

WA DER Market Participation Forum - ESS Contingency Raise

27 June 2022

Please note that this forum will be recorded for the purposes of assisting AEMO accurately capturing feedback.



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.

Online forum housekeeping

Please note that this forum will be recorded for the purposes of assisting AEMO accurately capturing feedback.



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 forum, we aim to respond to as many questions as possible.



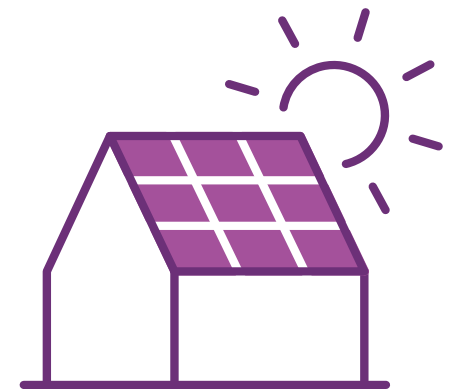
• Raise your hand during Q&A and wait till you're called upon. Don't forget to unmute and lower your hand after.



Agenda



1. **Welcome** by Tom Butler
2. **Overview and purpose of today** by Bruce Redmond
3. **Project Symphony - Essential System Services (ESS) Contingency Raise Scenario** by Andrei Costache
 - including discussion on questions posed
4. **Q&A and next steps** by Bruce Redmond



Questions for discussion

1) What are the main challenges you anticipate for VPP's participating in the future ESS-CR service?

2) What would you like to see included in the ESS-CR testing in Symphony?

3) What are your views on the monitoring performance for the ESS-CR service?

4) What suggested sample size of BTM batteries should be monitored for ESS-CR?



Project Symphony

Our energy future

Project Symphony

Essential System Services (ESS)
Contingency Raise Scenario

In partnership with:



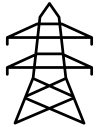
Project Symphony has received support from the Australian Renewable Energy Agency (ARENA) as part of ARENA's Advanced Renewables Program.

Project Symphony – Test scenarios



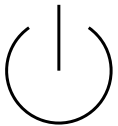
Balancing (Bi-Directional) Market

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 Services

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

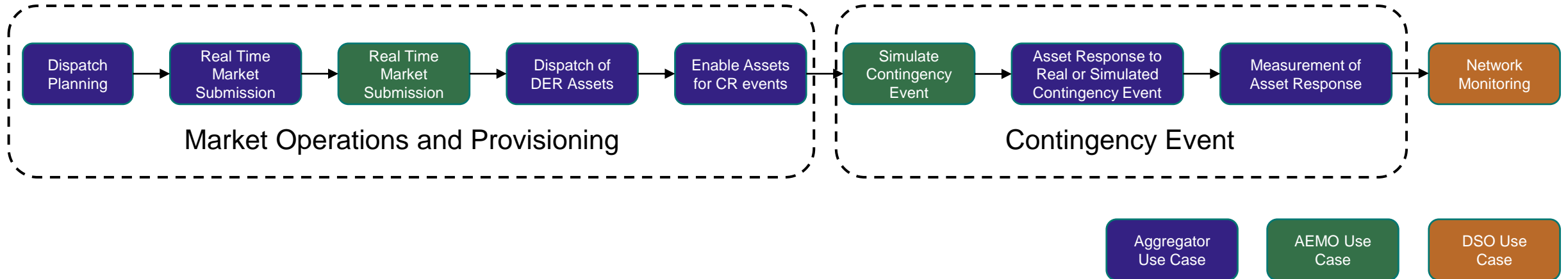
Constrain to Zero: AEMO dispatches an instruction to the Aggregator to constrain energy output from DER to zero export (net) or zero output (gross). This could be offered as a market service, or incorporated into normal dispatch arrangements if customers are remunerated appropriately.



Contingency Raise

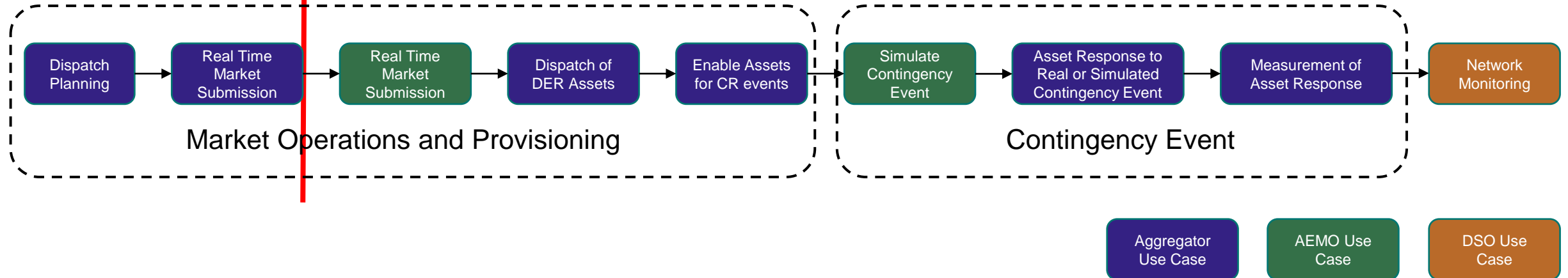
Essential System Services (ESS) Contingency Raise: Market provision of a response to a locally detected frequency deviation to help restore network frequency to an acceptable level in case of a contingency event (such as the loss of a large generator).

ESS Contingency Raise Step-through



ESS Contingency Raise (CR) Step-through

The Aggregator will submit ESS Contingency Raise bids alongside the Energy Market submissions



