

Electricity prices above \$5,000/MWh

South Australia,
30 & 31 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 30 December 2021, the 30-minute wholesale price for electricity in South Australia reached \$8,456/MWh and \$5,279/MWh for the 7.30 pm and 8 pm 30-minute periods. On 31 December at 7 pm the 30-minute price reached \$6,368/MWh in South Australia.

The high prices on both days were primarily due to:

- High demand
 - The temperature reached 38°C on 30 Dec and 39°C on 31 Dec. High temperatures drive a high demand for electricity through air conditioners.
 - As the sun set, customers with rooftop solar shifted their demand to the grid
- Very low levels of wind generation. There is over 2,100 MW of registered wind generation in South Australia, but only around 50 MW of wind generation was available during the times of high prices, significantly reducing the supply of low priced generation.
- A constraint managing transmission lines in NSW limited imports across Murraylink to avoid a voltage collapse.

Rebidding of capacity to higher prices did not contribute to the price outcomes on these days.

At the time of the high-prices, around 70% of capacity was offered below \$5,000/MWh. However, between 4 and 107 MW of high priced capacity was needed to meet demand during these times.

3 Analysis

3.1 Overview of actual and expected conditions

The 30-minute price for electricity reached \$8,456/MWh and \$5,279/MWh for the 7.30 pm and 8 pm 30-minute periods on 30 December. It also reached \$6,368/MWh for the 7 pm 30-minute period on 31 December, all in South Australia.

High prices were not forecast on either day until about 5 or 10 minutes before the start of each high priced 5-minute interval.

Table 1 and Table 2 below compare the actual and forecast 30-minute spot prices, demand and available capacity in South Australia on both days.

Our general observations are:

- The 30-minute prices were not forecast on either day, one or four hours prior.²
- Demand was between 37 MW and 70 MW higher than forecast, one hour prior.
- Availability was between 96 MW and 143 MW lower than forecast one hour prior. This was largely due to lower than forecast wind availability.

Under forecasting demand and overforecasting availability will often lead to higher priced outcomes than expected. Sensitivities published an hour before the start of each 30-minute interval in the tables below indicated that an increase of between 100 and 200 MW of demand (or loss of low priced supply) would result in prices greater than \$5,000/MWh

Table 1: 30 December Actual and forecast 30-minute price, demand and availability

30 minute period	Price (\$/MWh)				Demand (MW)				Availability (MW)			
	Actual	1 hr forecast	4 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast	4 hr forecast
7.30 pm	8,456	361	381		2,354	2,312	2,412		2,306	2,403	2,436	
8.00 pm	5,279	380	1,022		2,294	2,254	2,324		2,305	2,401	2,451	

Table 2: 31 December Actual and forecast 30-minute price, demand and availability

30 minute period	Price (\$/MWh)				Demand (MW)				Availability (MW)			
	Actual	1 hr forecast	4 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast	4 hr forecast	Actual	1 hr forecast	4 hr forecast	4 hr forecast
7.00 pm	6,368	349	12,999		2,414	2,377	2,506		2,564	2,679	2,688	

