WA DER Market Participation Forum

15 March 2022

Please note that this meeting is being recorded for note-taking purposes only.

Welcome

Tom Butler, Manager – Distributed Markets WA

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.

AEMO Competition Law Meeting Protocol

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**:

1. Ensure that discussions are limited to the matters contemplated by the agenda for the discussion
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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Online forum housekeeping

1. Please mute your microphone to avoid distracting background noises.
2. Video is recommended for presenters only, as this helps with webinar performance and minimises distractions. However, we encourage you to turn it on via Q&A.
3. We encourage you to ask questions and provide feedback.

- Use the chat function at any time during the presentation, we aim to respond to as many questions as possible.

- Raise your hand during Q&A and wait till you're called upon. Don't forget to unmute and lower your hand after.

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Agenda

1. Welcome by Tom Butler
2. Opening remarks by Kate Ryan
3. Energy Policy WA Update by Aden Barker
4. Project Symphony Update by Bruce Redmond & JP Montandon
5. DER Participation by Natalia Kostecki
6. The application of national interoperability standards to DER operating in the WEM by Allicia Volvricht
7. Q&A

Opening remarks

Kate Ryan, Executive General Manager - WA & Strategy

Government of **Western Australia**
Energy Policy WA

DER Integration

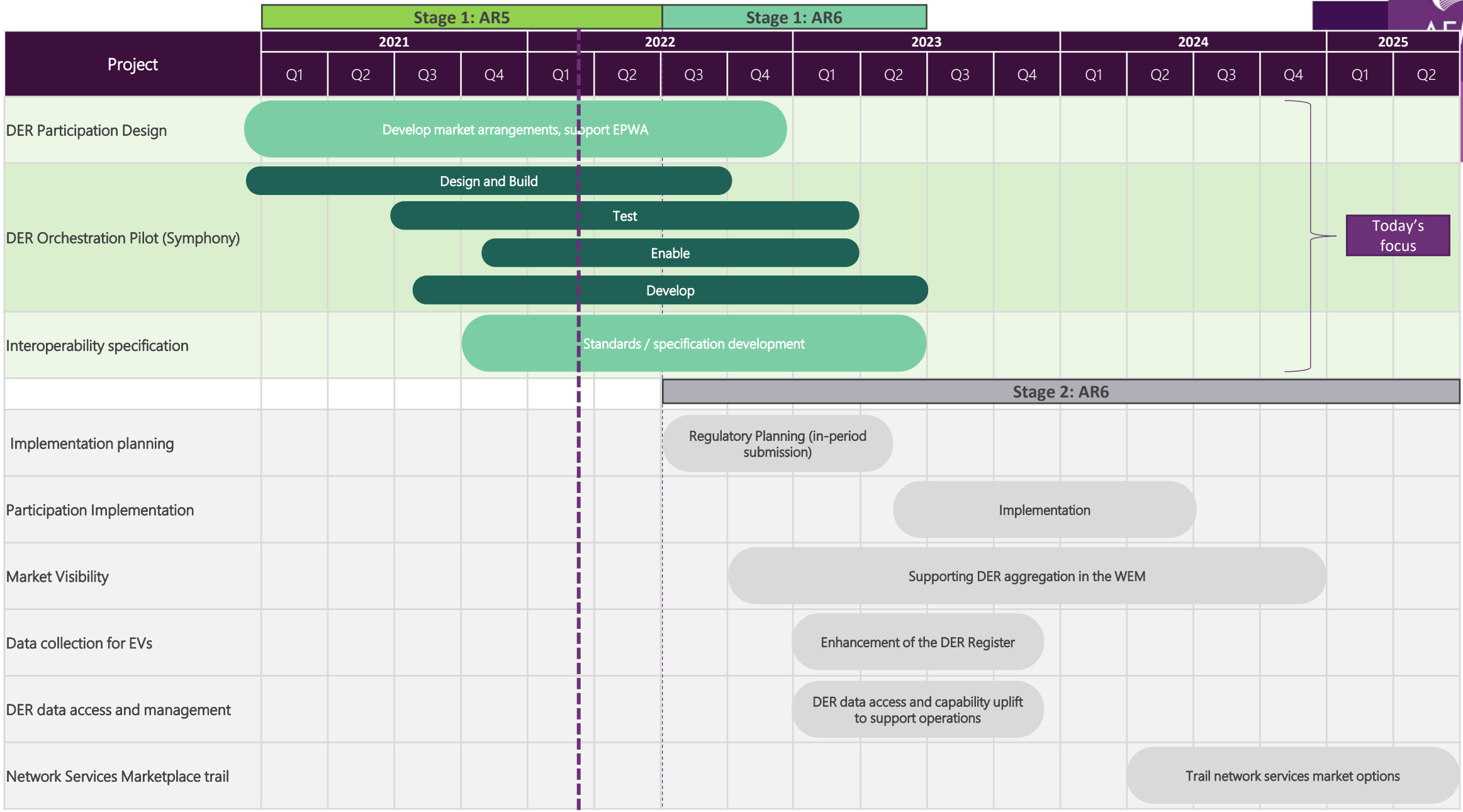
EPWA Update

Aden Barker

Director Network Regulation & Customer Participation

Working together for a **brighter** energy future.

WA DER Program – Market Participation Action Overview



Project Symphony

Our energy future

Project Symphony

Project Update

Scenario Bid, Offer & Dispatch

Test & Learn

Bruce Redmond, Project Symphony Workstream Leader

Jean-Philippe Montandon, Principal Analyst - DER Market Systems

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western power synergy AEMO GOVERNMENT OF WESTERN AUSTRALIA Energy Policy WA

Project Symphony has received support from the Australian Renewable Energy Agency (ARENA) as part of ARENA's Advanced Renewables Program.

Project Symphony – AEMO's Vision and Product Goals

Vision

To build a future where DER competitively participates to provide services to the WEM and to the network.

- ***Deliver the systems and processes to create the opportunity for all small scale 'behind the meter' devices – such as solar PV, batteries and controllable load – to support the SWIS and participate in the WEM.***

- ***In achieving this DER will become and integrated part of the SWIS and WEM. DER devices and equipment will provide the technical capability to allow Western Australia to increase our use of these resources as a foundational component of the energy mix.***

- **Product Goal 1: *Build*** a pilot DER Orchestration platform …
- **Product Goal 2: *Test*** the ability for DER Aggregators to interact with AEMO (via the DER Orchestration platform) …
- **Product Goal 3: *Enable*** AEMO to develop the services that will enable DER Aggregators to participate in the WEM…
- **Product Goal 4: *Develop*** technical and policy solutions aimed at enabling the future implementation of AEMO's role in DER Orchestration as the market operator and system manager…

