AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Activation of unscheduled reserves for Victoria and South Australia – 19 January 2018

May 2018

Event report for the National Electricity Market
Annexure B of *Summer 2017-18 operations review*

Important notice

PURPOSE

This report has been prepared for the purposes of providing information about the 19 January 2018 Reliability and Emergency Reserve Trader (RERT) activation in accordance with clause 3.20.6(a) of the National Electricity Rules (NER), in the Summer 2017-18 Operations Review. This report uses information available as at 1 May 2018.

Unless otherwise indicated, terms in this report have the same meanings as those defined in the NER.

DISCLAIMER

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VERSION CONTROL

Version	Release date	Changes
1	23/5/2018	

Summary

Between 18 and 22 January 2018, much of south-eastern Australia experienced hot temperatures and high electricity demands. These elevated temperatures, coupled with changes in generation and network conditions, resulted in consistent forecasts of lack of reserve (LOR) 2 conditions for the afternoon of 19 January 2018.

Additionally, several other events, including a forecast derating of Basslink, a trip of a major generating unit in Victoria, and the threat of bushfire in the southwest of Victoria presented an increased risk to the power system.

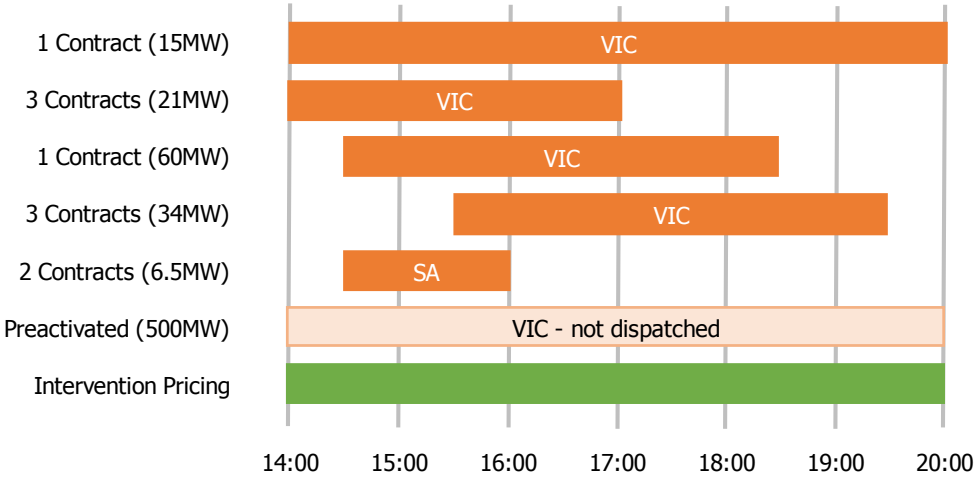
In response to these forecasts and supply uncertainties, on 18 January AEMO determined that pre-activation of 500 megawatts (MW) of longer-notice (20+hr) Reliability and Emergency Reserve Trader (RERT) reserve contracts was required, to ensure these resources would be available to cover contingency events on 19 January 2018.

As there was insufficient market response to alleviate the risk to supply reliability, AEMO subsequently activated 130 MW of unscheduled reserves across eight reserve contracts in Victoria, and 6.5 MW of unscheduled reserves across two reserve contracts in South Australia. These contracts were activated between 1400 hrs and 1530 hrs on 19 January 2018, with all ten contracts being deactivated by 2000 hrs.

The procurement and activation of reserves aligns with AEMO's obligations under the Reliability Standard Implementation Guidelines (RSIG) and the National Electricity Rules (NER). The timing, size and location of all reserve procurement and activation is shown in Figure 1. A complete timeline of key events is detailed in Section 3.

AEMO considered the relevant lead time, minimum run time, size, and activation costs associated with each reserve contract, and attempted to address the reserve requirement while minimising cost to market customers, in relation to pre-activation and activation. The total activation and pre-activation cost associated with this event was approximately $24 million.

Figure 1 Summary of reserve contract activation and intervention pricing on 19 January 2018



AEMO has assessed the actions taken to manage the risk posed to the power system on 19 January 2018, and is satisfied that all applicable procedures and processes were followed in assessing the need for market intervention, determining the latest time to intervene, and enacting and managing the intervention itself.

Intervention using RERT is rare and, following the event on 19 January 2018, AEMO is progressing several improvements to its RERT processes and management tools.

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1. Background

Reserve represents the amount of available supply in excess of demand, and therefore the amount available to maintain system reliability in the event of credible contingency events on the system.

Forecast reserve levels change over time as expectations of supply and demand change in response to changes in ambient conditions (such as temperature and weather), or plant changes (such as generator and network outages).

The following sections outline the risks and uncertainties associated with these factors on 18 and 19 January 2018.

1.1 Weather

Weather forecasts, and particularly extreme temperatures, have a significant impact on demand projections. The weather pattern on Thursday 18 January 2018 was dominated by high pressure just off the New South Wales coast and a pool of very warm air that had been developing over the central parts of the continent.

