Implementation of PFR rule

Update – Nov 2020

Mandatory Primary Frequency Response (PFR) rule

Timeline to date

March 2020

- Rule is made, covering all NEM Scheduled and Semi-Scheduled generation

June 2020

- AEMO publish Interim Primary Frequency Response Requirements (IPFRR)

Sept 2020

- Mass implementation of Tranche 1 commences from 30th Sept

Generation Tranches

Tranche	Membership	Capacity (approx.)	Stations / sites (approx.)	Target for Implementation
1	DUIDs > 200 MW	35.6 GW	44	Pre Summer 20/21
2	DUIDs 80 – 200 MW	17.4 GW	101	30 Mar 2021
3	DUIDs < 80 MW	5.1 GW	88	30 June 2021
Totals		58.1 GW	233	

Tranche 1 implementation as at 20th November

- Self-assessments were due 28th August.
- Assessments completed and settings agreed for 42 of 44 sites.
- Variations to PFR requirements agreed for 10 sites (17 DUIDs), mostly response time.
- No exemptions (applications at 3 sites).
- 21.7 GW with setting changes completed or commenced, of 35.6 GW total.
- Additional Tranche 1 capacity coming shortly at some or all units at:
  - Liddell, Loy Yang B, Mount Piper, Callide C, Swanbank E, Tumut 3
  - Multiple Semi-Scheduled Wind & PV sites still to come
- Details of all setting change by date and DUID available from AEMO website.

Tranche 2 & 3

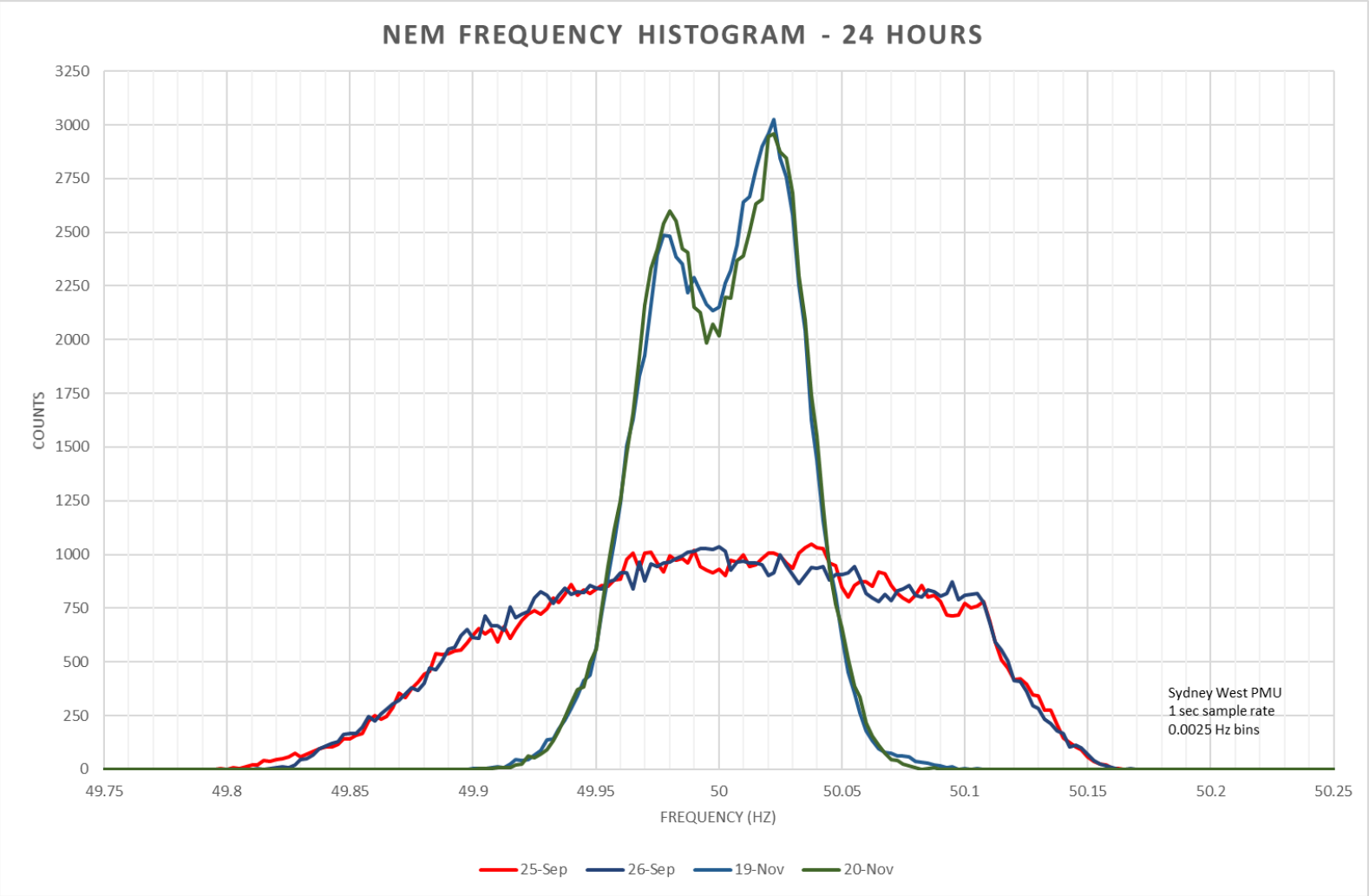
Tranche 2 (17.4 GW)

- Self-assessments due 19th Nov.
- Received 72 (of 101 sites expected)
- Assessments and settings for 9 now agreed.
- 6 applications for exemption
- No settings changes yet implemented for this tranche.

