ESIG presentation: DER Integration Down Under

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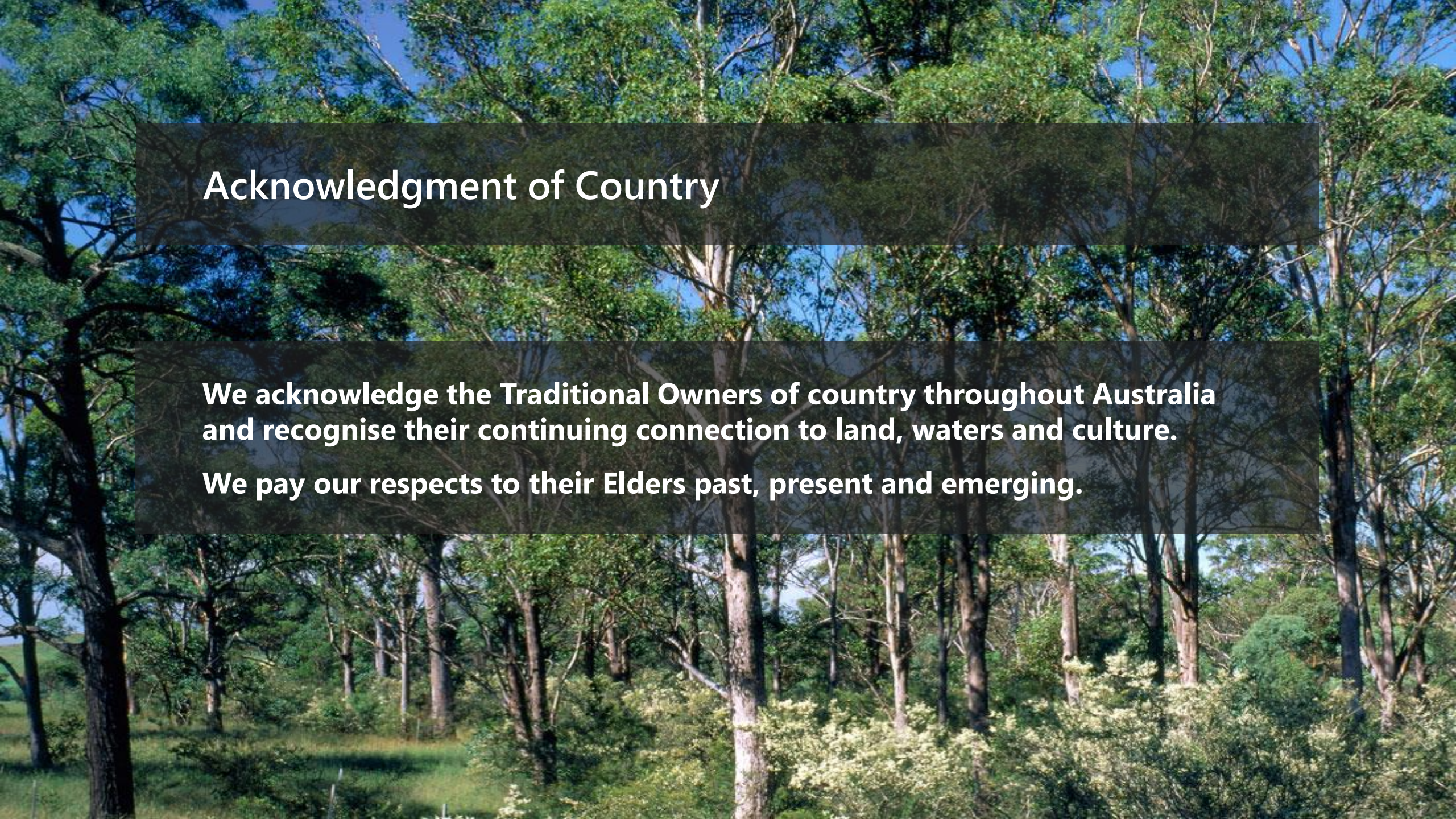
Manager DER Market Integration

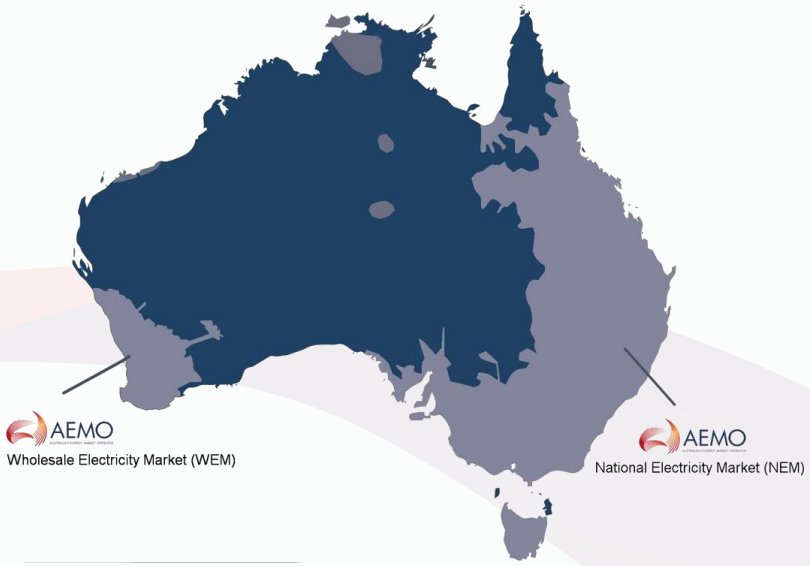


Acknowledgment of Country

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.

