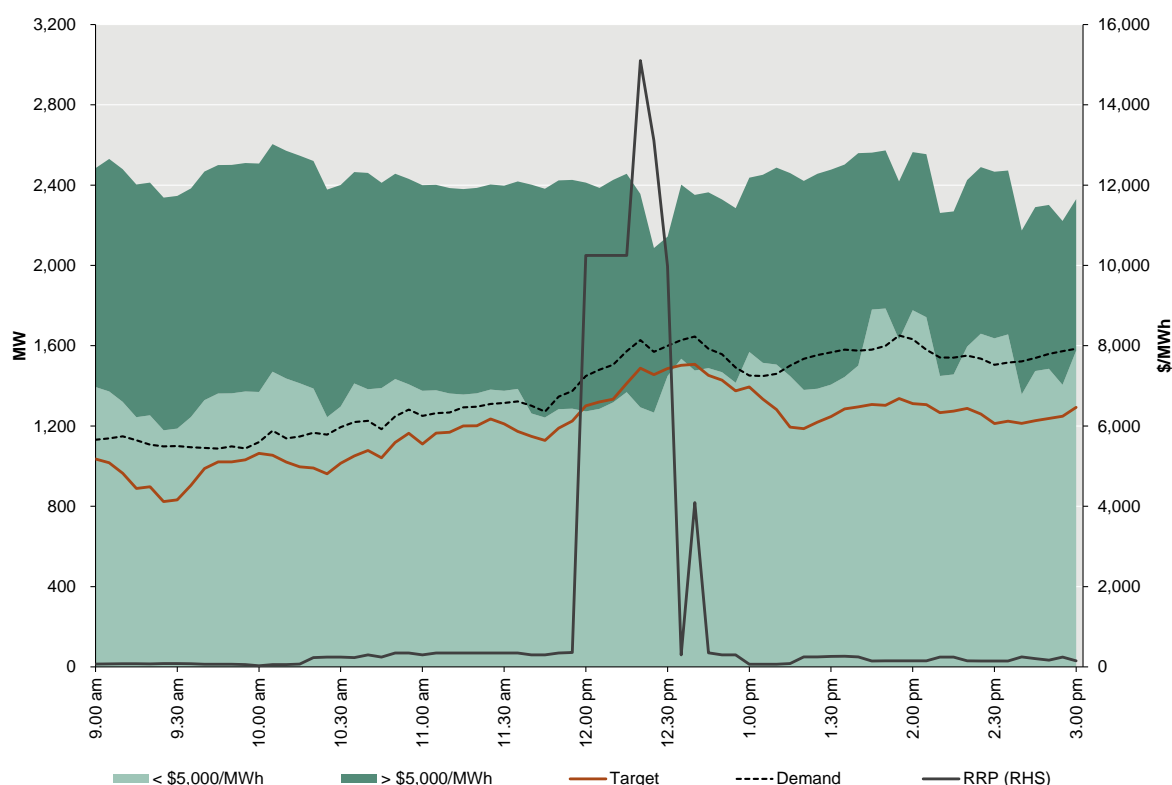


Note: All wind and solar availability was offered below \$5,000/MWh, there was no capacity offered above \$5,000/MWh. The shaded grey area represents when the 5-minute price in South Australia was above \$5,000/MWh between 12 pm and 12.30 pm.

### 3.2 Market conditions put pressure on the spot price

Reduced access to low-priced capacity and high demand pushed the spot price above \$5,000/MWh. 30-minute prices in South Australia began to exceed \$150/MWh at 10.30 am when the Heywood interconnector became increasingly constrained. The high-price interval then eventuated when, in combination with a jump in demand and a gradual decline in effective capacity available below \$5,000/MWh, expensive generation had to be dispatched (Figure 5).

**Figure 5: South Australia capacity offered above and below \$5,000/MWh**



Note: Capacity available below \$5,000/MWh refers to effective capacity.

All the 5-minute prices in the 12.30 pm 30-minute period were above \$5,000/MWh. Information about the generators involved in setting the price can be found in *Appendix B: Price Setter*.