A trough was moving towards the Great Australian Bight and was forecast to weaken as it approached the South Australian coastline on Friday 19 January. Forecasts issued on Thursday morning indicated maximum temperatures for Adelaide (West Terrace) of 41°C for Thursday and 41°C for Friday (after a minimum of 27°C).

Winds were expected to be from the north or north-west both days, although there was an expectation that they would shift west to south-west by early afternoon Friday, and south-west to south-east during the evening. It was indicated that cooling would only be subtle with a wind change, thanks to the dominant very warm air just above the surface. Maximum temperatures were forecast to remain in the mid-30s for Adelaide for the weekend to follow, despite a south-east component to the low-level wind flow.

Forecasts for Melbourne CBD issued by the Bureau of Meteorology early on Thursday 18 January indicated a maximum temperature of 39°C for both Thursday and Friday, with a minimum temperature of 25°C forecast for Friday.

Forecasts issued late Thursday 18 January for Friday 19 January maintained a maximum temperature forecast for Adelaide of 41°C, while forecasts for Melbourne raised the maximum temperature forecast to 42°C for Friday. The early morning forecast issued Friday 19 January was consistent with this.

Figure 2 Maximum temperature observations 18 and 19 January 2018

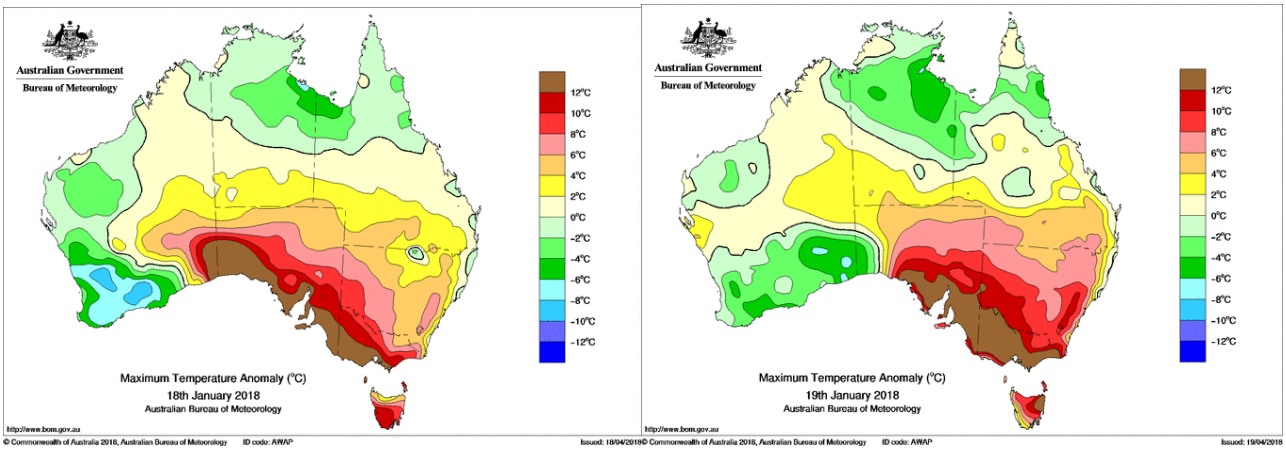


Figure 2 above indicates maximum temperatures more than 12°C above average for much of South Australia and Victoria on 18 and 19 January 2018. Actual temperatures stayed above 40°C until late afternoon on both days.

Observations during the late morning of Friday 19 January showed a change advancing more quickly than expected, resulting in some temperatures falling by nearly 10°C in 20 minutes. The change reached Melbourne (Olympic Park)

at 1429 Australian Eastern Daylight Time (AEDT). Initially temperatures fell from near 40°C to about 33°C. A more sustained cooling set in over the Melbourne CBD from around 1550 AEDT.

This weather system was a particularly challenging forecast situation, due to the extreme temperature outcomes, rapid temperature changes, and the substantial levels of warm air near the surface making the magnitude of changes difficult to project.

1.2 Availability of generating units

With the exception of approximately 409 MW across five units, all generating units were available for dispatch in Victoria and South Australia on 18 and 19 January 2018. Of these, most were outages with no or extended recall times. Due to the high ambient temperatures, many available thermal units also had reduced capacities.

In addition, a governor control issue at Loy Yang Power Station unit B1 resulted in a trip from 530 MW for one hour on Thursday 18 January. While this did not result in security or reliability issues at the time, it increased risk and uncertainty associated with supply while investigations were underway into the event.

1.3 Availability of network assets

Reserve conditions and uncertainty on 18 and 19 January 2018 were further exacerbated by network availability concerns.

A bushfire near Dartmoor in south-western Victoria on 18 January 2018 was reported within 7 km of the Heywood Interconnector, which required a reclassification assessment to be undertaken. As the fire was south of the interconnector and moving south-easterly, no action was deemed necessary, and the bushfire was monitored for the remainder of the event. However, had conditions changed and the interconnector been reclassified as a credible contingency, interconnector capacity would have been reduced from 600 MW to 250 MW, bringing forward LOR 2 conditions in South Australia.

