

Electricity prices above \$5,000/MWh

South Australia, 18 December 2021

February 2022

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Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 520
Melbourne VIC 3001
Tel: 1300 585 165

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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 18 December 2021, the 30-minute wholesale electricity price in South Australia reached \$5,715/MWh at 1 am.

The high price was primarily due to the following factors:

- Available capacity in South Australia was 755 MW lower than the forecast 4 hours prior.
 - Wind generation fell significantly in the lead up to 1 am, which reduced the amount of low-priced capacity available because wind is typically offered at negative prices.
- An unplanned outage on the Murraylink interconnector prevented imports from Victoria, further limiting South Australia's access to low-priced generation.
- Market participants rebid capacity from low to high prices.
 - NEOEN rebid 80 MW at Hornsdale Power Reserve from around \$4,000/MWh to above \$10,000/MWh.
 - Snowy Hydro rebid 56 MW from prices below \$400/MWh to around \$15,000/MWh.

During the high-price intervals, roughly 56% of available capacity was offered below \$5,000/MWh, which is typical of overnight offers in South Australia. In combination with the above factors, this meant that up to 47 MW of high-priced capacity had to be dispatched.

3 Analysis

3.1 Overview of actual and expected conditions

The 30-minute price in South Australia was \$5,715/MWh at 1 am on 18 December 2021. This was driven by two 5-minute prices of \$10,247/MWh and \$15,098/MWh at 12.50 am and 12.55 am respectively.

Table 1 compares the actual and forecast 30-minute prices, demand and available capacity in South Australia.

- Available capacity was 755 MW lower than the forecast 4 hours prior due to an unexpected fall in wind generation² (see Section 3.2.1).
- Demand was very close to the forecast.

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 |
| 1 am | 5,715 | 10 | 10 | 1,600 | 1,605 | 1,599 | 1,907 | 2,563 | 2,662 |

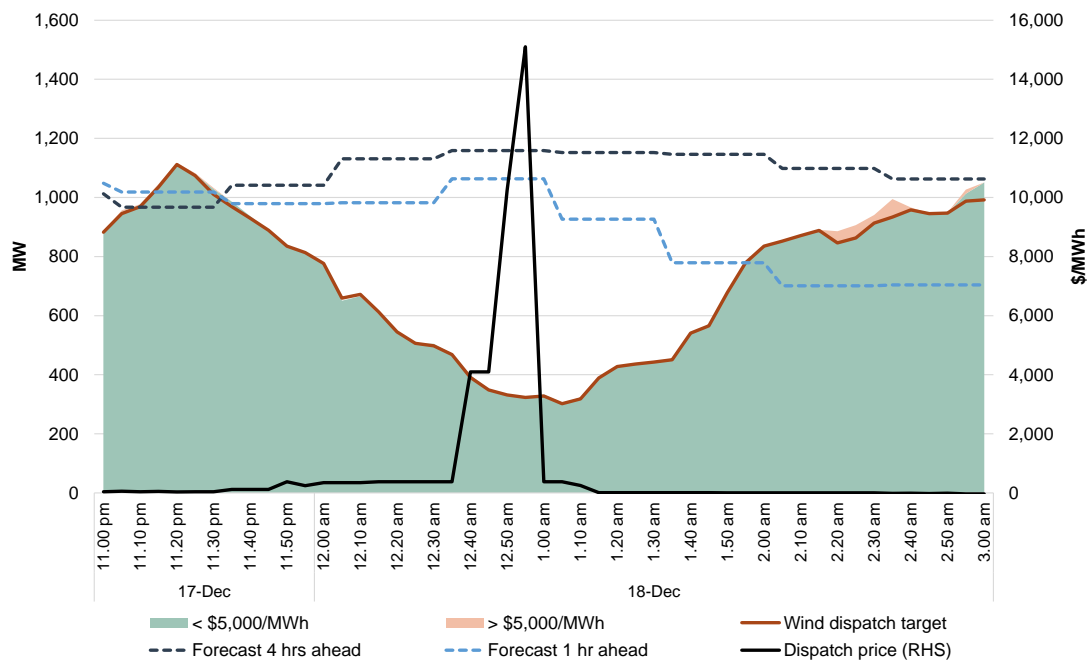
3.2 Reduced access to low-priced capacity

3.2.1 Wind generation was significantly lower than forecast

Generation in South Australia was lower than the forecasts between 12 am and 2 am. This was largely due to an unexpected fall in wind output which began at 11.30 pm on 17 December. The difference between actual and forecast wind generation was the most pronounced for the 1 am 30-minute period.

At around midnight, the forecast showed wind output would be roughly 1060 MW for 1 am. Instead, wind output was 373 MW, reflecting a 690 MW shortfall. This decline led to a reduction in the availability of cheap capacity in South Australia because wind is often offered below \$0/MWh (Figure 1). The ability of other generators to offset this was delayed as the drop in output was not anticipated (see Section 3.4 for more detail).

² Wind output refers to semi-scheduled wind generation and does not include non-scheduled wind generation.

