

# Non-Co-optimized Essential System Service for Fast Frequency Response

July 2022

Industry Consultation Session



We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

**We pay respect to their Elders past, present and emerging.**

# Overview

- SWIS is experiencing rapid uptake of large Distributed Solar PV (DPV) volumes, resulting in declining levels of system load and higher risk exposure to DPV tripping
- AEMO's system modelling has identified the risk associated with DPV tripping in a range of worst-case credible contingencies (based on resultant voltage disturbances) exceeds our current ability to manage through Spinning Reserve Ancillary Services
- Whilst new inverter standards (AS4777.2: 2020) should limit risk, AEMO has identified that its current ability to manage credible contingencies alongside DPV tripping is limited. Although rates of DPV installation have slowed since the Coordinator trigger.
- This presentation outlines:
  - the supporting modelling used to trigger the WEM Non-Co-optimised Essential System Services (NCESS) for a Fast Frequency Response service
  - the status of the procurement of Fast Frequency Response and results of the Expressions of Interest process
  - The characteristics of Fast Frequency Response which AEMO is seeking

# Timeline

**1 February 2022:** Tranche 5 WEM Rules for the NCESS framework commenced

**13 April 2022:** AEMO submitted a Trigger request to the Coordinator of Energy to procure up to 100 MW of FFR for the period 1 October 2022 to 1 October 2023

**28 April 2022:** the Coordinator determined to trigger the NCESS procurement, with AEMO to undertake the procurement and contracting

