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Operational Metering Working Group

11/12/2023

Agenda

13:00	*10 mins*	**Welcome & Introductions**
13:10	*20 mins*	**Case Studies Update**
13:30	*40 mins*	**ENCC Overview of Operational Metering**
14:10	*20 mins*	**Independent Operational Metering Review**
14:30	*20 mins*	**Trial Update**
14:50	*10 mins*	**Next Steps & AOB**

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Next Steps

Immediate

Update Trial Parameters to allow:

- 60 second asynchronous readings

Short Term

Collaboratively Develop Adaptive Sample Rate Metering

- Industry will be invited to inform the development of adaptive sample rate metering techniques and technical parameters.

Medium Term

External Independent Review of Operational Metering Technical Standards

- To provide a clear understanding of the role operational metering has in balancing the system and quantification of the implications of any amendments to the technical standards, considering the current and future energy mix.
- Independent review of metering capability on the full range of flexible assets that ESO can expect to be providing flexibility to the energy system.
- Recommendation for the technical standards ESO can adopt in order to maintain system stability.

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Case Study Refresher & Findings

Case Study Refresher

Case Study 1 (Aggregated Accuracy)

How differing measurement accuracies at the individual asset level influence the accuracy of a single metering feed at the aggregated level.

- To understand the likely error band of an aggregated metering feed comprising sub-units measuring to a nameplate accuracy of +/- 2.5% – Current CoP11 accuracy standards
- To understand the likely error band of an aggregated metering feed comprising sub-units measuring to a nameplate accuracy of +/- 10% – Current Electric Vehicle Smart Charge Point Regulation standards

Case study 2 (Read Frequency)

To understand how altering the measurement frequency at an individual asset level can impact the accuracy of an aggregated metering feed and how the aggregation methodology affects the accuracy of the aggregated metering feed.

- Established a 1 second synchronous base case
- Compare base case to various asynchronous measurement frequencies
- Analysed impacts of differing ramp-rates on accuracy

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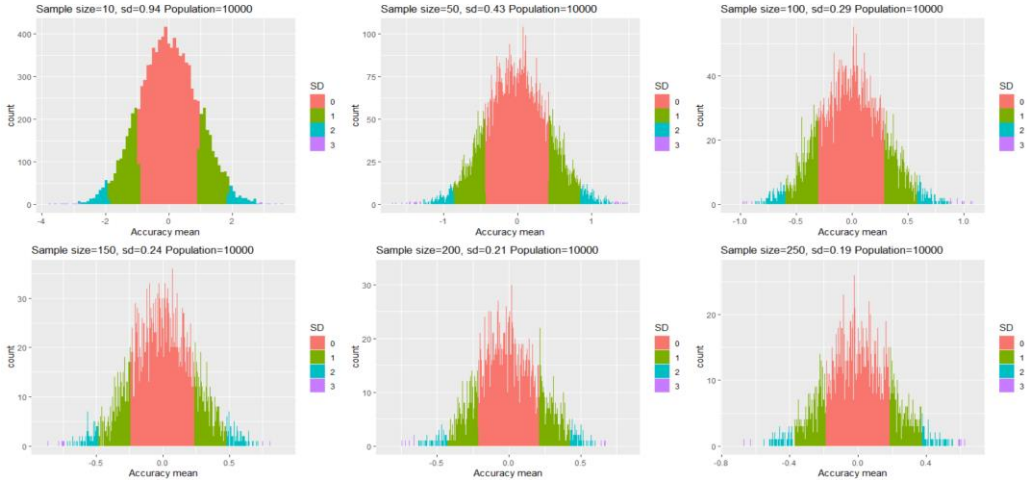
Case Study 1 Results (Aggregated Accuracy)

Overview

- Used a desk-based statistical approach
- Made assumptions around the population of measurement accuracies we are looking to aggregate
- We used the fact that if you know that measurements from the individual meters are on average within +/- 1% of a true value across your sample size, you can have confidence that your aggregated measurement accuracy is within +/-1% of the true value
- Study assumes measurements taken over same period doesn't consider different read frequencies



Example distribution of measurement accuracies based on different sample sizes – Original distribution range +/- 10%, population size 10,000

Findings

Nameplate measurement accuracy	Sample size required for 99.7% confidence that the average accuracy falls between +/1%
+/-1%	1
+/-2.5%	10
+/-10%	100

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Case Study 2 Results (Read Frequency)

Objective

Understand the dynamic time-lag error of an aggregate metering feed, based on the measurement rate of individual assets.

Overview

- Worked with E.V energy
- Tested impact of measurement frequency at the individual asset level on accuracy of aggregated metering feeds
- Assets able to read at a one second frequency, which was used as the base case in our example

Findings

- The aggregate metering time lag when ramping up or down is affected by the measurement rate of individual assets.
- The metering time lag when ramping up or down is greatly reduced with asynchronous metering of individual assets compared to synchronous sampling.
- Controlled ramp rates reduce the time lag error across the ramp rate, which could enable less strict metering standards for services that don't require a full ramp within one minute.

