



Electricity spot prices above \$5000/MWh

**New South Wales &
Queensland,
10 February 2017**

5 May 2017

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AER Reference: 61702-D17/47586

Amendment Record

Version	Date	Pages
Final report	5/5/2017	38

Contents

1	Obligation	4
2	Summary	5
3	Analysis.....	6
	3.1. Overview of actual and expected conditions	6
	3.2. Demand and Supply	7
	3.2.1 Demand	8
	3.2.2 Supply	9
	3.3. Causes of 5 pm high prices	15
	3.4. Causes of 5.30 pm and 6 pm high prices.....	15
	3.4.1 Circumstances leading to intervention event in New South Wales	15
	Appendix A: Significant Rebids	17
	Appendix B: Price setter	21
	Appendix C: Closing bids	25
	New South Wales.....	25
	Queensland	26
	Appendix D: Relevant Market Notices	29
	Appendix E: Lack of Reserve explained	37

1 Obligation

The Australian Energy Regulator regulates energy markets and networks under national legislation and rules in eastern and southern Australia, 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 energy markets, including the annual State of the energy market report, to assist stakeholders and the wider community.

The AER is required to publish a report whenever the electricity spot price exceeds \$5000/MWh in accordance with clause 3.13.7 (d) the National Electricity Rules.

The report:

- describes the significant factors contributing to the spot price exceeding \$5000/MWh, including withdrawal of generation capacity and network availability;
- assesses whether rebidding contributed to the spot price exceeding \$5000/MWh;
- identifies the marginal scheduled generating units; and
- identifies all units with offers for the trading interval equal to or greater than \$5000/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 enforcement action.

2 Summary

At 5 pm on Friday 10 February 2017, the wholesale, or spot price for electricity reached \$12 915/MWh in New South Wales and \$12 221/MWh in Queensland. While the spot price fell significantly in Queensland by 5.30 pm, in New South Wales it increased, reaching \$13 967/MWh at 5.30 pm and \$14 000/MWh at 6 pm.

The day was characterised by high temperatures in both states, reaching a maximum of 38 degrees in Sydney and 33 degrees in Brisbane. Accordingly, as expected, demand for electricity was high in both states - prices were also expected to be high.

Prices were aligned in New South Wales and Queensland from early hours of the morning up to, and including, the 5 pm trading interval. This means that the two states were effectively operating (electrically) as a combined region.

Approaching the evening peak demand time for electricity, a number of generators in New South Wales experienced difficulties. From around 4 pm output from Delta Electricity's Vales Point Power Station reduced and soon after Energy Australia's Tallawarra Power Station unexpectedly stopped generating. To meet these reductions the market operator (AEMO) instructed Snowy Hydro's Colongra Power Station to start but it was unsuccessful due to technical difficulties. Together these events reduced the available low priced supply in New South Wales by around 1200 MW and consequently the spot price exceeded \$12 000/MWh in both states at 5 pm.

In response to the local loss of supply, electricity was imported into New South Wales at a higher than the safely allowable rate, resulting in the network becoming insecure. AEMO instructed TransGrid to call on the Tomago aluminium smelter in New South Wales to take one of its pot lines out of service to reduce demand in the state by 290 MW. In accordance with the Electricity Rules, the five-minute price of electricity was set at the market price cap of \$14 000/MWh for the duration of the "load shedding" period in New South Wales only. As a result, the spot price in New South Wales reached \$13 967/MWh at 5.30 pm and \$14 000/MWh at 6 pm. The price fell to \$1196/MWh in Queensland during this trading interval as exports into New South Wales decreased and lower priced generation was sufficient to meet demand in that region.

Rebidding from low to high prices did not contribute to the high price events rather the sudden loss of low priced capacity, high demand and interconnectors operating beyond their limits led to high prices and intervention by the market operator.

3 Analysis

The following sections examine why the high spot prices occurred. Spot prices exceeding \$5000/MWh in New South Wales and Queensland in the late afternoon on Friday 10 February 2017 can be attributed to two main factors: high priced electricity generation was required to satisfy electricity demand (5 pm in Queensland and New South Wales) and the market operator intervened to require load shedding (5.30 pm and 6.00 pm in New South Wales).

To calculate the amount of electricity that must be supplied, or generated, AEMO collects information on network capability, offers from market generators and calculates expected (forecast) demand from customers. Generator offers comprise the mega-watt (MW) capacities generators are willing to supply at a price point and the amount the generator can generate in total (generator availability). AEMO publishes regular forecasts of its assessment of the demand for electricity in each region of the market based on a range of external inputs such as temperature.

Market conditions are dynamic and to inform market participants AEMO also publishes aggregated expected and actual dispatch information, price and network loadings at five minute and 30 minute intervals throughout the day. These forecasts form the basis for AEMO's recommendations with respect to interconnector capacity, transfers between regions, reserves and conditions that relate to power system security.

3.1 Overview of actual and expected conditions

Table 1 and Table 2 show, for the high price trading intervals and other relevant trading intervals, actual and expected spot prices, demand for and local generator supply of electricity (availability) for New South Wales and Queensland, respectively. Demand and supply conditions are discussed in detail in section 3.2.

New South Wales

Table 1 shows:

- Four and 12 hours ahead of the high price events, spot prices were expected to exceed \$5000/MWh for the 4 to 6.30 pm trading intervals. However, only the 5 pm, 5.30 pm and 6 pm trading intervals resulted in actual spot prices above \$5000/MWh.
- For the 5 to 6 pm trading intervals, demand for electricity was up to 970 MW lower than expected, and supply of electricity from local generators (availability) was up to 500 MW lower than expected.

Table 1: Actual and forecast spot price, demand and available capacity for New South Wales

Trading interval	Price (\$/MWh)			Demand (MW)			Generator Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
4 pm	2088	14 000	14 000	13 929	14 596	14 437	13 702	13 538	13 378

Trading interval	Price (\$/MWh)			Demand (MW)			Generator Availability (MW)		
4.30 pm	3747	14 000	14 000	13 981	14 734	14 581	13 537	13 360	13 325
5 pm	12 915	14 000	14 000	13 986	14 674	14 523	12 770	13 286	13 262
5.30 pm	13 967	14 000	14 000	13 526	14 493	14 340	12 815	13 363	13 192
6 pm	14 000	14 000	14 000	13 529	14 155	14 000	12 759	13 300	13 124
6.30 pm	4739	14 000	14 000	13 388	13 802	13 663	12 549	13 227	13 034

Queensland

Table 2 shows:

- Four and 12 hours ahead of the high price event, spot prices were expected to exceed \$5000/MWh for the 4 to 5.30 pm trading intervals. However, the actual spot price exceeded \$5000/MWh for only the 5 pm trading interval.
- For the 5 pm trading interval demand for electricity and local generator availability was close to expected.

Table 2: Actual and forecast spot price, demand and available capacity for Queensland

Trading interval	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
4 pm	1442	13 302	13 284	8580	8531	8425	10 905	10 894	10 974
4.30 pm	3460	13 308	13 289	8609	8606	8524	10 904	10 936	10 966
5 pm	12 221	13 319	13 303	8753	8691	8597	10 895	10 937	10 972
5.30 pm	1196	6667	13 291	8638	8611	8500	10 891	10 937	10 972

3.2 Demand and Supply

Participants in the National Electricity Market (NEM) choose the amount of electricity or capacity (MW) they offer for each of their generators for dispatch into the market and the price they are prepared to accept (\$/MWh) for the energy produced. Participant offers comprise 10 price and quantity (MW) pairs. AEMO aggregates all generator offers from lowest price to highest price and dispatches that generation in ascending order to meet its own forecast of the regional demand for electricity every 5 minutes of the day, taking into account the transfer capability of the network.

This section discusses changes to offered prices and capacity. It also shows how accurately AEMO predicted the demand conditions relevant to the high price periods.

3.2.1 Demand

On 10 February maximum temperatures in Sydney and Brisbane were 38 degrees¹ and 33 degrees² respectively. High demand for electricity was expected in both states, with New South Wales expected to be only 30 MW lower than record total demand.

On the day, demand for electricity in Queensland reached 8753 MW, close to expected but well below the record of 9508 MW. While demand for electricity in New South Wales was expected to be near the record (of 14 764 MW), at 13 986 MW it fell short by 778 MW.

In preparation for heatwave conditions driving high demand on the New South Wales network, the New South Wales Government called on the community to voluntarily reduce electricity consumption, particularly during the evening peak period from 4.30 - 6.30 pm.³ AGL exercised contractual options to reduce the demand from the Tomago smelter in a controlled fashion from around 3.45 pm. AEMO's system event report for 10 February indicated that the Tomago aluminium smelter voluntarily reduced consumption by up to 290 MW from around 2.30 pm.⁴

Figure 1 shows:

- actual demand for electricity in New South Wales (solid blue), expected demand four hours ahead (dashed blue) and record demand (dotted blue horizontal line).
- actual demand for electricity in Queensland (solid green) and expected demand four hours ahead (dashed green) and record demand (dotted green horizontal line).
- the period when the spot price exceeded \$5000/MWh, indicated by the blue vertical column.

