

Electricity prices above \$5,000/MWh

Victoria & South Australia,
31 January 2022

March 2022

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| 1 | 29 March 2022 | 14 |

Contents

| | |
|--|-----------|
| 1 Obligation | 1 |
| 2 Summary | 2 |
| 3 Analysis | 3 |
| 3.1 Overview of actual and expected conditions | 3 |
| 3.2 Demand was high | 4 |
| 3.3 Network constraint reduced access to cheap generation | 4 |
| 3.4 Generator outages, rebids and low wind generation reduced availability | 5 |
| Appendix A: Closing bids | 7 |
| Appendix B: Significant rebids | 12 |
| Appendix C: Price setter | 13 |

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 31 January 2022 the wholesale price of electricity reached \$14,149/MWh in Victoria and \$14,239/MWh in South Australia for the 6 pm 30-minute period.

The main drivers of the high price were:

- High demand, driven by hot temperatures. During the high price period, demand was about 8,300 MW in Victoria and about 2,400 MW in South Australia.
- A network constraint forced counterprice flows from Victoria into NSW.
- Planned outages meant that 720 MW of capacity was unavailable in Victoria.
- Availability was also lower than forecast, due to:
 - wind generation being lower than forecast in South Australia
 - units in Victoria withdrawing capacity due to technical issues.

While only about 11% of available generation capacity was priced above \$5,000/MWh, about 15% of this high-priced capacity was required to be dispatched.

3 Analysis

3.1 Overview of actual and expected conditions

The 30-minute price at 6 pm on 31 January 2022 reached \$14,149/MWh in Victoria and \$14,239/MWh in South Australia. Table 1 compares actual and forecast 30-minute prices, demand and availability. The Heywood interconnector was unconstrained so our analysis will consider Victoria and South Australia as one region.

- Prices above \$5,000/MWh were not forecast to occur in either region, 1 or 4 hours prior. However, forecasts were volatile on the day and multiple forecasts before, after and between these times did predict prices closer to the cap.
- Actual availability was about 350 MW lower than was forecast 1 hour before. Key drivers included:
 - 114 MW of capacity was withdrawn in Victoria due to technical issues
 - wind generation was 101 MW lower than forecast in South Australia.
- Overall, demand was close to forecast.

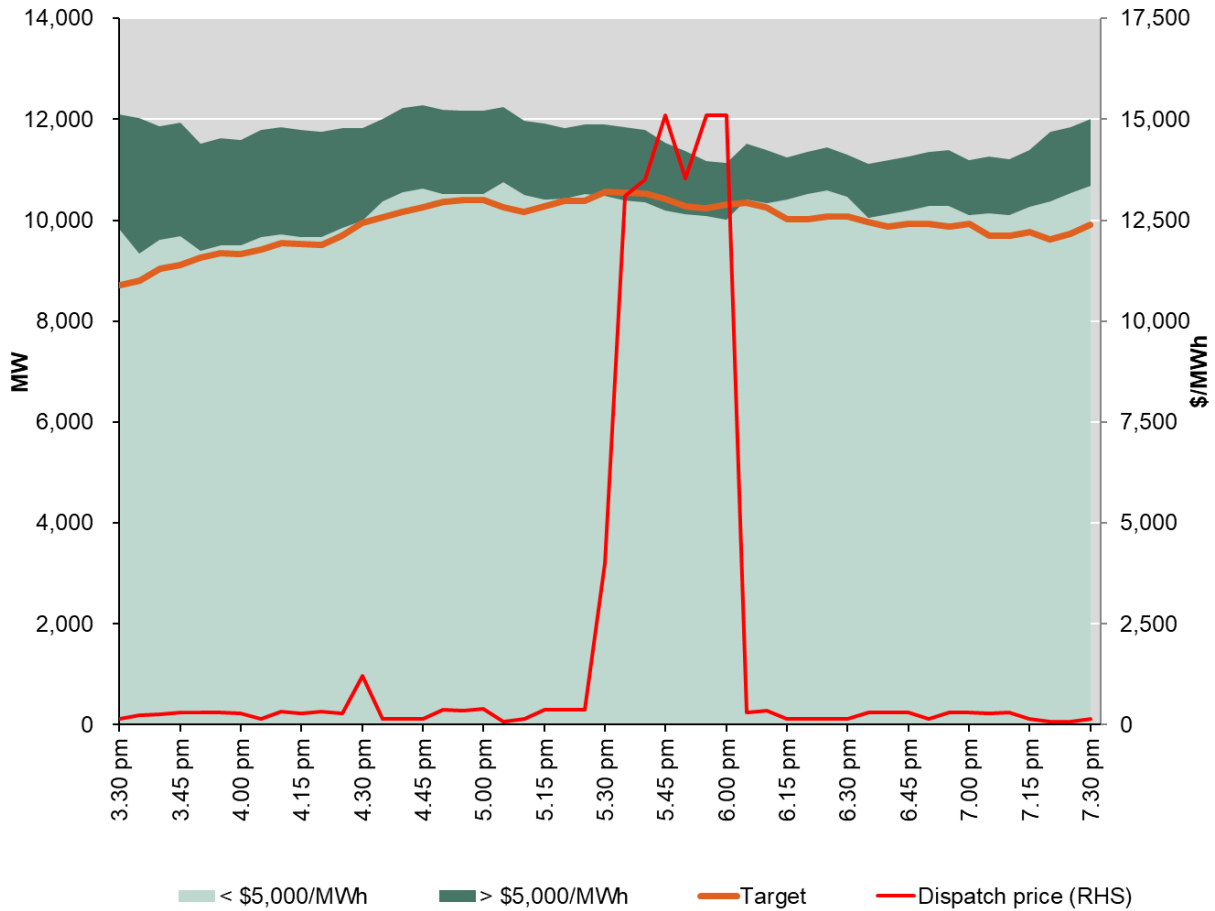
Table 1: Actual and forecast 30-minute price, demand and available capacity at 6 pm

| Region | 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 |
| Victoria | 14,149 | 326 | 435 | 8,274 | 8,376 | 8,381 | 9,196 | 9,354 | 9,534 |
| South Australia | 14,239 | 341 | 477 | 2,406 | 2,337 | 2,358 | 2,501 | 2,688 | 2,695 |
| Total | - | - | - | 10,680 | 10,713 | 10,739 | 11,697 | 12,042 | 12,229 |

The sensitivities published at the start of the 6 pm 30-minute interval indicated that a decrease of 100 MW in demand (or an equivalent increase in low-priced capacity) would lead to prices falling below \$5,000/MWh. This indicates that the price in both regions was highly sensitive to small changes in demand.