Basslink capacity was forecast to be significantly reduced on 19 January 2018 due to expected high ambient temperatures. Basslink has a number of different thermal equipment ratings that can cause automatic capacity reductions. Bids are automatically submitted based on capacity calculations which consider air temperature, cable temperature, and transformer hot spot measurements. Basslink capacity will be reduced if ambient temperature exceeds:

1. 33°C at George Town converter stations and progressively reduced to 0 MW at 36°C.
2. 43°C at Loy Yang converter stations, and progressively reduced to 0 MW at 46°C.

Forecast temperatures at Loy Yang were 35°C for 19 January 2018, and several Basslink rebids were received over the course of 18 January and 19 January which impacted Pre-Dispatch Projected Assessment of System Adequacy (PD PASA) reserve forecasts and increased operational uncertainty.

2. Intervention assessment

2.1 The need for intervention

By 1430 hrs on 18 January 2018, PD PASA runs had begun to identify forecast LOR 1 and LOR 2 conditions in Victoria and South Australia for 19 January 2018.

By the following day, elevated temperatures, coupled with expected supply conditions, resulted in consistent forecasts of LOR 2 conditions in Victoria and South Australia for the afternoon of 19 January 2018.

The severity of these shortfalls was exacerbated by:

- High Forecast Uncertainty Measure (FUM)[1] for the relevant periods.
- The recall time of some thermal units in Victoria and South Australia.
- The availability of short-notice RERT in Victoria and South Australia.
- The location of bushfires at Dartmoor in south-west Victoria near the Heywood Interconnector.
- Significant anticipated capacity reductions on Basslink, due to high ambient temperatures.

Given persistent LORs, and the significant risk factors highlighted above (particularly Basslink capacity reductions), AEMO determined that pre-activation of longer notice (20+hr) reserve contracts was required to ensure reserves would be available to cover contingency events on 19 January 2018.

Reserve shortfalls continued to be projected in PD PASA runs on 19 January 2018, showing reserves falling below:

- 560 MW in Victoria, with LOR 2 conditions starting between 1400 hrs and 1430 hrs.
- 350 MW in South Australia, with LOR 2 conditions between 1330 hrs and 1430 hrs.

A summary of the LOR forecasts and their timings is available in Appendix A.

To maintain power system reliability, and in accordance with the RSIG, AEMO determined that activation of RERT contracts would be required to alleviate these risks to supply reliability, should insufficient market response be provided.

2.2 Assessment of market response and latest time to intervene

AEMO assessed the latest time to intervene based on the time that LOR 2 conditions were forecast to begin, and on the lead time required to activate sufficient RERT contracts to reduce the risk to supply reliability at the least cost to market customers.

AEMO had a range of existing reserve contracts available, and additionally issued Invitations to Tender for short-notice reserve contracts on 18 and 19 January 2018. This was done to expand the pool of available reserve contracts, and maximise the amount of time available for market response before an intervention would become necessary.

AEMO revised the latest time to intervene several times as conditions changed following initial LOR forecasts on 18 January 2018. The final point identified was 1400 hrs on 19 January 2018, and AEMO had a total of 13 reserve contracts available by this time.

Under NER 4.8.5A(a) and (c), AEMO must notify the market of any anticipated power system security or reliability issue that may require intervention, and the latest time for market response before AEMO would need to intervene.

As the LOR 2 conditions had been persistently forecast, AEMO issued a number of Market Notices advising of the LOR conditions, sought a market response, and provided details on the latest time for intervention. A full list of relevant Market Notices is available in Appendix B.

[1] The FUM measures overall uncertainty in reserve forecasts due to forecasting of demand, intermittent generation, and scheduled generation availability, and AEMO used this to help guide its decisions on the management of reserves on 19 January 2018. The FUM has been used in the determination of LOR trigger levels since 15 February 2018.

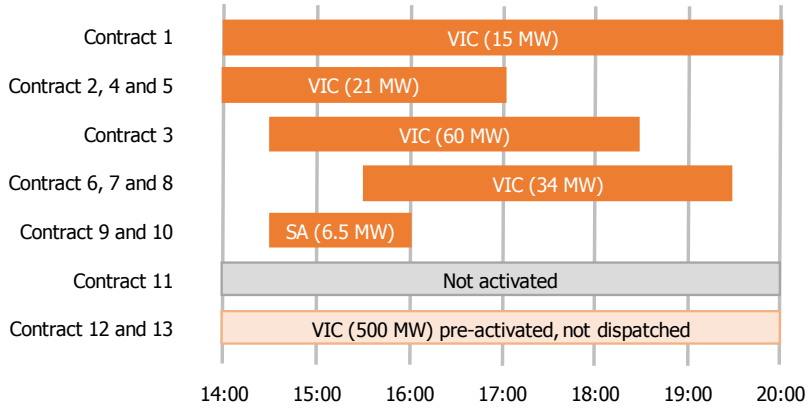
2.3 Decision to intervene

As described above, with LOR2 conditions identified by PD PASA, significant forecast uncertainty, and additional risk factors to both supply and network availability (particularly Basslink capacity reductions), AEMO determined that pre-activation of longer notice (20+hr) reserve contracts was required to ensure reserves would be available to cover contingency events on 19 January 2018.