3.2 High temperatures drove high demand

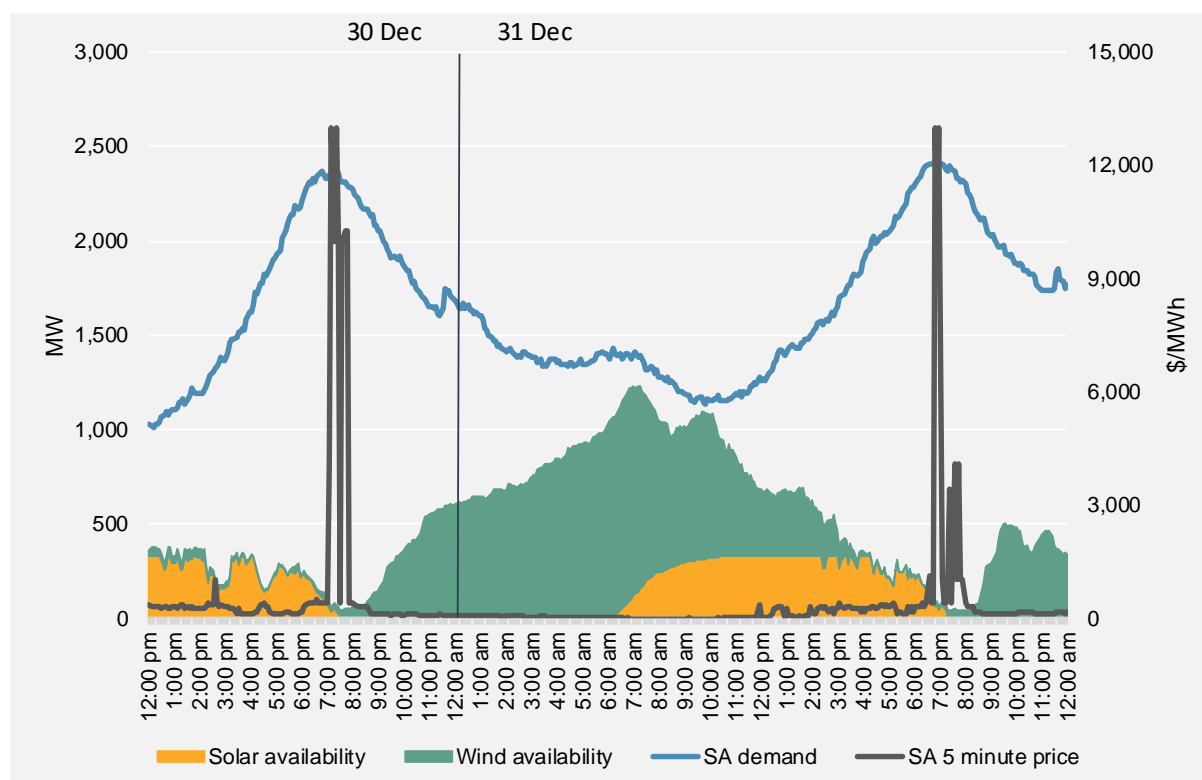
The temperature reached 38°C on 30 December and 39°C on 31 December in South Australia.³ AEMO issued temperature alert market notices (93488 and 93491) on both days. Some demand for electricity can be very sensitive to temperature. Very hot days drive

² In fact high prices were not forecast in any of the 30 minute predispach forecasts.

³ <http://www.bom.gov.au/climate/data/index.shtml?bookmark=200>

high demand from airconditioning units. The high priced intervals coincided with the times of high demand, meaning more expensive generation was needed at these times.

Figure 1: SA wind and solar availability, demand and 5 minute prices



Source; AER analysis using NEM data

Demand peaked around 7 pm on both days. Figure 1 shows how solar farm availability was declining at the time, as the sun was setting, reducing available supply. For the same reason, rooftop PV generation was also declining, so that meant some customers' supply of electricity generation shifted from rooftop PV to the grid, leading demand to increase further.

3.3 Low levels of wind generation reduced access to low-priced capacity

3.3.1 Calm conditions meant minimal generation from wind

There is over 2,100 MW of registered wind generation in South Australia. However, very still conditions on both evenings meant there was only around 50 MW of wind farm generation available (Figure 1).

3.3.2 Wind generation was significantly lower than forecast

On average, actual wind generation was around 65 MW lower than the one hour forecast expected. This meant that more expensive generation was needed than what was forecast, as wind offers are typically less than \$0/MWh.

3.4 Limited imports across Murraylink

Imports across Murraylink into South Australia were around 50 MW during the time of the high prices on both days even though its nominal capacity is 220 MW. During times of peak load,