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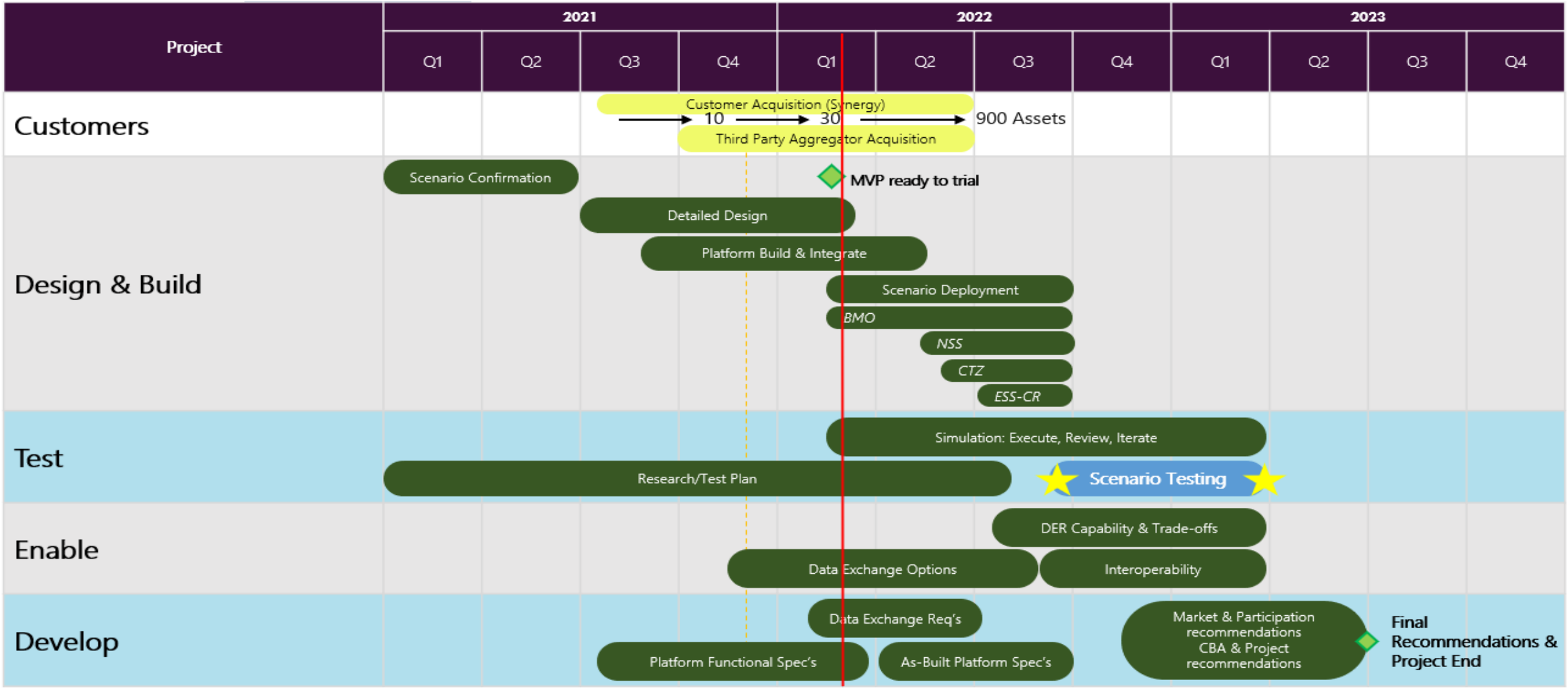
Project Symphony: Where are we at?



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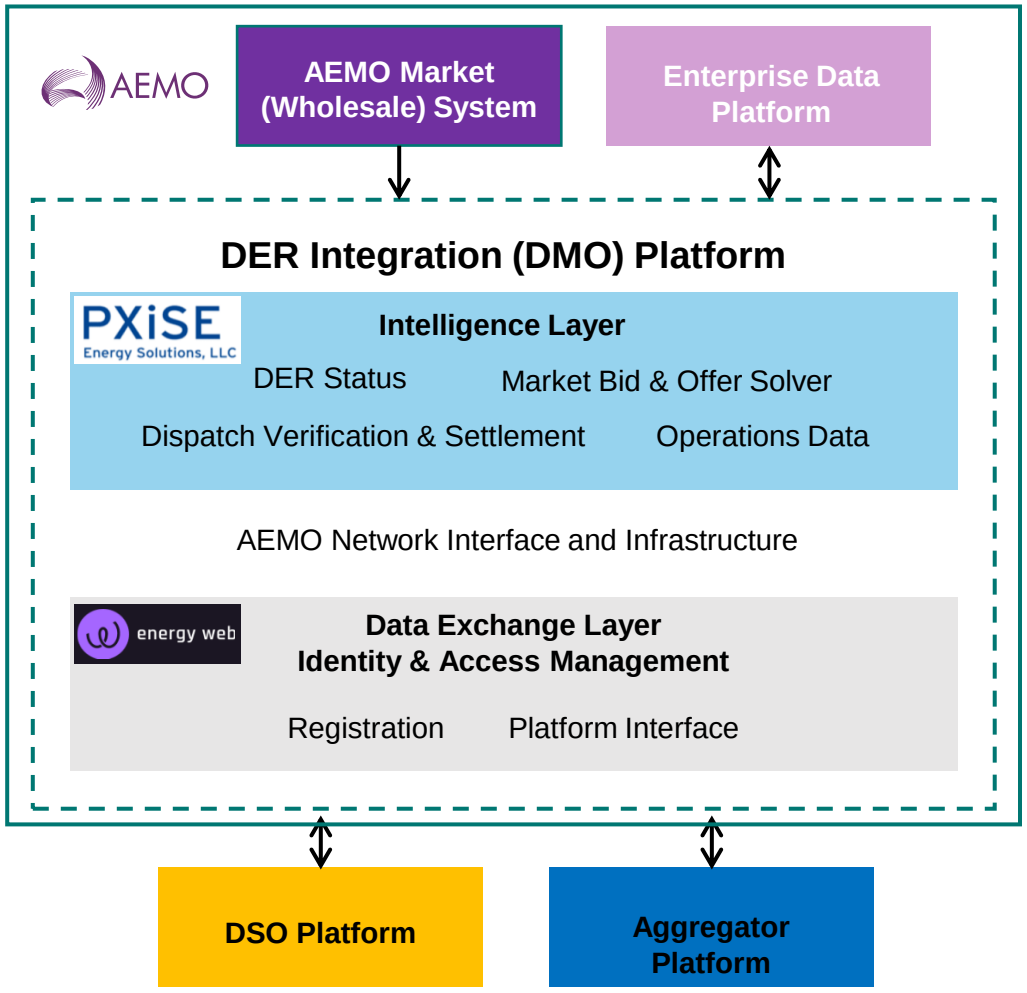
Market Platform: What we still need to build



Reporting & Analysis

EDP Model
Visuals & Tables
Dashboard and Reporting

Platform Functionality

Market Scenario's
- Balancing Market – Bi-directional
- Networks Services
- Constrain to Zero
- ESS-CR

Dashboard UI

Capability & Automation

Scalability
Performance
Capability

Platform Integrations

UI – Upload & Download
API-API

Not Started In Progress

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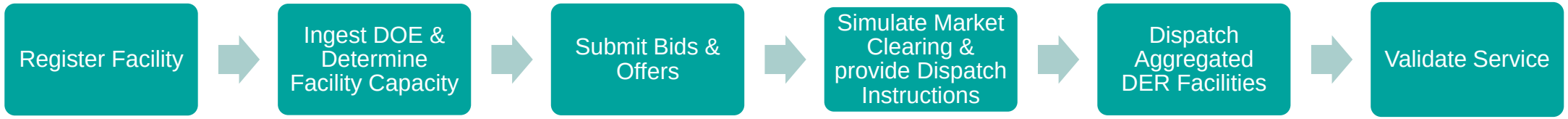
Market Platform MVP: What is it?

Energy Services: Bi-directional Energy – Balancing Market Offer

What is it?

- A mandatory ‘gross pool’ market for dispatch and ‘net pool’ for settlement that determines the most economically efficient dispatch of generation to meet system electricity demand at a given time

How does it work?



What value does it serve?

- Demonstrates technical capability of Aggregated DER to provide Wholesale market services
- Demonstrates the potential economic and commercial value of DER via an Aggregator

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Market Platform MVP: X-SIT - What did we achieve?

Drop Objective

To demonstrate at an MVP level that all parties provide the right inputs to simulate a market that can orchestrate energy over a balancing market trading interval.

