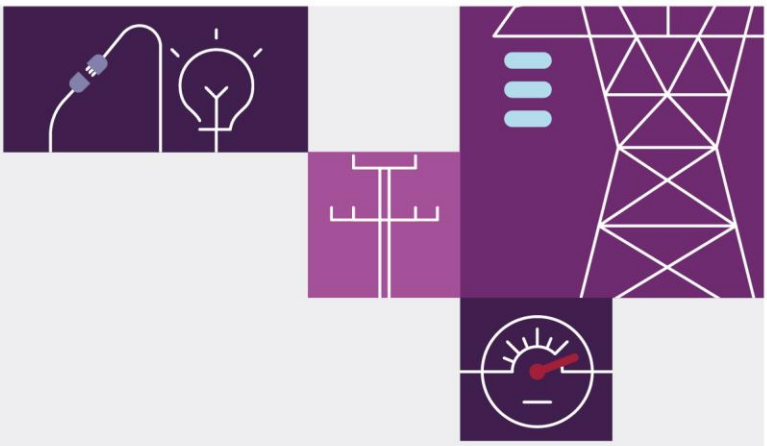
NEM Lack of Reserve Framework Report 1 July to 30 September 2023

October 2023

A report for the National Electricity Market on the operation of the Lack of Reserve Framework



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 from 1 July to 30 September 2023.

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Version control

Version	Release date	Changes
1	11/10/2023	Initial release

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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 July to 30 September 2023 (Quarter 3 2023), AEMO declared 47 individual Lack of Reserve (LOR) conditions in total in the National Electricity Market (NEM)[1].

Table 1 shows the number and type of LOR conditions declared in Quarter 3 2023.

Table 1 LOR conditions declared in Quarter 3 2023

LOR declarations		Total
LOR1	**Actual**	6
	Forecast	26
LOR2	**Actual**	0
	Forecast	15
LOR3	**Actual**	0
	Forecast	0
Total		**47**

This compares with 88 LOR conditions declared in the previous reporting period (Quarter 2 2023), and 253 LOR conditions declared in Quarter 3 2022.

Quarter 3 2023 covered the mid-to-late winter months and the first month of spring:

- Across the NEM, most of the LOR declarations in this quarter were due to decreased generation availability (including energy limitations) and reduced net import.
- Many of the forecast LOR conditions did not eventuate into actual LOR conditions, mainly because additional generation was made available, or transmission network service providers (TNSPs) were able to reschedule planned transmission outages.
- The LOR conditions in New South Wales and South Australia were mainly driven by decreased generation availability and reduced net import.
- There were no LOR conditions declared in Queensland, Victoria, and Tasmania.

Of the 47 LOR declarations in Quarter 3 2023:

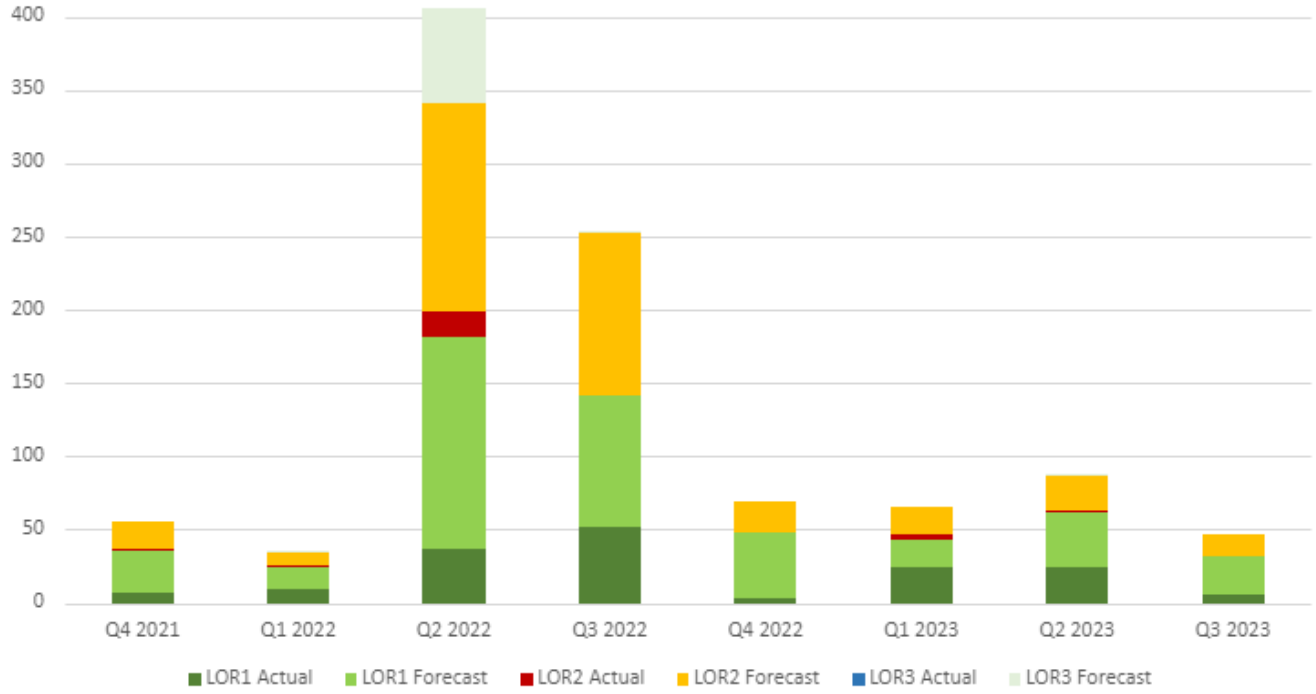
- For all 32 LOR1 declarations, the reserve requirement was set by the sum of the two largest credible risks (LCR2).
- There were 2 LOR2 declarations where the reserve requirement was set by the largest credible risk (LCR).
- There were 13 LOR2 declarations where the reserve requirement was set by the Forecast Uncertainty Measure (FUM).
- There were no LOR3 declarations.

[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.

This means 28% of LOR conditions were declared when the reserve requirement was set by the FUM. For comparison, in Quarter 2 2023, 19 of the 88 LOR declarations were set by the FUM (22%), and in Quarter 3 2022, 91 of the 253 LOR declarations were set by the FUM (36%).

Figure 1 below shows the historical trend of actual and forecast LOR conditions from Quarter 4 2021 to Quarter 3 2023. It shows that, as noted above, the total number of LOR declarations in this reporting period decreased moderately compared to last quarter and is significantly lower than the same period last year (Quarter 3 2022).

Figure 1 Quarterly comparison of actual and forecast LOR conditions, Q4 2021 to Q3 2023



The next report on the NEM Lack of Reserve Framework, for the reporting period 1 October 2023 to 31 December 2023, will be published by 31 January 2024.

Contents

Tables

Figures

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 July to 30 September 2023 (Quarter 3 2023).

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). For each condition declared, the report indicates the required reserve level and whether 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 each relevant 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 October 2023 to 31 December 2023, will be published by 31 January 2024.

2 Reserve level declaration guidelines

2.1 Changes in the reporting period

During the reporting period, there were no changes to the Guidelines[2].

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 October 2023 to include data up to 30 September 2023. The retraining involves a three-stage process:

1. Extract-Transform-Load (ETL) stage, to extract historical data up to 30 September 2023, 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 shortly, 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 July 2022 to September 2023 inclusive, 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 FUM values.