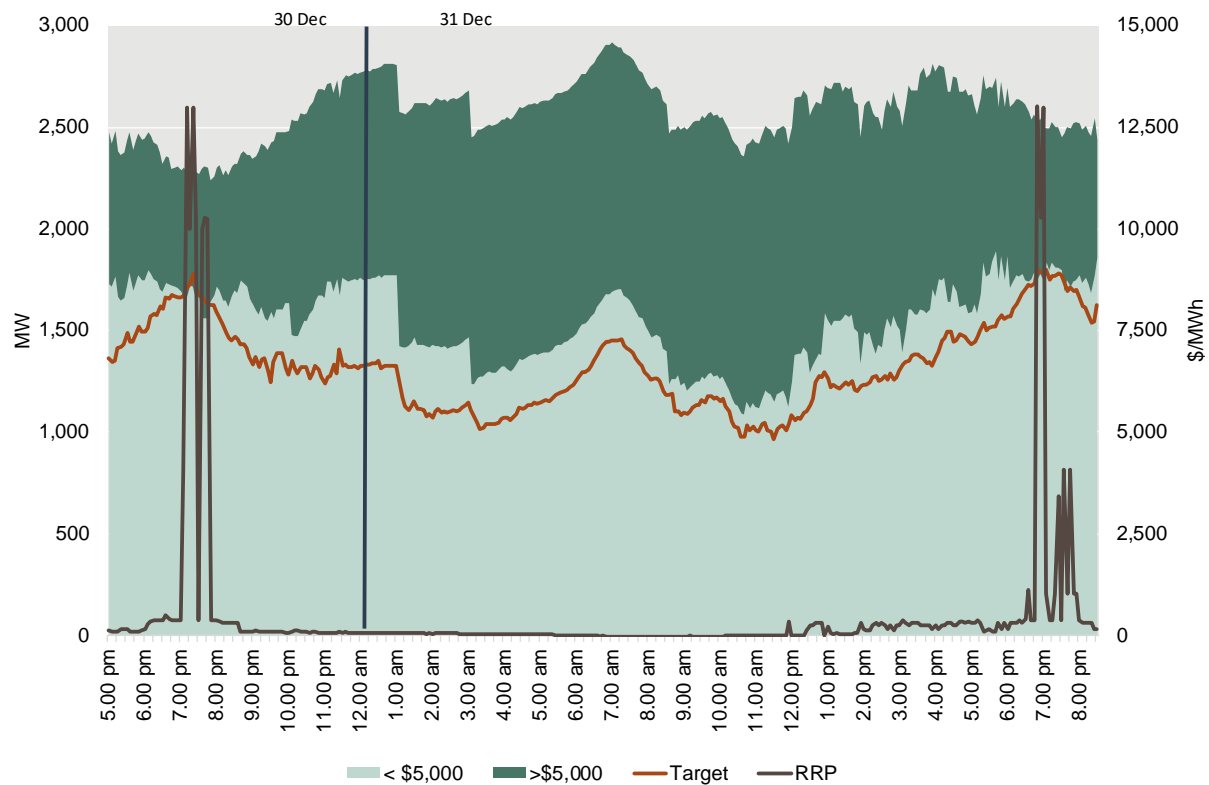
Murraylink’s capacity can be reduced to around 50 MW to avoid a voltage collapse if a significant transmission event occurs.⁴ On both evenings, constraints reduced imports into South Australia to avoid a voltage collapse at the Red Cliffs substation if lines in NSW tripped.

High priced capacity was needed to meet demand

Around 70% of the capacity offered was priced below \$5,000/MWh. As demand in the region peaked at around 7 pm each evening, only between 4 and 107 MW of high priced capacity was needed to meet demand.

Both interconnectors were importing at their maximum, meaning South Australia could not access any more low priced generation from neighbouring regions as demand increased on both evenings.

Figure 2: Capacity offered above and below \$5,000/MWh, target and 5 minute price



Source: AER analysis using NEM data

Note: The capacity priced less than \$5,000/MWh is adjusted to show effective availability, where ramp rate limited or FSIP limited capacity could not make it to market

Rebidding did not contribute to the high price events.

Further details on the generators involved in setting price during the high-priced periods are provided in *Appendix B: Price Setter*

⁴ <https://www.aer.gov.au/system/files/Murraylink%20-%20Proposed%20contingent%20project%20-%20May%202012.pdf>

4 Appendix A: Closing bids

Figure A1 to A7 highlight the 5-minute offers for participants in South Australia with capacity priced at or above \$5,000/MWh for 30 and 31 December 2021. They also show generation output and the 5-minute dispatch price.