- Test the manual integration of each organisation's solution into a functioning E2E solution
- Test the E2E business functions to validate conformance with business requirements

Scope

- 2 facilities
- 10 NMI's
- 20 Devices
  - PV Systems
  - BTM Batteries

Executed Test Cases (inc repeats)	Run (test steps)	Passed (test steps)	Failed (test steps)
All Tests	**21 (83)**	**20 (80)**	**1 (3)**
DMO Platform	**17 (67)**	**17 (67)**	**0 (0)***

* 5 minor defects were identified, 3 rectified, 2 outstanding for future drops

- ✓ 3 Platforms are able to communicate with each other
- ✓ Aggregator Platform can determine capacity based on DOEs
- ✓ DMO Platform can issue offers and dispatch instructions, Aggregator can orchestrate
- ✓ DSO ability to issue DOE to Aggregator and monitor orchestration

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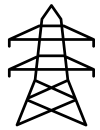
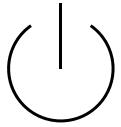
Project Symphony – Test scenarios

Balancing (Bi-Directional) Market



Network Services



Constrain to Zero

Contingency Raise

Energy Services - Bi-Directional - Balancing Market Offer (BMO): Offering (Sell) or bidding (Buy) energy into the balancing market, issuing, receiving & responding to dispatch instructions and settlement to determine the most economically efficient dispatch of generation to meet system electricity demand at a given time.

Network Support Services: a contracted service provided by a DER aggregator to help manage network constraints such as distribution level peak demand or reverse power flow and/or voltage issues as identified by the Distribution System Operator (DSO).

Constrain to Zero: AEMO dispatches an instruction to the Aggregator to constrain energy output from DER to zero export (net) or zero output (gross). This could be offered as a market service, or incorporated into normal dispatch arrangements if customers are remunerated appropriately.

Essential System Services (ESS) Contingency Raise: Market provision of a response to a locally detected frequency deviation to help restore frequency to an acceptable level in case of a contingency event (such as the loss of a large generator or load).

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Registering a facility to participate in Symphony

Facility – VPP_SYNERGY_SNR1 *(40 NMIs 0.200MW)*	Scope	Dataset Description	Purpose
Facility Standing	Portfolio Enrolment	Aggregated information and Capacity of the facility	Create Participant record and capture portfolio information in Symphony platform
NMI Standing Data		Aggregator facility NMI List containing connection point capacity details	
Device Standing		Aggregator facility Device list containing the various device attributes	

Device Standing Data

uId	NMI	inverterManufacturer	inverterSeries	inverterModelNumber	commisioningDate	inverterStatus	deviceInverterCapacity	rampRateUp	rampRateDown	inverterStandard	overFrequencyProtection	underFrequencyProtection	underVoltageProtection	overVoltageProtection	frequencyRateOfChange	voltageVectorShift	neutralVoltageDisplacement	deviceManufacturer	deviceModelNumber	deviceType	nominalRatedCapacity	nominalStorageCapacity	frequencyDroop	frequencyDeadband
200000006068855	Confiedential	TESLA	301301301	AC Powerwall	2021-10-19	Active	2.7			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	TESLA	Unknown	Solar PV	2.7	NULL	50	2
200000006068856		SUNGROW	301301301	SG5KTL-MT	2021-10-20	Active	2.7			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	SUNGROW	Unknown	Solar PV	2.7	NULL	50	2
200000005783455		TESLA	301301301	AC Powerwall	2021-10-21	Active	3.315			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	TESLA	Unknown	Solar PV	3.315	NULL	50	2
200000005783456		FRONIUS	301301301	Primo 5.0-1	2021-10-22	Active	3.315			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	FRONIUS	Unknown	Solar PV	3.315	NULL	50	2
200000005936501		ALPHAESS	301301301	SMILE5-INV	2021-10-27	Active	4.6			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	ALPHAESS	smile-bat-13.3p	Storage	4.6	13.34	50	2
200000005936500		SOLAREDGE	301301301	SE5K	2021-10-24	Active	3.33			AS4777.2:2015	49.20	50.99	1000	1100	3	30	240	SOLAREDGE	Unknown	Solar PV	3.33	NULL	50	2

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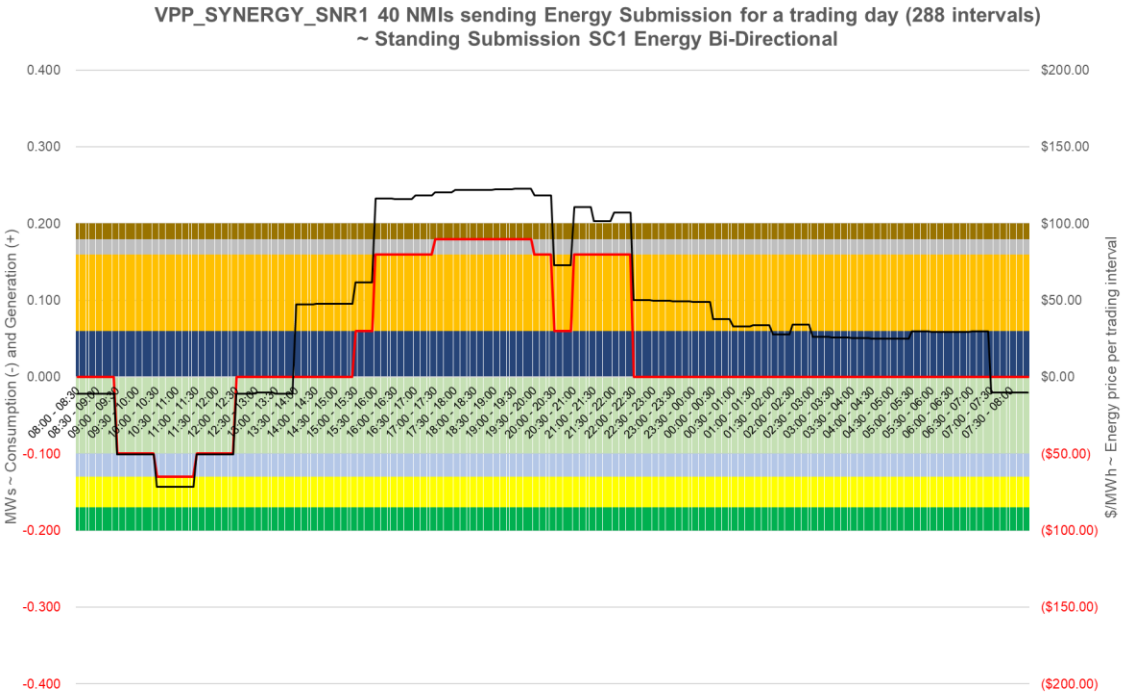
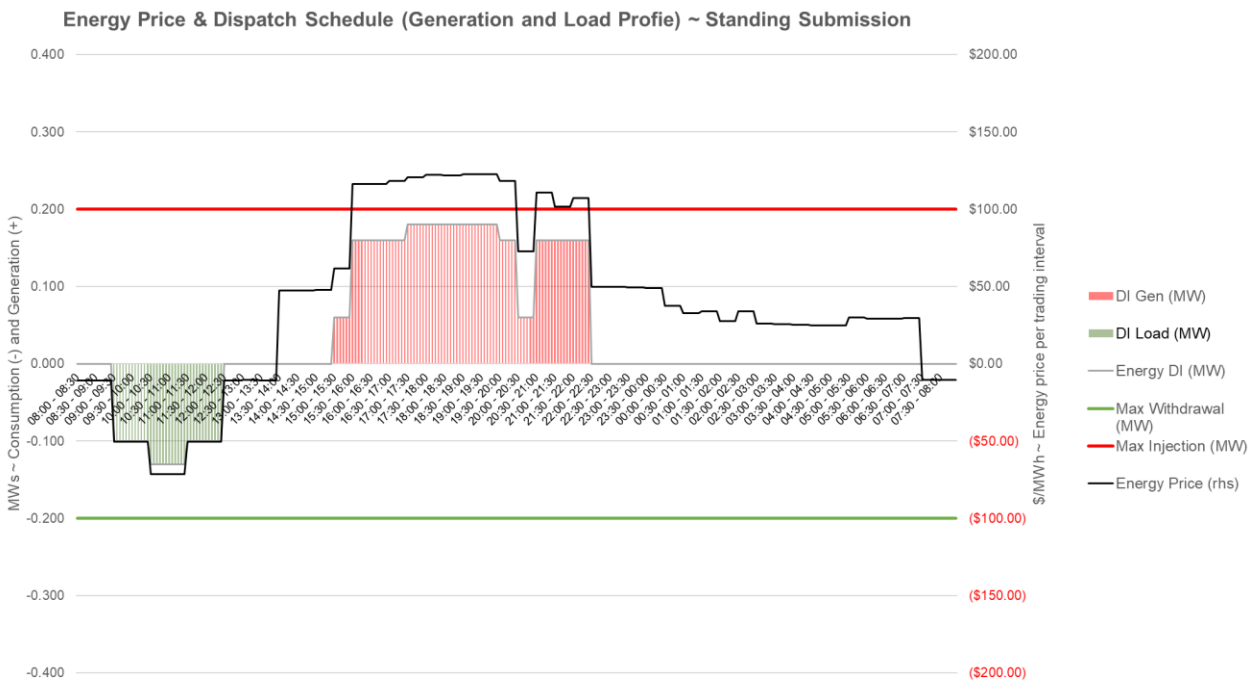
Scenario 1 Energy BMO – From Bid and Offer to Dispatch