Changes in 90th, 50th (median) and 10th percentiles FUM values between the existing and retrained BBN backcasts are listed below. Minor changes were identified for some other forecast horizons and distribution statistics but are not listed here. Maximum, mean, and minimum values are to still be included in visuals for review of actual FUM values in Section 4.1 of this report.

- New South Wales – median percentile FUM values decreased by 38 megawatts (MW) for the 24 hours ahead forecast horizon. 90th, median, and 10th percentile FUM values for all other forecast horizons remained relatively unchanged.
- Queensland – median percentile FUM values decreased by 25 MW for the 12 hours ahead forecast horizon. 90th, median, and 10th percentile FUM values for all other forecast horizons remained relatively unchanged.
- South Australia – 90th, median, and 10th percentile FUM values for all forecast horizons remained relatively unchanged.
- Tasmania – 90th percentile FUM values increased by 14 MW for the 12 hours ahead forecast horizon and decreased by 13 MW for the 60 hours ahead forecast horizon and by 12 MW for the 2 hours ahead forecast

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

horizon. 10th percentile FUM values increased by 12 MW for the 2 hours ahead forecast horizon. 90th, median, and 10th percentile FUM values for all other forecast horizons remained relatively unchanged.

- Victoria – 90th, median, and 10th percentile FUM values for all forecast horizons remained relatively unchanged.

3 Lack of Reserve conditions declared

Table 2 provides a high-level summary of the counts of forecast and actual LOR conditions for the reporting period (Quarter 3 2023) based on the declaration count principles.

Declaration count principles

For the reporting period, AEMO determined 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 at the same level 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 were 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 was counted.
  - 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.
- Continuous LOR conditions which spanned multiple periods throughout a day are counted as individual LOR declarations for each period covered. For this purpose, a NEM trading day is split into four 6-hour periods: morning peak covers 0400 hrs to 1000 hrs, mid-day covers 1000 hrs to 1600 hrs, evening peak covers 1600 hrs to 2200 hrs, and overnight covers 2200 hrs to 0400 hrs on the next day[3]. The maximum count allocated to each trading day is four.

[3] This is due to trading day rather than calendar day to prevent double-counting of a continuous condition.