While these reserves had been pre-activated on 18 January 2018, the latest time to intervene by dispatching reserves continued to evolve, with a final time declared to be 1400 hrs on 19 January 2018.

At 1400 hrs on 19 January, insufficient market response had been provided, and LOR 2 conditions were still forecast to apply. AEMO determined that additional reserves were required to maintain the reliability of the power system. AEMO issued activation instructions electronically, using the RERT interface developed for this purpose. The timing, size, and location of the activated reserve contracts is shown in Figure 3. As these contracts are commercial in confidence, they are referred to as Contract 1 to 13 for the purposes of this report.

Figure 3 Timing, size and location of reserve contracts activated on 19 January 2018



Three available reserve contracts were not activated on 19 January 2018:

- Contract 11 received an automated activation instruction, but was subsequently requested not to activate after discussion between AEMO and the reserve provider regarding the availability of the reserve.
- Contracts 12 and 13 were pre-activated on 18 January 2018, however were not subsequently activated on 19 January 2018. These reserves were pre-activated to ensure availability in case of a large contingency event, however such a contingency event did not eventuate.

AEMO issued Market Notices to inform the market that it was intervening by activating RERT, and declaring that intervention pricing would start from the dispatch interval ending 1405 hrs 19 January 2018. Later Market Notices announced that the reserves had been de-activated and the intervention ended at 2000 hrs 19 January 2018.

2.4 Cost of intervention

NER clause 3.20.2(b)(2) requires that when AEMO activates reserve contracts, it should aim to maximise the effectiveness of the activation at the least cost to end use consumers of electricity. Accordingly, AEMO activated reserve contracts based on cost, capacity, time to activate, minimum activation time, and the profile of the forecast lack of reserve.

The cost associated with intervening through the RERT on 19 January 2018 was approximately $24 million. These costs exclude ongoing RERT availability costs which do not apply to any one specific event, and are accurate as at 15 May 2018 (subject to finalisation with RERT providers).

Table 1 Costs associated with the 19 January 2018 RERT event ($ million)

	Pre-Activation Costs	Activation Costs	Other Costs[A]	Total Cost
19 January 2018	$21.56	$2.34	$0.17	**$24.07**

A. Other costs represent the compensation paid to Market Participants due to the intervention event (for example, to compensate for energy generation which is displaced by RERT capacity), and to Eligible Persons due to changes in interconnector flows, and therefore changes in the value of Settlement Residues.

3. Intervention process

AEMO's general process for deploying RERT is documented in its Procedure for the Dispatch and Activation of Reserve Contracts[2]. AEMO considers that it followed all applicable processes under NER clause 4.8 prior to the activation of reserves. Table 2 provides a high-level timeline of the intervention event. Figure 4 below outlines the process of pre-activation, activation, and de-activation for slow activation reserves.

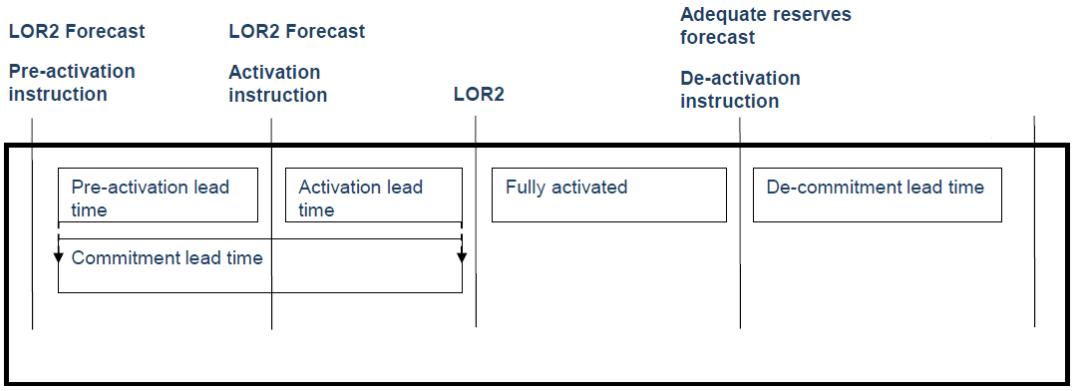
Table 2 Timeline of key events on 19 January 2018