Energy bi-directional offers can be up to 10 bands with Load and generation

Looking at Trading day 05-Mar-2022 – **Standing Submission 0.200MW (40NMI) facility**





Band	1	2	3	4	5	6	7	8	9	10
Price ($/MW/h)	-1,000	-500	-70	-30	-10	0	50	80	120	267
Quantity (MW)	-0.030	-0.040	-0.030	-0.100	0	0	0.060	0.100	0.020	0.020

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Scenario 1 Energy BMO – From Bid and Offer to Dispatch

Energy bi-directional offers can be up to 10 bands with Load and generation

Variation Submission @ 1704 SCH FRC – Manage SoC for Evening Peak and ESS CR

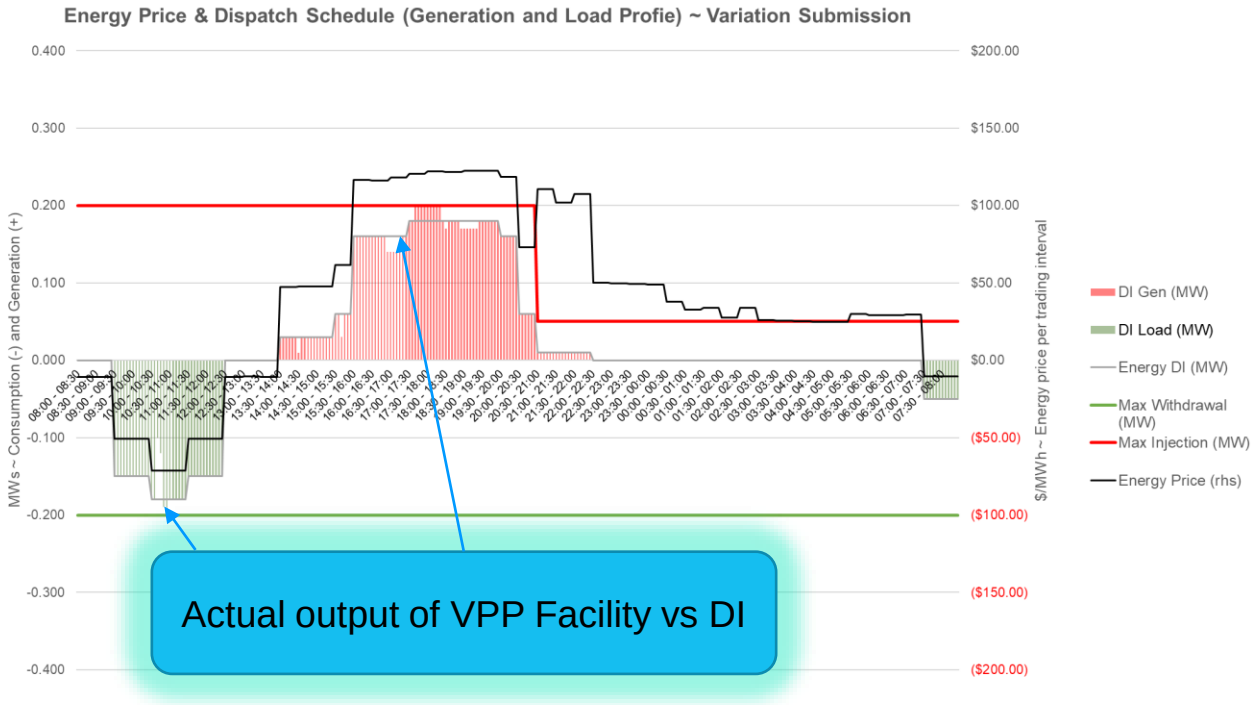
1. Ability to meet Dispatch Instructions Compliance is the key for the VPP facility

2. Dispatch Compliance and Allowable exceedance

Under the new WEM rules

- [MR 7.10.] Dispatch Compliance and
- [MR 2.13.11] and [MR 2.13.12] Tolerance Range

Participants (that will include a future VPP facility) must meet their DI's.



- *The Red (generation) and Green (consumption) represents the actual output of the VPP against the DI sent by AEMO.*

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Scenario 2 NSS – From Bid and Offer to Dispatch

