Electricity spot prices above $5000/MWh

South Australia
9 February 2017

27 April 2017

AUSTRALIAN ENERGY REGULATOR

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AER Reference: 61696-D17/19878

Amendment Record

Version	Date	Pages
version for publication	27 April 2017	29

Contents

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 participants 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

The spot price in South Australia exceeded $5000/MWh, on 9 February 2017, for the 5, 5.30 and 6.30 pm trading intervals. Prices in these trading intervals ranged from $6755/MWh to $9510/MWh.

On 9 February the temperature in Adelaide reached a maximum of 41 degrees as had been forecast by the Bureau of Meteorology consistently for two days. This was the second successive day that the temperature exceeded 40 degrees and resulted in high levels of electricity demand.

Spot prices were forecast to be high primarily because high priced generation would be needed to meet the predicted high levels of demand. Despite demand being lower than forecast, actual prices were determined by special pricing arrangements following directions by AEMO to Engie to start previously unavailable generating plant.

AEMO intervened, based on predicted shortfalls in spare capacity from local generators and from neighbouring regions across the interconnectors, to maintain system security if an unplanned failure were to occur. Special pricing arrangements apply following an intervention to maintain the market price signal by determining prices as if no action had been taken. AEMO's direction to Pelican Point Power Station, triggered these arrangements.

AEMO published notices throughout the day to encourage local market participants to make additional generating capacity ready before 3 pm. With little response, at 3.05 pm, AEMO directed Engie to start and run an additional generator at Pelican Point Power Station in South Australia.[1]

Rebidding of capacity from low to high prices did not contribute to spot prices exceeding $5000/MWh. While the analysis is complicated by the intervention, participants rebidding significant capacity from high to low prices, contributed to lower price outcomes.

[1] Only half of Pelican Point power station has been in service since April 2015 but the plant could be made fully available under special arrangements with AEMO given enough prior notice.

3 Analysis

3.1 Market Forecasts

To calculate the amount of electricity that must be supplied, or generated, AEMO collects information about network capability and 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 balances generator offers compiled by AEMO against forecast demand, and publishes aggregated expected and actual dispatch information, price and network loadings at five minute and 30 minute intervals for the remainder of the day. These forecasts also form the basis for AEMO's recommendations with respect to interconnector capacity, transfers between regions, reserves and conditions that relate to power system security.

The first forecast, or pre-dispatch run, for a trading day is prepared at around 1 pm the previous day and is updated every half hour, taking into account: changes in demand; network capability; and participant bids and rebids. AEMO also produces a more granular, 5 minute, pre-dispatch forecast for the next hour. The accuracy and timeliness of this information is critical to allow participants to make informed commercial decisions

On this day, AEMO's forecasts for South Australia, four and 12 hours prior, over-estimated the state demand for electricity by around 150 MW. Accordingly spot prices were also anticipated to be much higher than what actually occurred.

Table 1 shows the actual and forecast spot price, demand and generator availability for the high priced trading intervals. The spot price in South Australia exceeded $5000/MWh for the 5, 5.30 and 6.30 pm trading intervals. Other trading intervals where high prices were either forecast or actually occurred are included in this report as they add context to the events of the day.

While the price forecast four hours ahead for the 6.30 pm trading interval was around $600/MWh, all other forecast prices were close to the market price cap.

Table 1: Actual and forecast spot price, demand and available capacity

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
4.30 pm	2481	14 000	14 000	2772	2901	2921	2685	2542	2550
5 pm	**6755**	**13 168**	**14 000**	**2824**	**2931**	**2956**	**2660**	**2562**	**2555**

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
5.30 pm	**8958**	**13 168**	**14 000**	**2845**	**2972**	**2996**	**2657**	**2573**	**2543**
6 pm	133	13 160	13 999	2862	2967	2981	2650	2606	2554
6.30 pm	**9510**	**579**	**13 999**	**2932**	**2962**	**2977**	**2662**	**2674**	**2602**

3.2 Demand

Customer demand for electricity in South Australia is particularly sensitive to temperature: the higher the temperature - the higher the demand for electricity. AEMO's demand forecasts are based on temperature forecasts provided by two external service providers.

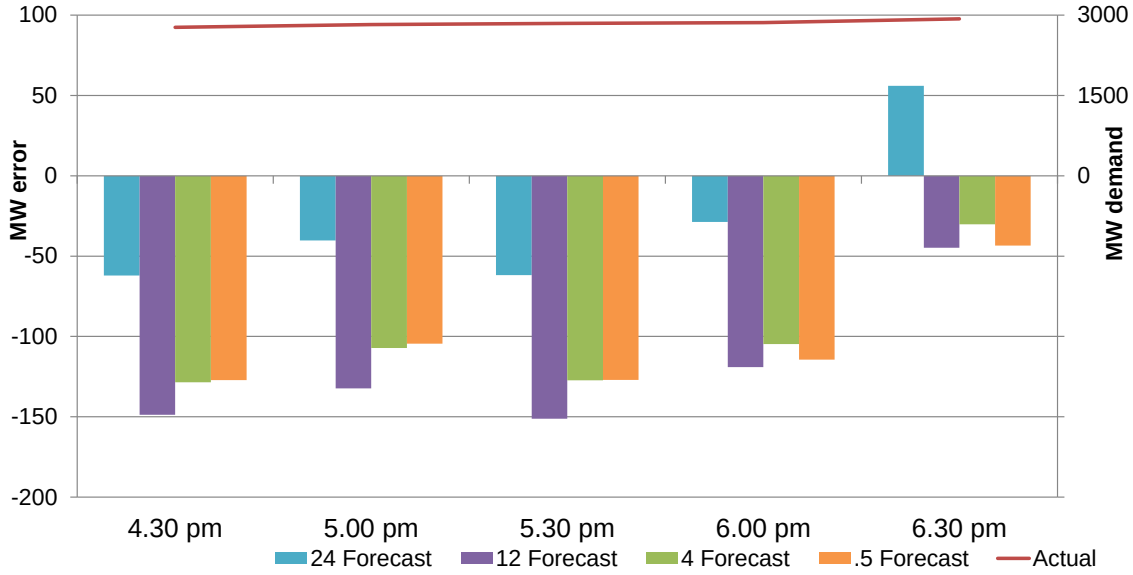
Bureau of Meteorology forecasts for South Australia had consistently predicted temperatures of 41 degrees two days prior to 9 February and, on the day, those forecasts were realised and resulted in high levels of electricity demand.[2]