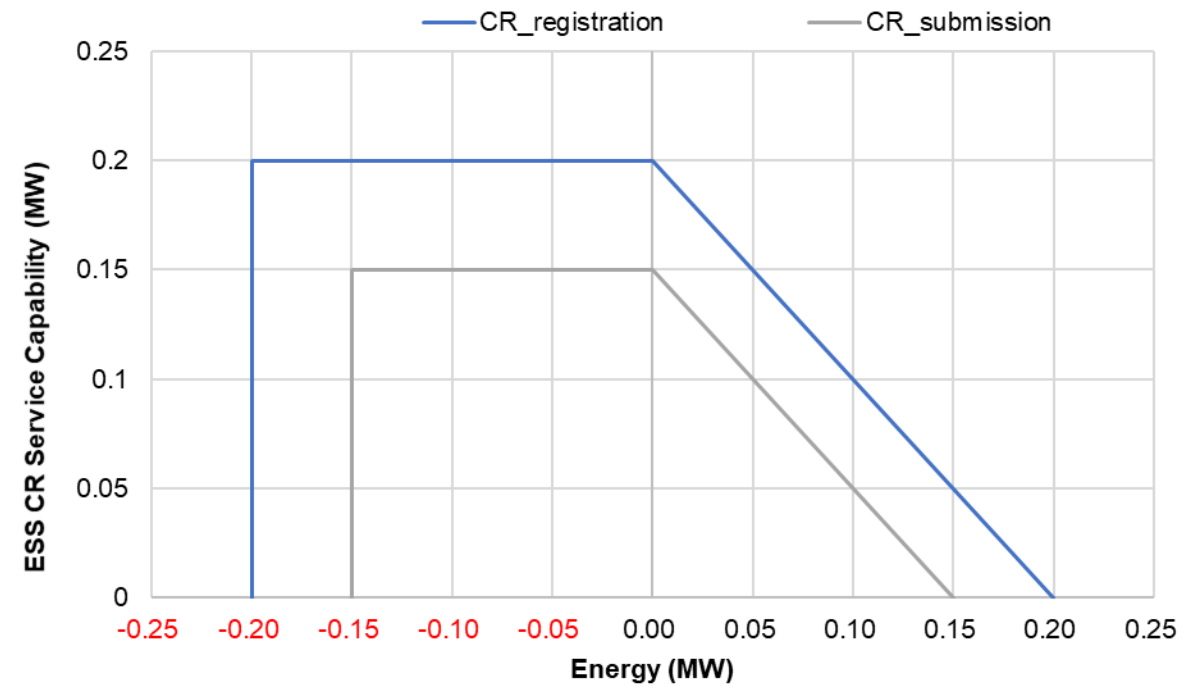
ESS CR Market Submission

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 price-quantity pairs

ESS trapezium defines the ESS-Energy capability curve

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



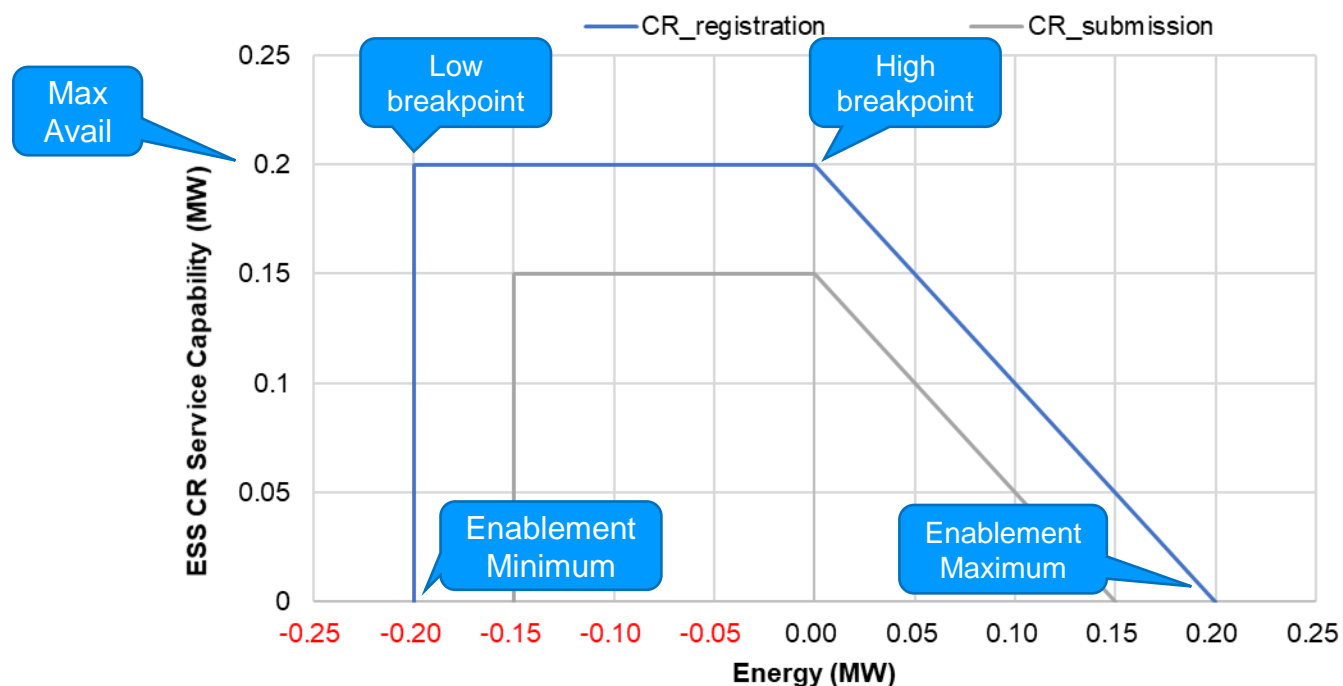
ESS CR Understanding Market Submission

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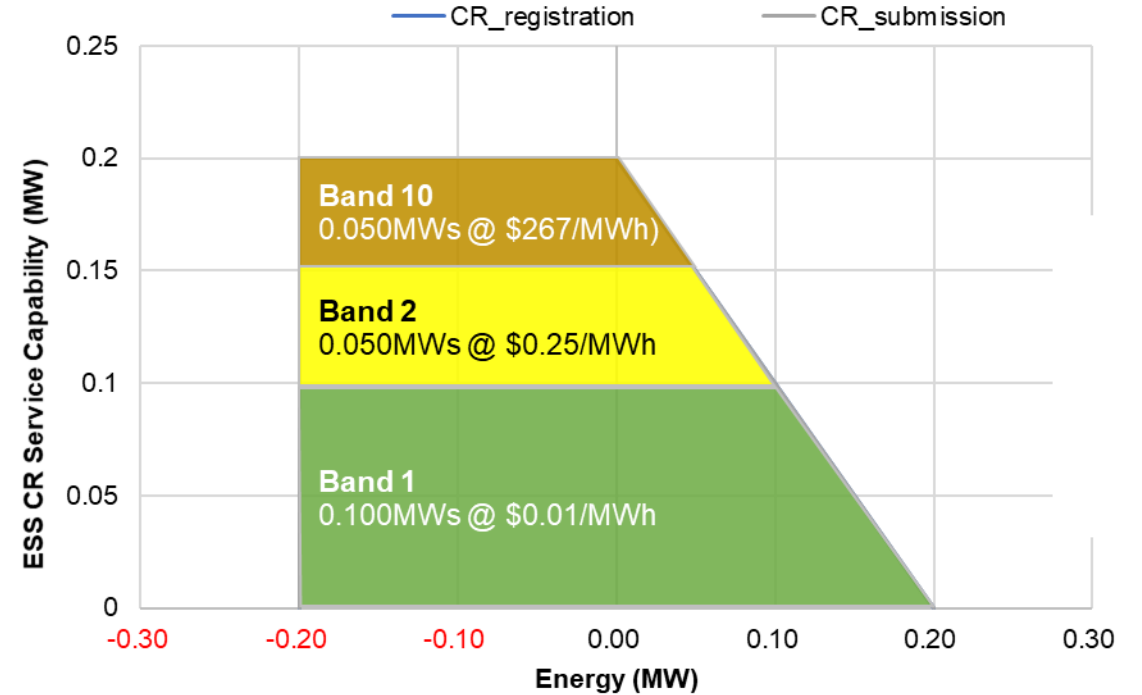
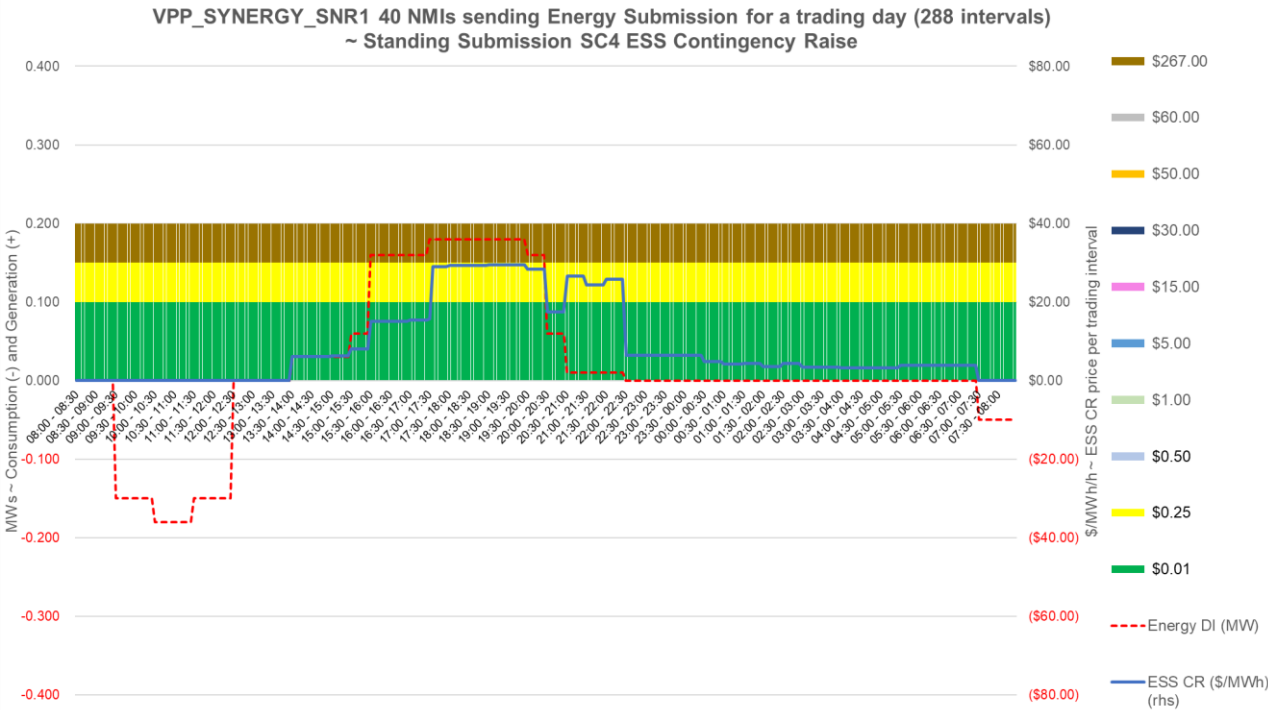
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Max Availability	Enablement Minimum	Enablement Maximum	Low Break Point	High Break Point
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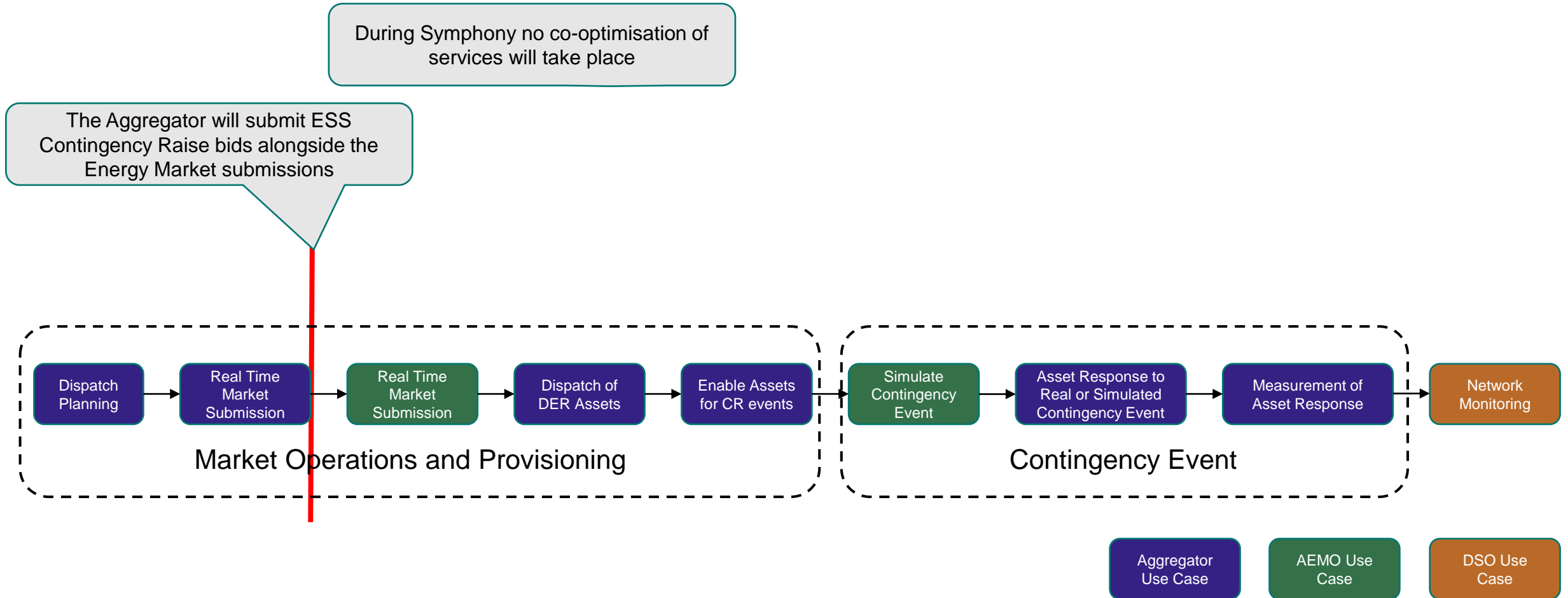
ESS CR Understanding Market Submission

