Reliability and Emergency Reserve Trader (RERT)

May 2022

Quarterly Report Q1 2022

A report for the National Electricity Market

Important notice

Purpose

AEMO publishes the Reliability and Emergency Reserve Trader (RERT) Quarterly Report under clause 3.20.6 of the National Electricity Rules.

Disclaimer

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the National Electricity Rules or any other applicable laws, procedures or policies. AEMO has made every reasonable effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.]

Version control

Version	Release date	Changes
1	12/05/2022	First issue

Executive summary

The Reliability and Emergency Reserve Trader (RERT) is an intervention mechanism under the National Electricity Rules (NER) that allows AEMO to contract for emergency reserves, such as generation or demand response, that are not otherwise available in the market. AEMO uses RERT as a safety net in the event that a critical shortfall in reserves is forecast. RERT is activated when market options have been exhausted, typically during periods when the supply demand balance is tight.

1 February 2022 RERT

Queensland

On 1 February 2022, in Queensland, high temperature and humidity drove higher operational demand. At the same time, approximately 2,000MW of scheduled generation was unavailable, solar generation was reducing and wind generation was low. These conditions resulted in a forecast Lack of Reserve 2 (LOR2) and forecast Lack of Reserve 3 (LOR3) and subsequently an actual LOR2.

To reduce the potential for involuntary load shedding, based on the forecast LOR2, AEMO procured short notice reserves. AEMO instructed the activation of 331MW of RERT. The reserves were activated at varying levels for 4.5 hours over the evening peak.

The total cost payable by AEMO for this RERT event was $50.1 million. The cost per MWh was $35,428, which is less than the average Value of Customer Reliability (VCR) of $41,520 per MWh for Queensland.

New South Wales

On 1 February 2022, in New South Wales, AEMO contracted 256MW of short notice reserves in response to a forecast LOR2 and subsequent actual LOR1 condition. As AEMO did not pre-activate or activate these reserves, no costs were incurred.

2 February 2022 RERT

Queensland

On 2 February 2022, in Queensland, AEMO contracted 8MW of short notice reserves in response to a forecast LOR2 and subsequent actual LOR1 condition. As AEMO did not pre-activate or activate these reserves, no costs were incurred.

AEMO's contracting and activation of RERT was consistent with the principles of having the least distortionary effect on the market, while improving reliability of the system and minimising cost to consumers.

This report is published under clause 3.20.6 (b) of the NER, and accounts for reserve contracts entered into and activated by AEMO in the period from 1 January 2022 to 31 March 2022.

Contents

Tables

1 RERT activity in Q1 2022

1.1 Procurement

The 2021 Electricity Statement of Opportunities (ESOO) presented a reliability forecast against the 0.002% reliability standard and against the Interim Reliability Measure (IRM) of 0.0006%.

For summer 2021-22, the 2021 ESOO did not forecast expected unserved energy (USE) to exceed the reliability standard nor to exceed the IRM in any NEM region. As a result, no Long Notice Reserve or Interim Reserve was contracted in the National Electricity Market (NEM).

AEMO established a panel of providers, in consultation with the relevant Governments, for the provision of reserves at short notice. At the start of Q1 2022, up to 2,030 megawatts (MW) of potential reserve capacity was in place through panel agreements. Under the panel agreements no capacity is contracted, or payments made, until a reserve shortfall arises.

In Q1 2022, short notice reserve was contracted on 1 February 2022 prior to reliability and emergency reserve trader (RERT) activation as detailed below in response to a forecast lack of reserve 2 (LOR2) condition and lack of reserve 3 (LOR3) which developed into an actual LOR2.

1.2 Activation

AEMO intervened in the market by activating RERT on one occasion during the reporting period, on 1 February 2022, due to a forecast LOR2 condition and forecast LOR3 condition which developed into an actual LOR2 in Queensland.

1.3 Costs incurred

The total amount payable by AEMO under RERT in Q1 2022 was $50.1 million. Table 1 shows a breakdown of the amounts payable in Queensland including payment type for all contracts activated in Q1 2022. No other RERT costs were incurred in Q1 2022.

Table 1 EMO – Table 4

NEM region	Availability costs ($)*	Pre-activation costs ($)	Activation costs ($)	Intervention costs ($)	Total cost ($)
Queensland	0	$7,057,335.89	$31,843,400.46	$11,212,590.73[1]	$50,113,327.08
Total cost					$50,113,327.08

* Availability payments do not apply for short notice contracts. NER 3.20.6(d)(1) requires average values per region, which in the case of a single event in a region are the same values as calculated for that event.

[1] Intervention costs are subject to change under clause NER 3.12.1(a).

2 Reserve procurement

2.1 Long Notice and Interim Reserves

The 2021 ESOO determined that in 2021-22 expected USE was not forecast to exceed the reliability standard nor to exceed the IRM in any NEM region. As a result, no long notice reserve or interim reserve was contracted in the NEM for 2021-22.

The 2021 ESOO reported that, continued rapid development of new large-scale and distributed renewable resources and dispatchable firming capacity (battery storage and gas generation) has helped improve the reliability outlook for summer 2021-22 and the first five years of the outlook, however that outcomes can be considerably higher than the standard with combinations of weather events and plant outages. AEMO noted that these risks could be mitigated through the use of medium notice and short notice reserve panel agreements.

2.2 Panel arrangements

Through open tendering processes under the NER, by the start of Q1 2022 AEMO had established a panel of providers representing estimated additional reserves of up to 2,030MW in total across the NEM under short notice panel agreements. These agreements enable potential RERT providers to offer reserves in short notice situations on pre-negotiated contract terms, to enable AEMO to manage risks such as demand exceeding forecast expectations, and unplanned events resulting in a reduction in generation and/or network capacity. Short notice reserve agreements were entered into in South Australia, Victoria, New South Wales, and Queensland.

In consultation with relevant State governments, and as required by the RERT guidelines[2], AEMO entered into panel agreements with potential reserve providers that met detailed cost, technical, and verification criteria.

RERT resources can have different response lead times, activation conditions, costs and response capability; as a result, not all resources will necessarily be activated for a given shortfall event.

Under the panel agreements utilising short notice contracts, there are no fixed costs incurred, and payments will only be made based on pre-activation and/or actual megawatt hours (MWh) activated. There is no cost to consumers unless this reserve is required[3].

AEMO did not enter into panel arrangements for medium notice Reserve in Q1 2022.