Electricity demand was lower than forecast, reaching a maximum of 2932 MW at 6.30 pm, lower than it had been the previous day when AEMO had directed load shedding in the State and well below record levels of around 3400 MW.

Figure 1 shows the actual demand and the demand forecast errors for the trading intervals from 4.30 - 6.30 pm. The forecast error has been calculated by subtracting the forecast demand from the actual – that is, a negative number means actual demand was less than forecast. Actual demand was 100 - 150 MW lower than forecast in the 12 hours preceding actual dispatch for the 4.30 - 6 pm trading interval. Forecasts produced 24 hours prior were closer, with errors typically around 50 MW with the exception of the 6.30 pm trading interval which was higher than the forecast.

[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=023090

Figure 1: Demand forecast error



On the day, because actual demand was in the order of 100-250 MW less than forecast, all other things constant, actual prices were likely to be lower than forecast.

3.2.1 Events on the day

On the day, LOR2 conditions were forecast from early morning with AEMO seeking a response from market participants with the largest deficit being 98 MW. At 2.49 pm AEMO issued a market notice seeking a market response by 3 pm. The Notice stated: "AEMO intends to intervene through an AEMO intervention event at 1500 hrs if a sufficient market response is not achieved".

With no significant market response received, at 3.05 pm AEMO issued a direction to Engie to synchronise and dispatch a second unit at Pelican Point to its minimum load until 7 pm.

The AEMO Intervention event commenced at 3.10 pm and a market notice was issued. AEMO issued a further market notice declaring intervention pricing would commence from the 3.50 pm dispatch interval.

Special pricing arrangements apply following an intervention in the market and, when this occurs, prices for all electricity services in all regions in the National Electricity Market (NEM) are subject to the special pricing arrangements. In this case, as AEMO directed Pelican Point in South Australia, "What if" pricing applied during the 3.30 - 7pm trading intervals. "What-if" pricing determining prices as if no action had been taken and therefore maintains market price signals that encourage generators to make their plant available and, into the future, build new capacity. The high prices during the 5, 5.30 and 6.30 pm intervals resulted from these arrangements.

These Intervention pricing arrangements are explained in Appendix E.

Engie made the increased capacity at Pelican Point available to the market via a rebid, effective at 3.30 pm and was issued an increased target at 4.15 pm. Pelican Point continued to operate at 320 MW until 7 pm, when the direction was cancelled and the Intervention pricing event ceased.

While an LOR2 was forecast in South Australia indicating a shortfall of 88 MW of reserve capacity, an actual LOR2 was not reported. This was as a result of the actual demand being around 100 MW lower than forecast.

3.3 Supply and network availability

Participants in the National Electricity Market (NEM) are free to 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. A participant's offer comprises 10 price and MW pairs. AEMO aggregates all generator offers, from lowest to highest price, and network transfer capabilities and dispatches generation in order to meet its forecast of the demand for electricity in a state every 5 minutes.

This section discusses changes to the offered prices, capacity and market demand conditions relevant to the high price periods.