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 (\$/MWh)	0.01	0.25	0.50	1	5	15	30	50	60	267
Quantity (MW)	0.100	0.050	0	0	0	0	0	0	0	0.050

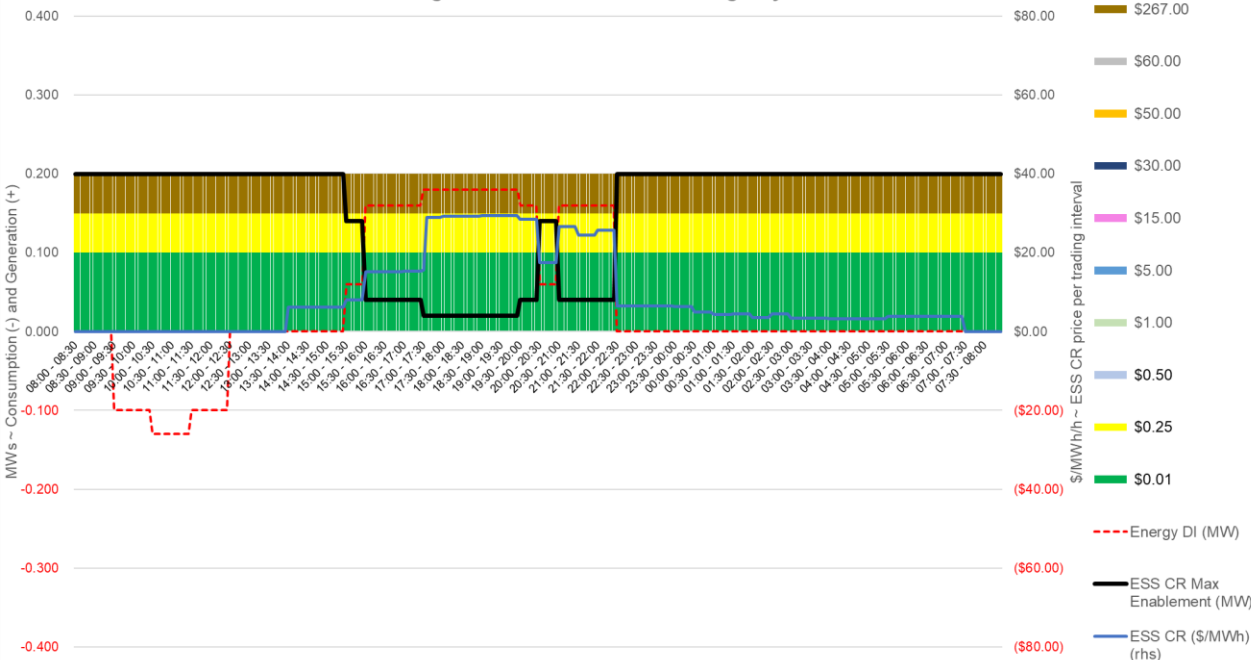
ESS Contingency Raise Step-through



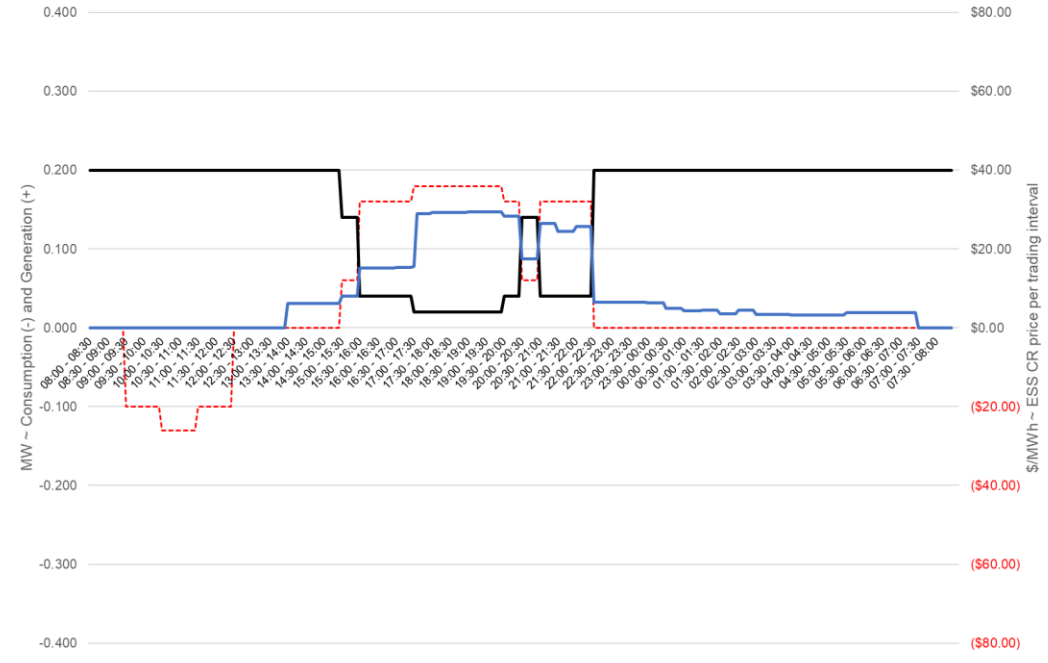
ESS CR From Bid and Offer to Dispatch

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VPP_SYNERGY_SNR1 40 NMIs sending Energy Submission for a trading day (288 intervals)
~ Standing Submission SC4 ESS Contingency Raise