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

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
19/07/2023	NSW	1						A forecast LOR1 was declared with effective period 17:30 – 20:00 (29 hour lead time) due to decreased imports (MN 108955, MN 108975, MN 108982). An actual LOR1 condition was present between 17:30 – 20:50 due to decreased imports (MN 108983, MN 108984). The actual LOR1 condition was cancelled when the effective period elapsed (MN 108986).
20/07/2023	NSW	1	1					**Morning Peak:** A forecast LOR1 was declared with effective period 07:00 – 08:00 (12 hour lead time) due to decreased generation availability (MN 108985, MN 109001). The forecast LOR1 condition was cancelled due to increased imports. **Evening Peak:** A forecast LOR1 was declared with effective period 18:00 – 19:30 (29 hour lead time) due to decreased imports (MN 108976, MN 108985, MN 108987, MN 109001, MN 109006). An actual LOR1 condition was present between 17:30 – 20:20 due to decreased imports (MN 109008). The actual LOR1 condition was cancelled due to increased imports (MN 109011).
1/08/2023	NSW	1						A forecast LOR1 was declared with effective period 07:30 – 08:00 (2 hour lead time) due to decreased generation availability (MN 109152, MN 109153). An actual LOR1 condition was present between 07:30 – 08:10 due to decreased generation availability (MN 109154). The actual LOR1 condition was cancelled when the effective period elapsed (MN 109155).
2/08/2023	NSW	1						A forecast LOR1 was declared with effective period 17:00 – 20:00 (4 hour lead time) due to decreased imports (MN 109176, MN 109184, MN 109185). An actual LOR1 condition was present between 17:00 – 20:00 due to decreased imports (MN 109186). The actual LOR1 condition was cancelled due to increased generation availability (MN 109190). A forecast LOR1 was declared with effective period 20:30 – 21:00 (5 minute lead time) due to decreased generation availability and increased demand (MN 109191). The forecast LOR1 condition was cancelled due to increased imports (MN 109192).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
3/08/2023	NSW		1					A forecast LOR1 was declared with effective period 07:30 – 08:00 (8 hour lead time) due to decreased imports (MN 109193). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109194). A forecast LOR1 was redeclared for the same effective period (5 hour lead time) due to increased demand (MN 109195). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109196).
15/08/2023	NSW		1					A forecast LOR1 was declared with effective period 18:00 – 18:30 (4 hour lead time) due to increased forecast operational demand (MN 109324). The forecast LOR1 condition was cancelled due to decreased forecast operational demand (MN 109325).
4/09/2023	NSW	1						A forecast LOR1 was declared with effective period 17:30 – 18:00 (1 hour lead time) due to decreased generation availability (MN 109571). An actual LOR1 condition was present between 17:30 – 18:30 due to decreased generation availability (MN 109581). The actual LOR1 condition was cancelled due to increased generation availability and increased import (MN 109600).
3/07/2023	SA		1					A forecast LOR1 was declared with effective period 18:00 – 19:30 (4 day lead time) due to decreased generation availability (MN 108786). The forecast LOR1 condition was cancelled due to increased generation availability (MN 108794).
17/07/2023	SA	1						An actual LOR1 was declared with effective period 19:30 – 20:10 due to decreased generation availability (MN 108948). The actual LOR1 condition was cancelled when the effective period elapsed (MN 108949).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
20/07/2023	SA		2		2			**Morning Peak:** A forecast LOR2 was declared and cancelled twice (3 day lead time) due to decreased generation availability. The effective period ranged 09:30 – 10:00. (MN 108947, MN 108952, MN 108969). The forecast LOR2 condition was cancelled due to increased imports (MN 108951, MN 108969). **Evening Peak:** A forecast LOR2 was declared and updated with effective period 18:00 – 18:30 (6 day lead time) due to decreased generation availability (MN 108904, 108910, 108919). The forecast LOR2 condition was cancelled due to increased imports (MN 108922). A forecast LOR1 was declared with effective period 17:30 – 18:00 (6 day lead time) due to decreased generation availability (MN 108905, MN 108920) A forecast LOR1 was declared with effective period 18:30 – 21:30 (6 day lead time) due to decreased generation availability (MN 108905, MN 108920) The forecast LOR1 condition was cancelled due to increased imports (MN 108930). **Overnight:** A forecast LOR1 was declared with effective period 22:00 – 22:30 (5 day lead time) due to decreased generation availability (MN 108920). The forecast LOR1 condition was cancelled due to increased imports (MN 108930).
21/07/2023	SA		2		2			**Morning Peak:** A forecast LOR1 was declared with effective period 06:30 – 09:30 (5 day lead time) due to decreased net import (MN 108931). With a 6 day lead time, forecast LOR2 was declared and updated several times due to changing effective period and forecast reserve level. The effective period ranged 07:00 – 09:00. The forecast LOR conditions worsened or improved due to changes in forecast operational demand and FUM level (MN 108953, MN 108954, MN 108958). The forecast LOR2 condition was cancelled due to increased net import and generation availability (MN 108962). **Evening Peak:** With a 6 day lead time, forecast LOR1 was declared and updated several times due to changing effective period and forecast reserve level. The effective period ranged 17:00 – 22:00. The forecast LOR conditions worsened or improved due to changes in net import, forecast operational demand and generation availability (MN 108921, MN 108931, MN 108957). The forecast LOR1 condition was cancelled due to increased net import and generation availability (MN 108979). A forecast LOR2 was declared with effective period 18:30 – 19:30 (5 day lead time) due to increased forecast operational demand and FUM level and decreased generation availability (MN 108933). The forecast LOR2 condition was cancelled due to increased net import (MN 108943). A forecast LOR2 was redeclared with effective period ranged 18:30 – 21:00 (3 day lead time) due to increased forecast operational demand and FUM level (MN 108970, MN 108971). The forecast LOR2 condition was cancelled due to increased net import (MN 108972).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
22/07/2023	SA		1					A forecast LOR1 was declared with effective period 18:00 – 20:30 (6 day lead time) due to decreased generation availability (MN 108932). The forecast LOR1 condition was cancelled due to increased imports and generation availability (MN 108940).
1/08/2023	SA		2					**Morning peak:** A forecast LOR1 was declared with effective period 07:30 – 08:30 (5 day lead time) due to decreased net imports (MN 109049). Several updates to the forecast LOR1 condition were issued due to changing forecast reserve level. The forecast LOR conditions changed due to changed generator availability and net imports (MN 109054, MN 109089). **Evening peak:** A forecast LOR1 was declared with effective period 18:00 – 21:00 (6 day lead time) due to decreased generation availability (MN 109036). The effective period of the forecast LOR1 condition was updated to 18:30 – 20:00 due to increased generator availability (MN 109089). The forecast LOR1 was cancelled due to increased generation availability (MN 109092).
5/08/2023	SA		1					A forecast LOR1 was declared with effective periods 18:30 - 21:00 and 22:00 - 22:30 (7 day lead time) due to decreased generation availability (MN 109093). The forecast LOR1 was cancelled due to increased generation availability and decreased forecast demand (MN 109121).
6/08/2023	SA		1					A forecast LOR1 was declared and updated with effective period 00:00 – 03:30 (5 day lead time) due to decreased generation availability (MN 109148, MN 109162) LOR1 was cancelled due to increased generation availability and decreased forecast demand (MN 109181).
11/08/2023	SA		3		2			**Morning Peak:** A forecast LOR1 was declared, updated and cancelled several times with effective period 07:30 – 08:30 (7 day lead time) due to decreased net import and decreased generation availability (MN 109220, MN 109223, MN 108794, MN 109269, MN 109275). **Evening Peak:** A forecast LOR1 was declared, updated and cancelled serval times with effective period range 17:30 – 23:30 (7 day lead time) due to increased forecast operational demand and decreased generation availability (MN 109220, MN 109266, MN 109269). A forecast LOR2 was declared with effective period 18:30 - 19:30 (28 hour lead time) due to increased FUM level and decreased generation availability (MN 109268). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109274).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
								Overnight: A forecast LOR2 was declared with effective period 23:30 – 01:30 (34 hour lead time) due to increased FUM level and decreased generation availability (MN 109265). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109274). A forecast LOR1 was declared and updated with effective period range 22:00 – 02:00 (29 hour day lead time) due to decreased generation availability and decreased net imports (MN 109266, MN 109269). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109275).
12/08/2023	SA		1					A forecast LOR1 was declared with effective period 01:30 – 02:00 (36 hour lead time) due to decreased net import and decreased generation (MN 109266). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109275).
14/08/2023	SA		1		1			A forecast LOR2 was declared with effective period 08:00 – 08:30 (3 day lead time) due increased forecast operational demand and FUM level (MN 109281). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109282). A forecast LOR1 was declared with effective period 07:30 – 08:30 (18 hour lead time) due to due increased forecast operational demand (MN 109298). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109301).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
15/08/2023	SA		3		2			**Morning Peak:** A forecast LOR1 was declared with effective period 07:00 – 08:30 (4 day lead time) due to increased forecast operational demand (MN 109278). A forecast LOR2 was declared and updated with effective period ranged 06:30 – 08:30 (3 day lead time) due to increased forecast operational demand and FUM level (MN 109293, MN 109295). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109303). **Evening Peak:** With a 7 day lead time, forecast LOR2 was declared and updated with effective period range 18:00 – 22:30 due to increased forecast operational demand and decreased generation availability (MN 109247, MN 109253). The forecast LOR2 condition was cancelled due to increased net imports (MN 109254). With a 6 day lead time, forecast LOR1 was declared and updated several times due to changing effective period and forecast reserve level. The effective period ranged 18:00 – 22:00. The forecast LOR conditions worsened or improved due to changes in forecast operational demand and generation availability (MN 109255, MN 109270, MN 109278, MN 109294). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109302). A forecast LOR2 was declared and updated several times with effective period ranged 18:00 – 21:30 (4 day lead time) due to decreased generation availability and increased forecast operational demand (MN 109291, MN 109293, MN 109295, MN 109299). The forecast LOR2 condition was cancelled due to decreased forecast operational demand and increased net imports (MN 109303). **Overnight:** With a 6 day lead time, a forecast LOR1 was declared with effective period 22:00 – 02:30 (16th) due to decreased generation availability (MN 109255, MN 109256). The forecast LOR1 condition was cancelled due to decreased forecast operational demand and increased generation availability (MN 109271).
16/08/2023	SA		1		2			**Evening Peak:** A forecast LOR2 was declared and updated several times with effective period ranged 18:00 – 22:00 (55 hour lead time) due to decreased generation availability (MN 109305, MN 109307, MN 109311). The forecast LOR2 condition was cancelled due to increased net imports (MN 109313). **Overnight:** With a 3 day lead time, a forecast LOR1 was declared with effective period 01:30 – 02:00 (17th) due to decreased generation availability (MN 109300). The forecast LOR1 condition was cancelled due to increased net imports (MN 109315). With a 2 to 3 day lead time, forecast LOR2 was declared and updated with effective period ranged 22:00 – 04:00 (17th) due to decreased generation availability (MN 109304, MN 109306, MN 109305). The forecast LOR2 condition was cancelled due to increased net imports (MN 109314).

Effective date[A]	Region	LOR1		LOR2		LOR3		Cause and resolution
		Actual	Forecast	Actual	Forecast	Actual	Forecast	
17/08/2023	SA		2		2			**Morning Peak:** A forecast LOR1 was declared with effective period 07:00 – 07:30 (3 day lead time) due to increased forecast operational demand (MN 109300). The forecast LOR1 condition was cancelled due to increased net imports and generation availability (MN 109315). A forecast LOR2 was declared and updated with effective period ranged 07:00 – 08:30 (3 day lead time) due to increased forecast operational demand decreased and decreased generation availability (MN 109308, MN 109312). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109314). **Evening Peak:** A forecast LOR1 was declared with effective period 18:00 - 18:30 (7 day lead time) due to increased forecast operational demand (MN 109273). The forecast LOR1 condition was cancelled due to increased net imports and generation availability (MN 109279). A forecast LOR2 was declared with effective period 18:00 - 18:30 (7 day lead time) due to increased forecast operational demand decreased and decreased generation availability (MN 109267). The forecast LOR2 condition was cancelled due to increased generation availability (MN 109272).
31/08/2023	SA		1		1			A forecast LOR1 was declared with an effective period 19:00 - 20:30 (3 day lead time) due to decreased generation availability (MN 109466). The forecast LOR1 was cancelled due to increased generation availability (MN 109481). A forecast LOR2 was declared with an effective period 16:30 - 17:30 (64 hour lead time) due to decreased generation availability and increased forecast demand (MN 109478). The forecast LOR2 was cancelled due to increased generation availability (MN 109482).
04/09/2023	SA		1		1			A forecast LOR1 was declared with and updated with effective period 18:30 – 19:00 (27 hour lead time) due to decreased generation availability (MN 109553, MN 109546). The forecast LOR1 condition was cancelled due to increased generation availability (MN 109560) A forecast LOR2 was declared and cancelled multiple times with an effective period 18:30 – 19:00 (54 hour lead time) due to decreased generation availability and decreased net imports (MN 109533, MN 109546, MN 109549, MN 109554).
Total		6	26	0	15	0	0	

