Implementation of the National Electricity Amendment (Mandatory Primary Frequency Response) Rule 2020

Status as at 9 Oct 2020

A report for the National Electricity Market

Important notice

PURPOSE

AEMO publishes this report to inform industry about AEMO's implementation of the National Electricity Amendment (Mandatory Primary Frequency Response) Rule 2020 (Mandatory PFR Rule).

This publication has been prepared by AEMO using information available at 9 October 2020. This information will be updated and superseded by future implementation reports until full implementation.

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1. Summary

This report provides information on the implementation of the National Electricity Amendment (Mandatory Primary Frequency Response) Rule 2020[1] (Mandatory PFR Rule). It will be updated periodically as implementation proceeds, at intervals of approximately two to three weeks.

The Mandatory PFR Rule affects all *Scheduled Generators* and *Semi-Scheduled Generators* (Affected Generators). They are initially required to undertake a self-assessment of the ability of their *generating systems* (Affected GS) to provide *primary frequency response* (PFR) in accordance with the *primary frequency response parameters* (PFRP) specified in the interim *Primary Frequency Response Requirements* (IPFRR).

Implementation of the Mandatory PFR Rule will be carried out in three tranches, as specified in the IPFRR. The results of the self-assessments (Results) for Tranche 1[2] Affected Generators were due on 28 August 2020, with implementation of setting changes for generation in Tranche 1 commencing from around 30 September 2020.

AEMO has also started receiving Results from Affected Generators with Affected GSs in Tranches 2 and 3. Some have provided draft Results and discussed issues associated with meeting the PFRP. Results for Affected GSs in Tranche 2 are due by 19 November 2020, and for Tranche 3 by 17 February 2021.

Table 1 shows the number of Results, applications for variation and exemption received as at the date of this report.

Table 1 Incoming Results and Applications

Number of Affected GS	Results	Applications for Variation	Applications for Exemption
Tranche 1	76	18	8
Tranche 2	6	2	3
Tranche 3	6		1

2. Self-Assessments

AEMO has received Results in respect of 88 Affected GSs, including for some Affected GSs in Tranches 2 and 3.

AEMO has completed its review for 80 of those, covering around 33,600 MW of installed capacity. A register of Affected GSs who have been sent their PFR Settings by AEMO is listed in Table 4.

[1] Available at https://www.aemc.gov.au/rule-changes/mandatory-primary-frequency-response.

[2] Tranche 1 Affected GS are those with a *Registered Capacity* above 200 MW. Tranche 2 Affected GS are between 80 and 200 MW. Tranche 3 are below 80 MW/. All Registered Capacities are the level of the individual DUID.

3. Applications for Variation

Table 2 details the number of applications for variation received in respect of Affected GSs, those granted and those still under consideration as at the date of this report.

The majority of variations granted in Tranche 1 were in relation to response time.

Table 2 Variations

Number of Affected GS	Applications for Variation	Variations Granted	Variations not Granted	Variations being Assessed
Tranche 1	18	14		4
Tranche 2	2	2		
Tranche 3				

4. Applications for Exemption

Table 3 details the number of applications for exemption received in respect of Affected GSs, those granted and those still under consideration as at the date of this report.

Table 3 Exemptions

Number of Affected GS	Applications for Exemption	Exemptions Granted	Exemptions not Granted	Exemptions being Assessed
Tranche 1	8		8	
Tranche 2	3			3
Tranche 3	1			1

5. Implementation Plan

5.1 Tranche 1 Implementation

AEMO is continuing to work to achieve implementation of PFR Settings across the largest possible proportion of Tranche 1 Affected GSs prior to Summer 2020-21.

Implementation of PFR settings for generation in Tranche 1 has now commenced. The latest information on expected and actual timing of setting changes in shown in Table 4.

A number of Tranche 1 Affected Generators have indicated is their preference to make staged changes to frequency response deadbands. In these cases, multiple Implementation Dates are listed in Table 4. Other Affected Generators have elected to alter settings in one step, and in these cases, a single implementation date is listed.

In some cases the implementation dates previously expected have changed. Changes to implementation dates have been necessary for a number of reasons, including:

- Affected GS forced outages.
- Affected Generator resourcing constraints.
- Delays in provision of key information or advice from OEMs.
- Problems encountered when altering settings.