**16 May 2022:** AEMO released the call for Expressions of Interest

**14 June 2022:** Expressions of Interest process closed

# NCESS Procurement Process

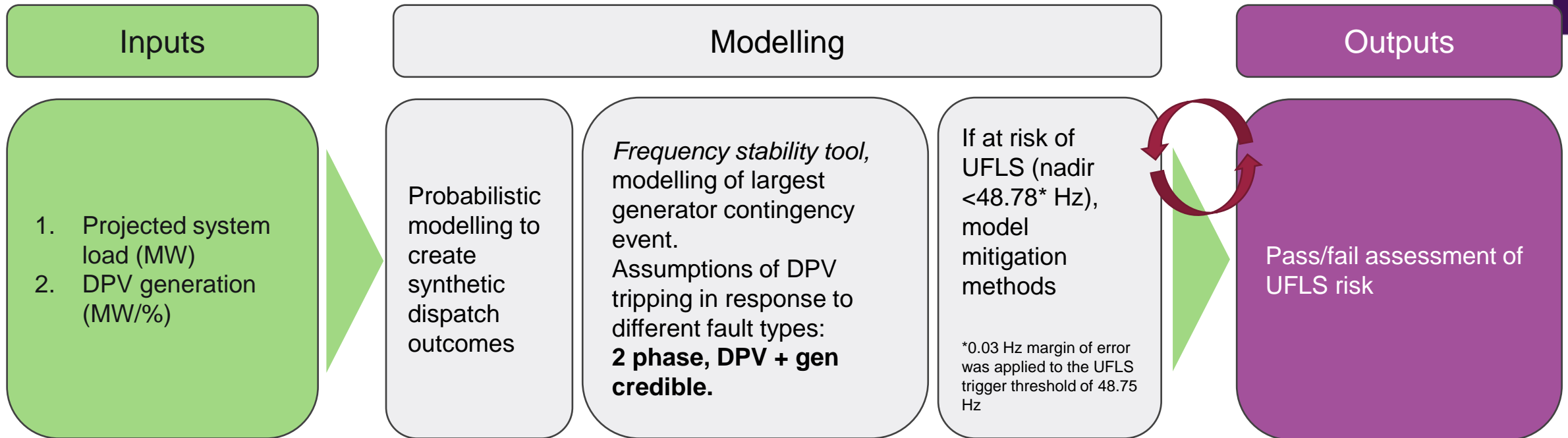
Fast Frequency Response



# Frequency modelling: methodology overview

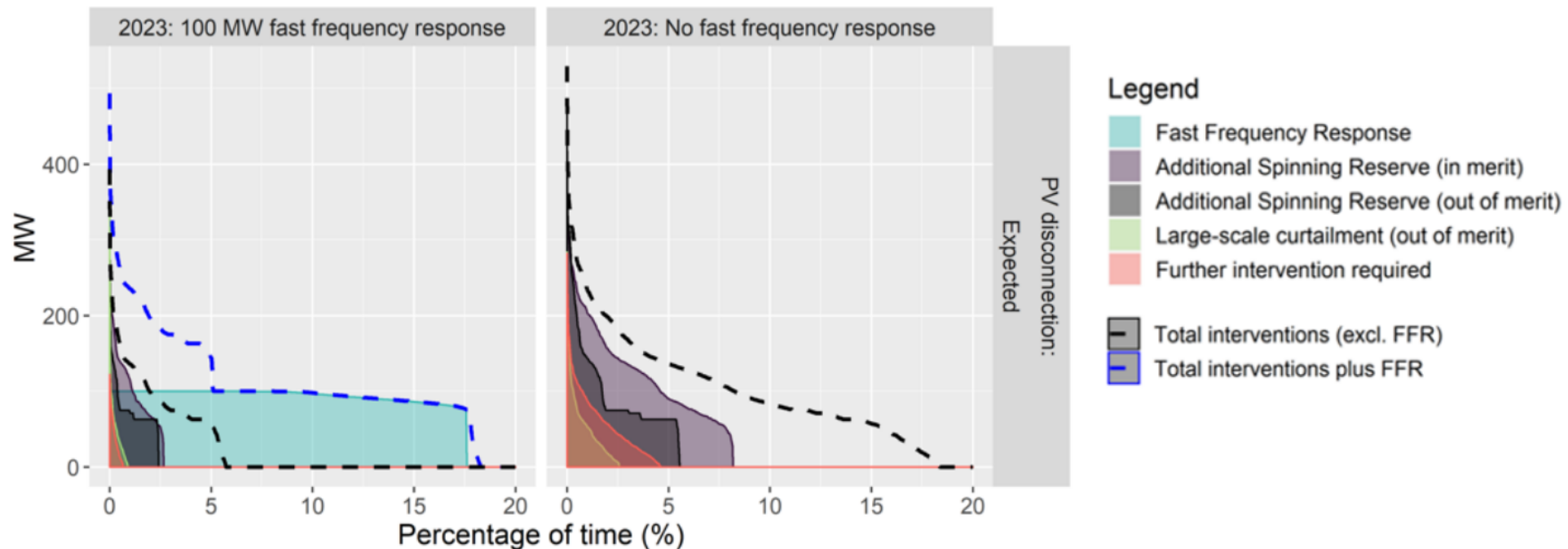
Purpose:

- to model the impacts of DPV and load tripping during a generator contingency event; and
- model possible risk mitigation methods (additional Spinning Reserve, generator curtailment, fast frequency response)



# Frequency modelling: results overview

- Figure: Percentage of time intervention is required during 2023
- Red areas represent where risk could not be resolved and further intervention would be required (e.g. UFLS)
- In scenarios with 100 MW FFR:
  - Reduced residual risk (red area), from approximately 5% of intervals to less than 1%.
  - Reduced need for interventions (represented by black dotted line) is required, reducing from approximately 16% to 7%
  - Overall less total MW (i.e. intervention or FFR, represented by the blue dotted line) is needed in the scenario with FFR, as the speed of response means 1MW of FFR out performs 1MW of Spinning Reserve.



# Expressions of Interest

Fast Frequency Response





# Summary

- AEMO received a limited quantity of offers, all of which included a level of non-compliance with the draft Service Specification.
- AEMO received 6 MW of potentially compliant offers for a FFR Service against a maximum requirement of 100 MW.
- Changes to the NCESS Service Specification to address non-compliances, whilst still meeting the fundamental nature of the proposed FFR Service, as set out in AEMO's submission to the Coordinator under clause 3.11A.2A of the WEM Rules, may increase the availability of a FFR Service to 13 MW for the period October 2022 – October 2023 – considerably less than the maximum 100 MW quantity specified.
- All received indicative prices for the service materially exceed the assessed value to the market presented by a FFR Service in reducing interventions in the market (where FFR offsets constrained on/off quantities).

