NEM Lack of Reserve Framework Report

31 July 2020

Reporting period 1 April 2020 to 30 June 2020

Important notice

PURPOSE

AEMO has prepared this document under clause 4.8.4B of the National Electricity Rules to report on the operation of the NEM Lack of Reserve Framework for the period 1 April 2020 to 30 June 2020 (Quarter 2 2020).

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VERSION CONTROL

Version	Release date	Changes
1	31 July 2020	Initial version

Executive summary

This report has been published in accordance with clause 4.8.4B of the National Electricity Rules (NER).

In the reporting period 1 April 2020 to 30 June 2020 (Quarter 2 2020), AEMO declared one Lack of Reserve (LOR) condition in the National Electricity Market (NEM)[1], compared with 19 in the previous reporting period (Quarter 1 2020). One LOR condition was declared for the same period last year (Quarter 2 2019)[2].

The declared condition in Quarter 2 2020 was a forecast LOR1.

Quarter 2 2020 covered the shoulder autumn months. The low number of LOR conditions, similar for the same period in 2019, is predominantly due to lower number of high demand days during this reporting period relative to last quarter.

The one forecast LOR condition in Quarter 2 2020 was not set by the Forecasting Uncertainty Measure (FUM), while in Quarter 1 2020, two of the 19 LOR conditions (11%) were set by the FUM.

The next report on the NEM Lack of Reserve Framework, for the reporting period 1 July 2020 to 30 September 2020, will be published by 31 October 2020.

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[1] Forecast or actual LOR1, LOR2, or LOR3. LOR is described in clause 4.8.4 of the NER. AEMO's considerations and methodology, and the LOR levels, are outlined in AEMO's Reserve Level Declaration Guidelines, at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Power-system-operation.

[2] Published 31 July 2019, available on AEMO's website at https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/lor-framework-quarterly-reports/2019/nem-lack-of-reserve-framework-report---quarter-ending-30-june-2019.pdf.

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1. Introduction

This report has been published in accordance with clause 4.8.4B of the National Electricity Rules (NER), to provide a high-level analysis of how the Lack of Reserve (LOR) framework is operating. This report covers the period from 1 April 2020 to 30 June 2020 (Quarter 2 2020).

Unless otherwise noted, all times in this report are National Electricity Market (NEM) time (Australian Eastern Standard Time [AEST]).

The report is divided into three sections:

- **Reserve Level Declaration Guidelines** – a summary of changes to the Guidelines over the past quarter, and the retraining of the Bayesian Belief Network (BBN).

- **LOR conditions declared** – details of all LOR conditions declared or revised during the past quarter (based on market notices), including an indication of the required reserve level and if the requirement was set by the Forecast Uncertainty Measure (FUM) or the largest credible risk/s (LCR) in the region. The reserve requirement can be set by the Largest Credible Risk (LCR, for LOR2 conditions) or the sum of the two Largest Credible Risks (LCR2, for LOR1 thresholds). The FUM value for the respective period is also provided.

- **Review of performance** – a review of the performance of the LOR framework and any observed trends, providing an assessment of FUM values compared to previous quarters, determinants of reserve level requirements, number of LOR declarations, and leading factors or causes of LOR declarations.

Please direct all LOR inquiries to www.aemo.com.au/Contact-us. In the inquiry form field '*What is your enquiry regarding?*', write "**LOR Framework Report**".

The next report on the NEM Lack of Reserve Framework, for the reporting period 1 July 2020 to 30 September 2020, will be published by 31 October 2020.

Table 1   Summary of forecast and actual LOR conditions, with causing factors

Effective date*	Region	LOR1		LOR2		LOR3		Cause
		Actual	**Forecast**	**Actual**	**Forecast**	**Actual**	**Forecast**	
25/05/2020	TAS		1					Reduced generation availability
Total		**0**	**1**	**0**	**0**	**0**	**0**	

* Effective date is the date on which the condition has or is expected to occur, and may differ from the date on which a market notice advising of the (forecast) condition is issued.

The count of LOR conditions uses the methodology defined in Section 3.

2. Reserve Level Declaration Guidelines

2.1   Changes in the reporting period

During the reporting period, there were no changes to the Guidelines[3].

2.2   Retraining of the Bayesian Belief Network

The BBN is the algorithm which determines the FUM, which in turn can determine LOR levels. This process is summarised in the Guidelines. The intention of retraining the BBN is to update the network to include recent historical data since the last retraining. AEMO commenced the retraining in July 2020 to include data up to 30 June 2020. The retraining involves a three-stage process:

1. Extract-Transform-Load (ETL) stage, to extract historical data up to 30 June 2020, perform data validation and cleansing, and compile the data into the structured format required to incorporate into the network.