¹ http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=122&p_display_type=dailyDataFile&p_startYear=&p_c=&p_stn_num=066062

² http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=122&p_display_type=dailyDataFile&p_startYear=&p_c=&p_stn_num=040211

³ <http://www.resourcesandenergy.nsw.gov.au/about-us/news/2017/what-we-can-do-to-reduce-the-load>

⁴ http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Incident-report-NSW-10-February-2017.pdf

Figure 1: Actual and forecast total demand

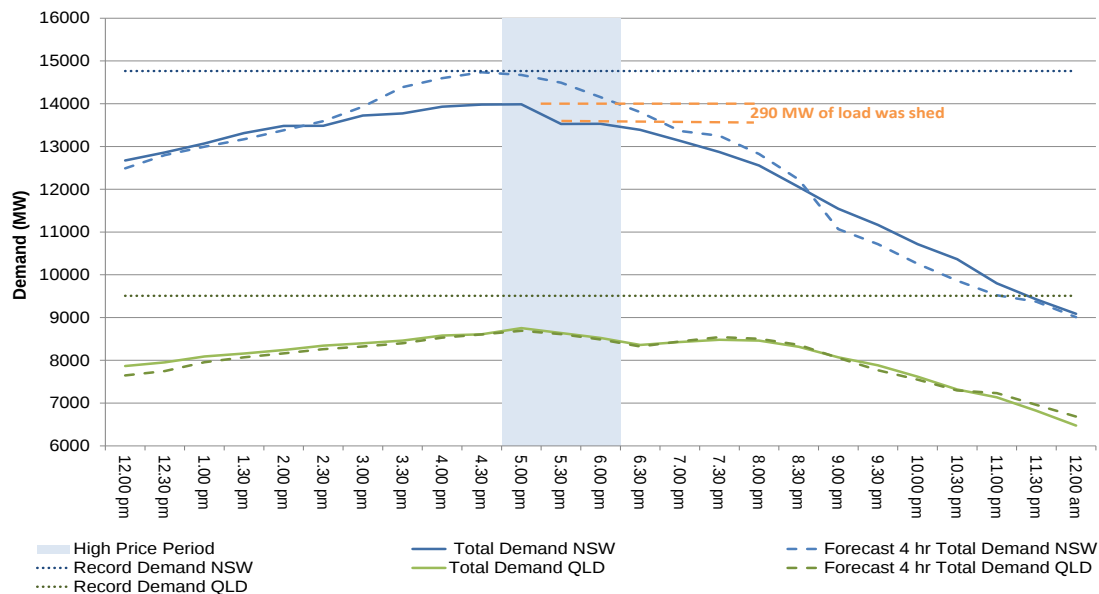


Figure 1 shows that from about 2 pm, the rate at which demand for electricity was increasing fell. It also shows the 290 MW reduction in demand from around 5 pm to around 6 pm as a result of AEMO directed load shedding at the Tomago aluminium smelter. The reason for the load shedding is discussed in section 3.4.1.

3.2.2 Supply

This section examines the supply side factors that had an effect on the high price outcomes; supply from generators and inflows of electricity from other states. This section also discusses the Lack of Reserve (LOR) conditions on the day.

3.2.2.1 Generator offers

Figure 2 and Figure 3 show the cumulative generator offers for New South Wales and Queensland respectively. Also known as closing bids, the figures show the capacity offered by generators in each state, including amendments to their offers throughout the day to match changes to their own economic and/or physical positions (known as “rebidding”). To put the figures in context, installed (summer) capacity is around 15 700 MW in New South Wales, and around 11 500 MW in Queensland.

Also shown on the figures (on a 5-minute basis) are the dispatch price (purple line) and local generation output (orange line).

Figure 2: Closing bids for New South Wales

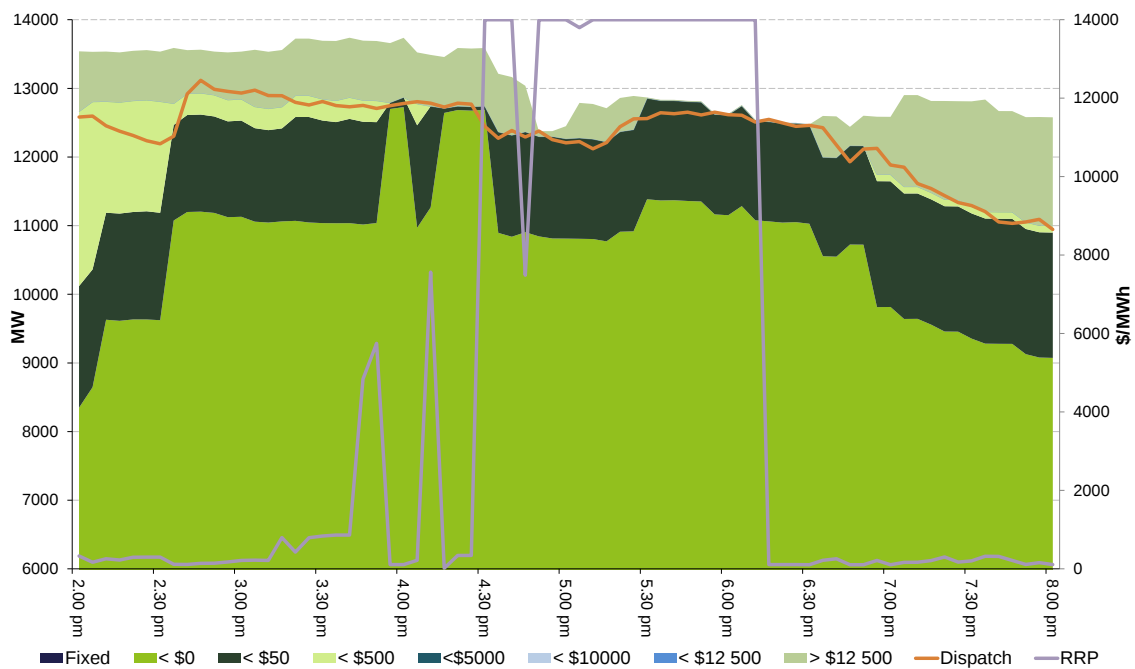
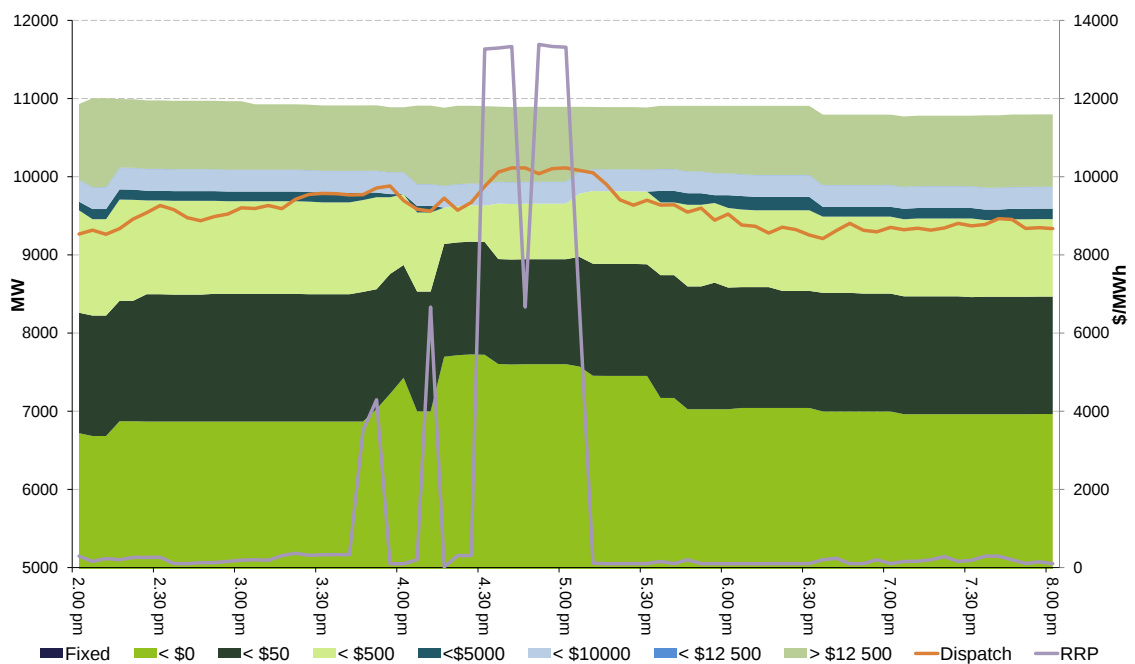


Figure 3: Closing bids for Queensland



Spot prices were effectively the same, or aligned, between New South Wales and Queensland until 5 pm as shown by the purple lines on the figures.

Together, in the two states, there was only 280 MW of capacity priced between around \$500/MWh and \$12 500/MWh, almost all of it in Queensland (shown as the dark blue and lilac coloured bands in Figure 3), meaning small increases in demand resulted in significant price increases. This is shown by the orange dispatch line moving in and out of these price bands.

Figure 2 shows a significant reduction in available generation from around 4.30 pm in New South Wales to a point at around 5 pm when all available local supply was generating at its maximum and led to a lack of reserve condition. This is discussed further in the next section.