# NCESS Service Specification

Fast Frequency Response



# What is Fast Frequency Response

- FFR generally refers to the delivery of a rapid active power increase or decrease by generation or load in a timeframe of two seconds or less, to correct a supply-demand imbalance and assist in managing power system frequency. \*
- Fast Frequency Response: power injected to (or absorbed from) the grid in response to changes in measured or observed frequency during the arresting phase of a frequency excursion event to improve the frequency nadir or initial rate-of-change of frequency\*\*

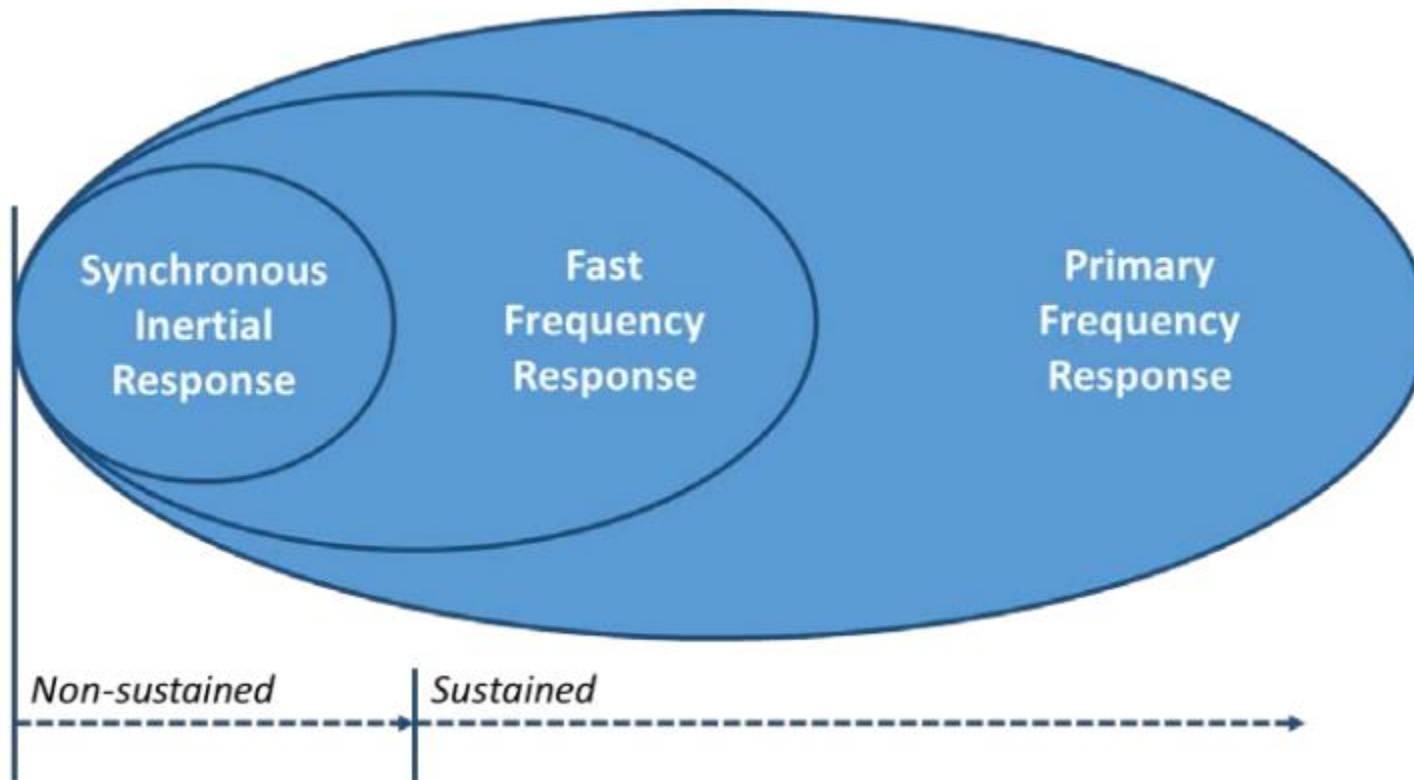
\*AEMO. Fast Frequency Response in the NEM, paper published in 2017