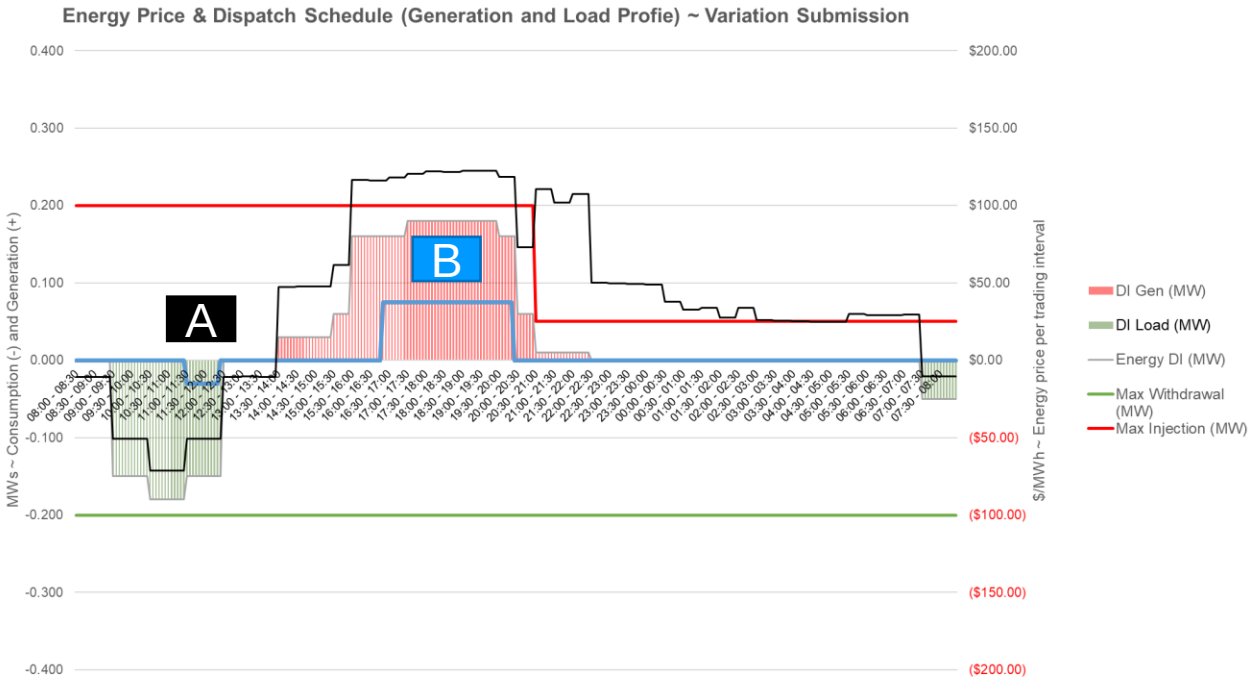
Network Support Service Background

- An NSS is a flexible contract arrangement.
- The contract will contain network locational information and the type of service(forward/reverse power).
- Under the contract, the contract partners agree on how to trigger the contract.

Registration Implication

- Facility Registration will include NSS contract information (contract IDs for each contract, time and MW quantity for each contract; list of NMIs to execute each contract).

- AEMO platform will pass on the contracted NSS commitment (between AGG and DSO) which is **initiated** by the **DSO** via a DI, for example A and B
- The NSS Dispatch MW must be embedded into the RTMS; i.e. for B to generate 0.075 MW, the VPP should offer those 0.075 MW at Min Price of $-1,000/MWh.
  - Therefore a Variation is required because in the 05-March example, only -0.020MW was offered.
- The NSS MW needs to be within the Maximum Withdrawal and Injection Capacity.



Scenario 3 – Constrain to Zero (CTZ) Net and Gross via a DI

1.The test will demonstrate the ability of the AEMO Platform to instruct the Aggregator platform:

- **Constrain energy output to zero export (net)**

AEMO will instruct the Aggregator to control assets behind the meter for exporting NMIs to achieve net zero exports for those NMIs.

NMIs that are not exporting do not need to be constrained to Zero load (It is net Zero export to grid for NMIs)

- **Constrain energy output to zero output (gross)**

AEMO will instruct the Aggregator at the facility level turn PV off that exists within the facility (excluding battery)

2. The AEMO platform will determine if the event is either a:
a) Net CTZ event; or
b) Gross CTZ event

3. The AEMO Platform sends the instruction to the Aggregator Platform. This will replace any Gen/Load (energy) instruction via *"dispatchMW"*

Data Model Level	Data Name	Units	Mandatory Field	Permitted Values
Dispatch Instruction	tradingDate	YYYY-MM-DD	Y	
Dispatch Instruction	facilityCode		Y	
Dispatch Instruction	dispatchInterval		Y	1:288
Dispatch Instruction	dispatchMW	MW	Y	
Dispatch Instruction	rampRate	MW/min	Y	
Dispatch Instruction	nssContractID		Conditional if NSS = Yes	
Dispatch Instruction	NSSenablement		Conditional if NSS = Yes	On/Off
Dispatch Instruction	nssProvision		Conditional if NSS = Yes	Yes/No
Dispatch Instruction	nssForwardPower		Conditional if nssForwardPower = Yes	Yes/No
Dispatch Instruction	nssReversePower		Conditional if nssReversePower = Yes	Yes/No
Dispatch Instruction	CR_Capacity	MW	Conditional if CR Control Signal	
Dispatch Instruction	CL_Capacity	MW	Conditional if CL Control Signal	
Dispatch Instruction	ESSenablement		Conditional if CR = Yes	On/Off
Dispatch Instruction	ESStest		Conditional if CR = Yes	On/Off
Dispatch Instruction	constrainGross		Conditional if Constrain to Zero	On/Off
Dispatch Instruction	constrainNet		Conditional if Constrain to Zero	On/Off

Scenario 4 – ESS CR Basics

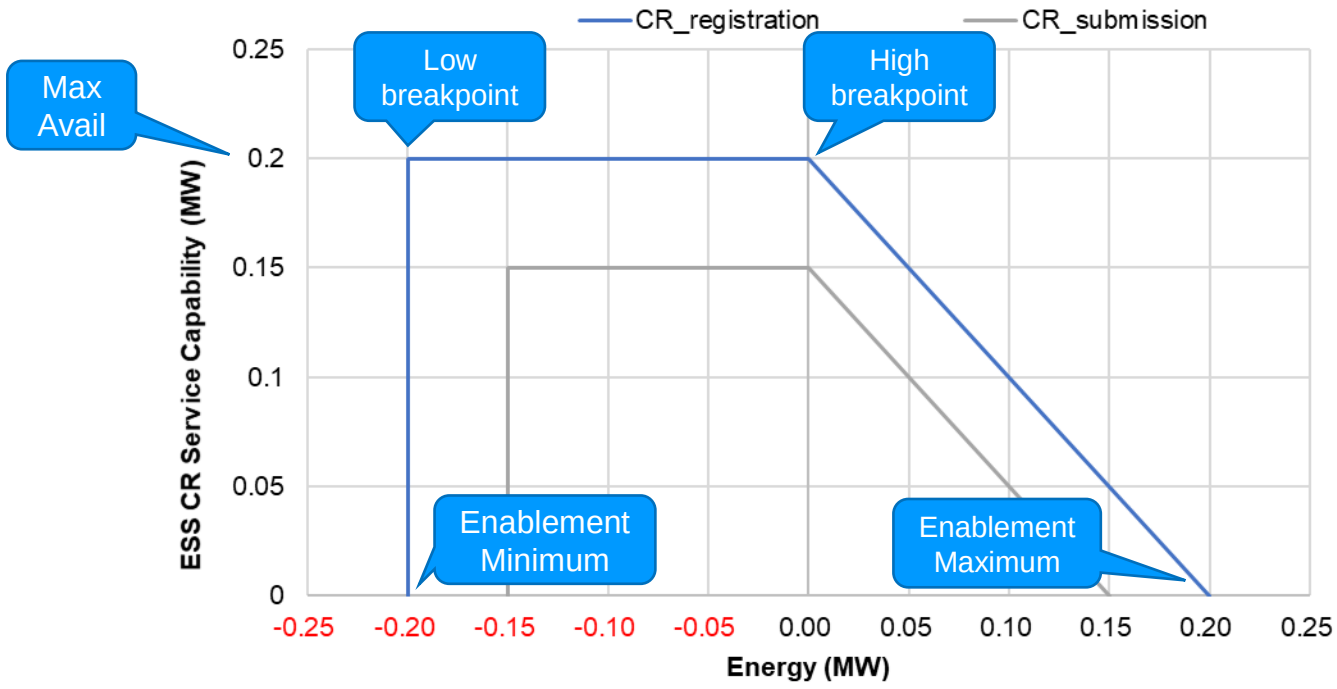
Band	1	2	3	4	5	6	7	8	9	10
Price ($/MW/h)	0.01	0.25	0.50	1	5	15	30	50	60	267
Quantity (MW)	0.10	0.05	0	0	0	0	0	0	0	0.05

ESS offers can be up to 10 bands

ESS trapezium defines the ESS-Energy capability curve

Capability defines shape; could also be a triangle, square, rectangle or a straight line