2. Analysis and modelling stage, to update the network and compile the network nodes.

3. Test and verification stage, to ensure the retrained network is suitable for production implementation.

AEMO is in the final stage of retraining and plans to implement the retrained BBN into production in July 2020, pending final verification and readiness checks in the pre-production environment.

2.2.1   Results from retraining

To verify the retraining, AEMO completed a backcast of all forecast intervals from April 2019 to March 2020 using the existing BBN and the retrained BBN. The intention of the backcast is to provide an indication of the magnitude of changes to future maximum, minimum and mean FUM values.

The results from the retrained BBN are summarised below. For forecast horizons and distribution statistics not mentioned, the changes were minor:

*   New South Wales – maximum FUM values increased by 146 MW for the 60 hours ahead, 86 MW for the 12 hours ahead, and 79 MW for the 6 hours ahead forecast horizons. The mean FUM value increased by 25 MW for the 60 hours ahead forecast horizon.

*   Queensland – maximum FUM values decreased by 105 MW for the 12 hours ahead, 78 MW for the 6 hours ahead, and 49 MW for the 60 hours ahead forecast horizons.

*   South Australia[4] – maximum FUM value increased by 219 MW for the 12 hours ahead forecast horizon. Minimum FUM values decreased by 25 MW for the 60 hours ahead and increased by 17 MW for the 6 hours ahead forecast horizons.

*   Tasmania – maximum FUM values decreased by 36 MW for the 6 hours ahead and increased by 35 MW for the 12 hours ahead forecast horizons.

*   Victoria – the maximum FUM values decreased by 94 MW for the 6 hours ahead and 90 MW for the 60 hours ahead forecast horizons.

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[3] The Guidelines are at http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Power-system-operation.

[4] Adelaide West Terrace will replace Kent Town as the weather station used to produce the FUM in South Australia due to the upcoming decommissioning of the Kent Town weather station by the Bureau of Meteorology.

3. Lack of Reserve conditions declared

Table 2 provides a high-level summary of the count of forecast and actual LOR conditions based on the declaration count principles.

Table 3 lists all market notice declarations of forecast and actual LOR conditions over the reporting period 1 April 2020 to 30 June 2020. Table 3 also identifies the market notices that communicated updates to, and cancellation of, either forecast or actual LOR conditions.

Declaration count principles

For each reporting period, AEMO determines the total count for LOR conditions based on the following principles:

- All market notices making the initial declaration of a forecast or actual LOR condition with an effective date during the reporting period were counted.

- Any market notices which updated previously issued forecast or actual LORs for a given effective date (in relation to the reserve requirement, reserve capacity available, or effective period) were not counted, to prevent double counting of a continuing condition.

- In cases where forecast LORs were cancelled but subsequently re-issued with approximately the same effective period, re-issues were not counted, to prevent double counting of effective periods.

- Updates to existing LOR conditions where the LOR level changed were counted as separate LOR conditions.

- Any forecast LORs which were subsequently declared as actual LORs at the same LOR level are counted once. In Table 2, these are shown as actual conditions only.

For example, where a forecast LOR1 was issued and later an actual LOR1 was declared for a similar period, only the actual LOR1 is counted. But if the initial forecast was for a forecast LOR2 condition and this was later declared as an actual LOR1, this would be counted as two LOR conditions, due to the differing LOR levels.

Table 2   Summary of forecast and actual LOR conditions, with causing factors

Effective date*	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
25/05/2020	TAS		1					A forecast LOR1 condition was declared due to reduced generation availability. Available reserves were generally low on the effective date, due to decreased generation availability. The actual LOR1 condition was cancelled when generation availability increased after the effective period.
Total		**0**	**1**	**0**	**0**	**0**	**0**	

* Effective date is the date on which the condition occurred or was expected to occur, and may differ from the date on which a market notice advising of the forecast or actual condition was issued.

