WA DER Market Participation Forum

5 July 2023

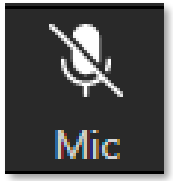
Welcome

Tom Butler – Manager, WA Distributed Markets

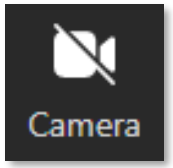
We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

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

Online forum housekeeping



Please mute your microphone during the presentation.



Please leave your camera off as well
but we'd love to see you during Q&A!

We are very interested in questions and feedback.

We will pause regularly to give you time to:

- comment in the chat; or
- raise your hand to ask a question.

We will share a copy of the presentation slides as a PDF after the meeting.

We welcome feedback via
WADERProgram@aemo.com.au

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AEMO is committed to complying with all applicable laws, including the Competition and Consumer Act 2010 (CCA). In any dealings with AEMO regarding proposed reforms or other initiatives, all participants agree to adhere to the CCA at all times and to comply with this Protocol. Participants must arrange for their representatives to be briefed on competition law risks and obligations.

Participants in AEMO discussions **must**:

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2. Make independent and unilateral decisions about their commercial positions and approach in relation to the matters under discussion with AEMO
3. Immediately and clearly raise an objection with AEMO or the Chair of the meeting if a matter is discussed that the participant is concerned may give rise to competition law risks or a breach of this Protocol

Participants in AEMO meetings **must not** discuss or agree on the following topics:

1. Which customers they will supply or market to
2. The price or other terms at which Participants will supply
3. Bids or tenders, including the nature of a bid that a Participant intends to make or whether the Participant will participate in the bid
4. Which suppliers Participants will acquire from (or the price or other terms on which they acquire goods or services)
5. Refusing to supply a person or company access to any products, services or inputs they require

Under no circumstances must Participants share Competitively Sensitive Information. Competitively Sensitive Information means confidential information relating to a Participant which if disclosed to a competitor could affect its current or future commercial strategies, such as pricing information, customer terms and conditions, supply terms and conditions, sales, marketing or procurement strategies, product development, margins, costs, capacity or production planning.

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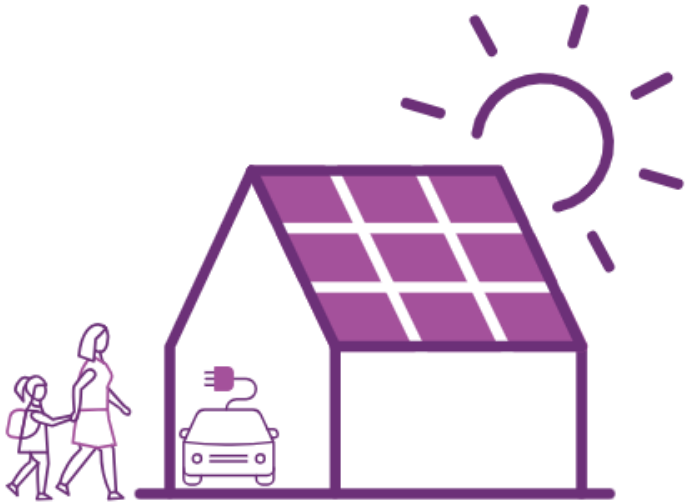
Agenda

*Please note that this meeting will be recorded by AEMO and may be accessed and used by AEMO for **capturing meeting outcomes**. By continuing, you consent to AEMO recording the call and using the recording for this purpose. If you do not consent, you may exit the meeting. No other recording of the meeting is permitted.*

1. **Welcome & Introduction** by Tom Butler
2. **Update from Energy Policy WA** by Kieran Rayney
3. **Conceptual DER Aggregator WEM opportunities** by Bruce Redmond, Jason Hart, Andrei Costache
4. **Next Steps**



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Energy Policy WA

Update by Energy Policy WA

Kieran Rayney

Working together for a
brighter energy future.

Context

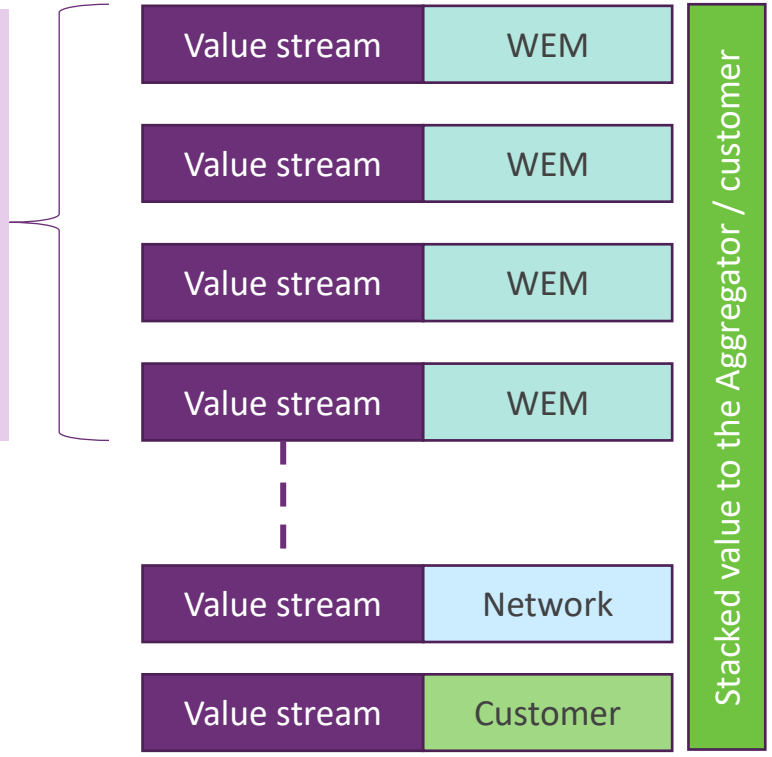
Progressing recommendations for Aggregator participation in the WEM

Developing recommendations for WEM opportunities

- Foundations for recommendations
- Observations and experiences from Symphony
- Market/system perspective
- VPP and stakeholder perspective
- Capability mapped to opportunity
- Current market arrangements
- Recommendations for reform

State Electricity Objective

Fit-for-purpose recommendations



State Electricity Objective

A new, overarching electricity objective applied to the whole Electricity Act has been drafted by EPWA, in consultation with industry. It is intended to replace the existing objectives in the Electricity Act. The draft bill is currently in consultation prior to passage through parliament.

The **State electricity objective (SEO)** is to promote efficient investment in, and efficient operation and use of, *electricity services* for the long-term interests of consumers of electricity in relation to:

- the quality, safety, security and reliability of supply of electricity; and
- the price of electricity; and
- The environment, including reducing greenhouse gas emissions

References: *Section s.3A, Draft Electricity Amendment (Distributed Energy Resources) Bill 2023*
TWDOG 48

State Electricity Objective

Electricity services means services that are necessary or incidental to the supply of electricity to consumers of electricity; and includes

- the production of electricity; and
- services provided by means of, or in connection with, an electricity network; and
- the sale of electricity

Reference: *Section s.3A, Draft Electricity Amendment (Distributed Energy Resources) Bill 2023*

Problem Statement

How might we enable net zero through actively managing DER via Aggregators in the WEM, **whilst enabling Aggregators to maximise the value of customer-owned DER equipment for their customers?**

Market and System Perspective

Orchestrating DER has the potential to support the system in a number of ways:

- Provide energy and capacity at times when the system and customer needs it
- Management of DPV generation at the source to limit increases in regulation requirements
- Embed operational capabilities that can provide value when needed
- Enable opportunities to provide services to the network to defer investment
- Enhance monitoring and compliance to limit growth in DPV contingency risks
- Reduce contingencies due to volatility and weather events
- Reduce frequency of market interventions, increasing investor confidence.
- Reduce reliance on need for new services to respond to emerging issues caused by uncontrolled DER

Stakeholder Perspective

Aggregators need confidence to invest

- Return On Invest (ROI)
  - Cost minimisation
  - Maximise assets
  - Portfolio optimisation
  - Price predictability / Risk Management
  - Growth (Scale)
- Keep customers happy
  - Reduce power bills
  - Grow value streams & customer offerings
  - Protect customers from volatility
- Understand technical requirements and obligations
  - Stability of investment and reduce customer impacts / barriers to scale

What other Aggregator / VPP perspectives are relevant?