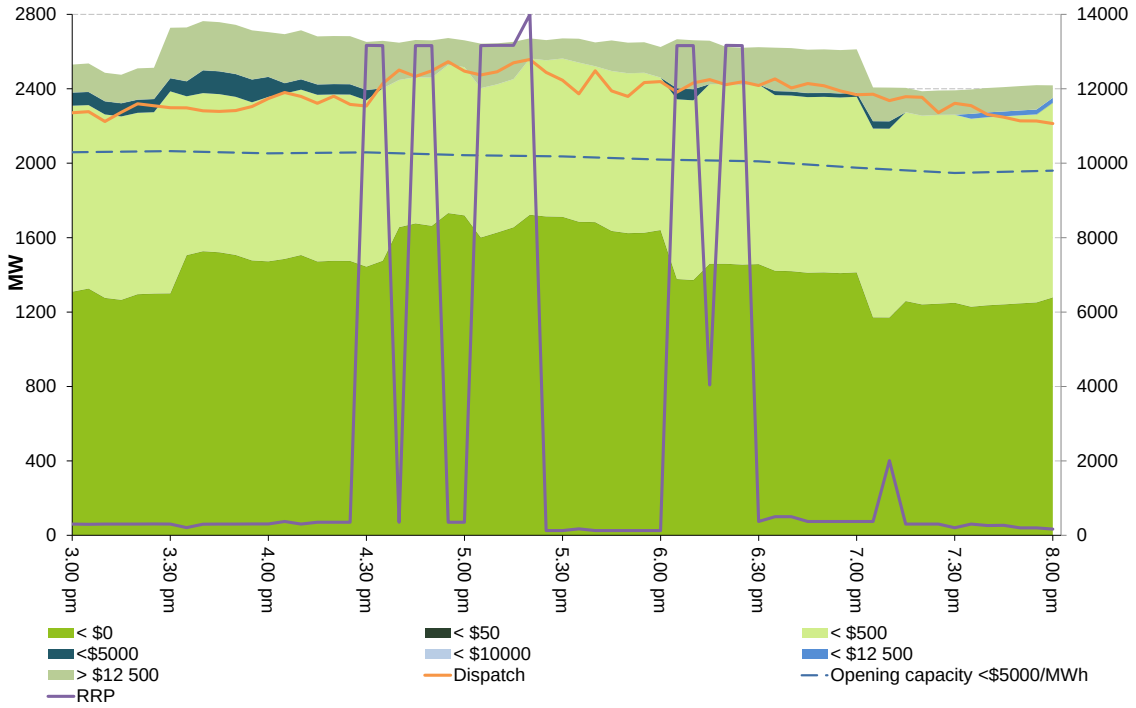
As a note of caution - These values included in the following section are inputs that AEMO would use for calculating dispatch targets, not necessarily those that would have been used for "what-if" pricing. For this reason the report will only highlight high level supply and demand conditions as specific changes in these variables cannot be directly attributed to movements in price.

3.3.1 Generator Offers

There was no significant rebidding of capacity from low to high prices which contributed to the high price trading intervals.

Figure 2 shows the closing bids for South Australia as well as dispatch and demand. Also shown is the South Australian dispatch price and the amount of capacity that was priced below $5000/MWh in the first forecast, the day before.

Figure 2: Closing bids for South Australia



In Figure 2 the dotted blue line represents the opening capacity priced below $5000/MWh (around 2000 MW) in the first published forecast based on participants' initial offers. This is well below the actual capacity that was available through the generators closing bids at the time of dispatch (around 2500 MW).

The impact of AEMO's direction to Pelican Point is evident in Figure 2 as available capacity increases at 3.30 pm and decreases at 7 pm, when the unit shut down. AEMO effectively ignores this capacity in determining the "What-If" price - that is it is treated as if it had remained unavailable.

There was however some additional rebidding of capacity from high to low prices and additional generation made available by Engie from Port Lincoln Power Station. This contributed to the lower than forecast prices.

These rebids and others considered to have been material to the event are listed in Appendix A.

Appendix B details the generators involved in setting the price during the high-price periods, and how that price was determined by the market systems.

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

3.4 Network availability

This section examines the change in network capability and its contribution to price outcomes. The net import limit into South Australia was close to forecast four hours ahead.

Table 2 shows the combined actual and forecast imports and import limit into South Australia on the Heywood and Murraylink interconnectors.

Table 2: Net actual and forecast network capability of Victoria to South Australia interconnectors (Murraylink and Heywood)

Trading interval	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
4.30 pm	586	511	545	592	511	602
5 pm	**512**	**515**	**489**	**512**	**515**	**601**
5.30 pm	**552**	**564**	**695**	**552**	**564**	**695**
6.30 pm	**602**	**580**	**690**	**602**	**580**	**690**

At the time of the high prices, up to 89 MW of flow across Murraylink were at times being forced from South Australia into Victoria. This was due to a constraint that avoids overloading the Ballarat to Bendigo line if the Shepparton to Bendigo line trips, both lines are in Victoria. These counter priced flows were not forecast four hours ahead. The Heywood interconnector was importing into South Australia at around 600 MW, which is at its nominal limit, up to 90 MW higher than forecast four hours ahead.

Australian Energy Regulator

April 2017

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 3: Significant energy rebids for 5 pm

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
1.38 pm		Engie	Mintaro	71	14 000	<300	1336A respond to 30pd $13160.01: extend Mintaro run[3]
1.51 pm		Engie	Dry Creek	35	13 100	<300	1350A respond to 5pd predispatch $10585.99
3.19 pm		Engie	Pelican Point	106	N/A	-1000	1518A respond to AEMO direction
3.53 pm		Engie	Dry Creek	24	13 100	<369	1553A respond to 5min pd prices
4.27 pm	4.35 pm	Engie	Snuggery	36	1750	<300	1627A respond to unforecast Sa price
4.31 pm	4.40 pm	Engie	Dry Creek	94	>300	-1000	1631A respond to dispatch price
4.47 pm	4.55 pm	Origin Energy	Quarantine	56	13 160	-1000	1645A MPC spike - sl

Table 4: Significant energy rebids for 5.30 pm

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
1.38 pm		Engie	Mintaro	71	14 000	<300	1336A respond to 30pd $13160.01: extend Mintaro run
1.51 pm		Engie	Dry Creek	35	13 100	<300	1350A respond to 5pd predispatch $10585.99