3.2.2.2 Unavailable generation

One of the main reasons for the high prices was the loss, or unavailability, of a significant volume of supply from New South Wales generators, for technical reasons. Given the predicted heatwave conditions in New South Wales, AEMO notified the market early in the day that there may be the potential for a shortage of supply to meet demand.

AEMO monitors the amount of electricity generation available to supply customers compared to the anticipated demand. The concept of Lack of Reserve is explained in detail in Appendix E. Simply put, reserves are the difference between the electricity available to consumers, comprising local generation supply and inflows from other states, and customer demand. Types of forecast LOR notices range, in ascending order of severity, from LOR 1 to LOR 3. Forecast LOR 3 notices are used to indicate the likelihood that customers will be required to reduce consumption (“load shedding”). AEMO issues forecast LOR notices to advise the market of forecast conditions and seek a market response to mitigate potential reserve shortfalls.

AEMO published several forecast LOR notices throughout the day, including two forecast LOR 3 notices. Forecast LOR 3 notices were issued throughout the day indicating the potential for load shedding in New South Wales from 4 to 5 pm.

Table 3 shows that around 1200 MW of local New South Wales supply became unavailable later in the afternoon. At around 4.20 pm Energy Australia’s Tallawarra power station unexpectedly stopped generating due to technical problems (or “tripped”), resulting in the loss of 410 MW of low-priced supply. In response to this significant loss of supply in New South Wales, at 4.44 pm AEMO issued Market Notice 57387 advising an actual LOR 2 had been declared in New South Wales from 4.35 pm, forecast to continue until 5.30 pm. Actual LOR notices differ from forecast LOR notices in that they indicate that minimum supply thresholds have been triggered and therefore an immediate response is required.

Table 3: Significant capacity changes in New South Wales

Submit Time	Time effective	Station	MW unavailable/lost	Reason
4.26 pm	4.35 pm	Tallawarra	410	Unit tripped off - GT failure
4.34 pm	4.45 pm	Colongra	177	Plant outage – failed to start
4.39 pm	4.50 pm	Vales Point	60	Condenser back pressure limited
4.40 pm	4.50 pm	Colongra	354	Plant outage – remaining units fail to start
4.42 pm	4.50 pm	Colongra	177	Plant outage – remaining units fail to start

Submit Time	Time effective	Station	MW unavailable/lost	Reason
4.53 pm	5 pm	Vales Point	60	Outlet canal temperature approaching limit
Total (MW)			1238	

Table 3 also shows that, technical problems prevented Snowy Hydro's Colongra power station starting from around 4.30 pm. In response, at 5.20 pm AEMO issued market notice 57396 advising that an actual LOR 3 had been declared in New South Wales from 4.50 to 6 pm, and that as a result load shedding would be required.

In a rebid submitted at 4.51 pm, Snowy Hydro made 164 MW of capacity at its Colongra power station available from 5 pm, signalling an end to the plant outage. Rebids relevant to Table 3 are at Appendix A.

Appendix B details the generators involved in setting the price during the high-price periods and when the Market Price Cap (MPC) was applied to particular dispatch intervals.

The closing bids for all participants in New South Wales and Queensland with capacity priced at or above \$5000/MWh for the high-price periods are set out in Appendix C.

The significant market notices are set out in Appendix D.

Details of the actual LOR notices are contained in Table 4 and a more detailed explanation of LOR's can be found in Appendix E.

Table 4: Actual LOR notices

LOR	Time	Reserve levels
LOR1	1 pm (effective 12.50 pm until 8 pm)	Contingency capacity reserve – 1345 MW Minimum LOR1 reserve available – 861 MW
LOR2	4.44 pm (effective 4.35 pm – 5.30 pm)	Contingency capacity reserve – 675 MW Minimum LOR1 reserve available – 570 MW
LOR3	5.20 pm (effective 4.50 pm until 6 pm)	Maximum load to be interrupted is 310 MW at 5.06 pm

3.2.2.3 Network Availability

The NEM regions are connected via high voltage interconnectors. Electricity is transferred between regions through these interconnectors. Queensland is connected to New South Wales via two interconnectors - the Queensland – New South Wales Interconnector (QNI) and Terranora. New South Wales is connected to Victoria via the Victoria – New South Wales (Vic – NSW) interconnector.

AEMO manages the network to ensure that system security is maintained, using constraints to manage network flows. Constraints are mathematical equations that determine the optimal output of generators based on their offers to manage or “limit” flows on specific transmission lines (including interconnectors) for each five minute interval.

Prices in New South Wales and Queensland were aligned from early hours of the morning up to and including the 5 pm trading interval. So, in effect the two states were behaving as one large combined region.

New South Wales

As New South Wales and Queensland were effectively behaving as one combined region leading up to the load shedding in New South Wales, our analysis in this section focuses on the flow of electricity into New South Wales from Victoria.

Table 5 shows actual imports (the actual “flow”) into New South Wales, across the Vic - NSW interconnector, were higher than predicted by AEMO from the 4 to 5 pm trading intervals. Importantly, Table 5 also shows that actual imports were at the import limit at 4 pm, but exceeded the import limit for the 4.30 and 5 pm trading intervals.

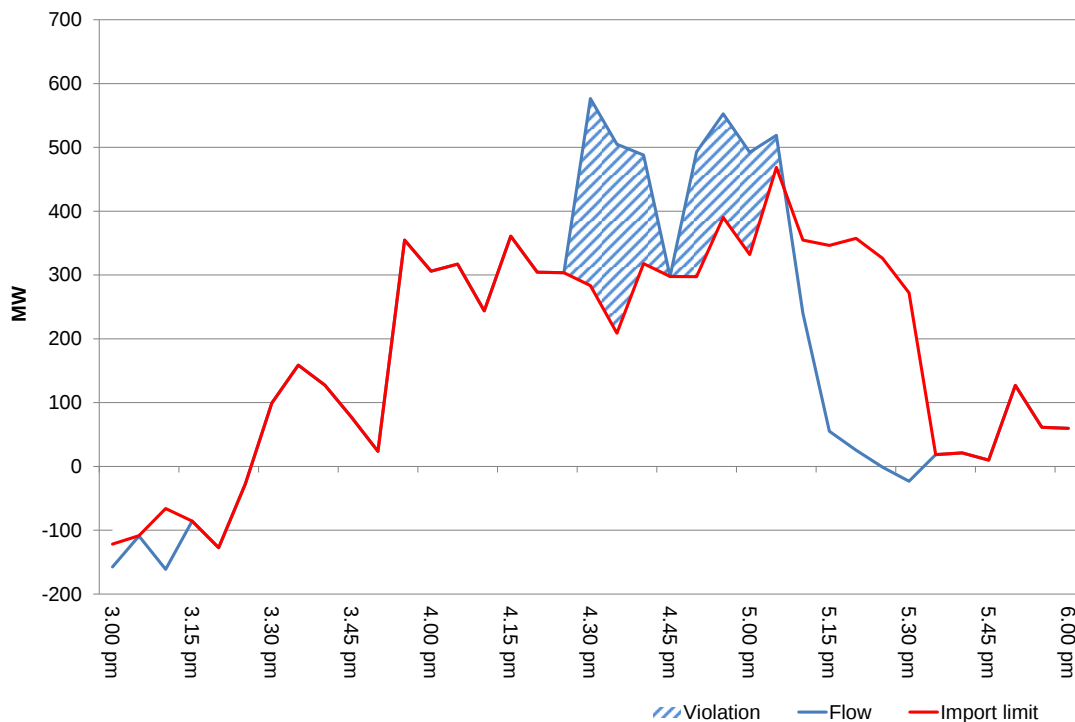
Actual imports exceeded import limits as a direct result of the loss of supply from the Tallawarra power station. With actual imports exceeding the import limit, constraints on the interconnector, designed to manage system security, “violated”. Effectively this means that to ensure there was sufficient supply to meet demand in New South Wales, electricity was forced from Victoria into New South Wales.

Table 5: Actual and forecast imports and import limit into New South Wales across the Vic –NSW interconnector

Trading interval	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
4 pm	175	88	50	175	88	50
4.30 pm	351	105	50	302	105	50
5 pm	471	156	50	307	156	50

To provide greater clarity, Figure 4 shows graphically, the degree of violation (indicated by the blue hashed area) across the Vic-NSW interconnector, on a five minute (or dispatch interval) basis. The interconnector violated from 4.25 pm to 5.05 pm, corresponding to the interval from the “trip” of Tallawarra power station to when load was shed at Tomago.

Figure 4: Import Limit, flows and degree of violation across the Vic-NSW interconnector



As a result of the “violation” the system was left in an insecure state. Under these circumstances AEMO must take all reasonable actions, including intervention if necessary, to return the power system to a secure operating state within 30 minutes. To remedy this, AEMO issued a start target to Snowy Hydro’s Colongra power station. However, as shown in Table 3, Colongra experienced technical problems which meant it could not start. Consequently, with insufficient available supply to maintain system security, AEMO reduced demand by directing TransGrid to instruct AGL Macquarie to shed load from the Tomago aluminium smelter in New South Wales by taking another one of its pot lines out of service.