Figure A1: AGL (Dalrymple North BESS, Barker Inlet Power Station, The Bluff WF, Hallett 1 WF, Hallett 2 WF, North Brown Hill WF & Torrens Island) offers, dispatch and SA regional reference price (RRP)

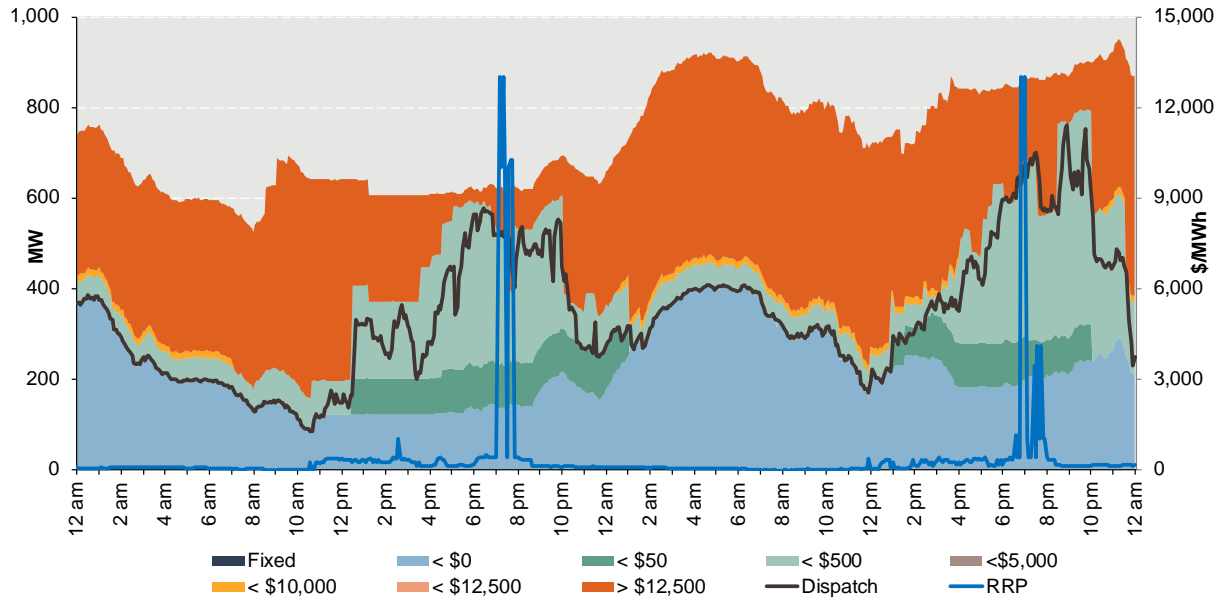


Figure A2: Engie (Pelican Point, Dry Creek, Mintaro, Port Lincoln, Snuggery & Willogoleche Wind Farm) offers, dispatch and SA regional reference price (RRP)

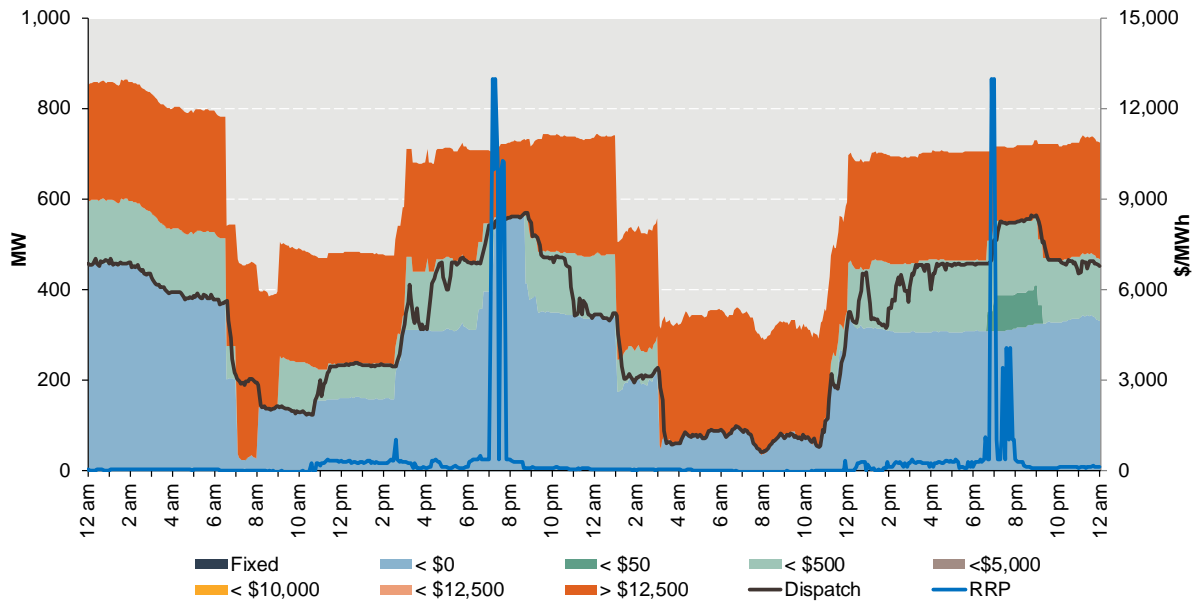


Figure A3: EnergyAustralia (Hallett & Waterloo WF) offers, dispatch and SA regional reference price (RRP)