[3] Shorthand from the generator in their rebid referring to predispatch

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
3.19 pm		Engie	Pelican Point	106	N/A	-1000	1518A respond to AEMO direction
3.53 pm		Engie	Dry Creek	24	13 100	<369	1553A respond to 5min pd prices
4.29 pm		Engie	Dry Creek	35	13 100	<369	1629A respond to unforecast dispatch price
4.42 pm		Engie	Port Lincoln	18	N/A	<124	1641P unit test run
4.56 pm	5.05 pm	Engie	Dry Creek	20	300	13100	1655A respond to 5min pd prices
5.03 pm	5.10 pm	Snowy Hydro	Pt Stanvac	19	14 056	-1004	17:02:43 f manage 30/5 min settlement - extreme price at start of ti - manage generation
5.08 pm	5.15 pm	Engie	Dry Creek	20	13 100	-1000	1708A respond to pd price
5.09 pm	5.20 pm	Origin Energy	Quarantine	92	>13 160	<80	1707A constraint management - v:s_600_hy_test sl
5.20 pm	5.30 pm	Engie	Port Lincoln	18	N/A	<124	1719P unit test run of pl2

Table 5: Significant energy rebids for 6.30 pm

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
3.11 pm		Snowy Hydro	Lonsdale	18	14 126	<353	15:06:00 A SA 5min pd price $50.00 lower than 30min pd 15:15@15:02 ($299.99)
3.19 pm		Engie	Pelican Point	100	N/A	-1000	1518A respond to aemo direction
3.53 pm		Engie	Dry Creek	27	13 100	<369	1553A respond to 5min pd prices
4.29 pm		Engie	Dry Creek	38	13 100	<369	1629A respond to unforecast dispatch price

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MWh)	Price to ($/MWh)	Rebid reason
4.56 pm		Engie	Dry Creek	33	300	13100	1655A respond to 5min pd prices
5.11 pm		Origin Energy	Osborne	11	N/A	80	1710P change in avail - evaps enabled sl
5.20 pm		Engie	Port Lincoln	36	N/A	<124	1719P unit test run of pl2
6.04 pm	6.15 pm	EnergyAustralia	Hallett	30	13 999	-1000	1800~A~band adj due to change in 5min pd price $13162 > $590 @ 1830 SL~
6.12 pm	6.20 pm	Engie	Dry Creek	33	13100	-1000	1811A respond to dispatch price

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.[4] The 30-minute spot price is the average of the six dispatch interval prices. The prices shown are a result of the "what-if" pricing calculation. Prices in *italics* are capped at the Market Price Cap of $14 000/MWh.

Table 6: Price setter for the 5 pm trading interval

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
16:35	$13 160.01	Origin Energy	QPS2	Energy	$13 160.01	0.50	$6580.01
		Origin Energy	QPS4	Energy	$13 160.01	0.50	$6580.01
16:40	$350.00	Snowy Hydro	LONSDALE	Energy	$350.00	1.00	$350.00
16:45	$13 160.01	Origin Energy	QPS1	Energy	$13 160.01	0.29	$3816.40
		Origin Energy	QPS2	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS3	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS4	Energy	$13 160.01	0.24	$3158.40
16:50	$13 160.01	Origin Energy	QPS2	Energy	$13 160.01	0.33	$4342.80
		Origin Energy	QPS3	Energy	$13 160.01	0.33	$4342.80
		Origin Energy	QPS4	Energy	$13 160.01	0.33	$4342.80
16:55	$349.99	AGL (SA)	TORRB1	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB2	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB3	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB4	Energy	$349.99	0.25	$87.50
17:00	$349.99	AGL (SA)	TORRB1	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB2	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB3	Energy	$349.99	0.25	$87.50
		AGL (SA)	TORRB4	Energy	$349.99	0.25	$87.50
Spot price		**$6755/MWh**					

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

Table 7: Price setter for 5.30 pm trading interval

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
17:05	$13 160.01	Origin Energy	QPS2	Energy	$13 160.01	0.33	$4342.80
		Origin Energy	QPS3	Energy	$13 160.01	0.33	$4342.80
		Origin Energy	QPS4	Energy	$13 160.01	0.33	$4342.80
17:10	$13 168.02	Origin Energy	QPS5	Energy	$13 168.02	1.00	$13168.02
17:15	$13 168.02	Origin Energy	QPS5	Energy	$13 168.02	1.00	$13168.02
17:20	*$14 7731.96*	Origin Energy	MORTLK12	Energy	$92.05	-9.94	-$914.98
		EnergyAustrali	TALWA1	Energy	$13 457.81	11.05	$14 8708.80
17:25	$125.22	AGL Energy	LYA1	Raise 60	$0.20	0.83	$0.17
		AGL Energy	LYA3	Raise 6 sec	$0.80	0.33	$0.26
		AGL (SA)	TORRA2	Energy	$124.99	0.50	$62.50
		AGL (SA)	TORRA2	Raise 60	$0.04	-0.42	-$0.02
		AGL (SA)	TORRA2	Raise 6 sec	$0.50	-0.17	-$0.09
		AGL (SA)	TORRA4	Energy	$124.99	0.50	$62.50
		AGL (SA)	TORRA4	Raise 60	$0.04	-0.42	-$0.02
		AGL (SA)	TORRA4	Raise 6 sec	$0.50	-0.17	-$0.09
17:30	$124.99	AGL (SA)	TORRA2	Energy	$124.99	0.10	$12.50
		AGL (SA)	TORRA2	Raise 6 sec	$0.50	-0.03	-$0.02
		AGL (SA)	TORRA3	Energy	$124.99	0.09	$11.25
		AGL (SA)	TORRA4	Energy	$124.99	0.10	$12.50
		AGL (SA)	TORRA4	Raise 6 sec	$0.50	-0.03	-$0.02
		AGL (SA)	TORRB1	Energy	$124.99	0.18	$22.50
		AGL (SA)	TORRB1	Raise 6 sec	$0.50	0.07	$0.04
		AGL (SA)	TORRB2	Energy	$124.99	0.17	$21.25
		AGL (SA)	TORRB3	Energy	$124.99	0.18	$22.50
		AGL (SA)	TORRB4	Energy	$124.99	0.17	$21.25
Spot price		**$8958/MWh**					