A. 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.

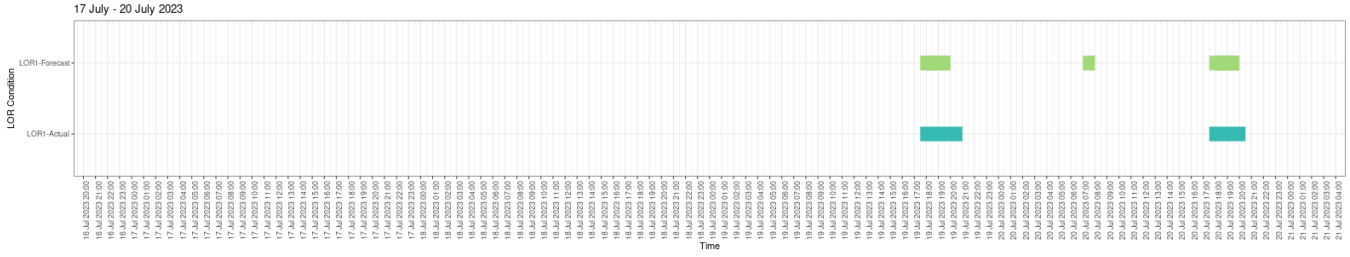
3.1 LOR declarations during the reporting period – Gantt chart

This section shows the LOR declarations during the reporting period 1 July to 30 September 2023 for each region using Gantt charts. Each Gantt chart covers a four-day period. Periods with no LOR declarations were omitted and not graphed.

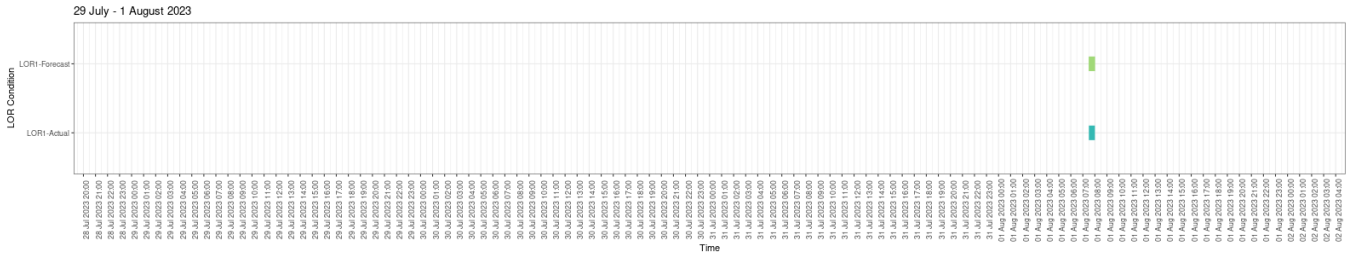
Forecast and actual LOR1, LOR2 and LOR3 conditions including updates are shaded according to the legend at the bottom of each page for the corresponding effective periods based on the market notices.

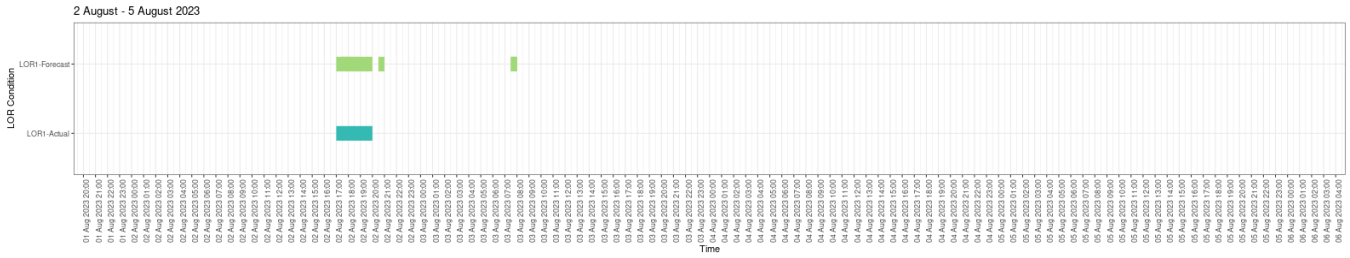
3.1.1 New South Wales

There were no LOR declarations in the period from 1 July to 16 July 2023.

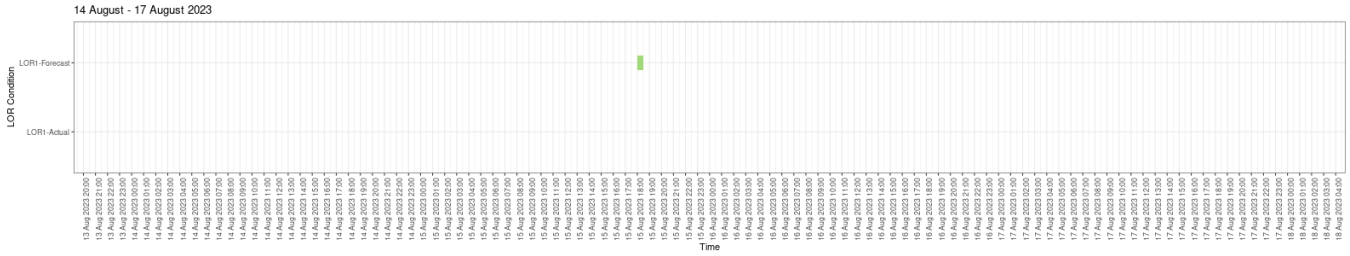


There were no LOR declarations in the period from 21 July to 28 July 2023.

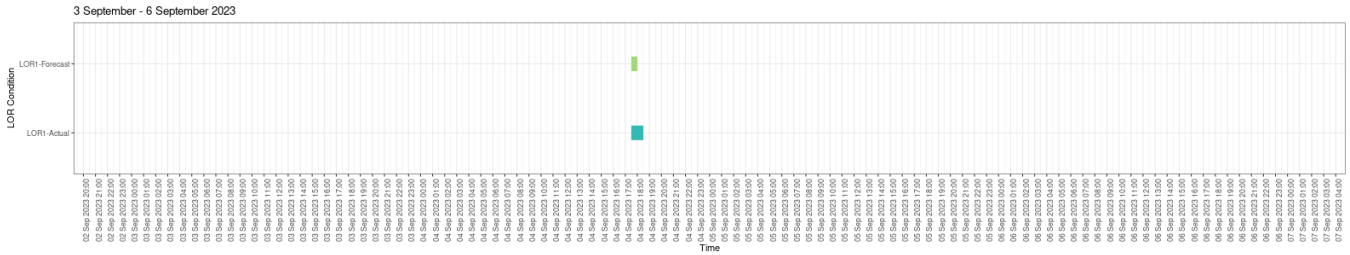




There were no LOR declarations in the period from 6 August to 13 August 2023.