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Q&A

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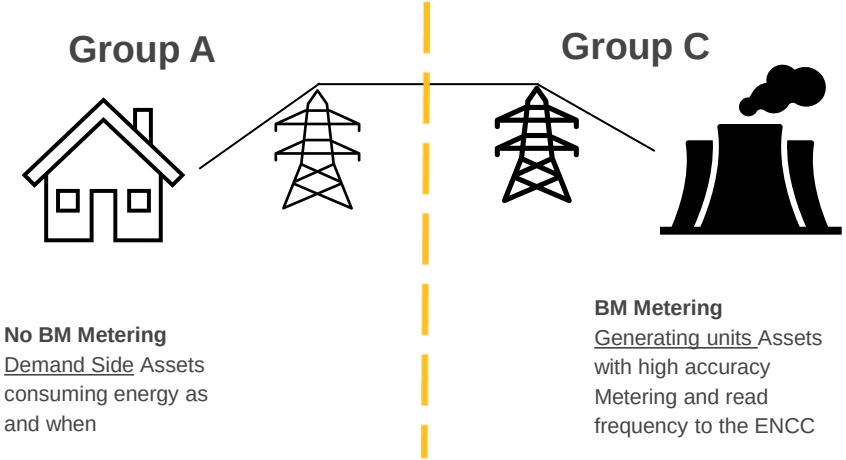
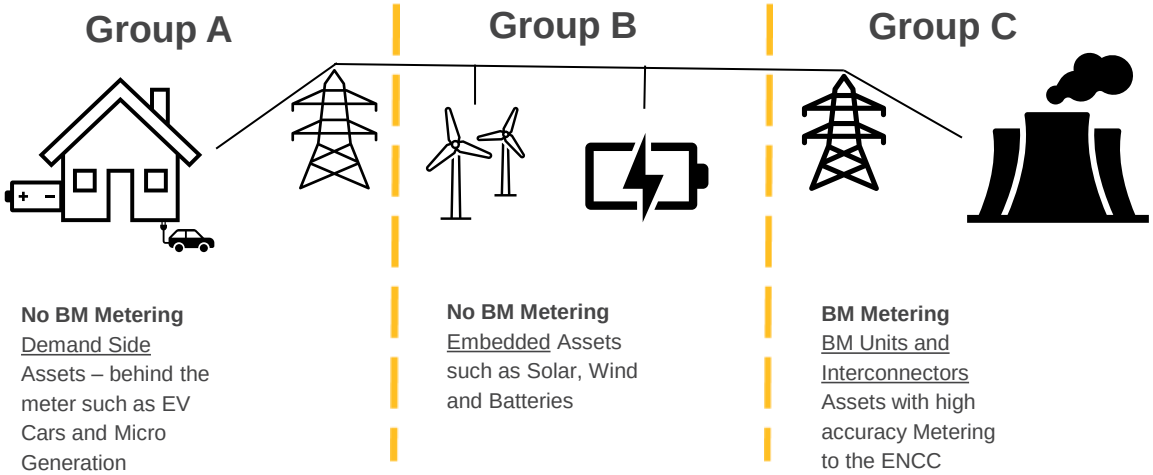
ENCC Overview of Operational Metering

ENCC Overview of Operational Metering – Origins



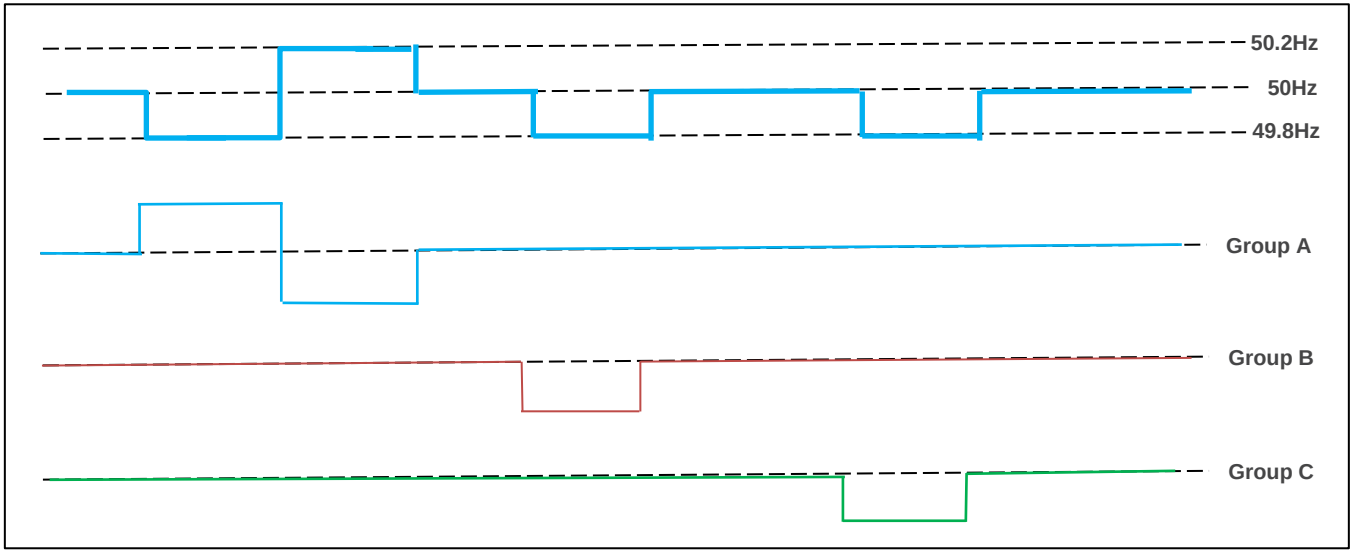
- Initially the Balancing Mechanism contained two main groups – Large scale generating units (with metering provided) & demand (no metering provided)
- Generating units were capable of a high level of metering (1 second refresh rate & 1% accuracy)
- As frequency on the system is maintained within 0.4% of 50Hz by the ENCC, the sum of the Group C metering was assumed to be the ‘demand’ on the system
- Fluctuations in demand are seen in frequency feed (sub second update) and instructions taken by ENCC can be seen quickly
- We know what ‘true demand’ is (Group A), our generation output (Group C) & our instructed level for Group C
- If frequency changes away from 50Hz, we know if this either due to changes in either Group A or Group C or our instruction isn’t responding as expected