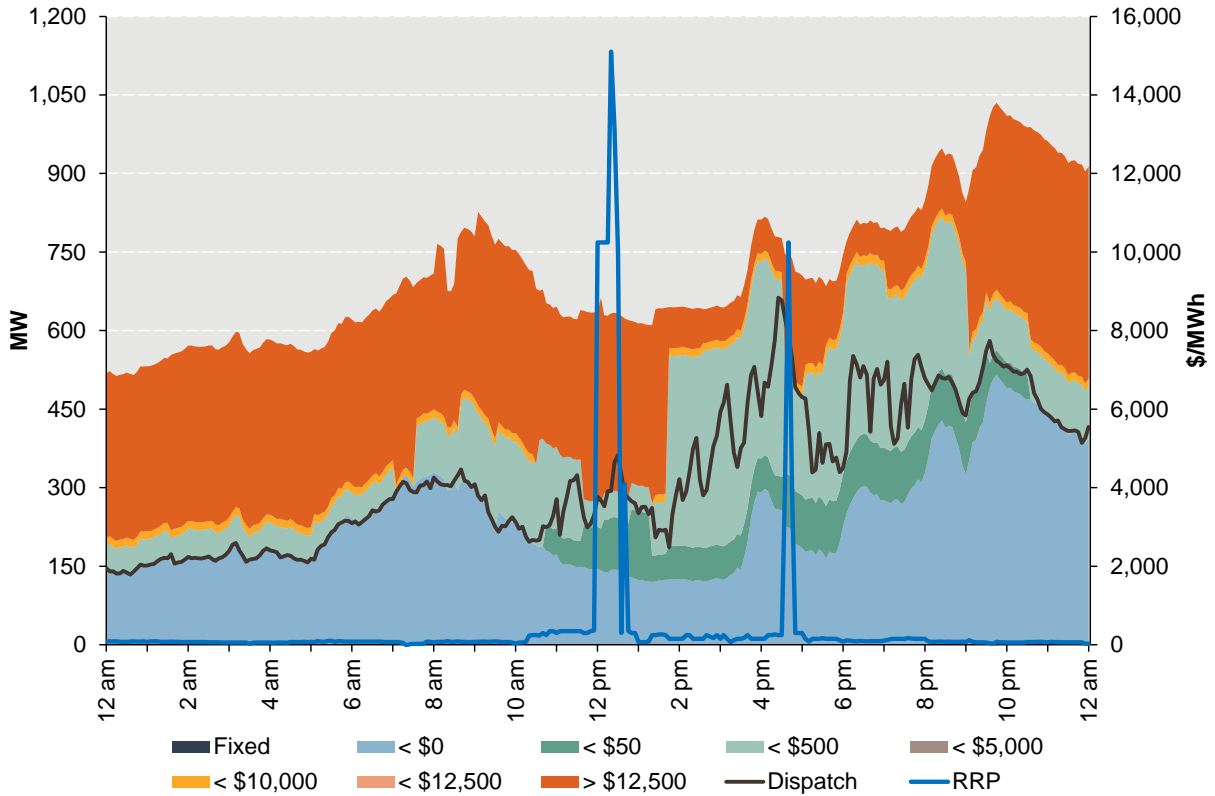
High 5-minute prices were able to persist throughout the 30-minute period because demand rose and solar generation fell suddenly. Gas and diesel generators could not start up and respond to these conditions instantly, creating a delayed market response. For example, while solar availability fell by 142 MW between 12.15 pm and 12.25 pm, gas and diesel units were generally not able to ramp up their production until 12.30 pm.

After 12.30 pm, South Australia’s import limit increased and solar and wind generation recovered. While there was still some volatility during the afternoon, the 30-minute price did not exceed \$5,000/MWh.