ESS Contingency (5min Bid, 30min Price) - Max Enablement vs Cleared Enablement

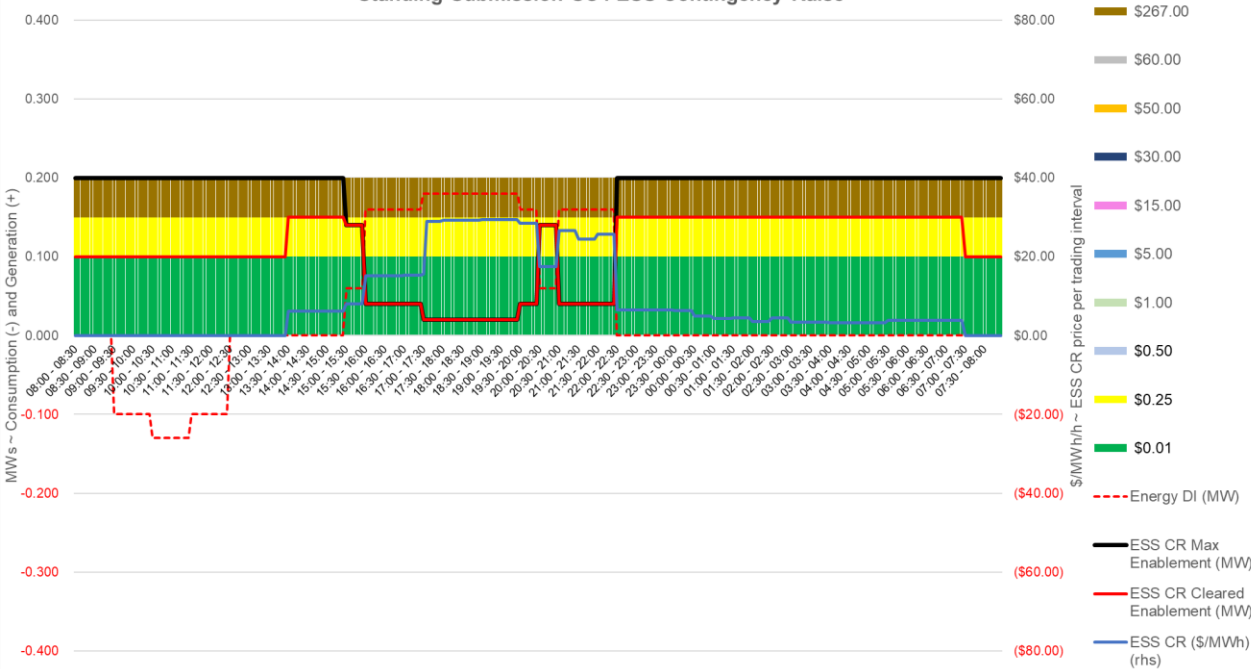


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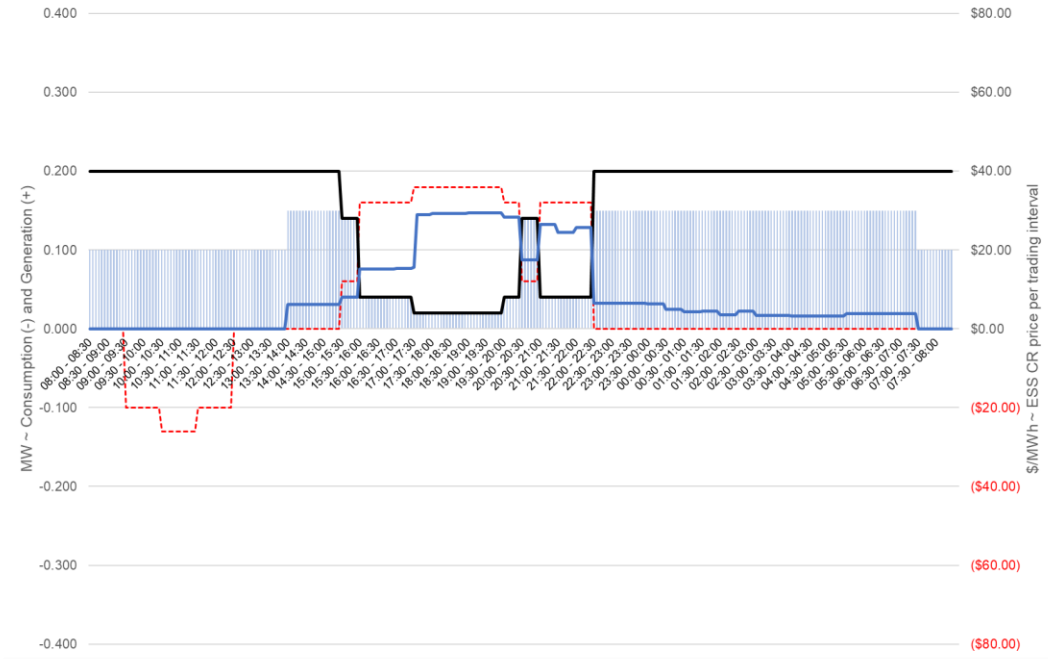
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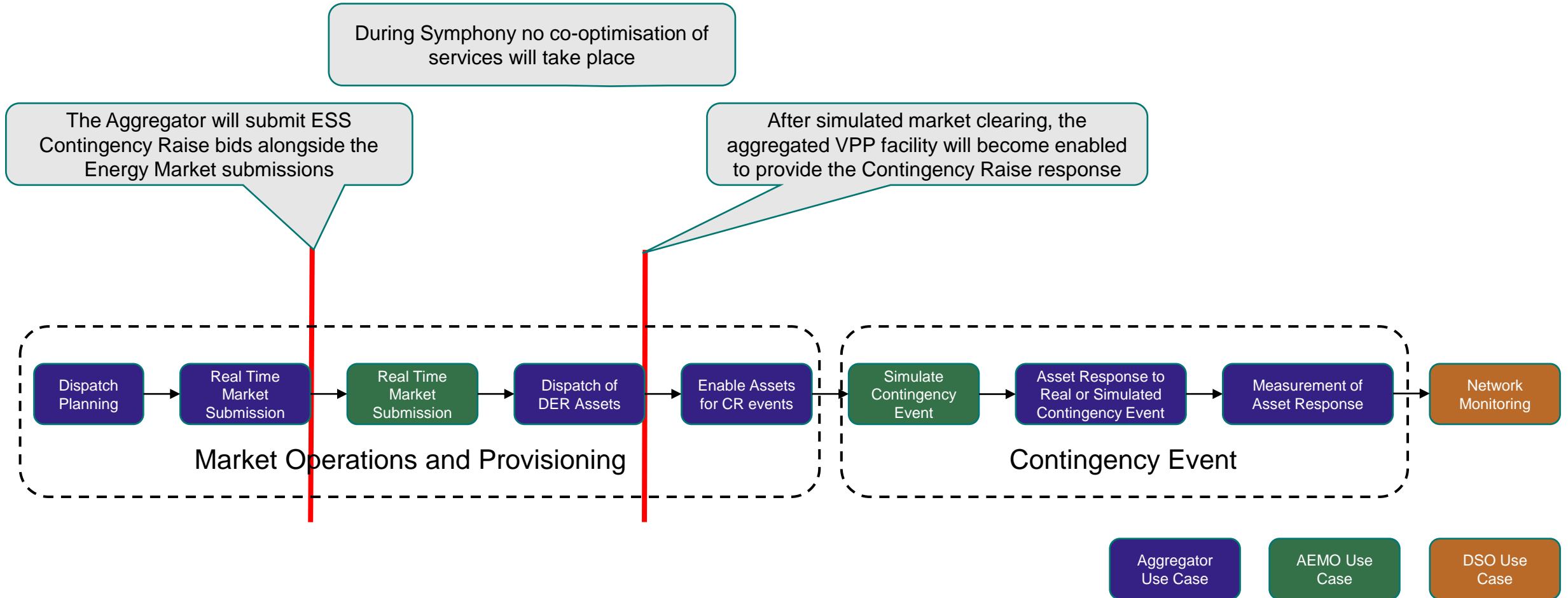