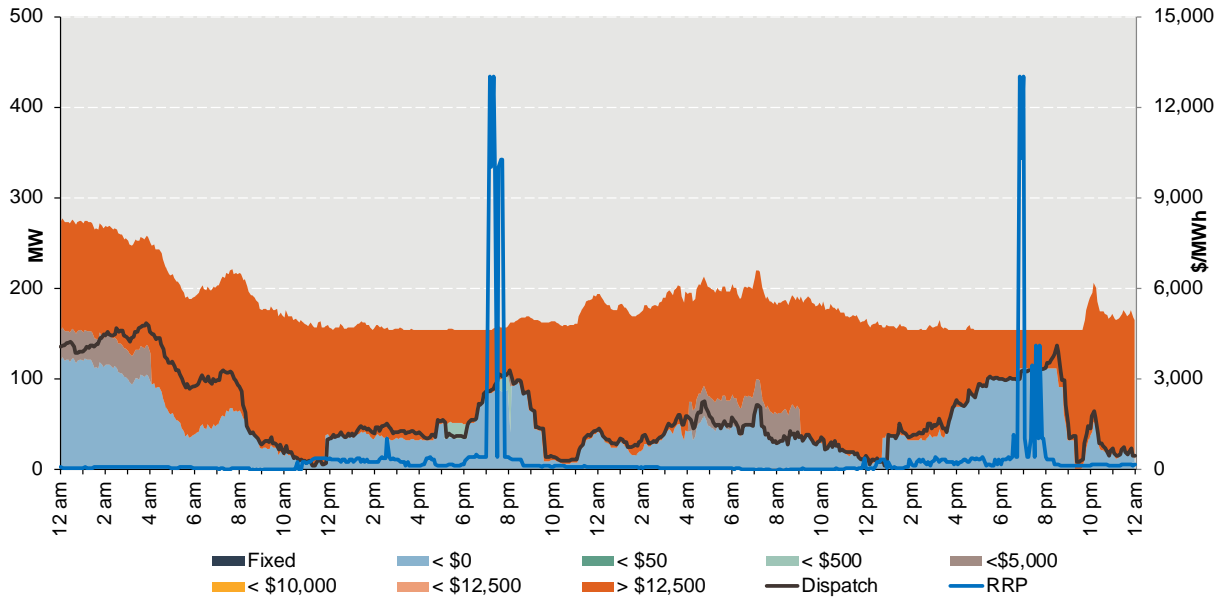


Figure A4: Snowy Hydro (Angaston, Lonsdale & Pt Stanvac) offers, dispatch and SA regional reference price (RRP)

