AEMO's Virtual Power Plant (VPP) Demonstration program

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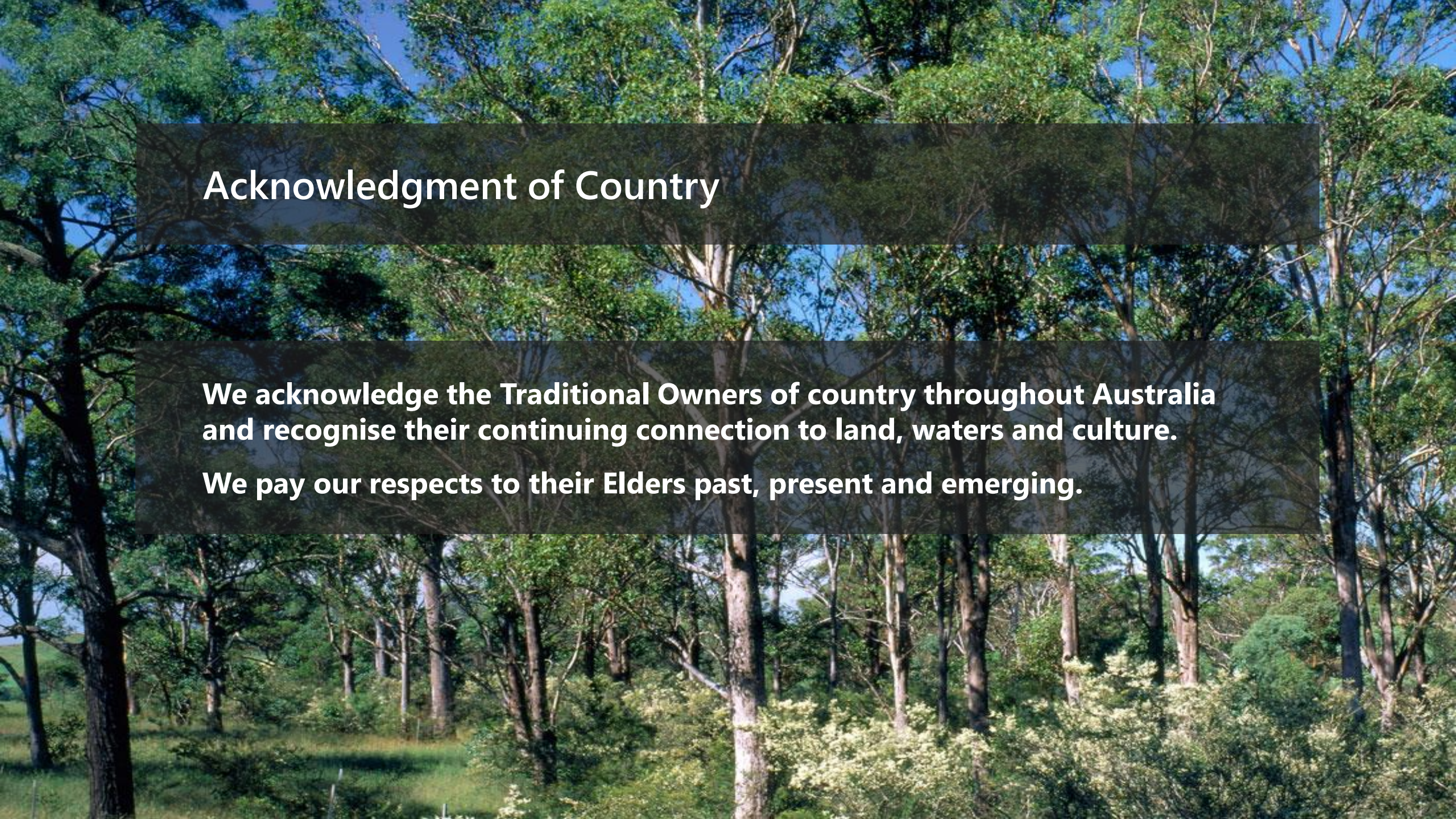
Note: This meeting will be recorded for the purpose of publication to AEMO's VPP Demonstrations website.



Acknowledgment of Country

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

We pay our respects to their Elders past, present and emerging.

ARENA ACKNOWLEDGEMENT AND DISCLAIMER

THIS PROJECT RECEIVED FUNDING FROM ARENA AS PART OF ARENA'S Advancing Renewables Program. The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.

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Agenda

- VPP Demonstrations background
- Participant update
- Insights & recommendations
- Q&A