Figure 1: Forecast and actual wind generation, wind offers and dispatch target

Note: Wind forecasts are for 30-minute periods (i.e. 11 pm, 11.30 pm, etc.).

3.2.2 Network outages and interconnector limits reduced access to energy from other regions

There was an unplanned outage to the Murraylink interconnector between 2 and 20 December³. This reduced South Australia's access to cheap generation from Victoria by 220 MW, Murraylink's nominal limit.

The remaining interconnector linking South Australia to Victoria, the Heywood interconnector, was operating at 544 MW⁴ at 12.30 am, close to its 600 MW nominal capacity. This meant South Australia could not import significantly more cheap capacity from Victoria when the price rose.

3.3 Rebidding capacity contributed to high prices

The price in South Australia began increasing after midnight, simultaneously with the decline in wind generation and in effective capacity priced below \$5,000/MWh. These factors, combined with market participants rebidding roughly 135 MW of capacity to high prices, contributed to the 1 am 30-minute price exceeding \$5,000/MWh.

All significant rebids are detailed in *Appendix A: Significant rebids*.

3.3.1 12.50 am trading interval

At 12.40 am and 12.45 am, Hornsdale Power Reserve Unit 1 (Hornsdale) set the 5-minute price at \$4,093/MWh. NEOEN then rebid all of Hornsdale's 80 MW capacity to \$10,247/MWh

³ Murraylink was out of service due to maintenance.

⁴ Exports from Victoria to South Australia.

for the 12.50 am interval, due to a change in forecast prices. For 12.50 am, Snowy Hydro rebid 56 MW of capacity in total at two diesel power stations, Angaston and Lonsdale, from under \$400/MWh to around \$15,000/MWh. The rebid reasons related to the pre-dispatch prices increasing.

These rebids meant that 47 MW of high-priced capacity was required to be dispatched and Hornsdale set the price at \$10,247/MWh.

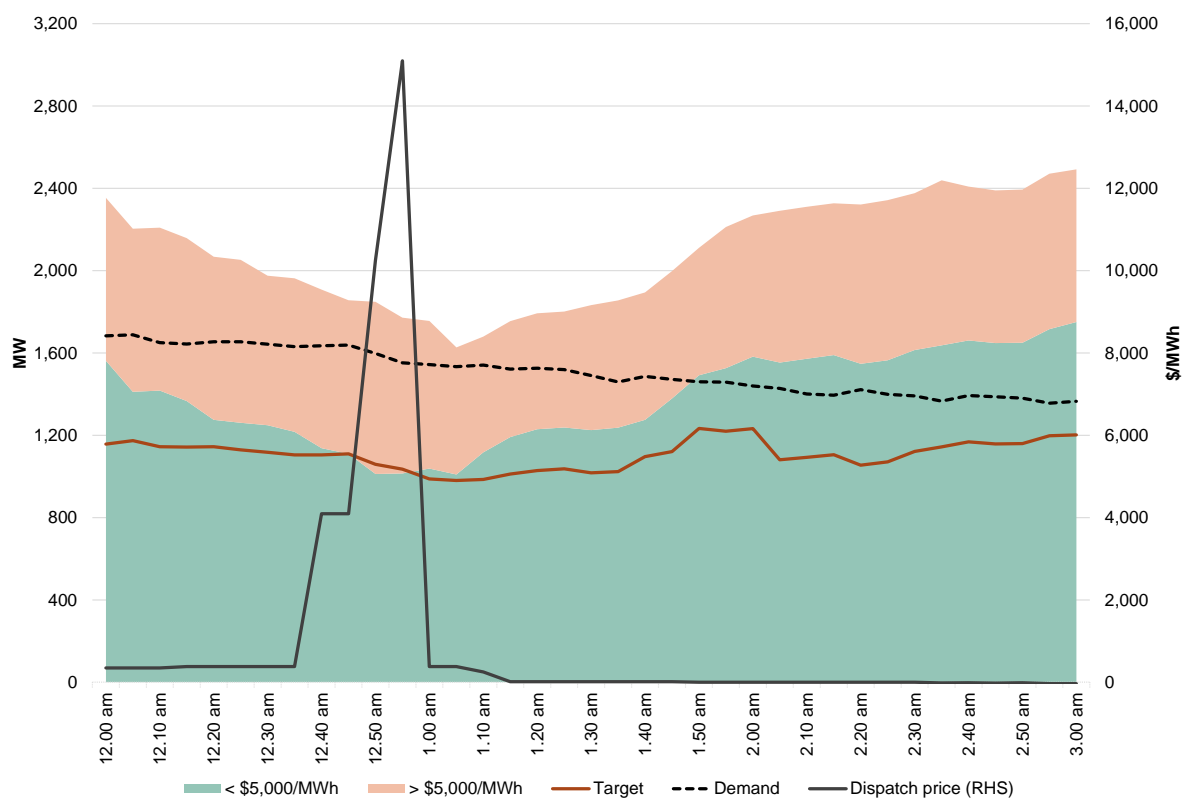
3.3.2 12.55 am trading interval

NEOEN removed Hornsdale's entire capacity for the 12.55 am 5-minute interval and attributed this to a change in forecast prices. This withdrawal of capacity was exaggerated by Heywood's export limit being constrained down by 24 MW relative to the 12.50 am interval. Consequently, capacity closer to the price cap was needed to supply the required 21 MW of energy priced above \$5,000/MWh. This led to the 12.55 am price reaching \$15,098/MWh.

