

Small Generation Aggregators and Contingency FCAS

Integrating Energy Storage Systems
30 March 2023



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.

PLEASE NOTE...



This session will be recorded to assist AEMO in accurately capturing feedback



Slide pack will be distributed after the meeting

AGENDA

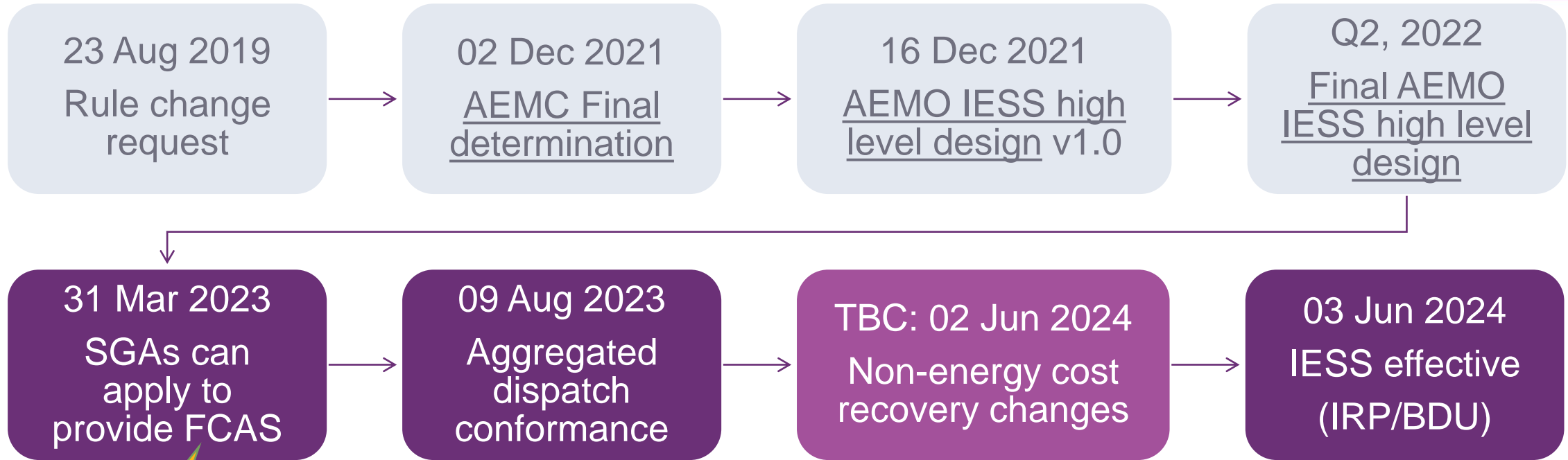
#	TOPIC	PRESENTER
1	Welcome	Rama Ganguli (AEMO)
2	Context	Emily Brodie & Carla Ziser (AEMO)
3	FCAS registration • Q&A	Akeesh Kusrutsing (AEMO)
4	SAPN perspectives	Blake Ashton (SAPN)
5	AEMO's engagement with SGAs	Emily Brodie (AEMO)
6	Implications for DNSPs	Carla Ziser (AEMO)
7	What's next	Emily Brodie (AEMO)
8	Functional requirements for a high DER power system	Nick Regan (AEMO) Joo Ean Prasad (Ausgrid)
9	Q&A	Rama Ganguli (AEMO)
APPENDIX		
	IRP classifications & services from 03 Jun 2024	

2. Context: Integrating Energy Storage Systems Rule

Emily Brodie & Carla Ziser

A decorative graphic in the bottom right corner consisting of several overlapping rectangular blocks in various shades of purple, ranging from dark to light.

I ESS high-level timeline



Focus of today's discussion

SGA	Small generation aggregator
FCAS	Frequency control ancillary service/s
IRP	Integrated resource provider
BDU	Bi-directional unit

REFERENCES

- **AEMC:** [IESS rule change](#)
- **AEMC:** [Implementing IESS rule change](#)
- **AEMO:** [IESS High Level Design and Implementation Strawperson](#)
- **AEMO:** [Toolbox for SGAs providing FCAS](#)