ENCC Overview of Operational Metering – Current challenges



- Introduction of embedded assets means Group C metering no longer represents Group A (‘true demand’)
- Increased flexible demand side assets also makes it more complex to understand what is causing imbalances or increased volatility in system frequency
- If frequency changes away from 50Hz, we now don’t know if this is due to changes in either Group A or Group B. However due to high capability of metering in group C we can still deduce if it due to assets in this group or assets not responding to instructions
- Variations in Group A & B have introduced more volatility in system frequency, therefore high levels of metering of Group C is vital as this is the only way we can monitor and manage this

ENCC Overview of Operational Metering – Example

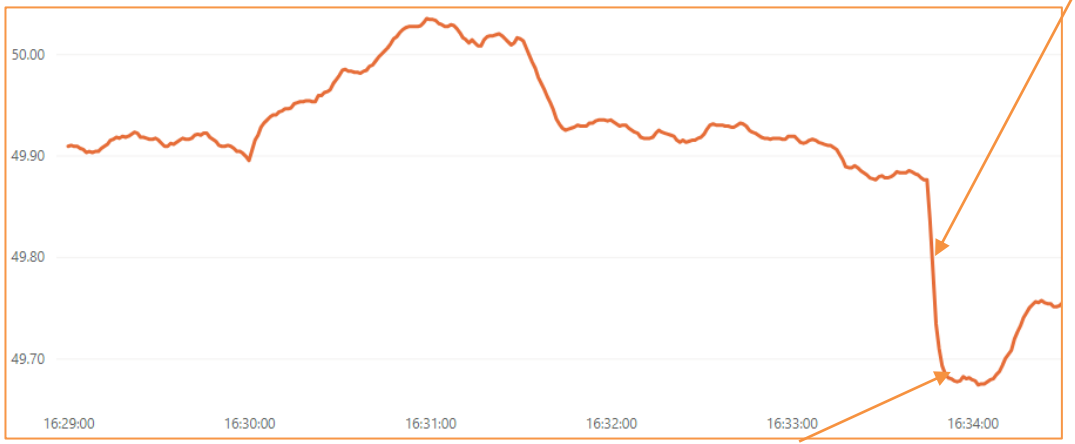


Frequency impact of Group A/B/C

Example: Frequency goes down

- Group A increased – add more generation in Group C (flexible as pickup could be short)
- Group B decreased – add more generation in Group C
- Group C decreased – add more generation in Group C (long duration if a fault)
- Group C shortfall (not meeting instructed output) - more generation in Group C, but how to respond?