There were no LOR declarations in the period from 18 August to 2 September 2023.

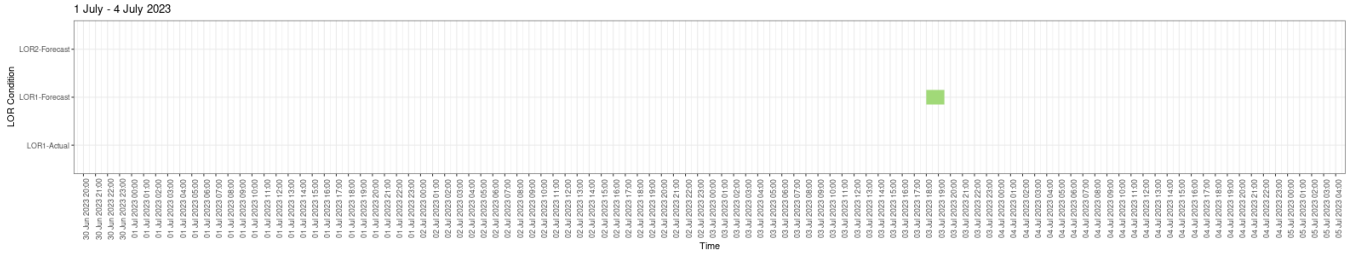


There were no LOR declarations in the period from 7 September to 30 September 2023.

3.1.2 Queensland

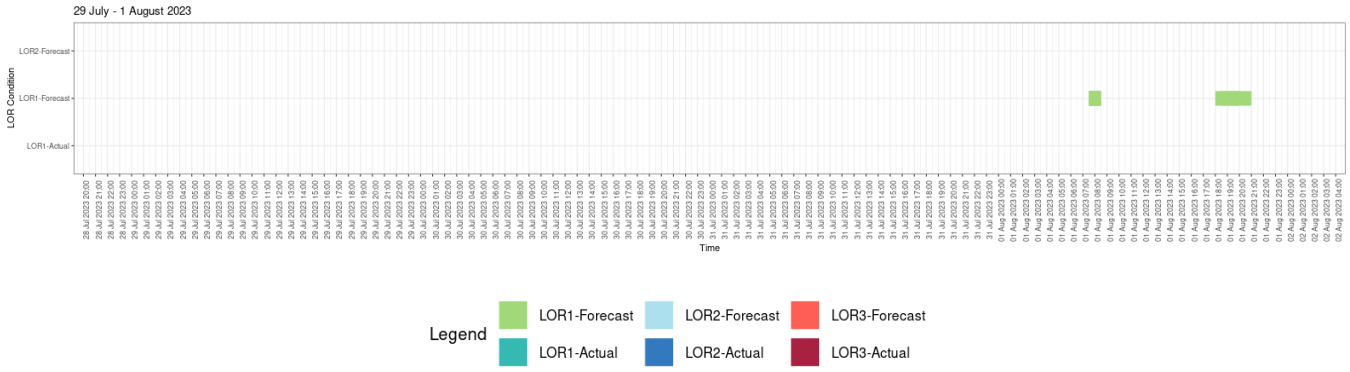
There were no LOR declarations in the period from 1 July to 30 September 2023.

3.1.3 South Australia



There were no LOR declarations in the period from 5 July to 16 July 2023.

There were no LOR declarations in the period from 25 July to 28 July 2023.



There were no LOR declarations in the period from 18 August to 29 August 2023.

There were no LOR declarations in the period from 7 September to 30 September 2023.

3.1.4 Victoria

There were no LOR declarations in the period from 1 July to 30 September 2023.

3.1.5 Tasmania

There were no LOR declarations in the period from 1 July to 30 September 2023.

4 Review of performance

4.1 Forecast Uncertainty Measure values

As in Section 2.1, this section will compare the 10th, 50th (median) and 90th percentile FUM values for this reporting period to those for each quarter from Quarter 3 2022 to Quarter 3 2023 (Figure 2 to Figure 6). FUM values decreasing is indicative of the distribution tightening with decreasing forecast uncertainty.

The most material changes in FUM values between Quarter 3 2022 and Quarter 3 2023 are summarised in this section. For forecast horizons not mentioned in this section, the changes from Quarter 3 2023 were minor:

- **New South Wales** – 10th percentile FUM values decreased for the 2, 6, 12, 24 and 48 hours ahead forecast horizons. Median percentile FUM values decreased for the 6, 12, 24 and 48 hours ahead forecast horizons and increased for the 2 and 60 hours ahead forecast horizons. 90th percentile FUM values decreased for all forecast horizons.
- **Queensland** – 10th percentile FUM values increased for the 12 hours ahead forecast horizon and decreased for the 60 hours ahead forecast horizon. The median FUM values increased across all forecast horizons. 90th percentile FUM values increased for the 2, 24 and 48 hours ahead forecast horizons.
- **South Australia** – 10th percentile FUM values decreased for the 24 hours ahead forecast horizon and increased for the 48 and 60 hours ahead forecast horizons. Median FUM values decreased for the 24 hours ahead forecast horizon and increased for the 60 hours ahead forecast horizon. 90th percentile FUM values increased for the 2,12 and 24 hours ahead forecast horizons and decreased for 48 and 60 hours ahead forecast horizons.
- **Tasmania** –The median FUM values increased across all forecast horizons. 90th percentile FUM values increased for the 2 and 60 hours ahead forecast horizons.
- **Victoria** – 10th, median and 90th percentile FUM values decreased across all forecast horizons.