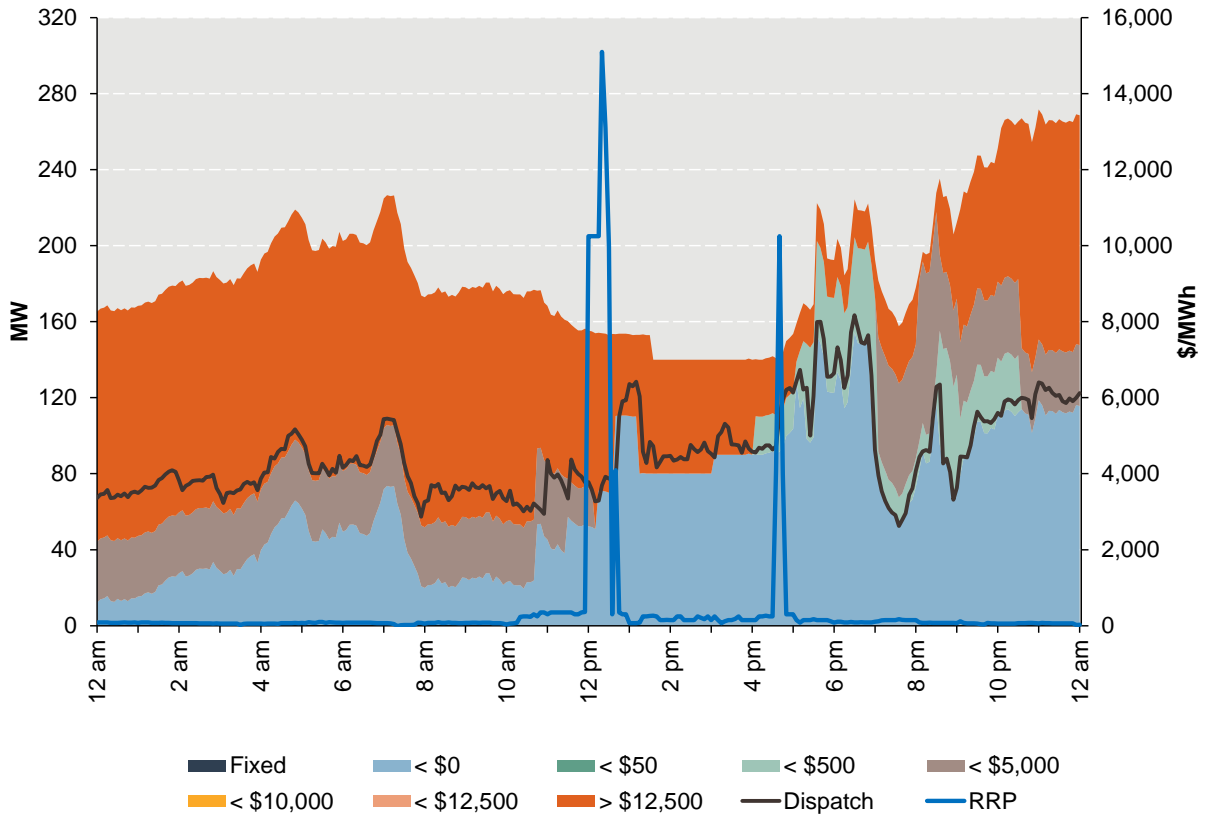
## Appendix A: Closing bids

Figures A1 to A7 highlight the 5-minute offers for participants on 10 January 2022 in South Australia with capacity priced at or above \$5,000/MWh during the period in which the 5-minute price exceeded \$5,000/MWh. They also show generation output and the 5-minute price.