In all cases, the earliest reasonably achievable date, subject to these constraints, has been determined, or re-determined (as applicable) after consultation with the relevant Affected Generator.

5.2 Flexible Implementation Dates

Some flexibility in implementation dates exists, particularly if an Affected Generator wishes to bring forward implementation of setting changes earlier than a previously agreed implementation date.

Provided they consult with AEMO beforehand, Affected Generators may commence making setting changes earlier, or in an incremental manner, to reach PFR Settings by the specified implementation date. Setting changes on several Affected GSs have already been implemented in this way.

Power system conditions, such as major network outages, could potentially also require alterations to implementation dates, though this has not been necessary to date.

5.3 Implementation of Subsequent Tranches

As outlined in the IPFRR, Tranche 2 and Tranche 3 Affected Generators are required to complete their self-assessments by 19 November 2020, and 17 February 2021, respectively.

These self-assessments will be key to determining implementation dates that are compatible with the urgency of the required changes, but cognisant of the practicalities of undertaking the necessary work (especially around COVID-19 impacts) and the prevailing power system conditions.

Power system reliability and security concerns suggest that requiring control system setting changes across a large number of Affected GSs in the middle of Summer 2020/21 might not be prudent, as this is, typically, the most challenging period of the year for power system operations.

Noting these competing demands, it is currently proposed that implementation of setting changes would be targeted for completion by the following dates:

- Tranche 2 (DUIDs 80 MW – 200 MW) – By 30 March 2021

- Tranche 3 (DUIDs below 80 MW) – By 30 June 2021

Again, some flexibility around these target dates is possible, particularly where Affected GSs are being commissioned, or Affected Generators may wish to make changes earlier.

6. Implementation of PFR settings

6.1 Generation providing PFR prior to Mandatory PFR Rule

Previous surveys of generator active power controls, and more recent engagement with Affected Generators indicate that no large Affected GSs were providing PFR that fully met the PFRP prior to the Mandatory PFR Rule.

AEMO is aware of a small number of, typically, smaller or low capacity factor Affected GSs that are operating in a way that could meet the PFRP (at least partially). Table 4 has been updated to confirm the identity of those Affected GSs, where this has been confirmed.

6.2 Early Implementation

Some Affected Generators have indicated that they wish to implement setting changes to their Affected GSs earlier than AEMO's target implementation dates noted in Section 5.1. AEMO understands that, in some cases, this is due to the availability of specialist resources, or the need to coordinate the PFR Setting changes with other planned works prior to Summer 2020-21.

As at the date of this report, a number of additional Affected GSs have commenced altering their control settings in a staged manner to meet their PFR Settings by the dates nominated in Table 4.

Many Affected GSs have operated in accordance with their PFR Settings on a trial basis for short periods to enable the Affected Generator to assess the impact and to undertake testing, and then restored the original control settings at the conclusion of those tests.

7. Register of Affected GS

Table 4 details, for each Affected GS, the planned or actual dates for completion of implementation of the PFR Settings notified by AEMO in accordance with the IPFRR, and whether AEMO has granted an exemption or variation from the PFRP. Where a variation has been granted, the table also indicates which PFRP has been varied.

A single implementation date under the 'Stage 1' column indicates that full implementation of the PFR Settings is to be, or has been, achieved by that date. The 'Stage 2' column will only be populated where the deadband is to be tightened in two stages.

Tranche 2 (in blue font) and Tranche 3 (in green font) generation is being added to this table as AEMO completes their assessments.