\*\* NERC, FFR White Paper,

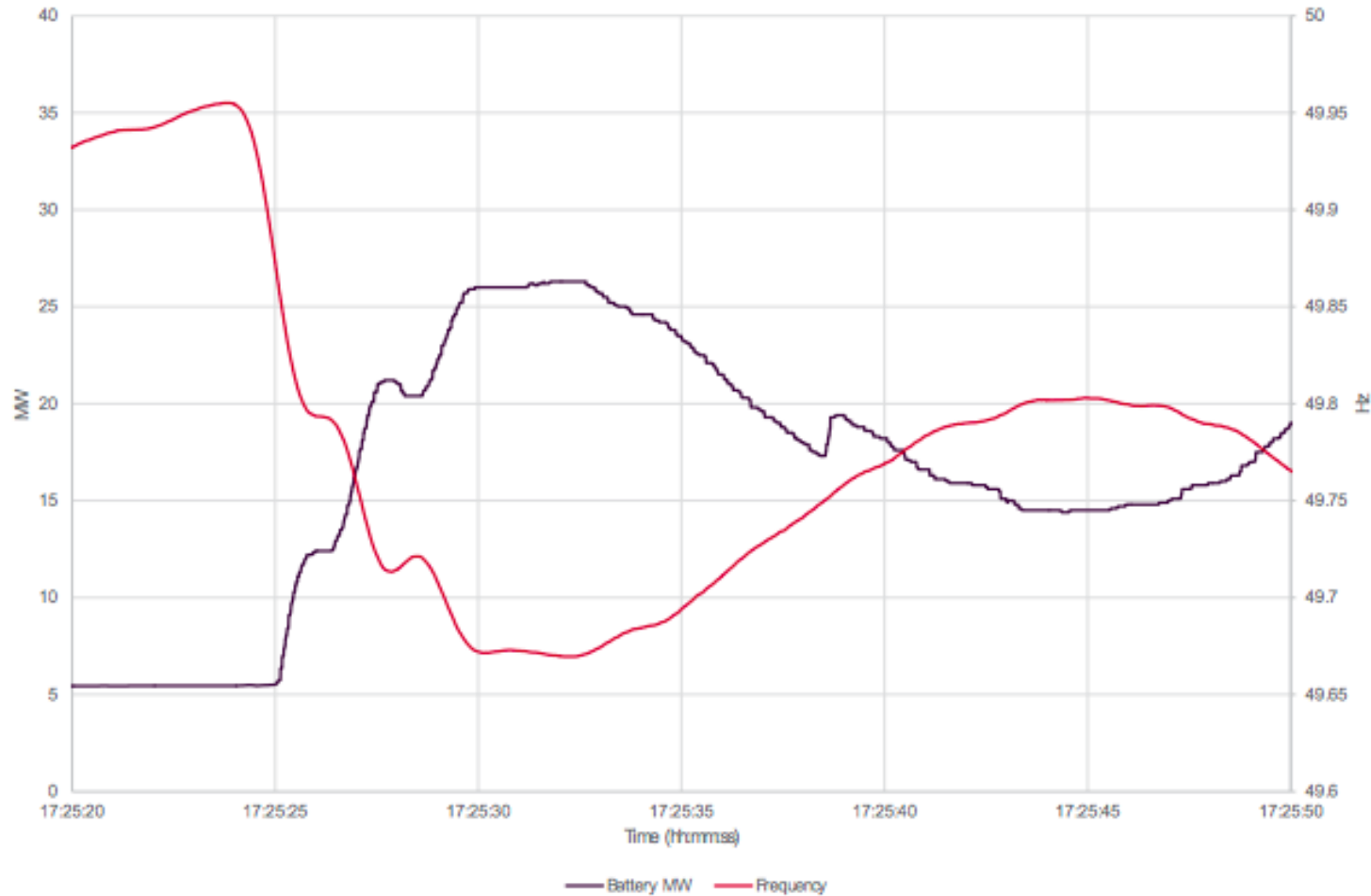
[https://www.nerc.com/comm/PC/InverterBased%20Resource%20Performance%20Task%20Force%20RPT/Fast\\_Frequency\\_Response\\_Concepts\\_and\\_BPS\\_Reliability\\_Needs\\_White\\_Paper.pdf](https://www.nerc.com/comm/PC/InverterBased%20Resource%20Performance%20Task%20Force%20RPT/Fast_Frequency_Response_Concepts_and_BPS_Reliability_Needs_White_Paper.pdf)