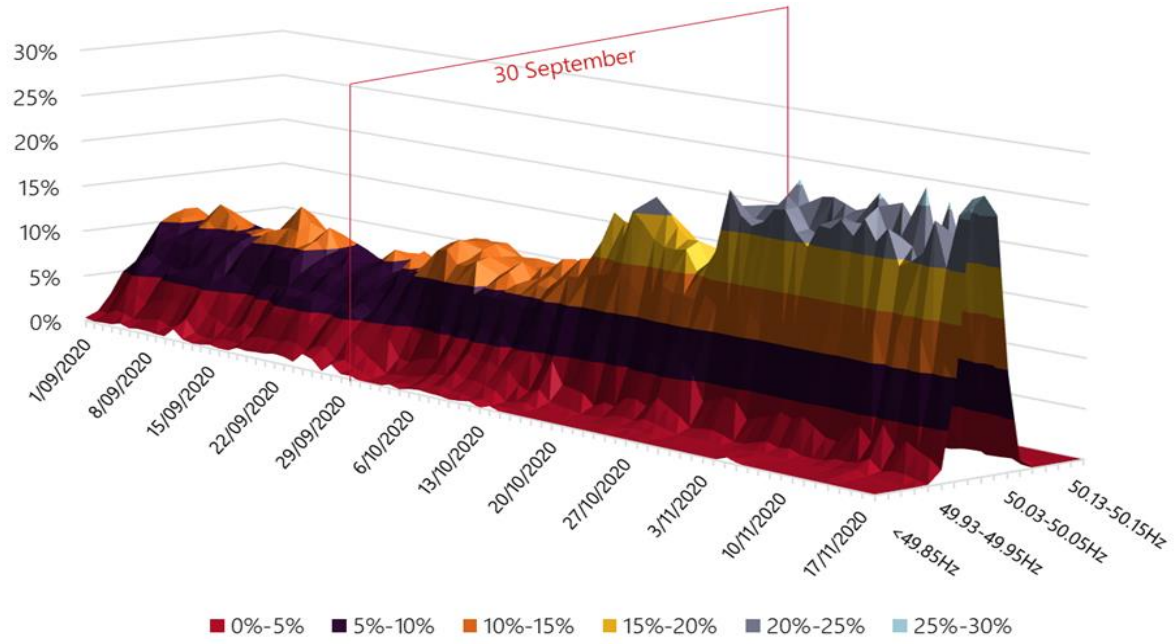
Tranche 3 (5.1 GW)

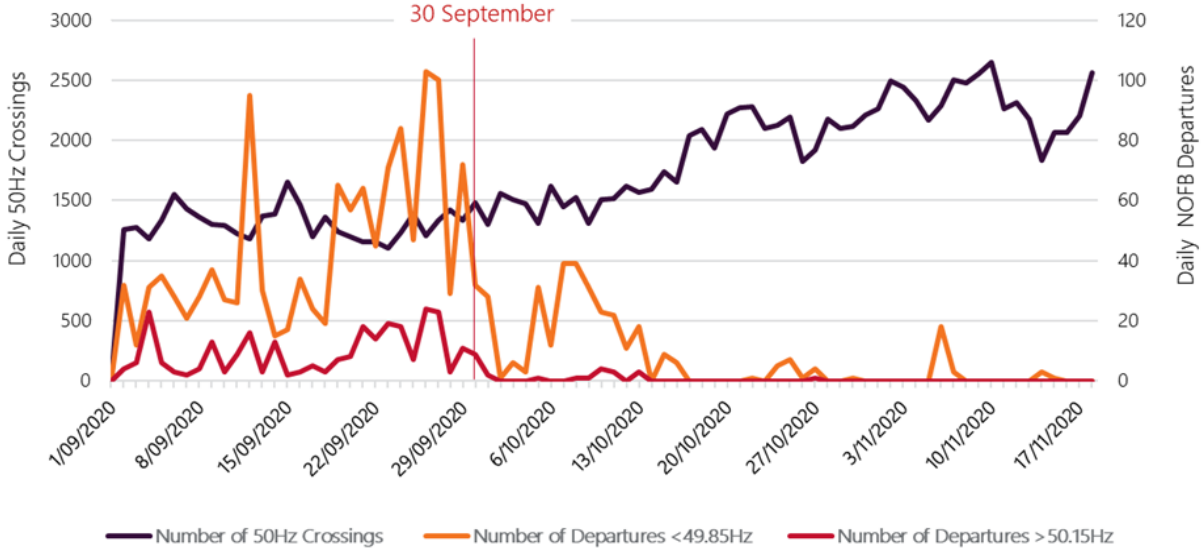
- Self-assessments due 17 Feb 2021.
- Received 17 (of 88 sites expected)
- Assessments and settings for 7 now agreed.
- 2 applications for exemption.
- No settings changes yet implemented for this tranche.