About AEMO



AEMO operates Australia's National Electricity Market and power grid in Australia's eastern and south-eastern seaboard, and the Wholesale Electricity Market and power grid in south-west WA.

Both markets supply more than 220 terawatt hours of electricity each year.

We also operate retail and wholesale gas markets across south-eastern Australia and Victoria's gas pipeline grid.

Collectively NEM & WEM traded over A$20 billion in the last financial year.

Ownership

40% Market participants

60% Governments of Australia

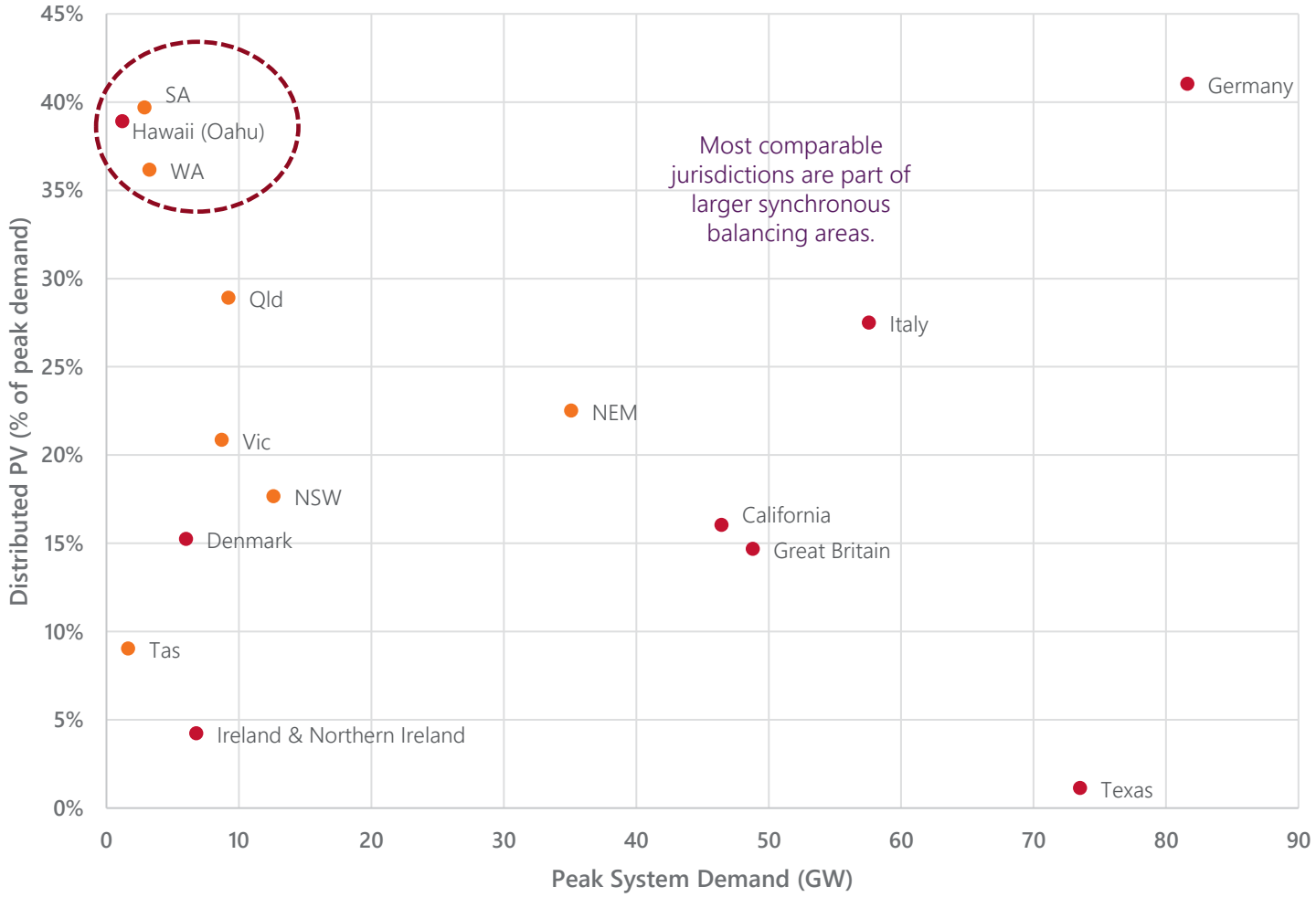
Australia is the world leader in household solar per capita

The **NEM** has approximately **12,250MW** of **distributed PV** (17% of total generation capacity). The **WEM** has approximately **1,740MW** (23%).