As shown in Figure 1, only about 11% of capacity was priced above \$5,000/MWh. However, high demand and low availability meant that about 15% of this high-priced capacity was required to be dispatched.

Figure 1: Combined target and capacity offered above and below \$5,000/MWh in Victoria and South Australia



Source: AER analysis using NEM data

Note: Victorian price only shown for clarity, as South Australian price was similar.

3.2 Demand was high

Combined Victorian and South Australian demand on 31 January reached 10,768 MW at 6:30 pm, the second highest level up to that point during the 2021-22 summer. This was made up of 8,329 MW of Victorian demand (the second highest level this summer) and 2,438 MW of South Australian demand (the third highest level this summer). At 6 pm, demand was 10,680 MW. For reference, record demand in South Australia is 3,385 MW and Victoria is 13,707 MW.

High demand was driven by hot weather, which leads to the increased use of air conditioners, with the temperature reaching 34°C in Melbourne² and 35°C in Adelaide.³

3.3 Network constraint reduced access to cheap generation

On the afternoon of 31 January, output from Snowy Hydro’s Murray power station was high. Murray is located in Victoria close to the Vic-NSW interconnector, so when Murray’s output is

² <http://www.bom.gov.au/climate/dwo/202201/html/IDCJDW3033.202201.shtml>

³ <http://www.bom.gov.au/climate/dwo/202201/html/IDCJDW5081.202201.shtml>

high it can cause congestion on the interconnector. At 4.30 pm, AEMO's operating staff manually invoked a network constraint to manage this congestion. The constraint forced up to 356 MW to be exported from Victoria into NSW during the high price period, despite the energy price being just \$300/MWh in NSW.

The network constraint invoked by AEMO limited the sum of output from Murray power station and imports into Victoria to 1100 MW. Murray was generating above 1100 MW from 4.05 pm onwards, so when the constraint was invoked at 4.30 pm, flows were forced out of Victoria into NSW to prevent the constraint from violating. At the beginning of the high price period Murray's output was 1456 MW, with 356 MW of this being forced from Victoria into NSW.

The previous day, Murray had rebid its ramp down rate from 100 MW to 32 MW and the majority of its capacity to the floor (from 4.05 pm 31 January onwards). The lower ramp rate meant that when the constraint bound, Murray could only be targeted to reduce its output slowly. This ensured that it continued to produce a high level of output for longer, prolonging forced exports.

3.4 Generator outages, rebids and low wind generation reduced availability

Some Victorian baseload capacity was unavailable on 31 January.

EnergyAustralia's Yallourn units 1 and 2 had been experiencing outages due to tube-leaks (since 30 and 25 January, respectively). Each of these units has a registered capacity of 360 MW, so the outages collectively reduced availability by 720 MW.

In addition to the outages of Yallourn units 1 and 2, units 3 and 4 were collectively offering 110 MW less than their registered capacity, due to technical issues.

Finally, a number of units removed capacity or rebid capacity to high prices shortly before the high price event.

- EnergyAustralia's Jeeralang B unit 3, in Victoria, removed 84 MW of capacity priced at the floor at 5.16 pm due to a unit trip.
- EnergyAustralia's Newport unit, also in Victoria, removed 30 MW of capacity priced at the floor at 3.04 pm due to a pressure limit.
- In South Australia, AGL's Torrens Island Power station, units 2, 3 and 4 collectively moved 30 MW of capacity from \$150/MWh to \$12,999/MWh at 5.19 pm, due to a change in forecast prices.

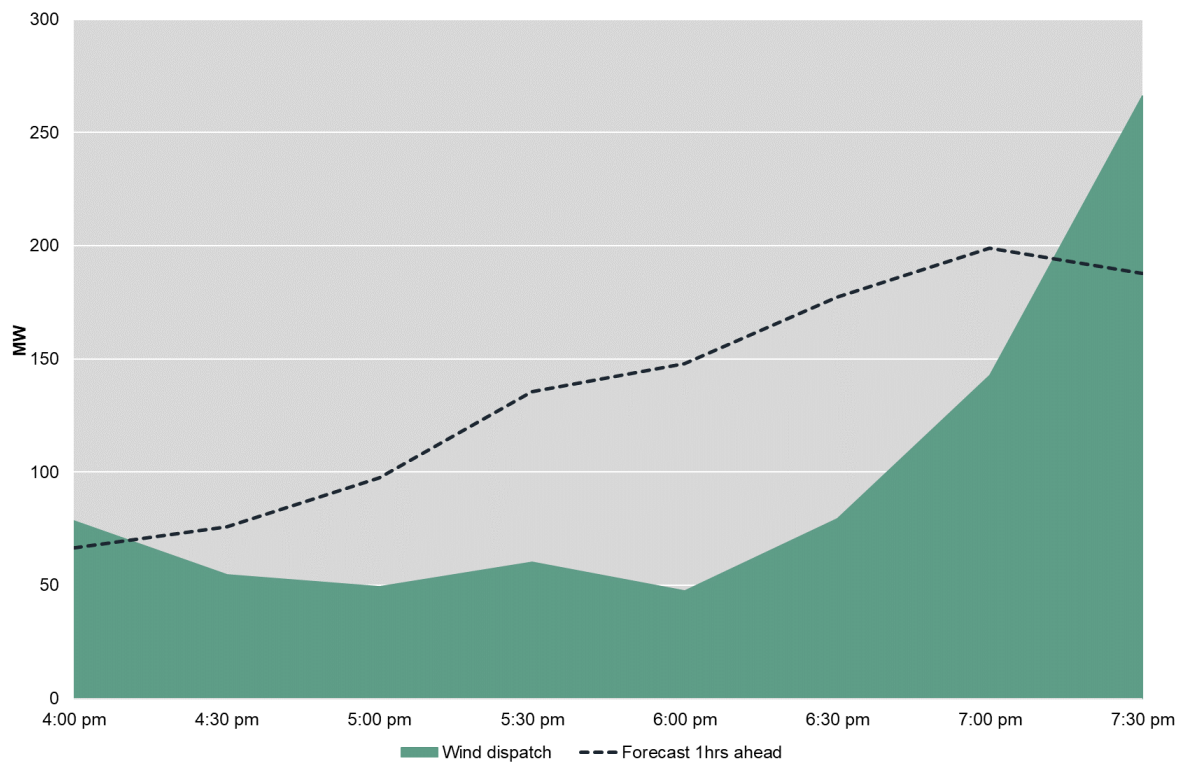
Wind generation in SA was below forecasts