Max Availability	Enablement Minimum	Enablement Maximum	Low Break Point	High Break Point



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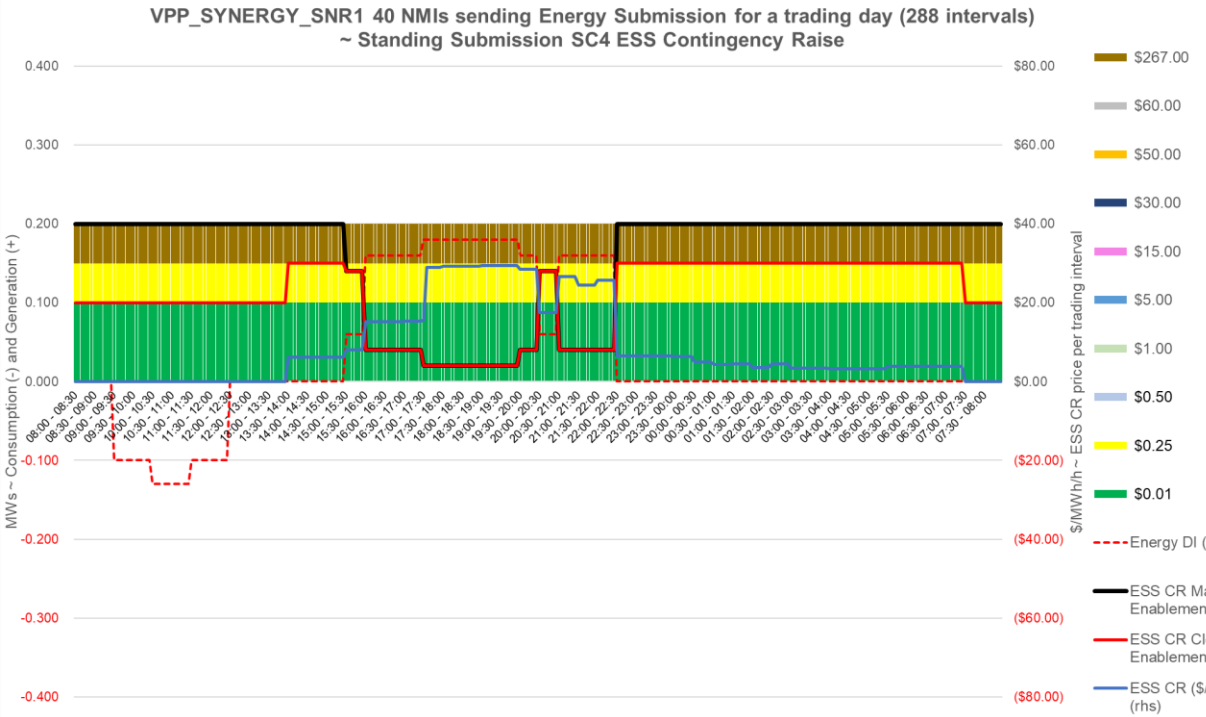
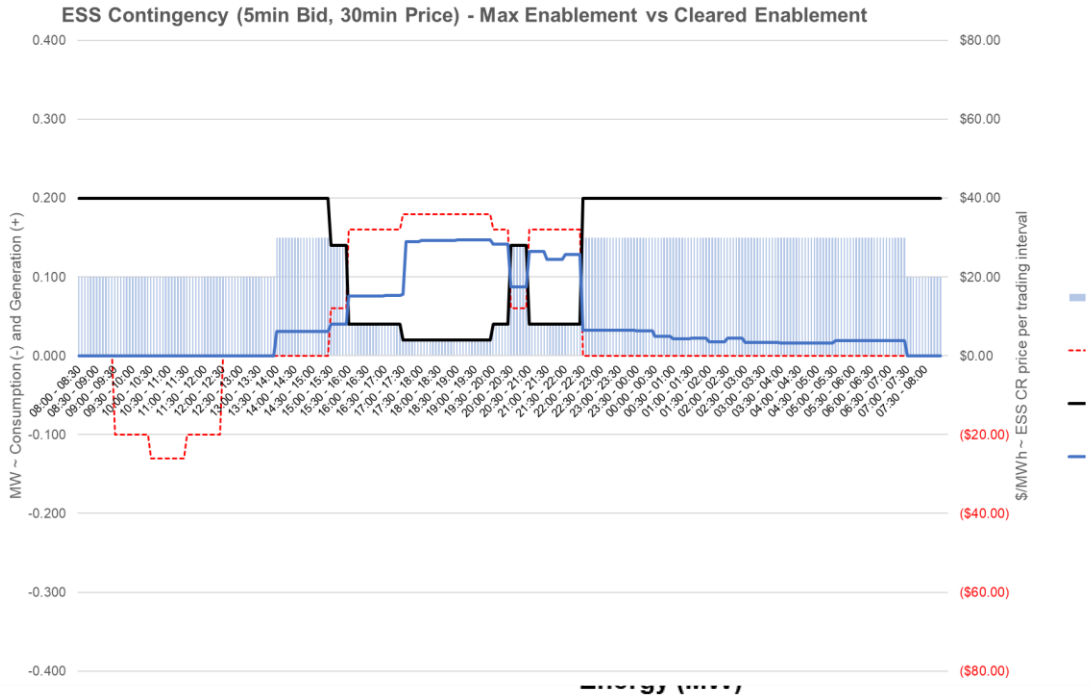
Scenario 4 – ESS CR From Bid and Offer to Dispatch

ESS Offers can be up to 10 bands, again looking at Trading day 05-Mar-2022 – **Standing Submission 0.200MW (40NMI) facility**





Band	1	2	3	4	5	6	7	8	9	10
Price ($/MW/h)	0.01	0.25	0.50	1	5	15	30	50	60	267
Quantity (MW)	**0.200**	0	0	0	0	0	0	0	0	0

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Project Symphony: AEMO Test & Learn

Generalised Test & Learn Hypothesis

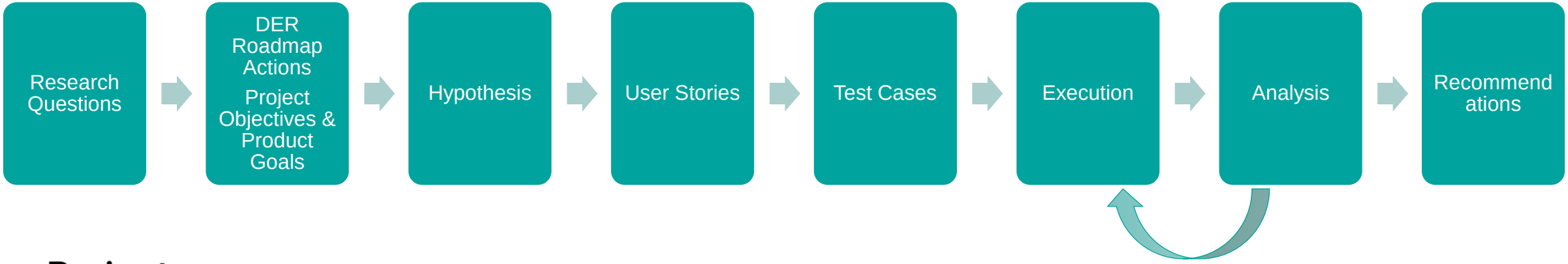
1. Aggregated DER Facilities can meet existing capability requirements for a Scheduled Generator registered to provide Energy Services.

2. Aggregated DER Facilities can meet existing Rules and Standards for Generators that are registered to provide ESS Contingency Raise services.