Details on the generators involved in setting the price during the 1 am 30-minute period are provided in *Appendix C: Price Setter*.

The AER will make further enquiries of participants regarding rebids that affected market outcomes.

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



Note: Capacity below \$5,000/MWh is effective capacity.

There were other market participants that offered capacity above \$5,000/MWh. These offers are illustrated in *Appendix B: Closing bids*.

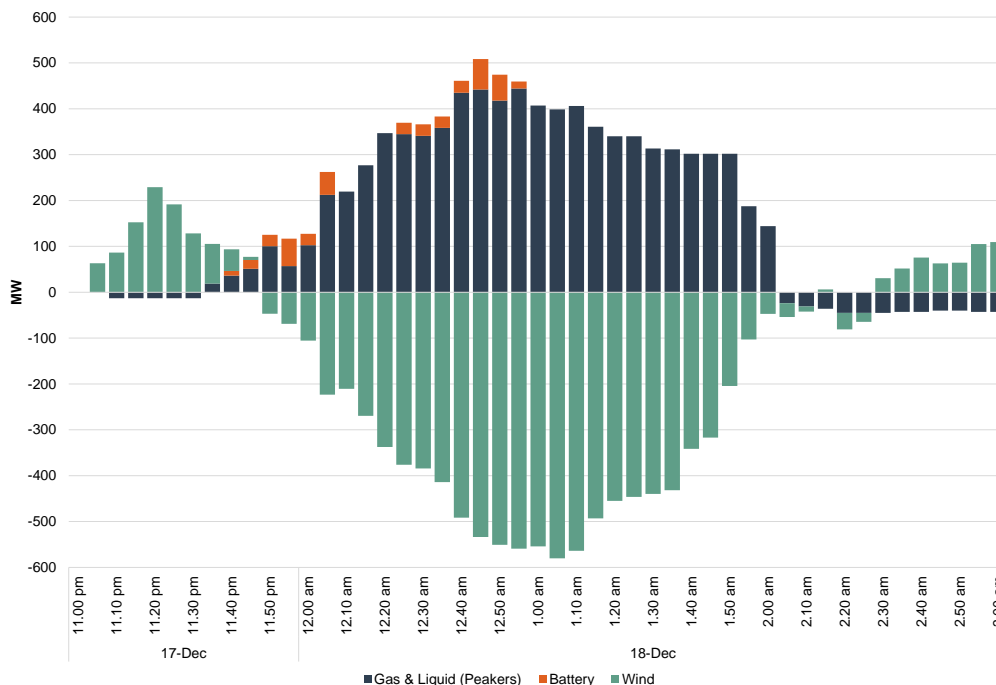
3.4 Market response

Between midnight and 1 am, peaking plants and batteries somewhat offset the decline in wind generation (Figure 3). However, the market response was often delayed due to technical parameters, such as the time to start a generator.

At 12.40 am the price first exceeded \$400/MWh and reached \$4,093/MWh. Subsequently, fast-start' units⁵ received a signal to come on but required 10 to 15 minutes before they could begin generating. This meant that a high price was able to persist until 1 am, when these units could increase their generation.

After 1 am, more capacity priced under \$5,000/MWh was made available (Figure 2) and demand gradually declined in line with the forecasts. Wind generation also recovered by 2 am.

Figure 3: Cumulative change in dispatch target for fuel types, relative to 11 pm



Note: The changes are cumulative relative to 11.00 pm on 17 December 2021.

⁵ Fast start units are generators which can meet their minimum load within 30 minutes.

Appendix A: Significant rebids

The rebidding tables highlight the relevant rebids submitted by generators that impacted market outcomes during the time of high prices. It details the time the rebid was submitted and used by the dispatch process, the maximum capacity involved, the change in the offer price for capacity, and the rebid reason.

Table A1: Significant rebids for the 1 am 30-minute period

| Submit time | Time effective | Participant | Station | Capacity rebid (MW) | Price from (\$/MWh) | Price to (\$/MWh) | Rebid reason |
|-------------|----------------|-------------|--------------------------------|---------------------|---------------------|-------------------|--|
| 12.37 am | 12.50 am | Infigen | Lake Bonney BESS1 | -15 removed | 249 | n/a | Updated SOC close to limit. |
| 12.41 am | 12.50 am | NEOEN | Hornsdale Power Reserve Unit 1 | 80 | 4,093 | 10,247 | A Change in forecast prices. |
| 12.43 am | 12.50 am | Snowy Hydro | Angaston | 36 | 376 | 14,934 | A SA 5MIN PD Price \$198.86 HIGHER THAN 5MIN PD 00:50@00:36 (\$578.81) – SL. |
| 12.43 am | 12.50 am | Snowy Hydro | Lonsdale | 20 | 381 | 15,130 | A SA 5MIN PD Price \$198.86 HIGHER THAN 5MIN PD 00:50@00:36 (\$578.81) – SL. |
| 12.49 am | 12.55 am | NEOEN | Hornsdale Power Reserve Unit 1 | -80 removed | 10,247 | n/a | A CHANGE IN FORECAST ENERGY PRICES. |
| 12.37 am | 12.55 am | Infigen | Lake Bonney BESS1 | -10 removed | 379 | n/a | Updated SOC close to limit. |