Table 8: Price setter for 6.30 pm trading interval

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
18:05	$13 160.01	Origin Energy	QPS1	Energy	$13 160.01	0.29	$3816.40
		Origin Energy	QPS2	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS3	Energy	$13 160.01	0.24	$3158.40

DI	Dispatch Price ($/MWh)	Participant	Unit	Service	Offer price ($/MWh)	Marginal change	Contribution
		Origin Energy	QPS4	Energy	$13 160.01	0.24	$3158.40
18:10	$13 160.01	Origin Energy	QPS1	Energy	$13 160.01	0.29	$3816.40
		Origin Energy	QPS2	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS3	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS4	Energy	$13 160.01	0.24	$3158.40
18:15	$4040.07	GDF Suez	LOYYB1	Energy	$10.50	-6.68	-$70.14
		GDF Suez	LOYYB2	Energy	$10.50	-6.68	-$70.14
		Snowy Hydro	MURRAY	Energy	$290.00	14.41	$4178.90
18:20	$13 168.02	Origin Energy	QPS5	Energy	$13 168.02	1.00	$13168.02
18:25	$13 160.01	Origin Energy	QPS1	Energy	$13 160.01	0.29	$3816.40
		Origin Energy	QPS2	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS3	Energy	$13 160.01	0.24	$3158.40
		Origin Energy	QPS4	Energy	$13 160.01	0.24	$3158.40
18:30	$369.02	GDF Suez	DRYCGT3	Energy	$369.02	1.00	$369.02
18:05	$13 160.01	Origin Energy	QPS1	Energy	$13 160.01	0.29	$3816.40
Spot price		**$9510/MWh**					

Appendix C: Closing bids

Figures C1 to C2 highlight the half hour closing bids for participants in South Australia 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.

Figure C1: Engie (Dry Creek, Mintaro, Pelican Point, Port Lincoln, Snuggery) closing bid prices, dispatch and spot price

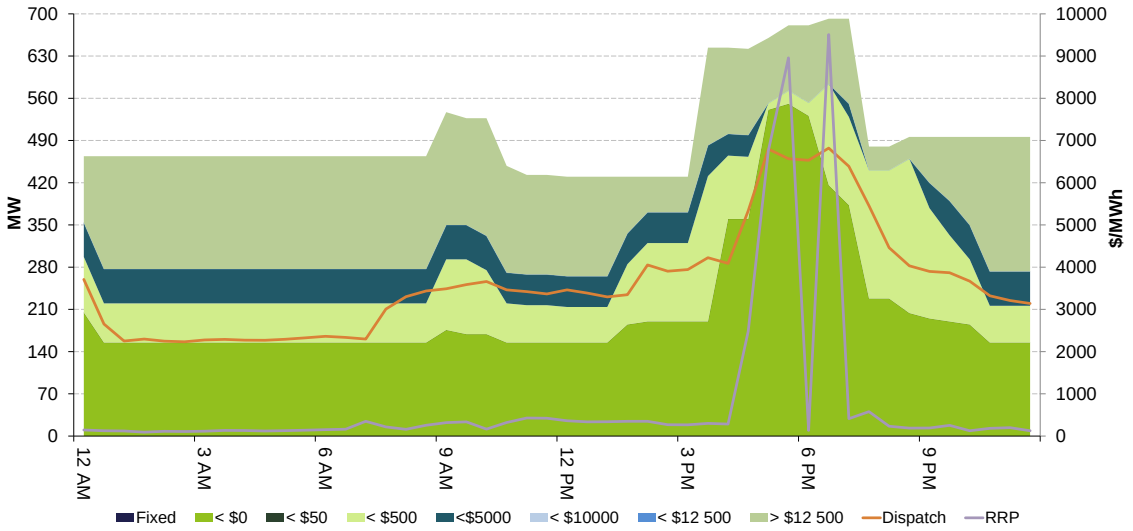
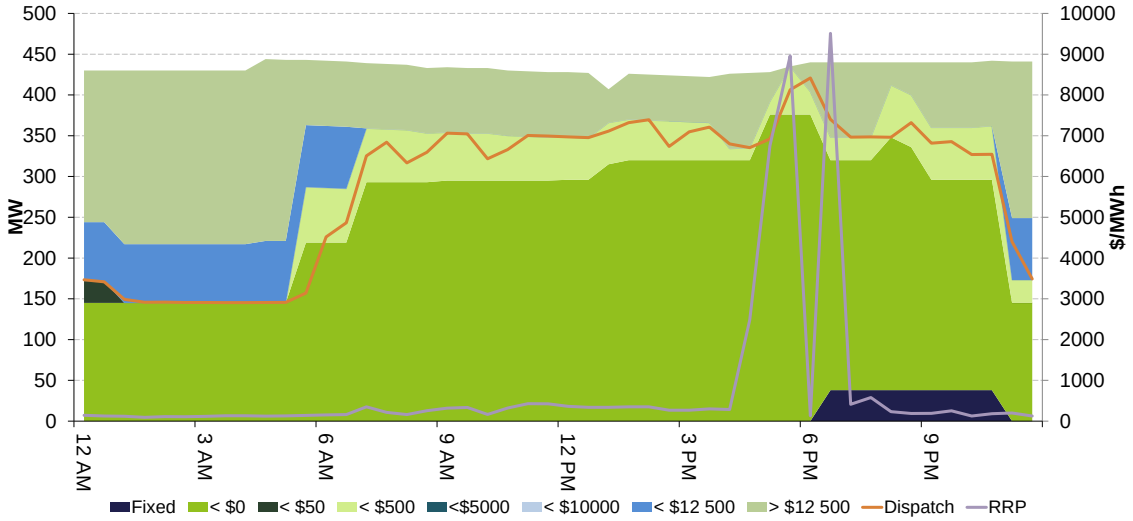