Table 4 Register of Affected GS

Affected GS Name	DUID	Reg Cap (MW)	PFR Settings changes to be (or have been) implemented by		Exemption	Variation	PFRP Varied
			Stage 1	Stage 2[3]			
Ararat WF	ARWF1	241	Mid Oct 20	21 Oct 20			
Barker Inlet PS	BARKIPS1	211	Pre-existing			Yes	Response time[4]
Bayswater PS	BW01	660	29 Sep 20	14 Oct 20			
Bayswater PS	BW02	660	14 Oct 20				
Bayswater PS	BW03	660	14 Oct 20				
Bayswater PS	BW04	660	29 Sep 20	14 Oct 20			
Bogong / Mackay PS	MCKAY1	300	28 Oct 20				
Callide B PS	CALL_B_1	350	After RTS in mid Nov 2020				
Callide B PS	CALL_B_2	350	30 Sep 20	28 Oct 20			
Callide C PS	CPP_3	420	23 Oct 20	28 Oct 20		Yes	Response time
Callide C PS	CPP_4	420	23 Oct 20	28 Oct 20		Yes	Response time
Coopers Gap WF	COOPGWF1	452	30 Nov 20	14 Dec 20			
Darling Downs PS	DDPS1	644	15 Jun 20				
Darlington Point SF	DARLSF1	324	Upon reaching 200 MW HP				
Eraring PS	ER01	720	After RTS in mid Oct 2020	30 Oct 20		Yes	Response time
Eraring PS	ER02	720	End of week commencing 12 Oct 20	30 Oct 20		Yes	Response time
Eraring PS	ER03	720	End of week commencing 19 Oct 20	30 Oct 20		Yes	Response time
Eraring PS	ER04	720	End of week commencing 19 Oct 20	30 Oct 20		Yes	Response time
Gangarri SF[5]	TBC[6]	120	Upon completion of commissioning				

[3] This column will be populated only when deadband adjustments will be made in two stages.

[4] AEMO has granted a variation in respect of response time, where 12 sec is required to achieve a 5% change in output. This information is included with the consent of the Affected Generator.

[5] Affected Generator not registered yet; still undergoing commissioning.

[6] DUID not yet assigned.

Affected GS Name	DUID	Reg Cap (MW)	PFR Settings changes to be (or have been) implemented by		Exemption	Variation	PFRP Varied
			Stage 1	Stage 2[3]			
Gladstone PS	GSTONE1	280					
Gladstone PS	GSTONE2	280					
Gladstone PS	GSTONE3	280					
Gladstone PS	GSTONE4	280					
Gladstone PS	GSTONE5	280					
Gladstone PS	GSTONE6	280					
Gordon PS	GORDON	432	Unit 1 – 11 Dec 20 Unit 2 – 28 Sep 20 Unit 3 – 29 Sep 20				
Hallett PS	AGLHAL	217	31 Oct 20[7]				
Jemalong SF	JEMALNG1	50	Upon completion of commissioning.				
Kiamal SF	KIAMSF1	239[8]	Upon reaching 200 MW HP				
Kogan Creek PS	KPP_1	744	After RTS in mid Nov 2020[9]				
Liddell PS	LD01	500	25 Nov 20				
Liddell PS	LD02	500	25 Nov 20				
Liddell PS	LD03	500	25 Nov 20				
Liddell PS	LD04	500	25 Nov 20				
Limondale 1 SF	LIMOSF11	275	Upon reaching 200 MW HP				
Lincoln Gap WF	LGAPWF1	212	23 Oct 20				
Loy Yang A PS	LYA1	560	End of week commencing 12 Oct 20				
Loy Yang A PS	LYA2	530	End of week commencing 12 Oct 20				
Loy Yang A PS	LYA3	560	After RTS in early Nov 2020				

[7] Applicable to one generating unit, remainder previously complied with the PFRP.

[8] This project has not yet achieved registration. Final registration details may change from those shown here.

[9] An implementation date has been agreed for this Affected GS. Discussions with the Affected Generator are ongoing in relation to other settings.