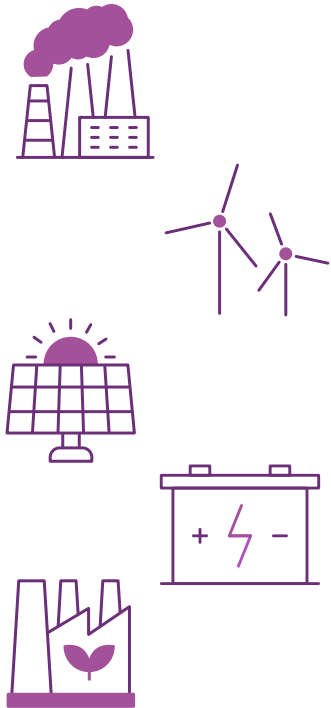
IESS introduces market efficiencies & has several releases

Date	Release	Affected Participants	High Level Scope
31 Mar 2023	FCAS option for Small Generation Aggregators (SGAs)	<ul style="list-style-type: none"> • SGAs 	<ul style="list-style-type: none"> • Optional for participants. • Allows aggregators of small-scale plant to provide frequency support
09 Aug 2023	Aggregate dispatch conformance (ADC)	<ul style="list-style-type: none"> • Aggregate system operators • Developers • Control system vendors 	<ul style="list-style-type: none"> • Optional for participants. • Gives grid-scale “aggregate” facilities more flexibility to dispatch energy at the connection point from any combination of its units (with some restrictions) rather than on a unit-by-unit basis. This change is important as we see more and more hybrid systems connecting. <ul style="list-style-type: none"> • Aggregate system ~ grid-scale, behind the connection point e.g. solar farm plus BESS.
02 Jun 2024*	Non-energy cost recovery (NECR) changes	Most participants (excluding metering service providers, network service providers, embedded network managers)	<ul style="list-style-type: none"> • Mandatory change for market participants • Changes the way market participants pay for “non-energy” services, making payments fairer and future-proofing non-energy cost recovery. <ul style="list-style-type: none"> • Non-energy services include costs of ancillary services, interventions etc.
03 Jun 2024	Introducing: <ul style="list-style-type: none"> • Integrated Resource Provider (IRP) category • Bi-directional Unit (BDU) classification & bidding 	<ul style="list-style-type: none"> • BDU participants • SGAs 	Makes it easier for grid-scale batteries to register, bid and be dispatched in the electricity market. Market registration changes: <ul style="list-style-type: none"> • IRPs introduced, alongside new classification and exemption criteria • Existing BDU participants (generator/customer) transition to IRPs • SGAs become IRPs • BDUs introduced • Ancillary service loads (ASL) & relevant generating units become ancillary service units (ASU) Bidding changes: <ul style="list-style-type: none"> • One bid form for BDU energy • One bid form for BDU FCAS

*AEMO has asked the AEMC to consider shifting the settlements go-live to a Sunday. Rule change request on [AEMC website](#).

SGAs and other aggregators

SGAs will be joining a list of aggregators, including VPPs, that are enabled to provide FCAS.



	Small Generating Units (< 5 MW)	Virtual Power Plants
Participation in dispatch	Non-scheduled*	Non-scheduled*
What can they aggregate?	Small generating units or BDUs, each on their own connection point.	Many types of small resources including behind-the-meter consumer DER.
Market participant	<ul style="list-style-type: none"> • SGA, as FRMP for the connection point • DRSP (for contingency FCAS)** 	<ul style="list-style-type: none"> • Market Customer (as retailer FRMP) • DRSP (for contingency FCAS)***
Revenue flows: Energy	SGA is paid the spot price for the unscheduled electricity generated.	Retailer pays/is paid the spot price for the unscheduled electricity respectively consumed or generated.
Revenue flows: FCAS	FCAS price/s are paid by AEMO to the Participant for the cont. FCAS enabled through dispatch.	FCAS price/s are paid by AEMO to the Participant for the cont. FCAS enabled through dispatch.

* Scheduled Lite reform may provide an avenue for them to provide greater visibility to AEMO and participate in scheduling processes in future

** From 3 June 2024

*** A non-retailer VPP coordinator could operate a VPP if it reached a commercial agreement(s) to “value share” with either the customer or the retailer

Arrangements for FCAS provision

Registration

From 31 March 2023, AEMO will assess applications from SGAs to provide ancillary services from its small generating unit/s.