Table 3   LOR notices declared during the reporting period 1 January 2020 to 31 March 2020

Effective date and time	Market Notice ID	Issue date and time	Level	Actual, forecast, update or cancel	Comments	Reserve requirement (MW)[A]		FUM value (MW)[B]	Reserve requirement set by
						Required	Available		
New South Wales region									
Nil									
Queensland region									
Nil									
South Australia region									
Nil									
Tasmania region									
25/05/2020 9:00-10:00	75812	24/05/2020 17:30	LOR1	Forecast	Forecast LOR1 declared due to decreased generation availability.	717	679	134	LCR2
25/05/2020	75813	25/05/2020 1:19	LOR1	Cancelled	This cancelled MN 75812. Forecast LOR1 cancelled due to increased generation availability.	720	725	116	LCR2
25/05/2020 9:00-9:30	75814	25/05/2020 6:07	LOR1	Forecast	Forecast LOR1 declared due to decreased generation availability.	720	709	104	LCR2
Victoria region									
Nil									

A. Reserve Required and Reserve Available are the values that correspond to the trading interval in the effective period with the lowest reserve available.
B. The value in this field represents the FUM value for the trading interval during which the minimum available reserve occurred (see Reserve Requirement (MW) – Available field).

4. Review of performance

4.1   Forecast Uncertainty Measure values

This section compares the average, minimum, and maximum FUM values for this reporting period to those for Quarter 2 2019 through Quarter 2 2020 (see Figures 1 through 5 below).

Changes in FUM values relative to Quarter 1 2020 are summarised below. For forecast horizons not mentioned below, the changes relative to Quarter 1 2020 were minor:

- New South Wales – the maximum and average FUM value increased for the 60 and 48 hours ahead forecast horizons. Average FUM value decreased for the 2 hours ahead forecast horizon.

- Queensland – the maximum FUM value decreased for the 24 and 6 hours ahead forecast horizons and increased for the 12 and 2 hours ahead forecast horizon.

- South Australia – the maximum and average FUM value increased for the 48 and 60 hours ahead forecast horizons. The maximum FUM value decreased for the 2, 6, and 12 hours ahead forecast horizons.

- Tasmania – the average FUM value notably increased for the 6, 24, 48, and 60 hours ahead forecast horizons. Maximum FUM notably increased for the 2 and 6 hours ahead forecast horizons.

- Victoria – the maximum FUM value decreased for the 2, 12, 24, and 48 hours ahead forecast horizon.

Figure 1   New South Wales region: maximum, minimum, and average FUM values for the reporting period, and compared to previous four quarters
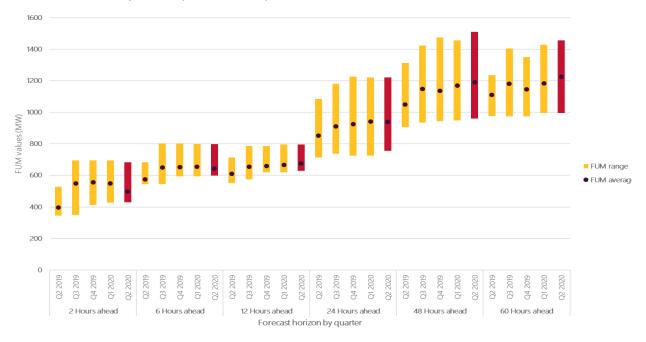
Figure 2   Queensland region: maximum, minimum, and average FUM values for the reporting period, and compared to previous four quarters
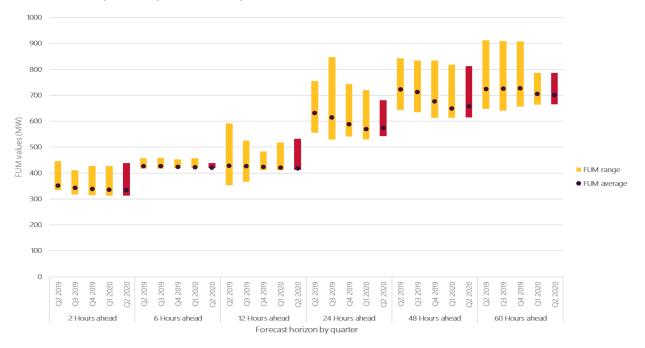

