Electricity prices above $5,000/MWh

Queensland & NSW, 20 & 28 April; 3, 4, 5 & 15 May

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AUSTRALIAN ENERGY REGULATOR

Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 3131
Canberra ACT 2601
Tel: 1300 585 165
AER reference: AER224903

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Version	Date	Pages
1	22 August 2022	12

Contents

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.

The AER has an obligation under the National Electricity Rules (NER) to monitor and report on significant price outcomes in the National Energy Market (NEM).

The Australian Energy Market Commission (AEMC) recently published a rule-change with respect to the AER's significant price reporting obligations. This has introduced greater flexibility and discretion to the AER in how it conducts significant price reporting going forward. However, the events covered by this report occurred prior to the rule-change taking effect.

Under the old clause 3.13.7(d) of the NER, which outlines the AER's reporting obligations for events occurring prior to 19 May, the AER is required to publish a report whenever the electricity 30-minute price[1] exceeds $5,000 per megawatt hour ($/MWh).

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

Between 20 April and 15 May, the wholesale price of electricity exceeded $5,000/MWh for 11 different 30-minute intervals across 6 days in Queensland and NSW. This report, as per the National Electricity Rules, covers the Australian Energy Regulator's (AER) review into these events.

A summary of the high priced events is contained in table 1.

Table 1 Summary of 30-minute high price events

Date	Time	Queensland price ($/MWh)	NSW Price ($/MWh)
20 April	6.30 pm	7,133	*below 5,000*
28 April	6 pm	13,200	*below 5,000*
3 May	6 pm	13,804	13,496
3 May	6.30 pm	9,342	9,105
4 May	6 pm	7,236	6,849
5 May	6 pm	9,950	7,833
15 May	6 pm	6,203	*below 5,000*

The drivers of the 11 price events were:

- A planned outage of the network equipment at Lismore, which limited Queensland's access to cheaper generation from NSW.
- Planned and unplanned generator outages, which led to reduced available low-priced capacity.
- An unplanned 330 kV line outage which prevented cheap generation from southern NSW and Victoria reaching the Sydney load centre.

Rebidding contributed to the 20 April, 28 April and 3 May high price events.

The price spikes described in this report were not key drivers of the recent energy supply 'crisis', which was largely driven by high underlying prices.

3 Queensland analysis

3.1 Overview of the conditions

In Queensland, prices exceeded $5,000/MWh for 7 30-minute intervals across 6 separate days between 20 April and 15 May. The drivers of the high prices were largely the same for each of the 30-minute intervals.

From Table 2, we observe that:

- Except for the 20 April event, all Queensland high prices were forecast 1 hour prior.
- Actual demand was only slightly lower than forecast.
- On 3 May at 6 pm, actual availability was about 400 MW lower than forecast. For all other 30 minute periods, availability was similar to forecasts.

All the high prices occurred during the evening peak demand period. Queensland maximum daily demand on most high price days was similar to average maximum daily demand for April and May 2022. Demand on 20 April was a few hundred megawatts higher, but remained well below the Queensland record maximum demand of 10,088 MW.

For most of these high prices, less than 15% of capacity was offered above $5,000/MWh. However, some of this high priced capacity was required to be dispatched.

Table 2: Actual and forecast 30-minute price, demand and availability in Queensland

Date	Time	Price ($/MWh)		Demand (MW)		Availability (MW)	
		Actual	1 hr forecast	Actual	1 hr forecast	Actual	1 hr forecast
20 April	6.30 pm	7,133	1,162	7,707	7,769	9,082	9,142
28 April	6 pm	13,200	13,200	7,307	7,349	8,398	8,342
3 May	6 pm	13,804	15,100	7,216	7,319	7,815	8,233
3 May	6.30 pm	9,342	15,100	7,216	7,308	8,069	8,091
4 May	6 pm	7,236	15,100	7,229	7,435	8,399	8,373
5 May	6 pm	9,950	15,100	7,434	7,600	8,548	8,578
15 May	6 pm	6,203	15,100	7,286	7,329	8,330	8,313

3.2 Planned network outages limited access to cheaper generation from NSW

Planned network outages were a factor in all 7 of Queensland's high price events. Since 2 February 2022, there has been an ongoing planned outage of the Lismore 132 kV line's Static VAR Compensator (SVC), which provides stability services to the grid. AEMO invoked constraints to manage this outage, which limited Queensland's access to imports from NSW.