- Under the transitional arrangements, a Market Small Generation Aggregator, for the purpose of NER clause 2.3.5, is deemed a Market Customer and its small generating unit an ancillary service load.
- This enables the SGA to apply to AEMO for approval to classify the small generating unit as an ancillary service load.
- Upon approval, the SGA would be taken to be an Ancillary Service Provider.

From June 2024, the participant will continue to be taken as an Ancillary Service Provider.

Operation

- ✓ The portfolio of ancillary service units will be able to apply to aggregate and bid and be dispatched in FCAS markets as a single ancillary service unit, if they are connected within a single region and are operated by a single person.
- ✓ NEMDE will not co-optimize energy and FCAS for these units (as they are not scheduled) - the participant will need to ensure that it is operated such that the enabled quantity of FCAS is available to be deployed.
- ✓ SGAs must comply with the measurement and data provision requirements which are specified in the MASS.
- ✓ AEMO verifies the deployment of contingency FCAS by enabled providers in response to a change in Local Frequency using locally recorded measurements of frequency and power flows.

3. FCAS registration

Akeesh Kusrutsing

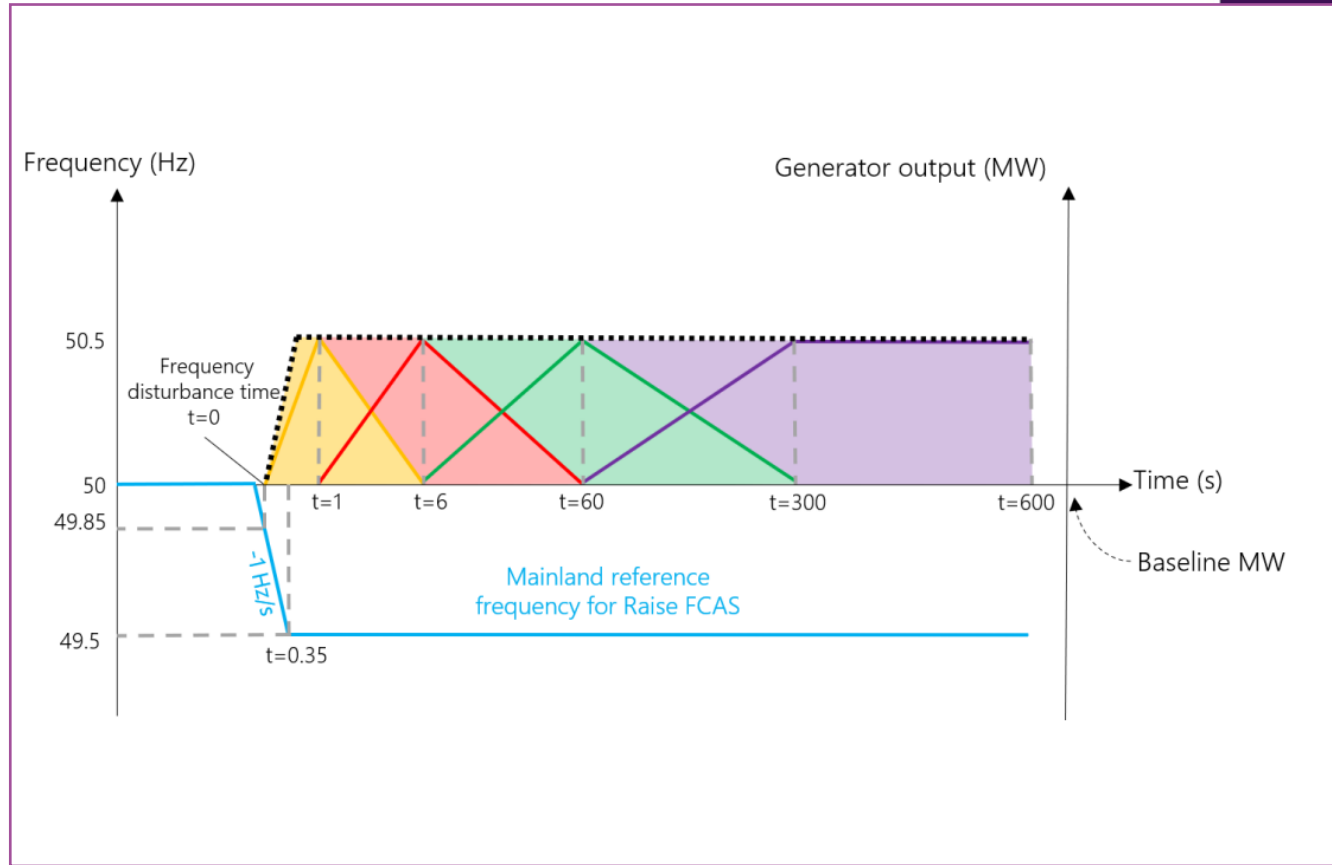
Overview

- Contingency FCAS refers to the NEM markets which procure frequency responsive reserves to stabilise the power system following sudden significant changes in supply and demand.
- FCAS is procured at all times but only needs to be delivered following a frequency excursion.
- There are 6 contingency FCAS markets, and as of 9 October 2023 there will be 2 new markets to procure faster FCAS response.
- The Market Ancillary Service Specification (MASS) contains the requirements for providing contingency FCAS
 - Current MASS is version 7.0, version 8.0 takes effect 9 October 2023.

Raise Very Fast – operational 9 October 2023	Lower Very Fast – operational 9 October 2023
Raise Fast	Lower Fast
Raise Slow	Lower Slow
Raise Delayed	Lower Delayed

FCAS delivery

- Contingency FCAS capacity is determined using a standardised assessment process.
- FCAS providers can offer a single controlled response across all contingency FCAS markets, subject to technical assessment.
- Graph shows the timeframe for each FCAS market
 - For example, Very Fast FCAS response will be measured between 0 s to 6 s of a frequency disturbance, peaks at 1 s.
- Graph does not show how an FCAS facility should respond to a frequency disturbance. The active power response to a frequency disturbance depends on the type of FCAS controller (variable or switching) and its settings.



FCAS registration considerations

FCAS Controller settings

- Frequency deviation settings (trigger) for switching FCAS controllers
- Droop setting and frequency deadband for variable FCAS controllers