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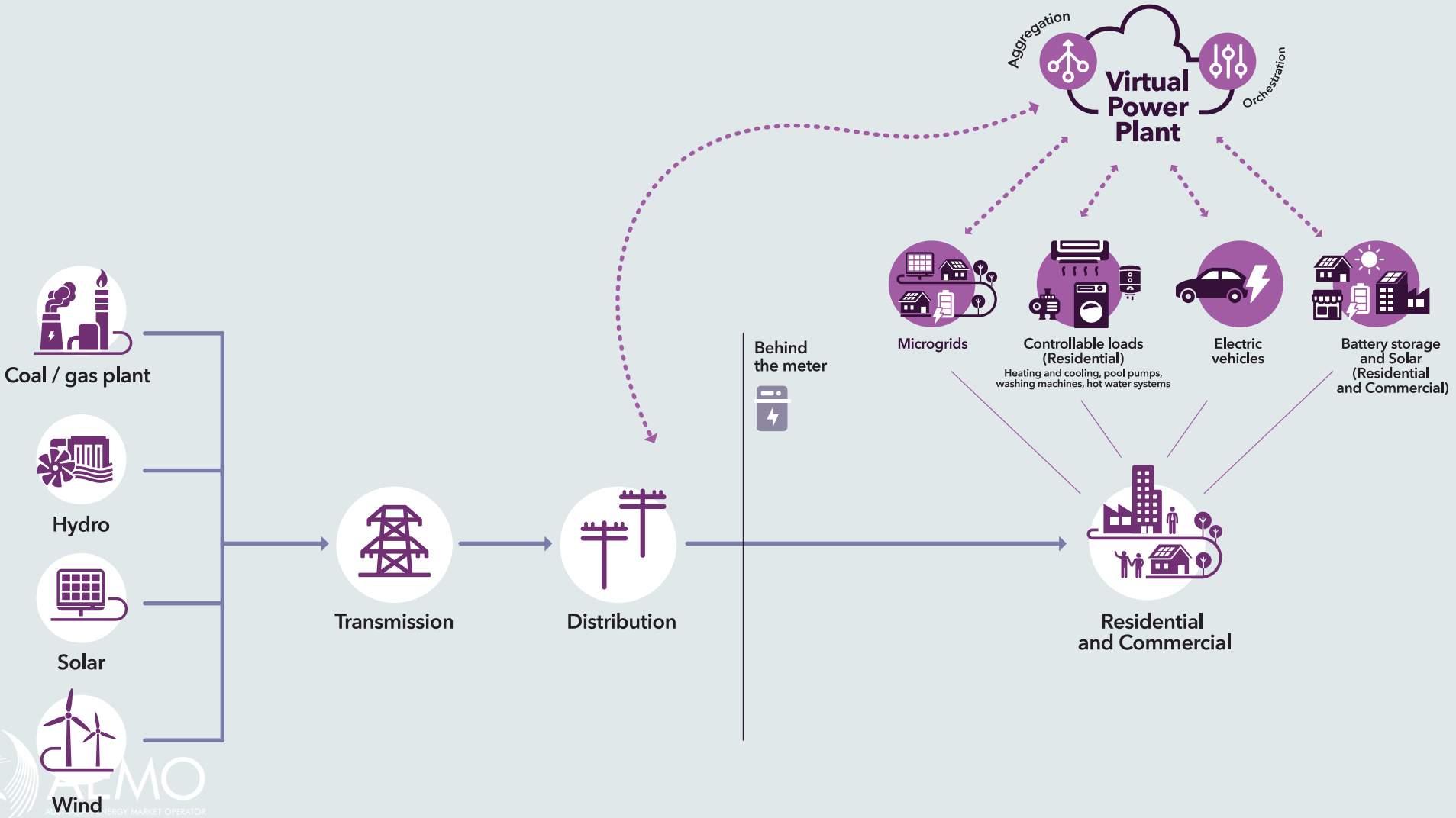
Overview - what is a VPP



Benefits

Network:

- Export energy
- Provide grid services

Consumer:

- Financial
- Environmental
- Shared benefits with community

VPP objectives

Test VPPs delivering contingency Frequency Control Ancillary Service (FCAS), obtain operational visibility, use learnings to inform changes to regulatory and operational frameworks.

1. Participants **demonstrate basic control and orchestration** capability for VPPs providing real time energy and Frequency Control Ancillary Services (FCAS).
2. Develop systems to deliver **operational visibility of VPPs** via new AEMO APIs.
3. Assess **current regulatory and operational arrangements** affecting market participation of VPPs.
4. Provide insights on how to **improve consumers' experience of VPPs** in future.
5. Understand what **cyber security measures** VPPs currently implement, and whether they should be augmented in future.

Value Stacking

Visibility

Inform Change

Customer insights

Cyber Security

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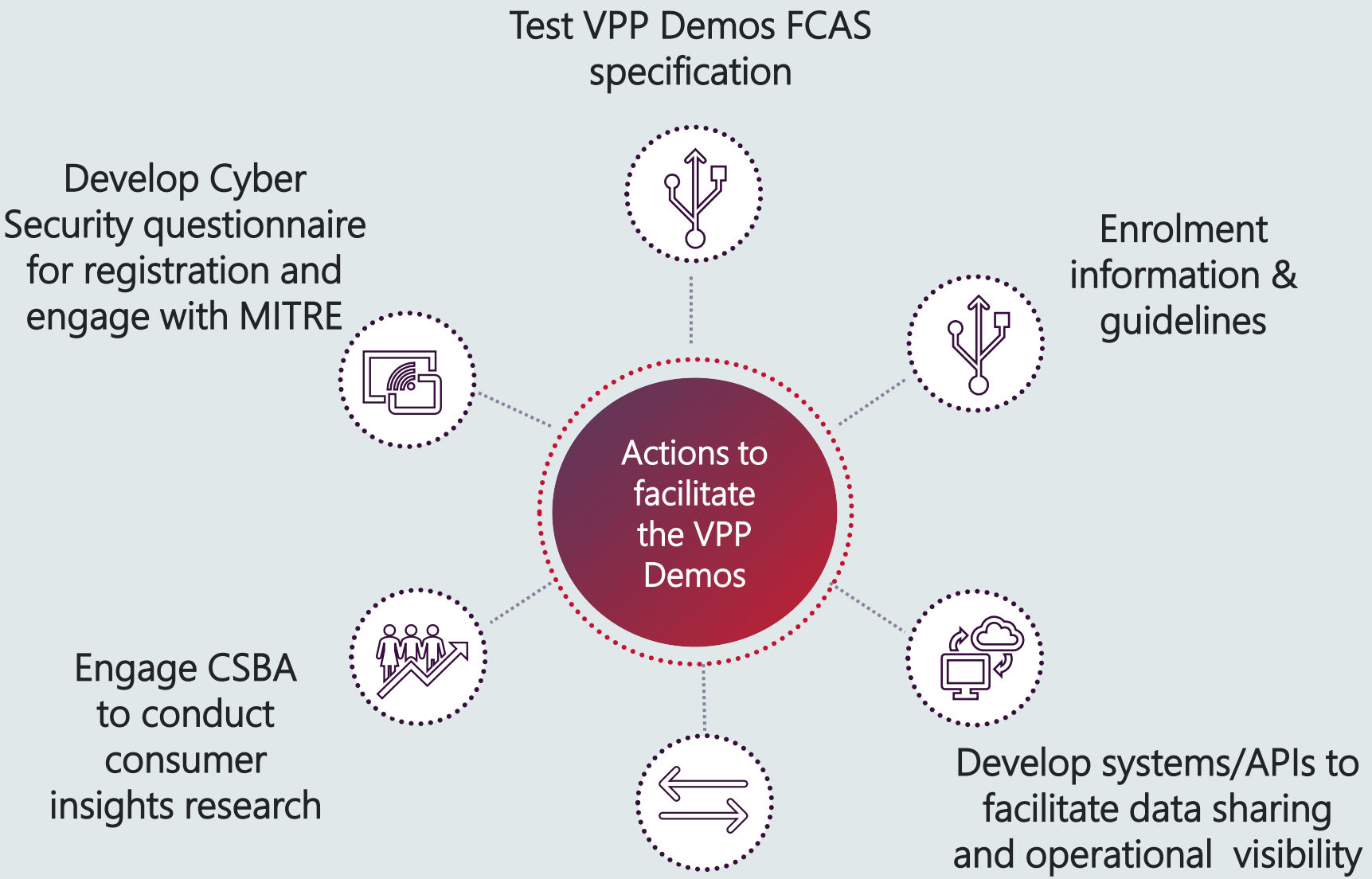
VPP Demonstrations