Time	Event/Comment
18 January 2018	
1430 hrs	The 1430 hrs PD PASA run identified that VIC had a forecast LOR 2 and SA had a forecast LOR 1 for TI ending 1500hrs on 19 January 2018. AEMO sought a market response (MN 60795).
1450 hrs	AEMO assessed these LOR conditions in conjunction with the significant supply uncertainties and network risks, and subsequently determined that pre-activation of longer notice (20+hr) reserve contracts was required to ensure reliability of supply on 19 January 2018 in the event of a contingency event. AEMO contacted and pre-activated 500 MW of reserve contracts.
19 January 2018	
0827 hrs	Following the 0830 hrs PD PASA run, AEMO declared forecast LOR 2 in VIC and SA, and sought a market response. (MN 60833, 60834)
1110 hrs	Latest time to intervene was determined as 1200 hrs for VIC and SA. (MN 60837, 60838)
1122 hrs	AEMO issued requests for tender for the provision of additional reserve in VIC. (MN60798)
1313 hrs	AEMO issued an activation instruction to the RERT Contract 1 provider for 15MW activation from 1400 hrs to 2000 hrs.
1314 hrs	AEMO issued an activation instruction to the RERT Contract 2 provider for 8MW activation from 1400 hrs to 1700 hrs.
1335 hrs	Constraint equations #RT_VIC1_OE and #RT_VIC1_PE invoked for RERT Contract 1 from 1400 hrs until 2000 hrs of RERT Contract 1 (minimum run time of 6 hours).
1342 hrs	MNs issued to advise that RERT had been activated and the invocation of RERT constraints between 1400 hrs and 2000 hrs. (MN60843, MN60844)
1349 hrs	Latest time to intervene is determined as 1400 hrs for VIC and SA. (MN 60845, 60846)
1408 hrs	Constraint equations #RT_VIC2_OE and #RT_VIC2_PE invoked for RERT Contract 2 from 1430 hrs until 1700 hrs of RERT Contract 2 (min run time of 60 mins).
1422 hrs	AEMO issued an activation instruction to the RERT Contract 3 provider for 60MW activation from 1430 hrs to 1830 hrs. This was less than the minimum activation lead time (1hr), however the provider could provide full capacity from 1430 hrs. Constraint equations #RT_VIC3_OE and #RT_VIC3_PE were invoked for RERT Contract 3 from 1515 hrs until 1615 hrs.
1426 hrs	AEMO issued automatic activation instructions for RERT Contracts 4, 5, 6, 7, 8 and 11. Note that while the automatic instructions were issued at 1426 hrs (and incorrectly indicated activation times), Contracts 4 and 5 were verbally activated from 1400 hrs, and Contracts 6, 7, and 8 were verbally activated from 1530 hrs. AEMO discussed the required activation timing for RERT Contract 11 with its provider and subsequently cancelled its activation. The total activation amount from contracts 4, 5, 6, 7 and 8 was 47MW. Constraint equations #RT_VIC4_OE and #RT_VIC4_PE were invoked to reflect these contracts from 1525 hrs to 1700 hrs.

[2] http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3717---Procedure-for-the-Dispatch-and-Activation-of-Reserve-Contracts.pdf.

Time	Event/Comment
1428 hrs	AEMO issued an activation instruction for RERT Contracts 9 and 10 in SA for a total of 6.5MW activation from 1430 hrs until 1600 hrs. This was less than the minimum activation lead time (1hr), however the provider was able to provide capacity from 1430hrs.
1545 hrs	Constraint equations #RT_VIC4_OE and #RT_VIC4_PE were revoked and replaced by #RT_VIC5_OE and #RT_VIC5_PE from 1545 hrs to 1700 hrs to amend the activated capacity amount.
1402 hrs	Actual LOR 1 in VIC declared. (MN 60847)
1444 hrs	Actual LOR 1 in VIC declared. (MN 60849)
1542 hrs, 1546 hrs	Forecast LOR 2 in VIC and SA cancelled. (MN 60853, 60855)
1621 hrs	Constraint equations #RT_VIC3_OE and #RT_VIC3_PE end time extended to 1830 hrs to reflect the earlier activation instruction.
1753 hrs	Actual LOR 1 cancelled in VIC. (MN60858)
2005 hrs	MNs issued advising cancellation of AEMO intervention event and de-activation of reserve contracts. (MN 60859, 60860)

Figure 4 Process of pre-activation, activation and de-activation for slow activation reserves



4. Changes in dispatch outcomes

4.1 Application of intervention pricing

AEMO declares intervention pricing for periods subject to an AEMO intervention event, including activation of the RERT. Under intervention pricing, NER 3.9.3(b) requires that AEMO set the dispatch price and ancillary service prices at the value which AEMO, in its reasonable opinion, considers would have applied had the intervention event not occurred. AEMO determines and publishes these prices in accordance with the Intervention Pricing Methodology[3].

Intervention pricing was applied for this event in accordance with NER 3.9.3(b) for the full intervention period from DI ending 1405 hrs on 19 January 2018, until DI ending 2000 hrs on 19 January 2018.