Wind generation in South Australia at 6 pm was just 47 MW, well below the hour ahead forecast of 148 MW. The 101 MW gap between actual wind generation and the 1 hour forecast formed the majority of the gap between actual generator availability in South Australia at 6 pm (2,501 MW) and hour forecast availability (2,688 MW).

As well as being low relative to forecast levels, wind generation at 6 pm was very low compared to typical South Australian wind generation. Over 2,000 MW of wind capacity is installed in South Australia, and by 9 pm 31 January, wind generation had increased to over 900 MW. The low forecast wind generation at 6 pm meant that market conditions were already tight, so when

actual wind generation was even lower than forecast levels, this contributed to the high price event.

Figure 2: Forecast and actual wind generation in South Australia



Appendix A: Closing bids

Figures A1 to A9 highlight the 5 minute offers on 31 January 2021 for participants in Victoria and South Australia 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: Vic: Snowy Hydro (Laverton North, Murray, Valley Power) offers, dispatch and dispatch price

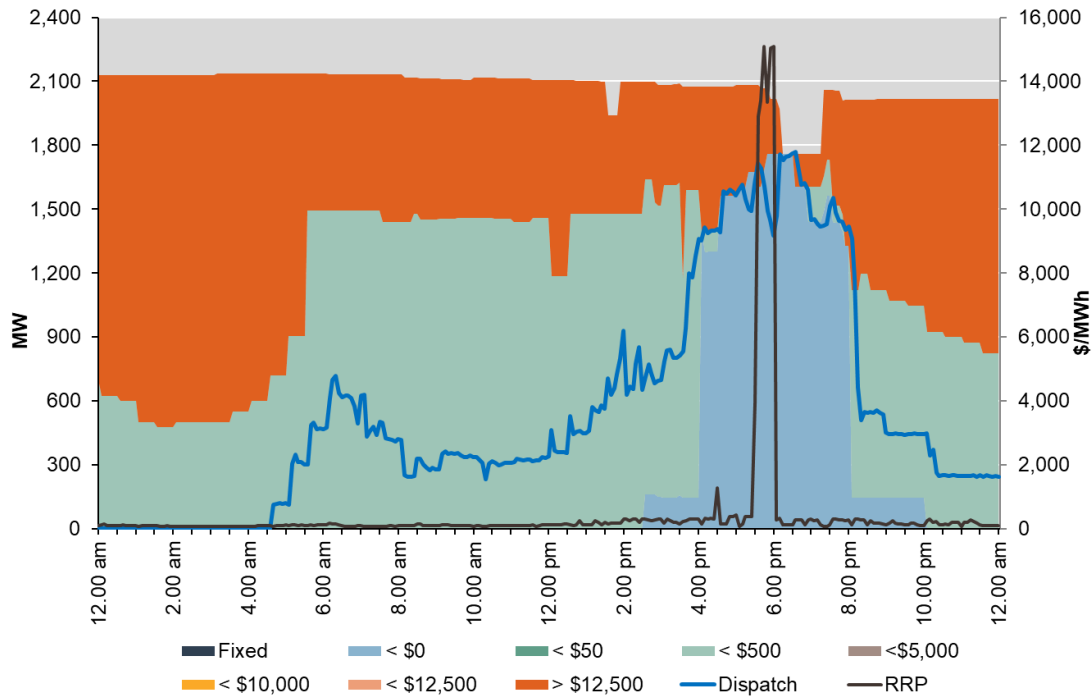


Figure A2: Vic: Origin Energy (Mortlake)