Appendix B: Closing bids

Figures B1 to B7 highlight the 5-minute offers between 12 pm 17 December and 12 pm 18 December for participants in South Australia that had capacity priced at or above \$5,000/MWh on 18 December 2021. They also show generation output and the 5-minute spot price.

Figure B1: AGL Energy (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)

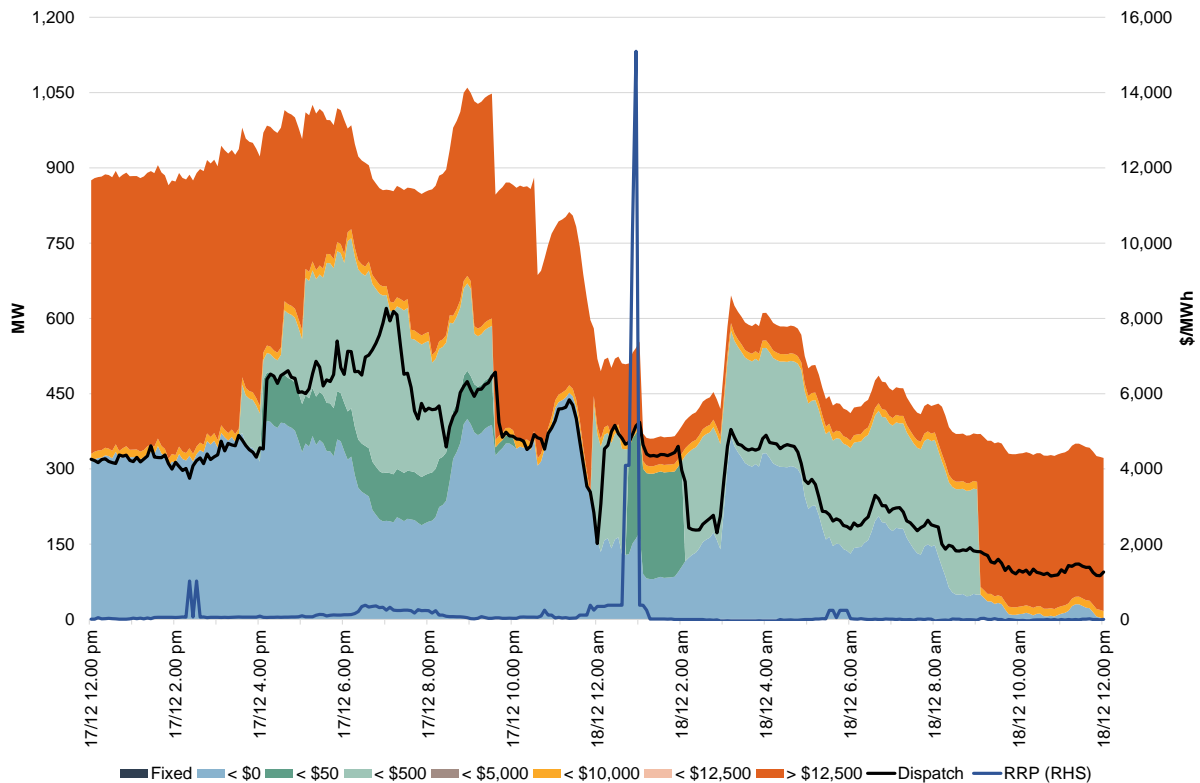


Figure B2: EnergyAustralia (Hallett & Waterloo WF) offers, dispatch and SA regional reference price (RRP)