ENCC Overview of Operational Metering – Asset/zonal level

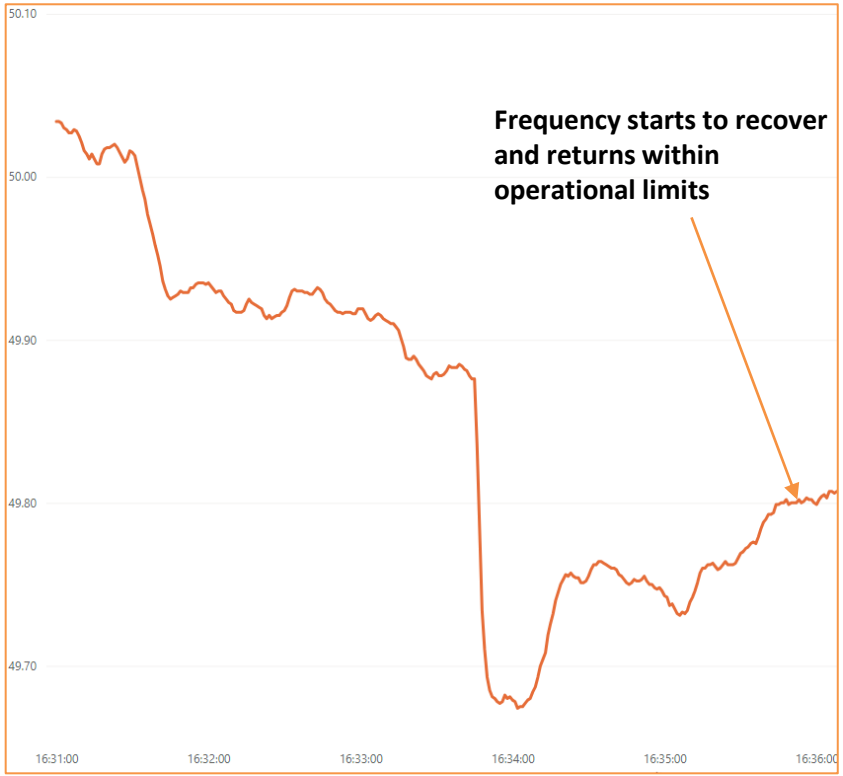


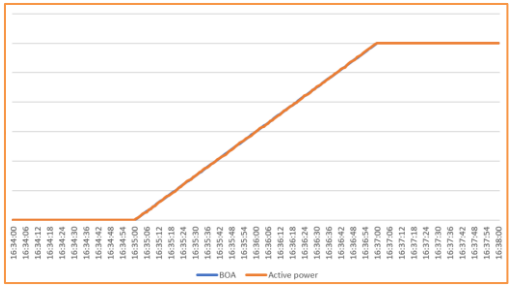
Frequency deviated outside of operational limits, requiring action to be taken

ENCC ACTION – Instruction sent to unit able to meet short-term energy imbalance

Frequency response has kicked in slowing the rate of change of frequency, but an imbalance still remains

ENCC Overview of Operational Metering – Scenario 1





Operational metering operating in line with CCL

Assumption

Group C - Asset responded as expected

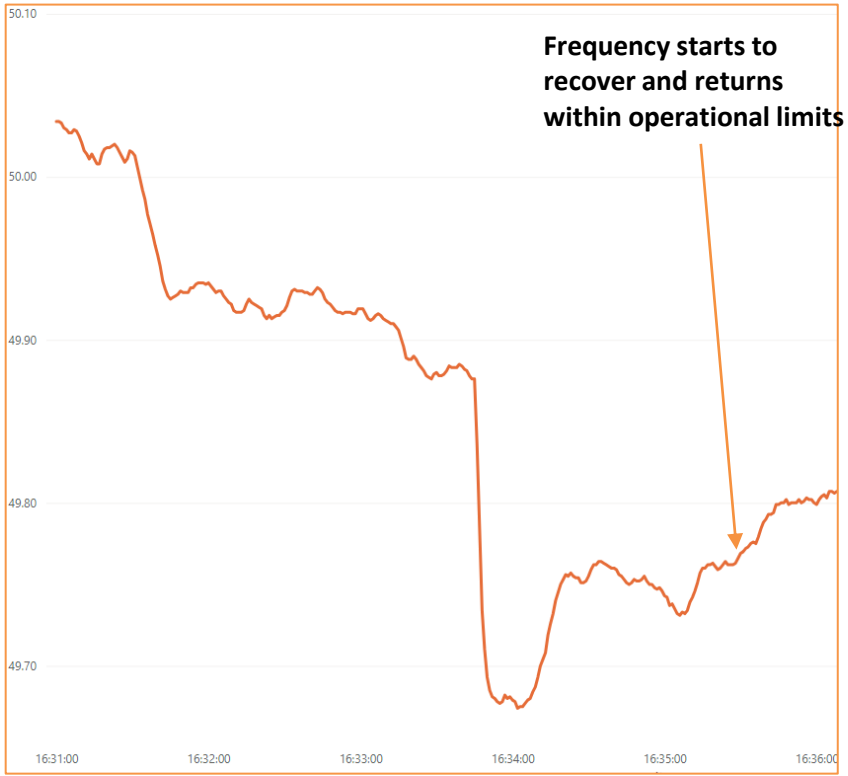
Group A/B - Underlying demand/embedded generation not having an impact

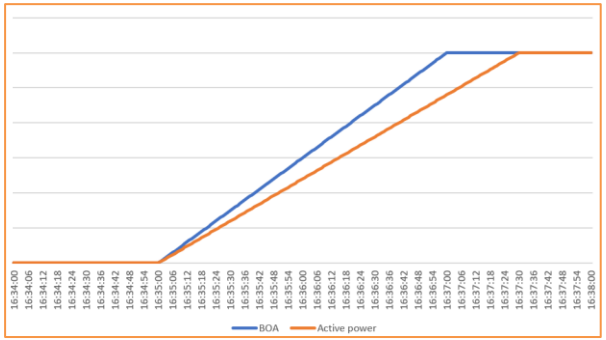
Frequency – Returning to 50Hz

Impact

Confidence that frequency is returning to 50Hz due to instruction and Group A/B aren't fluctuating – no additional action required