Queensland

Table 6: Combined actual and forecast exports and export limit from Queensland into New South Wales

Trading interval	Exports (MW)			Export limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
4 pm	1028	1222	1223	1061	1222	1223
4.30 pm	991	1223	1228	1018	1223	1228
5 pm	1200	1228	1229	914	1228	1229

Table 6 shows combined actual and forecast exports and export limits from Queensland to New South Wales across the QNI and Terranora interconnectors for the

same trading intervals. Similar to Table 5, Table 6 shows the violation across the interconnectors from Queensland to New South Wales during the high price interval in Queensland (5 pm), as actual exports (1200 MW) exceeded the export limit of 914 MW.

3.3 Causes of 5 pm high prices

The reduction of cheaper-priced supply associated with the loss of generation at Energy Australia's Tallawarra power station in New South Wales led to the spot price reaching \$12 221/MWh and \$12 915/MWh at 5 pm in Queensland and New South Wales respectively.

With all other low priced capacity from Queensland and New South Wales either at full output or unable to increase output due to physical limitations, and without the ability to import more electricity from Victoria, high priced supply met the demand for electricity in Queensland and New South Wales. The price for the 5-minute interval ("dispatch interval") ending 4.30 pm exceeded \$13 000/MWh in both states. The spot price is calculated by averaging the relevant six consecutive 5-minute dispatch prices. The 5 pm trading interval is comprised of the dispatch intervals from 4.35 to 5 pm.

3.4 Causes of 5.30 pm and 6 pm high prices

The 5.30 and 6 pm spot prices in New South Wales of \$13 996/MWh and \$14 000/MWh respectively were caused by special pricing arrangements which saw the 5-minute price set at the Market Price Cap (MPC) in New South Wales.

3.4.1 Circumstances leading to intervention event in New South Wales

At times, AEMO may need to override the normal dispatch process to maintain system security. For example, in an effort to reduce demand for electricity, AEMO may require customers to reduce consumption (or "shed load") if they consider forecast supply of electricity would be insufficient to meet forecast demand.

In accordance with National Electricity Rule 3.9.2(e), when load shedding occurs AEMO must set the dispatch price in that state at the market price cap (currently \$14 000/MWh).

As a result of the loss of supply at the Tallawarra power station, actual imports into New South Wales exceeded import limits, causing constraints to violate and leaving the power system in New South Wales in an insecure state. Following the trip of Tallawarra, AEMO issued Snowy Hydro's Colongra power station with a target to start generating electricity to meet the reduction in supply. However technical problems prevented Colongra power station operating at that time.

To maintain power system security, AEMO may issue directions to participants in accordance with Section 116 of the National Electricity Law and Clause 4.8.9 of the National Electricity Rules. To reduce demand in New South Wales at 4.58 pm and in accordance with jurisdictional load shedding procedures, AEMO issued a direction to the New South Wales transmission business, TransGrid, to shed Tomago aluminium

smelter's potline number 3. This became effective by 5.06 pm, reducing demand in New South Wales by 290 MW, thereby returning the power system to a secure state.

Under the Electricity Rules, AEMO has up to two dispatch intervals to commence special pricing arrangements after the instruction to shed load has occurred. In accordance with this, the dispatch price was set at the market price cap in New South Wales from 5.10 pm. At 5.20 pm AEMO published market notice 57396 advising that an actual LOR 3 applied in New South Wales and that load had been shed. Load at the Tomago smelter was restored by 6.07 pm and special pricing arrangements ceased at the end of the 6.10 pm dispatch interval.

With all load restored at Tomago and intervention pricing removed, the 5-minute price fell to around \$100/MWh by 6.15 pm, close to prices in other states.⁵

Australian Energy Regulator

May 2017

⁵ Specific times that events occurred and details were not provided in notices to the market have been referenced from AEMO's power system operating incident report (http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Incident-report-NSW-10-February-2017.pdf)

Appendix A: Significant Rebids

The 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 capacity involved, the change in the price of the capacity was being offered and the rebid reason.

Table 7: Significant energy rebids for 5 pm (New South Wales)

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.21 pm		Delta Electricity	Vales Point	80	-1000	13 800	1520P managing cw outlet temp - sl
4.09 pm		Delta Electricity	Vales Point	100	N/A	13 800	1608P managing cw outlet temp - sl
4.26 pm	4.35 pm	EnergyAustralia	Tallawarra	-410	-999	N/A	1620~P~adj avail unit tripped - rts unknown tba - sl~
4.34 pm	4.45 pm	Snowy Hydro	Colongra	-177	14 000	N/A	16:34:30 P plant outage
4.39 pm	4.50 pm	Delta Electricity	Vales Point	-60	13 800	N/A	1639P condenser back pressure limit
4.40 pm	4.50 pm	Snowy Hydro	Colongra	-177	14 000	N/A	16:40:05 p update capability parameters for change to outage plan/plant conditions
4.40 pm	4.50 pm	Snowy Hydro	Colongra	-177	14 000	N/A	16:40:07 p update capability parameters for change to outage plan/plant conditions
4.42 pm	4.50 pm	Snowy Hydro	Colongra	-177	14 000	N/A	16:41:59 p update capability parameters for change to outage plan/plant conditions

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
4.51 pm	5.00 pm	Snowy Hydro	Colongra	164	N/A	14 000	16:50:32 P plant outage complete
4.53 pm	5.00 pm	Delta Electricity	Vales Point	-60	13 800	N/A	1651P outlet canal temperature approaching limit

Table 7: Significant energy rebids for 5.30 pm (New South Wales)

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
4.26 pm		EnergyAustralia	Tallawarra	-410	-999	N/A	1620~P~ADJ avail unit tripped - rts unknown tba - sl~
4.39 pm		Delta Electricity	Vales Point	-60	13 800	N/A	1639P condenser back pressure limit
4.40 pm		Snowy Hydro	Colongra	-708	14 000	N/A	16:40 P update capability parameters for change to outage plan/plant conditions
4.53 pm		Delta Electricity	Vales Point	-60	13 800	N/A	1651P outlet canal temperature approaching limit
4.54 pm		Snowy Hydro	Colongra	492	N/A	14 000	16:54:32 P plant outage complete: gas start
5.04 pm	5.15 pm	Delta Electricity	Vales Point	-60	<13 800	N/A	1702P outlet canal temperature still too close to limit
5.11 pm	5.20 pm	EnergyAustralia	Tallawarra	190	N/A	-999	1710~P~ADJ avail, roc profile unit rts sl~

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
5.21 pm	5.30 pm	Snowy Hydro	Colongra	480	14 000	-1000	17:20:04 A nsw 5min actual price \$13,822.20 higher than 30 min pd 17:25@17:02 (\$14,000)

Table 8: Significant energy rebids for 6 pm (New South Wales)

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
3.54 pm		Delta Electricity	Vales Point	-120	13 800	N/A	1553P capacity limit due to very high cw outlet temp - sl
4.26 pm		EnergyAustralia	Tallawarra	-410	-999	N/A	1620~P~adj avail unit tripped - rts unknown tba - sl~
4.40 pm		Snowy Hydro	Colongra	-531	14 000	N/A	16:40 P update capability parameters for change to outage plan/plant conditions
4.42 pm		Snowy Hydro	Colongra	-177	14 000	N/A	16:41:59 P update capability parameters for change to outage plan/plant conditions
4.48 pm		Snowy Hydro	Colongra	492	N/A	14 000	16:48 P update capability parameters for change to outage plan/plant conditions
5.04 pm		Delta Electricity	Vales Point	-60	<13 800	N/A	1702P outlet canal temperature still too close to limit
5.11 pm		EnergyAustralia	Tallawarra	190	N/A	-999	1710~P~adj avail, roc profile unit rts sl~

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
5.28 pm	5.35 pm	Snowy Hydro	Colongra	480	14 000	-1000	17:26:00 a nsw 5min pd price \$13,892.33 higher than 30min pd 17:35@17:02 (\$14,000.00)
5.44 pm	5.55 pm	EnergyAustralia	Tallawarra	-190	-999	N/A	1740~P~adj avail,roc unit tripped on start sl~

Appendix B: Price setter

The following table identifies for the trading intervals in which the spot price exceeded \$5000/MWh, each five minute dispatch interval price and the generating units involved in setting the energy price. This information is published by AEMO.⁶ The 30-minute spot price is the average of the six dispatch interval prices.

Prices in bold italics have been set at the market price cap of \$14 000/MWh as they are either over the MPC, or have been set by special pricing arrangements.