Conceptual Opportunities

Orchestrating DER had the potential to support the State Electricity Objective and Problem Statement considering how Aggregate DER capability may provide for system needs

Capability	Opportunity
Energy	Deliver locally generated energy to customers Deliver energy at times of high demand and low load
Capacity	Provide capacity as injection capability and consumption offsets
Energy Variability	Improve control and stability of connection point power flows to reduce volatility
System Restart	Maintain load during the system restart process
FCESS	Participate in frequency co-optimised control essential system services (contingency raise)
NCESS / NSS	Provide locational network support services

Conceptual WEM value streams

Energy: Responding to price

“Low load & peak demand”

Deeply negative prices in middle of the day, high price in the evening

Evening price peak achieves good match between variation submission and dispatch outcome.

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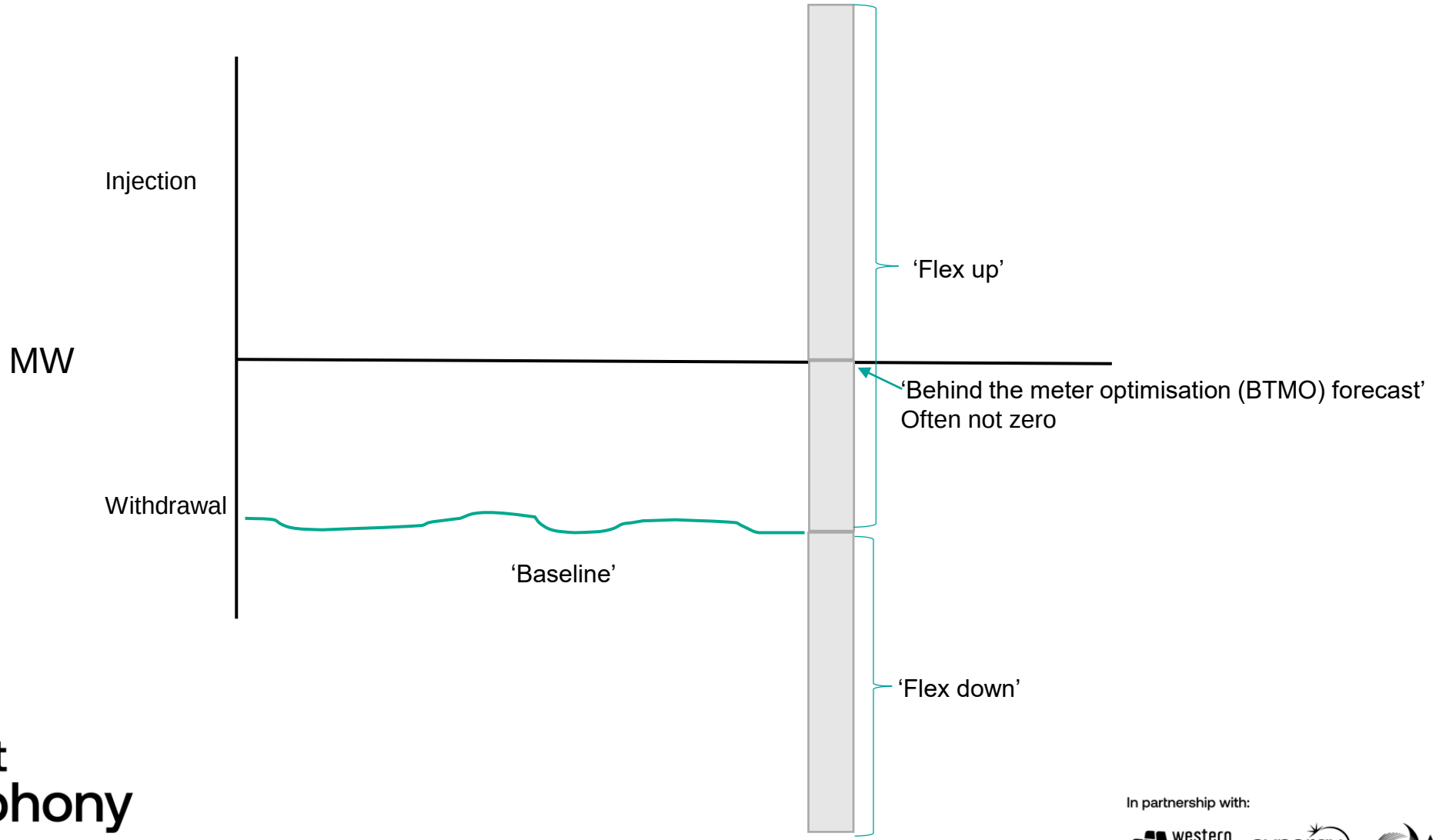
Energy: Dispatch terminology



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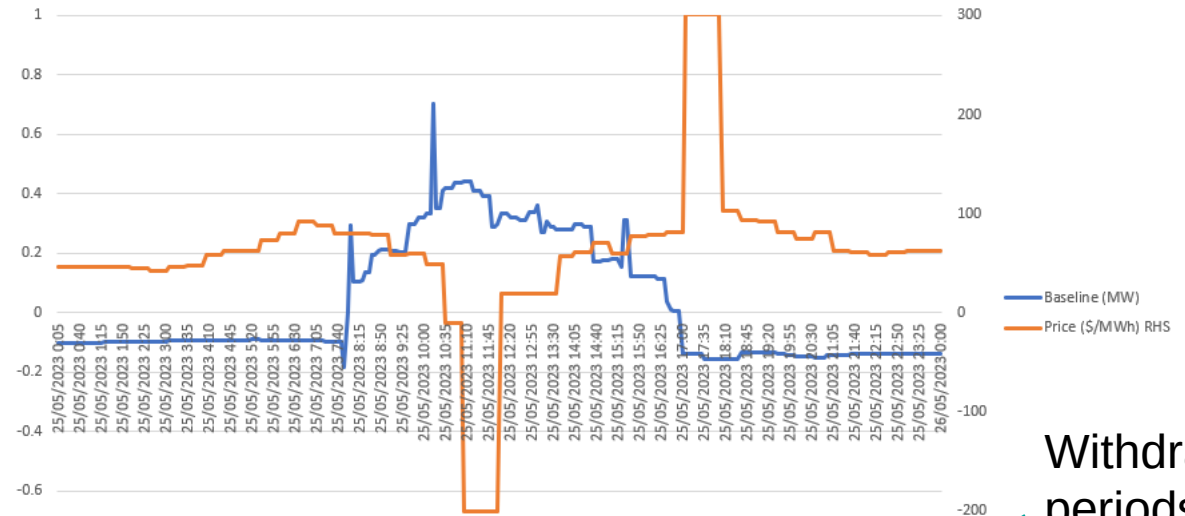
Energy