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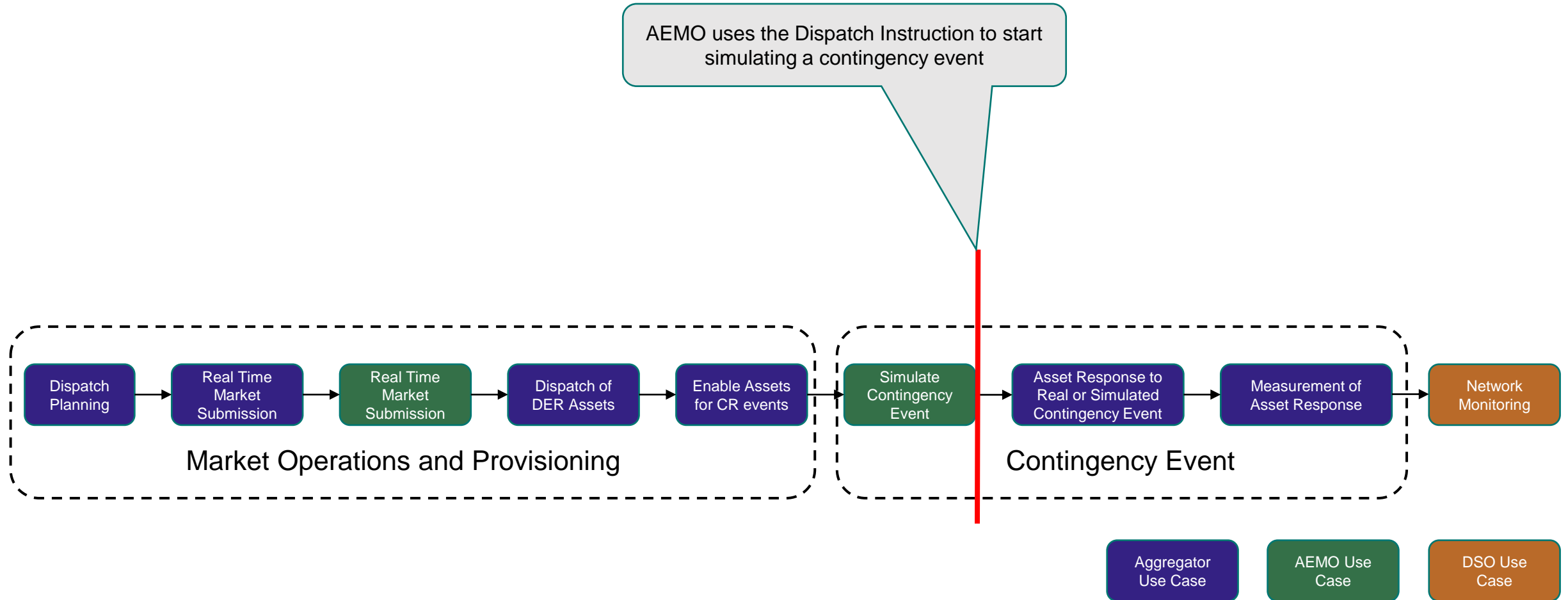


Band	1	2	3	4	5	6	7	8	9	10
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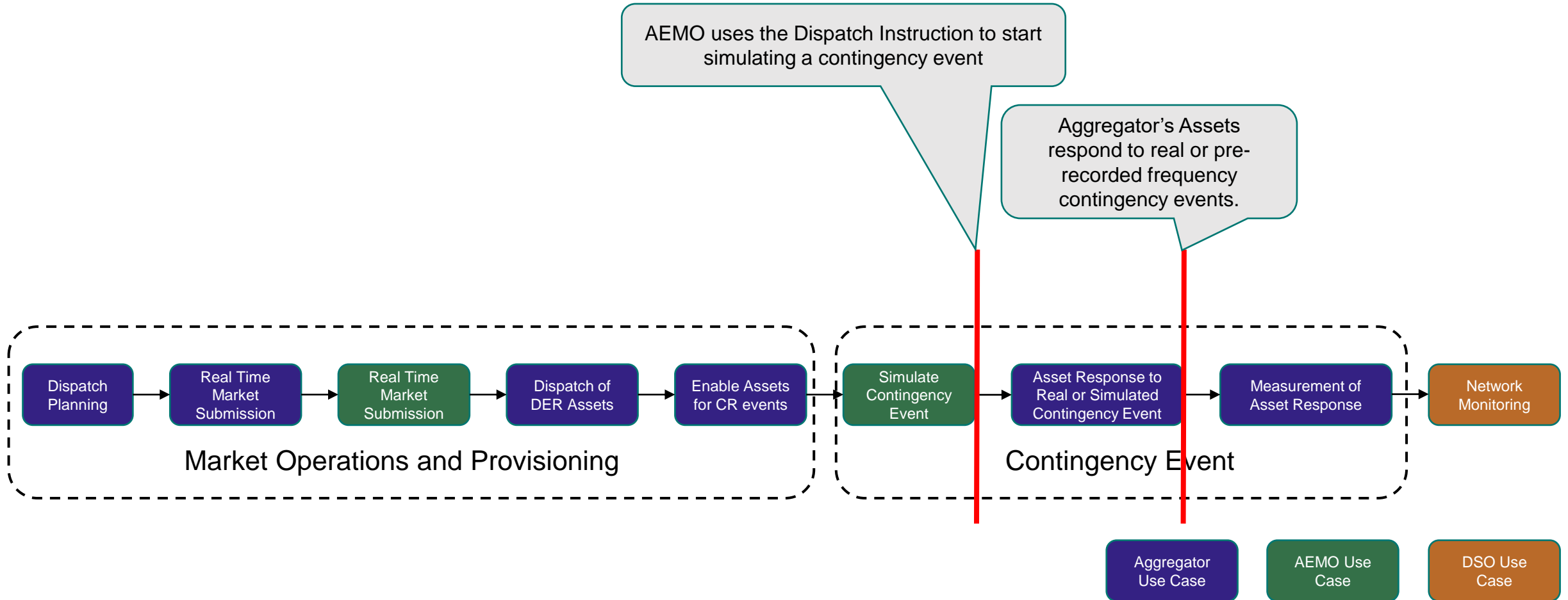
ESS Contingency Raise Step-through



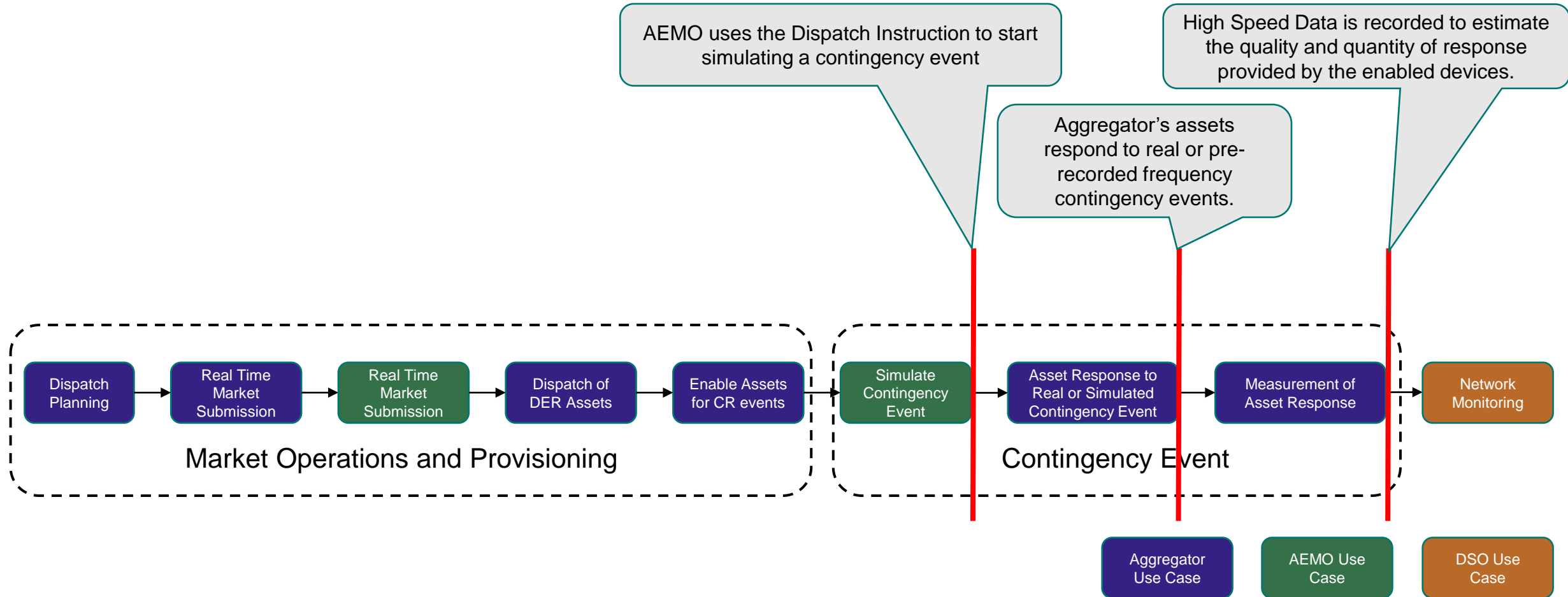
ESS Contingency Raise (CR) Step-through



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ESS Contingency Raise (CR) Step-through



How do we test ESS-CR?

Simulate a Contingency Raise event

AEMO will be responsible for receiving and processing the RTMS which will include CR quantities. The Dispatch Instruction then signals the VPP to deliver the offered CR MW quantity.



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CR enablement throughout the Pilot

While being enabled for ESS CR, the VPP can also respond to credible contingency events.