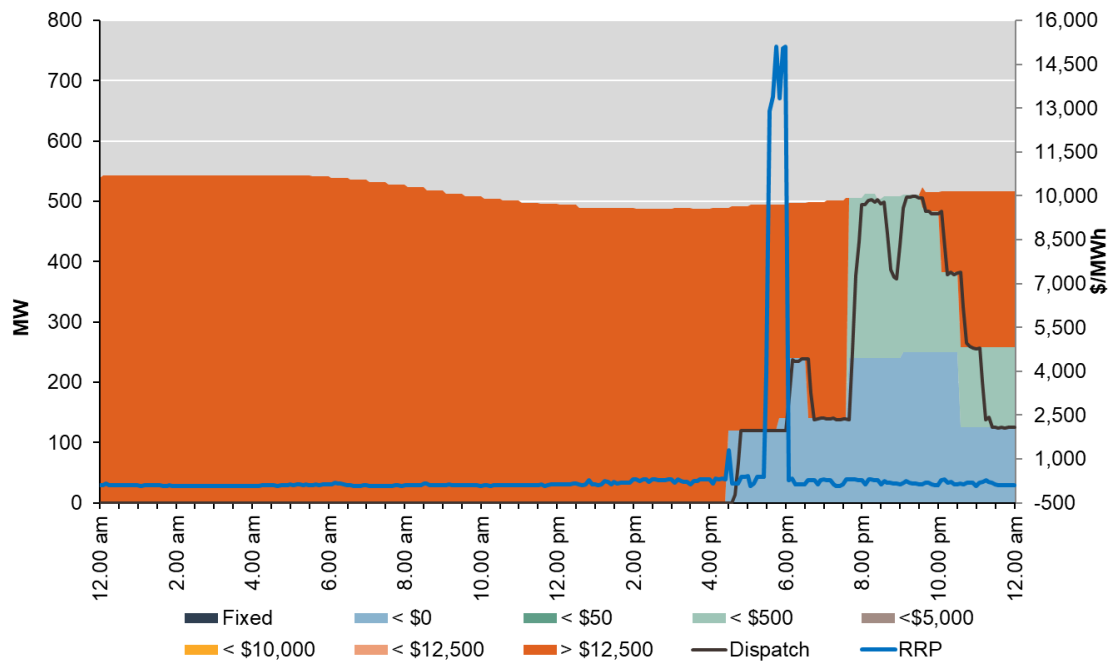


Figure A3: Vic: AGL (Dartmouth, Eildon, Loy Yang A, Macarthur WF, McKay, Oaklands Hill WF, Somerton, West Kiewa)

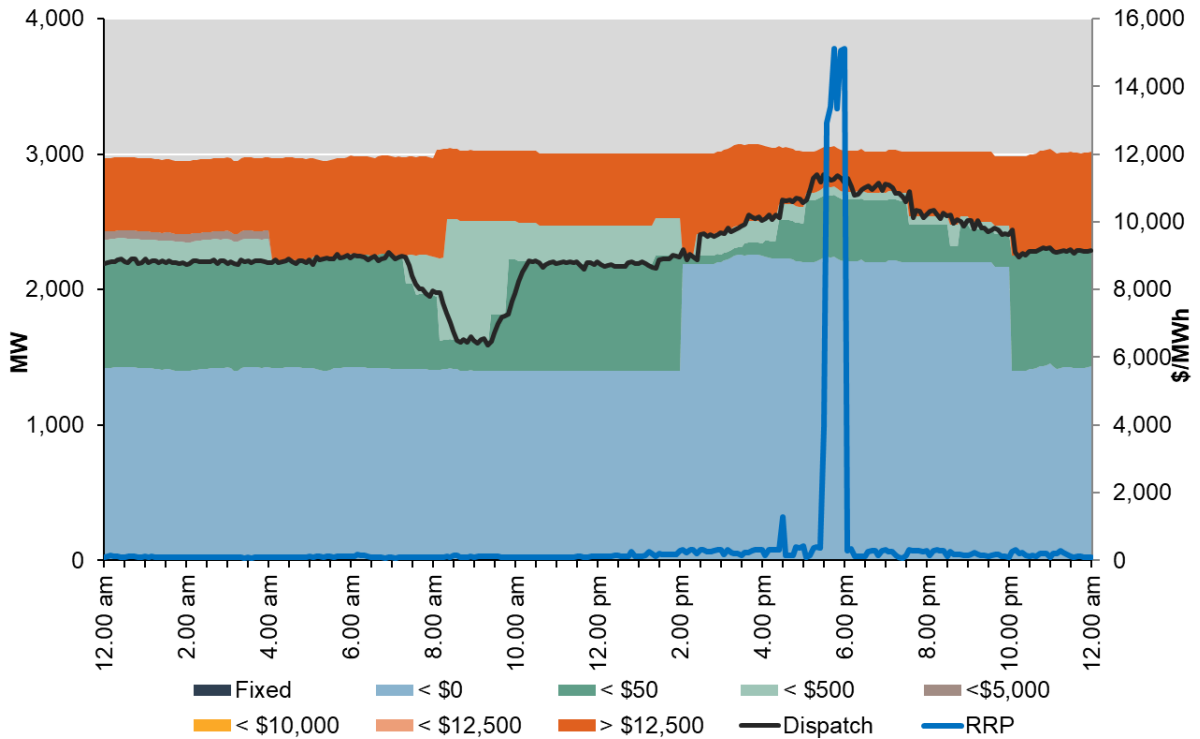


Figure A4: SA: AGL (Hallett 1 WF, Hallett 2 WF, North Brown Hill WF, The Bluff WF, Torrens Island, Wattle Point WF)