ENCC Overview of Operational Metering – Scenario 2





Operational metering operating with a lag

Assumption

Group C - Asset not responding as expected

Group A/B – underlying demand/embedded generation altered

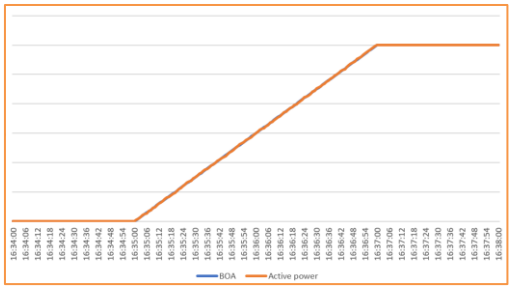
Frequency – Returning in some part due to the instruction, but also assumed Group A/B has also changed

Impact

Uncertainty around whether frequency deviating due to asset or underlying changes in demand/embedded generation. Leading to the consideration of counter actions to avoid high frequency

ENCC Overview of Operational Metering – Scenario 3

Frequency not recovering



Operational metering operating in line with CCL

Assumption

Group C - Asset responding as expected

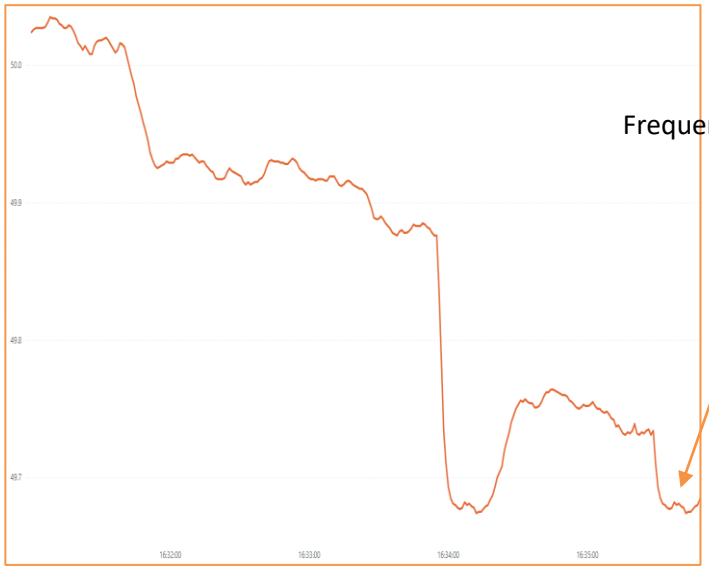
Group A/B - Underlying demand/embedded generation altered

Frequency - Not returning to 50Hz

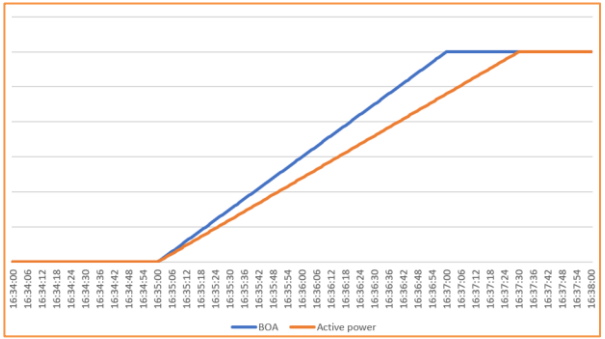
Impact

Confidence that group A/B have changed and therefore requiring further instructions to respond to low frequency