Actions taken to facilitate the delivery of objectives



VPP Demonstration Participant Update

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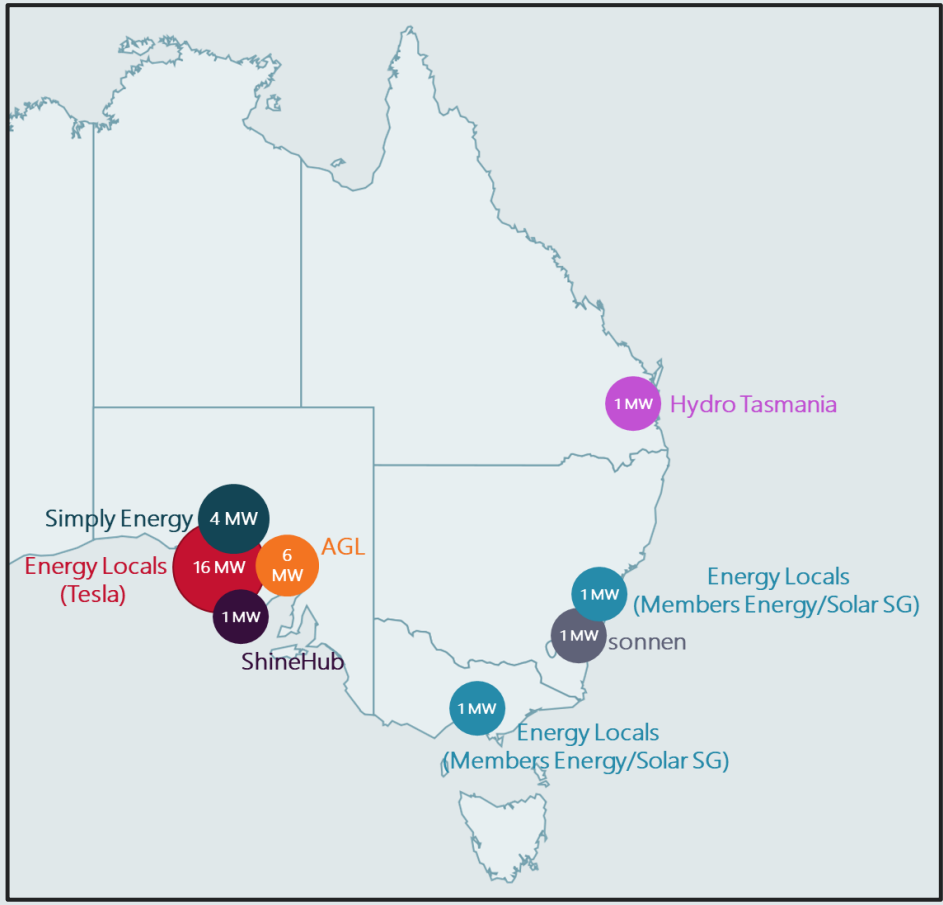
VPP Participants, 31MW, all mainland NEM states

	Energy Locals (Tesla SA VPP)	AGL	Simply Energy	sonnen	ShineHub	Energy Locals (Members Energy)	Hydro Tasmania
DUID	VSSEL1V1	VSSAE1V1	VSSSE1V1	VSNSN1V1	VSSSH1S1	VSVEL2S1, VSNEL2S1	VSQHT1V1
Jurisdiction	SA	SA	SA	NSW	SA	VIC and NSW	QLD
Registration *	MC	MC	MC	MASP	MASP	MC	MASP
Battery technology	Tesla PowerWalls	Tesla PowerWalls	Tesla PowerWalls	sonnen	AlphaESS	Alpha ESS Saj/Everready	Tesla PowerPack
FCAS delivery	Proportional	Proportional	Proportional	Proportional	Switched	Switched	Proportional
Registered capacity (Aug 2021)	16 MW All cont FCAS	6 MW All cont. FCAS	4 MW All cont FCAS	1 MW All cont FCAS	1 MW All 6 cont FCAS	1 MW (x2) All 6 cont FCAS, except L6	1 MW All 6 cont FCAS

*Registration types are MC = Market Customer, MASP = Market Ancillary Services Provider



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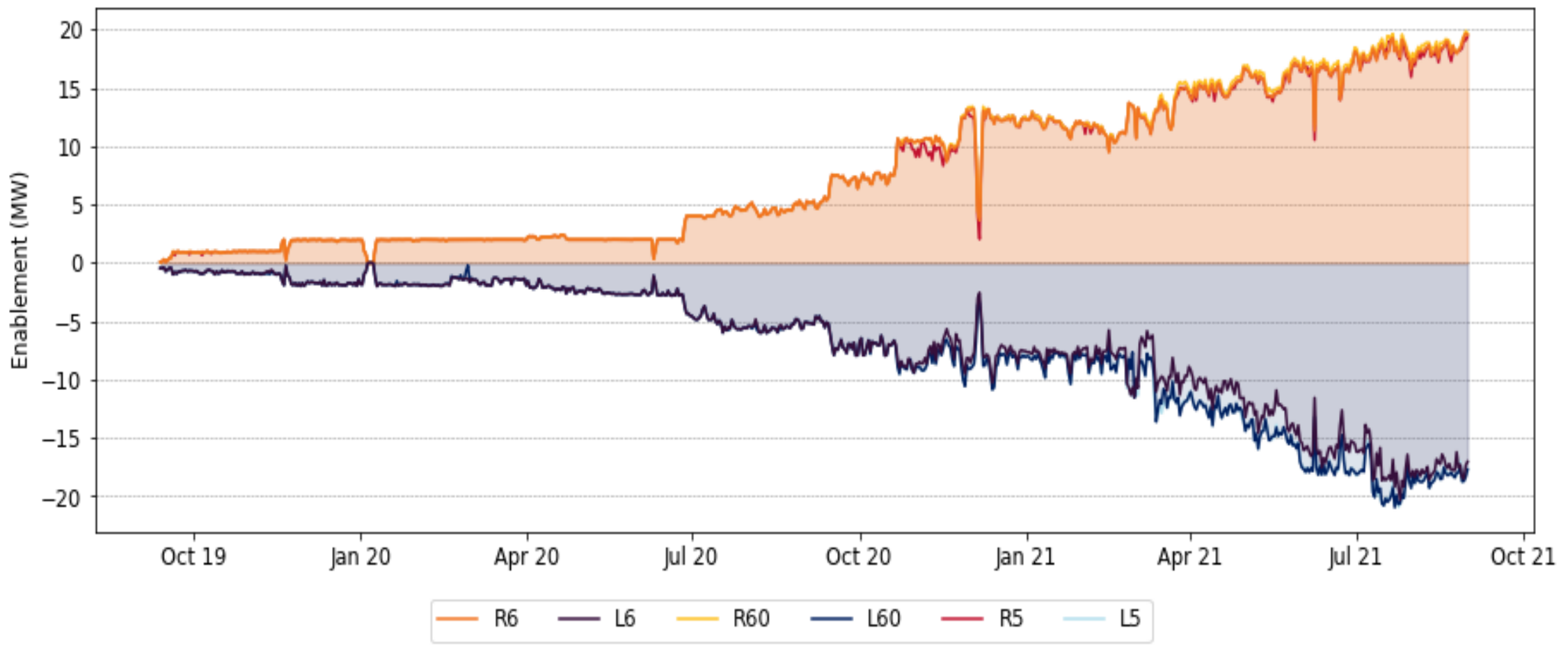
VPP enablement growth over time