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

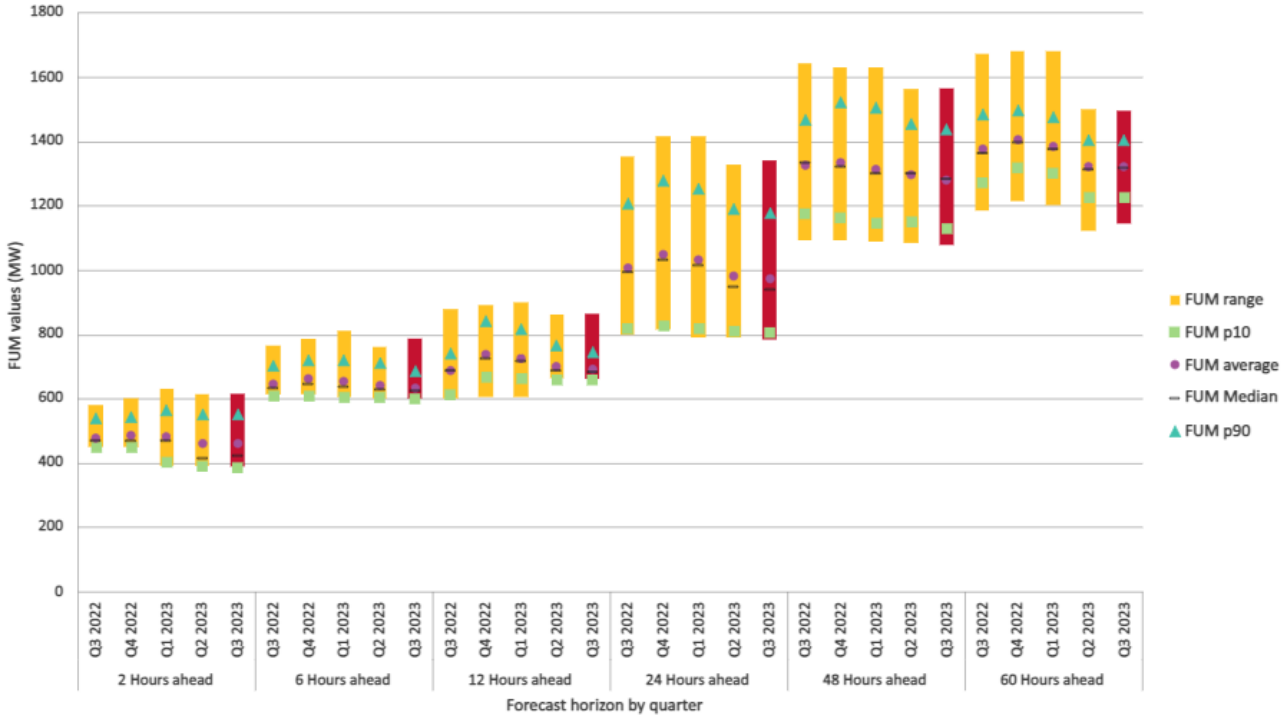


Figure 3 Queensland region: FUM values for the reporting period, and compared to previous four quarters

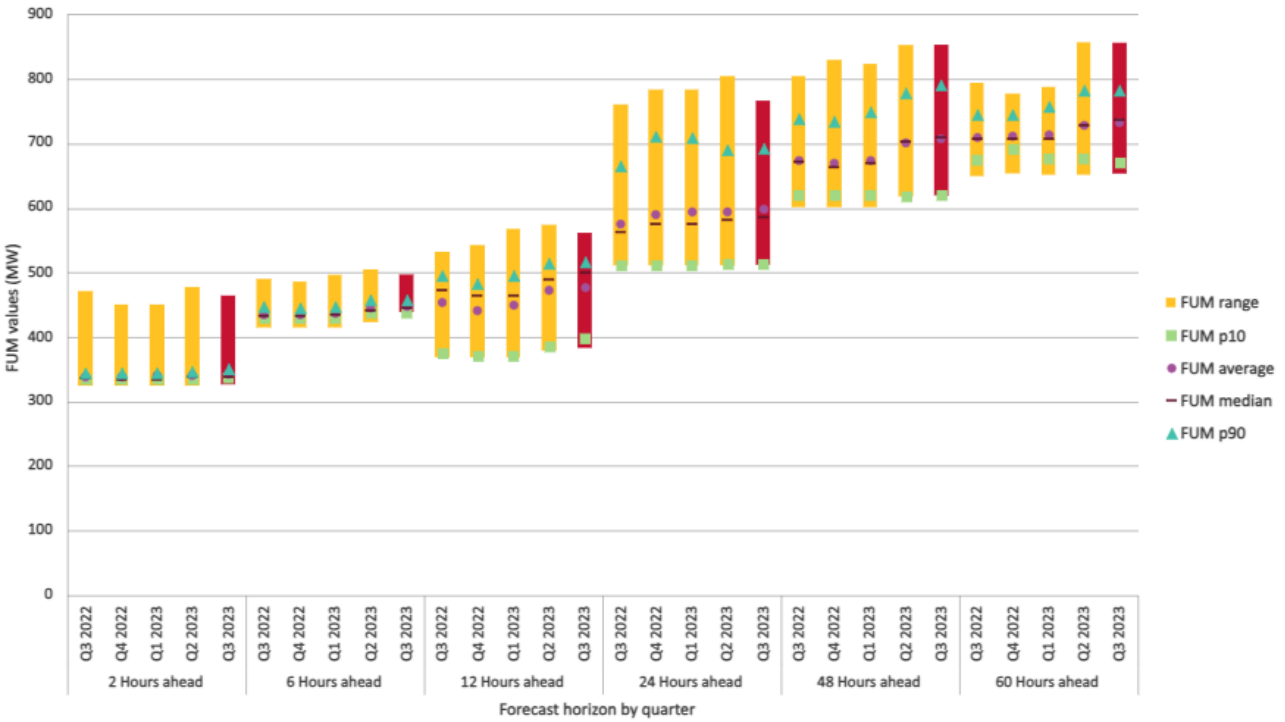


Figure 4 South Australia region: FUM values for the reporting period, and compared to previous four quarters

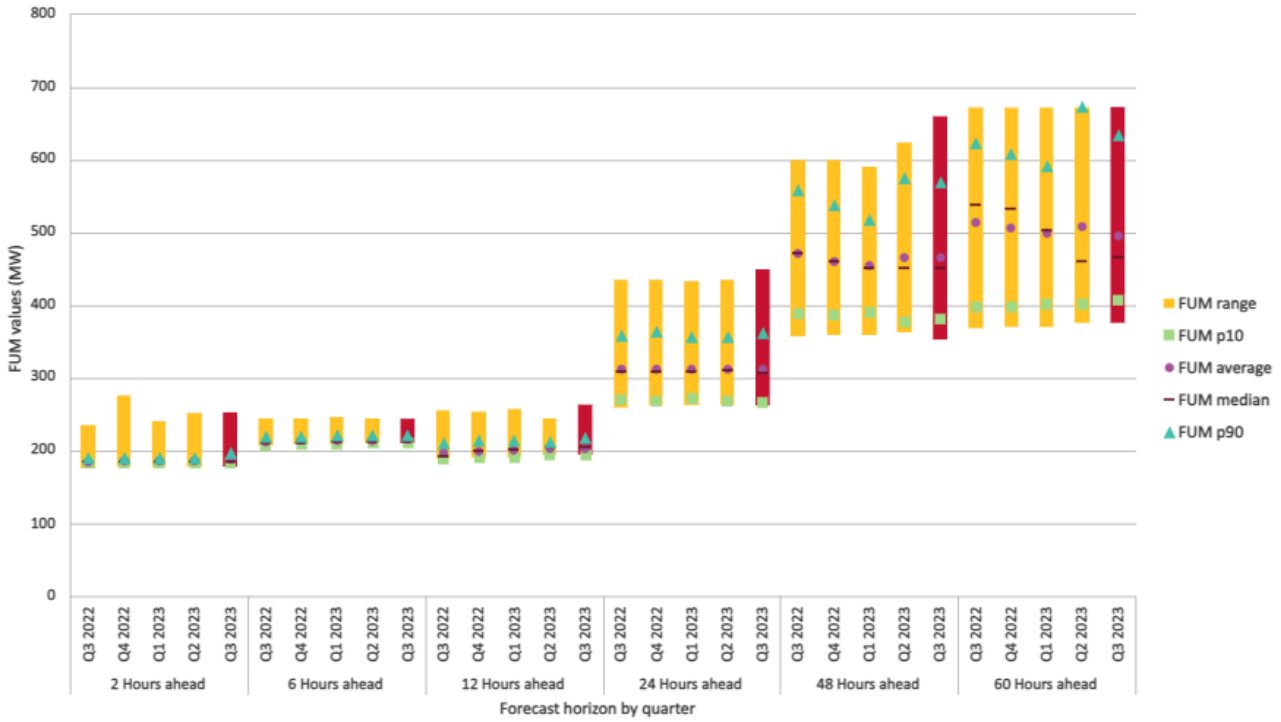


Figure 5 Tasmania region: FUM values for the reporting period, and compared to previous four quarters