Table 10: New South Wales – 5 pm

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
16:35	\$18 100.68	Braemar Power Projects	BRAEMAR1	Energy	\$13 879.99	1.30	\$18 043.99
16:40	\$17 387.36	Callide Power	CPP_3	Energy	\$13 333.00	0.47	\$6266.51
		Callide Power	CPP_4	Energy	\$13 333.00	0.47	\$6266.51
		Millmerran	MPP_1	Energy	\$13 333.00	0.18	\$2399.94
		Millmerran	MPP_2	Energy	\$13 333.00	0.18	\$2399.94
16:45	\$7487.80	Stanwell	STAN-2	Energy	\$6666.66	0.11	\$733.33
		Stanwell	STAN-3	Energy	\$6666.66	0.11	\$733.33
		Stanwell	STAN-4	Energy	\$6666.66	0.11	\$733.33
		Stanwell	TARONG#1	Energy	\$6666.66	0.27	\$1800.00
		Stanwell	TARONG#3	Energy	\$6666.66	0.27	\$1800.00
		Stanwell	TARONG#4	Energy	\$6666.66	0.27	\$1800.00
16:50	\$16 880.58	Stanwell	TARONG#2	Energy	\$13 399.95	0.63	\$8441.97
		Stanwell	TARONG#3	Energy	\$13 399.95	0.63	\$8441.97
16:55	\$17 387.36	Callide Power	CPP_3	Energy	\$13 333.00	0.47	\$6266.51
		Callide Power	CPP_4	Energy	\$13 333.00	0.47	\$6266.51
		Millmerran	MPP_1	Energy	\$13 333.00	0.18	\$2399.94
		Millmerran	MPP_2	Energy	\$13 333.00	0.18	\$2399.94
17:00	\$17 387.36	Callide Power	CPP_3	Energy	\$13 333.00	0.47	\$6266.51
		Callide Power	CPP_4	Energy	\$13 333.00	0.47	\$6266.51

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

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
		Millmerran	MPP_1	Energy	\$13 333.00	0.18	\$2399.94
		Millmerran	MPP_2	Energy	\$13 333.00	0.18	\$2399.94

Spot Price \$12 915/MWh

Table 11: New South Wales – 5.30 pm

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
17:05	\$13 800.00	Delta Electricity	VP5	Energy	\$13 800.00	0.50	\$6900.00
		Delta Electricity	VP6	Energy	\$13 800.00	0.50	\$6900.00
17:10	\$131.25	AGL Hydro	MCKAY1	Energy	\$129.86	1.01	\$131.16
17:15	\$106.92	CS Energy	GSTONE4	Energy	\$98.66	0.36	\$35.52
		CS Energy	GSTONE5	Energy	\$98.66	0.36	\$35.52
		CS Energy	GSTONE6	Energy	\$98.66	0.36	\$35.52
17:20	\$107.43	Origin Energy	MSTUART2	Energy	\$98.97	0.57	\$56.41
		Origin Energy	MSTUART3	Energy	\$98.97	0.52	\$51.46
17:25	\$109.86	Origin Energy	MSTUART1	Energy	\$98.97	0.38	\$37.61
		Origin Energy	MSTUART2	Energy	\$98.97	0.38	\$37.61
		Origin Energy	MSTUART3	Energy	\$98.97	0.35	\$34.64
17:30	\$109.16	Origin Energy	MSTUART1	Energy	\$98.97	0.38	\$37.61
		Origin Energy	MSTUART2	Energy	\$98.97	0.38	\$37.61
		Origin Energy	MSTUART3	Energy	\$98.97	0.35	\$34.64

Spot Price \$13 967/MWh (this calculation assumes that prices in bold italics are at the MPC (\$14 000/MWh))

Table 12: New South Wales – 6 pm

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
17:35	\$174.35	Stanwell	STAN-1	Energy	\$155.93	1.12	\$174.64
17:40	\$110.80	Origin Energy	MSTUART1	Energy	\$98.97	0.56	\$55.42

Electricity spot prices above \$5000/MWh

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
		Origin Energy	MSTUART2	Energy	\$98.97	0.56	\$55.42
17:45	\$220.46	ERMPower and Arrow	BRAEMAR5	Energy	\$198.50	0.37	\$73.45
		ERMPower and Arrow	BRAEMAR6	Energy	\$198.50	0.37	\$73.45
		ERMPower and Arrow	BRAEMAR7	Energy	\$198.50	0.37	\$73.45
17:50	\$107.00	Origin Energy	MSTUART3	Energy	\$98.97	1.08	\$106.89
17:55	\$107.62	Origin Energy	MSTUART1	Energy	\$98.97	0.54	\$53.44
		Origin Energy	MSTUART2	Energy	\$98.97	0.54	\$53.44
18:00	\$105.91	CS Energy	GSTONE6	Energy	\$98.66	1.07	\$105.57

Spot Price \$14 000/MWh (this calculation assumes that prices in bold italics are at the MPC (\$14 000/MWh))

Table 13: Queensland – 5 pm

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
16:35	\$13 879.99	Braemar Power Projects	BRAEMAR1	Energy	\$13 879.99	1.00	\$13 879.99
16:40	\$13 333.00	Callide Power	CPP_3	Energy	\$13 333.00	0.36	\$4799.88
		Callide Power	CPP_4	Energy	\$13 333.00	0.36	\$4799.88
		Millmerran	MPP_1	Energy	\$13 333.00	0.14	\$1866.62
		Millmerran	MPP_2	Energy	\$13 333.00	0.14	\$1866.62
16:45	\$6666.66	Stanwell	STAN-2	Energy	\$6666.66	0.10	\$666.67
		Stanwell	STAN-3	Energy	\$6666.66	0.10	\$666.67
		Stanwell	STAN-4	Energy	\$6666.66	0.10	\$666.67
		Stanwell	TARONG#1	Energy	\$6666.66	0.24	\$1600.00
		Stanwell	TARONG#3	Energy	\$6666.66	0.24	\$1600.00
		Stanwell	TARONG#4	Energy	\$6666.66	0.24	\$1600.00
16:50	\$13 399.95	Stanwell	TARONG#2	Energy	\$13 399.95	0.50	\$6699.98

DI	Dispatch Price (\$/MWh)	Participant	Unit	Service	Offer price (\$/MWh)	Marginal change	Contribution
		Stanwell	TARONG#3	Energy	\$13 399.95	0.50	\$6699.98
16:55	\$13 333.00	Callide Power	CPP_3	Energy	\$13 333.00	0.36	\$4799.88
		Callide Power	CPP_4	Energy	\$13 333.00	0.36	\$4799.88
		Millmerran	MPP_1	Energy	\$13 333.00	0.14	\$1866.62
		Millmerran	MPP_2	Energy	\$13 333.00	0.14	\$1866.62
17:00	\$13 333.00	Callide Power	CPP_3	Energy	\$13 333.00	0.36	\$4799.88
		Callide Power	CPP_4	Energy	\$13 333.00	0.36	\$4799.88
		Millmerran	MPP_1	Energy	\$13 333.00	0.14	\$1866.62
		Millmerran	MPP_2	Energy	\$13 333.00	0.14	\$1866.62
Spot Price		\$12 221/MWh					

Appendix C: Closing bids

Figures C1 to C7 highlight the half hour closing bids for participants in New South Wales and Queensland with significant capacity priced at or above \$5000/MWh during the periods in which the spot price exceeded \$5000/MWh. They also show generation output and the spot price.

New South Wales

Figure C1 – Delta Electricity (Vales Point) closing bid prices, dispatch and spot price

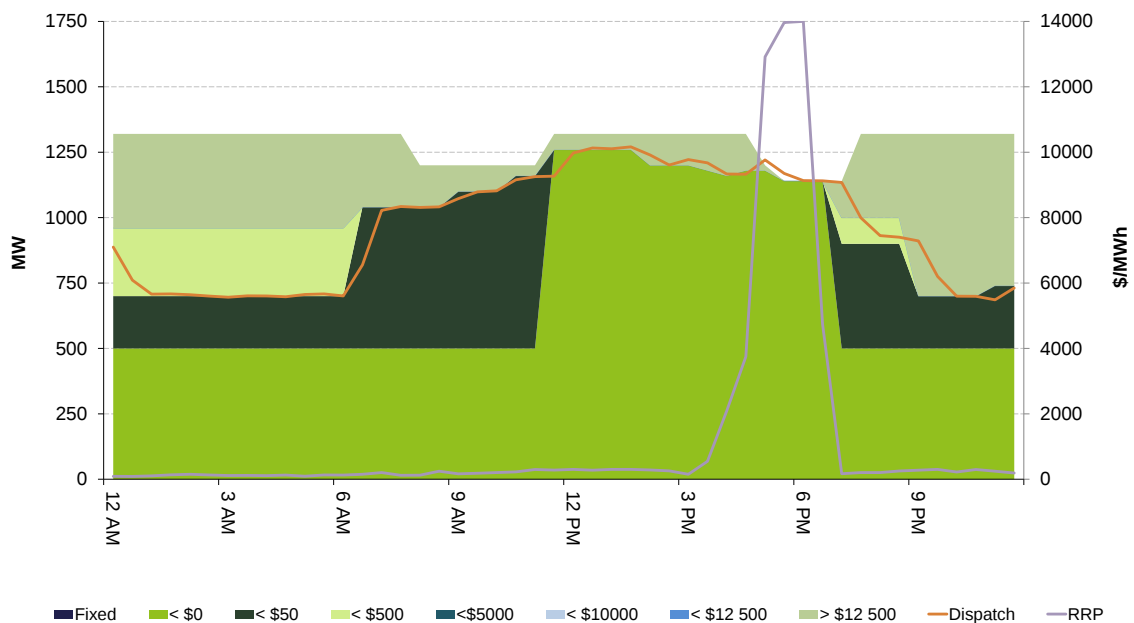
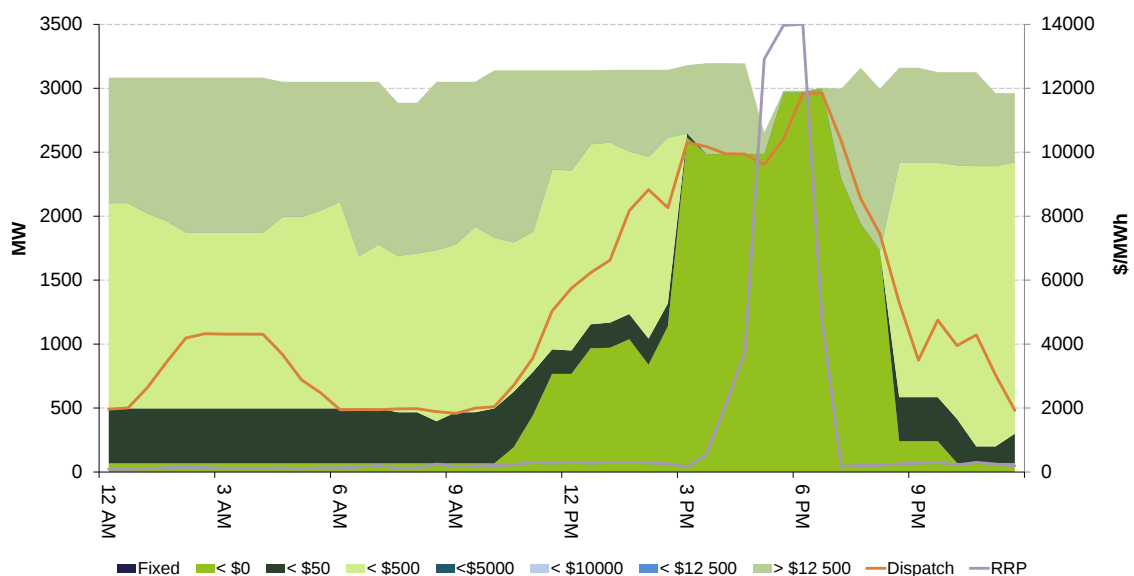