Figure 3   South Australia region: maximum, minimum, and average FUM values for the reporting period, and compared to previous four quarters
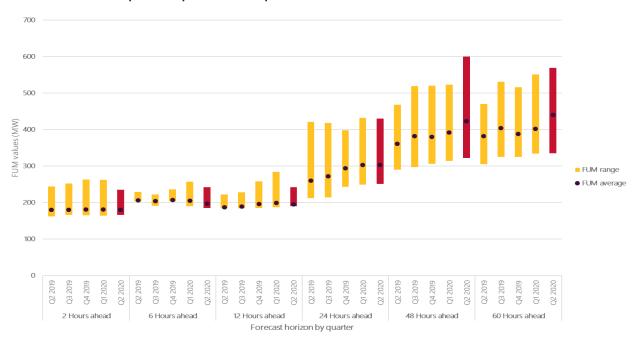
Figure 4   Tasmania region: maximum, minimum, and average FUM values for the reporting period, and compared to previous four quarters
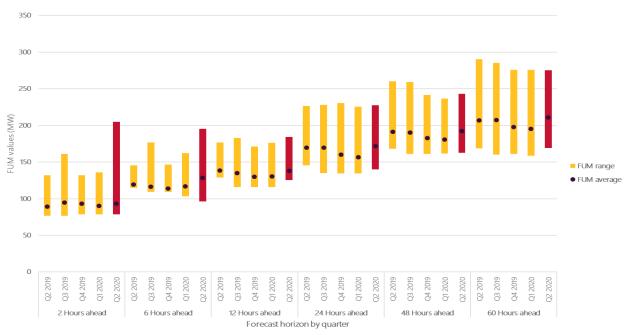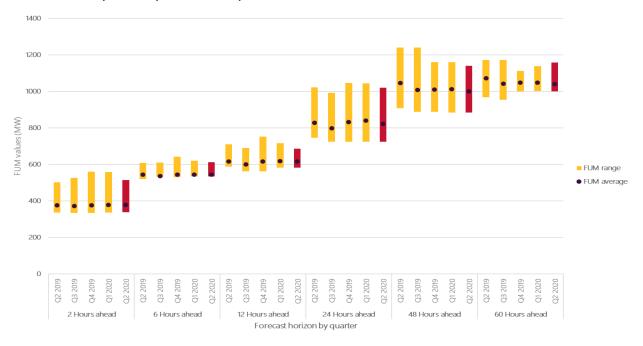

Figure 5   Victoria region: maximum, minimum, and average FUM values for the reporting period, and compared to previous four quarters

4.2   Forecast and actual LOR declarations

A summary of the count and causes of forecast and actual LOR declarations can be found in Table 1 in Section 3 of this report.

As there was only one declaration in the reporting period, and it was not set by the FUM, the percentage of LOR conditions where the FUM set the reserve requirement is 0%. In Quarter 1 2020 the percentage was approximately 11%, and it was 0% in Quarter 2 2019.

There were no forecast or actual LOR2 or LOR3 conditions declared during the current reporting period. This outcome indicates that there was sufficient generation to meet demand during Quarter 2 2020.

Table 4   LORs declared during the reporting period by trigger (FUM or LCR)

Effective period	LOR1	LOR2	LOR3
Tasmania (TAS)			
25/05/2020	Forecast		
Queensland (QLD), New South Wales (NSW), Victoria (VIC), South Australia (SA)			
Nil			

Note. Yellow shading indicates the requirement was set by the LCR, and orange indicates the requirement was set by the FUM.

On 25 May 2020, a sudden reduction of generation availability in Tasmania resulted in a forecast LOR1 declaration.

During the reporting period, Reliability and Reserve Trader (RERT) services were not activated.

By comparison, 19 LOR declarations were made in Quarter 1 2020 (seven forecast LOR events and 12 actual LOR events) and 1 LOR declaration was made in Quarter 2 2019 (which was a forecast LOR event).

4.3   LOR declaration of reserve requirement

No forecast or actual LOR3 conditions were declared.

No forecast or actual LOR2 conditions were declared.

One forecast LOR1 condition was declared, it did not result in an actual LOR1 condition[5].

The forecast LOR1 condition did not develop into an actual LOR condition on this occasion due to market response following the issue of the forecast market notice. The market response generally took the form of increased available generation.

4.4   Number and cause of LOR declarations

One forecast and no actual LOR conditions were declared during the current reporting period.

This is significantly lower than the 19 recorded in the previous reporting period (1 January to 31 March 2020). The predominant factor contributing to reduced LOR conditions during this period was lower number of high demand days when compared to the previous quarter.

Operational demand for Quarter 2 has been relatively similar over the past four years for most regions. There were no extreme weather events during the reporting period Quarter 2 2020 (please refer to Appendix A).

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[5] There was an actual LOR1 in the Pre Dispatch Projected Assessment of System Adequacy (PD PASA), however AEMO did not issue a market notice as a market partipant advised AEMO they were able to make additional generation available.