Averaged VPP (all) FCAS enablement growth, per market (1 September 2019 – July 2021)



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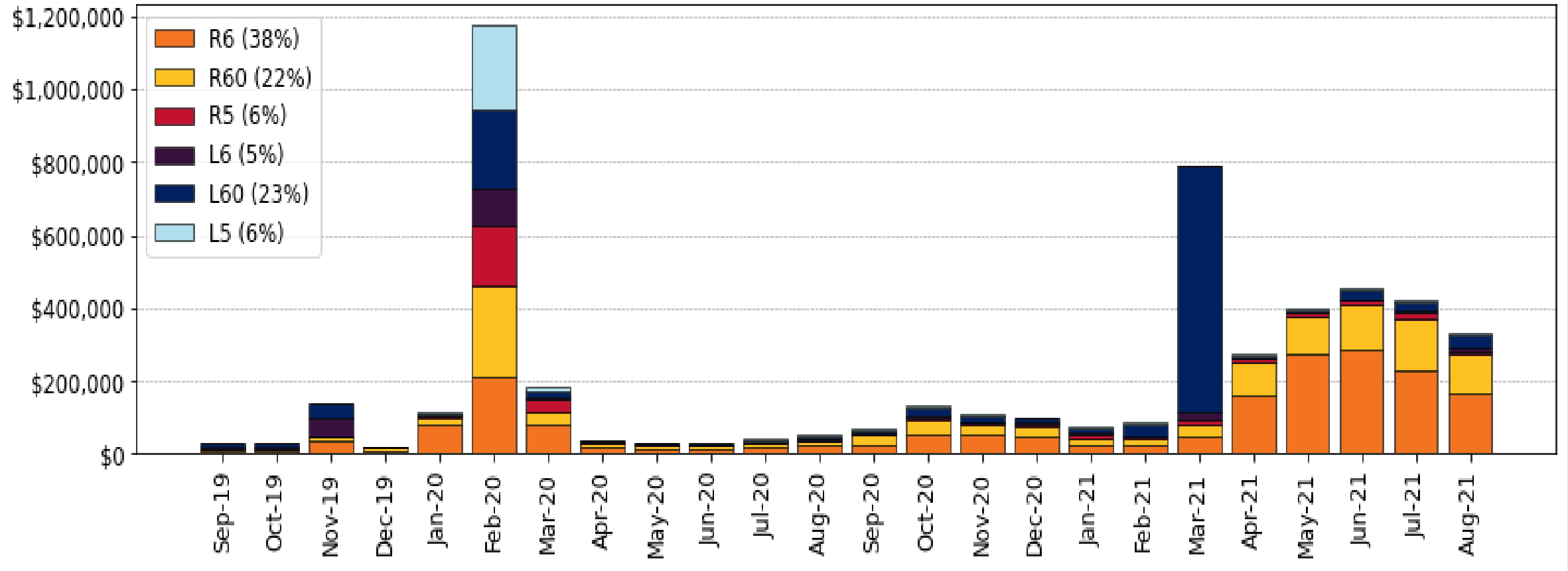
Revenue update – by market

VPP FCAS monthly revenue by market (September 2019 to July 2021)



Insights & recommendations

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VPP capability for market participation