STEPS TO REGISTER IN THE FCAS MARKETS

- Participant submits application to AEMO to classify NMI as ancillary service generating unit or ancillary service load
- AEMO determines settings of FCAS controller such as droop setting, frequency deadband or trigger setting
- Participant is generally required to complete a desktop simulation to demonstrate the FCAS capacity of the site, or if possible, a lab test on one of the battery inverters
- AEMO determines if the settings of FCAS controller need to be amended based on results of the desktop simulation or lab test
- Participant completes onsite testing to confirm the FCAS capacity of the site or the aggregated facility.

FCAS registration concerns & compliance

DURING THE CONNECTION PROCESS

- AEMO will consider any concerns that the DNSP raises when it is assessing a connection application
 - For example, concerns with a site planning to participate in the FCAS markets and not meeting the requirements to do so.

AFTER REGISTRATION

- The participant must have adequate processes in place to rebid the FCAS availability of the site before the next 5-min interval whenever the maximum export or import is limited due to a network constraint or a comms outage.
- If the participant fails to rebid the FCAS availability of the site, AEMO may apply constraints to limit the FCAS enablement of the site until adequate processes are in place to identify any export or import limits in time to rebid.
- If the participant was to be notified ahead of time that their site export would be constrained, they would be able to rebid their FCAS availability and remain compliant.

Access to FCAS data and information

DATA TYPE		SOURCE	FREQUENCY	
OPERATIONAL DATA	FCAS capacity dispatched in each region	NEM Web	Every 5 minutes	
	FCAS prices			
STANDING DATA	Participant	NEM Registration & Exemption list	~ Ad hoc basis depending on number of new registrations	
	Station Name			
	Region			
	DUID			
	Bid Type			<ul style="list-style-type: none"> • Lower5min • Lower60sec • Lower6sec • Lowerreg • Raise5min • Raise60sec • Raise6sec • Raisereg
	Max Cap (MW)			
	FCAS trapezium	<ul style="list-style-type: none"> • Min Enablement Level • Max Enablement Level • Max Lower Angle • Max Upper Angle 		
REPORTS	Quarterly energy dynamics	<ul style="list-style-type: none"> • FCAS cost trends • FCAS provision by technology • FCAS events analysis 	QED page on AEMO website Quarterly	

4. SAPN perspectives

Blake Ashton



5. AEMO's engagement with SGAs

Emily Brodie

Overview

- AEMO held an [information session](#) for all existing SGAs in October 2022.
 - Presented an overview of application process as well as overview of what's required to participate in the FCAS markets
- Strong levels of interest were expressed through a follow up survey
- On request of some SGAs, AEMO also undertook to discuss the change with DNSPs to ensure a common understanding between parties.