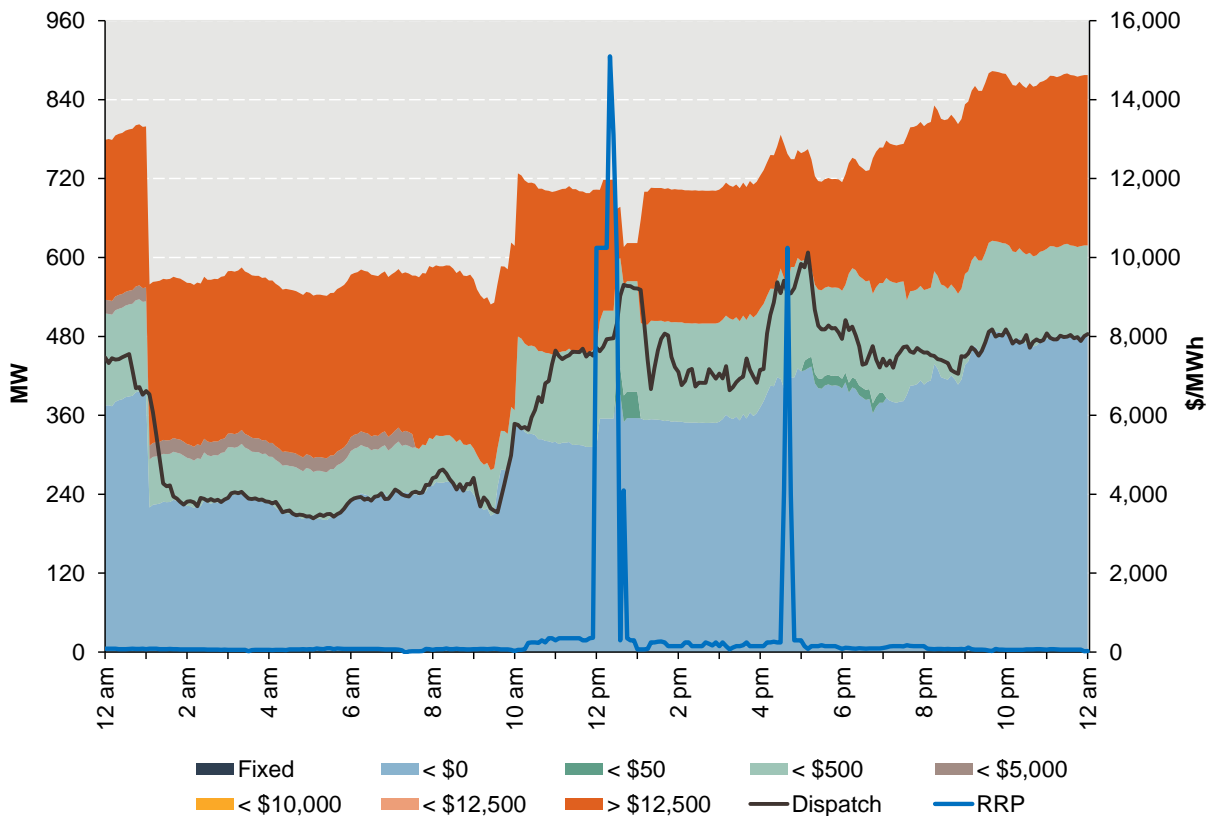
**Figure A1: AGL (Barker Inlet, Dalrymple North BESS, The Bluff Wind Farm, Hallett Wind Farms, North Brown Hill Wind Farm, Torrens Island, Wattle Point Wind Farm) offers, dispatch and regional reference price (RRP)**



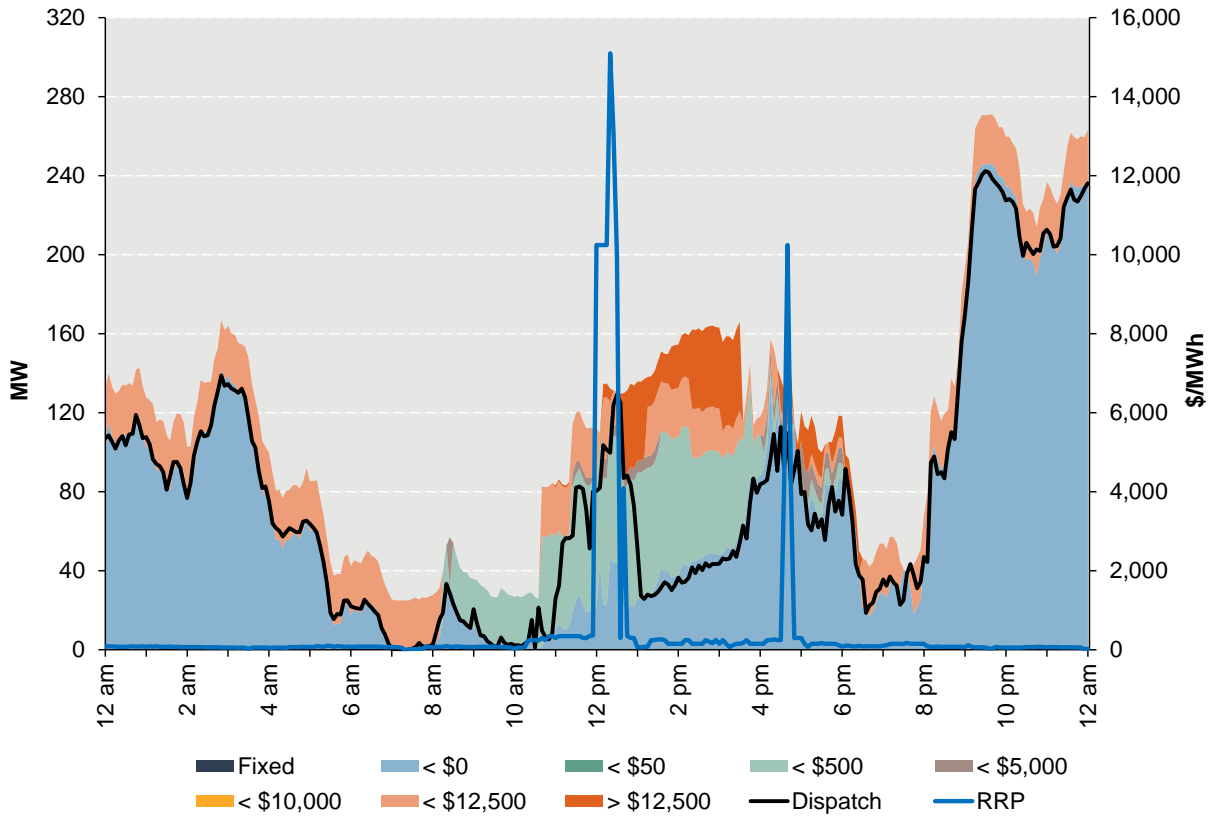
**Figure A2: EnergyAustralia (Hallett, Waterloo Wind Farm) offers, dispatch and regional reference price (RRP)**