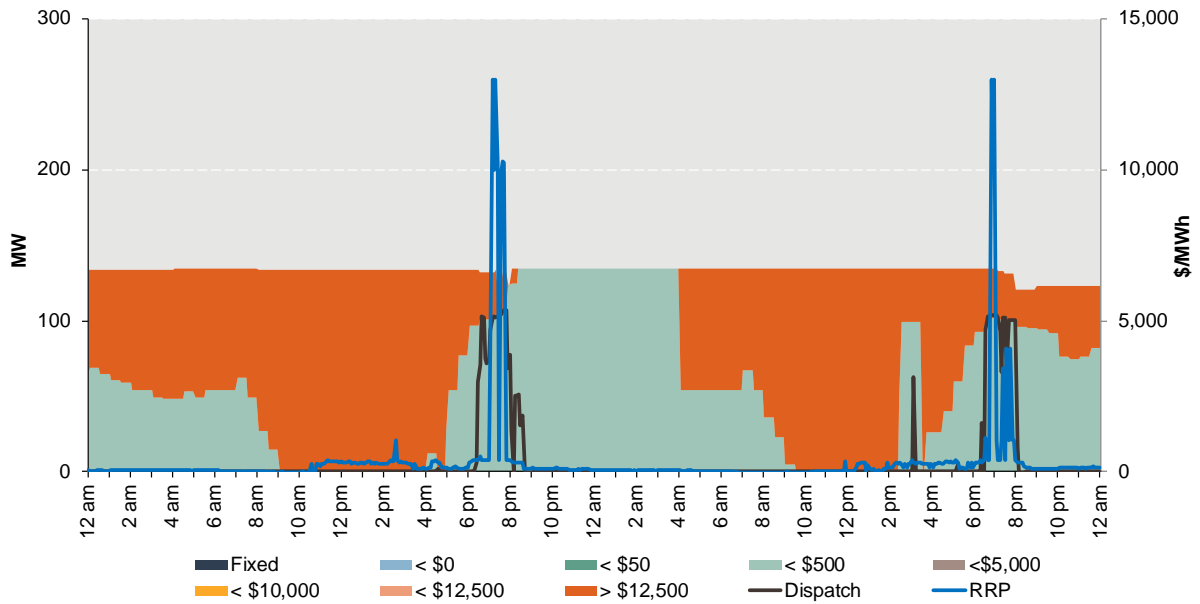


Figure A5: Origin (Ladbroke Grove, Osborne, Quarantine, Bungala One Solar Farm & Bungala Two Solar Farm) offers, dispatch and SA regional reference price (RRP)

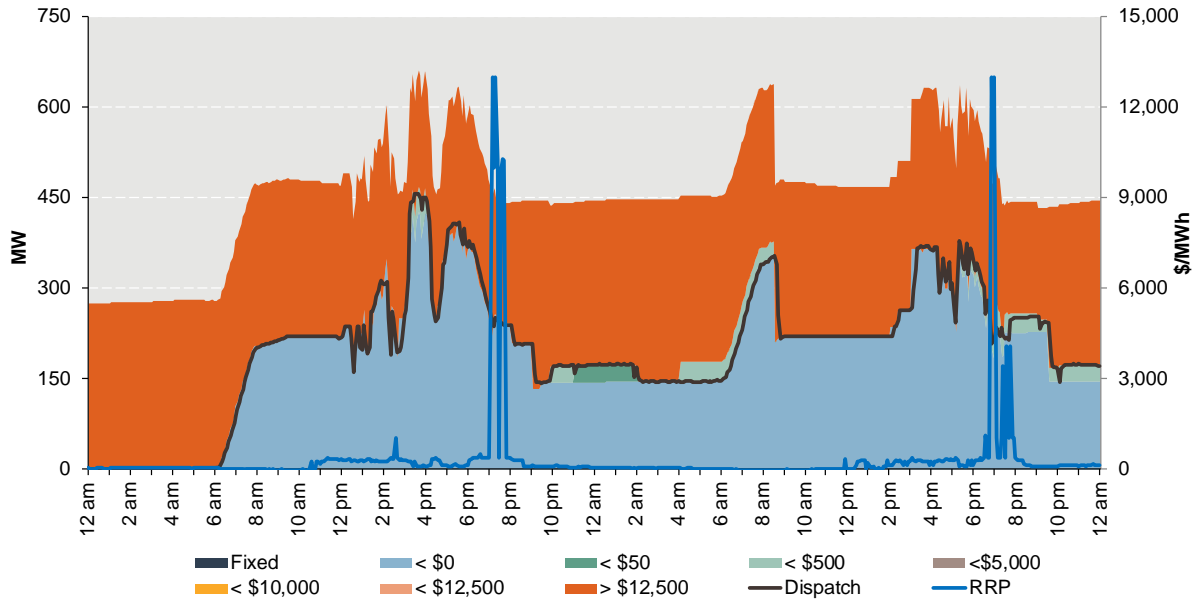


Figure A6: Neoen (Hornsedale Wind Farm 2, Hornsedale Power Reserve Unit 1 & Hornsedale Wind Farm 3) offers, dispatch and SA regional reference price (RRP)