Distribution of NEM frequency



Frequency statistics





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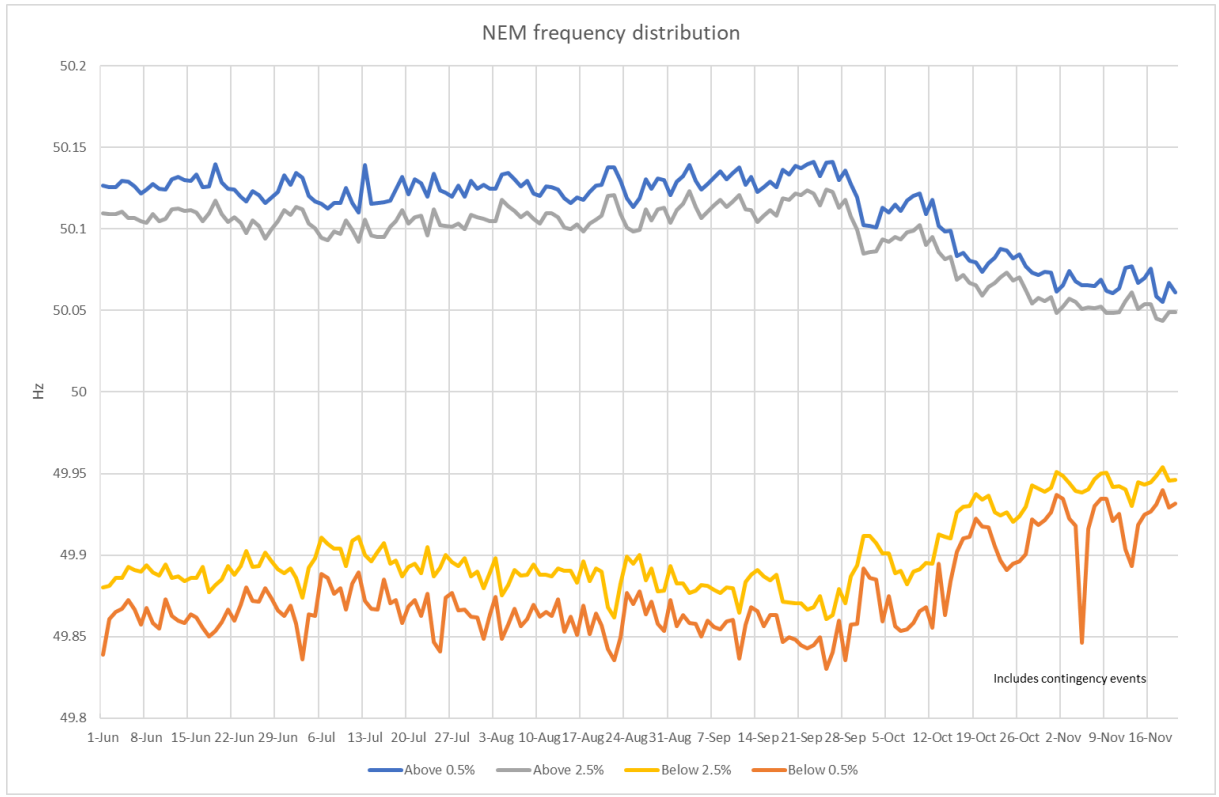