Typical extra fleet capacity

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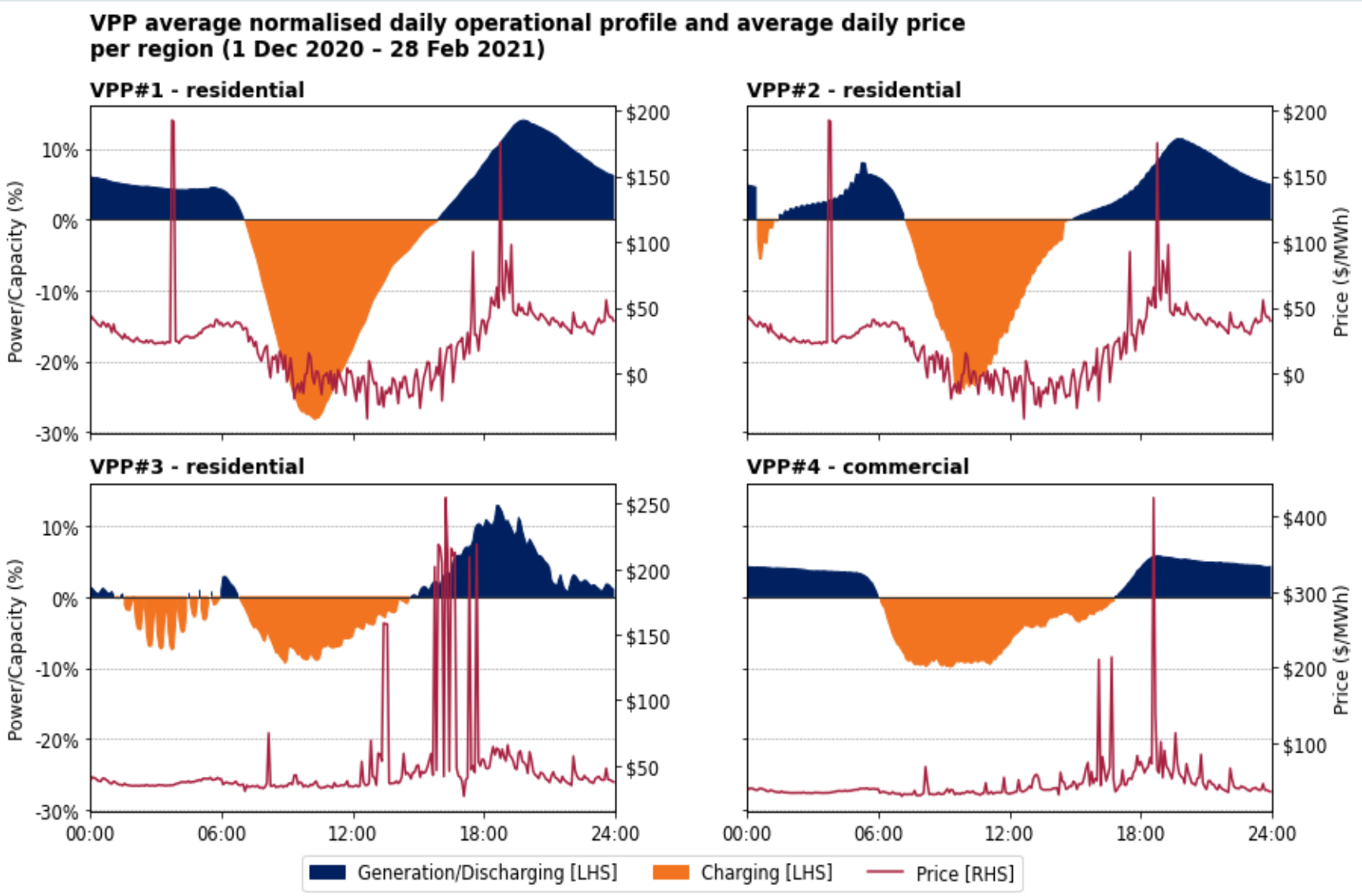
VPP capability for market participation

Response to energy market signals



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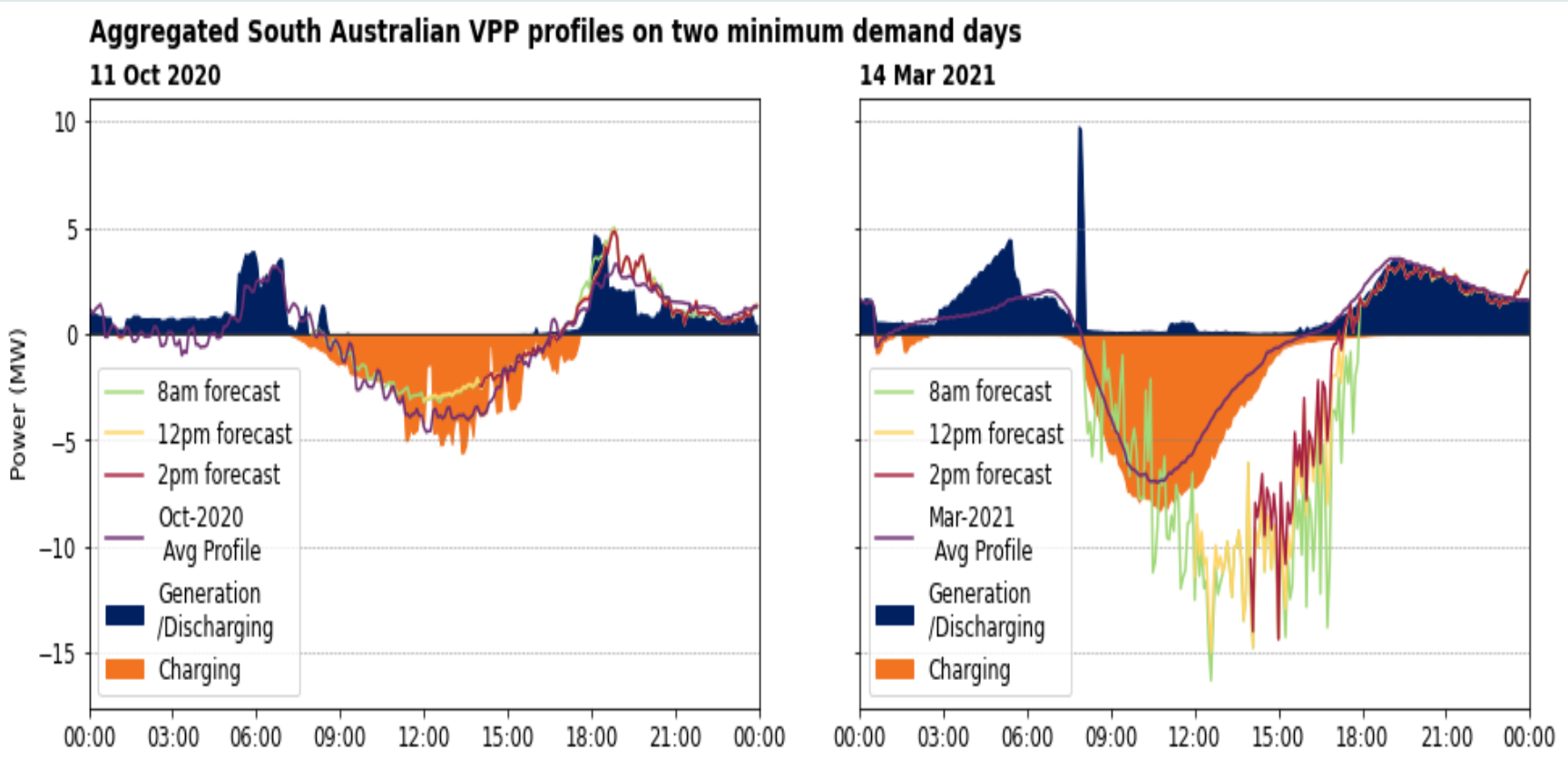
Operational visibility



Forecasting accuracy

Forecasting (normalised mean absolute error) accuracy of South Australian VPP's compared to Large Scale Solar.