Anticipated participant process

Steps an SGA will need to take to participate in FCAS

Assess

- Technical and regulatory feasibility
- Commercial assessment

Prepare

- Prepare site, metering arrangements, market IT systems
- Apply for FCAS after 31 March 2023
- Demonstrate ability to provide FCAS and participate in FCAS markets
- Meet any required network approvals for frequency response

Participate

- Comply with NER and AEMO procedures
- Bid, be enabled for, and provide contingency FCAS
- Provide necessary data

AEMO is ready for SGAs to apply for FCAS from 31 March 2023

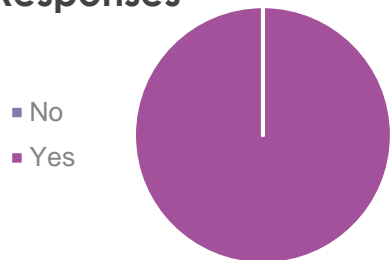
Survey revealed strong intent by multiple SGAs

Registered Market Small Generation Aggregators were asked to indicate intent and timing for opting in for provisioning FCAS as per IESS rule from 31 March 2023.

Intent: Strong

Q: Are you considering opting in to provide ancillary services?

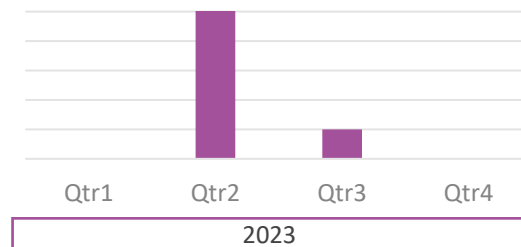
Responses



Timing: Early-mid 2023

Q: When are you likely to apply to register?

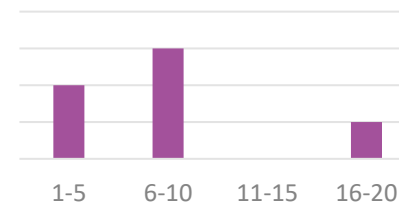
Distribution of responses



Sites: ~10 (per participant)

Q: Can you give an indication of the number of sites and technology types?

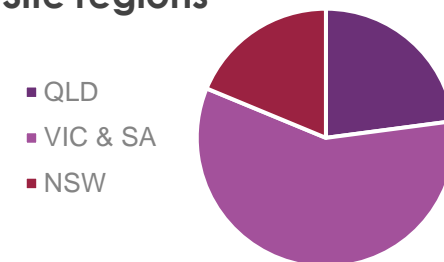
Number of sites



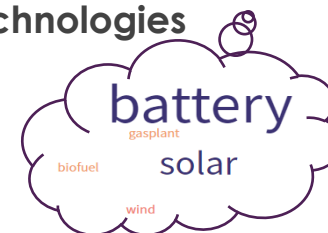
Geography: Mixed with VIC as predominant location

Q: Can you give an indication of intended regions?

Site regions



Technologies



Notes:

This is graphical representation of anonymised information from a portion of registered MSGAs. Engagement activity underway to gather additional data

6. Implications for DNSPs

Carla Ziser



Implications for DNSPs

AEMO understands that the IESS Rule, and aggregations more generally, may have implications for DNSPs.

- A select number of SGAs have concerns they may face barriers or delays to contingency FCAS participation due to their unit/s location within the distribution network.
- What AEMO understands from initial discussions:
 - DNSPs are generally aware that a generator must act within its connection agreement and MASS obligations when providing contingency FCAS
 - DNSPs recognise that increases in inverter-based distributed generation and FCAS participation is a future reality
 - Network capability to enable this may be a concern in the medium to long term
 - Connections are assessed individually and these assessments do not fulfil a need for more wholistic engineering assessments and planning



7. What's next

Emily Brodie

What's next

- AEMC set its policy intent for SGAs to provide FCAS via the IESS Rule change
- AEMO is ready to enable this from 31 March 2023
- This falls within the broader context of aggregators' increased contribution to the dispatchability of the power system
- AEMO has a goal of addressing gaps identified by the Engineering Framework, facilitated via the workshops planned with the ENA throughout 2023.