2.3 Short Notice reserves contracted

AEMO may enter into reserve contracts at short notice in order to ensure that the reliability of supply in a region meets the reliability standard for the region. In short notice situations, this occurs when there is a forecast or

[2] At https://www.aemc.gov.au/sites/default/files/2020-08/Updated%20Amended%20Panel%20RERT%20Guidelines%20-%2018%20August%202020%20-%20Final%20for%20publication_0.pdf.

[3] For more information on RERT costs, please refer to the AEMO website at https://aemo.com.au/en/energy-systems/electricity/emergency-management/reliability-and-emergency-reserve-trader-rert.

actual LOR2 or LOR3. The Reserve Level Declaration Guidelines published by AEMO provide guidance for determining the term and quantity associated with a reserve shortfall.

In addition to forecast or actual LOR2 and/or LOR3 conditions, other factors such as projected assessment of system adequacy (PASA) generator availability, may also be considered as inputs into the decision-making process for contracting short notice reserves. Under AEMO's panel arrangements, AEMO can contract for short notice reserves with no cost to consumers (unless the reserve is pre activated or activated). RERT contracting occurs in the context of highly uncertain and complex power system conditions, where actual and projected reserve levels can change at short notice.

AEMO contracted 331MW of short notice reserve in Queensland on 31 January and 1 February 2022 in response to forecast LOR2 and LOR3 conditions on 1 February 2022, which developed into an actual LOR2 condition. AEMO contracted all available short notice reserves in Queensland based on the forecast capacity reserve requirement of over 443MW. This was contracted in case they would be required to maintain reserves, thereby reducing the potential risk of load shedding in Queensland. The risk of load shedding existed due to the combination of high demand, approximately 2,000MW of scheduled generation being un-available, the expected reduction in solar generation and low wind generation. On average over the period in which reserves were contracted, approximately 227MW of semi-schedule generation was available compared to the registered capacity of 3,488MW. No costs were incurred at the point of contracting because panel agreements utilise short notice contracts that have no ongoing fixed costs and payments are only made based on pre-activation and/or actual MWh activated.

AEMO contracted 8MW of short notice reserve in Queensland on 1 February 2022 in response to a forecast LOR2 condition on 2 February 2022, which developed and an actual LOR1 condition. AEMO contracted 8MW due to the operational lead time required from the reserve provider and based on the forecast capacity reserve requirement of 534MW.

AEMO contracted 267MW short notice reserve in New South Wales on 1 February 2022 in response to a forecast LOR2 condition on 1 February 2022, which developed into an actual LOR1 condition. AEMO contracted 267MW based on the forecast capacity reserve requirement of 686MW.

Table 2 below shows short notice reserve contracts entered into by AEMO in Q1 2022. The term (reserve period) of each contract, as identified in Table 2, were considered reasonably necessary to cover the period of the forecast LOR conditions (see Section 3.2 and Appendix A1) and to cover the operational requirements such as forecast uncertainty, pre-activation periods, activation periods, deactivation periods, and minimum contract durations.

Table 2 Term of short notice reserve contracted

Provider	Reserve Date	Time[4]	Capacity (MW)	Region	Basis for contract
AGL Energy Services Pty Ltd	01 Feb 2022	1500 to 2100	7	QLD	Forecast LOR2 and LOR3
Energy Australia Pty Ltd	01 Feb 2022	1530 to 2130	10	QLD	Forecast LOR2 and LOR3
Enel X Australia Pty Ltd	01 Feb 2022	1400 to 2100	7	QLD	Forecast LOR2 and LOR3

[4] Please note AEMO contracts for short notice reserve at no cost and these times may not align with activation times.

Provider	Reserve Date	Time[4]	Capacity (MW)	Region	Basis for contract
Origin Energy Electricity Ltd	01 Feb 2022 (contracted on 31 Jan 2022)	0530 to 2200	8	QLD	Forecast LOR2 and LOR3
QGC Pty Ltd	01 Feb 2022	1610 to 2130	70	QLD	Forecast LOR2 and LOR3
QGC Pty Ltd	01 Feb 2022	1600 to 2130	25	QLD	Forecast LOR2 and LOR3
QGC Pty Ltd	01 Feb 2022	1400 to 2130	185	QLD	Forecast LOR2 and LOR3
Shell Energy Retail Pty Ltd	01 Feb 2022	1500 to 2100	12	QLD	Forecast LOR2 and LOR3
Visy Industries Australia Pty Ltd	01 Feb 2022	1600 to 2130	7	QLD	Forecast LOR2 and LOR3
AGL Energy Services Pty Ltd	01 Feb 2022	1430 to 1900	4	NSW	Forecast LOR2
AGL Energy Services Pty Ltd	01 Feb 2022	1430 to 1900	30	NSW	Forecast LOR2
Cadia Holdings Pty Ltd	01 Feb 2022	1535 to 1900	60	NSW	Forecast LOR2
Endeavour Energy Network Operator Partnership	01 Feb 2022	1615 to 1900	30	NSW	Forecast LOR2
Energy Australia Pty Ltd	01 Feb 2022	1500 to 1900	22	NSW	Forecast LOR2
One Steel NSW Pty Ltd	01 Feb 2022	1428 to 1900	38	NSW	Forecast LOR2
Origin Energy Electricity Ltd	01 Feb 2022	1230 to 1900	10	NSW	Forecast LOR2
Paper Australia Pty Ltd	01 Feb 2022	1528 to 2230	19	NSW	Forecast LOR2
Progressive Green Trading Pty Ltd	01 Feb 2022	1430 to 1900	30	NSW	Forecast LOR2
Visy Industries Australia Pty Ltd	01 Feb 2022	1530 to 1900	13	NSW	Forecast LOR2
Origin Energy Electricity Ltd	02 Feb 2022 (contracted on 01 Feb 2022)	0500 to 2130	8	QLD	Forecast LOR2

2.4 AEMO's methodology for contracting RERT

AEMO's procedure for the exercise of the Reliability and Emergency Reserve Trader sets out the methodology which it follows in determining the triggers for RERT, as well as the quantity and term of reserves contracted.

AEMO followed its procedures and the NER in contracting for short notice RERT, including:

- RERT Panel recruitment.
- Publication of notices.
- Requiring that unscheduled reserves are not otherwise offered to the market or engaged.
- Determining the term and quantity of reserves to be contracted.
- The basis for determining the estimated Value of Customer Reliability (VCR).

Under NER clause 3.20.2(b), AEMO must have regard to the RERT principles in exercising the RERT. These principles stipulate that AEMO is to take actions that have the least distortionary effect on the operation of the market, and actions taken should aim to maximise the effectiveness of reserve contracts at the least cost to end use consumers of electricity.