Affected GS Name	DUID	Reg Cap (MW)	PFR Settings changes to be (or have been) implemented by		Exemption	Variation	PFRP Varied
			Stage 1	Stage 2[3]			
Loy Yang A PS	LYA4	560	End of week commencing 19 Oct 20				
Loy Yang B PS	LOYYB1	500	12 Dec 20	17 Dec 20			
Loy Yang B PS	LOYYB2	500	30 Sep 20	28 Oct 20			
Macarthur WF	MACARTH1	420	16 Nov 20				
Millmerran PS	MPP_1	426	1 Oct 20	28 Oct 20		Yes	Response time
Millmerran PS	MPP_2	426	After RTS in early Nov 2020			Yes	Response time
Morgan Whyalla Pump PV1	MWPS1PV1	6	Upon completion of commissioning in Feb 2021				
Morgan Whyalla Pump PV2	MWPS2PV1	6	Upon completion of commissioning in Feb 2021				
Morgan Whyalla Pump PV3	MWPS3PV1	8	Upon completion of commissioning in Oct 2020				
Morgan Whyalla Pump PV4	MWPS4PV1	6	Upon completion of commissioning in Feb 2021				
Mortlake PS	MORTLK11	283	30 Sep 20				
Mortlake PS	MORTLK12	283	After RTS in early Nov 20.				
Mt Piper PS	MP1	700	After RTS in late Dec 20.				
Mt Piper PS	MP2	700	29 Sep 20	28 Oct 20			
Murra Warra WF	MUWAWF1	231	17 Oct 20				
Murray PS	MURRAY	1500	31 March 21[10]				
Newport PS	NPS	500	28 Sep 20	30 Oct 20			
Pelican Point PS	PPCCGT	478	30 Sep 20				

[10] One *generating unit* (out of 14) will have PFR Settings implemented after RTS in Oct 2021.

Affected GS Name	DUID	Reg Cap (MW)	PFR Settings changes to be (or have been) implemented by		Exemption	Variation	PFRP Varied
			Stage 1	Stage 2[3]			
Poatina PS	POAT220	200	Pre-existing			Yes	Deadband, Response Time[11]
Poatina PS	POAT110	100	Pre-existing			Yes	Deadband, Response Time[12]
Sapphire WF	SAPHWF1	270	30 Oct 20				
Shoalhaven PS	SHGEN	240	Bendeela Unit 1 – 31 October 2022 Bendeela Unit 2 - 31 August 2021 Kangaroo Valley Unit 3 -30 November 2023 Kangaroo Valley Unit 4 -31 August 2021				
Stanwell PS	STAN-1	365	28 Oct 20				
Stanwell PS	STAN-2	365	28 Oct 20				
Stanwell PS	STAN-3	365	28 Oct 20				
Stanwell PS	STAN-4	365	28 Oct 20				
Swanbank E GT	SWAN_E	385	16 Nov 20			Yes	Response Time
Tallawarra PS	TALWA1	440	31 Dec 20				
Tamar Valley CCGT	TVCC201	208					
Tarong North PS	TNPS1	443					
Tarong PS	TARONG#1	350	23 Sep 20[13]				
Tarong PS	TARONG#2	350	11 Nov 20				
Tarong PS	TARONG#3	350	30 Sep 20[14]				
Tarong PS	TARONG#4	350	30 Sep 20[15]				
Torrens Island B PS	TORRB1	200					

[11] The variation to the deadband at ±150 mHz is for 6 months only. The variations were granted due to the inherent capability and design of the Affected GS. This information is included with the consent of the Affected Generator.

[12] The variation to the deadband at ±150 mHz is for 6 months only. The variations were granted due to the inherent capability and design of the Affected GS. This information is included with the consent of the Affected Generator.

[13] Unit operating with +/- 50 mHz deadband as of 6th Oct 20

[14] Unit operating with +/- 50 mHz deadband as of 6th Oct 20

[15] Unit operating with +/- 50 mHz deadband as of 6th Oct 20

Affected GS Name	DUID	Reg Cap (MW)	PFR Settings changes to be (or have been) implemented by		Exemption	Variation	PFRP Varied
			Stage 1	Stage 2[3]			
Torrens Island B PS	TORRB2	200					
Torrens Island B PS	TORRB3	200					
Torrens Island B PS	TORRB4	200					
Tumut 3 PS	TUMUT3	1500	30 Nov 20				
Tumut 1 & 2 PS	UPPTUMUT	616	30 Nov 20				
Vales Point B PS	VP5	660	30 Sep 20			Yes	Deadband[16]
Vales Point B PS	VP6	660	30 Sep 20			Yes	Deadband[17]
Wivenhoe PS	W/HOE#1	285	26 Oct 20			Yes	Response Time
Wivenhoe PS	W/HOE#2	285	27 Oct 20			Yes	Response Time
Yallourn W PS	YWPS1	360	After RTS in early Oct 20	28 Oct 20			
Yallourn W PS	YWPS2	360	29 Sep 20	28 Oct 20			
Yallourn W PS	YWPS3	380	29 Sep 20	28 Oct 20			
Yallourn W PS	YWPS4	380	29 Sep 20	28 Oct 20			

8. Impact on Frequency Performance

AEMO provides detailed reporting on power system frequency performance in its Frequency and Time Error Monitoring reports[18] published quarterly. The most recent report was published in August 2020.