	5 minutes ahead	1 hour ahead	4 hours ahead	24 hours ahead
South Australian Large-Scale Solar	2%	4%	5%	5%
South Australian VPPs	12%	12%	12%	13%

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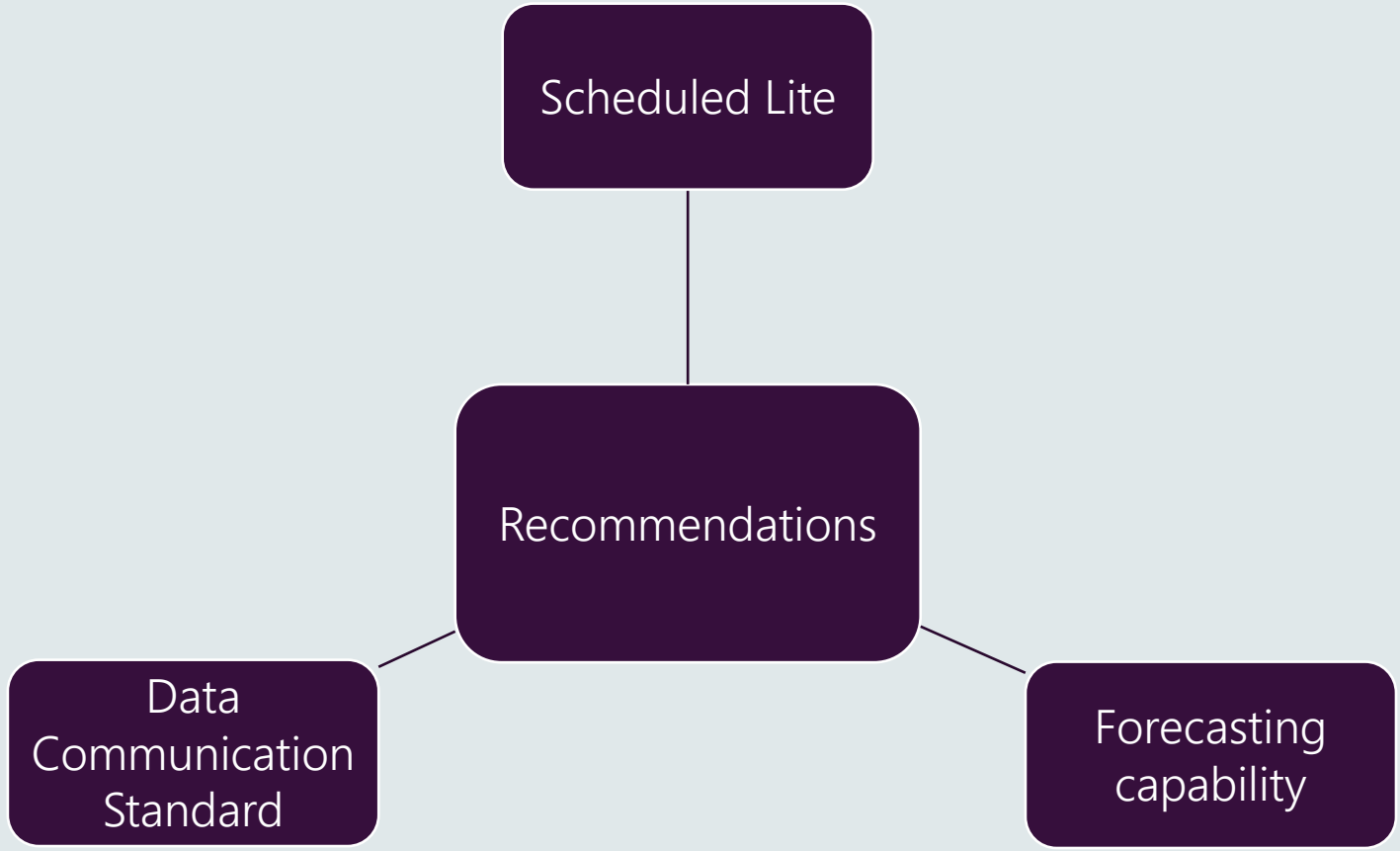
Operational visibility

With VPPs & price-responsive demand at material capacities in the NEM, forecasting accuracy is often impacted during periods of price volatility

Visibility is increasingly critical to ensure efficient power system operations can be maintained, particularly at times of system stress

Recommendations



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Assess regulatory settings for VPPs

FCAS – MASS Consultation

- MASS Consultation final determination towards the end of 2021.
  - Will determine ongoing measurement & verification arrangements

- AEMO intends to establish a Consultative Forum to collaborate with VPPs and DNSPs on issues relating to the MASS, including:
  - Prioritisation of services
  - Mandating compliance with AS 4777.2.2020
  - Firmware upgrade arrangements
  - Implementation of Dynamic Operating Envelopes for contingency FCAS
  - Improving processes for portfolio upgrades

- Future MASS Consultations;
  - Fast Frequency Response (FFR)

- Regulation FCAS – AEMO will work with industry to explore how technical barriers to participation can be overcome