On 29 March, AEMO introduced 2 constraints to manage the Lismore SVC outage. The first, invoked to avoid voltage collapse in the network should the Armidale to Coffs Harbour line trip, limited exports from NSW to Queensland on the Terranora interconnector to 100 MW.

A second constraint, invoked to avoid voltage collapse in the network in the event of losing CS Energy's Kogan Creek Power Station, limited flows from NSW to Queensland on both Terranora and QNI.

One or both of these constraints were binding during each of the Queensland high prices. For example, on 20 April at 6.30 pm, when the 30-minute price was high in Queensland but not in NSW, only 87 MW could flow into Queensland from NSW. For reference, QNI has a nominal capacity of 300 – 600 MW for flows from NSW to Queensland, while Terranora has a nominal capacity of 107 MW.[2] As such, normally when the price is higher in Queensland, the region can import over 400 MW.

Figure 1 shows interconnector flows between Queensland and NSW during each of the high priced intervals. A small amount of capacity flowed into Queensland during the intervals when the NSW price was below $5,000/MWh. When prices were high in both regions, capacity flowed out of Queensland into NSW.

Figure 1: Net interconnector flows between NSW and Queensland during high price events

	6.30 pm 20 April	6 pm 28 April	6 pm 3 May	6.30 pm 3 May	6 pm 4 May	6 pm 5 May	6 pm 15 May
Queensland	87 MW	89 MW				36 MW	25 MW
	↑	↑	↓	↓	↓	↑	↑
NSW			169 MW	150 MW	6 MW		

3.3 Baseload generator outages reduced availability of low-priced capacity

Outages were another factor that affected Queensland's high prices. Multiple coal generators were out of service across the 6 days when high prices occurred. In addition, CleanCo Energy's 365 MW Swanbank E gas power station, has been offline since December 2021

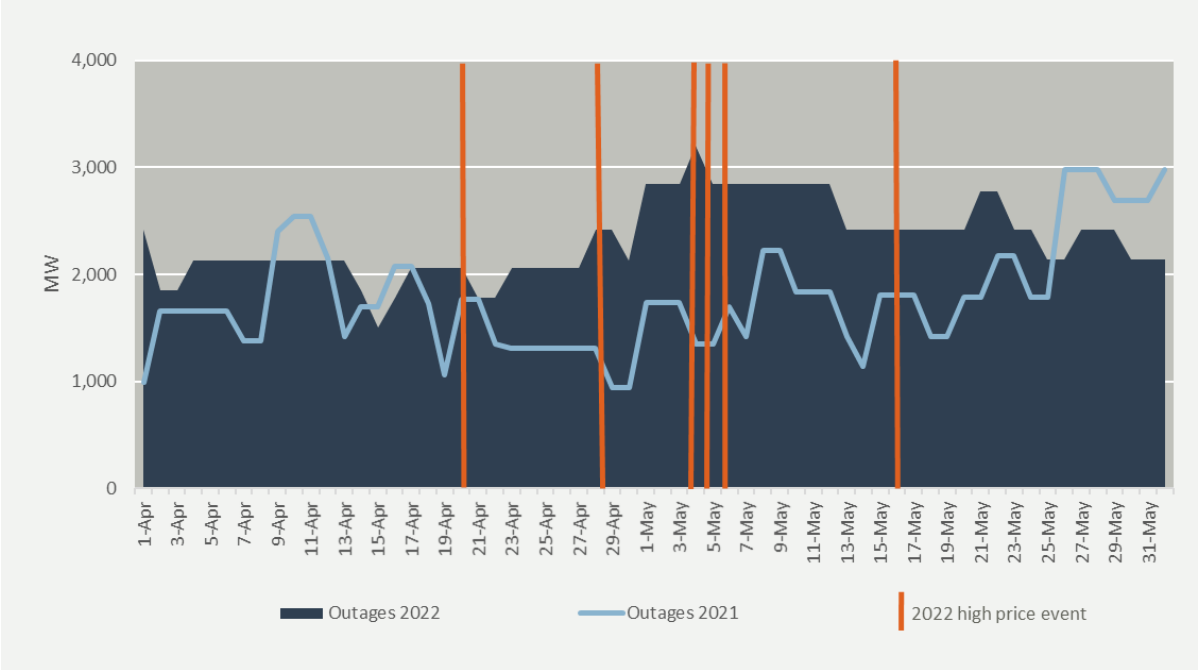
[2] AEMO, *Interconnector Capabilities,* November 2017, p. 4. https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Congestion-Information/2017/Interconnector-Capabilities.pdf

due to a damaged voltage regulator. Swanbank E is not expected to return until September 2022.[3] When including Swanbank E, over 2,000 MW of baseload capacity was offline in Queensland during the high price events.