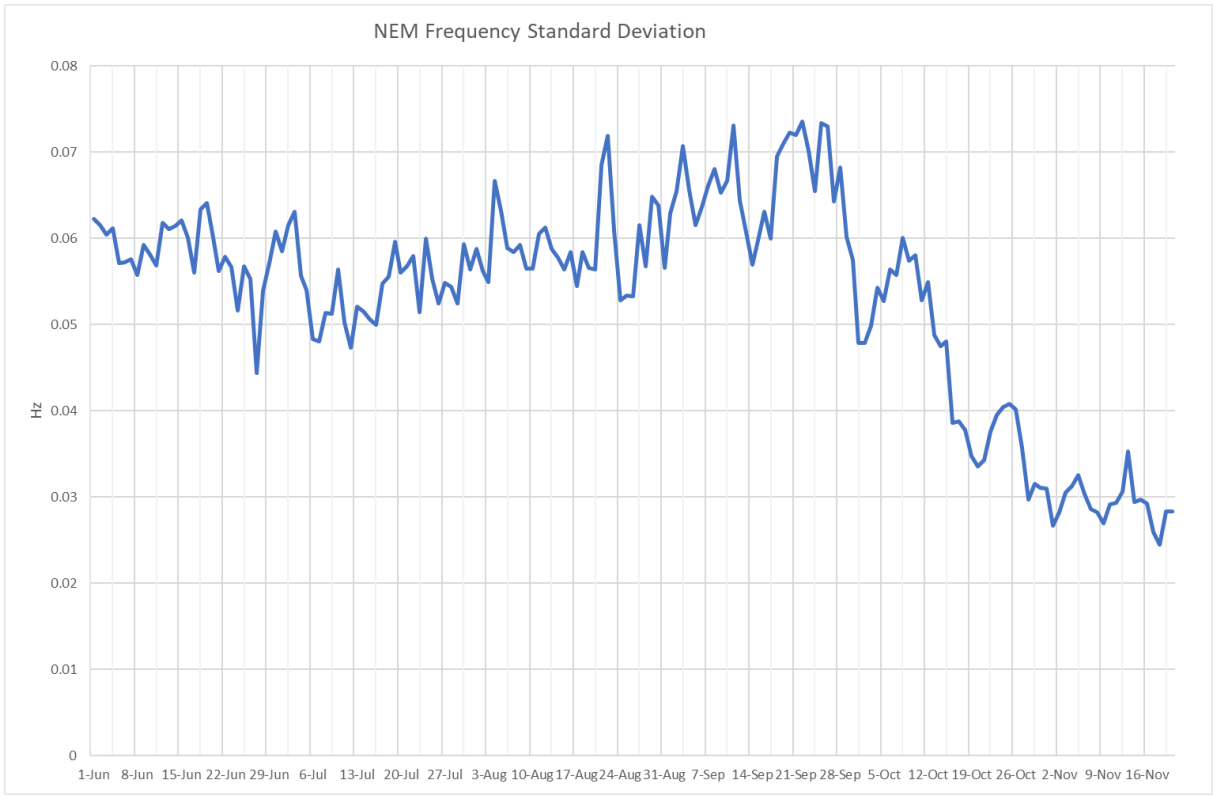
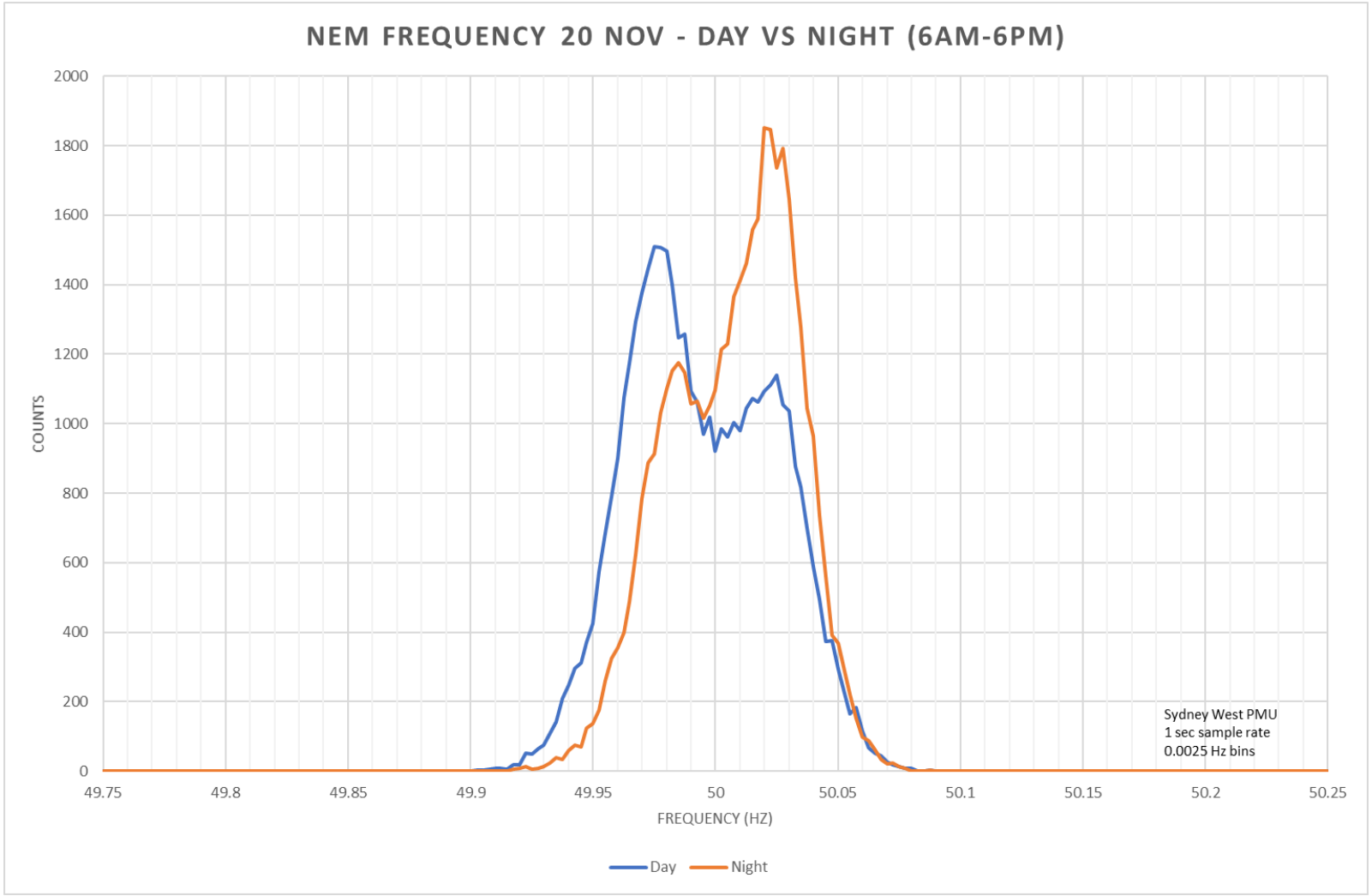
Frequency statistics (cont.)