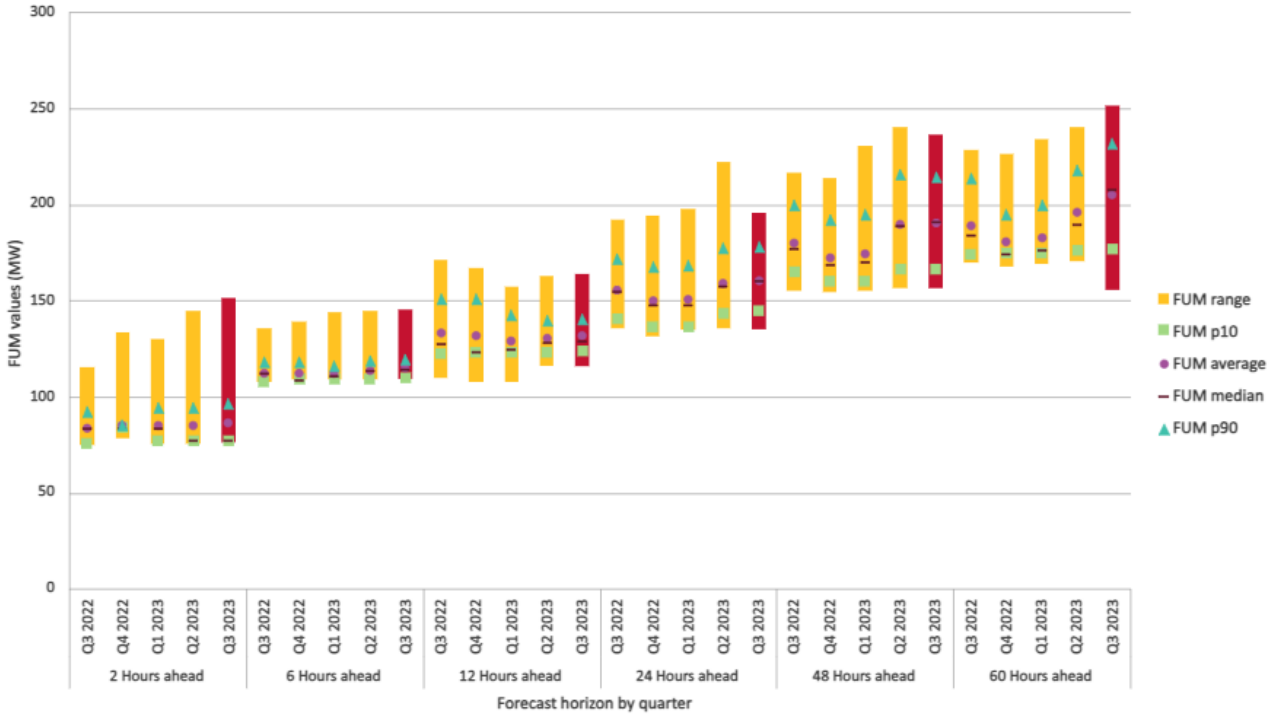
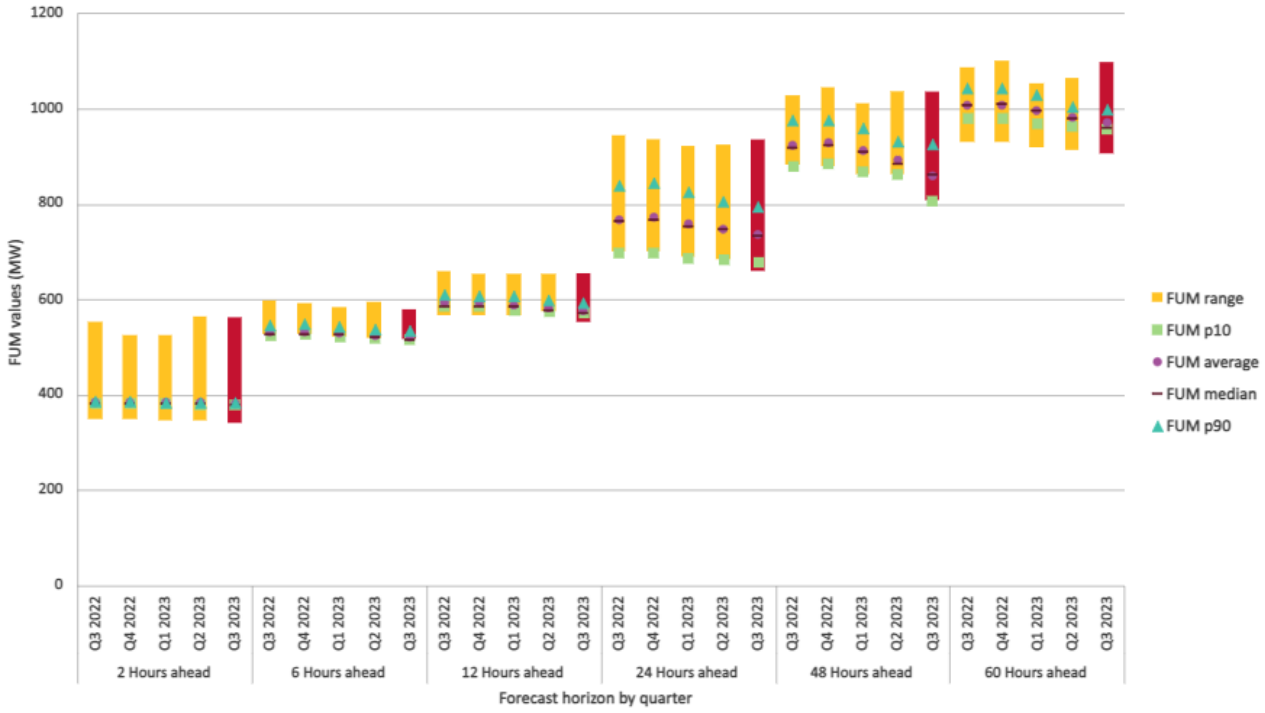


Figure 6 Victoria region: FUM values for the reporting period, and compared to previous four quarters



4.2 Forecast and actual LOR declarations

A summary of the count and causes of declared forecast and actual LOR conditions can be found in Table 2 in Section 3 of this report.

Of the 47 LOR declarations in the reporting period, 41 were for forecast LOR conditions:

- 26 forecast LOR1 conditions were declared.
- 15 forecast LOR2 conditions were declared.
- No forecast LOR3 conditions were declared.
- None of the forecast LOR1 conditions were set by the FUM.
- 13 forecast LOR2 conditions were set by the FUM.

A total of six actual LOR1 conditions were declared. Of these, five were observed as forecast LOR1 prior to being declared as an actual, therefore not counted as a forecast declaration based on the declaration count principles outlined in Section 3. One was declared as an actual LOR1 condition without prior forecast.

There were no actual LOR2 conditions declared.

Table 3 Summary of LOR conditions during reporting period, 1 July to 30 September 2023

Region	LOR1		LOR2		LOR3	
	Actual	Forecast	Actual	Forecast	Actual	Forecast
NSW	5	3	0	0	0	0
QLD	0	0	0	0	0	0
SA	1	23	0	15	0	0
TAS	0	0	0	0	0	0
VIC	0	0	0	0	0	0
Total	**6**	**26**	**0**	**15**	**0**	**0**

Reliability and Emergency Reserve Trader (RERT) activations

During the reporting period, no RERT services were activated[4].