Figure C2 – Snowy Hydro (Colongra, Tumut, Upper Tumut, Guthega, Blowering) closing bid prices, dispatch and spot price



Queensland

Figure C3 – Alinta Energy (Braemar A) closing bid prices, dispatch and spot price

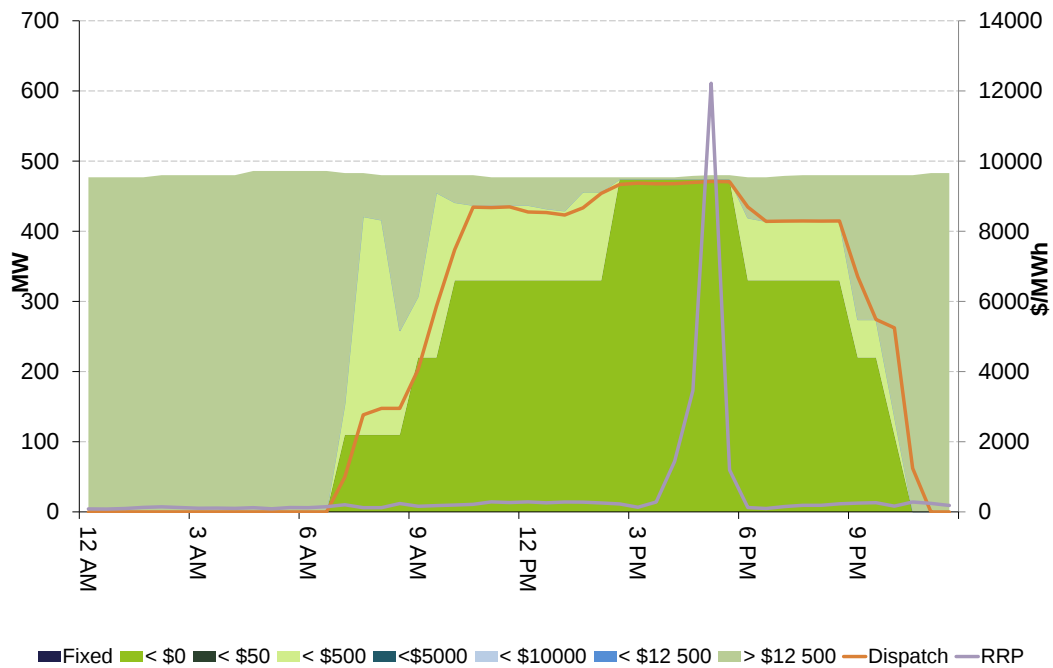


Figure C4 – Callide Power Trading (Callide C) closing bid prices, dispatch and spot price

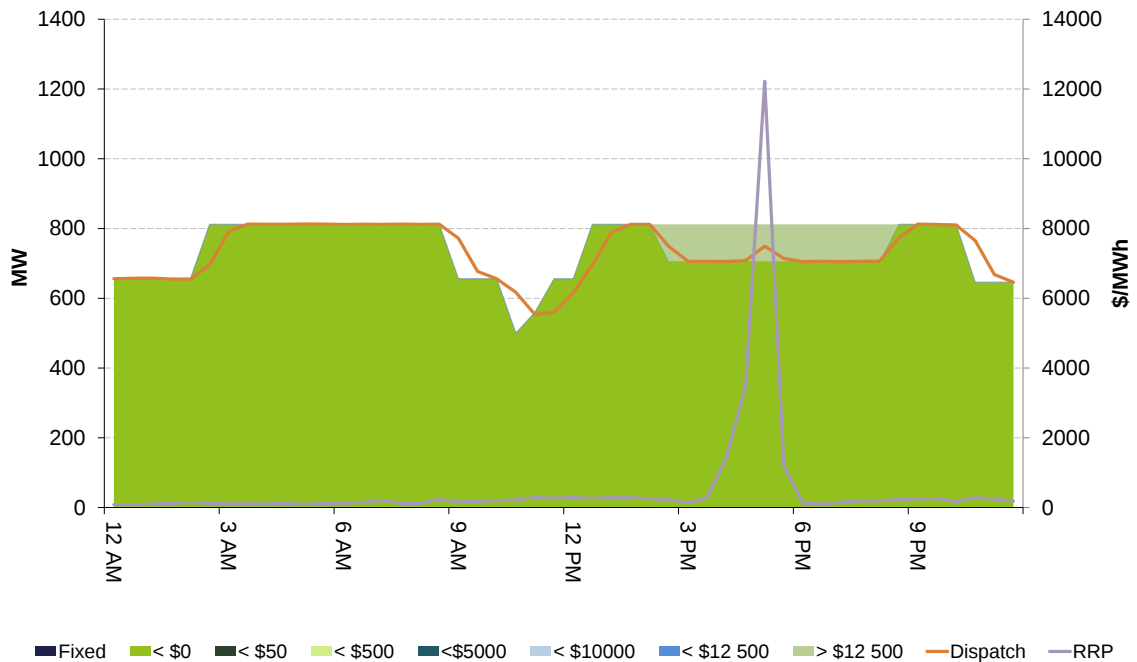


Figure C5 – CS Energy (Callide B, Gladstone, Kogan Creek, Wivenhoe) closing bid prices, dispatch and spot price

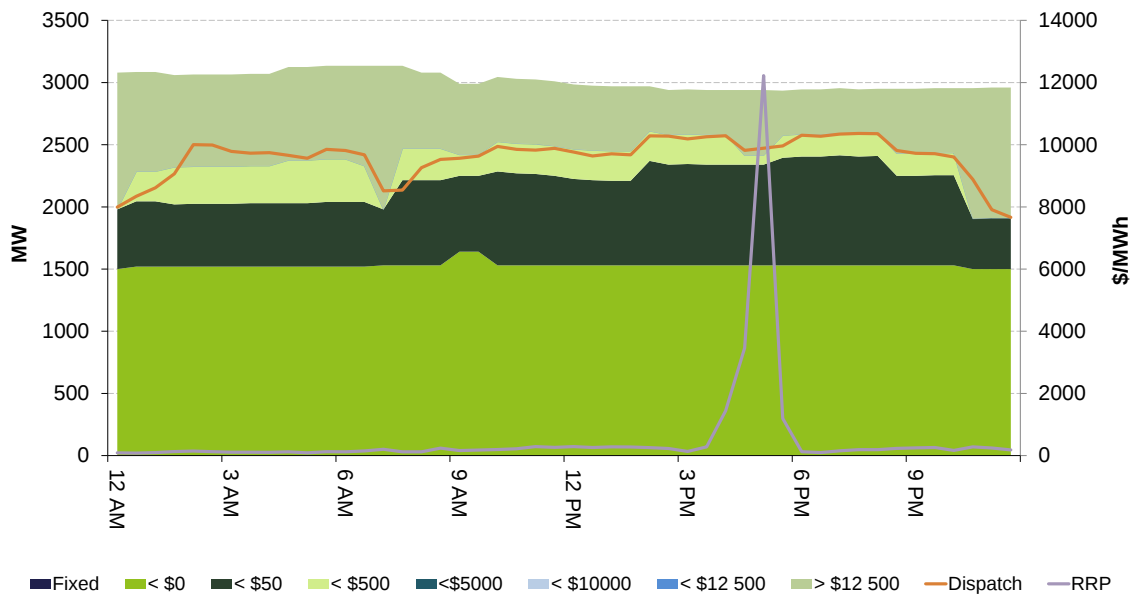


Figure C6 – Millmerran Energy Trader (Millmerran) closing bid prices, dispatch and spot price