ENCC Overview of Operational Metering – Scenario 4



Frequency not recovering



Operational metering operating with a lag

Assumption

Group C - Asset not responding as expected

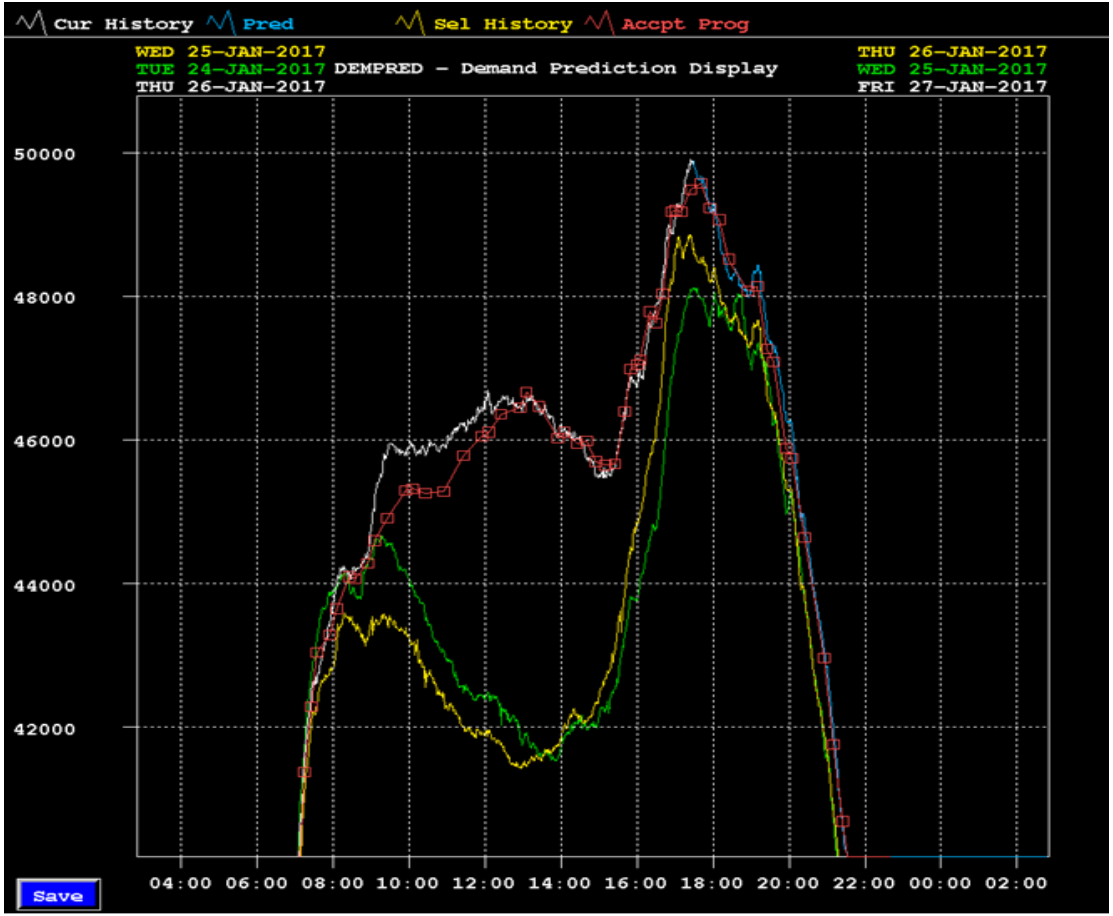
Group A/B - Underlying demand/embedded generation altered

Frequency - Not returning to 50Hz

Impact

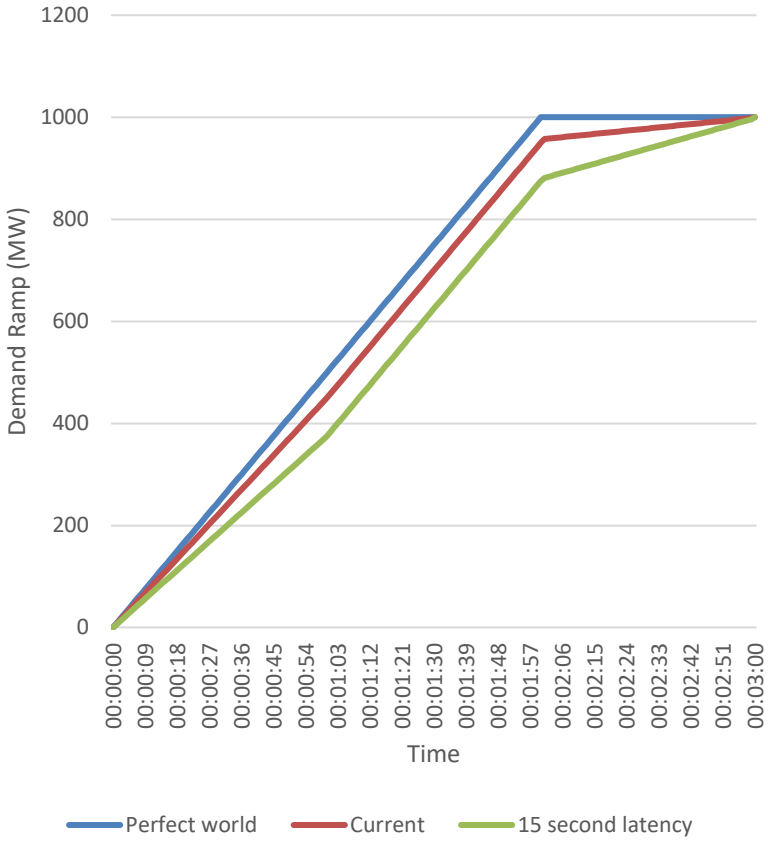
Actions taken to cover both underlying changes in group A/B and the assumption that Group C isn't delivering as expected. Leading to overcommitment which could propagate into frequency swings

ENCC Overview of Operational Metering – National View



- Operational metering provides the control room a view of what overall 'demand' is at any point in time **(white line)** – 1 minute resolution
- The predicted demand **(blue line)** is based upon this operational metering and updates every minute
- The program set **(red line)** will try to meet predicted demand, this will filter through to target programmes for each zone. Instructions sent will ultimately be trying to reach these requirements at a national level, hoping to ensure the system is balanced and reduce frequency deviations in real-time
- Previous days demand outturn **(yellow and green lines)** will feed into the predicted demand calculation
- This minute profile has large changes in output at key times of the day when underlying demand changes rapidly

ENCC Overview of Operational Metering – Impacts of latency/error



- Latency/error in operational metering will filter through to how we predict 'demand' for following
- At certain periods during the day (e.g. 01:00), we witness large ramps in demand on the system over a short space of time. **1000MW across a 2-minute period**
- We already have a latency of 6 seconds from point of measurement through to end processes, this brings about some error. **50MW error at 2-minute reporting in our example**
- If we increase the latency to 15 seconds say, this error grows. 125 MW **at 2-minute reporting in our example**
- This error in our prediction means we won't be covering the ramp with the actions we have taken, leading to frequency deviations. This will require further actions to manage
- At periods of high frequency volatility, we hold more response & reserve to mitigate the effects

Additional frequency response and reserve would have to be procured to cover the net error produced by both an increase in refresh rate and latency and in accuracy.