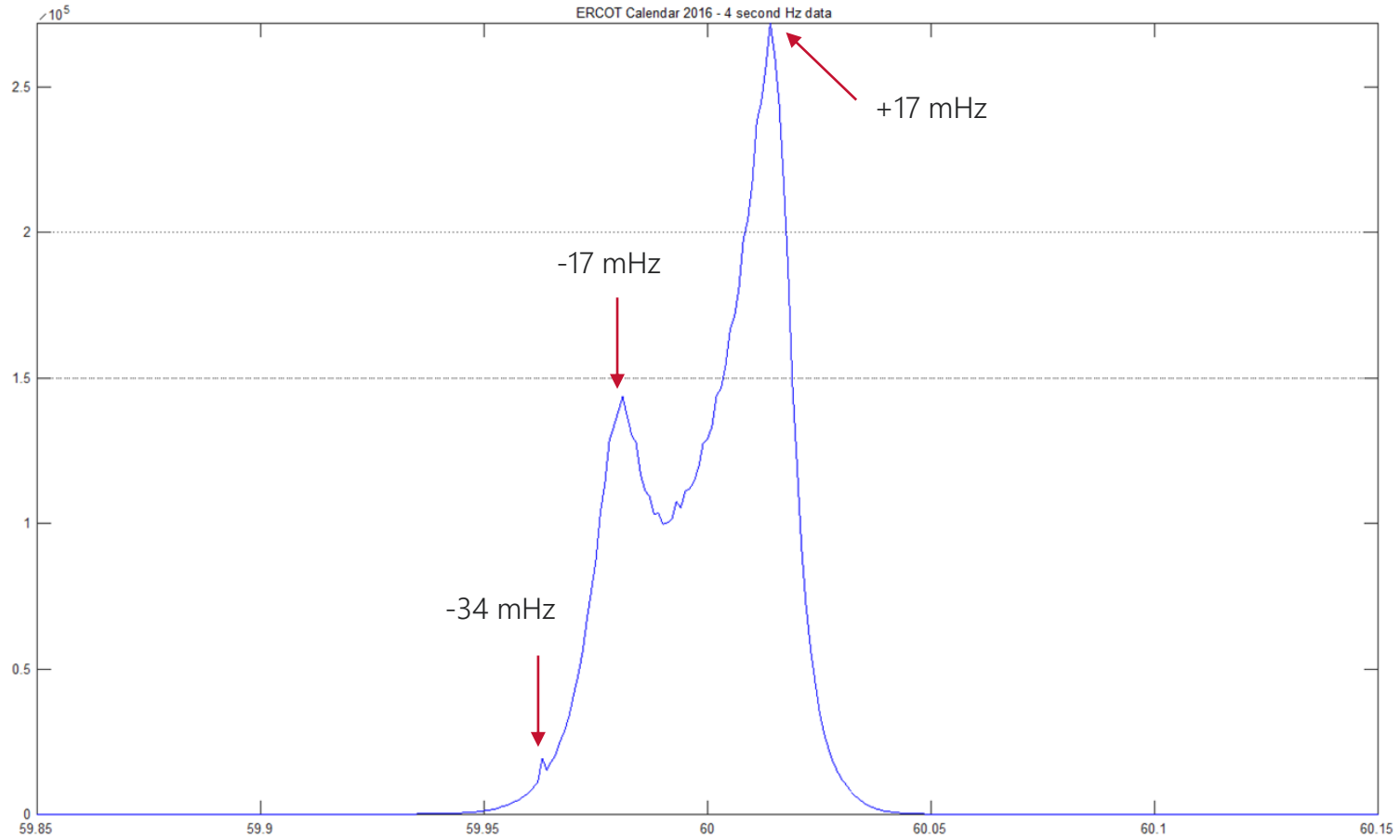
Day vs Night

- Broader frequency distribution, more low-frequency events during daylight hours
- PV ramping / forecasting ?
- Price volatility -> physical volatility ?
- Daytime load behaviour ?