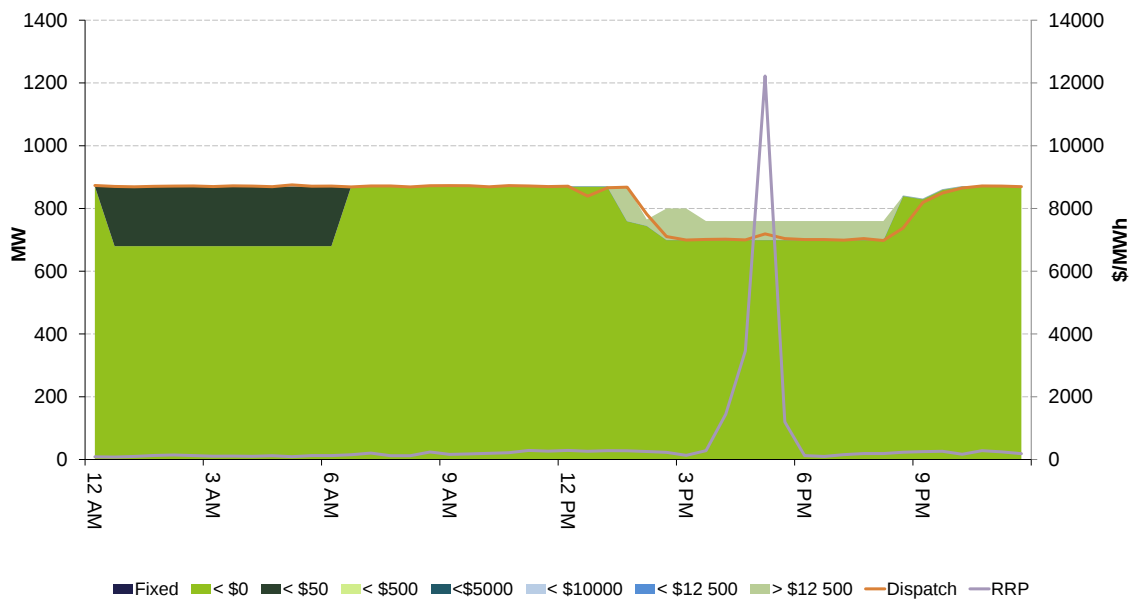
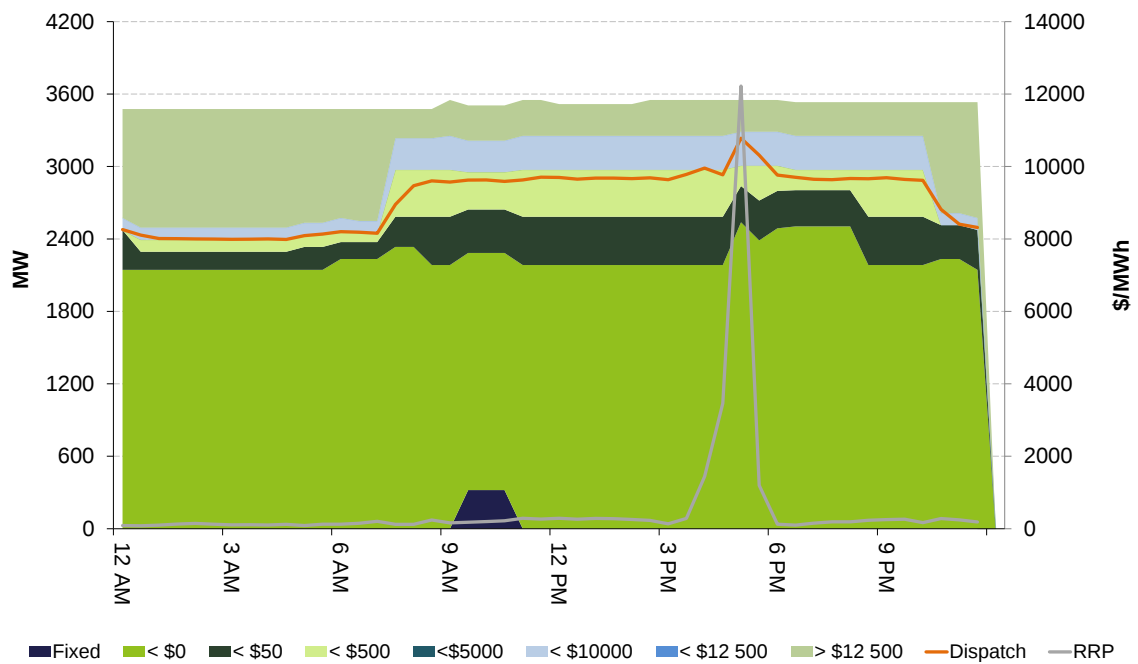


Figure C7 – Stanwell Corporation (Barron Gorge, Kareeya, Mackay, Stanwell, Tarong, Tarong North) closing bid prices, dispatch and spot price



Appendix D: Relevant Market Notices

This appendix contains relevant market notices published by AEMO.

Market Notice	Type	Date of issue	Last Changed
57355	Reserve Notice	10/02/2017 10:36:06	10/02/2017 10:36:06
External Reference			
Update - FORECAST LACK OF RESERVE LEVEL 1 (LOR1) in the New South Wales region -PD PASA.			
Reason			
AEMO ELECTRICITY MARKET NOTICE Update - FORECAST LACK OF RESERVE LEVEL 1 (LOR1) in the New South Wales region -PD PASA. Refer to AEMO Electricity Market Notice 57314, 57337 AEMO declares forecast LOR1 conditions for the New South Wales region for the following periods Friday 10th February 2017 from 1200 hrs to 1430 hrs The minimum reserve available is 780 MW. Friday 10th February 2017 from 18300 hrs to 2030 hrs The minimum reserve available is 891MW. This calculation is based on a LOR1 trigger level of 1400 MW. Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57356	Reserve Notice	10/02/2017 10:36:37	10/02/2017 10:36:37
External Reference			
Update - FORECAST LACK OF RESERVE LEVEL 2 (LOR2) in the New South Wales region- PD PASA.			
Reason			
AEMO ELECTRICITY MARKET NOTICE Update - FORECAST LACK OF RESERVE LEVEL 2 (LOR2) in the New South Wales region- PD PASA. Refer to AEMO Electricity Market Notice 57315, 57338 AEMO declares forecast LOR2 conditions for the NSW Region for the following period. Friday 10th February 2017 from 1430hrs to 1600 hrs The minimum reserve available is 50 MW. Friday 10th February 2017 from 1700 hrs to 1830 hrs The minimum reserve available is 338 MW. This calculation is based on a LOR2 trigger level of 700 MW. AEMO is seeking a market response. AEMO will determine the latest time at which it would need to intervene through an AEMO intervention event. Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57357	Reserve Notice	10/02/2017 10:36:56	10/02/2017 10:36:56
External Reference			
Update - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.			
Reason			
AEMO ELECTRICITY MARKET NOTICE			
Update - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.			
Refer to AEMO Electricity Market Notice 57339			
AEMO declares forecast LOR3 condition for the NSW Region for the following period.			
Friday 10th February 2017 from 1600 hrs to 1700 hrs			
The minimum reserve available is -77			
This calculation is based on a LOR3 trigger level of 0 MW.			
AEMO is seeking a market response.			
AEMO will determine the latest time at which it would need to intervene through an AEMO intervention event.			
Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57359	Reserve Notice	10/02/2017 13:00:01	10/02/2017 13:00:01
External Reference			
Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region- 10-02-2017			
Reason			
AEMO ELECTRICITY MARKET NOTICE			
Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region- 10-02-2017			
An Actual LOR1 condition has been declared for the NSW Region from 1250 hrs.			
The Actual LOR1 condition is forecast to exist until 2000 hrs			
The contingency capacity reserve required is 1345 MW			
The minimum LOR1 reserve available is 861 MW			
Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57360	Reserve Notice	10/02/2017 13:16:07	10/02/2017 13:16:07

External Reference

Update - FORECAST LACK OF RESERVE LEVEL 2 (LOR2) in the New South Wales region- PD PASA.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - FORECAST LACK OF RESERVE LEVEL 2 (LOR2) in the New South Wales region- PD PASA.
10/02/2017

Refer to AEMO Electricity Market Notice 57315, 57338, 57356

AEMO declares forecast LOR2 conditions for the NSW Region for the following period.

Friday 10th February 2017 from 1430hrs to 1600 hrs

The minimum reserve available is 42 MW.

Friday 10th February 2017 from 1700 hrs to 1830 hrs

The minimum reserve available is 94 MW.

This calculation is based on a LOR2 trigger level of 675 MW.

AEMO is seeking a market response.

AEMO has determined the latest time at which it would need to intervene through an AEMO intervention event as 1430 hrs 10/02/2017.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57361	Reserve Notice	10/02/2017 13:28:06	10/02/2017 13:28:06

External Reference

Update - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.

Refer to AEMO Electricity Market Notice 57339, 57357

AEMO declares forecast LOR3 condition for the NSW Region for the following period.

Friday 10th February 2017 from 1600 hrs to 1700 hrs

The minimum reserve available is -189

This calculation is based on a LOR3 trigger level of 0 MW.