**Figure A3: Engie (Canunda Wind Farm, Dry Creek, Mintaro, Pelican Point, Port Lincoln, Snuggery, Willogoleche Wind Farm) offers, dispatch and regional reference price (RRP)**



**Figure A4: Infigen Energy (Lake Bonney Wind Farms and Battery) offers, dispatch and regional reference price (RRP)**



**Figure A5: Neoen (Hornsdale Wind Farm and Battery) offers, dispatch and regional reference price (RRP)**

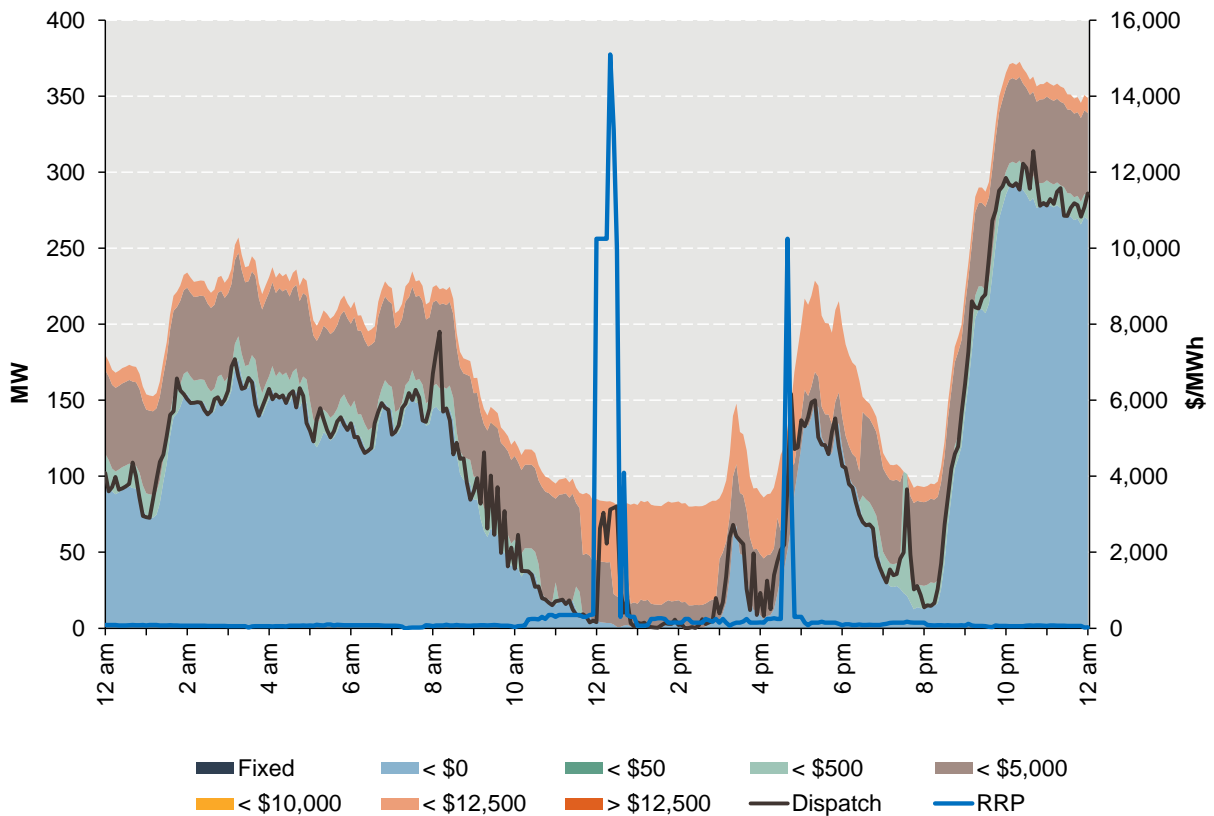


Figure A6: Origin (Ladbroke, Osborne, Quarantine and Bungala Solar Farm) offers, dispatch and regional reference price (RRP)