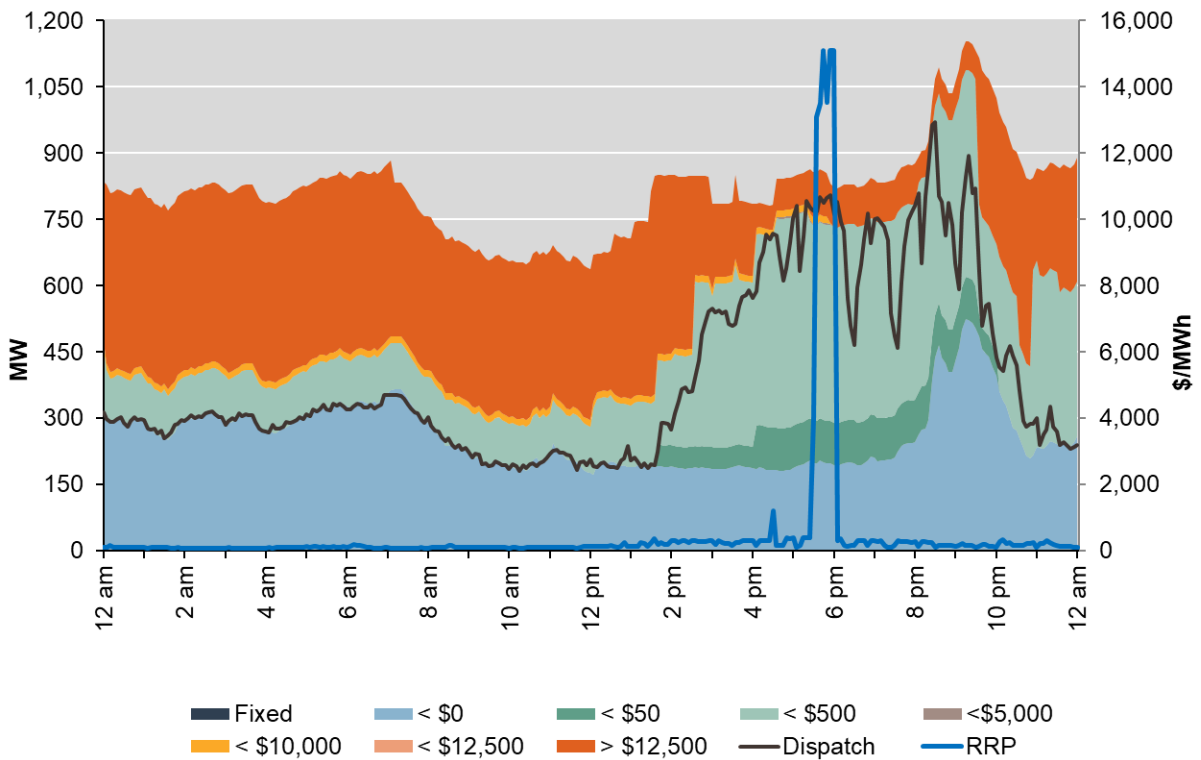


Figure A5: SA: Engie (Canunda WF, Dry Creek, Mintaro, Pelican Point, Port Lincoln, Snuggery)

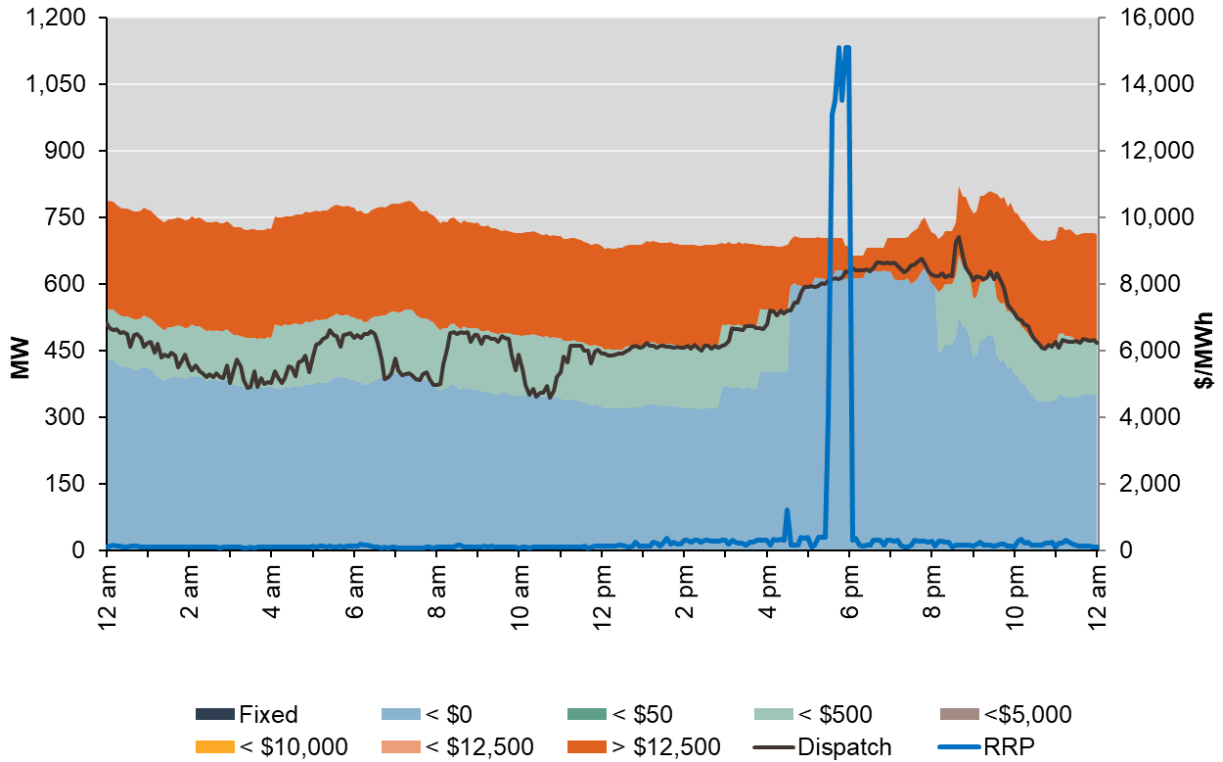


Figure A6: SA: Infigen (Lake Bonney 1, 2 and 3 WF)