Price and energy quantity without acting on submissions

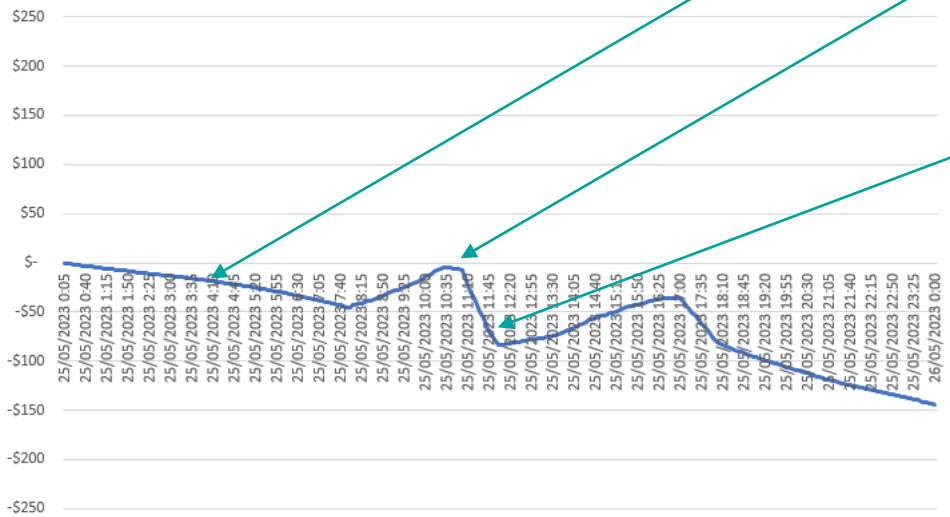


Withdrawal during positive priced periods accumulates cost

Injection during positive priced periods accumulates income

Injection during negative priced periods accumulates cost

Cumulative energy cost (price * quantity)



Benefit from injecting solar offset by negative wholesale price

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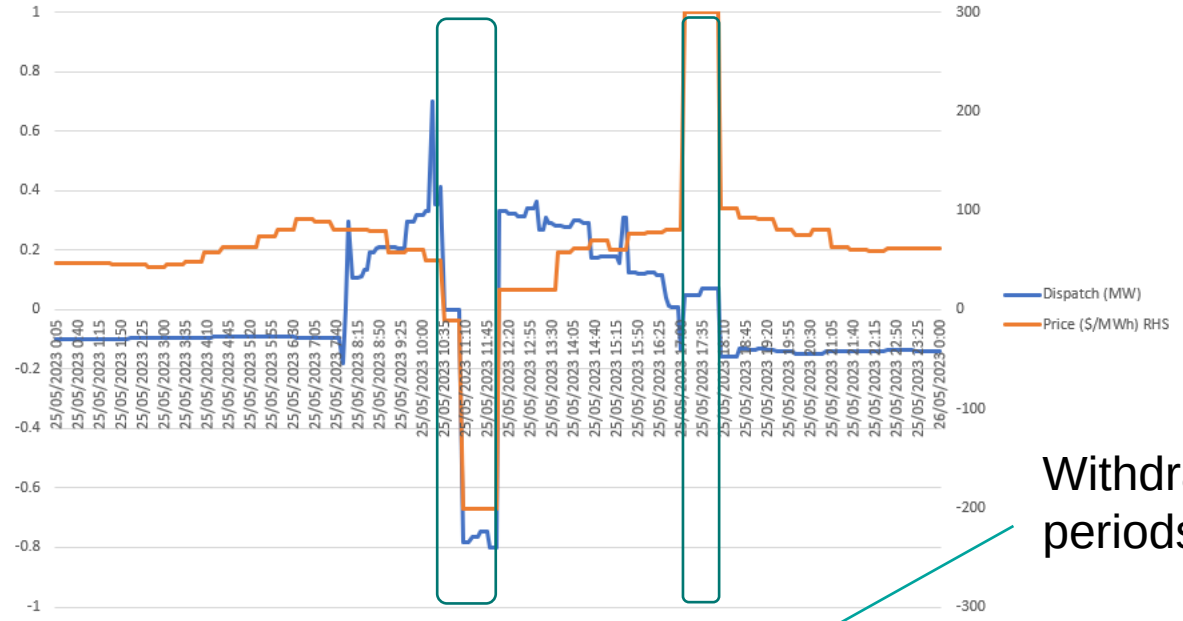
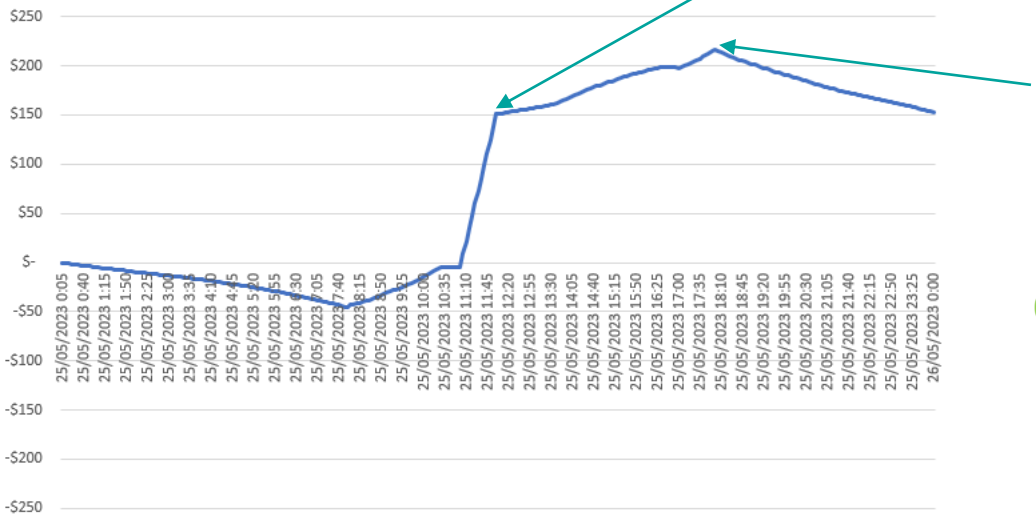
Energy

Price and energy quantity
with submissions acted upon



Withdrawal during negative priced periods accumulates income

Cumulative energy income
(price * quantity)