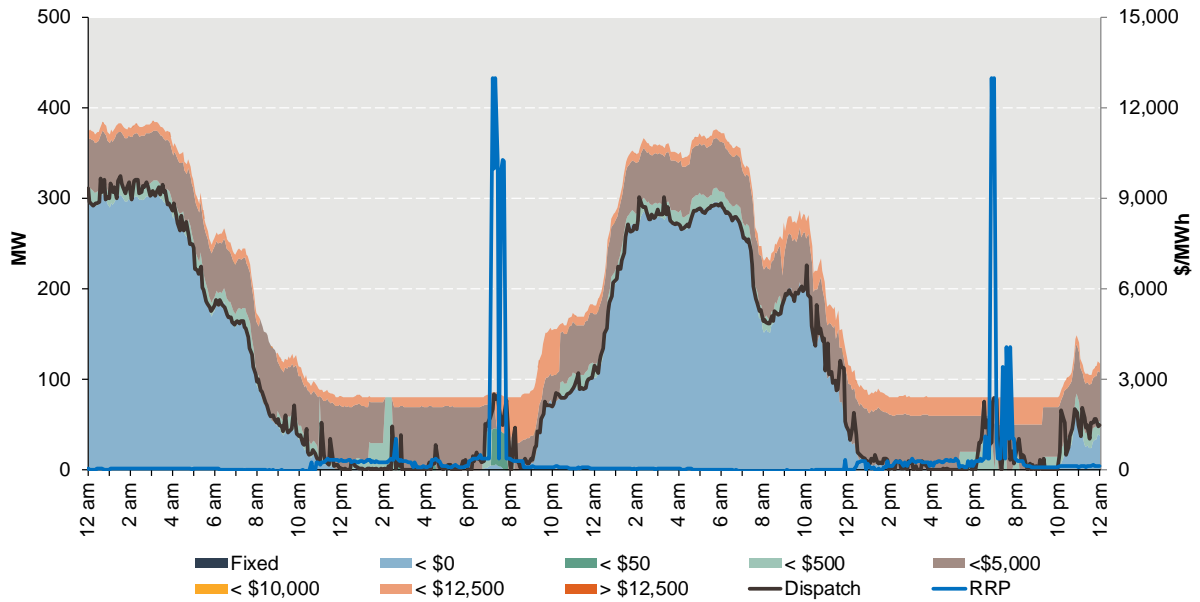
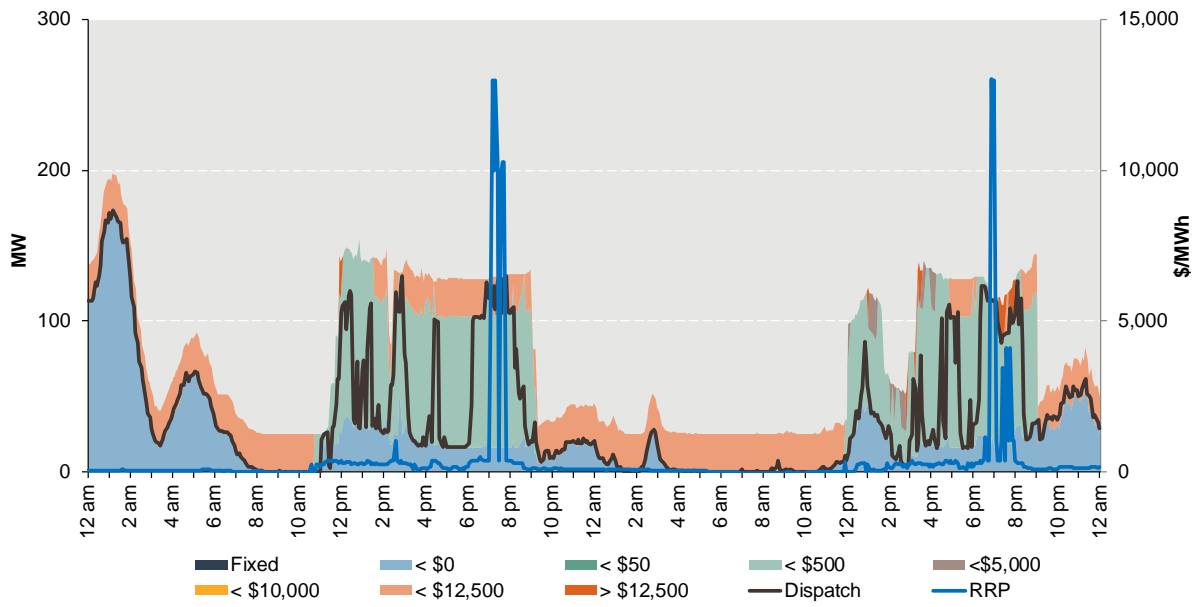


Figure A7: Infigen Energy (Lake Bonney BESS1, Lake Bonney 2 WF & Lake Bonney 3 WF) offers, dispatch and SA regional reference price (RRP)



5 Appendix B: Price Setter

The following table identifies the generating units involved in setting the energy price for each 5-minute interval for the 30-minute trading intervals above \$5,000/MWh. This information is published by AEMO⁵. The 30-minute price is the average of the six 5-minute interval prices.