8. Functional requirements for operating a high DER power system



Rama Ganguli



Functional requirements for consideration

- Coordination between aggregators, DNSPs and AEMO for situational awareness of aggregated DER behaviour locationally.
- Aggregated device operation respecting both D network and bulk power system security requirements
- Aggregator bids reflecting the constraints on participation implied by these requirements

Project EDGE

AEMO-DNSP Forum | 30 March 2023

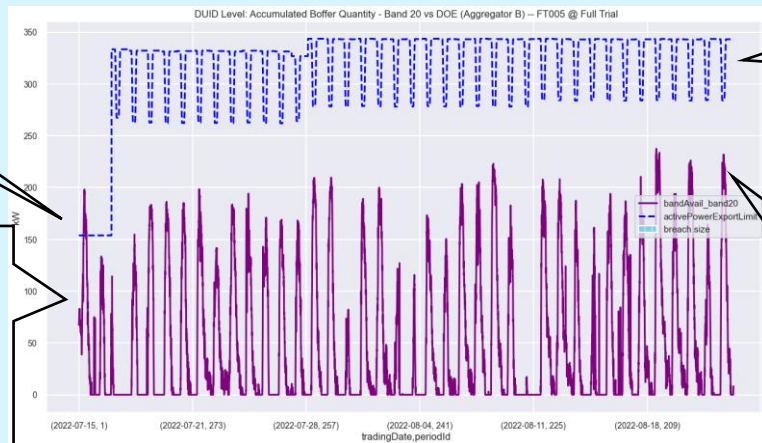
Select DOE/DER Aggregator insights for DNSP friends

Nick Regan – Business Lead, AEMO

Although rare, DUID level DOE breaches have been observed, impacts look manageable but work is needed to protect customers



Bidding breach (intention)



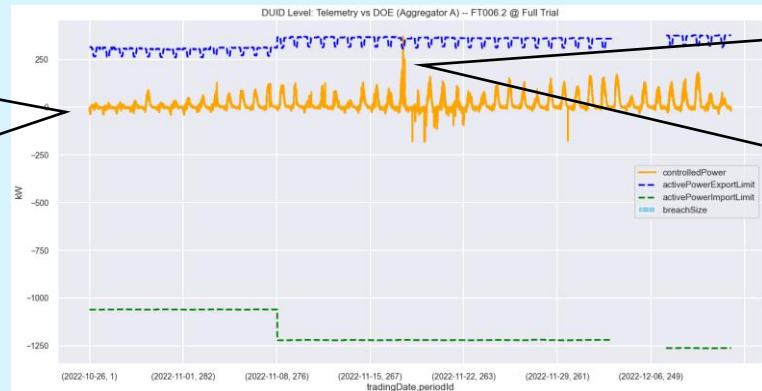
DUID level DOE bid breach

DUID level DOE export limit

DUID level cumulative generation bid quantity (band 20)

There is an increase in the scale of DOE limits a day after new NMIs were registered, indicating a delayed reflection of increased fleet size in DOEs.

Performance breach (actual)



DUID level telemetry (net controlled generation and load)

- The aggregator's aggregated net controlled generation and load exceeded the aggregated DOE export limits.
- The breach size is 53.97 kW (20%), 1 min duration
- Cause is under investigation

Influencing factors

There is no established method to synchronise new NMI enrolment in an aggregator portfolio with DOE updates from the DSO for those NMIs. This means for a period of time aggregators do not have all DOE limits that apply to their portfolio.