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Q&A

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External Review of Operational Metering Impacts

Operational Metering Standards – External review (terms of reference)

Remit for review

Recommend robust technical operational metering standards for the Balancing Mechanism that meet the following requirements:

- Ensure we can continue to meet the SQSS to ensure system security can be maintained with the current and forecasted energy mix
- A clear and transparent methodology
- Feasibility assessment of meeting current metering standard
- Be considerate of how providers with a diverse range of assts could meet the standards

Involved parties

Internal	External
National Control SME's	Charge point manufacturers
Markets SME's	Suppliers/Aggregators
	Metering experts
	Communication/Protocol experts

Key considerations for the review

System requirement

- The purpose of operational metering and review of the current standards
- Quantifying the impacts of altering operational metering standards (accuracy, read frequency & latency)
- Whether standards need to the same for all asset types
- Whether standards need to be the same for individual assets and aggregated units
- Whether a more targeted approach can be adopted (e.g. adaptive sampling rates)
- Processes to ensure standards are met by providers

Market insights

- Current/future metering capabilities across different asset types
- Current/future communication protocol capabilities across different asset types and providers
- Current/future regulations that will dictate measurement equipment and protocols being developed
- Data processing and storage implications
- Innovation options

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Q&A

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Live BM Trial Update

Trial Objectives Refresher

Market framework

To identify how flexible controllable smaller-scale assets can operate in the BM

- Assess accuracy of data submissions (PN, MEL/MILs, Ramp rates etc.)
- Demonstrate reliability of assets when responding to instructions
- Evaluate commercial viability of assets operating in the BM, both in terms of participating customers and in relation to lowering balancing costs

Operational metering

Provide evidence to support PR in creating clear understanding of operational metering requirements for smaller-scale aggregated assets

- Establish the reliability of operational metering feeds using either boundary point metering or asset metering.

Benefits & impacts

Assess the benefits and impacts of aggregated smaller-scale assets operating in the BM across systems, processes & people

- Highlight systems, processes & resourcing that need reviewing in order to maximise benefits from aggregated small-scale assets operating in the BM

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Trial Metrics – Initial view (up to 20/11)

Participating

- One provider operational in the BM since Mid-September
- Several other providers interested but still see barriers (e.g. volume requirements, Half-hourly Settlement)

Asset summary

- Octopus Energy owned and operated assets
- Combining a 1 MW of registered capacity from Domestic Electric Vehicles with a pre-existing Battery BM unit

High-level stats

- Number of BOA's sent – 230
    - Bids – 147
    - Offers – 83

Challenges so far

- Hybrid asset requiring offline data to assess metrics of Electric Vehicle performance
- Clarity around how data parameters should be interpreted for these types of assets (e.g. Ramp rates & Maximum limits)

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Trial Metrics

Objective	Data item	Metric	Assessed currently
Accuracy of data submissions	Physical notification (PN)	Error between Active Power measurement & PN	Additional data parameters required
	Maximum Export/Import Limits (MEL/MIL)	Instances of Active Power exceeding limits	In development
		Error between Active Power & Bid/Offers to maximum limits	Yes
	Dynamic parameters (e.g. Ramp rates)	Error between ramps rates & Active Power measurement when responding to instructions (considering Bid/offer shape)	In development
Accuracy of response to instructions	Bid Offer instruction	Assessing whether the unit has responded to an instruction	Yes
		Error between Bid/Offer instruction & Active Power measurement when responding to instructions	Yes
		Delivered volume vs requested volume	Additional data parameters required
		Delivery shape vs expected shape	Additional data parameters required
Reliability of assets responding to instructions	Various	Impact of instructions on future data parameters (MEL/MIL, PN, Bid/Offer prices)	Additional data parameters required
Reliability of operational metering feeds	Active Power operational metering measurement	% of time we receive a valid measurement from the unit (considering aggregation methodology & fault scenarios at sub-asset metering)	Yes
Balancing costs	Bid/Offer price	Comparing Bid/Offer prices against similar asset types across different settlement periods	In development

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Updated Trial Parameters

Aggregated signals	Required (Y/N)	Range	Scale (unit)	Accuracy (existing)	Accuracy (proposed)	Resolution	Refresh rate (existing)	Refresh rate (proposed)
Active Power	Yes	-10 MW to +10 MW	MW	1% of meter reading	+/-2.5% of meter reading – this is to align with Code of Practise 11[1] and Measurement Instrument Regulations accuracy tolerances	1 kW	1 per second	- 1 per second at aggregate level - 1 per 60 seconds at sub-asset

The trial parameters are as follows;