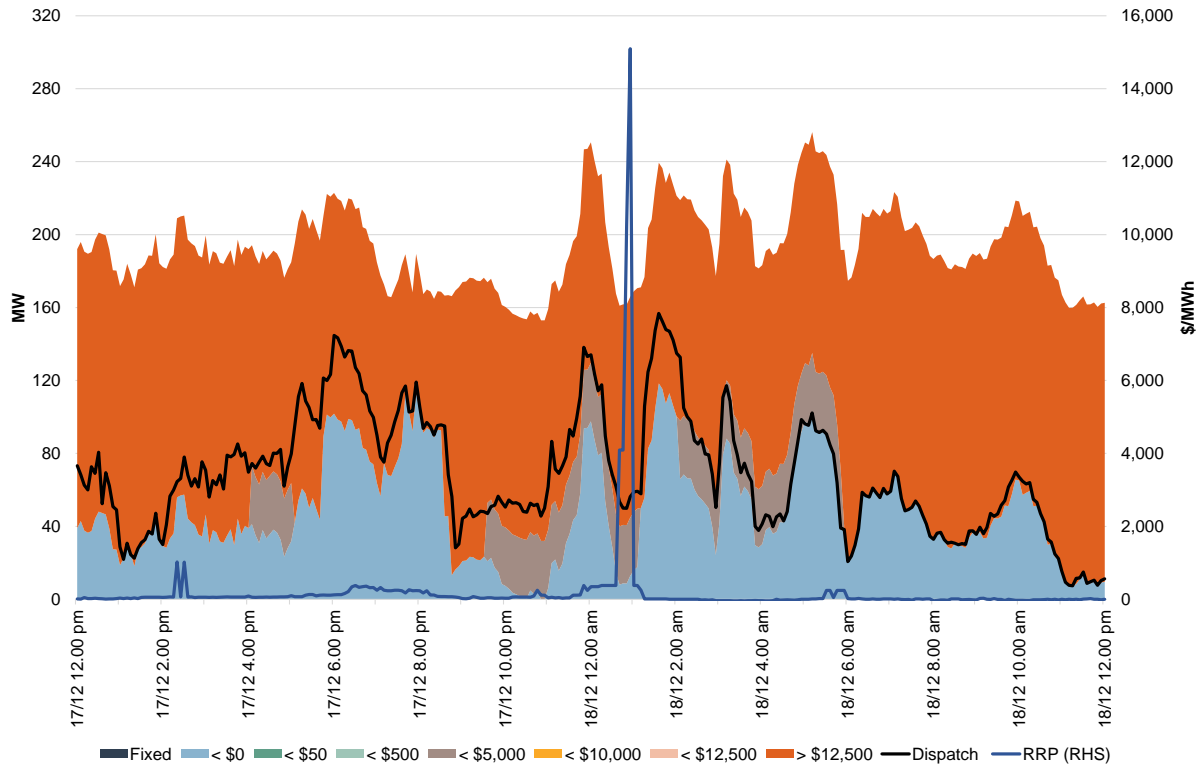


Figure B3: Engie (Pelican Point, Dry Creek, Mintaro, Port Lincoln, Snuggery & Willogoleche Wind Farm) offers, dispatch and SA regional reference price (RRP)

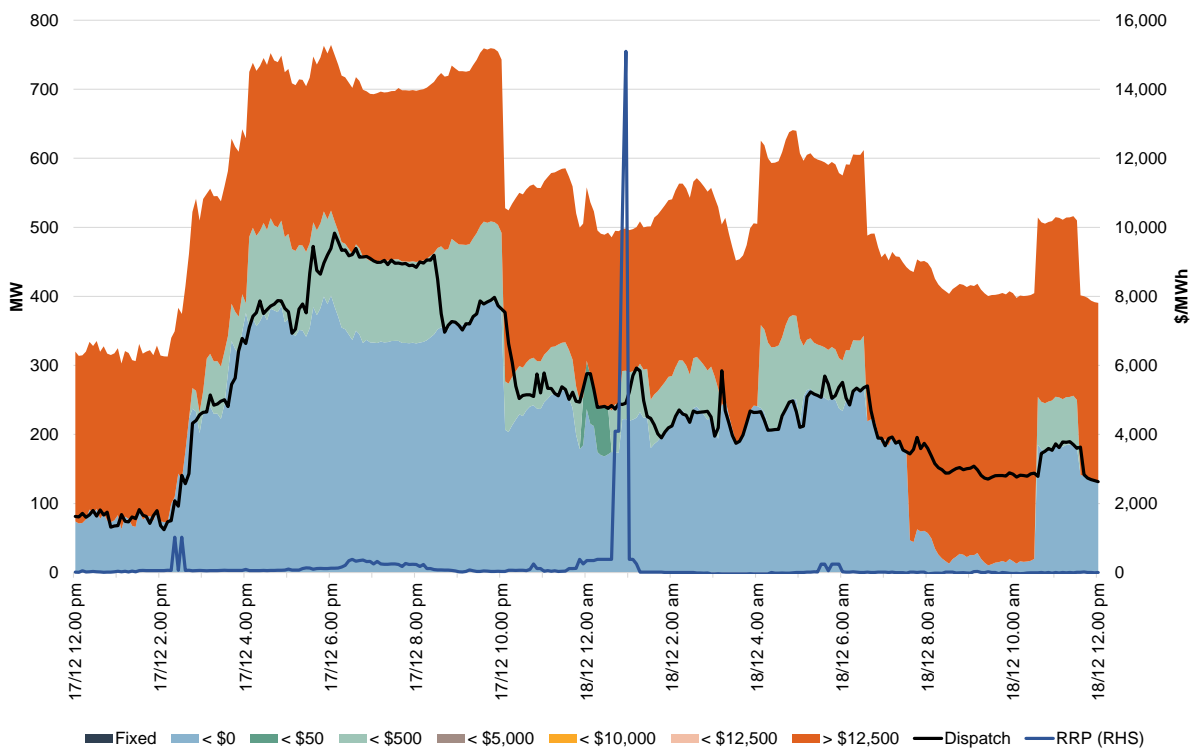


Figure B4: Infigen Energy (Lake Bonney BESS1, Lake Bonney 2 WF & Lake Bonney 3 WF) offers, dispatch and SA regional reference price (RRP)