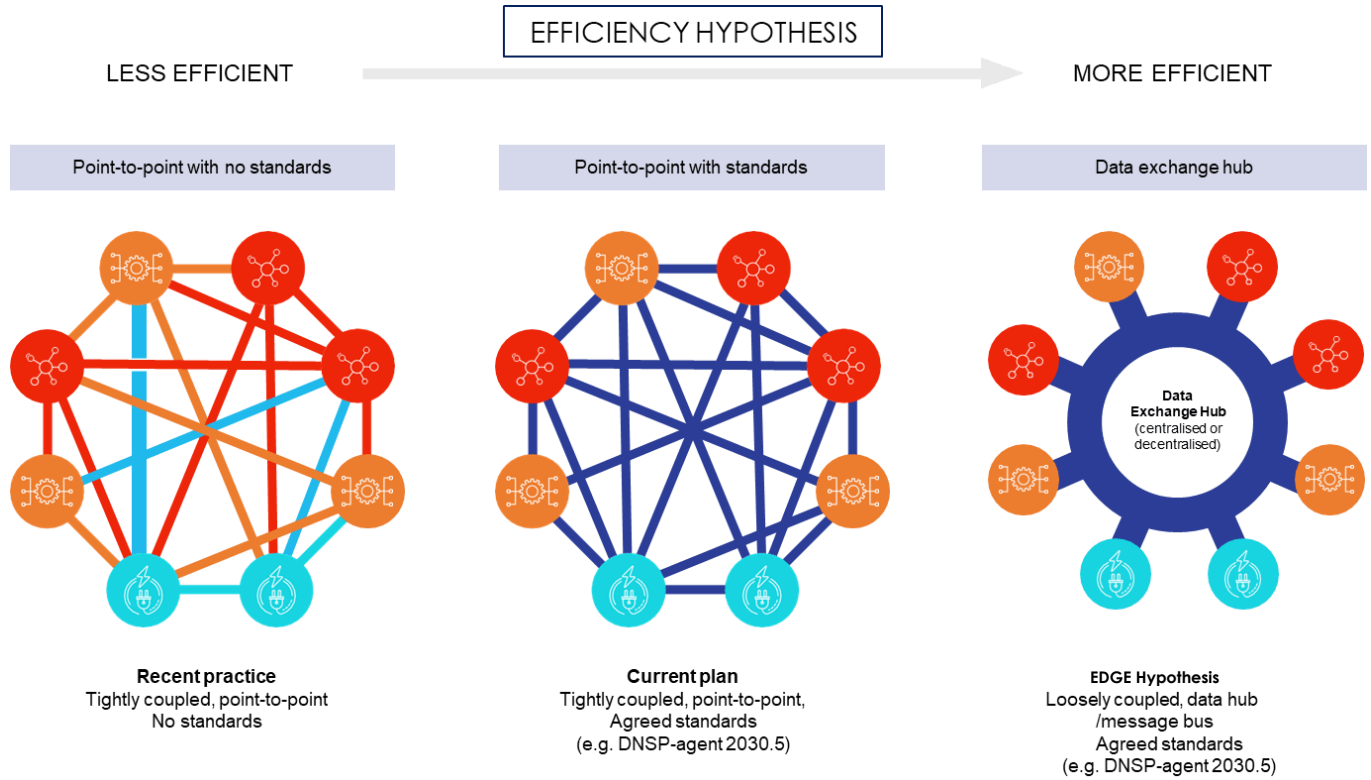
Implications of DOE breaches

- **Economic (TBC):** Value of unutilised DOE capacity vs constrained bid underway
- **Operational Planning (TBC):** Under investigation
- **System Security**
 - AEMO:** *Manageable if Dx limits provided at the distribution and transmission network interfaces (e.g TNI or PASA zone) align with the bid qty received by aggregators (controllable DER qty only required for visibility) so that Security Constrained Economic Dispatch is preserved*
 - DNSP:** Curtailment triggers are protection mechanisms for networks, meaning that DOE breaches have a lower impact on the network itself than on customers (e.g Inverter Power Quality settings)
- **Customer:** DOE breaches can impact voltage level (gradually reducing the life of electronic equipment) and power quality (flicker).
- Voltage increases trigger curtailment of export in newer PV inverters with a power quality setting, reducing the use of their PV and export of neighbouring customers.
- Net NMI DOEs hold customer to account for uncontrolled load/generation causing a breach.
- **Market Suspension Results:** DNSP -> AEMO visibility of network limits (DOEs) is essential to operational forecasting and balancing system supply/demand (*enabling AEMO to direct VPPs within their network limits!*) but they are *not an accurate tool for managing DER fleets to a set point*

How can we approach data exchange?