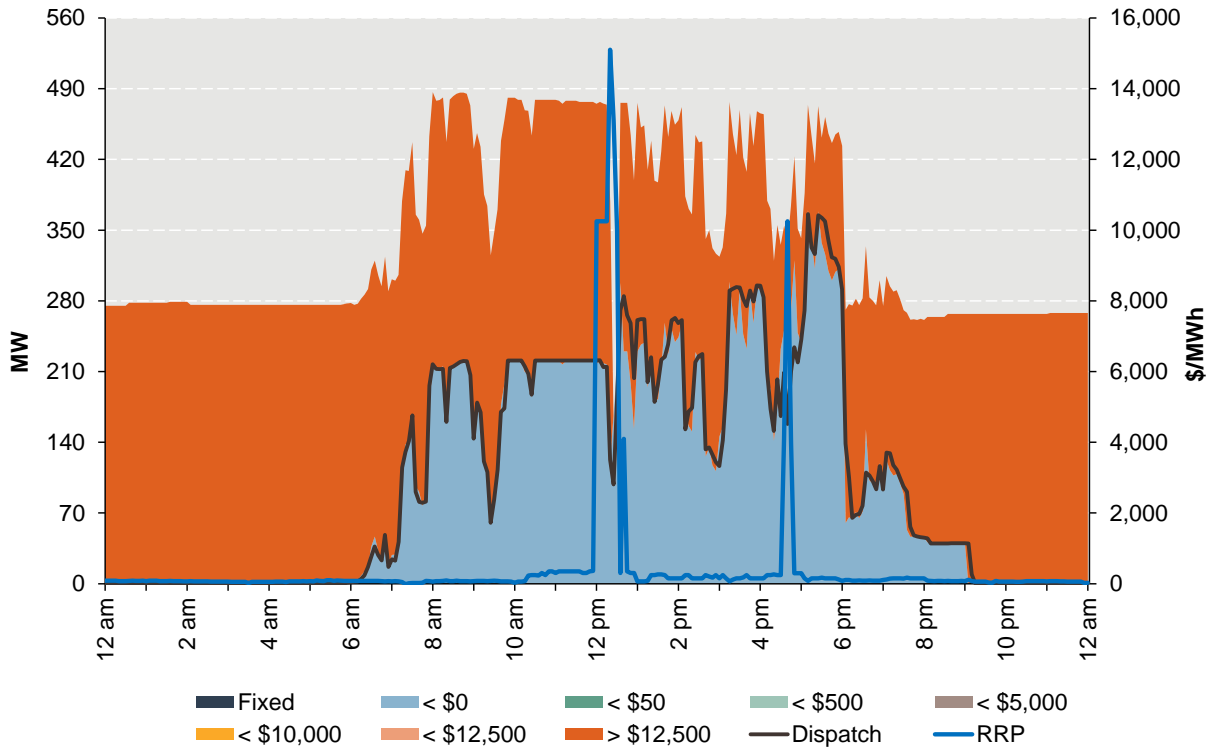
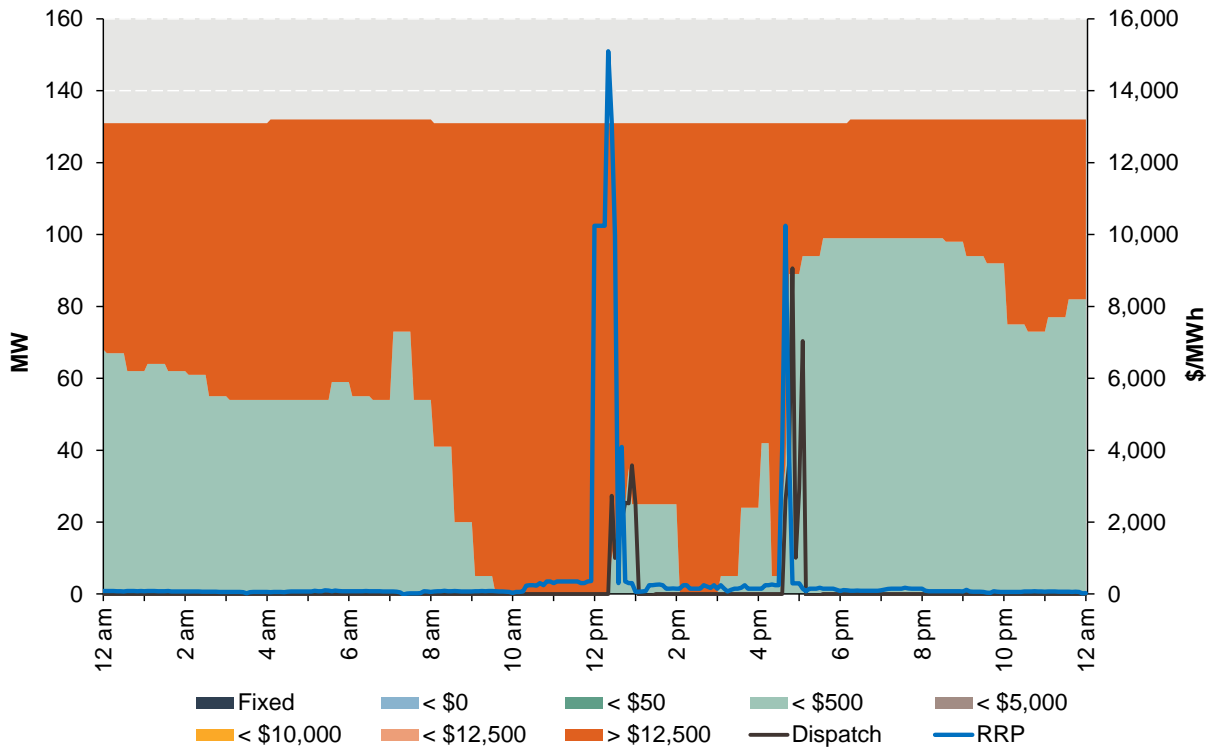