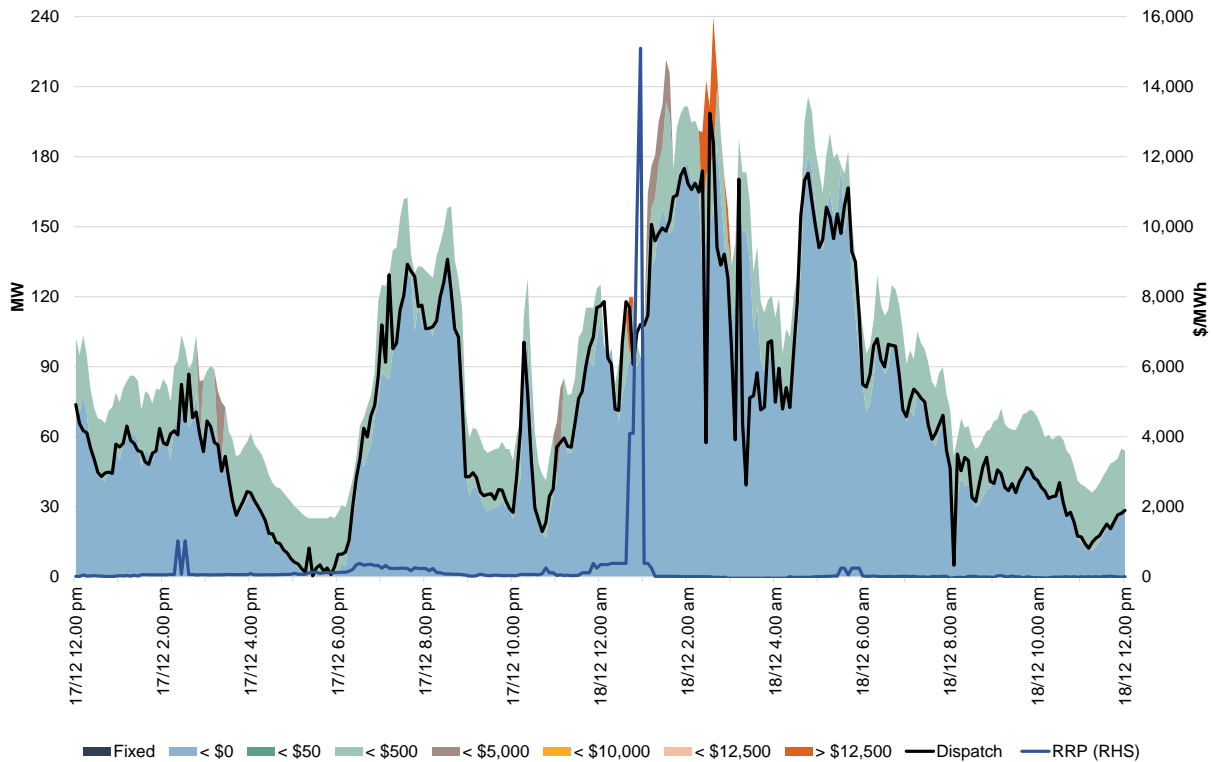


Figure B5: NEOEN (Hornsedale Wind Farm 2, Hornsedale Power Reserve Unit 1 & Hornsedale Wind Farm 3) offers, dispatch and SA regional reference price (RRP)