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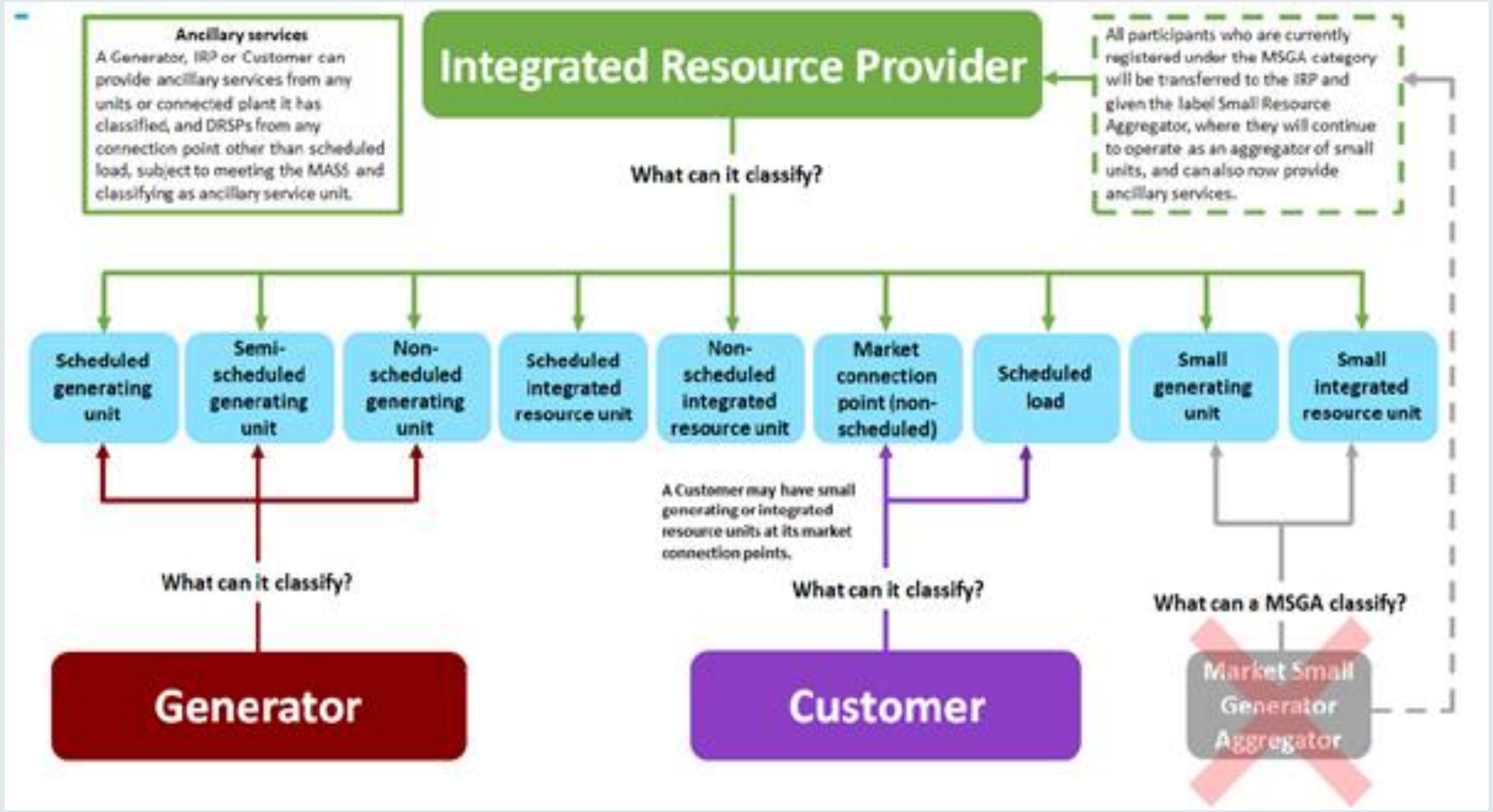
Assess regulatory settings for VPPs

Energy Market next steps

- ESB Post 2025 reforms
  - Scheduled Lite – AEMO developing rule change proposal
  - Flexible Trading Arrangements
- Integrating Energy Storage Systems (see below)
- Project Edge



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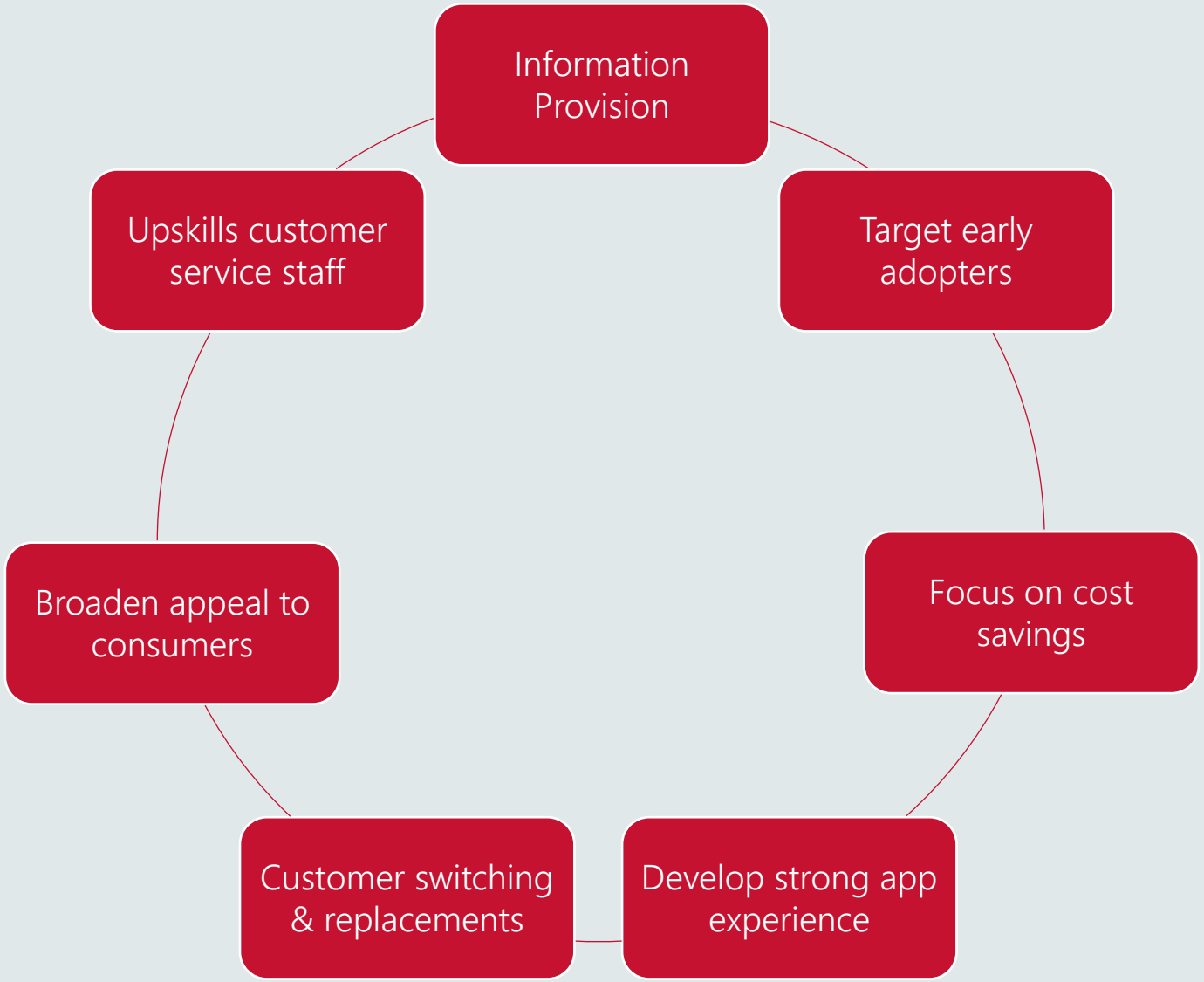
Customer insights