Appendix A

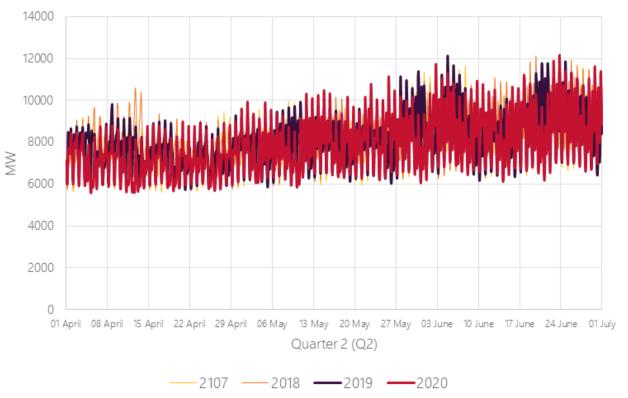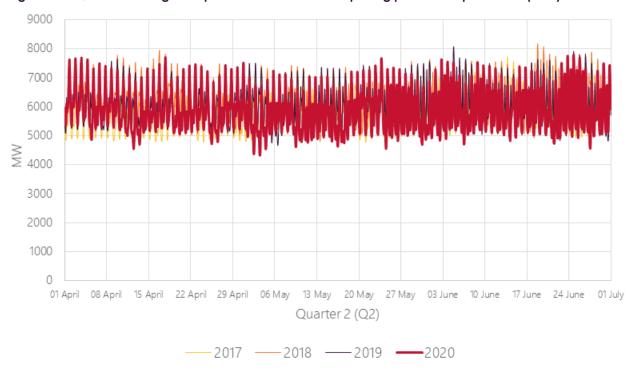**Figure 6   New South Wales region: Operational demand for reporting period compared with past years**

Figure 7   Queensland region: Operational demand for reporting period compared with past years

Figure 8   South Australia region: Operational demand for reporting period compared with past year
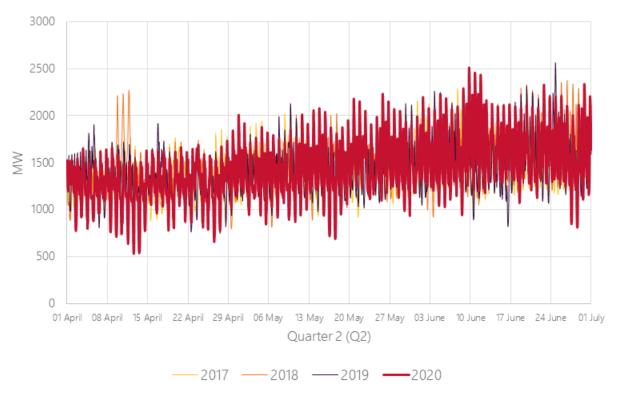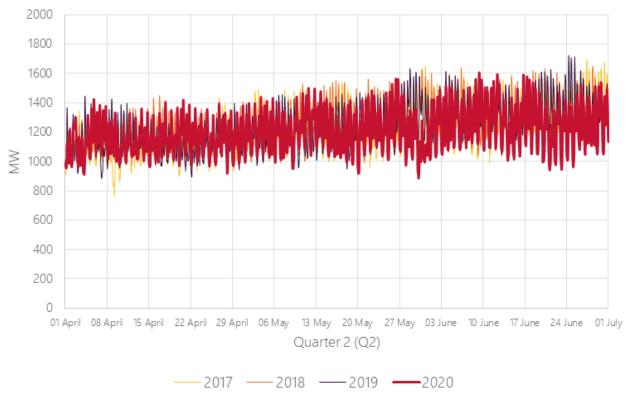

Figure 9   Tasmania region: Operational demand for reporting period compared with past years
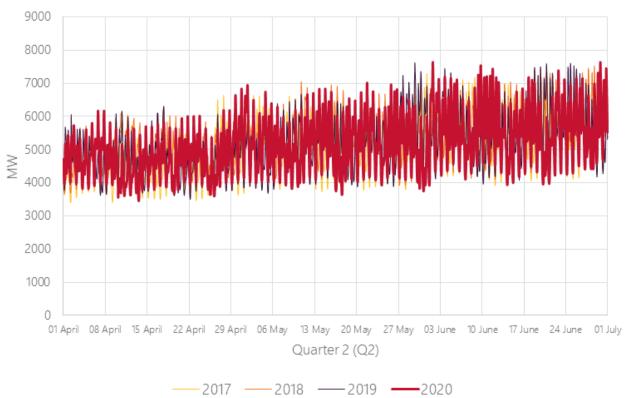
Figure 10   Victoria region: Operational demand for reporting period compared with past years

Glossary

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

For each of the terms below, refer to the Guidelines for further information.

Term	Definition
FUM	Forecast Uncertainty Measure (the number of MW representing the level of forecasting uncertainty)
Guidelines	The Reserve Level Declaration Guidelines published by AEMO under clause 4.8.4A of the NER
LCR	Largest Credible Risk – the single largest credible risk in the region
LCR2	Largest Credible Risk 2 – the sum of the two largest credible risks in the region
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.