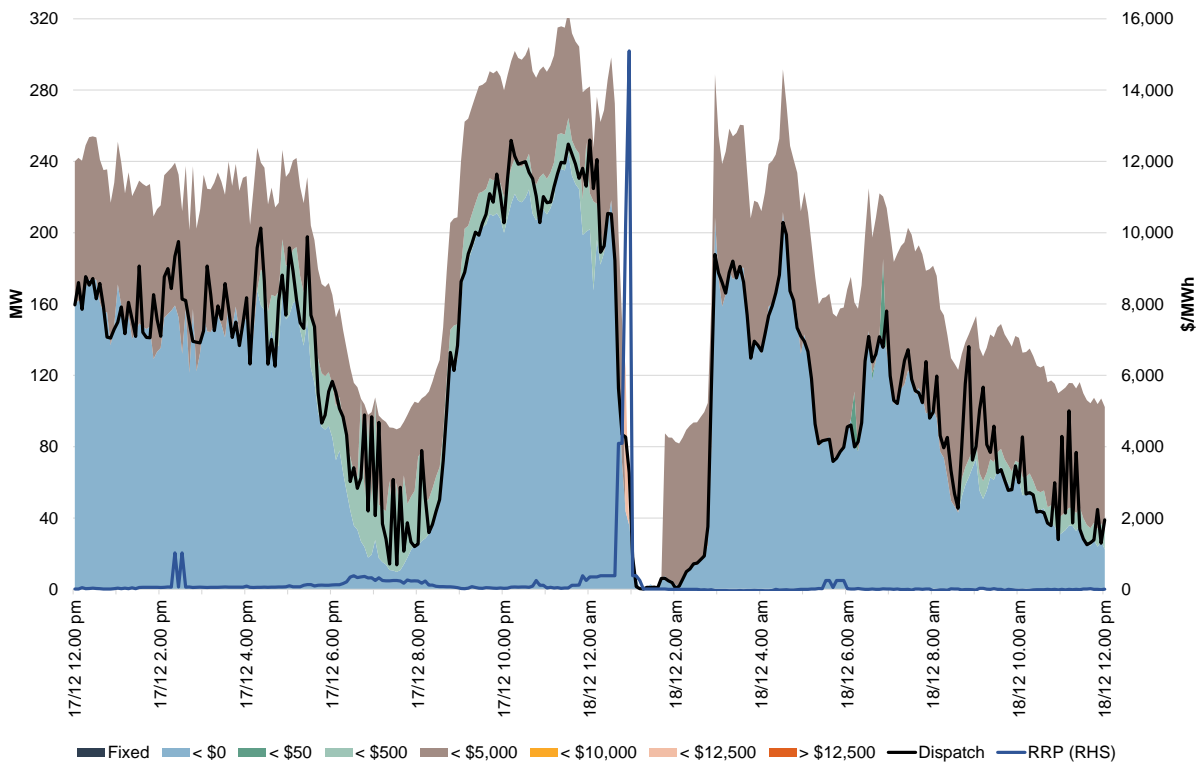


Figure B6: Origin Energy (Ladbroke Grove, Osborne, Quarantine, Bungala One Solar Farm & Bungala Two Solar Farm) offers, dispatch and SA regional reference price (RRP)

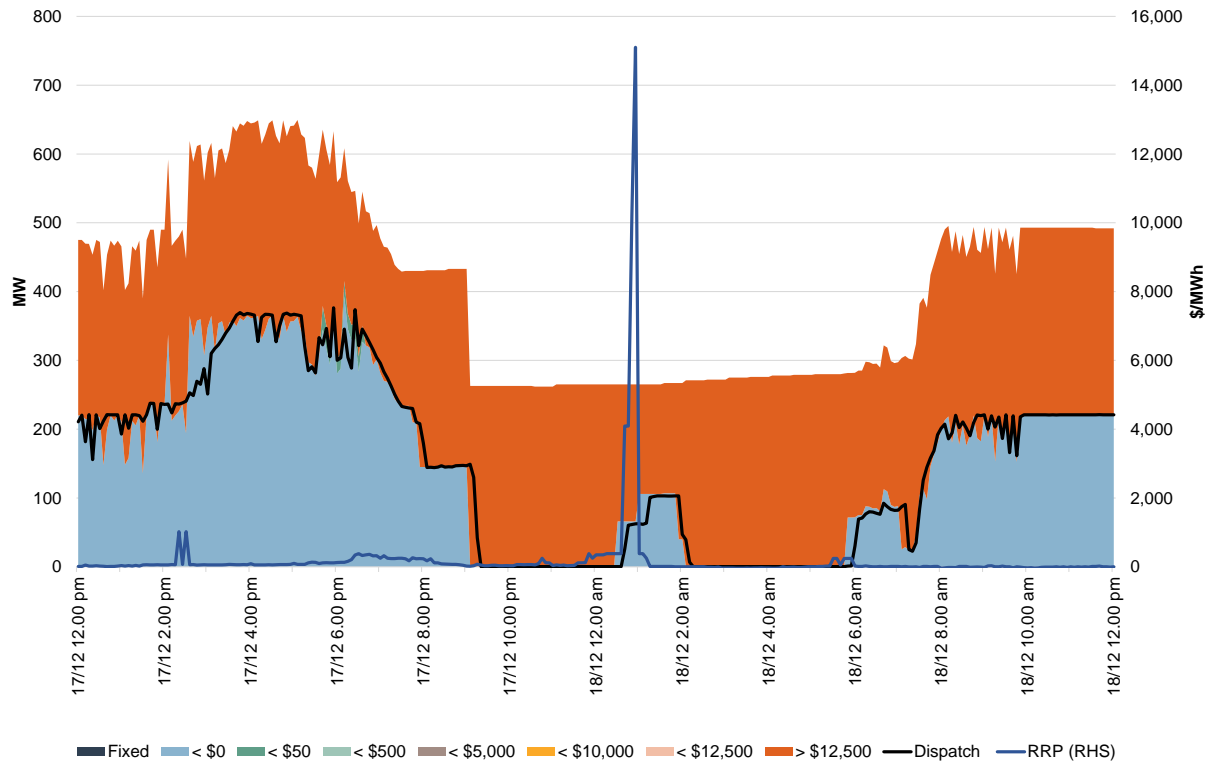
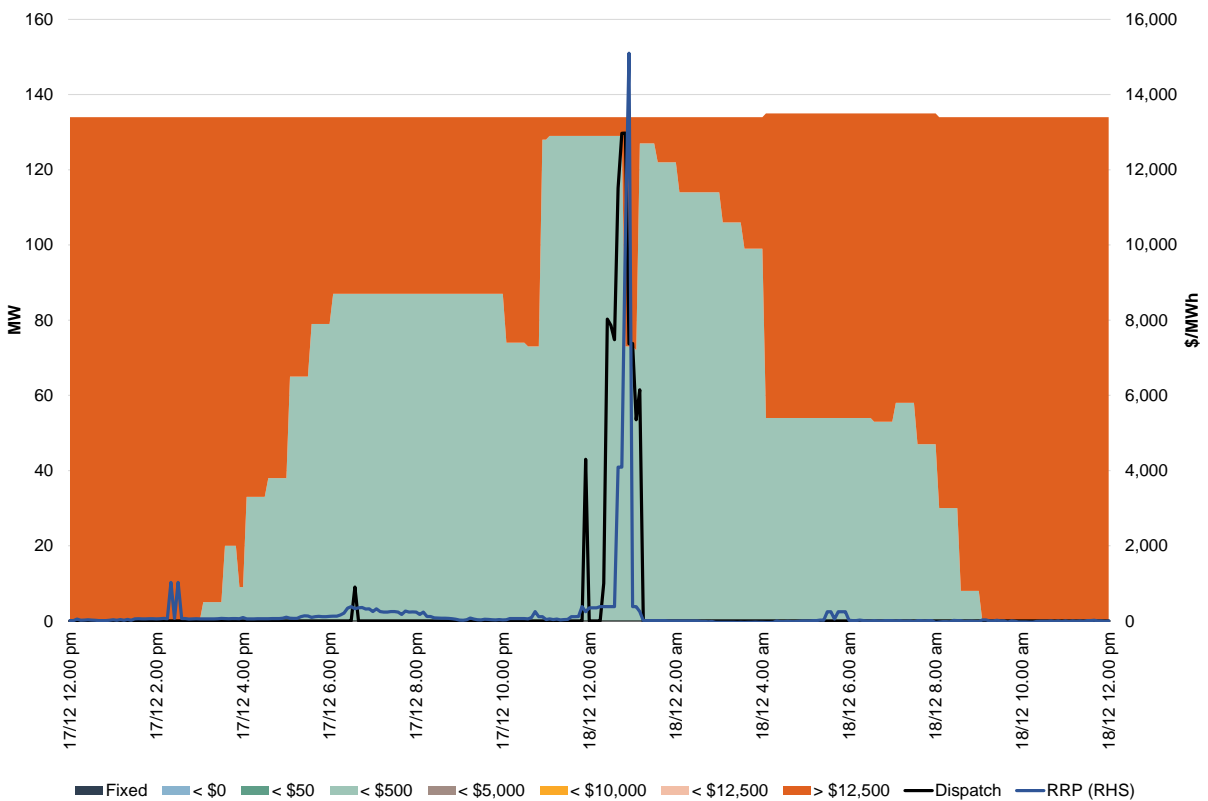