Figure C2: Origin Energy (Ladbroke Grove, Osborne, Quarantine) closing bid prices, dispatch and spot price



Appendix D: Relevant Market Notices

The following market notices either were notifying the market of the network issues in South Australia.

Market Notice	Type	Date of issue	Last Changed
57295	RESERVE NOTICE	9/02/2017 3:28:11 AM	9/02/2017 3:28:11 AM

External Reference

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

AEMO declares a Forecast LOR2 condition for the South Australia region.

From 1630 hrs to 1800 hrs Thursday, 9 February 2017

The contingency capacity reserve required is 200 MW

The minimum reserve available is 156 MW

AEMO is seeking a market response.

AEMO determines the latest time it would need to intervene through an AEMO intervention event is 1430 hrs Thursday, 9 February 2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57307	RESERVE NOTICE	9/02/2017 10:49:58 AM	9/02/2017 10:49:58 AM

External Reference

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

AEMO declares a Forecast LOR2 condition for the South Australia region.

From 1530 hrs to 1800 hrs Thursday, 9 February 2017

The contingency capacity reserve required is 220 MW

The minimum reserve available is 122 MW

AEMO is seeking a market response.

AEMO determines the latest time it would need to intervene through an AEMO intervention event is 1330 hrs Thursday, 9 February 2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57308	RESERVE NOTICE	9/02/2017 10:51:14 AM	9/02/2017 10:51:14 AM

External Reference

Forecast Lack Of Reserve Level 1 (LOR1) in the South Australia Region - PD PASA

Reason

AEMO ELECTRICITY MARKET NOTICE

Forecast Lack Of Reserve Level 1 (LOR1) in the South Australia Region - PD PASA

AEMO declares a Forecast LOR1 condition for the South Australia Region.

From 1330 hrs to 1530 hrs and 1800 to 1900 hrs Thursday 9th February 2017

The contingency capacity reserve required is 420 MW

The minimum reserve available is 217 MW

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57313	RESERVE NOTICE	9/02/2017 1:20:52 PM	9/02/2017 1:20:52 PM

External Reference

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Refer to AEMO Electricity Market Notice No. 57307

AEMO declares a Forecast LOR2 condition for the South Australia region.

From 1530 hrs to 1800 hrs Thursday, 9 February 2017

The contingency capacity reserve required is 220 MW

The minimum reserve available is 129 MW

AEMO is seeking a market response.

AEMO determines the latest time it would need to intervene through an AEMO intervention event is 1400 hrs Thursday, 9 February 2017

AEMO intends to intervene through an AEMO intervention event at 1400 hrs if a sufficient market response is not achieved.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57318	RESERVE NOTICE	9/02/2017 2:39:54 PM	9/02/2017 2:39:54 PM

External Reference

Actual Lack Of Reserve Level 1 (LOR1) in the South Australia Region- 9/02/17

Reason

AEMO ELECTRICITY MARKET NOTICE

Actual Lack Of Reserve Level 1 (LOR1) in the South Australia Region- 9/02/17

An Actual LOR1 condition has been declared for the South Australia Region from 1430 hrs.

The Actual LOR1 condition is forecast to exist until 1530 hrs.

The contingency capacity reserve required is 414 MW

The minimum reserve available is 293 MW

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57319	RESERVE NOTICE	9/02/2017 2:49:29 PM	9/02/2017 2:49:29 PM

External Reference

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Reason

AEMO ELECTRICITY MARKET NOTICE

Update - Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA -Thursday 9th February 2017.

Refer to AEMO Electricity Market Notice No. 57313

AEMO declares a Forecast LOR2 condition for the South Australia region.

From 1600 hrs to 1800 hrs Thursday, 9 February 2017

The contingency capacity reserve required is 214 MW

The minimum reserve available is 126 MW

AEMO is seeking a market response.

AEMO determines the latest time it would need to intervene through an AEMO intervention event is 1500 hrs Thursday, 9 February 2017

AEMO intends to intervene through an AEMO intervention event at 1500 hrs if a sufficient market response is not achieved.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57310	MARKET INTERVENTION	9/02/2017 3:17:21 PM	9/02/2017 3:17:21 PM

External Reference

Direction - Pelican Point Power Limited (Pelican Point GT12) - 9/02/17

Reason

AEMO ELECTRICITY PARTICIPANT NOTICE.

Direction - Pelican Point Power Limited

In accordance with clause 4.8.9 of the National Electricity Rules AEMO is issuing a direction to Pelican Point GT 12 to take the following action.