This autumn, more Queensland baseload capacity has been offline than is typical. For example and as shown by Figure 2, in April and May 2021, the average amount of baseload capacity experiencing outages was less than 1,800 MW.

Autumn is typically a shoulder period, when coal plants often undergo planned outages for maintance. However, more than half of the Queensland outages during the high price events were unplanned and due to technical issues.

Figure 2: Baseload capacity offline* in April and May 2022 vs 2021



**Generators totally offline for the entire day. Includes Swanbank E.*

While some generators were offline, other generators were offering below their registered capacity. Reasons for this included technical problems, planned maintenance and coal quality issues. As illustrated by Table 3, when including these generators, more than 3,000 MW of Queensland baseload capacity was unavailable on most of the event days. This represents over a third of total Queensland baseload capacity.

[3] CleanCo Community alerts, accessed 16 June https://cleancoqueensland.com.au/our-community/

Reduced generator availability coincided with limited access to imports from NSW (discussed in Section 3.2) to substantially limit Queensland's access to cheap generation capacity at the time of the high price events.

Table 3: Baseload generation capacity unavailable* in Queensland

Date	Generators unavailable (MW)	Generators partially available (MW)	Total Generation unavailable
20 April 6.30pm	2,045	606	2,651
28 April 6 pm	2,395	747	3,142
3 May 6 pm	3,066	283	3,349
3 May 6.30 pm	3,066	336	3,402
4 May 6 pm	3,066	348	3,414
5 May 6 pm	3,066	334	3,400
15 May 6 pm	2,631	521	3,152

**Generators unavailable at the time of each high price event. Includes Swanbank E.*

3.4 Rebidding contributed to some of the high prices

Rebidding by participants contributed to the high price on some of the event days. Most notably, Intergen contributed to the price on 20 and 28 April through late rebids at Millmerran power station.

On 20 April, there were 3 dispatch intervals at $13,200/MWh for the 6.30 pm trading interval. Intergen made a number of rebids which contributed to the high prices. The reason given by InterGen for the rebids referenced a change in Queensland prices.[4]

At 5.54 pm, for the 6 pm and 6.05 pm dispatch intervals only, Intergen rebid all 870 MW of Millmerran's available capacity from the price floor to the price cap. However, ramp down constraints meant output could only be reduced by 40 MW every 5 minutes and it was unable to set price.[5] This 40 MW was offset by increased generation at Wivenhoe, which was setting price at $1,200/MWh for 6 pm and at $13,200/MWh for 6.05 pm.

[4] The rebid reason given for the 5.54 pm rebids was 'QLD1 RRP P5SENS Q+150 CHANGE +13898 (17:50 P5 DI 20/04/22 18:00 VALUE 15100 VS 17:45 P5 DI 20/04/22 18:00 VALUE 1202) S' while the reason for the 6.04 pm rebids was 'QLD1 RRP CHANGE +12183 (18:00 P5 DI 20/04/22 18:10 VALUE 13200 VS 17:55 P5 DI 20/04/22 18:10 VALUE 1017) SL'.

[5] A unit's ramp-down rate refers to how quickly it can reduce its output. Price is typically set by the next marginal MW that is available. When a unit is ramp-down constrained, it cannot set price as it cannot provide the next marginal MW.

At 6.04 pm, InterGen rebid 70 MW from the price floor to the cap for the 6.10 pm interval and 80 MW for the 6.15 pm interval. Only 22 and 52 MW of high priced capacity, offered at $13,200/MWh, was needed for the 6.10 and 6.15 pm intervals, respectively.

At 5.28 pm on 28 April, InterGen made a similar late rebid to the one made at 6.04 pm on 20 April, moving 105 MW from the price floor to the cap for the 5.35 and 5.40 pm dispatch intervals. Without this rebid, the price would have been below $5,000/MWh for these intervals, but the 30-minute price would have remained slightly above $5,000/MWh. Once again, the rebid reason referred to a change in the Queensland price.[6]

Rebidding from low to high prices is permitted under the energy rules. However, the ability of a participant to regularly influence the price through rebidding strategies may indicate excessive market power leading to reduced effectiveness of market competition. We conduct a detailed examination of the effectiveness of competition in the NEM in our upcoming *Wholesale electricity market performance report*.