Injection during positive priced periods accumulates income

Example $300 difference as a result of dispatch with less than 300 customers

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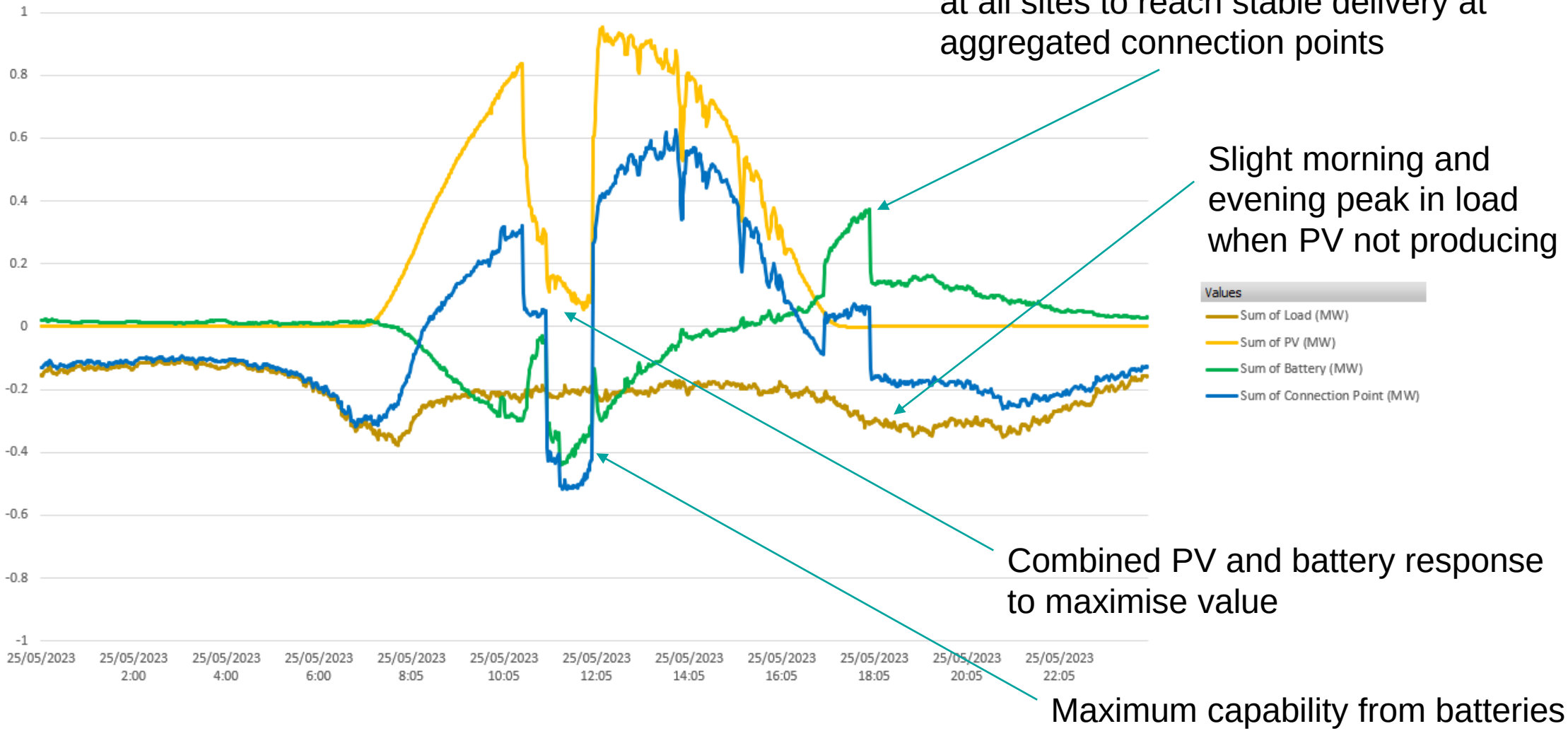
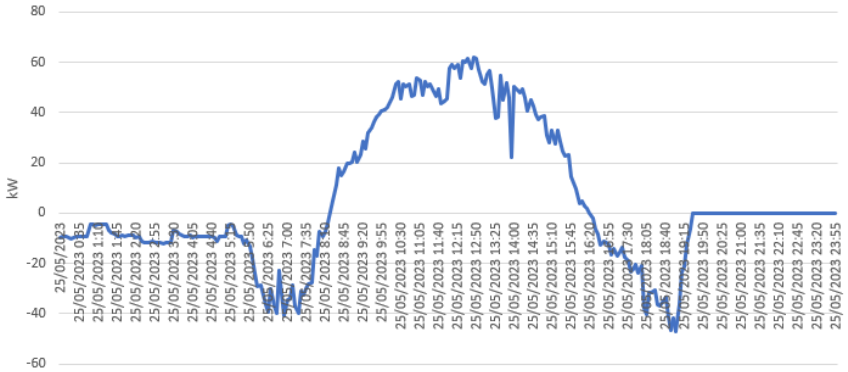
Device performance

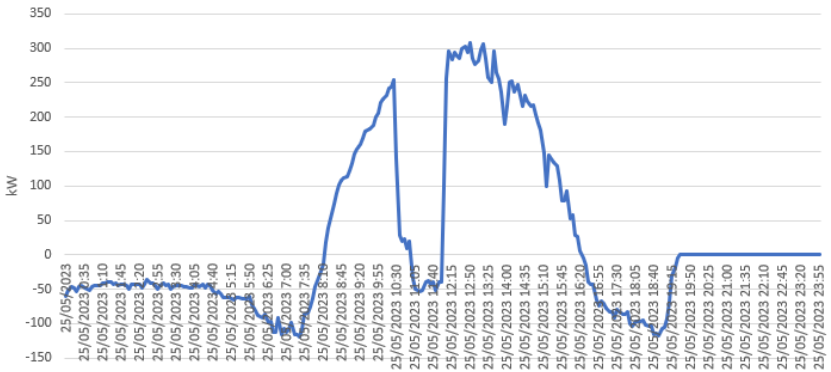


Household performance



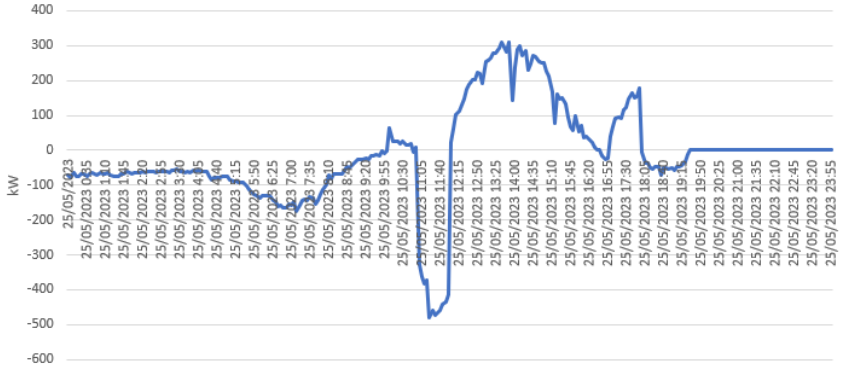
Unorchestrated customers show no response compared to baseline

Cost



PV control customers respond to negative prices

Cost neutral



Battery and PV control customers respond to negative prices and high prices and store energy between events to reduce volatility and maximise value from all opportunities

Earn

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Capacity

Value to the system / market?

- Capacity Services
  - Flex – reduce afternoon ramp (in consultation)
  - Peak – capital cost of generator and obligations to provide support during defined periods
  - SRC – additional capacity procured at peak periods
- System Benefit
  - Planning: Assurance there is capacity to meet or reduce future demand, more capacity available to market processes
  - Price signals promotes confidence to invest opposed to IRCR cost avoidance
  - SRC
    - DER can readily be adopted into the market

Value to the Aggregator?

Benefits for the Aggregator

- Orchestration is critical to meet obligations of SRC, Reserve Capacity and Energy and managing the Aggregator's risk
- Additional revenue stream, more confidence to invest

Is there value for BTM batteries to be included in the capacity market?

How could they be assessed?