Figure B7: Snowy (Angaston, Lonsdale & Portt Stanvac) offers, dispatch and SA regional reference price (RRP)



Appendix C: Price Setter

The following table identifies the generating units involved in setting the energy price for each 5-minute trading interval across the 1 am 30-minute period. This information is published by AEMO⁶. The 30-minute price is the average of the six 5-minute interval prices.

Table C1: Price Setter

| Time | Dispatch price | Participant | Unit | Service | Offer price | Marginal change | Contribution |
|------------------------|----------------|--------------------------|----------|-------------|-------------|-----------------|--------------|
| 00:35 | \$380.00 | Snowy Hydro | LONSDALE | Energy | \$380.00 | 1.00 | \$380.00 |
| 00:40 | \$4,093.33 | Hornsedale Power Reserve | HPRG1 | Energy | \$4,093.33 | 1.00 | \$4,093.33 |
| 00:45 | \$4,093.33 | Hornsedale Power Reserve | HPRG1 | Energy | \$4,093.33 | 1.00 | \$4,093.33 |
| 00:50 | \$10,247.41 | Hornsedale Power Reserve | HPRG1 | Energy | \$10,247.41 | 1.00 | \$10,247.41 |
| 00:55 | \$15,098.43 | AGL (SA) | TORRB2 | Energy | \$15,100.00 | 1.00 | \$15,100.00 |
| | | AGL (SA) | TORRB2 | Lower 6 sec | \$0.50 | 0.83 | \$0.42 |
| | | Alinta Energy | LOYB1 | Lower 6 sec | \$2.39 | -0.83 | -\$1.98 |
| 01:00 | \$379.95 | Snowy Hydro | PTSTAN1 | Energy | \$379.95 | 1.00 | \$379.95 |
| 30-minute price | | \$5,715.41/MWh | | | | | |

⁶ Details on how the price is determined can be found at www.aemo.com.au.