Synchronise and dispatch to minimum load.

The direction is issued subject to the Registered Participant's best endeavours to comply with it unless compliance would be a hazard to public safety or materially risk damaging equipment or contravene any other law.

The direction is issued at 1505 hrs 9/02/17 and is expected to stay in place until 1900 hrs 9/02/17

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57312	MARKET INTERVENTION	9/02/2017 3:17:31 PM	9/02/2017 3:17:31 PM

External Reference

Direction - South Australia region - 9/02/17

Reason

AEMO ELECTRICITY MARKET NOTICE.

In accordance with clause 4.8.9 of the National Electricity Rules AEMO has issued a direction to a participant in the South Australia region.

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

The direction was issued at 1505 hrs 9/02/17 and is expected to stay in place until 1900 hrs 9/02/17.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57316	MARKET INTERVENTION	9/02/2017 3:17:46 PM	9/02/2017 3:17:46 PM

External Reference

AEMO Intervention Event intervention price dispatch intervals - 9/02/17

Reason

AEMO ELECTRICITY MARKET NOTICE.

AEMO Intervention Event intervention price dispatch intervals - 9/02/17

Refer AEMO Electricity Market Notice No. 57312

An AEMO Intervention Event has been implemented by issuing a direction to maintain the power system in a reliable operating state.

AEMO declares all dispatch intervals during the AEMO Intervention Event to be intervention price dispatch intervals.

The AEMO Intervention Event commenced in the 1510 hrs dispatch interval and is forecast to apply until 1900 hrs 9/02/17

Intervention pricing may be implemented during these intervention price dispatch intervals. AEMO will provide an update market notice when intervention pricing has been implemented in dispatch.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57321	MARKET INTERVENTION	9/02/2017 3:52:16 PM	9/02/2017 3:52:16 PM

External Reference

Update - AEMO Intervention Event intervention price dispatch intervals - 9/02/17

Reason

AEMO ELECTRICITY MARKET NOTICE.

Update - AEMO Intervention Event intervention price dispatch intervals - 9/02/17

Refer AEMO Electricity Market Notice No. 57312 and 57316

The AEMO Intervention Event commenced in the 1510 hrs dispatch interval and is forecast to apply until 1900 hrs 9/02/17.

Intervention pricing was implemented from the 1550 hrs dispatch interval and is forecast to apply until the end of the AEMO Intervention Event.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57336	RESERVE NOTICE	9/02/2017 5:06:09 PM	9/02/2017 5:06:09 PM

External Reference

Cancellation of the Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA - Thursday 9th February 2017.

Reason

AEMO ELECTRICITY MARKET NOTICE

Cancellation of the Forecast Lack Of Reserve Level 2 (LOR2) in the South Australia region - PD PASA - Thursday 9th February 2017.

Refer to AEMO Electricity Market Notice No. 57319

The Forecast LOR2 condition in the South Australia Region advised in AEMO Electricity Market Notice No.57319 is cancelled at 1600 hrs 9/02/17.

The Forecast LOR2 condition was resolved by the AEMO Intervention Event declared in market notice 57312. Please note PD PASA is not reporting the effective LOR reserve in the South Australia region during the period of the Intervention Event due to the effect of the direction constraint.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57340	MARKET INTERVENTION	9/02/2017 5:17:48 PM	9/02/2017 5:17:48 PM

External Reference

Update - Direction - South Australia region - 9/02/17

Reason

AEMO ELECTRICITY MARKET NOTICE.

Update to AEMO Electricity Market Notice No. 57312

For the duration of the direction referred to in Market Notice 57312, AEMO has applied constraints to generating units in the South Australia region to minimise the effect on interconnector flows and minimise the number of Affected Participants in accordance with clause 4.8.9(h) of the National Electricity Rules.

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57347	MARKET INTERVENTION	9/02/2017 7:09:55 PM	9/02/2017 7:09:55 PM

External Reference

Cancellation - Direction South Australia Region Thursday, 9 February 2017

Reason

AEMO ELECTRICITY MARKET NOTICE

Cancellation - Direction South Australia Region Thursday, 9 February 2017

Refer AEMO Electricity Market Notices 57312 and 57340

Direction cancelled at 1900 hrs Thursday, 9 February 2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57348	MARKET INTERVENTION	9/02/2017 7:10:25 PM	9/02/2017 7:10:25 PM

External Reference

Cancellation: Direction - Pelican Point Power Limited (Pelican Pt GT12) Thursday, 9 February 2017.

Reason

AEMO ELECTRICITY PARTICIPANT NOTICE.

Cancellation: Direction - Pelican Point Power Limited (Pelican Pt GT12) Thursday, 9 February 2017.

Refer to AEMO Participant Market Notice 57310

Direction cancelled at 1900 hrs Thursday, 9 February 2017

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57349	RESERVE NOTICE	9/02/2017 7:20:35 PM	9/02/2017 7:20:35 PM

External Reference

Actual Lack Of Reserve Level 1 (LOR1) in the South Australia Region. PD PASA.

Reason

AEMO ELECTRICITY MARKET NOTICE

Actual Lack Of Reserve Level 1 (LOR1) in the South Australia Region.

An Actual LOR1 condition has been declared for the South Australia Region.