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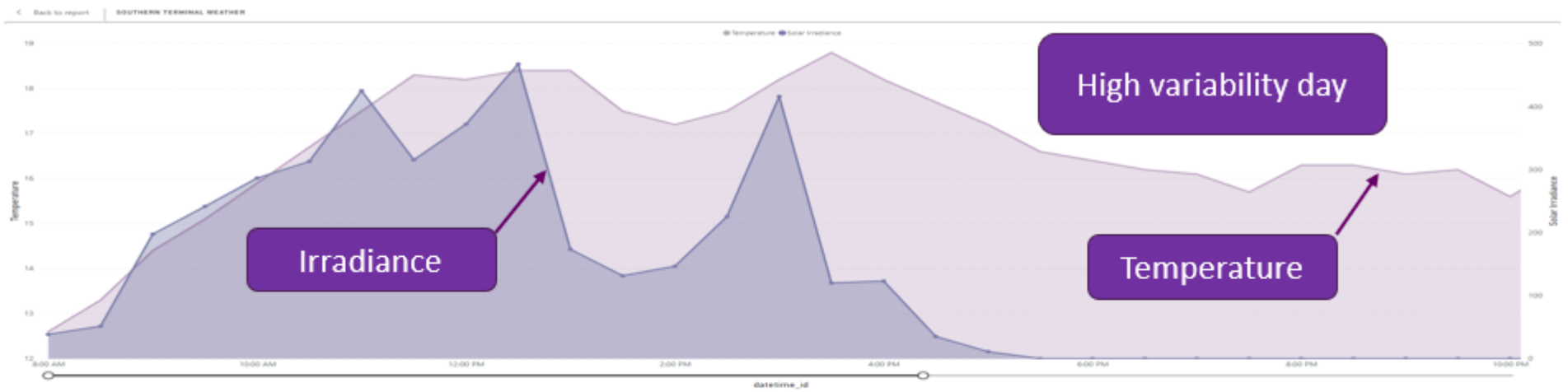
Energy Variability

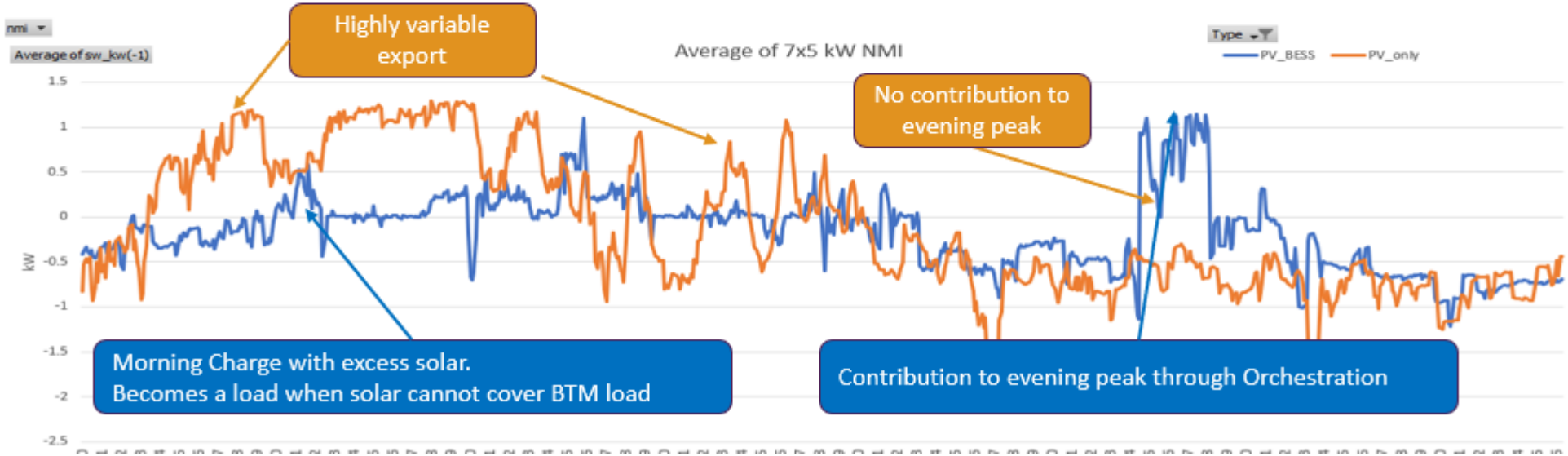
Smoothing by decentralised control

NMI analysis
PV vs PV+BESS

PV only systems do not control exports

PV+BESS systems smoothing export and load at connection point





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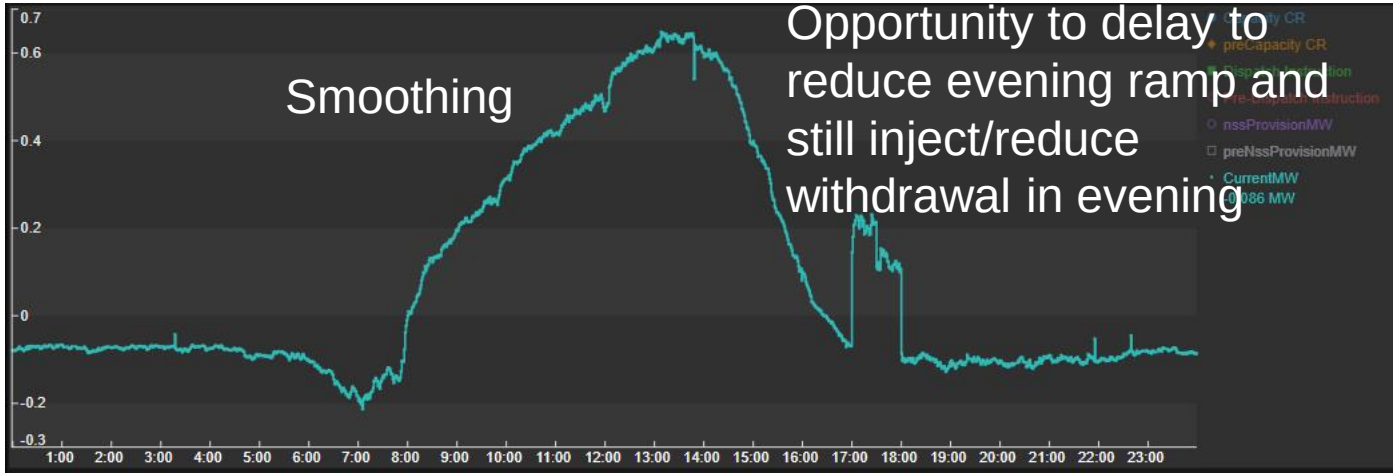
Energy Variability

Value to the system / market from decentralised control

- Behind the Meter optimisation using decentralised monitoring and control capabilities is a critical feature for customers
- It cannot be used all the time as batteries are fully charged and discharged
- Timing of when it is used and not used, including knowing when additional charging from grid is required, is an important input into planning and operation



What would be the best way to reflect BTM Optimisation in dispatch?

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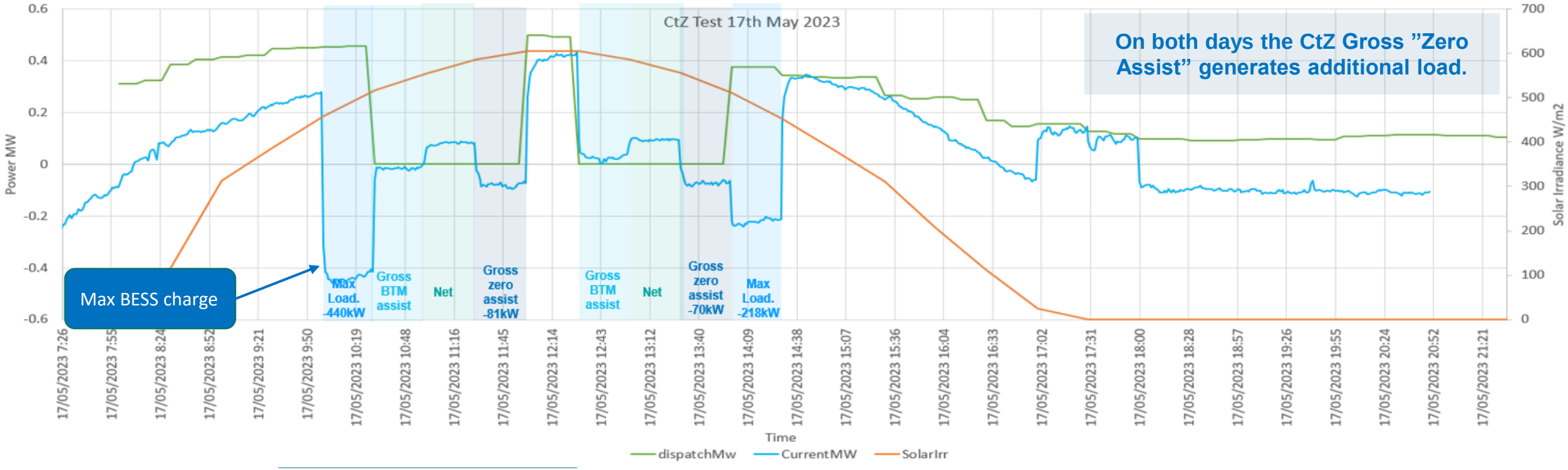
Device control: System Restart