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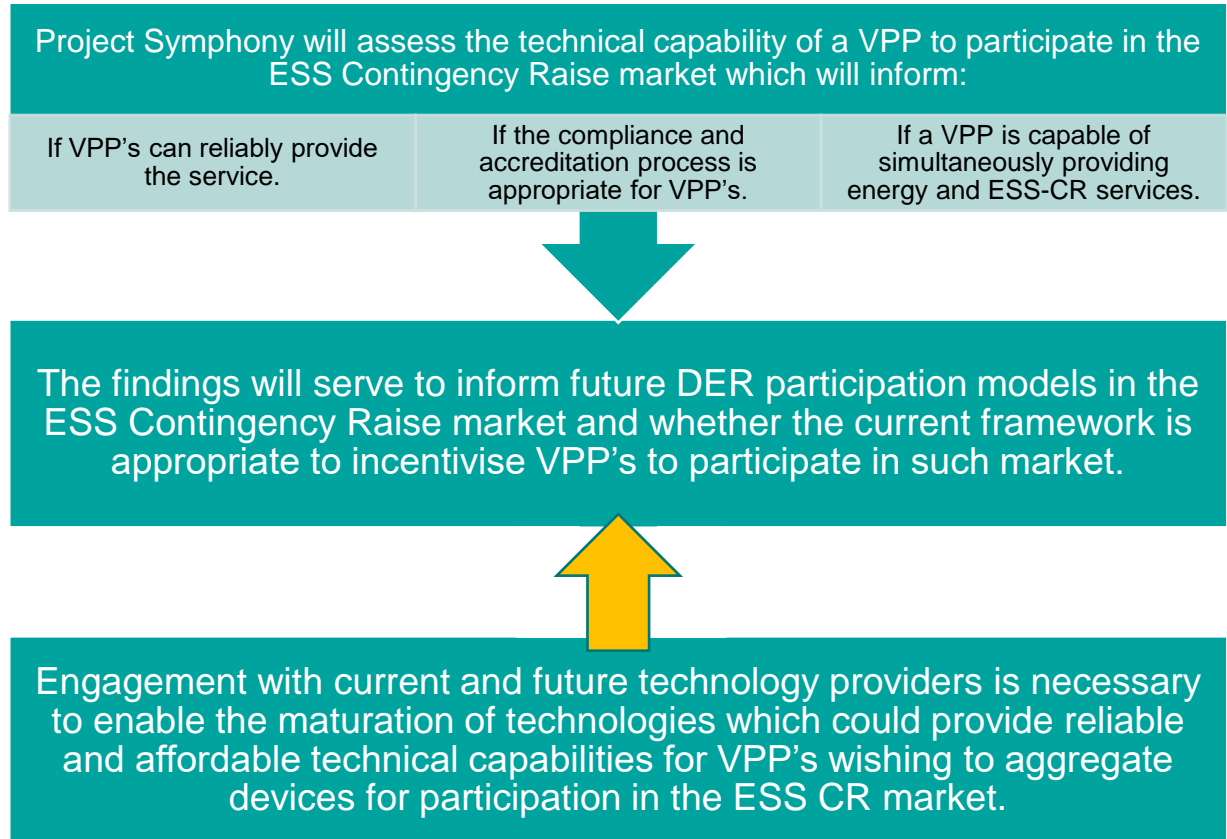
CR enablement throughout the Pilot

While being enabled for ESS CR, the VPP can also respond to credible contingency events.

Quantifying the Response

High speed data will be recorded at each participating NMI for analysis of the ESS-CR response.

WHY are we testing ESS-CR in Project Symphony?



WHY are we testing ESS-CR in Project Symphony?

Project Symphony will assess the technical capability of a VPP to participate in the ESS Contingency Raise market which will inform:

If VPP's can reliably provide the service.

If the compliance and accreditation process is appropriate for VPP's.

If a VPP is capable of simultaneously providing energy and ESS-CR services.



The findings will serve to inform future DER participation models in the ESS Contingency Raise market and whether the current framework is appropriate to incentivise VPP's to participate in such market.

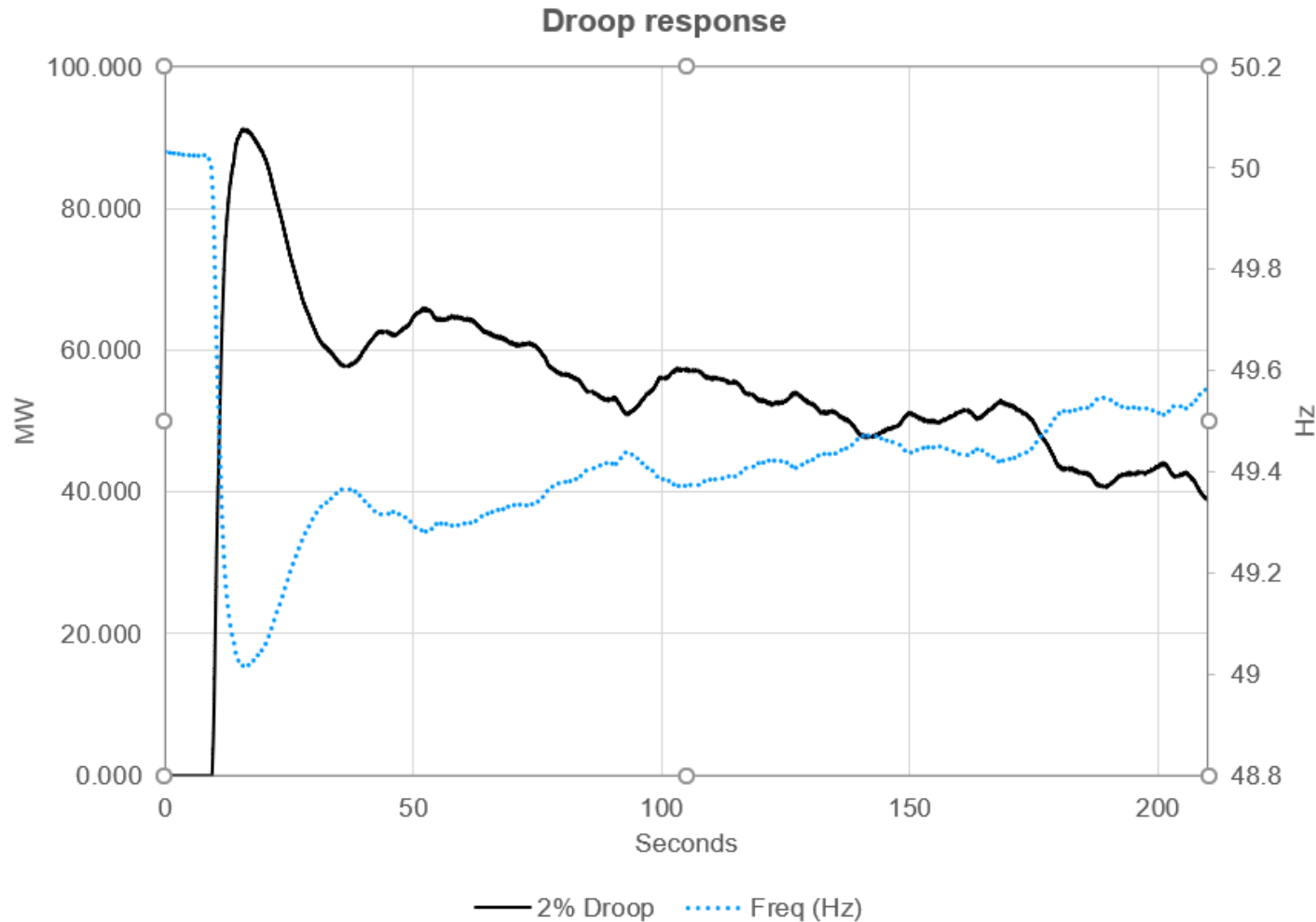


Engagement with current and future technology providers is necessary to enable the maturation of technologies which could provide reliable and affordable technical capabilities for VPP's wishing to aggregate devices for participation in the ESS CR market.

Questions

1. What are the main challenges you anticipate for VPP's participating in the future ESS-CR service?
2. What would you like to see included in the ESS-CR testing in Symphony?