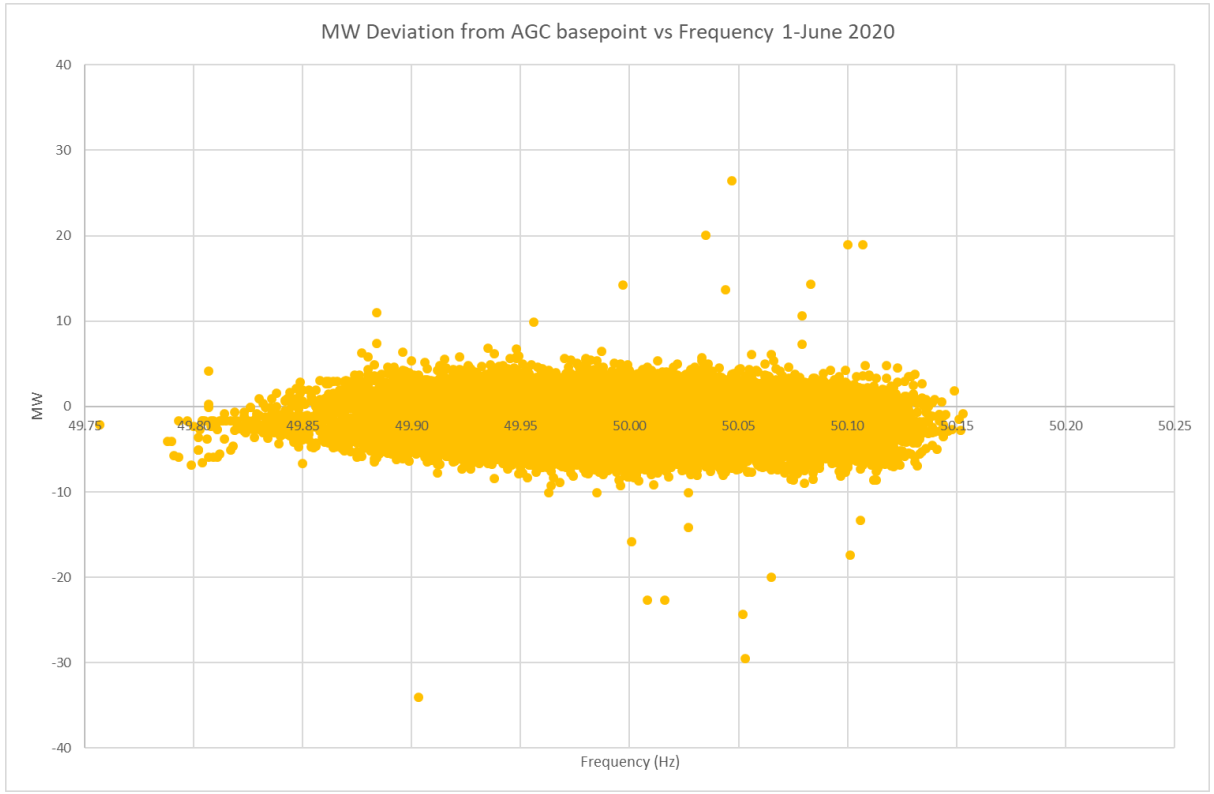
Shape of frequency distribution

- ERCOT (Texas) frequency – 2016
- 75 GW peak, synchronous island
- Dead-bands at +/- 17 mHz (a few exceptions at +/- 34 mHz)