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

Effective period	LOR1	LOR2	LOR3
New South Wales (NSW)			
19/07/2023	Forecast then Actual		
20/07/2023	Forecast		
	Forecast then Actual		
01/08/2023	Forecast then Actual		
02/08/2023	Forecast then Actual		
03/08/2023	Forecast		
15/08/2023	Forecast		
04/09/2023	Forecast then Actual		
Queensland (QLD)			
NIL			
South Australia (SA)			
03/07/2023	Forecast		
17/07/2023	Actual		
20/07/2023		Forecast	
	Forecast	Forecast	
	Forecast		
21/07/2023	Forecast	Forecast	
	Forecast	Forecast	
22/07/2023	Forecast		
01/08/2023	Forecast		
	Forecast		
05/08/2023	Forecast		
06/08/2023	Forecast		

[4] RERT reporting can be found at https://aemo.com.au/energy-systems/electricity/emergency-management/reliability-and-emergency-reserve-trader-rert/rert-reporting.

Effective period	LOR1	LOR2	LOR3
11/08/2023	Forecast		
	Forecast	Forecast	
	Forecast	Forecast	
12/08/2023	Forecast		
14/08/2023	Forecast	Forecast	
15/08/2023	Forecast	Forecast	
	Forecast	Forecast	
	Forecast		
16/08/2023		Forecast	
	Forecast	Forecast	
17/08/2023	Forecast	Forecast	
	Forecast	Forecast	
31/08/2023	Forecast	Forecast	
04/09/2023	Forecast	Forecast	
Tasmania (TAS)			
NIL			
Victoria (VIC)			
NIL			

Note. Yellow shading indicates the requirement was set by the LCR or LCR2, and orange indicates the requirement was set by the FUM.

4.3 Causes of LOR declarations

As summarised in Table 2, a total of 47 LOR conditions were declared during the reporting period: 41 forecast and six actual LOR conditions.

Based on Table 2:

- Of the 26 forecast LOR1 conditions declared, five resulted in actual LOR1 conditions. These were counted as actual LOR1 conditions based on the declaration count principles outlined in Section 3.
- Of the 15 forecast LOR2 conditions declared, none resulted in an actual LOR2 condition.
- There were 21 forecast LOR1 conditions that did not develop into actual LOR1 conditions, and 15 forecast LOR2 conditions that did not develop into actual LOR2 conditions. The reasons were either a market response following the issue of the forecast market notice, or changes to the net import or changes in forecast demand. The market response generally took the form of increased available generation or transmission network service providers (TNSPs) rescheduling planned transmission outages. Some of the forecast LOR conditions were cancelled when the FUM value decreased.
- As Table 4 above shows, during the reporting period there was one instance where an actual LOR1 condition occurred with no prior forecast.
- The LOR conditions in New South Wales and South Australia were mainly driven by decreased generation availability and reduced net import.
- There were no LOR conditions declared in Queensland, Victoria, and Tasmania.

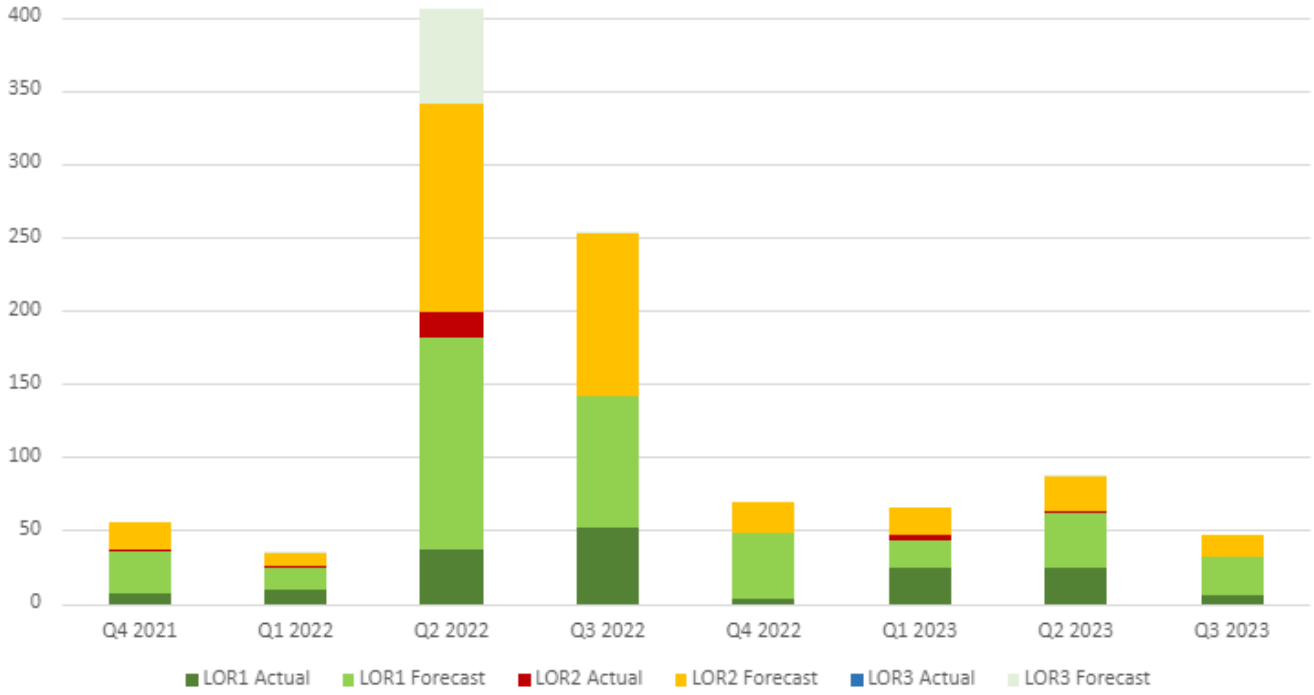
4.4 Number of LOR declarations compared to previous quarters

Quarter 3 2023 covered the mid-to late winter months and the first month of spring.

A total of 47 LOR conditions were declared during Quarter 3 2023 – 41 forecast and six actual LOR conditions. This is lower than the 88 LOR declarations recorded in the previous reporting period (1 April to 30 June 2023), and lower than the 253 LOR conditions declared for the same period last year (Quarter 3 2022).

Figure 7 shows the historical trend of actual and forecast LOR conditions in past quarters from Quarter 4 2021 compared to Quarter 3 2023.

Figure 7 Quarterly comparison of actual and forecast LOR conditions, Q4 2021 to Q3 2023



Glossary

This document uses many terms that have meanings defined in the NER. The NER meanings are adopted unless otherwise specified.

For each of the terms below, refer to the Reserve Level Declaration Guidelines[5] for further information.

Term	Definition
AEST	Australian Eastern Standard Time
BBN	Bayesian Belief Network[6]
ETL	Extract-Transform-Load
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.
PASA	Projected Assessment of System Adequacy[7]
RERT	Reliability and Emergency Reserve Trader[8]
TNSP	Transmission network service provider

[5] See AEMO's reserve level declaration guidelines, at https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/reserve-level-declaration-guidelines.pdf.

[6] More detail regarding Bayesian Belief Networks is available in the Appendix of AEMO's reserve level declaration guidelines document in the link above.

[7] See AEMO's Projected Assessment of System Adequacy (PASA) principles, at https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/projected-assessment-of-system-adequacy.

[8] See AEMO's Reliability and Emergency Reserve Trader (RERT) guidelines, at https://aemo.com.au/en/energy-systems/electricity/emergency-management/reliability-and-emergency-reserve-trader-rert.