1. **Interim standards** – Relaxed operational metering standards for active power measurements
2. **Time limited** – To align with completion of external independent review
3. **Volume limited** - Total volume of 50 MW, with a limit of 10 MW per provider. This will be allocated on a first come first served basis.
4. **Participation** – Applies for sub-assets < 100 kW, within an aggregated asset of a minimum 1MW.
5. **Registration** - Providers must register a new aggregated asset in the Balancing Mechanism or add additional sub-assets to an already existing aggregated BM unit. All BM requirements (other than the metering requirements listed below) still apply.
6. **Settlement** – Prior to the trial, all BMUs (existing or new) must be registered with Elexon's settlement process.
7. **Post-trial period** - At the end of a trial, all assets that don't meet the enduring BM operational metering requirements (subject to full review) cannot continue to operate in the BM.

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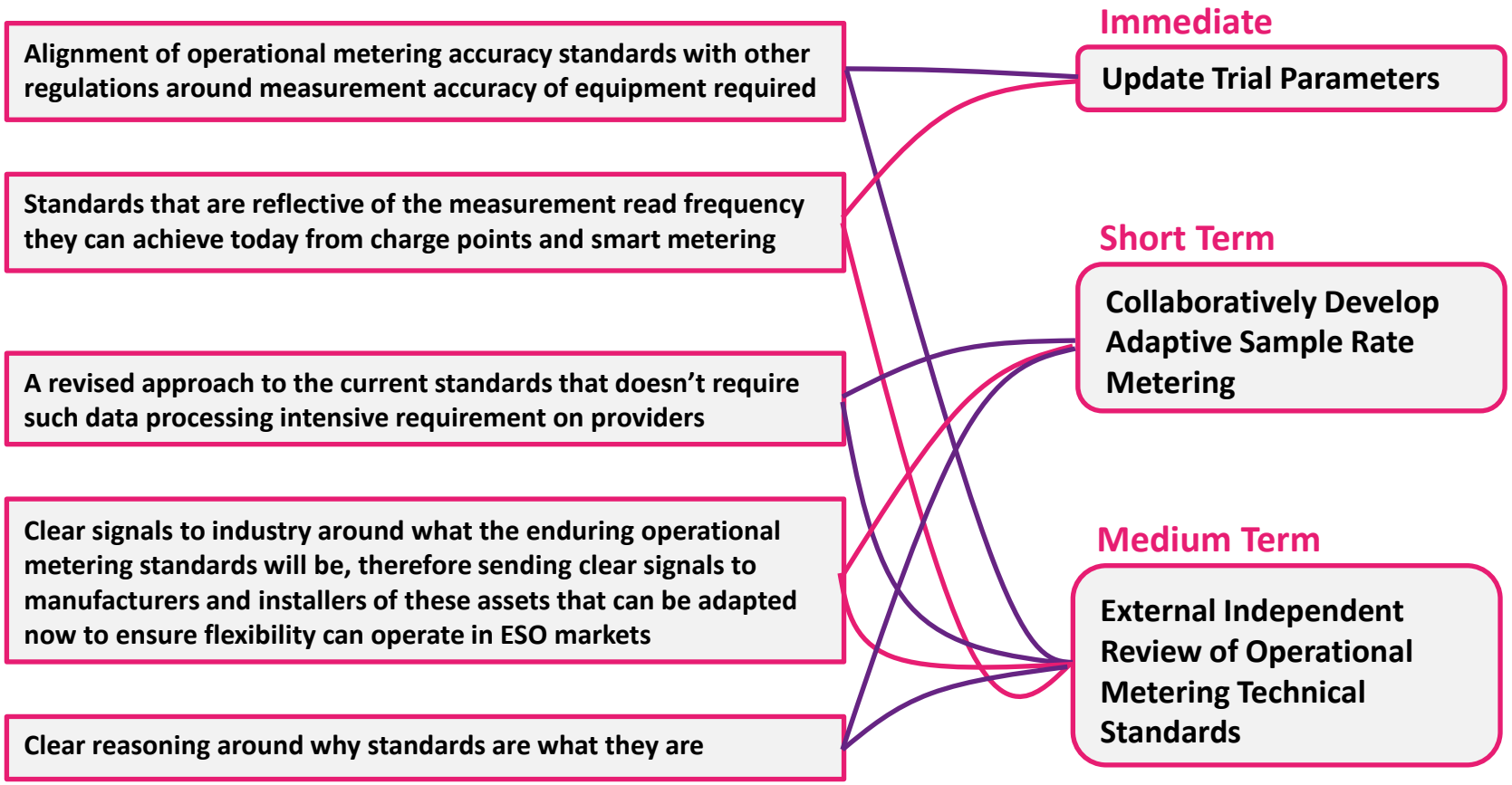
Q&A

You Said, We Did



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Next Steps

Next Steps

Look out for comms from the Power Responsive team about the External Review - **please provide your input**.

Minutes will be circulated next week and published on the Power Responsive webpage.

Please provide feedback on this meeting and the content covered to help us improve our work and the comms going forwards.

Feedback form

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