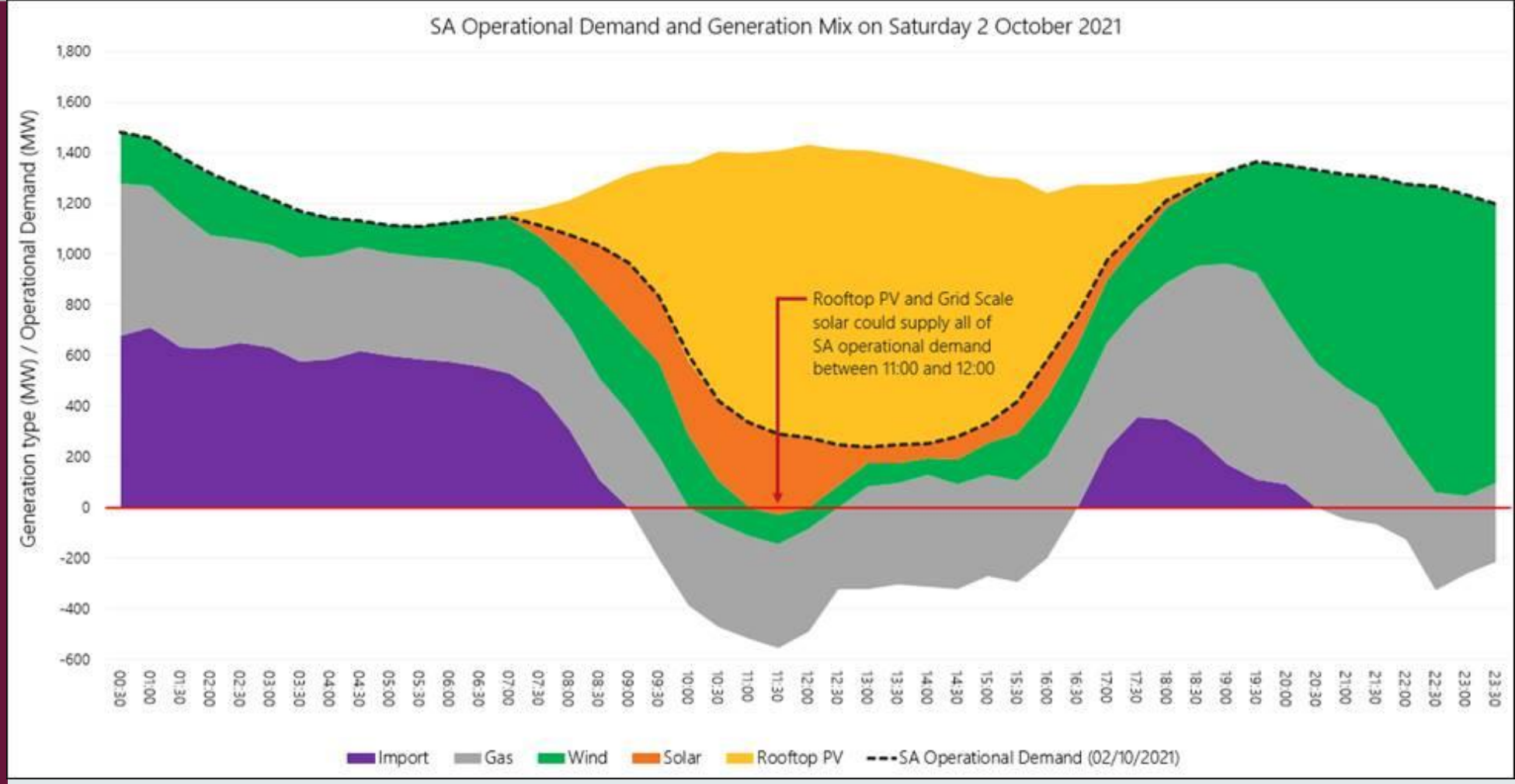
Most distributed PV across Australia is **residential**.

Australia has **over 2 million rooftop solar** installations.

Equates to about 1 in 4 homes, but ~40% of homes in SA, QLD & WA.



South Australia 2 Oct. 2021



SA underlying demand met by 100% solar (Grid Scale + rooftop PV) – Sat. 2nd October 2021

- Minimum operational demand of 239MW just 3MW above the record on Sun 26th Sep. 2021
- Between the 11:00 and 12:00 intervals solar generation (grid scale + rooftop PV) could supply all of the SA underlying demand (operational demand + rooftop PV)

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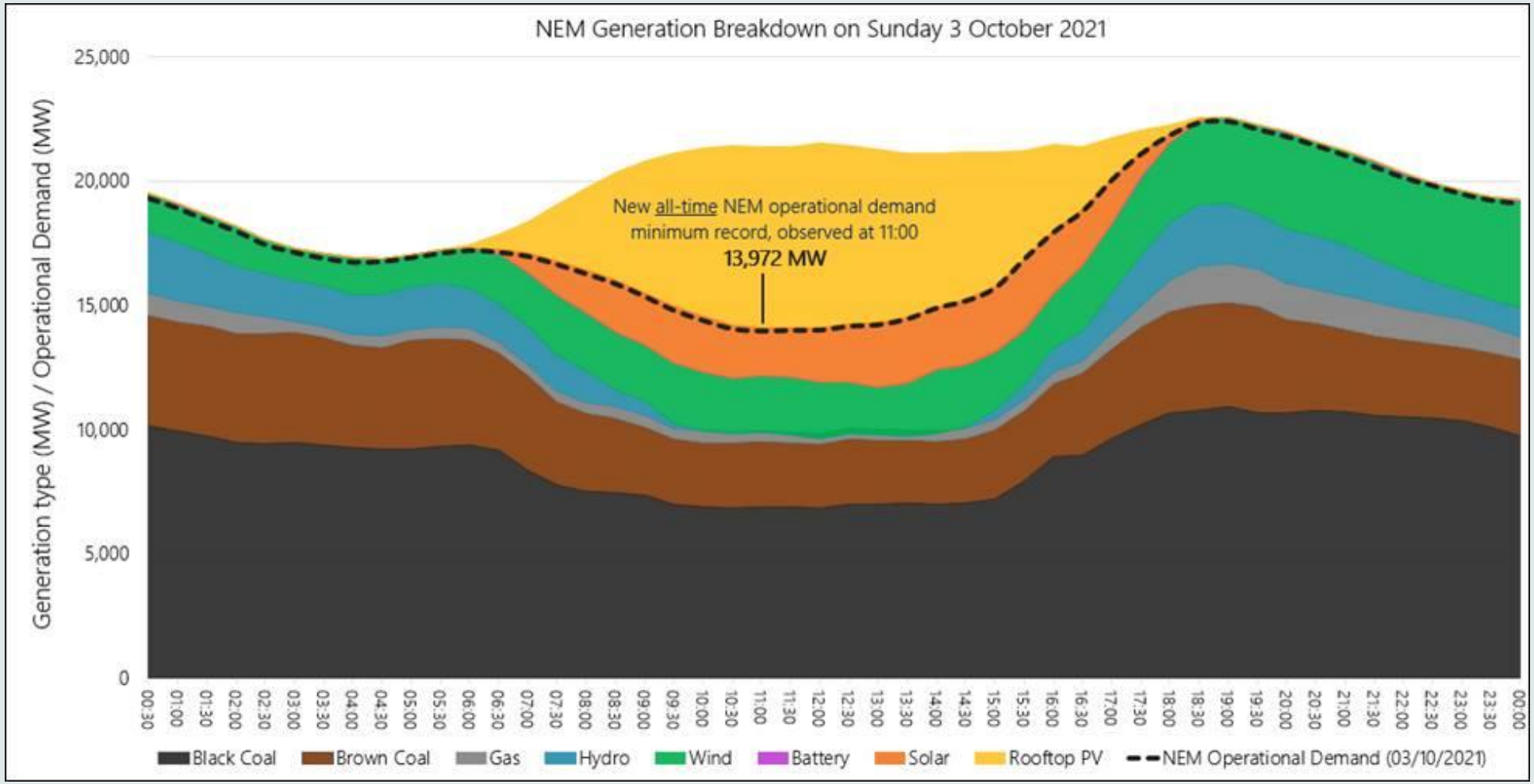
NEM all day min record 3 Oct 2021