AEMO is seeking a market response.

AEMO will intervene through an AEMO intervention event as required in the dispatch timeframe.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57382	Reserve Notice	10/02/2017 16:19:49	10/02/2017 16:19:49
External Reference			
Cancellation - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.			
Reason			
AEMO ELECTRICITY MARKET NOTICE			
Cancellation - FORECAST LACK OF RESERVE LEVEL 3 (LOR3) in the New South Wales region- PD PASA.			
Refer to AEMO Electricity Market Notice 57339, 57357			
AEMO has cancelled the forecast LOR3 condition for the NSW Region for the following period as previously advised.			
Friday 10th February 2017 from 1600 hrs to 1700 hrs			
Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57387	Reserve Notice	10/02/2017 16:44:29	10/02/2017 16:44:29
External Reference			
Actual Lack Of Reserve Level 2 (LOR2) in the NSW Region - 10-02-2017			
Reason			
AEMO ELECTRICITY MARKET NOTICE			
Actual Lack Of Reserve Level 2 (LOR2) in the NSW Region - 10-02-2017			
An Actual LOR2 condition has been declared for the NSW region from 1635 hrs.			
The Actual LOR2 condition is forecast to exist until 1730 hrs			
The contingency capacity reserve required is 675 MW			
The minimum reserve available is 570 MW			
AEMO is seeking a market response.			
Manager NEM Real Time Operations			

Market Notice	Type	Date of issue	Last Changed
57396	Reserve Notice	10/02/2017 17:20:49	10/02/2017 17:20:49

External Reference

Actual Lack Of Reserve Level 3 (LOR3) in the NSW Region- 10-02-2017

Reason

AEMO ELECTRICITY MARKET NOTICE

Actual Lack Of Reserve Level 3 (LOR3) in the NSW Region- 10-02-2017

Under the NER CI 4.8.4(d), AEMO considers that Customer load is actually being interrupted in order to maintain or restore the security of the power system in NSW Region.

An Actual LOR3 condition has been declared for the NSW region from 1650 hrs.

The Actual LOR3 condition is forecast to exist until 1800 hrs

The maximum load to be interrupted is 310 MW at 1706 hrs 10/02/2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57397	Market Intervention	10/02/2017 17:43:05	10/02/2017 17:43:05

External Reference

AEMO Electricity Market Direction - NSW Region

Reason

AEMO ELECTRICITY MARKET NOTICE.

In accordance with Section 116 National Electricity Law and clause 4.8.9 of the National Electricity Rules AEMO has issued a direction to a participant in the NSW region.

The direction was necessary to maintain the power system in a secure operating state.

The direction was issued at 1658 hrs 10/02/17 and is expected to stay in place until 1800 hrs 10/02/17.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57399	Market Intervention	10/02/2017 17:43:05	10/02/2017 17:43:05

External Reference

Cancellation - AEMO Electricity Market Direction - NSW Region

Reason

AEMO ELECTRICITY MARKET NOTICE.

Cancellation - AEMO Electricity Market Direction - NSW Region

Refer AEMO Electricity Market Notice 57397

Direction cancelled at 1801 hrs Friday, 10 February 2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57340	Reserve Notice	10/02/2017 18:26:34	10/02/2017 18:26:34

External Reference

Cancellation - Actual Lack Of Reserve Level 3 (LOR3) in the NSW Region- 10-02-2017

Reason

AEMO ELECTRICITY MARKET NOTICE

Cancellation - Actual Lack Of Reserve Level 3 (LOR3) in the NSW Region- 10-02-2017

Refer Electricity Market Notice 57396

Customer load is no longer being interrupted in NSW Region.

The Actual LOR3 condition has been cancelled for the NSW region from 1805 hrs.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57402	Reserve Notice	10/02/2017 18:38:15	10/02/2017 18:38:15

External Reference

Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region - 10-02-2017

Reason

AEMO ELECTRICITY MARKET NOTICE

Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region - 10-02-2017

An Actual LOR1 condition has been declared for the NSW region from 1830 hrs.

The Actual LOR1 condition is forecast to exist until 1900 hrs

The contingency capacity reserve required is 1340 MW

The minimum reserve available is 843 MW

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57404	Market Intervention	10/02/2017 19:27:16	10/02/2017 19:27:16

External Reference

Drection - TransGrid - NSW - 10/02/2017

Reason

AEMO PARTICIPANT NOTICE

Section 116 National Electricity Law direction - TransGrid - NSW

Issue:

In accordance with Section 116 National Electricity Law AEMO is issuing a direction to TransGrid to take the following action.

AEMO directs TransGrid to shed one Tomago potline immediately.

The Section 116 National Electricity Law direction is issued at 1658 hrs 10/02/2017.

Cancellation:

Direction cancelled at 1801 hrs 10/02/2017.

Permission to restore Tomago potline to full load.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57406	Reserve Notice	10/02/2017 19:44:57	10/02/2017 19:44:57
External Reference			
Cancellation - Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region - 10-02-2017			
Reason			
AEMO ELECTRICITY MARKET NOTICE			
Cancellation - Actual Lack Of Reserve Level 1 (LOR1) in the NSW Region - 10-02-2017			
Refer Electricity Market Notice 57402			
The Actual LOR1 declared for the NSW region is cancelled from 1930 hrs.			
Manager NEM Real Time Operations			

Appendix E: Lack of Reserve explained

AEMO constantly monitors the level of reserves, or spare capacity, within each state. Reserves are defined as the difference between the volume of electricity that can be made available to consumers, either by local generation or through the network via interconnectors with other states, and the regional customer demand at that time.

Reserves are effectively an indicator of the supply demand balance and an important tool to communicate with the market potential and actual shortfalls. This is achieved through the release of LOR notices by AEMO. Forecast LOR notices are designed to elicit a response from generators to increase their declared available capacity which may then remove the forecast reserve shortfall. Actual LOR notices are issued when the thresholds are actually triggered.

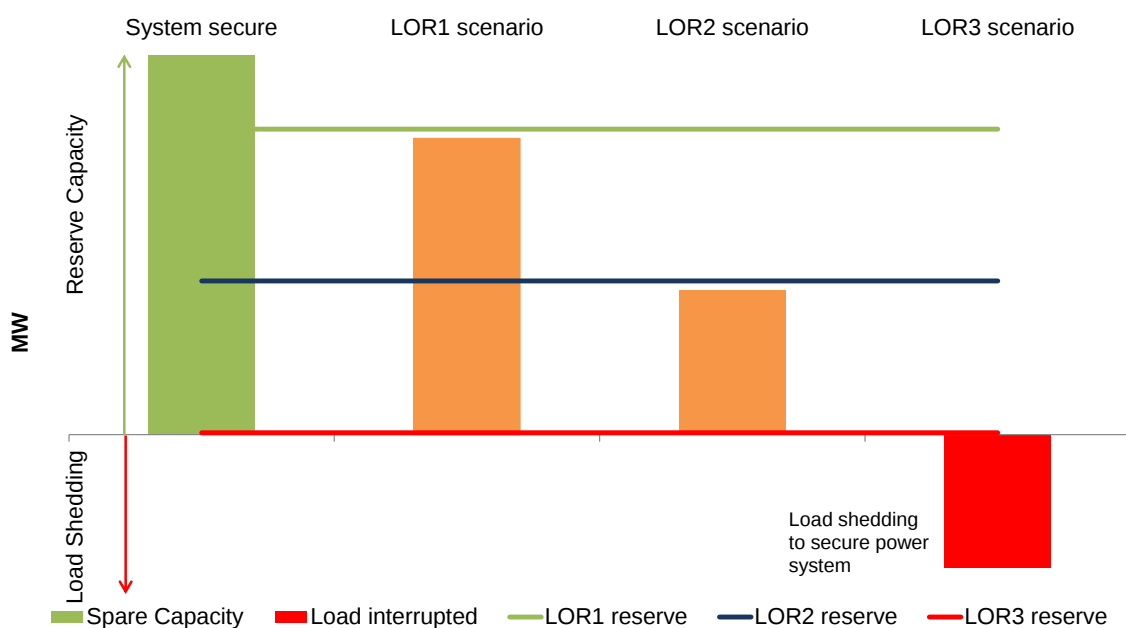
There are three Reserve thresholds which relate to managing power system security following a defined number of unplanned failures of either transmission or generating equipment (credible contingencies). An example of a credible contingency would be the failure of a large thermal generator or the failure of a transmission line that would reduce interconnector capacity.

The three LOR levels are categorised as follows:

- An LOR1 is declared when AEMO considers load shedding would occur after two single credible contingencies.
- An LOR2 is declared when AEMO considers load shedding would occur after a single credible contingency.
- An LOR3 is declared when customer(s) load would be, or is shed, in order to maintain the stability of the power system.

Figure 5 shows the decrease in spare capacity and the lack of reserve thresholds.

Figure 5: Spare capacity and lack of reserve



As the spare capacity drops below a reserve trigger level (represented as a horizontal line on the chart) either by a reduction in available spare capacity or an increase in demand, a new LOR reserve notice is issued to participants. If the region is left with insufficient reserve capacity to supply customer demand, an LOR3 is issued and load shedding occurs as happened on this day in New South Wales.