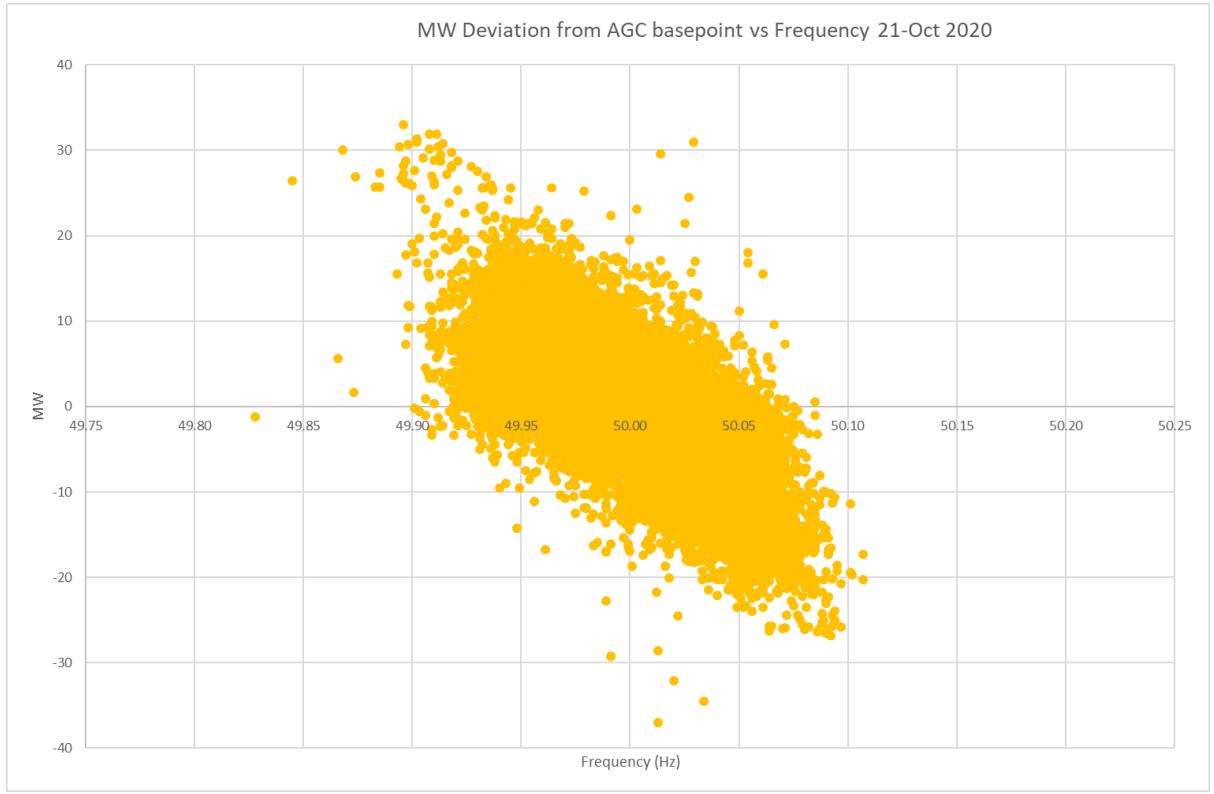


Impact on generation

Before – Frequency vs MW deviation



After – Frequency vs MW deviation



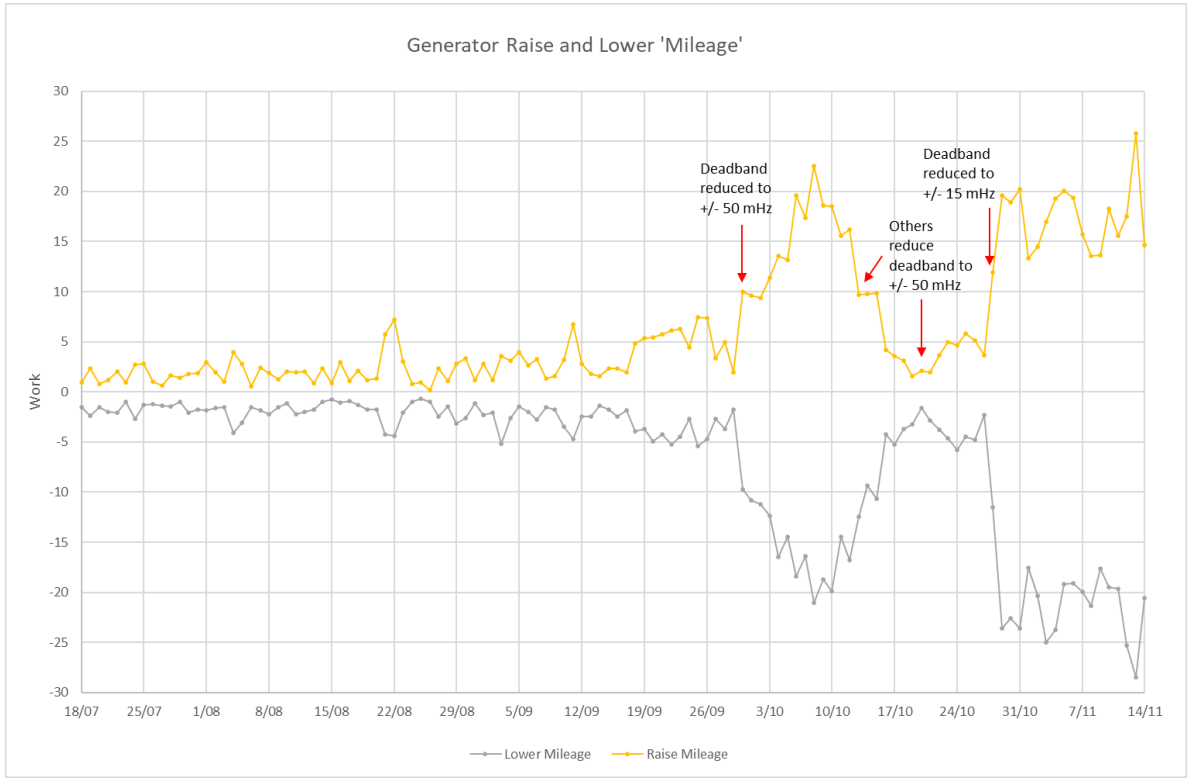
- Large sub-critical steam turbine before and after altering settings to respond outside +/- 15 mHz

Impact on generation (cont.)