This report focuses on a sub-set of the matters raised in the quarterly report and provide some information focusing on relatively recent frequency performance to help capture impacts on power system frequency that are (at least in part) associated with the implementation of the Mandatory PFR Rule.

Figure 1 shows the monthly frequency distribution for the last six months (01 Apr 2020 to 04 Oct 2020). Figure 2 shows the day-by-day frequency distribution around the time Affected Generators began implementation of their PFR Settings at the end of September 2020.

[16] AEMO has granted a variation to the deadband at ±100 mHz based on the unique condition of the Affected GS for a period of 12 months. This information is included with the consent of the Affected Generator.

[17] AEMO has granted a variation to the deadband at ±100 mHz based on the unique condition of the Affected GS for a period of 12 months. This information is included with the consent of the Affected Generator.

[18] Available at https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/ancillary-services/frequency-and-time-deviation-monitoring.

These figures show improvement in the closeness of the distribution of frequency around 50 Hz. This trend is expected to continue as additional Affected GSs alter settings over the following weeks and months.

Figure 1 Monthly frequency distribution (six-month rolling, 01 Apr 2020 to 04 Oct 2020)

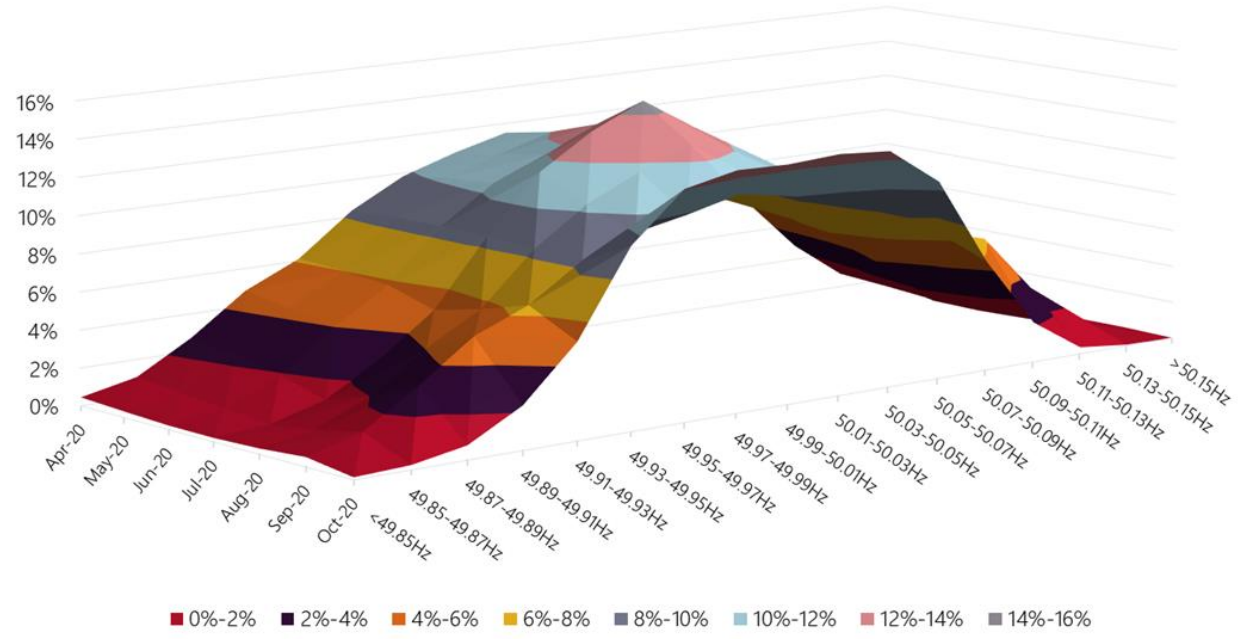
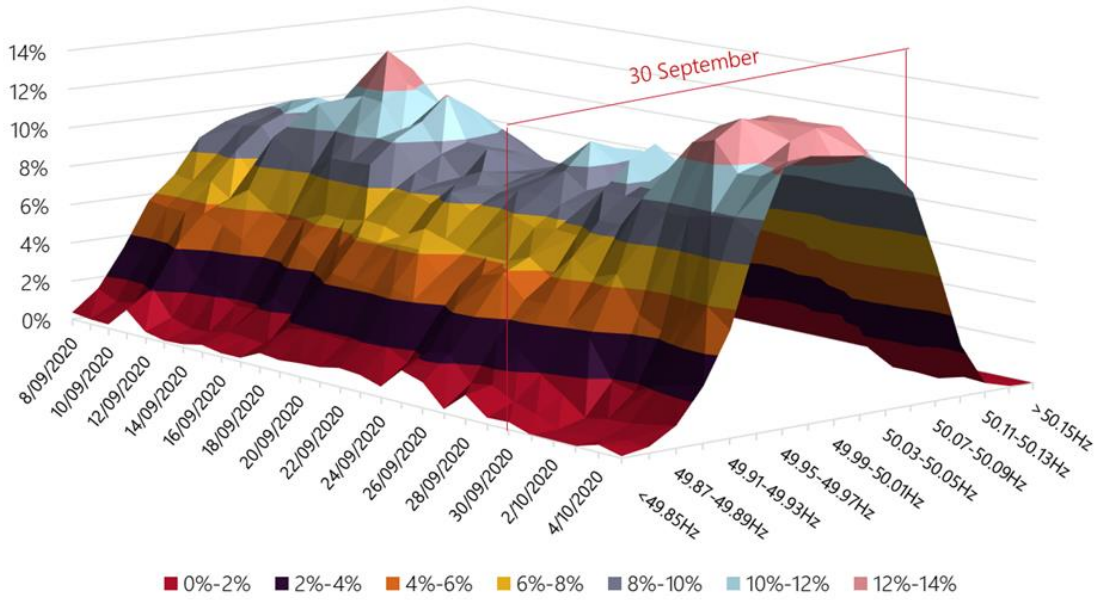