During intervention pricing, AEMO performs two runs to generate dispatch targets and spot prices. Dispatch targets are produced from a run which includes the physical impact of the intervention; while energy and ancillary service prices are produced from an intervention pricing run, which attempts to remove the impact of the intervention.

The following sections compare these two runs to assess the impact of RERT on dispatch outcomes.

Please note that for the purposes of participant compensation, AEMO has performed manual reruns of the intervention period correcting the timing of applied RERT constraints to match the activation timing of the associated RERT Contracts. The revisions do not affect the prices on which the market was settled. This is discussed in more detail in Section 5.2.

4.2 Changes in spot market prices

The activated reserves effectively reduce the demand to be met by the spot market. Therefore, spot market prices in the physical run, which include the activated RERT capacity, are expected to be lower than those in the intervention pricing run.

Table 3 compares the maximum and average energy spot prices between the two runs for Victoria and South Australia from 1400 hrs until 2000 hrs on 19 January 2018.

Table 3 Summary of energy spot prices during the RERT event in the physical and pricing run ($/MWh)

	Average Spot Price		Maximum Spot Price	
	Physical Run	**Pricing Run**	**Physical Run**	**Pricing Run**
Victoria	$ 703.87	$ 1,620.94	$ 5,723.09	$ 10,152.42
South Australia	$ 1,577.66	$ 3,537.06	$ 6,369.09	$ 13,408.28

4.3 Changes in generation and interconnector flows

The addition of RERT capacity into Victoria and South Australia reduced the need for imports from neighbouring regions. This is reflected in Tables 4 and 5, which compare generation and interconnector flows between the physical run (including activated RERT contracts), and the revised intervention pricing run (without activated RERT contracts).

[3] Intervention Pricing Methodology https://www.aemo.com.au/-/media/Files/PDF/Intervention-Pricing-Methodology-October-2014.pdf.

Table 4 Estimated changes to local generation in each region (MWh)

	QLD	NSW	VIC	SA	TAS
Revised Pricing Run (Without RERT)	49,574	59,069	49,127	13,842	9,990
Outturn Run (Actual)	49,442	58,935	48,976	13,628	9,993
Change	**-132**	**-134**	**-151**	**-214**	**+3**

Table 5 Estimated changes to interconnector flow between regions (MWh)

	Terranora	QNI	VIC-NSW	Heywood	Murraylink	Basslink
Revised Pricing Run (Without RERT)[A]	-641	-3,978	-1,287	1,192	429	2,868
Outturn Run (Actual)A	-794	-3,702	-1,096	1,394	429	2,868
Change[B]	153 MWh more to NSW	275 MWh less to NSW	191 MWh less to VIC	202 MWh more to SA	0 MWh	0 MWh

A. Positive numbers are for flows flowing north or west, negative for flows flowing south or east.
B. Change = |Actual - Without direction|.

5. Issues and further actions

AEMO considers that it followed all applicable processes under NER Clause 4.8 for the management of the RERT event on 19 January 2018.

Post-event analysis has identified several opportunities for improvement in the way AEMO communicates and implements RERT contracts operationally. These improvements are in addition to those identified through the RERT activation process on 30 November 2017.

In particular, the use of some manual processes was complicated by the number of small reserve contracts being managed, and the changing nature of system reserves on the day due to weather and demand uncertainty.

The following sections provide information on the issues identified, and the actions AEMO is taking to improve the RERT processes and tools. The identified issues did not have a material impact on decision making or market outcomes on 18 and 19 January 2018, and are being addressed to reduce complexity and room for human error in future RERT activation events.

5.1 Communication with the market

AEMO believes it could have improved the level and consistency of information provided to the market surrounding the RERT event. In particular:

- AEMO did not issue a Market Notice to declare that it had activated (and later de-activated) reserve contracts in South Australia.
- AEMO did not issue a Market Notice to declare that it had updated the latest time to intervene until after the previous time had elapsed.

To address these issues, AEMO is updating its RERT management tools to automate the publication of market notices associated with the activation of RERT to avoid human error.

5.2 Application of intervention constraints

Post-event analysis identified that several of the system constraints used to represent reserve activation timings and values were incorrect. Table 6 compares the original and revised constraint details.

Table 6 Original and revised intervention constraints

Region	RERT Constraints	Original Intervention Constraints			Revised Intervention Constraints		
		Start Time	End Time	MW	Start Time	End Time	MW
VIC	#RT_VIC1_P_E	14:00	20:00	15	14:00	20:00	15
	#RT_VIC2_P_E	14:30	17:00	8	14:00	17:00	8
	#RT_VIC3_P_E	15:15	18:30	60	14:30	18:30	60
	#RT_VIC4_P_E	15:25	15:45	60	14:00	17:00	13
	#RT_VIC5_P_E	15:45	17:00	52	15:30	19:30	34
SA	#RT_SA1_P_E	N/A	N/A	N/A	14:30	16:00	6.5

AEMO identified these discrepancies after the RERT event had concluded, and mitigated any market impacts by accounting for the revised intervention constraints in its subsequent settlement processes for participant compensation[4].