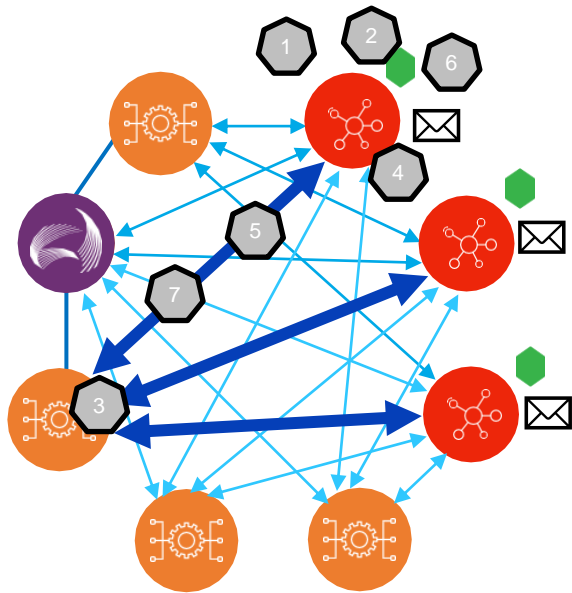
There is a spectrum of approaches to exchange data among many parties, including:

- **Heterogenous Point-to-point (no standards)** – individual connections to share data with no preferred methods/protocols
- **Point-to-point with standards** – individual connections to share data with agreed preferred methods/protocols
- **Hub** – connect once to a data exchange hub to share data with all parties. Project EDGE will consider both a centralised and a decentralised hub approach



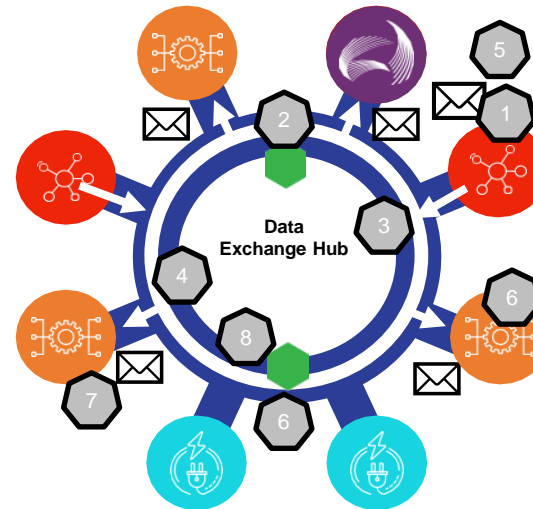
Data Exchange Use Case 1: Dynamic Operating Envelopes

As an Aggregator, I have a problem that	Therefore, I want to	So that I can
I need to integrate into multiple, separate, and bespoke data exchange systems with each DNSP to know which Dynamic Operating Envelopes to apply in operating my portfolio in addition to integrating with AEMO to provide wholesale market services. This adds to my compliance burden and cost to serve customers	Be able to access all DOEs that relate to my portfolio across different DNSP jurisdictions in the NEM via one integration point	minimise my operational costs and cost to serve customers



Point to Point Process:

1. DNSP notified of an aggregator site
2. **Aggregator registers Portfolio and Identity with each DNSP**
3. Integration established between aggregator and each DNSP
4. **DNSPs map NMIs to aggregator portfolios and send multiple DOE packets**
5. Aggregator receives and operates within DOEs
6. Aggregator updates their portfolio information
7. **DNSP repeats this mapping process with any updates to an Aggregator's Portfolio**



Data Hub Process

1. DNSP notified that a site needs a DOE
2. Aggregator registers Portfolio and Identity
3. Integration established between DNSP and DER Data Hub
4. **Integration established between aggregator and DER Data Hub and DNSP using existing identities**
5. DNSPs add new NMIs to batch of DOEs and send one packet of DOEs to the hub
6. **The Hub broker takes the single DOE packet based on portfolio information and sends the correct DOEs to their site aggregator**
7. Aggregator receives and operates within DOEs
8. Aggregator updates their portfolio information
9. **Mapping process repeats within the Data Hub with any updates to an Aggregator's Portfolio, DNSPs do not need to perform this task**

Q&A

Rama Ganguli





For more information visit

aemo.com.au

APPENDIX



IRP classifications & services from 03 Jun 2024

Source: Australian Energy Market Commission, [IESS Final Determination](#), 02 Dec 2021. p iv.