NEM and QLD operational demand record – Sunday 3rd October 2021

- **NEM – 13,972 MW** during interval ending 11:00
  - Estimate rooftop PV: 7,266 MW at min. demand supplying 34% of underlying demand

- **QLD – 3,784 MW** during interval ending 11:30
  - Estimated rooftop PV: 2,772MW at min. demand supplying 42% of underlying demand

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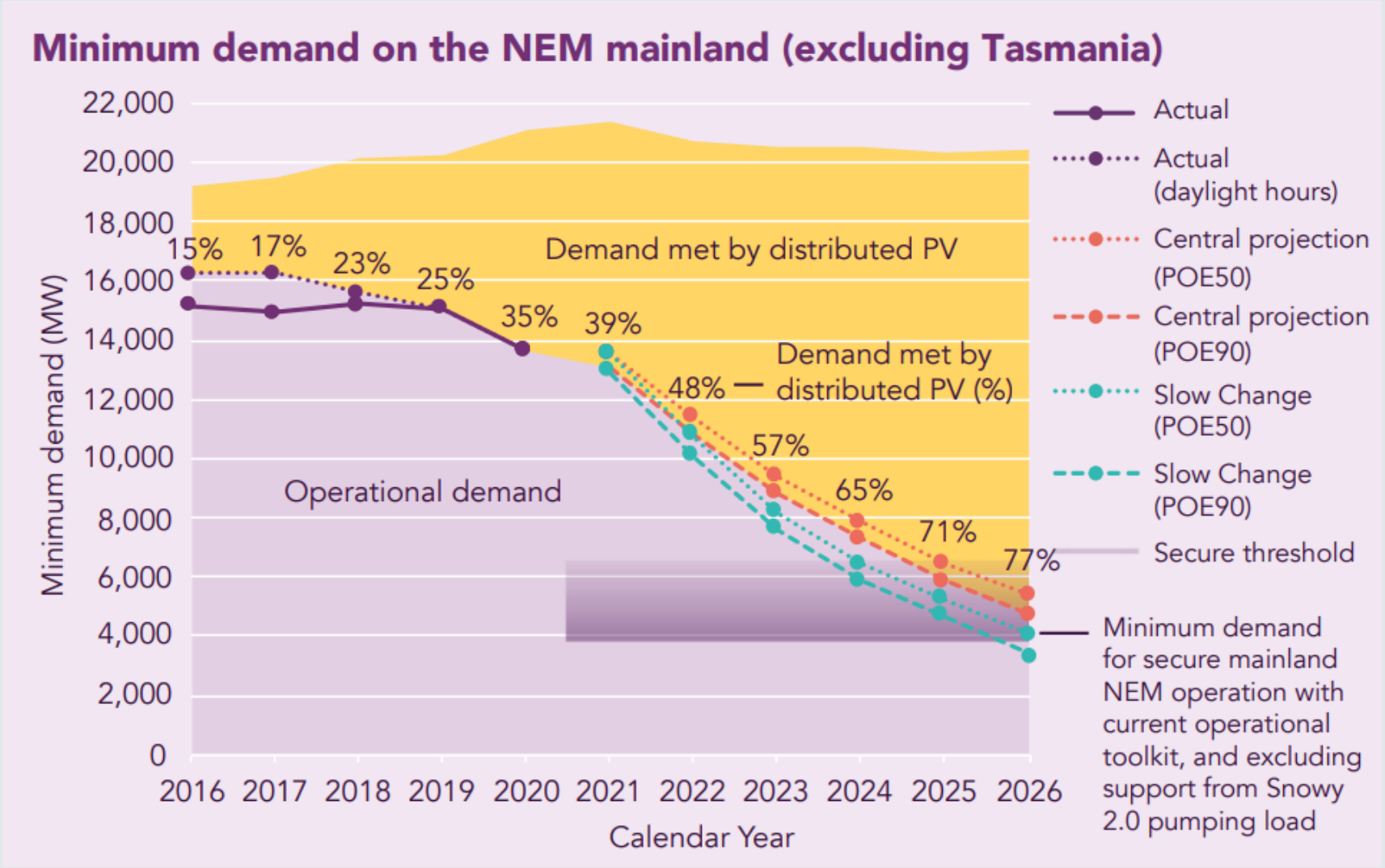
Forecast minimum demand in the NEM