Figure 2 Daily frequency distribution (08 Sep 2020 to 04 Oct 2020)



The total number of departures from the normal operating frequency band (NOFB) and the number of times frequency crossed the nominal 50 Hz is shown on a monthly basis in Figure 3 and on a day-by-day basis in Figure 4.

These figures show a reduction in the number of excursions outside the NOFB following the commencement of implementation of PFR setting changes from the end of September 2020. This trend is expected to improve as further Affected GSs implement setting changes over the upcoming weeks and months.

Figure 3 Monthly frequency crossings – under 49.85 Hz, across 50 Hz, beyond 50.15 Hz

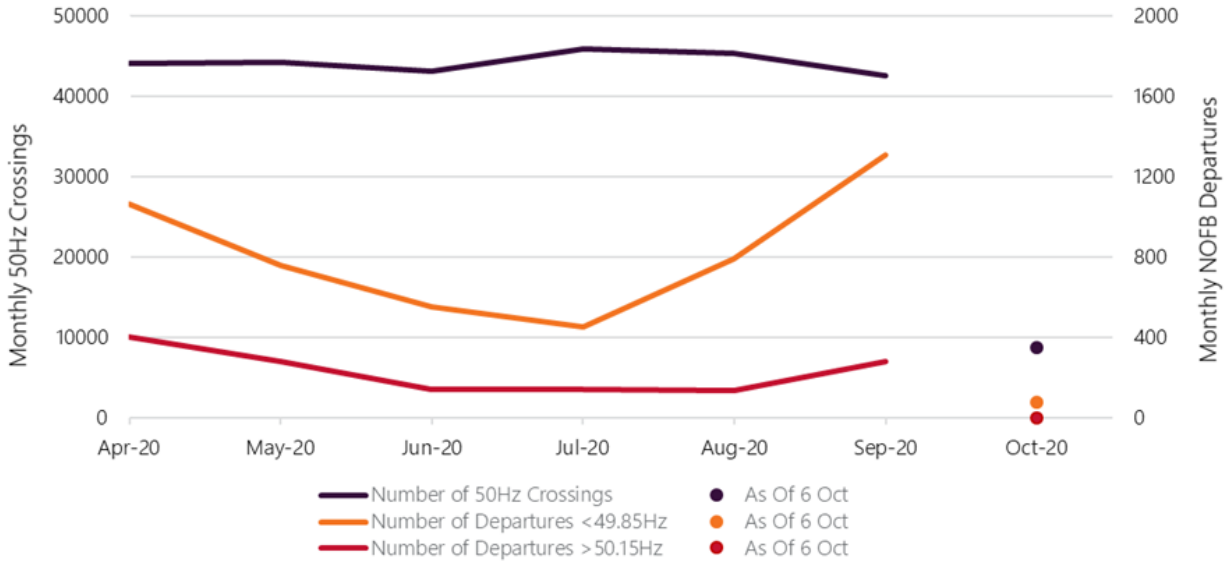
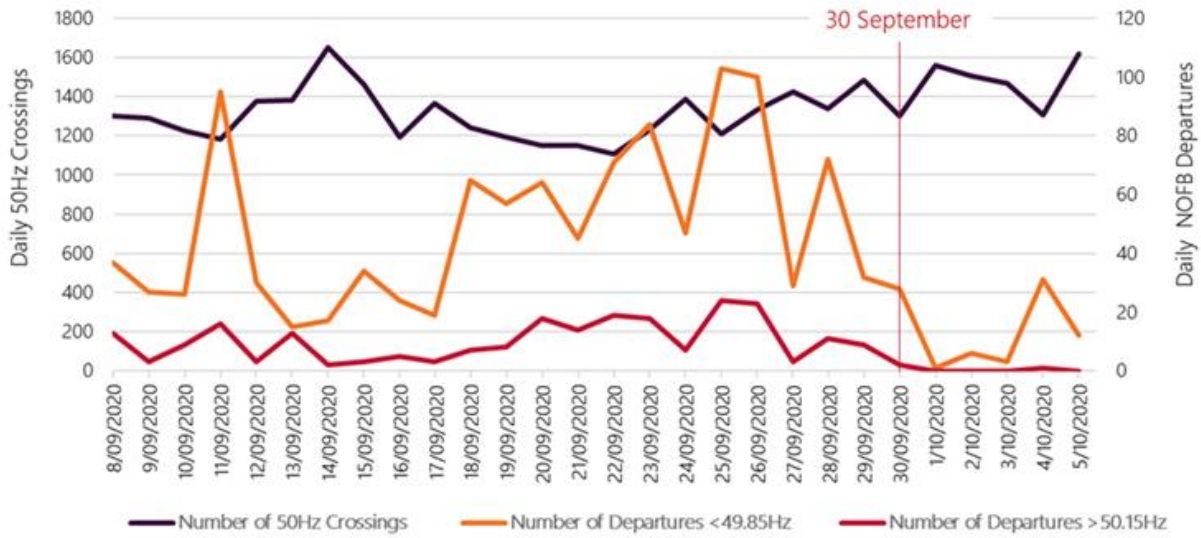


Figure 4 Daily frequency crossings – under 49.85 Hz, across 50 Hz, beyond 50.15 Hz



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
Affected Generator	As defined in the IPFRR.
Affected GS	As defined in the IPFRR.
CCGT	Combined Cycle Gas Turbine.
DUID	Dispatchable unit identification.
GT	Gas Turbine
HP	Hold Point. A point during commissioning of new *plant* determined by reference to *generation* output.
IPFRR	Interim Primary Frequency Response Requirements.
Mandatory PFR Rule	National Electricity Amendment (Mandatory Primary Frequency Response) Rule 2020.
NOFB	*normal operating frequency band.*
PFR	*primary frequency response.*
PFRP	*primary frequency response parameters.*
PS	Power Station.
PV	Photovoltaic
Results	As defined in the IPFRR.
RTS	Return to service following an *outage*.
SF	Solar Farm.
Tranche 1	Affected GS with a *nameplate rating* of >200 MW.
Tranche 2	Affected GS with a *nameplate rating* between 80 MW and 200 MW.
Tranche 3	Affected GS with a *nameplate rating* of <80 MW.
WF	Wind Farm.