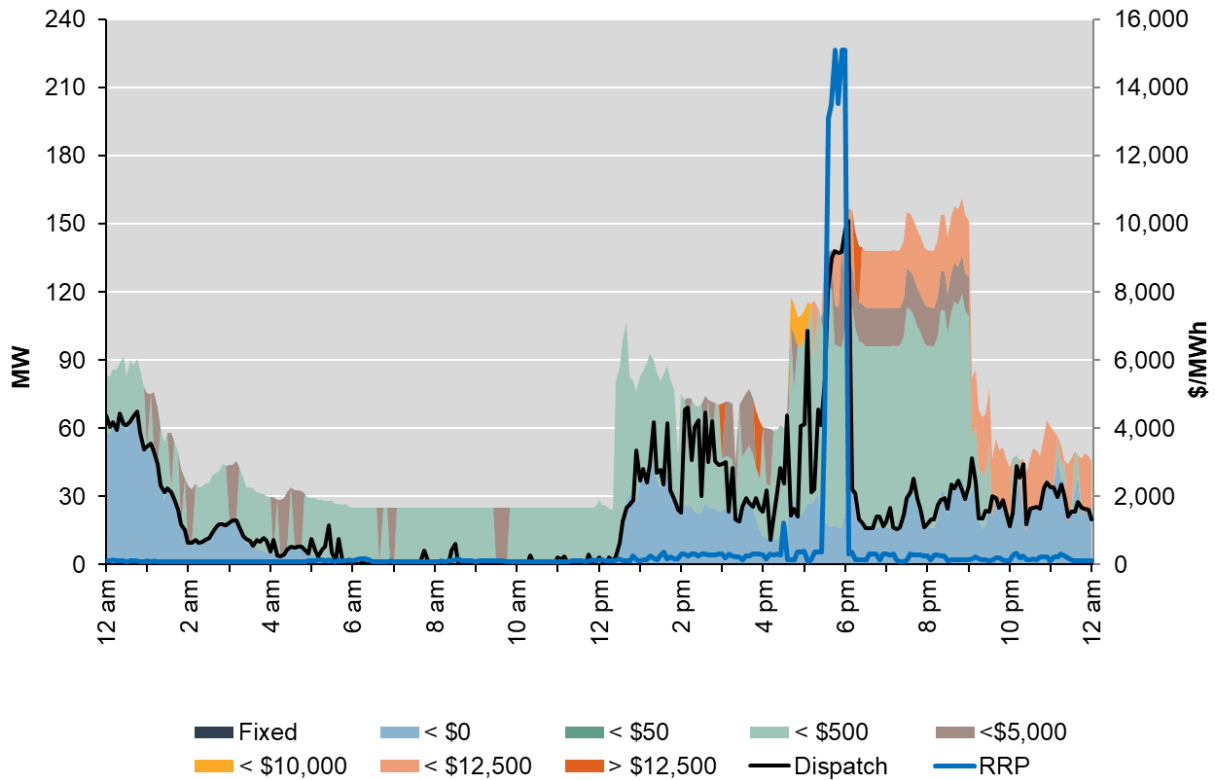


Figure A7: SA: Neoen (Hornsedale Wind Farm)

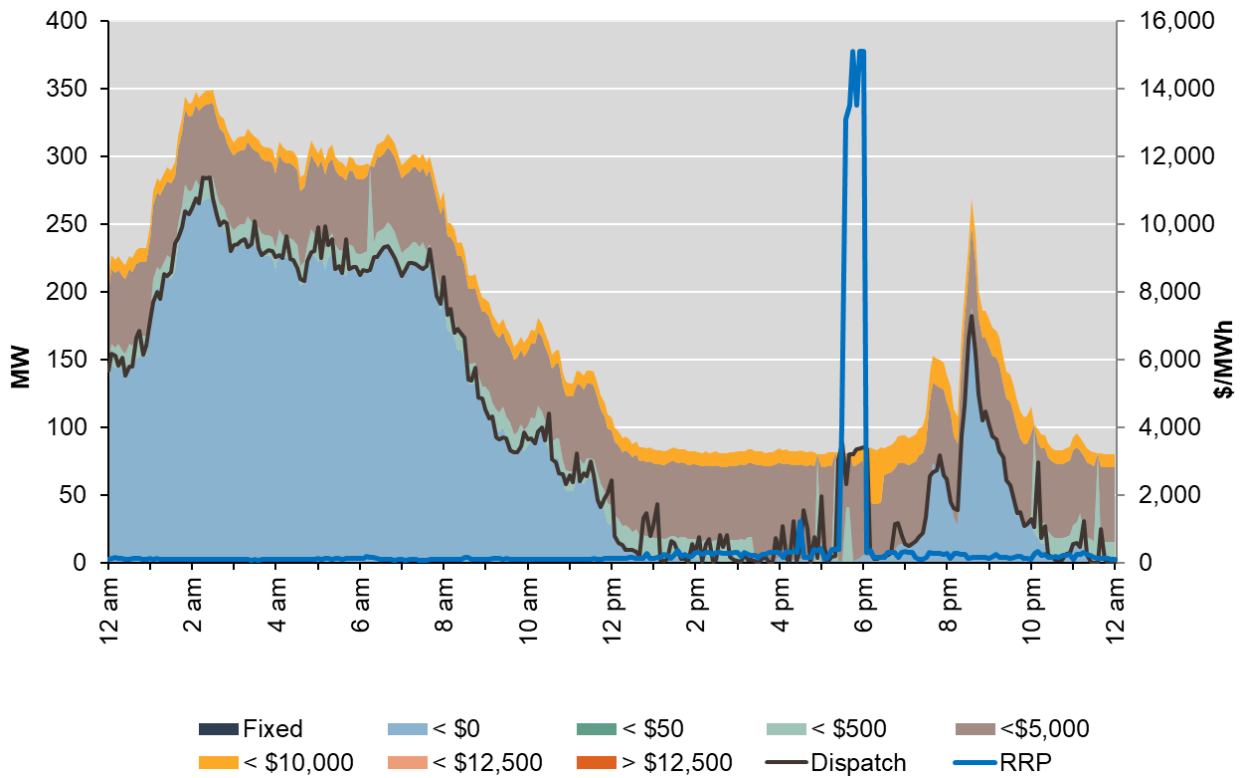


Figure A8: SA: Origin (Ladbroke Grove, Osborne, Quarantine)