- Distributed PV uptake continues to exceed expectations
- AEMO now forecasts an additional 8.9 GW of distributed PV capacity to be installed by 2025
- AEMO now forecasts earlier tipping points for secure operation of the NEM



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Operational and planning items to consider

Improve DER ride-through standards	• Reduce unintended disconnection of future distributed PV installations – AS4777.2.2020
Increase frequency control enablement	• Enable sufficient frequency reserves to manage larger contingencies – e.g. if generator trip causes PV to trip
Re-assess under-frequency load shedding schemes	• Reverse flows make UFLS exacerbate a frequency decline • Implement dynamic arming to avoid tripping reverse flows
Update load models	• To ensure load models adequately represent growing distributed PV levels
Transmission network limits	• Operate network within stability limits, taking into account larger contingencies • Publish information regarding minimum demand risks
Distribution network limits (Dynamic Operating Envelopes)	• Dynamic connection agreements & operating envelopes • Increase utilisation of network capacity (e.g. 10kW exports) • Ensures minimum demand/peak PV can be managed

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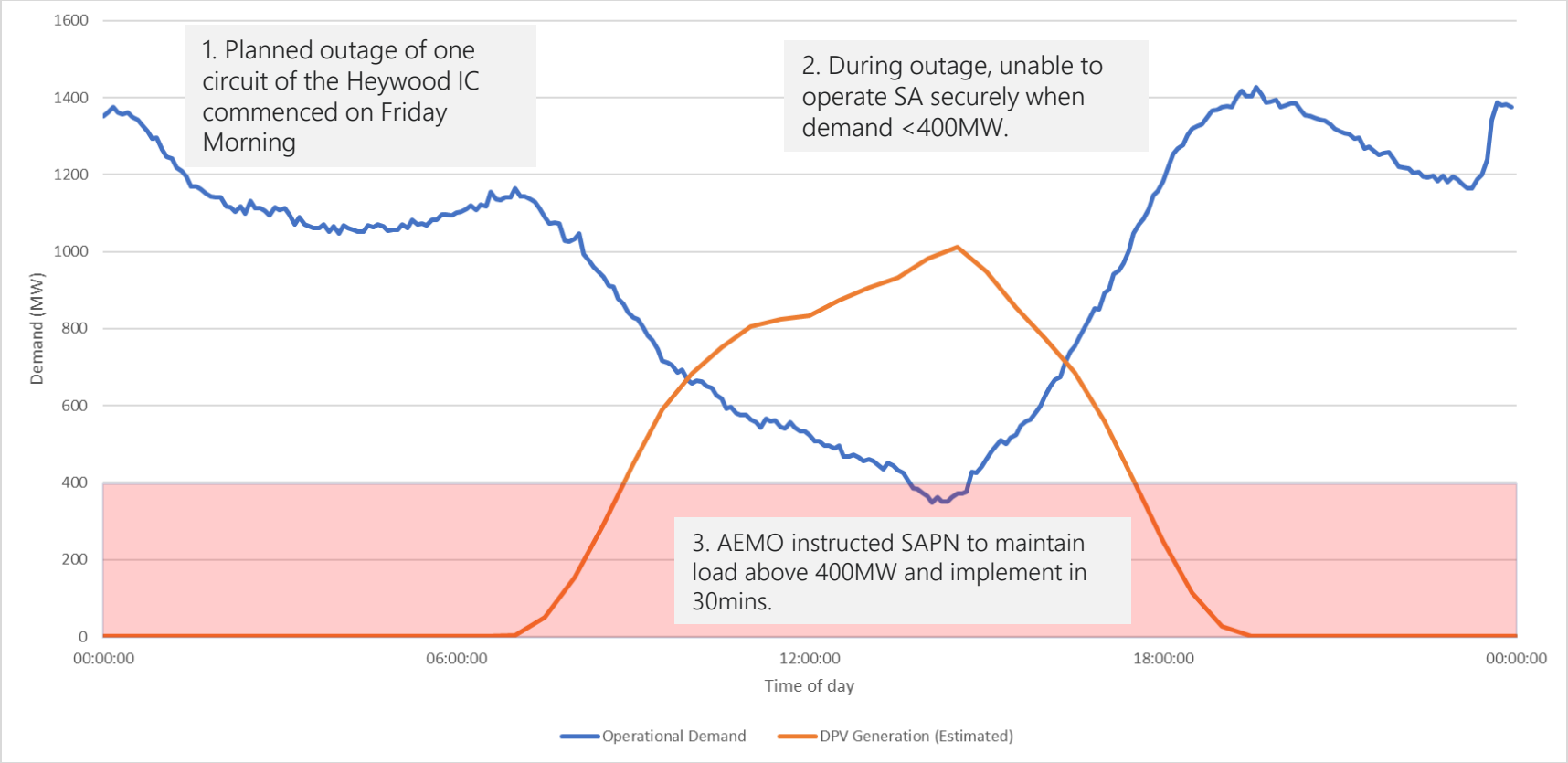
Generation Shedding Event 14 March 2021

SA Power Networks:

- From 2017, systems which export >200kW under SCADA control
- From 28 September 2020, all new PV systems must be capable of disconnection and reconnection through a remote agent (Smarter homes regulation).
- Legacy PV curtailed by inducing overvoltage tripping (Enhanced Voltage Management)



Mechanism	Amount (MW)	Total amount
Smarter Homes (Relevant Agents/Aggregators)	~14	~50MW
SCADA-controlled DPV (All systems which export >200kW)	~17	~60MW
Enhanced Voltage Management (2 EVM blocks, total 7 substations)	~40	~300MW
Total	**~71**	

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AEMO VPP Demos

Website link

VPP Demos on a page

Overarching Objective

Test Virtual Power Plants delivering Contingency FCAS, obtain operational visibility and use learnings to inform changes to regulatory and operational frameworks

Project Participants

EnergyLocals, TESLA, agl, sonnen, Simply Energy, SolarSG Pty Ltd, shinehub, Hydro Tasmania

Inputs & Engagement

Funding	Cyber Security	Customer Research	Stakeholder engagement & industry advisory groups	
ARENA	MITRE	csba THE CUSTOMER EXPERIENCE EXPERTS	Distributed Energy Integration Program	Consumer Research Working Group
			AEMC, AER, ESCOSA	Monthly VPP FAQs working group

Objectives

- Participants demonstrate basic control and orchestration capability for VPPs providing real time energy and FCAS
- Develop systems to deliver operational visibility of VPPs
- Assess current regulatory and operational arrangements affecting market participation of VPPs
- Provide insights on how to improve consumers' experience of VPPs in future.
- Understand what cyber security measures VPPs currently implement, and whether they should be augmented in future

Timeline

Nov 2018	July 2019	Sep 2019	July 2020	Sep 2020	Jan 2021	Dec 2021
Consultation, Design & Tech Development	VPP Demos Launch	SA VPP joins, then AGL (Dec)	1 year extension	7 VPPs registered	Launch MASS review	Close VPP Demos & MASS

Outputs
What did the VPP Demo deliver?

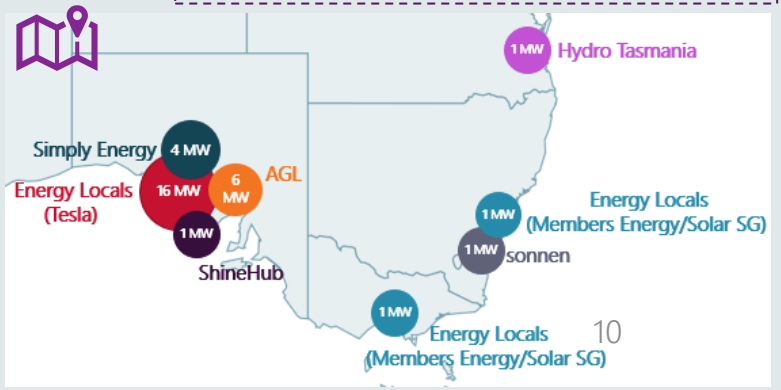
- **Four knowledge sharing reports published**
- **Evidence to support policy and regulatory reform**
- **DER visibility to inform Operations**
- **Flagship Customer Research**
- **DER MASS Review**
- **Evidence to support AEMO operational changes**

Outcomes

- **Uplifted VPP sector capability WRT market services delivery**
- **DER Reforms (P2025, 2SM, WDR, ST-PASA, IESS, Sch. 'lite') informed by evidence**
- **Action on RIS recommendations 2.2, 2.3, 6.2: Visibility and confidence of aggregated DER dispatch capability**

Where

VPPs in each mainland state…31 MW, ~7,000 customers (resi & commercial)



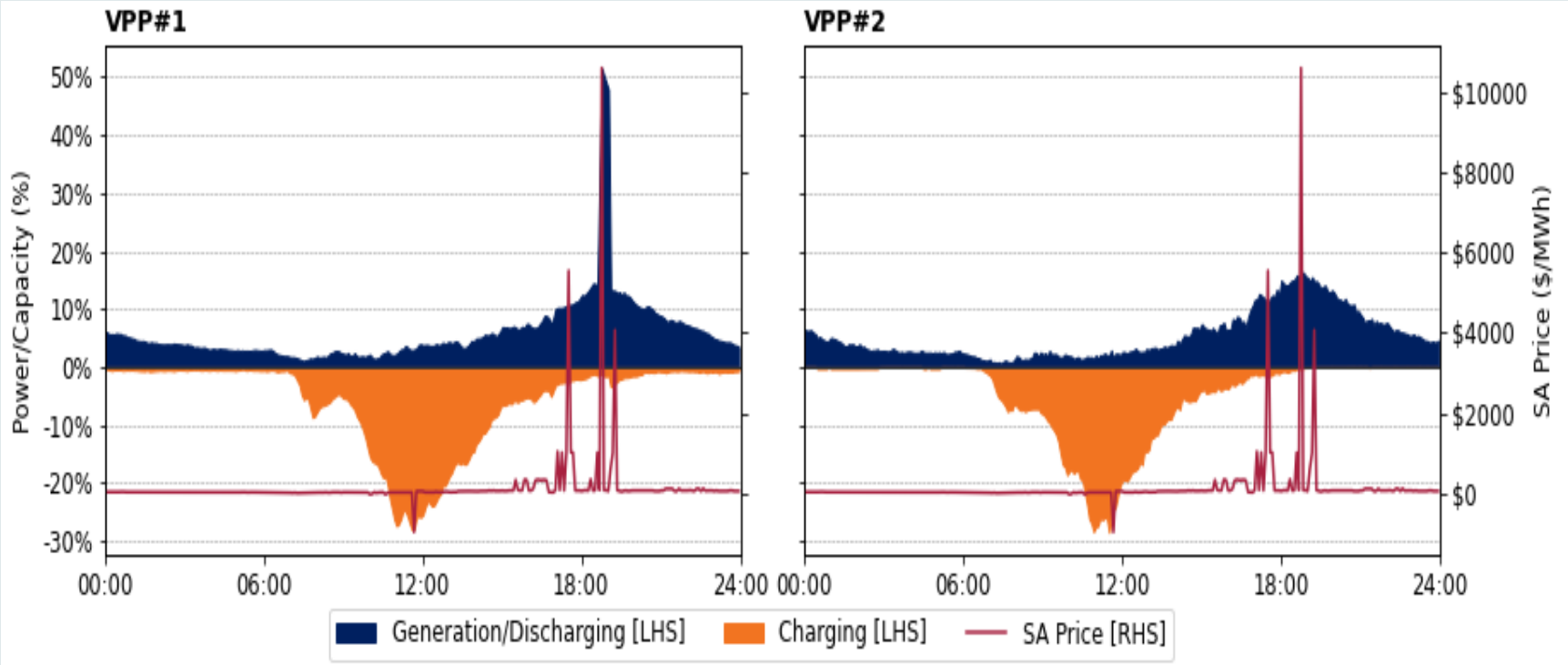
VPP Demos learnings for planning studies