When entering into reserve contracts, AEMO factored these RERT principles into its decision-making:

- To minimise distortionary effects on the operation of the market, AEMO categorises RERT into the following three types based on their pre-activation and activation times:
  - Type 1 – capacity that can be pre-activated and activated in less than 30 minutes. These contracts are pre activated and activated post-contingency when an actual LOR3 occurs.
  - Type 2 – capacity where the sum of the pre-activation and activation lead times is greater than 30 minutes, but the activation lead time alone is less than 30 minutes. This means that for this capacity to be activated post-contingency (when an actual LOR3 occurs), it must be pre-activated in advance of the actual LOR3.
  - Type 3 – capacity whereby activation requires more than 30 mins. This capacity need to be pre activated and activated in advance to ensure RERT is delivered on time.
- The use of these categories allows for minimal pre-activation and activation, since Type 1 and 2 categories can be activated post-contingent (during LOR3). This not only minimises impacts on the market, but also maximises the effectiveness of reserve contracts at the least cost to end use consumers of electricity.
- During the RERT procurement process, AEMO implemented the use of VCR as the maximum for assessing offers by potential RERT providers. As a result, no RERT contract AEMO entered into exceeds VCR.

3 Intervention on 1 February 2022

3.1 Decision to intervene

3.1.1 Day-ahead forecast expectation

On Tuesday 1 February 2022 a hot air mass moving over New South Wales (NSW) and Queensland (QLD), was creating a risk of extreme temperatures. Maximum temperatures were forecast to reach 34.8°C at Archerfield and Rockhampton, 32.2°C at Townsville, 34.1°C at Penrith and Bankstown, and 31.1°C at Sydney Airport. These high temperatures were accompanied by high humidity along the coasts of both NSW and QLD, the result of a build-up of moisture in the atmosphere and moist onshore winds along the southern QLD coast maintaining a high level of humidity over the greater SE QLD. The 1500 hrs dew point forecast for Archerfield was 23.6°C, considerably higher than the February average of 18.8°C. Bankstown's dew point was also forecast to be higher than the February average of 16.6°C, with a forecast of 20.2°C. The BOM describes a dew point greater than 24 in Brisbane as oppressive, uncomfortable for most, with the possibility of heat stress issues[5]. Dew points at these levels would be expected to feel even more uncomfortable in Southern Australia, where people are less acclimatised to this type of weather. These high forecasts for dew point were expected to make temperatures feel several degrees above the actual. The peak day-ahead operational demand forecast for QLD and NSW were 9,918MW at 1800 hrs and NSW 12,009MW at 1730 hrs respectively.

A monsoon trough and low-pressure in the northern tropics was forecast to produce showers, supressing large scale solar PV generation around Townsville. At the time of peak operational demand there was forecast to be 267MW of non-scheduled and semi-scheduled solar generation and 233MW of rooftop solar generation in QLD and 597MW of non-scheduled and semi-scheduled solar generation and 521MW of rooftop solar generation in NSW. Day-ahead forecasts for wind generation indicated generation of 25MW in QLD and 355MW in NSW at the time of peak operational demand.

3.1.2 Pre-event conditions

At 1400 hrs on Tuesday 1 February temperatures and dew points were in line with day ahead forecasts at Archerfield, Townsville, Penrith, and Bankstown with Rockhampton and Sydney Airport experiencing temperatures above day ahead forecasts and dew points slightly below day ahead forecast. Temperatures at 1400 hrs were 34.3°C at Archerfield, 31°C at Townsville and 37.4°C at Rockhampton (2.6°C above forecast). In NSW temperatures at 1400 hrs were 34.6°C at Bankstown, 32°C at Penrith, and 34°C at Sydney Airport (3°C above forecast). Dew points at 1400hrs were 23.9°C at Archerfield, 24.3°C at Townsville,20.1°C at Rockhampton, 19°C at Bankstown, 20.1°C at Sydney Airport and 22.7°C at Penrith.

At 1330hrs, in anticipation of RERT activation and load reductions, AEMO locked in the QLD South forecast for peak operational demand at 7,061 at 1730 hrs. At 1400 hrs the forecasts for QLD and NSW peak operational demand were 10,118MW at 1730 hrs and 12,955MW at 1700 hrs respectively.

[5]The weather concept of dew point provides a gauge of the impact of the combination of temperature and humidity and helps infer what the conditions may feel like. For more information on dew point visit https://media.bom.gov.au/social/blog/1324/feeling-hot-and-bothered-its-not-the-humidity-its-the-dew-point/

3.2 Assessment of market response and latest time to intervene

Where market mechanisms are not successful in alleviating a reserve shortfall and the latest time to intervene has been reached, AEMO may intervene in the market by issuing a direction or a clause 4.8.9 instruction or by exercising the RERT in accordance with NER clause 3.20.

AEMO's approach to determining its choice of supply scarcity mechanism when the need for intervention arises (RERT, direction, or clause 4.8.9 instruction) is detailed in the Supply Scarcity Procedure[6].

In making this decision, AEMO must use reasonable endeavours to choose the mechanism, or combination of mechanisms, that is effective in addressing the supply scarcity conditions while minimising the associated direct and indirect costs.

On 1 February 2022, AEMO complied with NER clause 3.8.14 and followed its procedures in determining that RERT was the appropriate mechanism to address the conditions of supply scarcity since:

- Direction options were exhausted.
- The cost of activating RERT was less than that of issuing a clause 4.8.9 instruction, determined as the average aggregate VCR for Queensland as published by the Australian Energy Regulator (AER).

At 1030 hrs AEMO issued MN 94343, forecasting a LOR2 in the Queensland region on 1 February 2022 from 1700 hrs to 2130 hrs. The forecast capacity reserve required was 443MW and the minimum capacity reserve forecast was 43MW. Based on the forecast and the minimum activation lead times AEMO determined the latest time to intervene was 1400 hrs the same day. Each individual reserve provider was activated at the latest time based on their minimum activation lead time see section 3.3.

3.3 Intervention event

RERT contracts vary in terms of pre-activation and activation lead times, as well as response times (for example, an industrial load responding to a request to reduce load under RERT may need several hours to prepare plant or undertake a safe shutdown) and minimum continuous run times.

On 1 February 2022 in response to forecast LOR2 and LOR3 conditions in Queensland, based on the minimum lead times of RERT providers, AEMO followed the procedure for the exercise of the Reliability and Emergency Reserve Trader[7] to do the following:

- 0600 hrs pre-activated a reserve contract,
- 1400 hrs pre-activated four reserve contracts, activated one reserve contract,
- 1500 hrs pre-activated two reserve contracts, activated three reserve contracts,
- 1530 hrs pre-activated one reserve contract,
- 1600 hrs pre-activated one reserve contract, activated three reserve contracts,
- 1630 hrs activated two reserve contracts.