Comparing Net and Gross Constrain-to-Zero

- Net CTZ controls all available assets via the gateway device in an attempt to achieve a target measure of zero net injection at the connection point.
- Gross CTZ BTM Assist is a PV resource level response via the gateway device in an attempt to achieve a target measure of zero generation (battery assisted) for all solar assets under control.
- Gross CTZ Zero Assist is a PV and BESS resource level response via the gateway device in an attempt to achieve load at the connection point through full PV curtailment and zero battery discharge to supply BTM loads.

➢ Potential Role for **System Restart**

- System wide support – DER aggregation acts as a load via Constrain To Zero (CTZ) Gross service – No PV export, constant load



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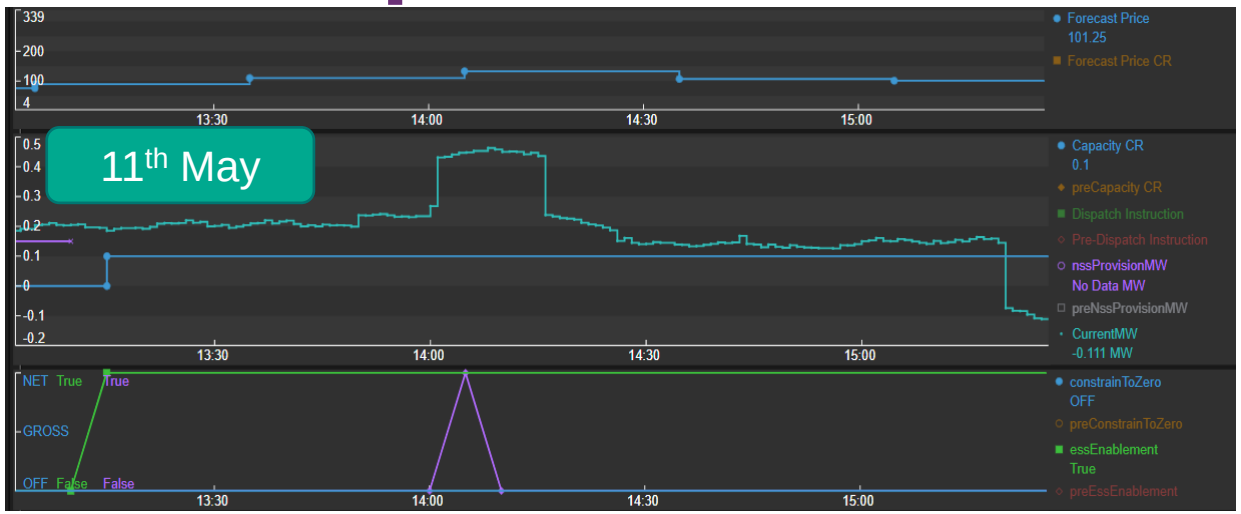
ESS Contingency Raise

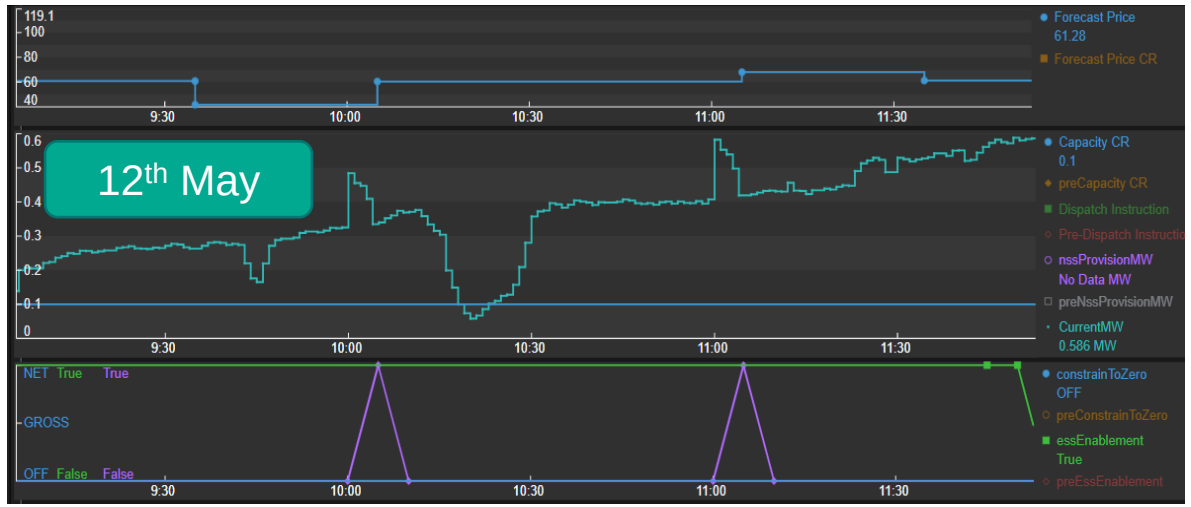
Comparing ESS Response methods

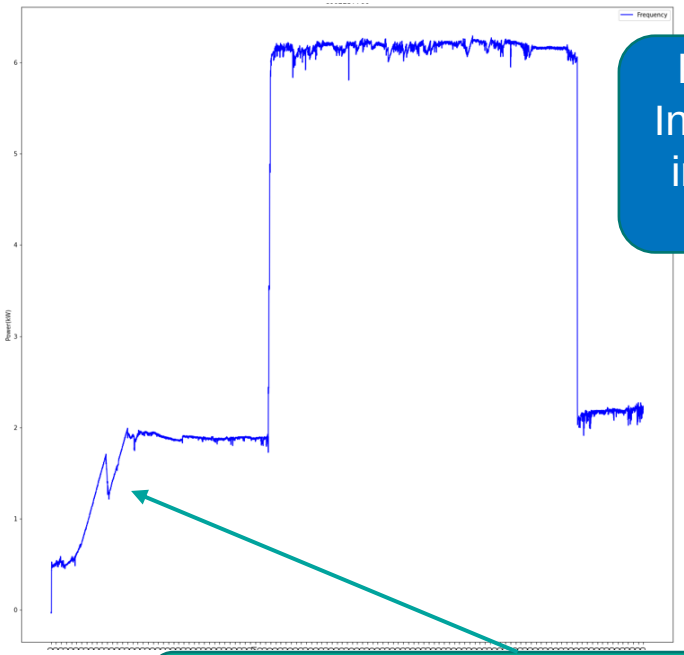
- **Full Power response:** BESS inverters are set “on hold” before the scheduled ESS tests. The droop response starts from zero and the battery injection is not offset by BTM load following.
    - Tests the maximum possible ESS CR response but results in a short term facility generation disturbance.
- **Self Consumption response:** BESS inverters work to cover either BTM load or achieve dispatch outcomes. Droop response starts immediately without disturbing the VPP baseline.
    - Simulated response is most similar to what a real contingency response would be. The VPP reverts back to it’s dispatch after the ESS response.