Previous Integrated System Plans applied the following assumptions for modelling VPPs:

- A proportion of batteries are associated with VPPs
- Aggregated batteries are included in the market models and are optimised with perfect foresight to maximise their benefit to the system
- All rooftop PV is modelled as uncurtailed

The VPP Demonstrations will help improve future ISP modelling around VPPs:

- The proportion of batteries in VPPs has been underestimated previously
- Response of VPP batteries to both high and negative price events is smaller and less predictable than currently assumed in AEMO's models.
- Emergence of dynamic connection agreements may increase size/exports of DPV



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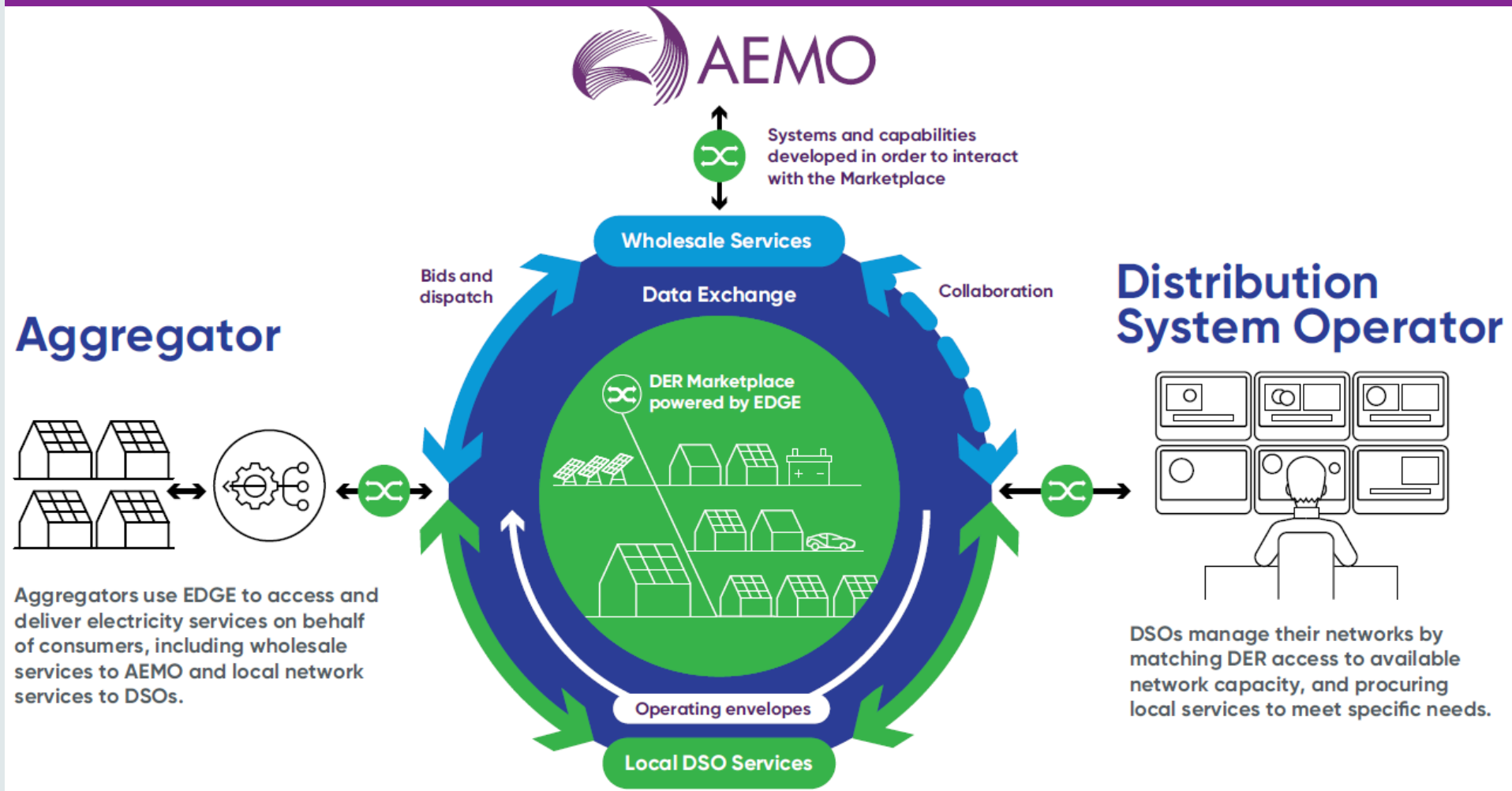
Project EDGE

(Energy Demand & Generation Exchange)

Website link

Project EDGE

An efficient, scalable and integrated technology ecosystem that enables DER to deliver wholesale and local services within Distribution & Transmission network limits.