[6] The Supply Scarcity Procedure can be found in appendix A of the Short Term Reserve Management procedure numbered SO_OP_3703.

[7] See the RERT procedure at https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3717-procedure-for-the-exercise-of-the-reliability-and-emergency-reserve-trader.pdf?la=en

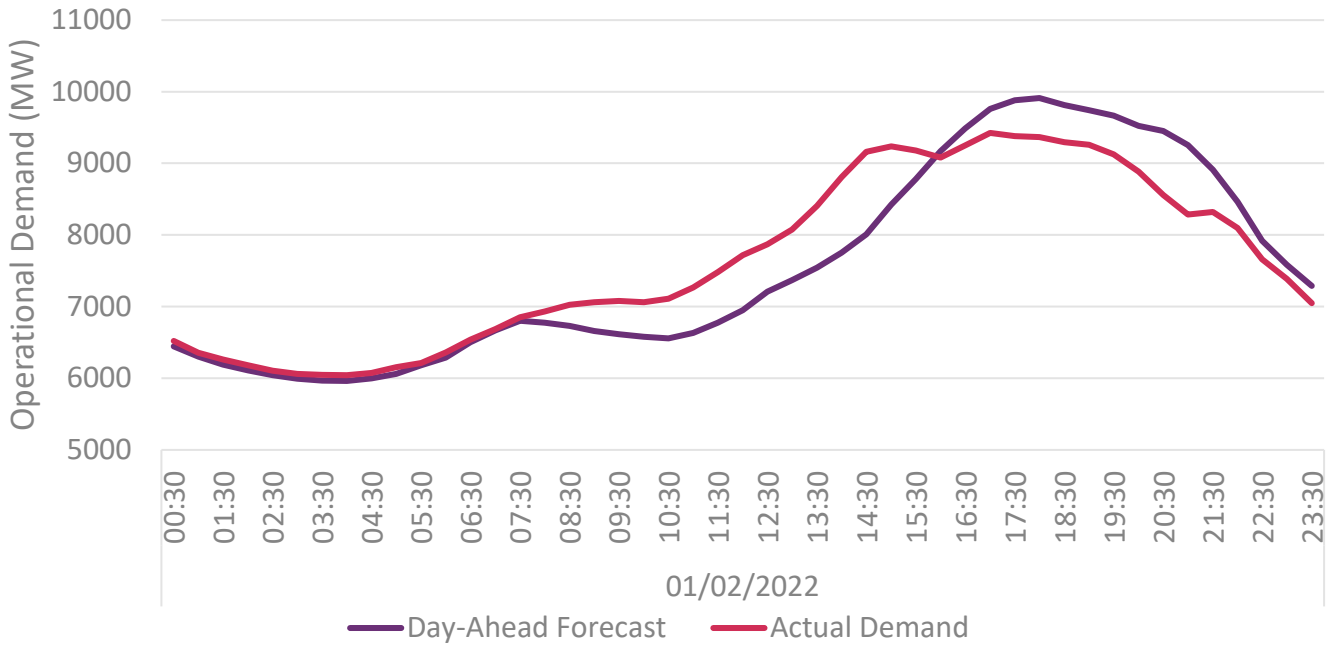
The 1400 hrs pre-dispatch PASA (PD PASA) run indicated a forecast LOR2 condition between 1630 hrs and 2130 hrs which escalated to a forecast LOR3 condition[8] from 1800 hrs to 1830 hrs and again at 1900 hrs to 1930 hrs.

The 1500 hrs demand forecast that was adjusted to reflect all committed RERT and the pre-dispatch PASA (PD PASA) results indicated the forecast LOR3 condition had cleared.

The 1600 hrs pre-dispatch PASA (PD PASA) run indicated a forecast LOR2 condition between 1730 hrs and 1930 hrs.

The eventual maximum demand in Queensland on 1 February 2022 was lower than forecast expectations due to the influence of weather, RERT activations and load reductions. A thunderstorm passed over South Brisbane between 1500 hrs and 1600 hrs, reducing temperatures at Archerfield from 34.1C to 29.5C. Operational demand during the same period decreased from 9,235MW to 9,078MW. Following the passing of the storm operational demand began to ramp up again and peaked at 9,425MW at 1700 hrs. At 1730 hrs AEMO updated its forecast as demand continued to track below expectation, as seen in Figure 1. 331MW of RERT was activated between 1730hrs and 2130hrs which also contributed to reducing the observed peak in operational demand.

Figure 1 Queensland day-ahead forecast and actual operational demand



The 1930 hrs PD PASA run indicated Queensland was no longer in an LOR2 condition, with an actual LOR1 condition forecast to remain until 2000 hrs. The 2000 hrs PD PASA run indicated QLD was no longer in a LOR1 condition. AEMO issued MN 94406 and MN 94407 at 1959 hrs cancelling all LOR conditions in Queensland.

AEMO proceeded to deactivate all reserve contracts at the earliest possible times. All reserves were de-activated by 2130 hrs, reflecting either the deactivation lead time required by the reserve providers, or the activation instruction end time, some automated de-activation instructions were not sent to reserve providers due to an AEMO RERT scheduling tool system error and AEMO reverted to manual instructions as needed. The AEMO system error has now been fixed and processes are being put in place to ensure similar errors can be avoided in

[8] Market notices were not updated for the 1400hr and 1530hr PD PASA forecast LOR3 conditions because these were expected to be cleared.

the future. 2130 hrs AEMO issued MN 94413 to declare the activation of RERT and AEMO intervention event had ended.

On 1 February 2022, AEMO instructed the activation of 1,448MWh volume of RERT. Where the volume of RERT delivered by a RERT provider is greater than the amount set out in the activation instruction, the payment is only for the volume activated. Table 3 shows a breakdown of RERT instructed per 30-minute period.

Table 3 RERT activation instruction in Queensland on 1 February 2022

30-minute period ending	RERT activated capacity (MW)
17:30	331
18:00	331
18:30	331
19:00	331
19:30	331
20:00	331
20:30	307
21:00	307
21:30	295

3.4 Intervention pricing

Intervention pricing was applied for this event in accordance with NER 3.9.3(b) for the intervention periods from the dispatch intervals (DIs) ending 1735 hrs to 2130 hrs on 1 February 2022.

Intervention pricing is applied based on the constraints populated into the National Electricity Market Dispatch Engine (NEMDE). These constraints are created by AEMO's RERT scheduling tool based on the times the contracted reserves are scheduled. On 1 February 2022, a RERT scheduling tool automation error caused actual contracted end times to be incorrect in the tool, as such the reserve amounts used in the intervention pricing run were lower from 2000 hrs to 2130 hrs. Intervention pricing on 1 February 2022 reflects 1290MWh of RERT load applied throughout the RERT intervention pricing period.