Generation impact

- Increased movement off market or AGC basepoints.
- Increased MW ‘mileage’
- Increased control valve / guide vane movements
- More stable rotational speed
- Far fewer triggers for contingency frequency response
- Impact on any individual minimised by maximising participation

Example of mileage assessment



Going forward

- Majority of installed MW capacity, and sites, still to come.
- Semi-Scheduled generation
  - Over 50% of Tranche 2 & 3 capacity
  - Well proven to be capable of rapid and effective frequency response.
  - For each OEM, will be proving integrated functionality at a small number of projects before moving to mass rollout.
- AGC tuning
  - Focus on units with AGC issues post PFR changes, major REG FCAS providers
  - Assessment of REG FCAS performance and utilisation

Further information

PFR implementation status reports

- Published every 2-3 weeks from July 2020
- Register of all setting changes, variations and exemptions.

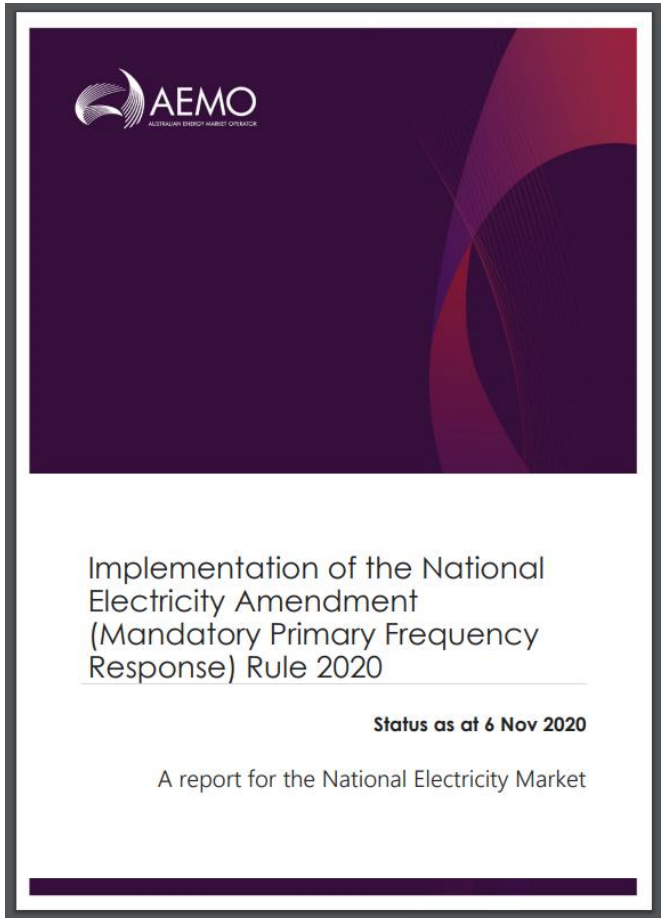
Quarterly monitoring reports

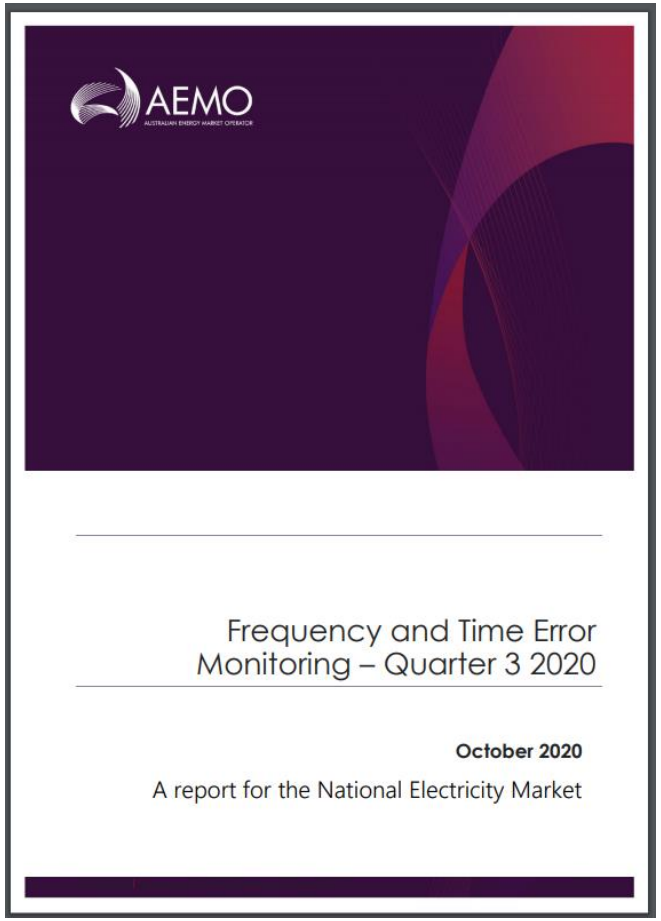
- Range of statistical data on frequency, AGC, time error, and contingency events.

Weekly frequency reports

- Numerical raw data and statistics for frequency, time error, procurement and utilisation of AGC regulation reserves (REG FCAS).

Questions to pfr@aemo.com.au



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