Recommendations



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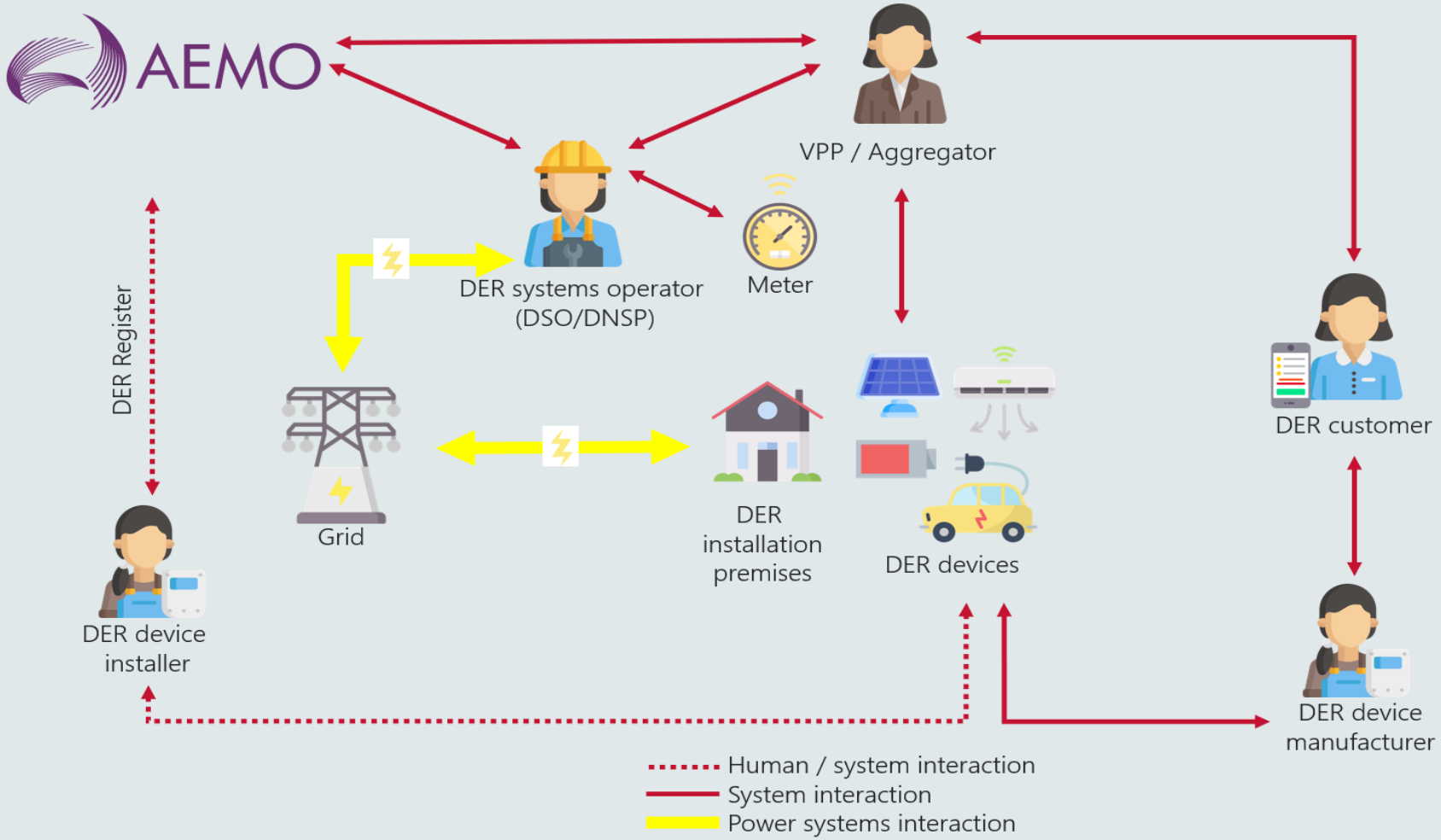
Cyber security

Overview of the actors and interactions of the DER ecosystem



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Cyber Security Risks

Recommendations

Risks

- Securing Remote Instruction of the DER Fleet
- DER device not responding to remote instructions in a timely fashion
  - Tampering
  - Denial of Service
- DER device responding or behaving incorrectly either in response to a required instruction or autonomously.

Reducing cyber security risk

- Voluntary Code of Practice: Securing the Internet of Things for Consumers
- Australian Energy Sector Cyber Security Framework
- Australian Federal Governments' Cyber Security Strategy 2020; Critical Infrastructure – Systems of National Security (CI-SONS) legislation (tbc - Q4 2021)

https://www.homeaffairs.gov.au/reports-and-publications/submissions-and-discussion-papers/code-of-practice
https://aemo.com.au/en/initiatives/major-programs/cyber-security/aescsf-framework-and-resources
https://www.homeaffairs.gov.au/about-us/our-portfolios/cyber-security/strategy

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VPP Demos: Key takeaways

- ✓ VPPs have **proven their capability to deliver contingency FCAS** and respond to energy price signals.
- ✓ The VPP sector has grown in size and capability over the last 2 years, is still in early development, but with a material capacity in South Australia
- ✓ AEMO is completing a **DER MASS consultation** to settle the ongoing arrangements for FCAS (including measurement & verification).
- ✓ Consumers' experiences mostly translate into **high levels of satisfaction**;
- ✓ **ESB P2025 emphasises role of aggregators** in future arrangements, including Flexible Traders, and to allow participation in ancillary services
- ✓ VPP Demos aimed to adopt a **collaborative approach** to the integration of an emerging sector – **informing change with evidence – with great feedback**
- ✓ Ongoing **collaboration with industry and development of** operational visibility, forecast-ability and coordination of VPPs will be critical to ensuring efficient integration into the power system.

<u>Thank you to all who engaged with us!</u>

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Questions?

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Close

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