➢ VPP demonstrates droop response capability in a simulated environment without negative impact to it’s operation in the energy market.

ESS Response

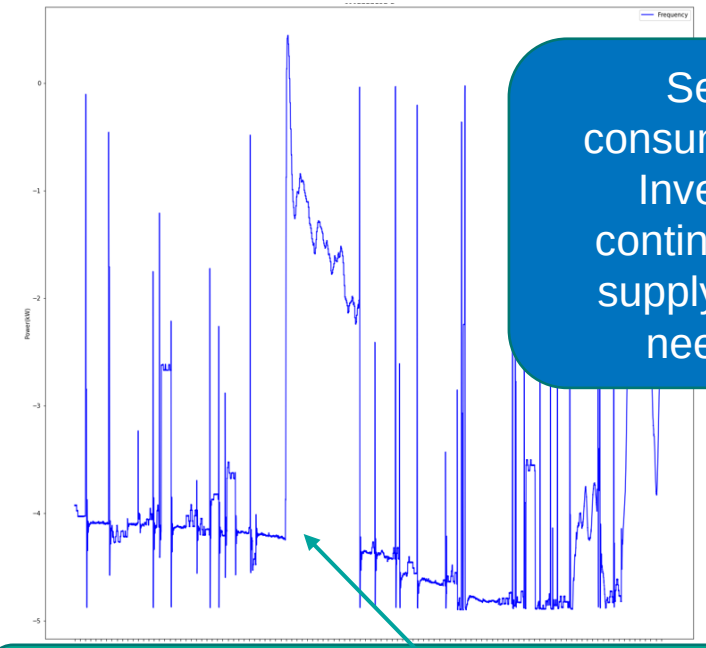


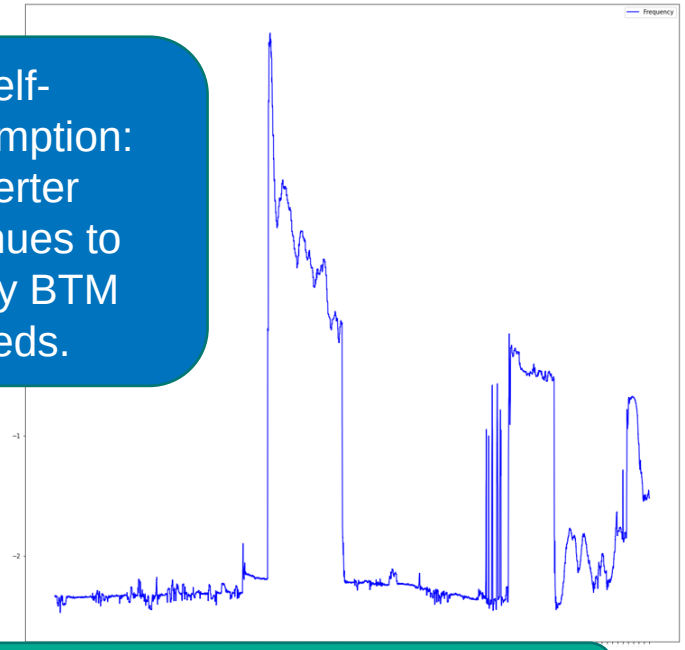




Full Power: Inverter stops importing or exporting

CR response disturbs the NMI output prior to test





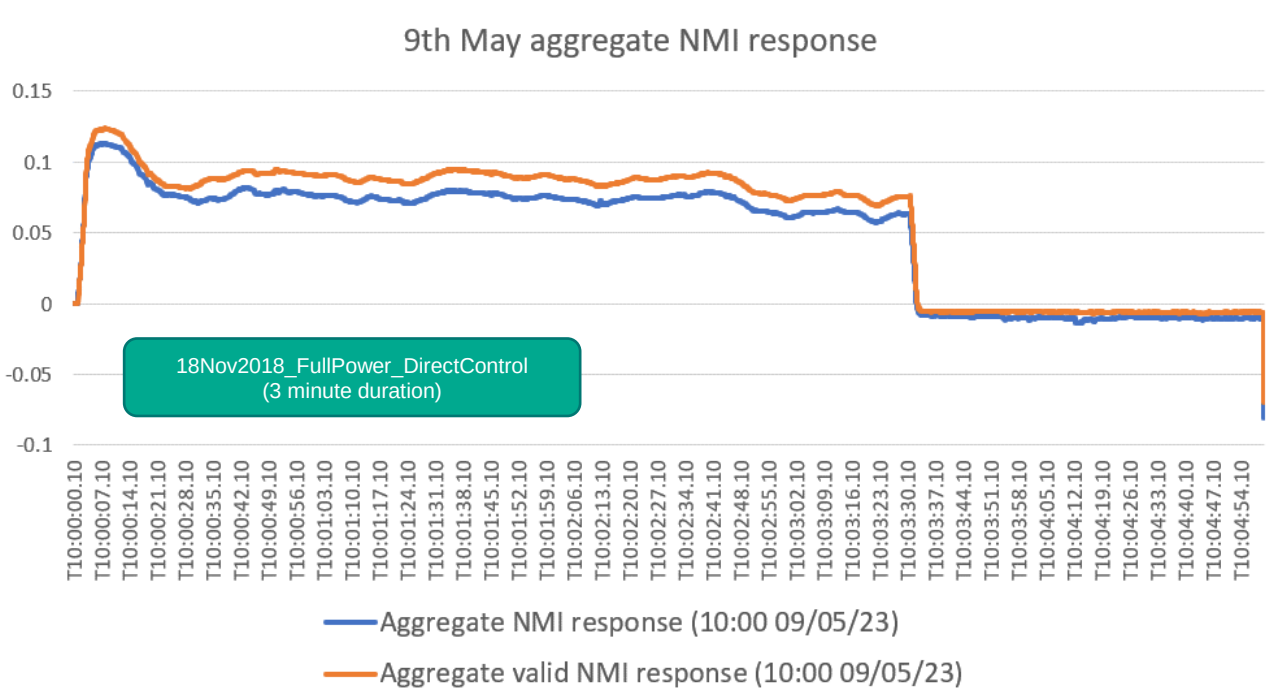
Self-consumption: Inverter continues to supply BTM needs.