3.5 Changes in dispatch outcomes

The activation of RERT resulted in changes in dispatch outcomes. The activation of RERT reserves in Queensland had the effect of decreasing the demand for electricity, which decreased the amount of generation in all regions when comparing the difference in output between the physical and revised pricing runs, as shown in Table 4.

Table 5 compares the variation in total interconnector flows between the physical and revised pricing runs. Aggregate flows from Queensland to New South Wales (Terranora and QNI) decreased during the RERT event.

Table 4 Summary of total energy generation during 1 February 2022 RERT event (MWh)

	NSW	QLD	SA	TAS	VIC
Physical run	46,162	39,816	7,189	3,488	25,330
Pricing run	46,426	40,648	7,244	3,601	25,401
Change	-264	-832	-55	-113	-71

Table 5 Summary of total interconnector flows during 1 February 2022 RERT event (MWh)

	Terranora	QNI	VIC-NSW	Heywood	Murraylink	Basslink
Physical run[A]	-589	940	2,023	-809	227	-1,748
Pricing run[A]	-551	1,374	2,258	-839	203	-1,635
Change	-38	-434	-235	29	24	-113

A. Positive numbers are for flows flowing north or west, negative for flows flowing south or east.

3.6 Impact on reliability

For the 1 February 2022 RERT event, there was no manual involuntary load shedding. AEMO activated RERT on the basis of forecast LOR2 and LOR3 conditions which developed into an actual LOR2 condition, according to AEMO and the NER operating procedures.

The activation of 331MW emergency reserves combined with some proactive response by NSPs to reduce demand, assisted in removing the reserve shortfall. Manual involuntary load shedding was avoided in part because of these combined actions.

Figure 2 to 5 describe the load shedding that was forecast to occur given forecast conditions at 1400hrs, 1500hrs, 1530hrs and 1600hrs. Reserves were activated between 1400hrs and 1630hrs based on the latest time possible for each given reserve contract. These intervals all show a very tight reserve situation over the evening peak.

Figure 2 Forecast reserves position and operational demand at 1400hrs.

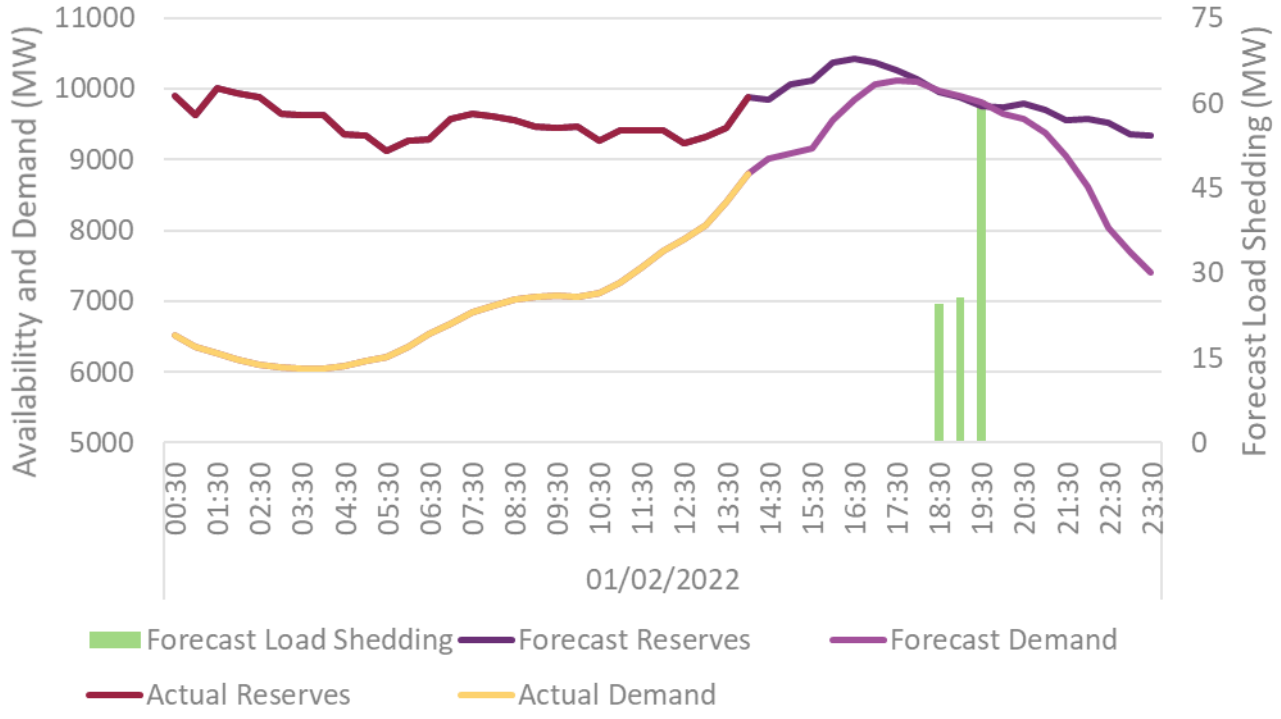


Figure 3 Forecast reserves position and operational demand at 1500hrs.