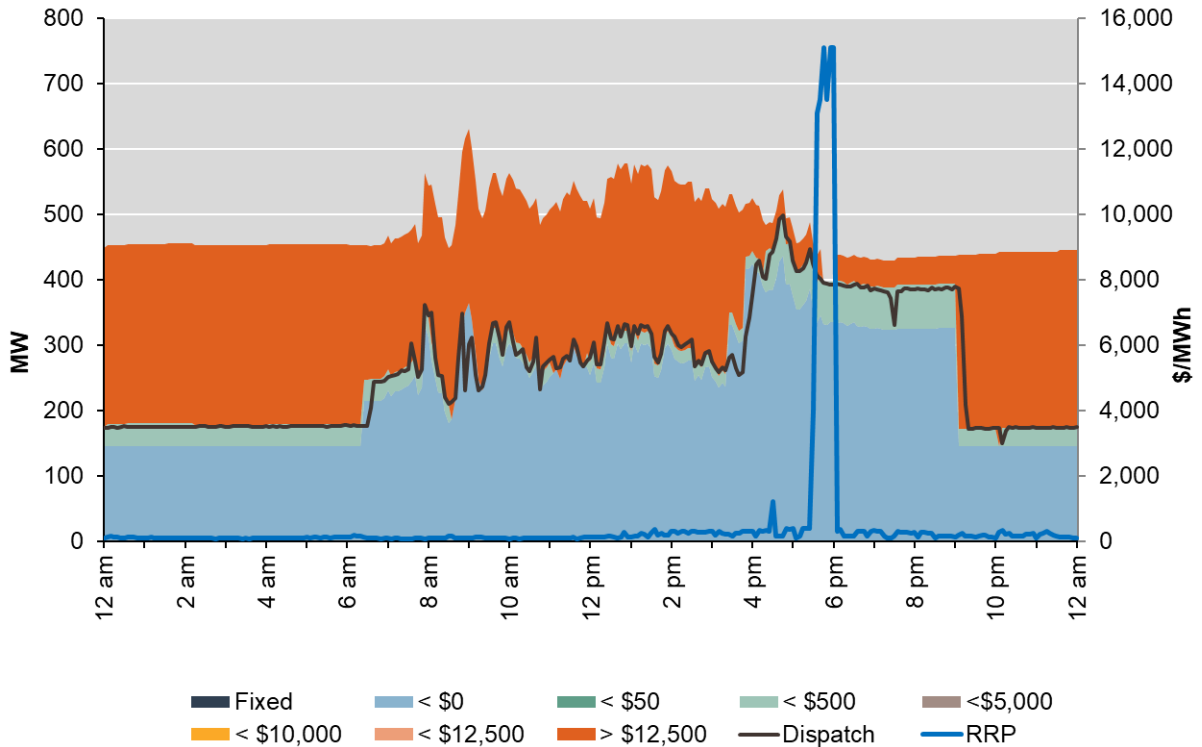
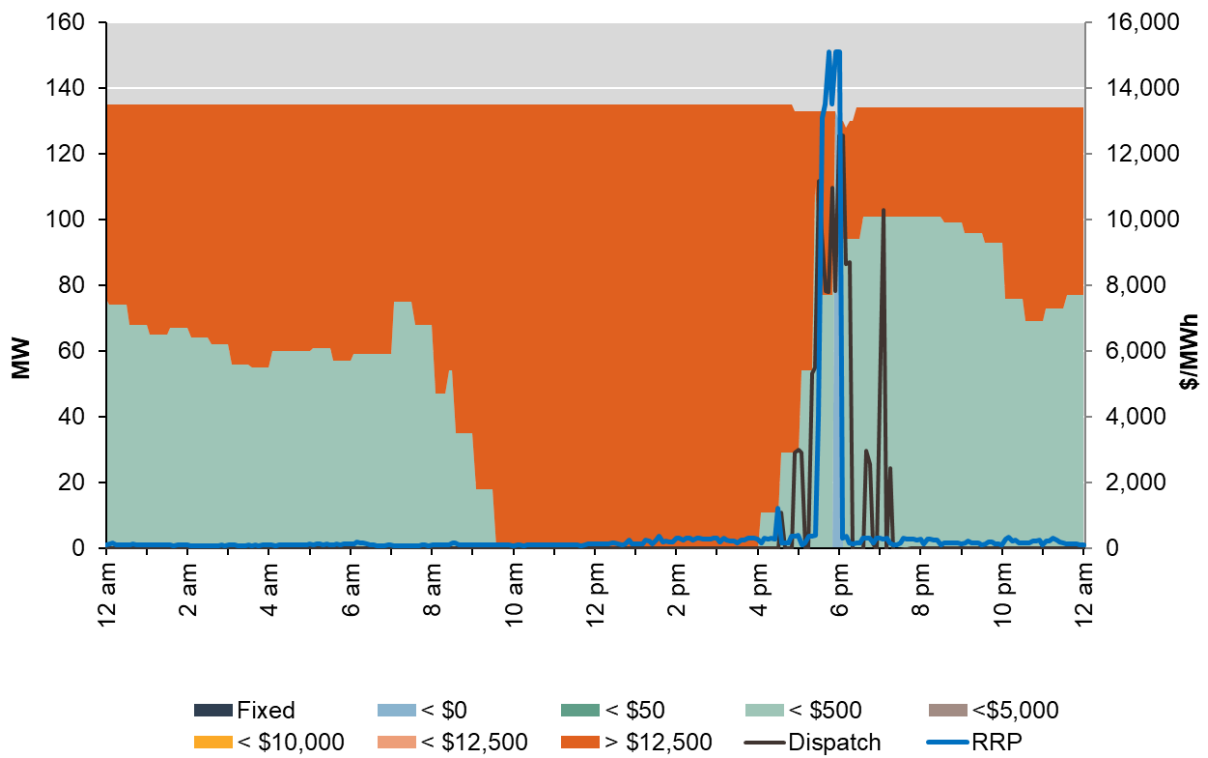


Figure A9: SA: Snowy Hydro (Angaston, Lonsdale, Pt Stanvac)



Appendix B: Significant rebids

The following 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 maximum capacity involved, the change in the price of the capacity being offered.