Table B 1: Price Setter 30 December 7.30 pm South Australia

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
19:05	\$4,093.33	NEON	HPRG1	Energy	\$4,093.33	1.00	\$4,093.33
19:10	\$13,003.20	Origin Energy	ER02	Energy	\$85	-0.12	-\$10.20
		Snow y Hydro	MURRAY	Energy	\$132	0.13	\$17.16
		AGL (SA)	BARKIPS1	Energy	\$12,998	1.00	\$12,998.00
19:15	\$10,000.00	Infigen	LBBG1	Energy	\$10,000	1.00	\$10,000.00
19:20	\$13,001.39	CS Energy	GSTONE3	Energy	\$118.73	0.04	\$4.75
		CS Energy	GSTONE4	Energy	\$118.73	0.04	\$4.75
		CS Energy	GSTONE5	Energy	\$118.73	0.04	\$4.75
		CS Energy	GSTONE6	Energy	\$118.73	0.04	\$4.75
		Origin Energy	ER01	Energy	\$85	-0.17	-\$14.45
		AGL (SA)	BARKIPS1	Energy	\$12,998	1.00	\$12,998.00
19:25	\$10,258.10	NEON	HPRG1	Energy	\$10,247	1.00	\$10,247.41
19:30	\$380.00	Snow y Hydro	LONSDALE	Energy	\$380	1.00	\$380.00
30-minute price							\$8,456/MWh

Table B 2 Price Setter 30 December 8 pm South Australia

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
19:35	\$10,000	Infigen	LBBG1	Energy	\$10,000	1.00	\$10,000
19:40	\$10,278	NEON	HPRG1	Energy	\$10,247	1.00	\$10,247.41
		Origin Energy	ER03	Energy	\$85	-1.00	-\$85.00
		Snow y Hydro	MURRAY	Energy	\$132	1.06	\$139.92
19:45	\$10,254	NEON	HPRG1	Energy	\$10,247	1.00	\$10,247.41
19:50	\$379.98	Snow y Hydro	ANGAST1	Energy	\$379.98	1.00	\$379.98
19:55	\$379.98	Snow y Hydro	ANGAST1	Energy	\$379.98	1.00	\$379.98
20:00	\$379.95	Snow y Hydro	PTSTAN1	Energy	\$379.95	1.00	\$379.95
30-minute price		\$5,279/MWh					

⁵ Details on how the price is determined can be found at www.aemo.com.au.

Table B 3 Price Setter 31 December 7 pm South Australia

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:35	\$1,135.50	ERMPower and Arrow	BRAEMAR 5	Energy	\$200	2.14	\$428
		ERMPower and Arrow	BRAEMAR 7	Energy	\$200	2.14	\$428
		Infigen	KIATAWF 1	Energy	-\$95.01	-2.92	\$277.43
18:40	\$383.75	NEON	HPRG1	Energy	\$383.75	1.00	\$383.75
18:45	\$383.75	NEON	HPRG1	Energy	\$383.75	1.00	\$383.75
18:50	\$13,018.21	AGL (SA)	TORRB2	Energy	\$12,999	0.33	\$4,289.67
		AGL (SA)	TORRB3	Energy	\$12,999	0.33	\$4,289.67
		AGL (SA)	TORRB4	Energy	\$12,999	0.33	\$4,289.67
18:55	\$10,285.62	NEON	HPRG1	Energy	\$10,247.41	1.00	\$10,247.41
19:00	\$12,999	AGL (SA)	TORRB2	Energy	\$12,999	0.33	\$4,289.67
		AGL (SA)	TORRB3	Energy	\$12,999	0.33	\$4,289.67
		AGL (SA)	TORRB4	Energy	\$12,999	0.33	\$4,289.67
30-minute price		\$6,368/MWh					