# FFR Response time

FFR response is in the timescales of inertial response and Primary Frequency Response and has to be sustained for a period of time



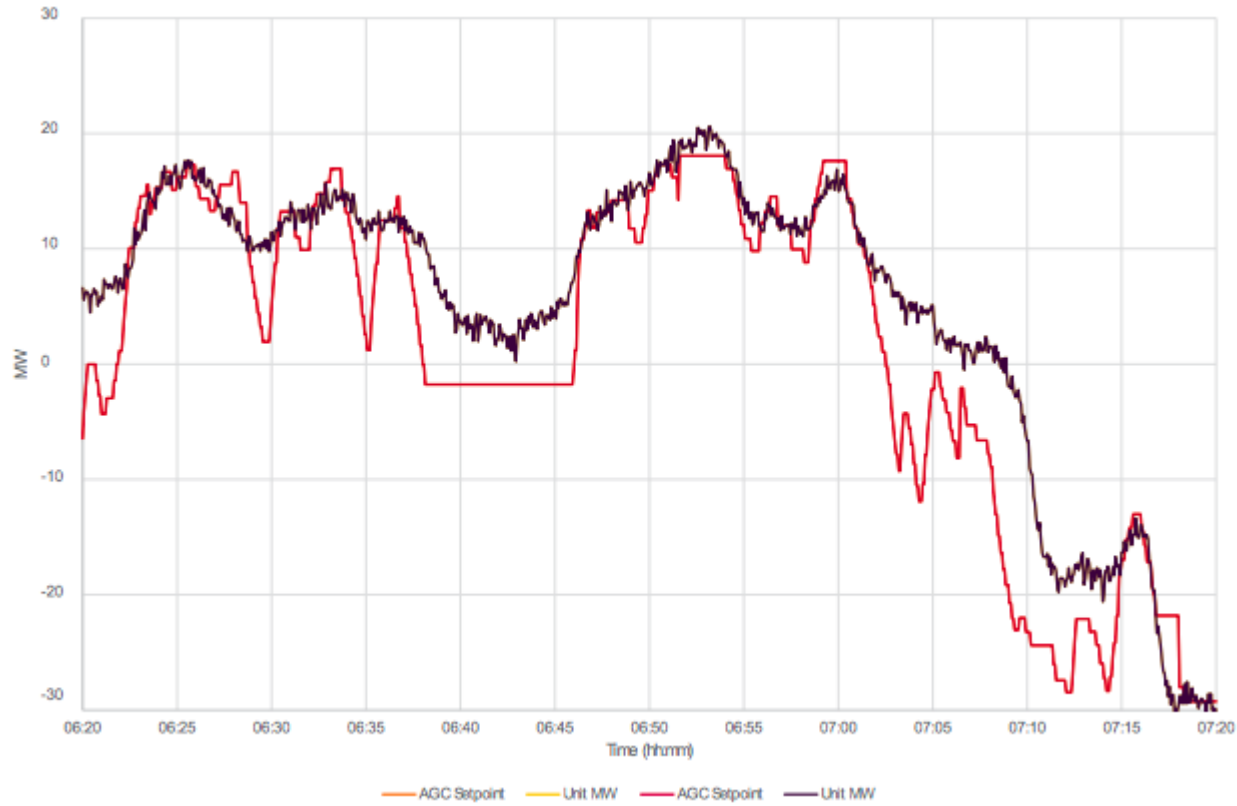
# Ideal Response



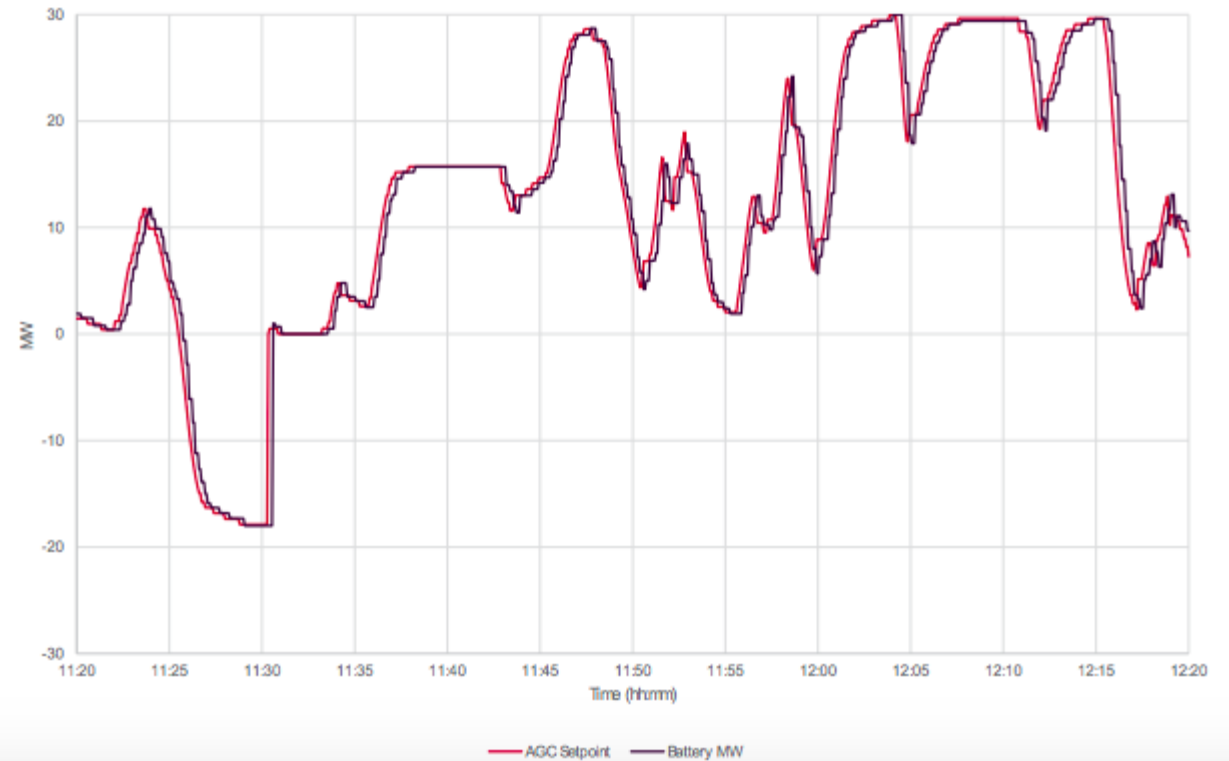
A positive verification of the response is required, so that it can be assessed after contingencies