AEMO attributes the misapplication of these constraint equations to the increased complexity associated with managing many small reserve contracts at a time when the power system was under considerable stress.

While these discrepancies were identified and dealt with through normal intervention compensation processes, AEMO intends to automate the production of constraints associated with the activation of RERT to prevent these issues from reoccurring.

5.3 Other Issues

Following the RERT event, AEMO has identified two additional areas for improvement.

- **Forecast Demand Adjustments** – the activation of unscheduled reserves in Victoria reduced demand by 130 MW, however demand forecasts were not adjusted downwards for the region. As a result, PD PASA forecasts for the six-hour period following RERT activation may have been higher than expected.

  This issue is being address through automation and tighter integration between AEMO's demand forecasting and RERT activations processes, simplifying RERT driven demand forecast adjustments.

- **Automated activation notices** – on several occasions, the lead times used for activating unscheduled reserves on 19 January 2018 were less than the lead times specified in the associated reserve contracts. In addition, several automated activation notices were issued with incorrect instructions, which needed to be corrected verbally with RERT providers.

  To resolve this issue, AEMO is updating its RERT management tools to better coordinate RERT activations (and revisions) when dealing with multiple contracts with differing pre-activation and activation requirements.

[4] Compensation for Affected Participants and Eligible Persons following an AEMO intervention event is defined in NER clause 3.12.2.

6. Conclusions

On 18 and 19 January 2018, tight supply-demand condition resulted in consistent forecasts of low reserve conditions in South Australia and Victoria. Additionally, several other events, including a forecast derating of Basslink, a trip of a major unit in Victoria, and the threat of bushfire in the southwest of Victoria presented an increased risk to the power system.

In response to these forecasts and supply uncertainties, AEMO determined that pre-activation of 440 MW of longer notice (20+hr) reserve contracts was required to ensure these would be available to cover contingency events on 19 January 2018. Insufficient market response was provided to alleviate the forecast reserve shortfalls, and AEMO subsequently activated 130 MW of unscheduled reserves in Victoria, and 6.5 MW of unscheduled reserves in South Australia.

The total activation cost (including pre-activation costs) associated with this event was approximately $24 million.

AEMO is satisfied that all applicable procedures and processes were followed in assessing the need for intervention, determining the latest time to intervene, and enacting and managing the intervention itself.

AEMO's backcast of the event[5] highlighted that increased risk was likely during the event. The underlying uncertainty on 19 January 2018 would have increased the LOR 2 level from 560 MW to 1,099 MW in Victoria, and from 350 MW to 501 MW in South Australia.

Intervention using RERT process is rare and, following the event on 19 January 2018, AEMO has identified several processes that warrant improvement. AEMO is currently updating its RERT management tools to:

- Automate the publication of Market Notices, and the production of constraint equations, associated with the activation of RERT.
- Integrate AEMO's demand forecasting and RERT activation processes to simplify RERT driven demand forecast adjustments.
- Better coordinate RERT activations when dealing with multiple contracts that have differing pre-activation and activation requirements.
- Allow real-time adjustment of RERT activation plans to better respond to the dynamic operational environment.
- Simplify, and automate where possible, a number of interfaces between AEMO's RERT activation processes and AEMO's market systems.

[5] Using the Australian Energy Market Commission's recently approved rule changes regarding Declaration of LOR conditions as described in section 3.5 of AEMO's Summer 2017-18 Review

A1. PD PASA runs for Victoria and South Australia

In these tables, each column represents a PD PASA run for the 19 January 2018. Comparing successive columns moving to the right represents AEMO's evolving view of forecast reserve conditions. For example, at 1330 hrs (column heading), AEMO estimated that by 1600 hrs (row heading) only 30 MW of reserve would be available in Victoria.

Table 7 Victoria forecast reserve levels for 19 January 2018

		PD PASA Run																				
		0800	0830	0900	0930	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1500	1530	1600	1630	1700	1730	1800
VIC LOR Reserve (MW) for trading intervals (TIs) ending	1300	1457	1216	1204	1220	1192	1188	1225	1183	1176	1177	1176										
	1330	1303	1050	1037	1052	1021	1057	1095	1050	1052	1053	1058	968									
	1400	1106	894	878	890	856	890	918	915	880	876	876	766	806								
	1430	636	364	342	356	326	356	361	759	707	697	687	616	667	669							
	1500	613	320	302	313	284	298	306	257	217	194	174	135	504	545	406						
	1530	710	430	405	414	377	354	351	313	262	248	217	166	169	266	275	800					
	1600	615	287	289	292	256	213	205	158	112	99	65	30	32	155	203	685	730				
	1630	732	464	438	476	435	398	380	335	293	286	246	231	233	300	226	661	691	740			
	1700	778	549	531	534	531	486	467	422	404	380	335	317	357	323	244	671	694	750	815		
	1730	983	799	770	773	738	741	715	678	650	641	592	567	591	417	509	858	866	945	1019	1096	
	1800	1167	1112	1104	997	945	864	802	762	671	649	617	539	635	606	700	1008	1027	1080	1186	1257	1182
	1830	1567	1529	1513	1426	1374	1303	1211	1198	1106	1081	948	969	1021	999	1060	1347	1343	1414	1532	1615	1511
	1900	1950	1908	1895	1823	1779	1713	1618	1540	1445	1315	1292	1357	1462	1430	1486	1738	1740	1773	1896	1987	1930
	1930	2430	2346	2328	2274	2234	2190	2078	2013	1930	1872	1840	1834	2015	1971	2000	2179	2135	2118	2213	2321	2325
	2000	2832	2753	2742	2684	2655	2640	2518	2472	2415	2367	2387	2308	2477	2408	2463	2585	2517	2497	2601	2690	2685