Figure A7: Snowy Hydro (Angaston, Lonsdale, Pt Stanvac) offers, dispatch and regional reference price (RRP)



## Appendix B: Price setter

The following table identifies for the 12.30 pm 30-minute period, each 5-minute price and the generating units involved in setting the energy price. This information is published by AEMO.<sup>4</sup> The 30-minute price is the average of the six 5-minute intervals. The prices that are in italics are capped at the price cap of \$15,100/MWh when published by AEMO.

**Table B1: Price setter**

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
12:05	\$10,247.41	Neoen	HPRG1	Energy	\$10,247.41	1.00	\$10,247.41
12:10	\$10,247.41	Neoen	HPRG1	Energy	\$10,247.41	1.00	\$10,247.41
12:15	\$10,247.41	Neoen	HPRG1	Energy	\$10,247.41	1.00	\$10,247.41
12:20	\$15,100.00	EnergyAustralia	AGLHAL	Energy	<i>\$15,100.00</i>	0.40	\$6,040.00
		Infigen Energy	SATGS1	Energy	<i>\$15,100.00</i>	0.06	\$906.00
		Snowy Hydro	ANGAST1	Energy	<i>\$15,100.00</i>	0.11	\$1,661.00
		Snowy Hydro	LONSDALE	Energy	<i>\$15,100.00</i>	0.05	\$755.00
		Snowy Hydro	PTSTAN1	Energy	<i>\$15,100.00</i>	0.14	\$2,114.00
		AGL (SA)	BARKIPS1	Energy	<i>\$15,100.00</i>	0.24	\$3,624.00
12:25	\$13,111.81	Engie	DRYCGT1	Energy	\$13,111.81	0.50	\$6,555.91
		Engie	DRYCGT2	Energy	\$13,111.81	0.50	\$6,555.91
12:30	\$9,980.00	Infigen Energy	SATGS1	Energy	\$9,980.00	1.00	\$9,980.00
<b>30-minute price</b>		<b>\$11,489/MWh</b>					

<sup>4</sup> 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](https://aemo.com.au/-/media/files/electricity/nem/it-systems-and-change/nemde-queue/nemde_queue_users_guide.pdf?la=en)