Ideal Contingency Raise response

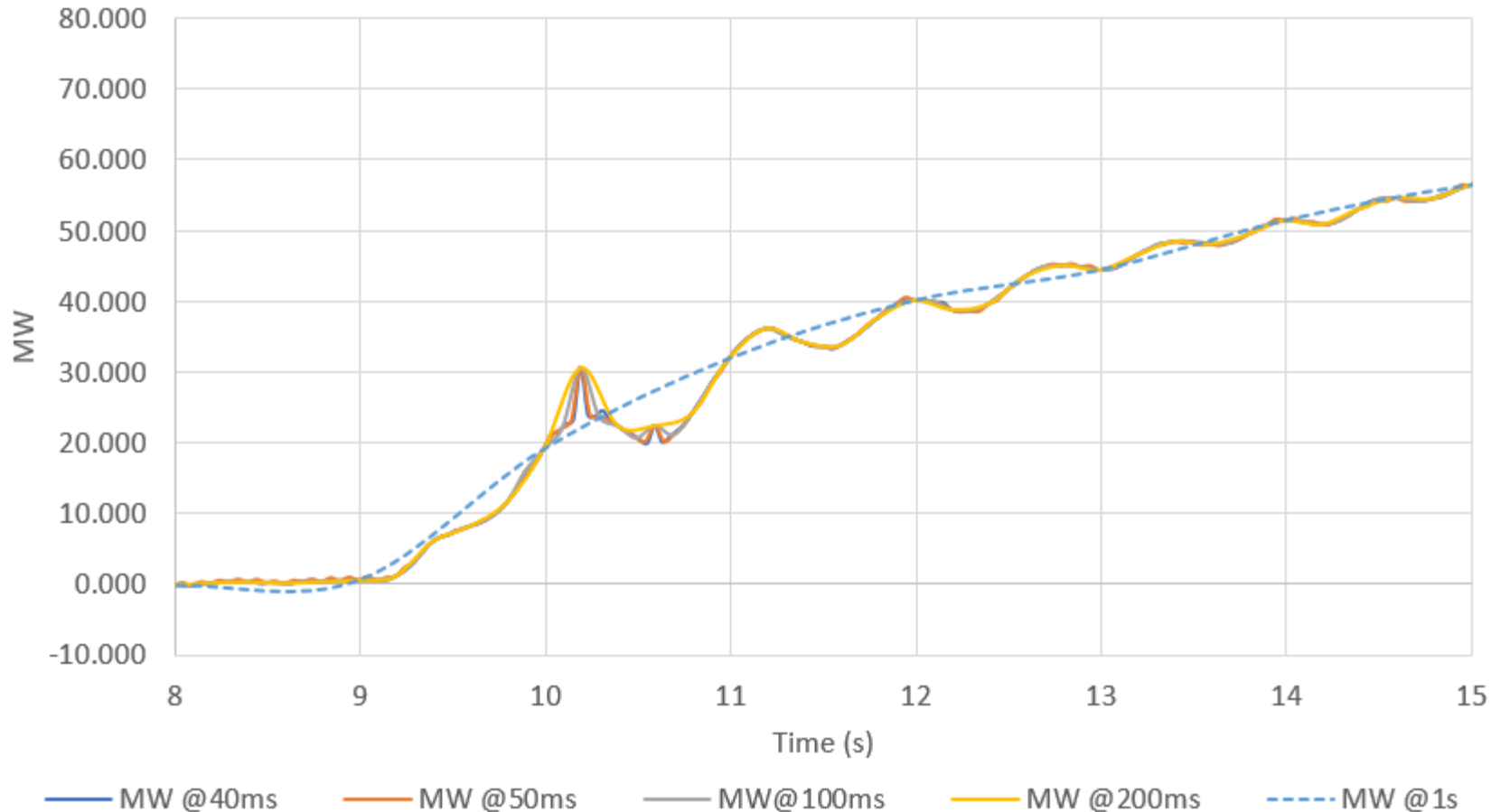


$$\Delta P = \frac{\Delta f}{f_{nom} * droop} P_n = \frac{1 \text{ Hz}}{50 \text{ Hz} * 0.02} P_n = P_n$$

- ΔP : Change in active power [MW]
- Δf : Change in frequency [Hz]
- f_{nom} : 50 Hz nominal frequency
- $droop$: Droop setting [%]
- P_n : Nameplate capacity [MW]

Sampling Rate effect

Effect of Sampling Frequency on ESS CR quantity



Lower resolution results in significant impacts on service measurement accuracy and therefore over/under estimation of the facility's response.

Conclusion:

AEMO has accepted some error based on a 50ms resolution (from 40ms), and requires data from HSRs to verify performance and develop CR requirements for aggregated DER beyond Project Symphony.

High Speed Recorder Compliance: ESS-CR Testing in Symphony

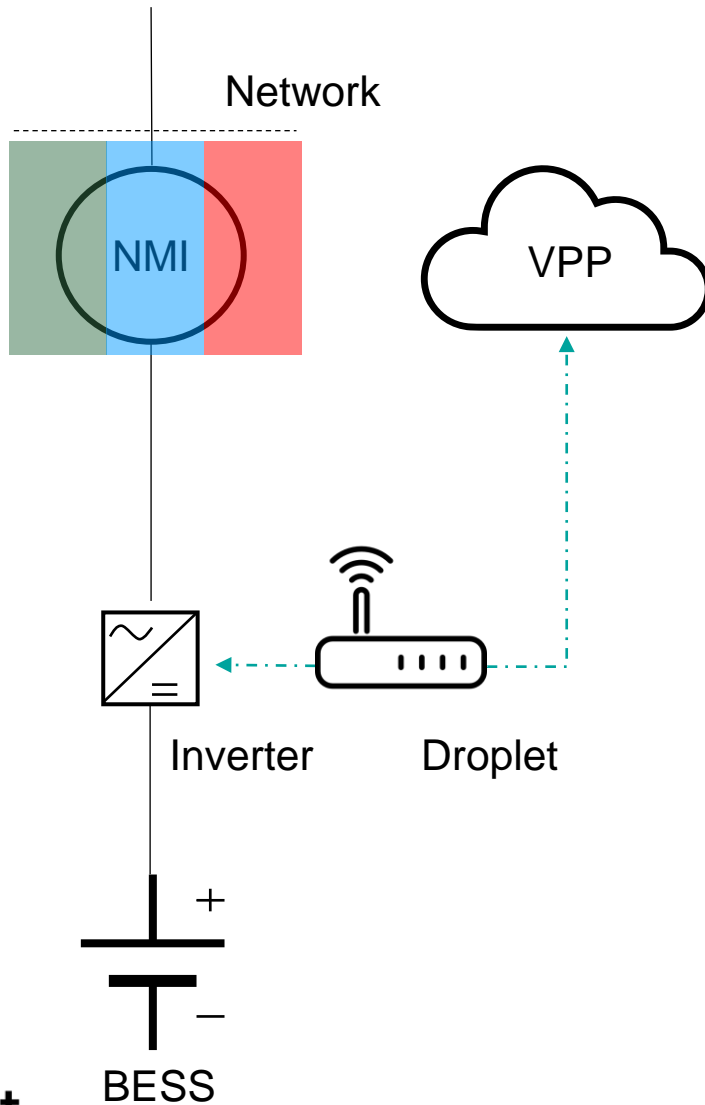
Quantifying the response

High speed recorders are required to measure the ESS-CR response at a granularity required for it to be accurately quantified.

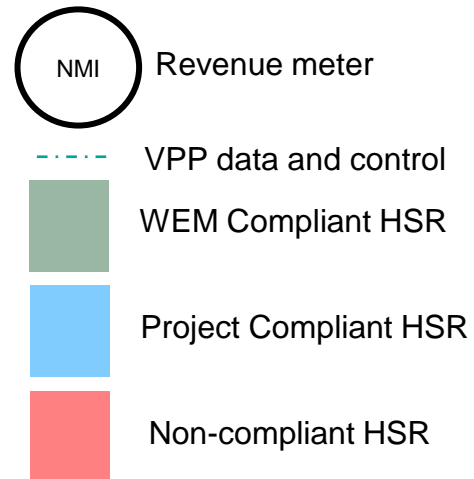
The Pilot has defined three categories for HSR devices based on their level of adherence to the **Specifications for High-Resolution Time Synchronised Data Recorders in the WEM Communications and Control Systems Procedure***:

HSR Category	Description	Value to Learnings
WEM Compliant Device	Fully compliant	High
Project Compliant Device	High degree of compliance to enable measurement of the ESS-CR response at high granularity	High
Non-Compliant Device	Low degree of compliance e.g. OEM Device based measurement	Low