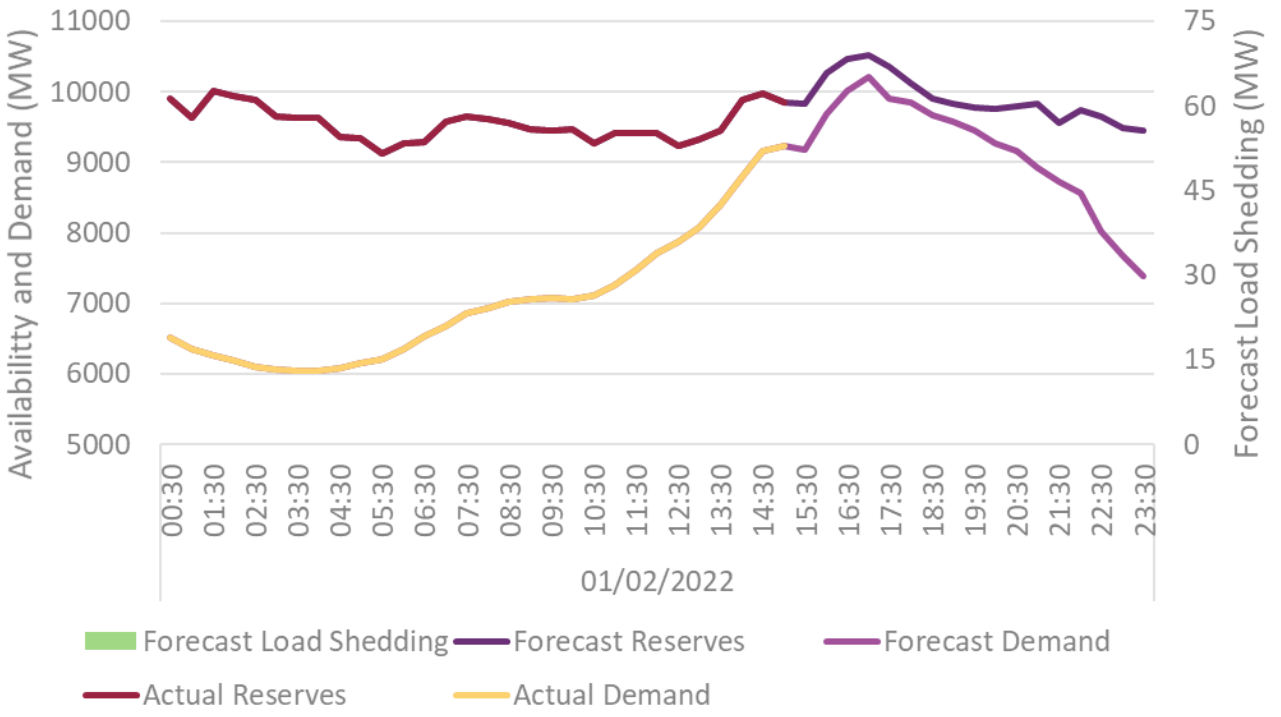


Figure 4 Forecast reserves position and operational demand at 1530hrs.

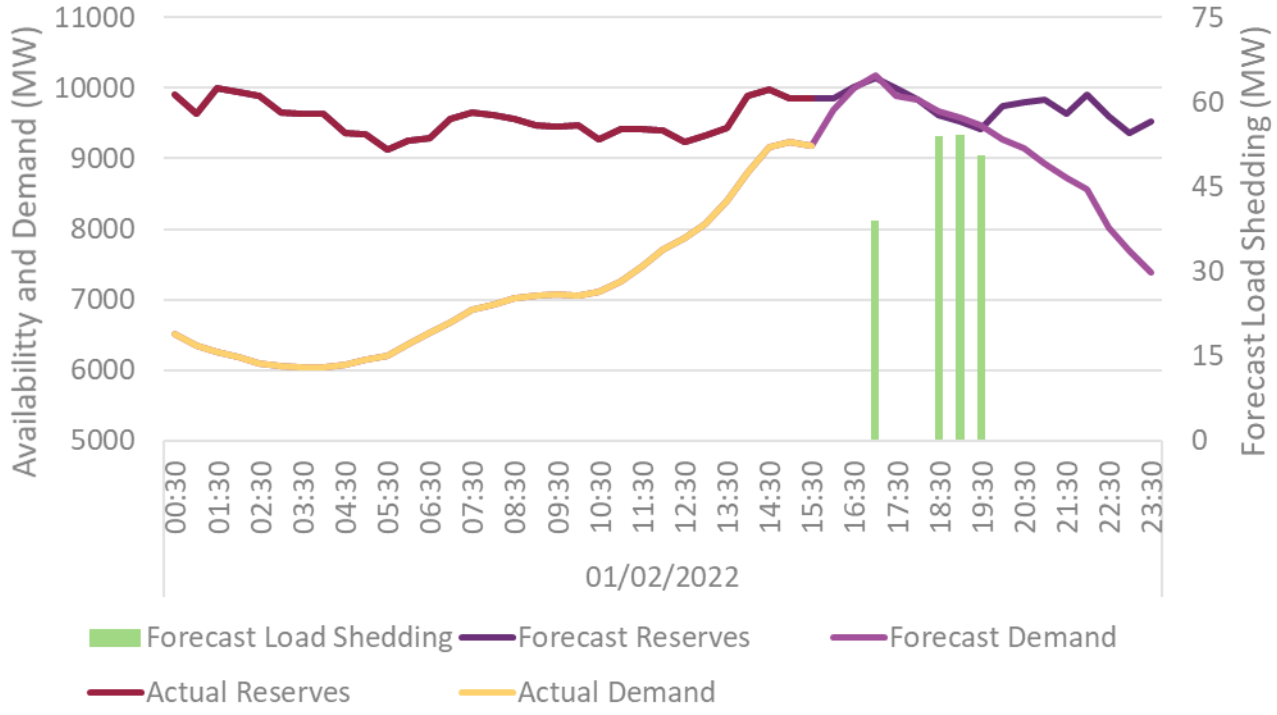
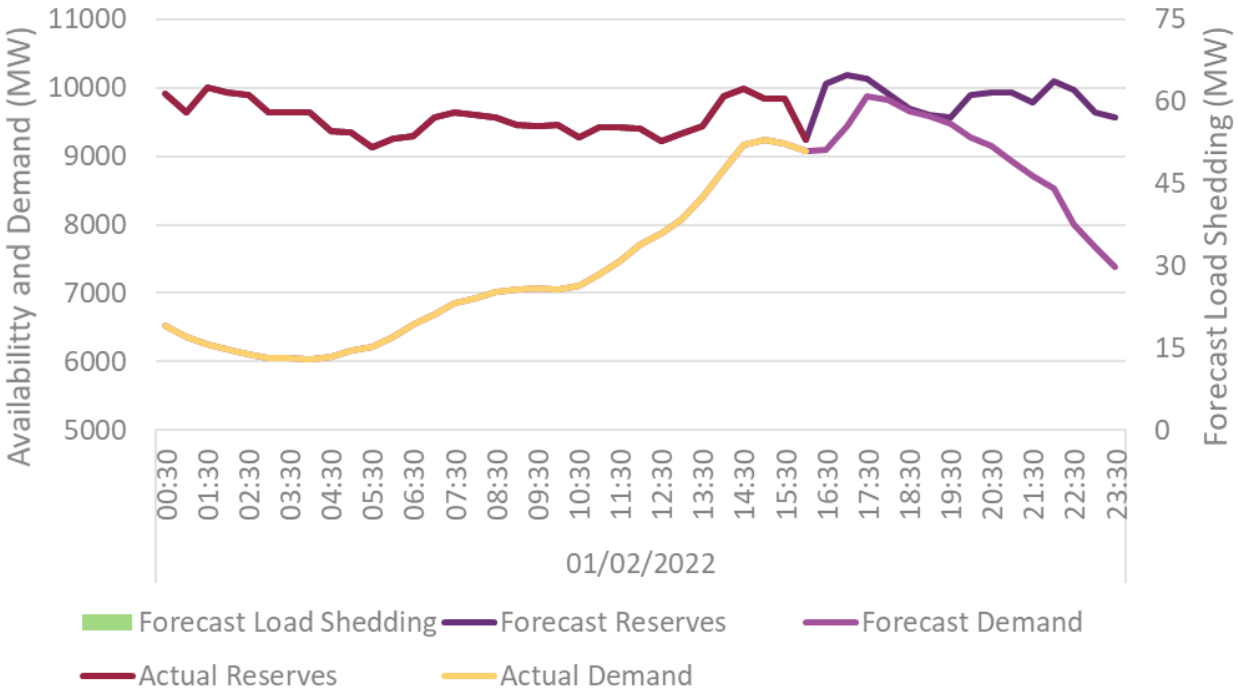