DSO – the Distribution System Operator is a role that the Distribution Network Service Provider transitions to as they dynamically manage capacity and operate the network to optimise value to customers and the energy system, including increased hosting of DER.

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Distributed Energy Integration Program

DEIP overview

PURPOSE
The Distributed Energy Integration Program (DEIP) is a collaboration of government agencies, market authorities, industry and consumer associations aimed at maximising the value of Distributed Energy Resources (DER) for all energy users.

VISION
DEIP members have a shared interest in supporting our evolution toward a distributed energy system that is secure, reliable, resilient, affordable and efficiently integrates and utilises customer's DER.

WHO IS INVOLVED
The DEIP Steering Group involves 13 organisations who communicate regularly (see logos on right) and collaborate with a wider cross section of stakeholders.

DEIP Public Forum – October 2021 1

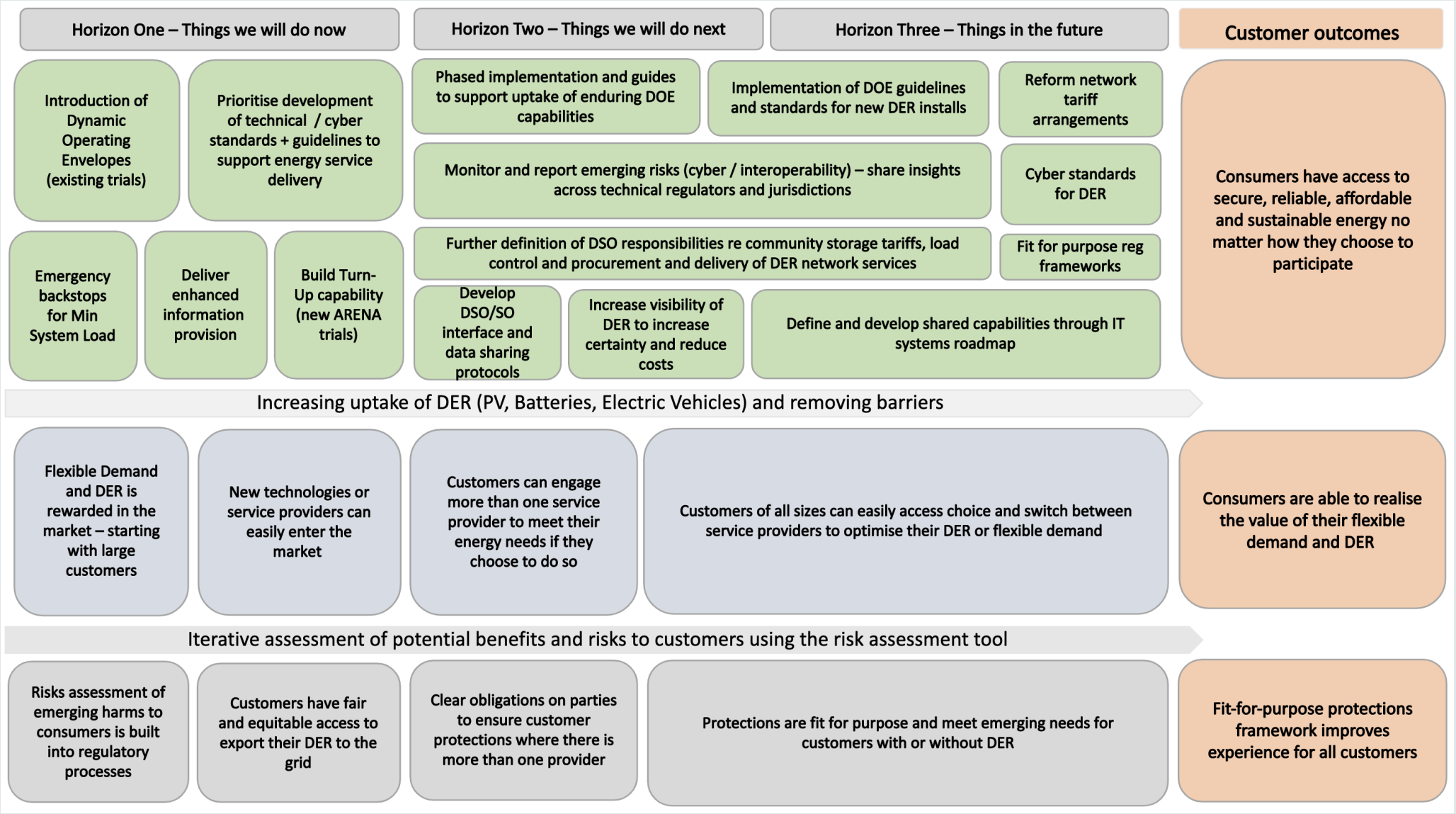
Four Working Groups

1. Network Access & Pricing
2. Interoperability Steering Committee
3. Dynamic Operating Envelopes
4. EV Grid Integration

Website link

ESB – DER Implementation Plan

Website Link



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