The relevant rebids were identical for each of the six dispatch intervals during the 30-minute period. As such, only one table has been produced for each region.

Table B1: Victorian significant rebids for 6 pm 30-minute period

| Submit time | Time effective | Partipant | Station | Capacity rebid (MW) | Price from (\$/MWh) | Price to (\$/MWh) | Rebid reason |
|---------------|----------------|-----------------|-----------------------|---------------------|---------------------|--------------------|---|
| 5.16 pm | 5.25 pm | EnergyAustralia | Jeeralang B | 84 | -\$1,000 | capacity withdrawn | adj avail unit trip loss of excitation SL |
| 3.04 pm | | EnergyAustralia | Newport Power Station | 30 | -\$1,000 | capacity withdrawn | adj avail bands pressure limit SL |
| 2.20 pm 30/01 | 4.05 pm | Snowy Hydro | Murray Power Station | 1473 | ≥\$55 | -\$1,000 | A Initial response to predispatch |

Table B2: South Australian significant rebids for 6 pm 30-minute period

| Submit time | Time effective | Partipant | Station | Capacity rebid (MW) | Price from (\$/MWh) | Price to (\$/MWh) | Rebid reason |
|-------------|----------------|-----------|----------------|---------------------|---------------------|-------------------|--|
| 5.19 pm | 5.25 pm | AGL | Torrens Island | 30 | \$150 | \$12,999 | 040 Chg in AEMO DISP~Price increase [SA] 5MD \$379 for DI ending 17:20 vs 30MPD \$149.99 for PE 17:30. |

Appendix C: Price setter

The following tables identify for the 6 pm 30-minute periods, each 5-minute price and the generating units involved in setting the energy price. This information is published by AEMO.⁴ The 30-minute price is the average of the six 5-minute intervals.

We have only included the 5.45 pm dispatch interval for South Australia, because for all other dispatch intervals, the same units set price in both regions.

Table C1 Victoria Price setter for 6.00 pm

| Time | Dispatch price | Participant | Unit | Service | Offer price | Marginal change | Contribution |
|------------------------|----------------|---------------------|----------|--------------|-------------|-----------------|--------------|
| | | AGL (SA) | TORRB2 | Energy | \$12,999 | 0.33 | \$4,290 |
| | | AGL (SA) | TORRB3 | Energy | \$12,999 | 0.33 | \$4,290 |
| | | AGL (SA) | TORRB4 | Energy | \$12,999 | 0.33 | \$4,290 |
| | | Delta Electricity | VP6 | Raise 5 min | \$2 | -0.99 | -\$2 |
| | | Ballarat BESS | BALBG1 | Raise 5 min | \$51 | 0.99 | \$50 |
| | | AGL (SA) | TORRB2 | Raise reg | \$32 | -0.33 | -\$11 |
| | | AGL (SA) | TORRB3 | Raise reg | \$32 | -0.33 | -\$11 |
| | | AGL (SA) | TORRB4 | Raise reg | \$32 | -0.33 | -\$11 |
| | | Delta Electricity | VP6 | Raise reg | \$48 | 0.99 | \$48 |
| | | Delta Electricity | VP6 | Raise 60 sec | \$15 | -0.99 | -\$15 |
| 17:35 | \$12,914 | EnergyAustralia | MP1 | Raise 60 sec | \$51 | 0.99 | \$50 |
| | | AGL Hydro | MCKAY1 | Energy | \$13,304 | 1.00 | \$13,304 |
| | | Delta Electricity | VP6 | Raise 5 min | \$2 | -1.00 | -\$2 |
| | | AGL (SA) | TORRB4 | Raise 5 min | \$12 | 1.00 | \$12 |
| | | AGL Hydro | MCKAY1 | Raise reg | \$0 | -1.00 | \$0 |
| | | Delta Electricity | VP6 | Raise reg | \$48 | 1.00 | \$48 |
| | | Delta Electricity | VP6 | Raise 60 sec | \$15 | -1.00 | -\$15 |
| | | Delta Electricity | VP5 | Raise 60 sec | \$30 | 1.00 | \$30 |
| | | Delta Electricity | VP6 | Raise 6 sec | \$15 | -1.00 | -\$15 |
| 17:40 | \$13,394 | AGL Energy | LD04 | Raise 6 sec | \$32 | 1.00 | \$32 |
| 17:45 | \$15,099.99 | Snowy Hydro | LNGS1 | Energy | \$15,100 | 1.00 | \$15,100 |
| | | AGL Hydro | MCKAY1 | Energy | \$13,304 | 1.00 | \$13,304 |
| | | AGL Hydro | MCKAY1 | Raise reg | \$0 | -1.00 | \$0 |
| 17:50 | \$13,335.80 | Wallgrove BESS | WALGRVG1 | Raise reg | \$32 | 1.00 | \$32 |
| 17:55 | \$15,050.34 | Engie | POR03 | Energy | \$15,100 | 1.00 | \$15,100 |
| | | Origin Energy | MORTLK12 | Energy | \$15,100 | 0.74 | \$11,174 |
| 18:00 | \$15,100 | AGL Hydro | EILDON1 | Energy | \$15,100 | 0.26 | \$3,926 |
| 30-minute price | | \$14,149/MWh | | | | | |

⁴ 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 C2: South Australia price setter for 5.45 pm dispatch interval

| Time | Dispatch price | Participant | Unit | Service | Offer price | Marginal change | Contribution |
|------------------------|----------------|---------------------|----------|---------|-------------|-----------------|--------------|
| | | Engie | POR03 | Energy | \$15,100.00 | 0.24 | \$3,624.00 |
| | | Snowy Hydro | ANGAST1 | Energy | \$15,100.00 | 0.53 | \$8,003.00 |
| 17:45 | \$15,100.00 | Snowy Hydro | LONSDALE | Energy | \$15,100.00 | 0.22 | \$3,322.00 |
| 30-minute price | | \$14,239/MWh | | | | | |