Figure 5 Forecast reserves position and operational demand at 1600hrs.



4 Cost of exercising RERT

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

Table 6 shows a breakdown of the costs associated with exercising RERT during Q1 2022, which were included in the 2 March final statements, as per NER clause 3.20.6(f)(1). The total cost of exercising RERT was $50.1 million, which includes pre-activation, activation, and intervention costs. The cost per MWh has been calculated based on the total cost divided by the MWh delivered for the activation event. The total cost per MWh associated with exercising RERT in Q1 2022 is $35,428.

Table 6 Costs associated with activating RERT in Q1 2022

	State	Pre-activation costs ($)	Activation costs ($)	Intervention costs ($)*	Total cost ($)	Cost pre megawatt hour ($/MWh)
1 February 2022	QLD	$7,057,335.89	$31,843,400.46	$11,212,590.73	$50,113,327.08	$35,428

*Intervention 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 (SRA holders) due to changes in interconnector flows, and therefore changes in the value of Settlement Residues. Note that these costs are subject to change under clause NER 3.12.1(a).

Table 7 below presents the cost recovery for the activation event, including a breakdown of the cost recovery from Market Customers using electricity during the RERT event (Usage) and cost recovery from Market Customers using electricity in the billing week[9] (Other), as per NEM clause 3.20.6(f)(2). All RERT costs were recovered from Market Customers.

Table 7 Breakdown of how costs were allocated to the Market Customers - RERT Q1 2022

Region	Participant Category	Payment type	Recovery period start	Recovery period end	Amount Recovered	Period Total Energy(MWh)	Recovery rate ($/MWh)
QLD	Market Customers	Usage	1/02/2022 17:05	1/02/2022 20:00	$1,018,147.25	25,876.60	$39.35
QLD			1/02/2022 17:05	1/02/2022 21:00	$686,351.40	33,766.75	$20.33
QLD			1/02/2022 17:05	1/02/2022 21:30	$41,351,492.55	37,660.62	$1,098.00
QLD		Other	30/01/2022 0:00	05/02/2022 0:00	$7,057,335.89	1,081,987.30	$6.52

If the largest credible contingency had occurred, the cost of avoided manual load shedding would have been $56.5 million.

[9] The billing period is the period ending 05/02/2022.

Table 8 Recovery of costs associated with activating RERT in Q1 2022

Event	Queensland, 1 February 2022 ($ million)
Largest credible contingency risk, represented as a cost.	$56,491,420

5 AEMO's intervention process

AEMO's general process for deploying RERT is documented in SO_OP_3717 - Procedure for the Exercise of the Reliability and Emergency Reserve Trader.

AEMO considers that it followed all relevant provisions under NER clause 4.8 and procedures in SO_OP_3717 in the exercising of RERT in Q1 2022, to the extent it was able to do so.

A1. Appendix A1

The tables below provide a summary timeline for RERT events in Q1 2022.

Table 9 Timeline of key events on 1 February 2022 Queensland

Date	Event/comment
31/01/2022 **13:32 hrs**	Market Notice (MN) 94254 – PDPASA – Forecast Lack of Reserve Level 2(LOR2) in the QLD Region on 01/02/2022 AEMO declares a Forecast LOR2 condition under clause 4.8.4(b) of the National Electricity Rules for the QLD region for the following period: [1.] From 1630 hrs 01/02/2022 to 2130 hrs 01/02/2022. The forecast capacity reserve requirement is 606 MW. The minimum capacity reserve available is 30 MW. AEMO is seeking a market response. AEMO has not yet estimated the latest time it would need to intervene through an AEMO intervention event. Manager NEM Real Time Operations
31/01/2022 **2000 hrs**	Market Notice (MN) 94315 – PDPASA – Update of the Forecast Lack Of Reserve Level 2 in the QLD Region on 01/02/2022 The Forecast LOR2 condition in the QLD region advised in AEMO Electricity Market Notice No. 94254 has been updated at 1945 hrs to the following: [1.] From 1630 hrs 01/02/2022 to 1800 hrs 01/02/2022. The forecast capacity reserve requirement is 701 MW. The minimum capacity reserve available is 23 MW. [2.] From 1900 hrs 01/02/2022 to 2100 hrs 01/02/2022. The forecast capacity reserve requirement is 636 MW. The minimum capacity reserve available is 149 MW. AEMO is seeking a market response. AEMO estimates the latest time it would need to intervene through an AEMO intervention event is 1400 hrs on 01/02/2022
31/01/2022 **2047 hrs**	MN 94321 – INTENTION TO COMMENCE RERT CONTRACT NEGOTIATIONS Reliability and Emergency Reserve Trader (RERT) Intention to negotiate for additional reserve - QLD1 Region- 31/01/2022 Refer to AEMO Electricity Market Notice no. 94315. AEMO intends to commence negotiations with RERT Panel members for the provision of additional reserve by issuing requests for tender for the following period of time; 16:00 to 22:00 hrs 01/02/2022 If reserve is required, the period of activation or dispatch will be within this period but may not be for the entire period. AEMO will issue a further advice if reserve is contracted.
31/01/2022 **2143 hrs**	MN 94325 – INTENTION TO IMPLEMENT an AEMO INTERVENTION EVENT WITH RERT