[6] The rebid reason was 'QLD1 RRP CHANGE +12186 (17:25 DS DI 28/04/22 17:30 VALUE 13200 VS 17:20 P5 DI 28/04/22 17:30 VALUE 1014) SL'.

4 NSW analysis

4.1 Overview of the conditions

In NSW, prices exceeded $5,000/MWh for 4 30-minute intervals across 3, 4 and 5 May. The drivers of the high price were largely the same for each of the 30-minute intervals.

From Table 4 we observe that:

- Each of the prices were forecast 1 hour prior to be close to the cap. Actual prices were lower than forecast on all days.
- Forecasts for both demand and availability were reasonably accurate.

As in Queensland, each of the high prices occurred during the evening peak demand period. Demand was higher on these days than on most days this Q2 to date. However, there have been several days this Q2 with higher demand, when high prices did not occur.

Table 4: Actual and forecast 30-minute price, demand and availability in NSW

Date	Time	Price ($/MWh)		Demand (MW)		Availability (MW)	
		Actual	1 hr forecast	Actual	1 hr forecast	Actual	1 hr forecast
3 May	6 pm	13,496	15,100	9,064	9,150	10,621	10,619
3 May	6.30 pm	9,105	14,969	9,065	9,208	10,665	10,714
4 May	6 pm	6,849	14,358	9,254	9,249	10,581	10,721
5 May	6 pm	7,833	14,880	9,122	9,204	10,359	10,300

4.2 Unplanned network outage limited access to cheaper generation

On the evening of 2 May, one of the 330kV Ravine - Yass lines in south west NSW tripped. As a result, price forecasts for 6 pm on 3 May changed from around $300/MWh to $15,100/MWh.

When the line tripped, constraints were invoked which limit generation in southern NSW and imports across the Vic-NSW interconnector. Instead, more expensive generation had to meet demand.

This outage contributed to the high price in NSW during all 4 high priced intervals.

4.3 Baseload generator outages reduced availability of low-priced capacity

Five baseload units were offline in NSW during 3 and 4 May high prices, amounting to 3,400 MW of unavailable capacity. EnergyAustralia's Liddell unit 1 tripped late on 4 May,

meaning that a further 440 MW of capacity was unavailable during the 5 May high price period. By comparison, in April and May 2021 the average unavailable capacity was around 2,200 MW.

As in Queensland, some generators were online but offering reduced capacity. For example, AGL's Bayswater unit 4 and EnergyAustralia's Liddell unit 2 reduced their output due to coal mill limitations.

Table 5: Generator outages in NSW during all 3 high price days

Company	Unit	Capacity (MW)	Planned or unplanned?
AGL Energy	Bayswater unit 1	660	Unplanned
AGL Energy	Bayswater unit 3	660	Unplanned
Origin Energy	Eraring unit 4	720	Planned
EnergyAustralia	Mount Piper unit 2	700	Planned
Delta Electricity	Vales Point unit 5	660	Planned

4.4 Rebidding contributed on 3 May

At 5.27 pm on 3 May, Origin Energy rebid 20 MW of capacity from $137 to $12,590/MWh at Eraring unit 3 for all 12 dispatch intervals during the high priced 6 and 6.30 pm 30 minute intervals. For a number of these dispatch intervals, Eraring unit 3 set the price.

In addition, at 6.06 pm Origin rebid a total of 40 MW of capacity at Eraring units 1 and 2 from $137 to $12,590/MWh for the 6.15, 6.20, 6.25 and 6.30 pm intervals. This contributed to the 6.30 pm high price as less than 40 MW of high priced capacity was dispatched.

The reasons given by Origin Energy for these rebids referenced 5 minute predispatch demand being lower than 30 minute predispatch demand.[7]

Rebidding from low to high prices is permitted under the energy rules. However, the ability of a participant to regularly influence the price through rebidding strategies may indicate excessive market power leading to reduced effectiveness of market competition. We conduct a detailed examination of the effectiveness of competition in the NEM in our upcoming *Wholesale electricity market performance report*.

[7] The rebid reason given was 'DEC NSW DEM 5PD 8737 MW < 30PD 8922 MW @1900 SL'.