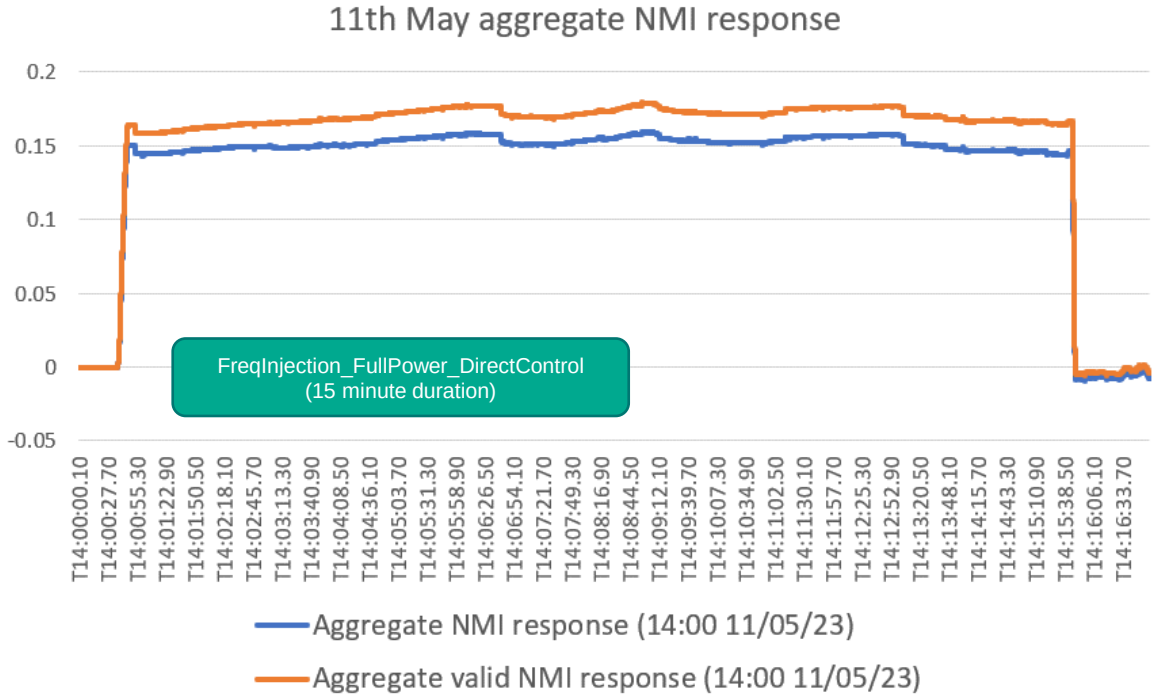
Minor to no disturbance of NMI output before and after the test event.

Aggregated NMI ESS Response

50 Sites

Date	Total MW	Total MW Correct Responses	Valid Response Rate%	Achieved Response MW	Achieved Response Rate %
9th May 10:00	0.374	0.252	76	0.124	49
11th May 14:00	0.374	0.287	82	0.179	62





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NCESS / Network Support Services (NSS)

Value to the system / market?

- Defer network augmentation / capex
- Supports immediate system needs
- Multiple Forms for both HV & LV network: locational and scalable
  - System wide
  - Tx Node
  - Feeder
  - Transformer
- Flexible: can incorporate multiple services for different systems needs (peak constraints, voltage control, reverse power flows)

Value to the Aggregator?

NCESS / NSS can't be provided without orchestration of DER

- Additional revenue stream
- Potentially increases case for battery installs which can leverage multiple value streams

NCESS / Network Support Services (NSS)

Symphony Observations –Final recommendations to come

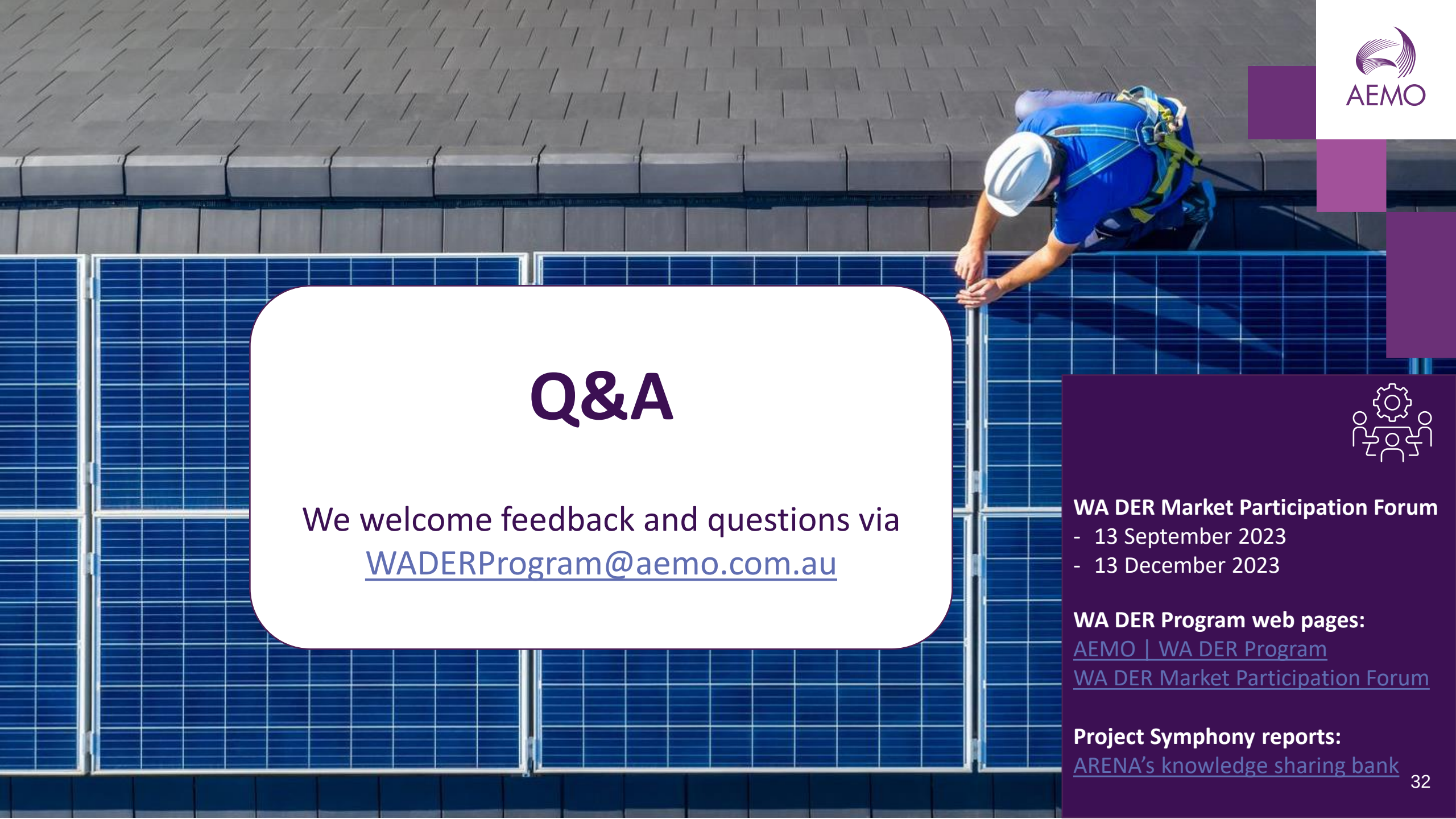
- Technical alignment with other services is important: measurement point / control
  - Holistic approach (connection point control) will optimise multiple services and enable visibility of customer / aggregation value stack, uncontrolled & controlled load to enhance optimisation and performance, or
  - Device only
    - Can limit participation with other services
    - Might not be aligned with customer incentives / behaviour
- Technical alignment with other services is important: deployment demonstrated to be able to be coordinated with WEM services
- NCESS can be value stacked with market services
  - If optimised, could the Aggregator be paid twice for the service?
    - Distribution NCESS – locational, defer network augmentation
    - Balancing Market – provide energy during peak demand and provide visibility to System / Market

What's Next?

13th September Stakeholder Forum

- DER Program Updates
- Project Symphony
  - Final Report Updates

Feedback can be emailed to:
WADERProgram@aemo.com.au



Q&A

We welcome feedback and questions via
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