From 1900 hrs to 2000 hrs Thursday, 9 February 2017

The contingency capacity reserve required is 253 MW

The minimum reserve available is 200 MW

Manager NEM Real Time Operations

Market Notice	Type	Date of issue	Last Changed
57350	RESERVE NOTICE	9/02/2017 8:07:42 PM	9/02/2017 8:07:42 PM

External Reference

Cancellation of Actual (LOR1) condition in the South Australia region.

Reason

AEMO ELECTRICITY MARKET NOTICE

Cancellation of Actual (LOR1) condition in the South Australia region.

Refer to AEMO Electricity Market Notice No. 57349

The Actual LOR1 Condition in the South Australia Region is cancelled at 2000 hrs Thursday, 9 February 2017.

Manager NEM Real Time Operations

Appendix E: Pricing during intervention

At times, AEMO, may need to override the normal dispatch process to maintain system security. In accordance with the National Electricity Rules (NER) a dispatch interval where an AEMO intervention event occurs, must be declared an intervention price dispatch interval and set the energy and FCAS prices for all regions as if AEMO had not intervened in the market. An intervention pricing interval is declared when AEMO directs a participant to operate plant other than in accordance with dispatch instructions, or activates a reliability and emergency reserve trader (RERT) contract.

RERT contracts refer to specific arrangements by AEMO by which additional capacity may be made available under special circumstances. AEMO may dispatch or activate a RERT contracts to address a power system security situation.

Under normal operations AEMO sets targets for generation and interconnectors and determines wholesale electricity market prices (energy and FCAS) in a single calculation for every five minute dispatch interval. Under “Intervention pricing” these are calculated twice for each dispatch interval, one taking into account the direction called “Intervention” and one that does not include the direction called “What-if”.

The “Intervention” calculation takes into account the direction by AEMO (in this case at Pelican Point) and is used to set targets for generation in order to meet demand. The pricing outcome of this calculation is not received by the generators.

The “What-If” calculation does not take the direction into account and is used to calculate the wholesale electricity market price and is received by generators. The generation targets calculated are not used to dispatch generation.

These calculations dispatch generation to meet demand (intervention calculation) while providing the pricing signal to indicate a shortage of supply (what-if calculation).

Appendix F: Lack of Reserve

AEMO is required to monitor the level of reserve, or spare capacity, within each region of the NEM. 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 from other regions of the NEM, and the regional customer demand at that time.

Reserves are 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 market response from generators to increase their declared available capacity or retailers to reduce demand to address any forecast reserve shortfalls. Actual LOR notices are also 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 generator or the failure of a transmission line that would reduce interconnector capacity.

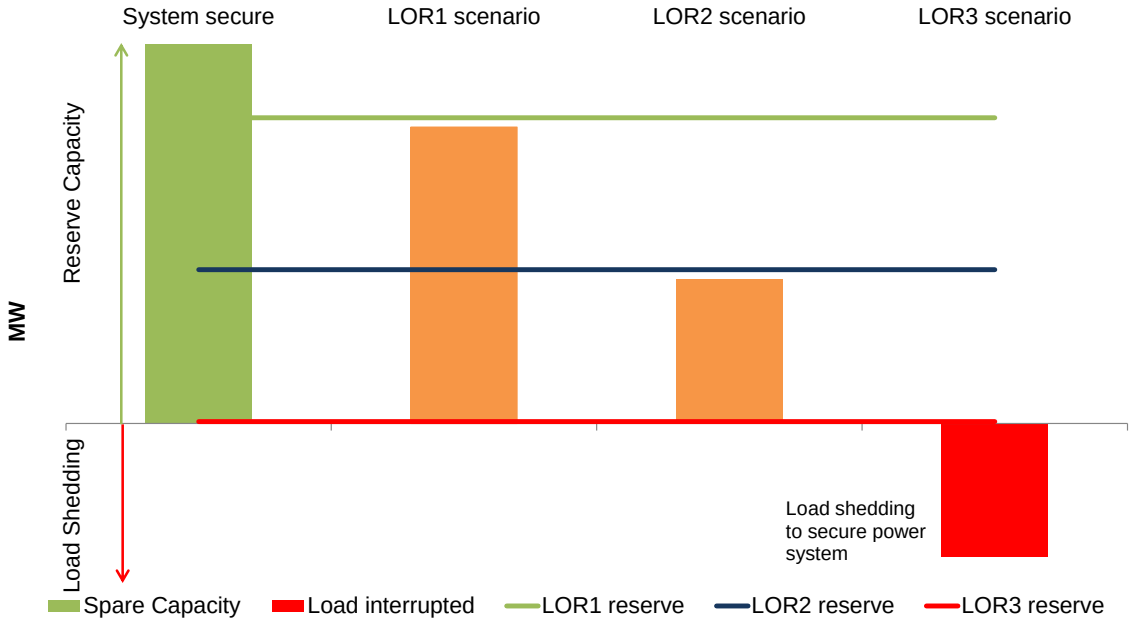
The three LOR levels are broadly categorised as follows: [5]

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

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

[5] These definitions have been simplified for the sake of readability. An interactive glossary of electricity market terms can be found on the AEMO website at: https://www.aemo.com.au/Datasource/Archives/Archive1767#

Figure 3: Spare capacity and lack of reserve scenarios



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 8 February 2017 in South Australia).

The solid green and amber blocks represent spare capacity. As the spare capacity drops below a reserve line (the horizontal lines) either by a reduction in available capacity or an increase in demand, a new reserve condition exists. AEMO monitors this situation continuously and issues LOR notices to inform participants.