3. Aggregated DER Facilities and the DMO and Aggregator Platforms can meet enablement Instruction(s), dispatch, control and service performance requirements to the same level to that of a Scheduled Generator registered to provide energy, network support and essential services.

Test & Learn Categories

- Compliance
- Contractual Agreements
- Energy Supply & Security
- Facility Composition & Service Reliability
- Market Price
- Operational Cost / Benefit
- Platform Functionality
- Platform Performance / Response
- Scalability - Transaction Volume
- Scalability - Transaction Concurrency



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Project Symphony: Hypothesis to Test Case

Hypothesis	User Story	Test Case	Test Requirements	Tests
Aggregated DER Facilities can meet existing capability requirements for a Scheduled Generator registered to provide Energy Services.	**Balancing Market Offer (BMO) Scenario** Given the limitations of DER capability, I want to know the capability of DER to act as a Scheduled Generator and meet the requirements of the Energy Service, So that I can determine what changes may be needed to Rules and Standards and Generator Compliance Procedures and Systems to permit DER VPPs to operate in a wholesale energy services market.	**BMO Generator Compliance** Tests that the Pilot DER Facilities can meet existing WEM Rules and Standards for the supply of energy in the Balancing Market	**Requirement Category** **Active Power Capability**	**Active Power Capability** What is the maximum level of Active Power (Rated Maximum Active Power) that the Facility can generate and maintain? Does the Generating System comply with all other GPS Technical Requirements at the Rated Maximum Active Power? How does the Active Power capability vary with temperature? Tests run at 35% & 100% AP

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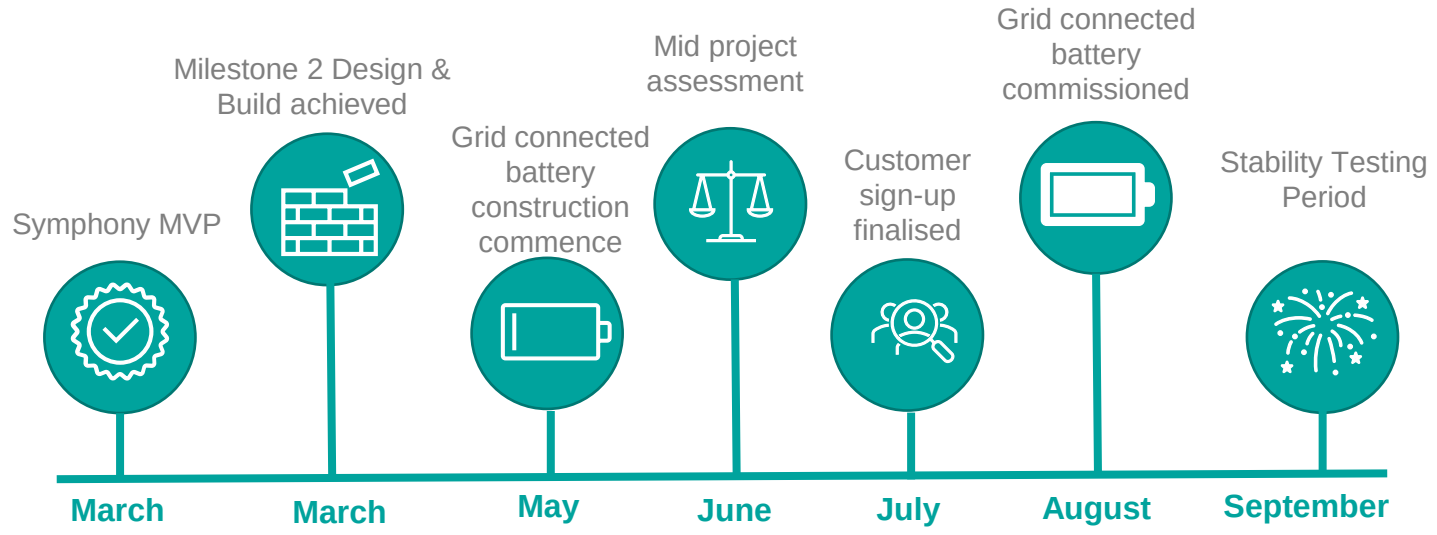
Project Symphony Communications Timeline 2022



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DER Participation

Enabling aggregated DER services within a secure system

Natalia Kostecki, DER Participation Workstream Leader

Glidepath to full market participation

Priority is delivery of power system Immediate Needs (IN) during transition

- IN1 – Emergency Solar Management (ESM) initiative – announced 30 November 2021
- IN2 – Arrangements to enable 'Visibility'
  - Forecasting
  - Operational planning
  - Co-ordinate with market DER service offerings with off-market services
- IN3 - Initial ‘controllable’ aggregated DER service offering
  - Market-based ESM?
  - NCESS?

Regulatory due diligence exercise

- No Regret Actions
- Options in the short-term for collection of ‘visibility’ data
- Options for collection of ‘visibility’ data under New Market design

Internal workshops

- An initial, proposed set of minimum data for visibility
- Potential uses of visibility data
- Potential uses of a ‘controllable’ DER service

DER Workplan 2022

- No Regret Actions - Visibility
  - Fit-for-purpose definitions
  - DER aggregation guidelines
  - Identify minimum data requirements
- Data collection framework
  - Informal arrangements prior to New Market start
  - Use identified new mechanisms from New Market start
- Identify ‘controllable’ DER service offering and market participation mechanism

1. Identify potential data types to enable visibility and controllability

2. Determine baseline minimum data requirements

- WEM Rules
- Standing Data requirements (Appendix 1)

3. Determine options for data provision

- Internal workshops
- Symphony

4. Identify data uses as enabler for integration of DER aggregations

- Regulatory due diligence

5. Identify mechanism to enable IN3

- Internal workshops
- Symphony

- System need

2022 Workplan

- Targeted consultation
- Implement data collection arrangements pre-New Market start
- Implement data collection arrangements for New Market start
- Implement arrangements to procure 'controllability' service
- Implement 'no regret' actions

Consultation paper(s)

- New VPP definition
- Aggregation guidelines
- Specified minimum data requirements

WA DER Roadmap Action 3. Inverter standards

Allicia Volvricht, Manager - Market Change and Registration

WA DER RoadMap – Inverter Standards

Action	RoadMap Element	Owner	Description	Priority
3	Invertor Standards	AEMO Western Power	By July 2022, introduce mandatory inverter communications functionality, including communications protocols, through AS/NZS 4777, to allow remote dynamic management of DER.	High

- The WA DER Roadmap released in December 2019 provided a timeline for Action 3 to be completed by July 2022, however since its release the WA DER Program timeline has shifted and work has progressed nationally to review the common standards, protocols and governance of inverter communications functionality.

- A revised work plan is to be developed to consider:

  - EPWA's policy decisions and interdependencies with the overall action plan as part of the WA DER Roadmap.
  - learnings from Project Symphony.
  - a revised timeline, including an assessment of the various reviews progressing nationally (see next slide) to understand interdependencies, overall implications and adequacy for WA.
  - interdependencies with Project Eagle to consolidate and rationalise regulatory instruments when considering the appropriate regulatory framework and implementation options.

DER_Roadmap.pdf (www.wa.gov.au)

For reference, related reviews and trials which are being undertaken nationally or jurisdictionally regarding standards

The drafting of the guide for Common Smart Inverter Profile – Australia (CSIP-AUS) was published in September 21, published by ARENA and developed by the DEIP Interoperability Steering Committee (ISC) and the DER Integration API Technical Working Group (DERIAPITWG). The versions of CSIP-Aus and IEEE 2030.5 which form the basis for this document are: IEEE2030.5,AS/NZS4755.2 physical response, AS/NZS 4777.2 inverter functions). This is a guide and has not been adopted by Standards Australia formally, currently in project approval - further work is progressing in 2022.