Date	Event/comment
	AEMO Intervention Event, Reliability and Emergency Reserve Trader (RERT) - QLD1 Region - 31/01/2022 Refer to AEMO Electricity Market Notice no. 94321. AEMO has entered into a reserve contract and may implement a AEMO Intervention Event by dispatching that reserve contract to maintain the power system in a Reliable operating state during the following period of time; 16:00 to 22:00 hrs 01/02/2022 If reserve is required, the period of activation or dispatch will be within this period, but may not be for all the entire period. AEMO will issue a further advice if the reserve contract is dispatched/activated.
31/01/2022 **2151 hrs**	MN 94326 – PD PASA Forecast LOR2 in QLD1 Region. Refer Market Notice 94315 on Forecast LOR2 condition for the QLD1 region for the following period: From 16:30 hrs 01/02/2022 to 21:00 hrs 01/02/2022. AEMO estimates the latest time at which it would need to intervene through an AEMO intervention event is 14:00 hrs on 01/02/2022.
01/02/2022 **10:49 hrs**	MN 94343 – PD PASA – Update to the Forecast Lack of Reserve Level 2 (LOR2) in the QLD Region on 01/02/2022 The Forecast LOR2 condition in the QLD region advised in AEMO Electricity Market Notice No. 94335 has been updated at 1030 hrs to the following: [1.] From 1700 hrs 01/02/2022 to 2130 hrs 01/02/2022. The forecast capacity reserve requirement is 443 MW. The minimum capacity reserve available is 43 MW. AEMO is seeking a market response. AEMO estimates the latest time it would need to intervene through an AEMO intervention event is 1400 hrs on 01/02/2022
01/02/2022 **1357 hrs**	MN 94370 – RERT DISPATCHED AEMO Intervention Event, Reliability and Emergency Reserve Trader (RERT) - QLD1 Region- 01/02/2022 Refer AEMO Electricity Market Notice no. 94325 AEMO has dispatched/activated reserve contract(s) to maintain the power system in a reliable operating state. The reserve contract(s) was dispatched/activated at 17:00 hrs 01/02/2022 and is forecast to apply until 21:30 hrs 01/02/2022 AEMO has implemented an AEMO intervention event for the duration the reserve contract(s) is dispatched/activated/ To facilitate the RERT process, constraints commencing with the following identifiers may be evident at various times in dispatch, #RT_QLD1
01/02/2022 **1404 hrs**	MN 94372 – AEMO Intervention Event – Intervention price dispatch intervals – 01/02/2022 AEMO Intervention Event - Intervention price dispatch intervals - 01/02/2022 Refer AEMO Electricity Market Notice no. 94370 An AEMO Intervention Event, the dispatch of Reliability and Emergency Reserve Trader (RERT) has been implemented. The AEMO Intervention Event commenced at 17:00 hrs 01/02/2022 and is forecast to apply until 21:30 hrs 01/02/2022 AEMO declares all dispatch intervals during the AEMO Intervention Event to be intervention price dispatch intervals.

Date	Event/comment
	The AEMO Intervention Event is expected to affect dispatch quantities for intervention pricing purposes from the 17:05 hrs dispatch interval on 01/02/2022
01/02/2022 **2144 hrs**	MN 94413 – End of RERT Dispatch – 01/02/2022 and End of intervention event End of Reliability and Emergency Reserve Trader (RERT) dispatch for - QLD1 Region - 01/02/2022 and end of AEMO Intervention Event. Refer AEMO Electricity Market Notices 94372 Activation of reserve contract(s) has ended. The reserve contract(s) were activated from 17:00 hrs 01/02/2022 to 21:30 hrs 01/02/2022 The AEMO Intervention Event ended from 21:30 hrs 01/02/2022

Table 10 Timeline of key events on 2 February 2022 QLD

Date	Event/comment
01/02/2022 **1823 hrs**	MN 94398 PDPASA - Forecast Lack Of Reserve Level 2 (LOR2) in the QLD Region on 02/02/2022 AEMO declares a Forecast LOR2 condition under clause 4.8.4(b) of the National Electricity Rules for the QLD region for the following period: [1.] From 1600 hrs 02/02/2022 to 2100 hrs 02/02/2022. The forecast capacity reserve requirement is 534 MW. The minimum capacity reserve available is 54 MW. AEMO is seeking a market response. AEMO has not yet estimated the latest time it would need to intervene through an AEMO intervention event.
01/02/2022 **2012 hrs**	MN 94411 INTENTION TO COMMENCE RERT CONTRACT NEGOTIATIONS Reliability and Emergency Reserve Trader (RERT) Intention to negotiate for additional reserve - QLD1 Region- 02/02/2022 Refer to AEMO Electricity Market Notice no. 94398. AEMO intends to commence negotiations with RERT Panel members for the provision of additional reserve by issuing requests for tender for the following period of time; 16:00 to 21:30 hrs 02/02/2022 If reserve is required, the period of activation or dispatch will be within this period but may not be for the entire period. AEMO will issue a further advice if reserve is contracted.

Table 11 Timeline of key events on 1 February 2022 NSW

Date	Event/comment
01/02/2022 **0530 hrs**	Market Notice (MN) PDPASA – Update of the Forecast Lack Of Reserve Level 2 in the NSW Region on 01/02/2022 The Forecast LOR2 condition in the NSW region advised in AEMO Electricity Market Notice No. 94333 has been updated at 0515 hrs to the following: [1.] From 1700 hrs 01/02/2022 to 1800 hrs 01/02/2022. The forecast capacity reserve requirement is 686 MW. The minimum capacity reserve available is 588 MW.

Date	Event/comment
01/02/2022 **1132 hrs**	MN 94347 INTENTION TO COMMENCE RERT CONTRACT NEGOTIATIONS Reliability and Emergency Reserve Trader (RERT) Intention to negotiate for additional reserve - NSW1 Region- 01/02/2022 Refer to AEMO Electricity Market Notice no. 94338. AEMO intends to commence negotiations with RERT Panel members for the provision of additional reserve by issuing requests for tender for the following period of time; 16:30 to 19:00 hrs 01/02/2022 If reserve is required, the period of activation or dispatch will be within this period but may not be for the entire period. AEMO will issue a further advice if reserve is contracted.

Glossary

This document uses many terms that have meanings defined in the National Electricity Rules (NER). The NER meanings are adopted unless otherwise specified.

Term	Definition
ESOO	Electricity Statement of Opportunities
IRM	Interim reliability measure
LOR1	Lack of Reserve level 1. The threshold for an LOR1 is determined by the larger value of either the FUM or the sum of the two largest credible risks in the region (LCR2).
LOR2	Lack of Reserve level 2. The threshold for an LOR2 is determined by the larger value of either the FUM or the largest credible risk in the region (LCR).
LOR3	Lack of Reserve level 3. The threshold for an LOR3 condition is when the forecast reserve for a region is at or below zero.
NER	National Electricity Rules
RERT	Reliability and Emergency Reserve Trader
USE	Unserved Energy
VCR	Value of Customer Reliability