VIC LOR1 Trigger	1100 or 1120
VIC LOR2 Trigger	560
VIC LOR3 Trigger	0

Table 8 South Australia forecast reserve levels for 19 January 2018

		PD PASA Run																				
		0800	0830	0900	0930	1000	1030	1100	1130	1200	1230	1300	1330	1400	1430	1500	1530	1600	1630	1700	1730	1800
SA LOR Reserve (MW) for trading intervals (TIs) ending	1300	1351	1329	1340	1354	1425	1447	1418	1395	1408	1420	1345										
	1330	1252	1168	1155	1174	1147	1177	1160	1149	1136	1216	1224	1048									
	1400	1147	891	868	890	870	879	875	902	878	924	980	827	875								
	1430	621	475	445	456	425	447	440	730	778	727	757	643	705	669							
	1500	600	375	353	358	328	337	342	291	255	218	203	153	513	545	345						
	1530	600	432	405	414	377	354	351	313	262	248	217	166	169	266	154	800					
	1600	600	287	289	292	256	213	205	158	112	99	65	30	32	155	203	685	730				
	1630	623	464	438	476	435	398	380	335	293	286	246	231	233	300	226	661	691	740			
	1700	600	549	531	534	531	486	467	422	404	380	335	317	357	323	244	671	694	730	476		
	1730	600	591	589	593	600	600	600	600	607	600	592	567	591	417	509	690	703	694	441	465	
	1800	600	600	600	600	600	600	600	600	601	600	617	539	631	579	579	680	695	681	438	462	482
	1830	600	600	600	600	600	600	600	600	600	600	599	674	659	615	607	707	717	695	455	479	496
	1900	600	600	600	600	600	601	611	613	618	620	622	699	754	712	707	784	811	773	538	554	570
	1930	622	638	646	656	694	742	742	744	750	751	752	726	888	827	820	878	906	870	634	646	661
	2000	791	791	790	812	864	909	906	906	916	922	925	883	1054	978	976	1022	1046	1006	778	792	814

SA LOR1 Trigger	435 or 600
SA LOR2 Trigger	220 or 350
SA LOR3 Trigger	0

A2. Market Notices

Table 9 Summary of relevant Market Notices issued 19 January 2018

Market Notice	Time	Summary
60833	08:27	Forecast LOR2 Victoria 1400 – 1700 hrs. Market response sought.
60834	08:27	Forecast LOR2 South Australia 1530 – 1600 hrs. Market response sought.
60837	11:10	Updated forecast LOR2 Victoria 1430 – 1700 hrs. Market response sought. Latest time to intervene 1200 hrs.
60838	11:09	Updated forecast LOR2 South Australia 1430 – 1630 hrs. Market response sought. Latest time to intervene 1200 hrs.
60840	11:22	Intention to start RERT negotiations for additional reserve Victoria 1400 – 1700 hrs.
60843	13:43	AEMO intervention event. RERT activated Victoria 1400 – c.2000 hrs. #RT_VIC constraints in dispatch.
60844	13:42	AEMO intervention event. RERT activated. Declaration of intervention pricing from DI 1405.
60845	13:48	Updated forecast LOR2 Victoria 1430 – 1700 hrs. Market response sought. Latest time to intervene 1400 hrs.
60846	13:49	Updated forecast LOR2 South Australia 1500 – 1630 hrs. Market response sought. Latest time to intervene 1200 hrs.
60853	15:42	Forecast LOR2 Victoria cancelled 1530 hrs.
60855	15:46	Forecast LOR2 South Australia cancelled 1530 hrs.
60859	20:05	AEMO intervention event cancelled. RERT deactivated Victoria. RERT ran 1400 – 2000 hrs.
60860	20:05	AEMO intervention ended.

Abbreviations

Abbreviation	Expanded name
DI	Dispatch Interval
MN	Market Notice
NEM	National Electricity Market
NEL	National Electricity Law
NER	National Electricity Rules
PD PASA	Pre-Dispatch Projected Assessment of System Adequacy
RERT	Reliability and Emergency Reserve Trader
SA	South Australia
TI	Trading Interval
VIC	Victoria