The DERAPIWG is undertaking work in 2022 to draft and develop a testing and conformance guide to assist in the development and testing of compliant server and client implementations. CSIP test procedures are expected to be reviewed as a baseline to consider alignment with international equivalents where possible/appropriate.

The AEMC published a consultation on DER Technical Standards, submissions closed 22 Feb 2022. The draft sets out: 1. to identify when the NEM needs new DER technical standards, 2. Work with the Energy Security Board (ESB) and the Australian Renewable Energy Agency (ARENA)'s Distributed Energy Integration Program (DEIP), 3. Observe Standards Australia's DER committees. 4. Update DER technical standards in the NER & 5. Report on progress adopting standards and integrating DER. See Project Page also for further information.

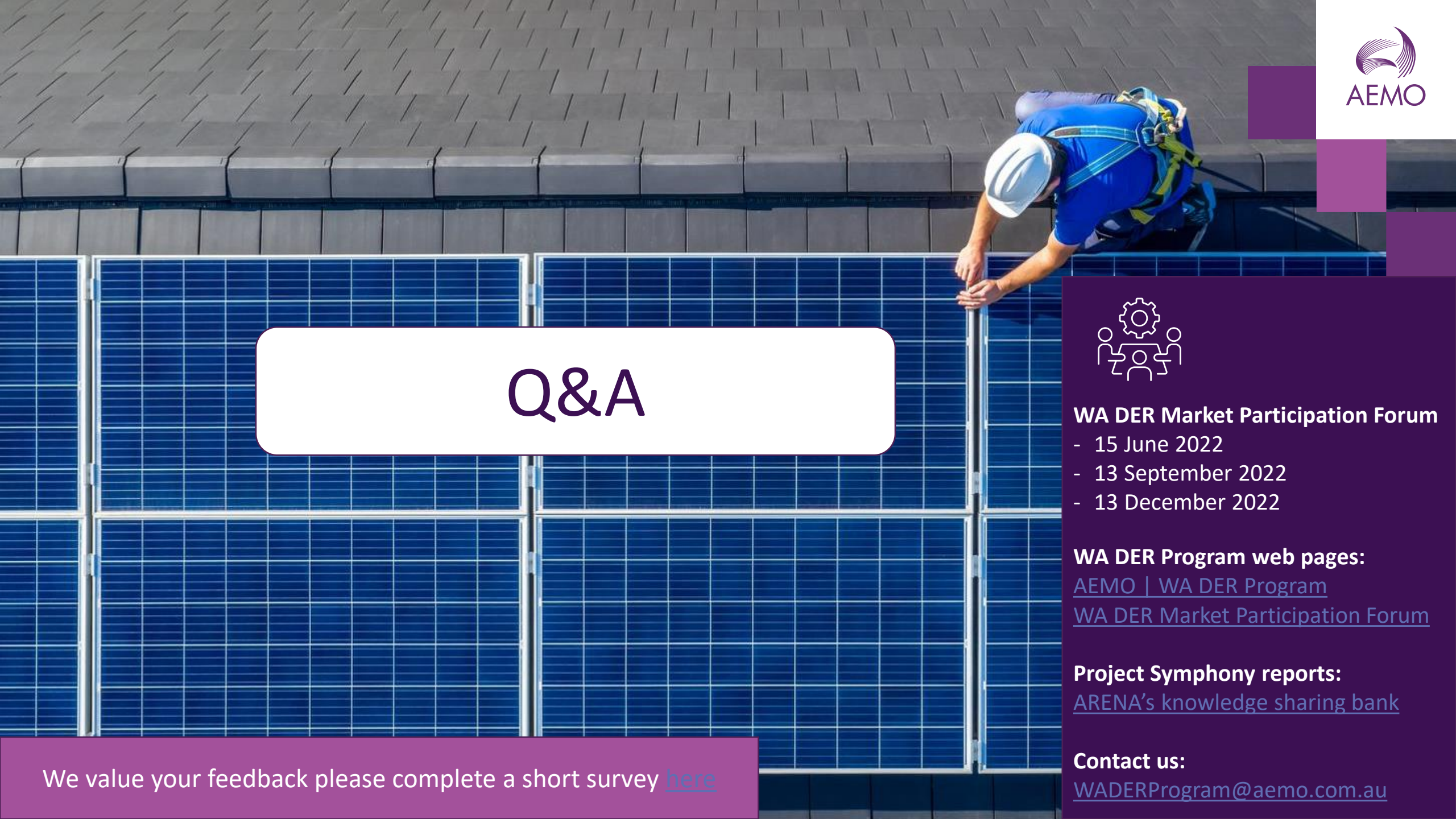
The consultation on the application of CIS-AUS, Interoperability produced by the Energy Security Board (ESB), submissions closed 11 February 2022.
Various stakeholder workshops are being held in 2022, and quarterly DER check in forums with the first being held 31 March 22. A direction paper is expected to be released in June 2022. Also for reference the ESB produced DER Implementation Plans in Dec 21, including Attachment C (Table 3 pages 8 & 9) outlining Horizon One Activities, which includes development of technical standards and other future activities to be considered such as phased introduction of mandatory technical standards for inverter based solar PV and battery storage, related processes to enable DER interoperability along-side standards, e.g registration, telemetry data collection and management of identity and access control etc and development of DER cyber standards to provide scope and need ahead of the Commonwealth DISER standards.

The South Australian Dept of Energy and Mining (DEM),the Office of the Technical Regulator (OTR) already have in place Technical Regulator Guideline for Relevant Agent and Responsibilities to support disconnection functionality/capability. In addition, the Technical Regulator Guide DER, is also already in place and amendments to include dynamic export controls have been drafted, the consultation closed 25 February 2022 with implementation anticipated near end 2022. The guide includes: Remote Communications Capabilities for Inverters, Declared components of electricity infrastructure or an electrical installation associated with an electricity generating plant, deemed Methodologies for Remote Disconnection and Reconnection of Electricity Generating Plants, Remote Updating Methods Export Limiting Methods to require flexible exports (which includes the application of the IEEE 2030.5 using the CSIP-AUS implementation guide). Previous consultations on regulatory changes for Smarter Homes can also be found on their website.

Elements of the international standard IEEE 2030.5 is being utilising in various projects in Australia. For example, Horizon Power Onslow DER Project (Western Australia) and the Flexible Exports project with SA Power Networks and Ausnet Services (SA & VIC) .

A study funded by Arena to assess how residential energy customers can coordinate their distributed energy resources (DERs) through a Home Energy Management System (HEMS). The study compiled by ENEA consulting considers the readiness of available HEMS products and services to respond to dynamic operating envelopes (DOEs), including IEEE 2030.5 communication exchange concepts.

Australia Department of Home Affairs - On 13 July 2021, the Australian Government opened consultation on options for regulatory reforms and voluntary incentives to strengthen the cyber security of Australia's digital economy. Submissions to the discussion paper, *Strengthening Australia's cyber security regulations and incentives,* closed on 27 August 2021. This work forms part of *Australia's Cyber Security Strategy 2020* and also responds to recommendations of the 2020 Cyber Security Strategy Industry Advisory Panel. It complements the Government's critical infrastructure reforms and the *Review of the Privacy Act 1988*.



Q&A

WA DER Market Participation Forum
- 15 June 2022
- 13 September 2022
- 13 December 2022

WA DER Program web pages:
AEMO | WA DER Program
WA DER Market Participation Forum

Project Symphony reports:
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