Hornsedale response to the trip of a generator on 18 December 2017

# Ideal Response

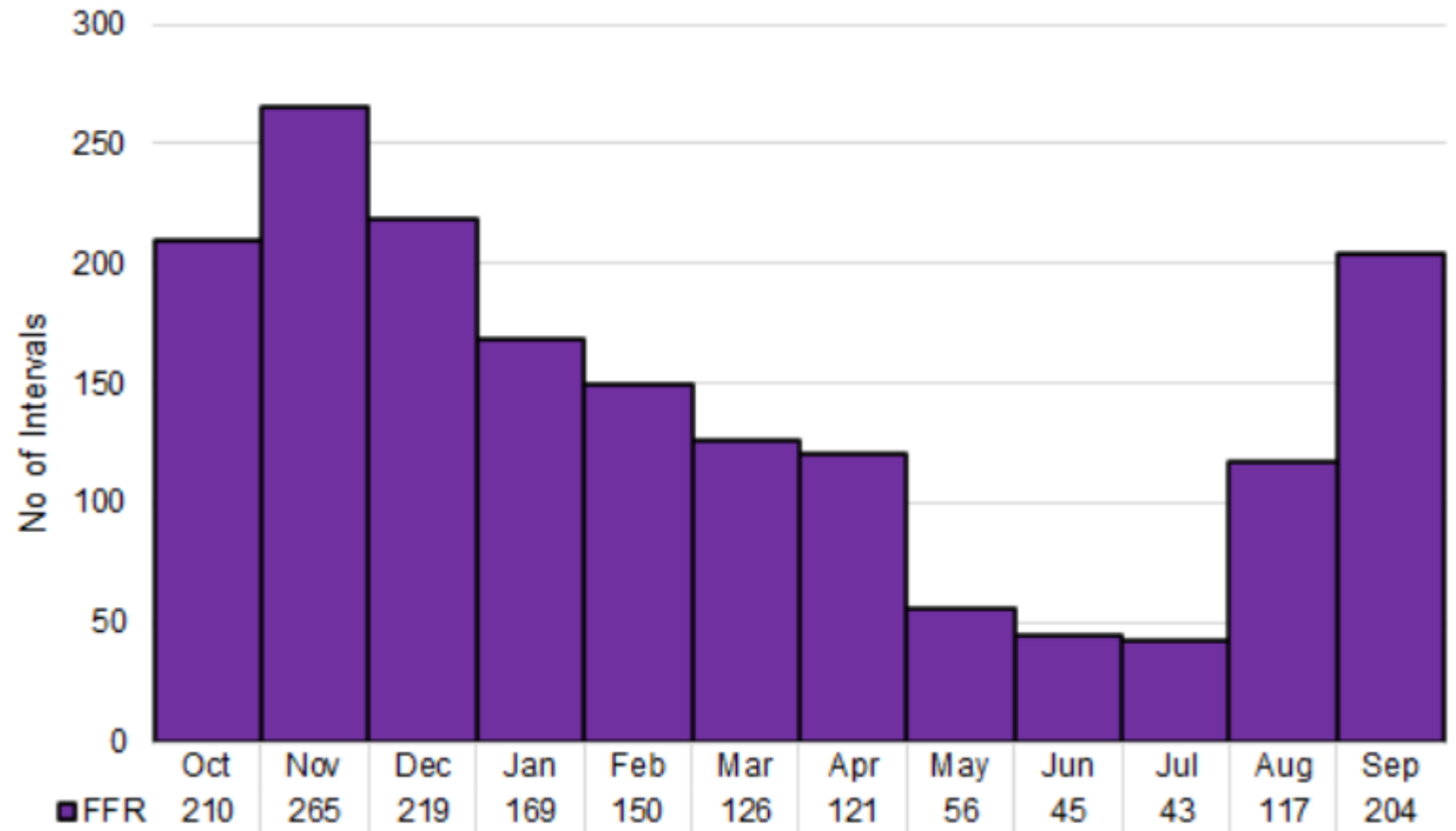


Synchronous generator response vs. power electronics response providing AGC



# Service Timing

- AEMO’s modelling has identified the shoulder season as the critical timing for FFR, due to the incidents of low ambient temperatures and high irradiance, which drives low load and large contingency sizes due to DPV tripping



# Fast Frequency Response

The draft NCESS Service Specification released with EOI includes the following key requirements:

- Service timing, October 2022 – September 2023
- Service delivery aligned with Contingency Reserve Raise requirements of the new market (glidepath to future participation)
- Service delivery aligned with Communications and Control Systems WEM Procedure (SCADA obligations and High Resolution Time Synchronised Data Recorder)
- Additional Requirements:
  - Response in <1 second (Tau factor of 0.2)
  - Re-enablement in 15 minutes of SWIS Frequency Recovery



# Questions for industry

- Are there elements of the draft NCESS Service Specification which discouraged participation in the Expressions of Interest process?
- Are there proponents who did not participate in the Expressions of Interest process who are potentially interested in participating in a call for NCESS submissions? (tender)



For more information visit

[aemo.com.au](http://aemo.com.au)