Calibration - BESS/Tesla Connection Point

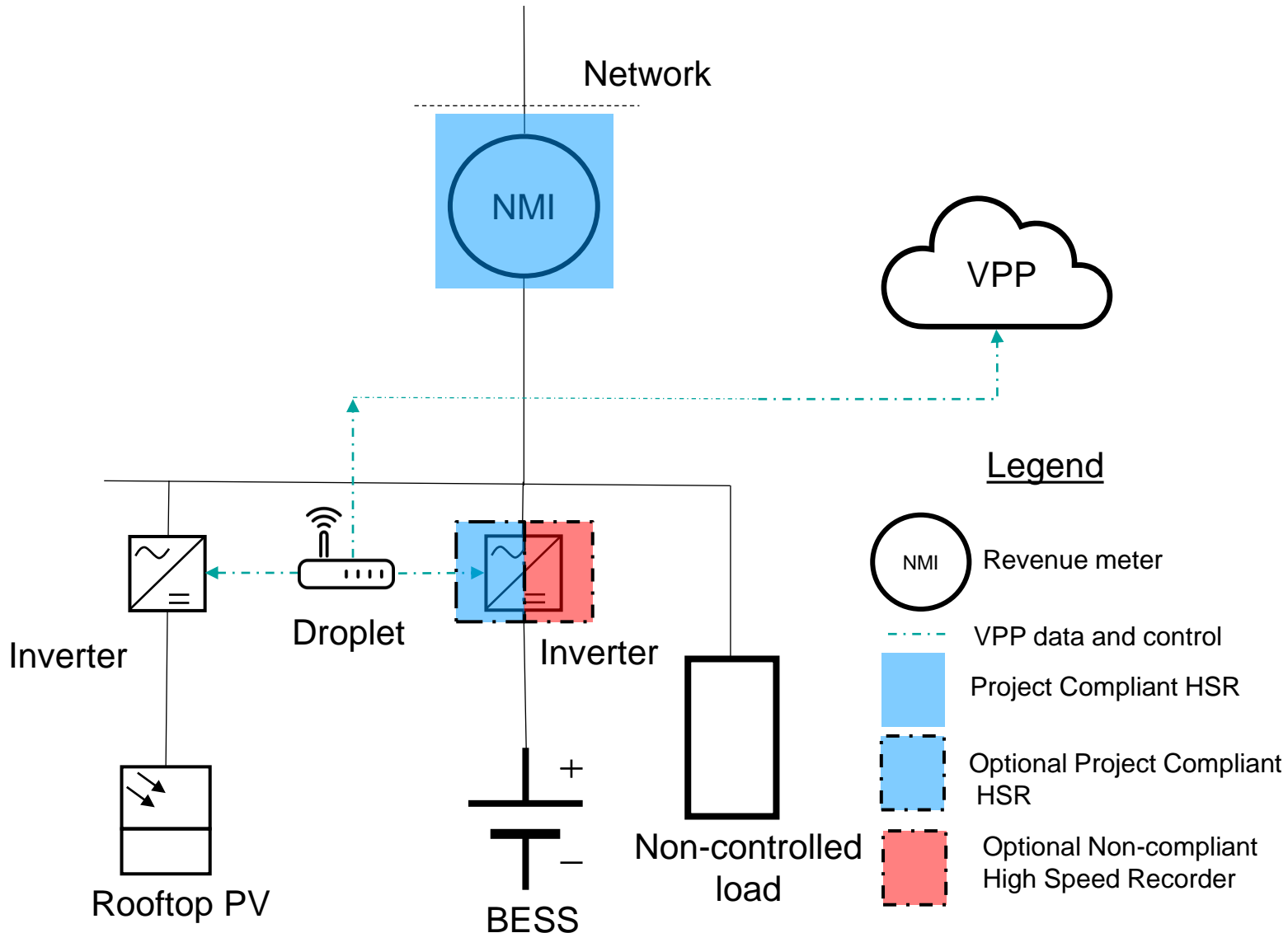


Legend



1. The network facing effect of the NSS CR delivered by the BESS/Tesla must be measured at the NMI.
2. The WEM compliant HSR is used to calibrate Project compliant and non-compliant devices using a simulated contingency event.
3. Results from simulated contingency events at the BESS/Tesla connection point during calibration will also inform the ESS CR capacity of the device.

Residential - Connection Point

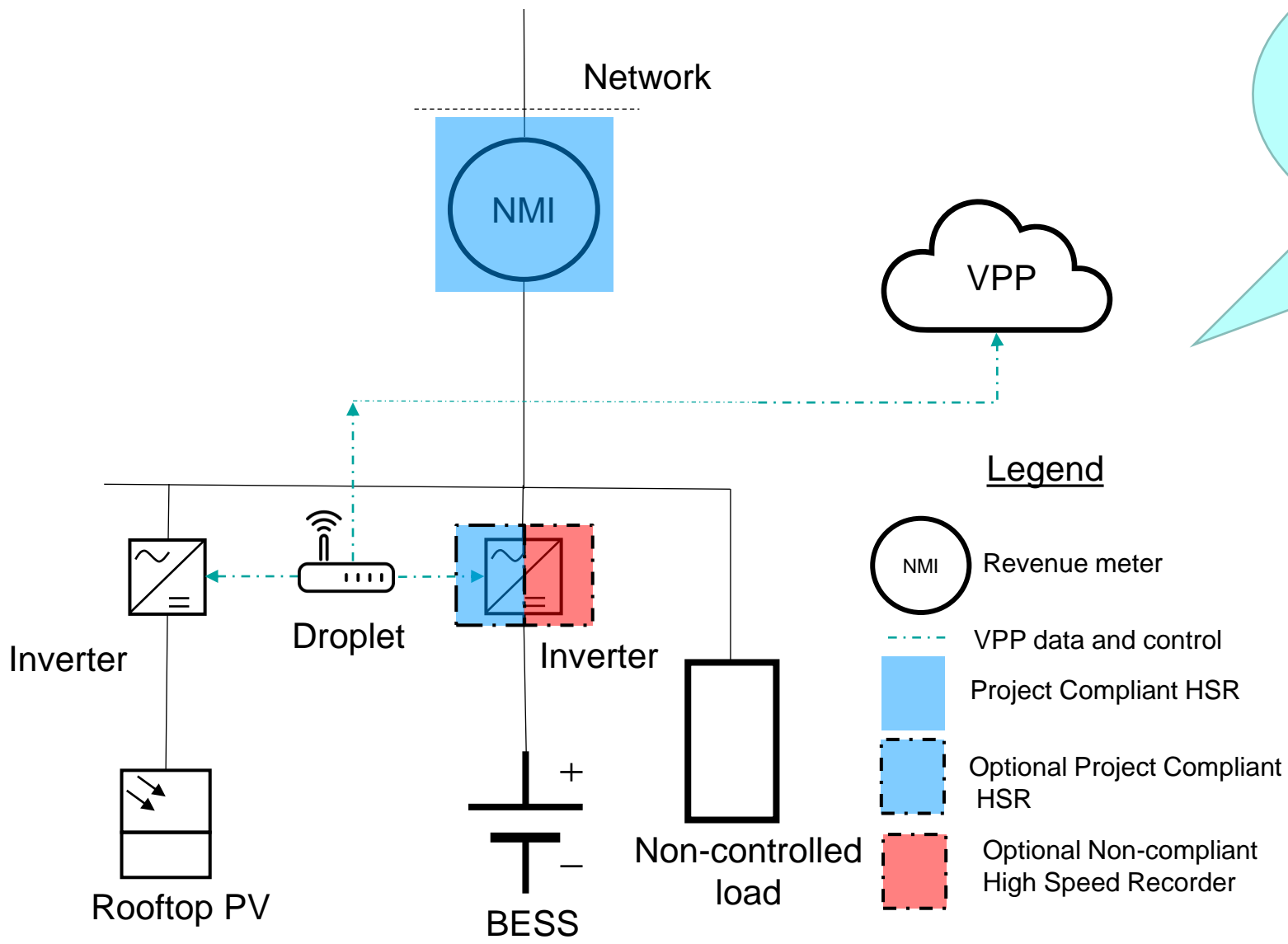


1. The network facing effect of the NSS CR delivered by the BESS must be measured at the NMI.
2. Contingency response is captured using a Project compliant HSR.
3. Results from real or simulated contingency events at the connection point will inform the ESS CR capacity.
4. Additional HSRs can be installed at the BESS inverter.

In partnership with:



Residential - Connection Point



Question
 3. What are your views on the monitoring performance for the ESS-CR service?

1. The network facing effect of the NSS CR delivered by the BESS must be measured at the NMI.
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Project Symphony Assets for ESS-CR

SNR-540: Southern River

Target Assets: ~150 Batteries totalling ~2MW

Device Type	Qty	Total Power (kW)	Provider	Comment
BTM Residential Battery	150	~700	Synergy	5 types of BTM batteries to be installed
Commercial BESS	1	~250	Synergy	BTM
FoM Battery	1	1,300	Western Power	FTM
Distribution Transformer	20	-	Western Power	3 types of loggers will be trialled for network measurements
TNI (SNR-540)	1	-	Western Power	Existing HSR at TNI (WEM compliant)

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Commercial BESS	1	~250	Synergy	BTM	1	
FoM Battery	1	1,300	Western Power	FTM	1+	Preferred location for Baseline Station
Distribution Transformer	20	-	Western Power	3 types of loggers will be trialled for network measurements		
TNI (SNR-540)	1	-	Western Power	Existing HSR at TNI (WEM compliant)		

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Question
4. What suggested sample size of BTM batteries should be monitored for ESS-CR?

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Q&A



WA DER Market Participation Forum

- 13 September 2022
- 13 December 2022

WA DER Program web pages:

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[WA DER Market Participation Forum](#)

Project Symphony reports:

[ARENA's knowledge sharing bank](#)

Contact us:

WADERProgram@aemo.com.au