

DEIP

DISTRIBUTED ENERGY
INTEGRATION PROGRAM

DEIP Public Forum

5 October 2021

1. Introduction

Darren Miller, ARENA CEO

2. ESB update

Kerry Schott, ESB Chair

Energy Security Board

Post 2025 Market Design Program

Final Recommendations
Integrating DER and Flexible Demand

SEPTEMBER 2021





- ESB delivered final recommendations to Ministers in late July-agreed 1 October
 - Public release of advice
 - Ministers have supported the recommendations, endorsed at National Cabinet in October
- Post-2025 recommendations cover three time-frames:
 - Immediate – do now
 - Initial – need to be developed now for implementation in medium term
 - Long term –the need for further reforms will be assessed over time



RECOMMENDATIONS 7, 8 & 9: IMMEDIATE REFORMS

Delivery of DER Implementation Plan

Ministers agreed:

- Support for the plan and sequence of delivery of regulatory, market and technical reforms to address emerging risks

Next steps:

- Technical/cyber standards & guidelines
- Maturity Plan approach to inform activities with priority consumer needs and insights
- Development of two-sided market reforms underway in rule changes
- DER technical standards governance rule change process starts 5 August

Adopt emergency backstop measures

Ministers agreed:

- To adopt emergency backstop measures to address emerging system security challenges associated with minimum system load conditions (to be implemented by individual jurisdictions)

Next steps: (parallel activities underway)

- Roll out of Dynamic Operating Envelopes
- Enhanced information provision – e.g., Lack of Demand market notices
- Trials for enhancing ‘turn up’ capabilities
- States to consider policy ‘nudges’ to align support schemes with the needs of the market and system

Consumer risk assessment tool

Ministers noted:

- risk assessment tool now in place to be used by market bodies in carrying out their activities

Next steps:

- market bodies will use tool to ensure consumer protections to remain fit for purpose

THE ESB RECOMMENDS IMPLEMENTATION OF DATA STRATEGY TO ENABLE IMPROVED CONSUMER OUTCOMES

Ministers yet to agree detail but overall direction supported:

- Implementing of strategy including introduction of new high level policy principles to govern management and use of data
- Regular reporting and advice about forward priorities, changing data needs and risks in the context of the NEM

Next steps

- Focus on priority data gaps – proposed areas include: EVs, Network Transparency, Consumer Research, Consumer bill transparency



- Advice sets out directions for how roles and responsibilities of various actors across the energy ecosystem will need to evolve to enable the effective integration of DER. These directions have been built into reform activities.

- **Customers**

- Facilitating the energy needs of the customer is the fundamental role of the energy system

- **Traders (Retailers and Aggregators)**

- Traders provide the operational and financial connection between the customer and the market

- **Distribution Network Service Providers**

- DNSP provides the physical connection of the customer to the system and market, management of capacity and operation of distribution network

- **System and Market Operator (AEMO)**

- Operation of the system and market, management of system security and reliability (keeping the lights on), ensuring the supply and demand balance

- **Data and Technology**

- In a high-DER, decentralised system with millions of actors and devices, digitalisation is a necessary capability

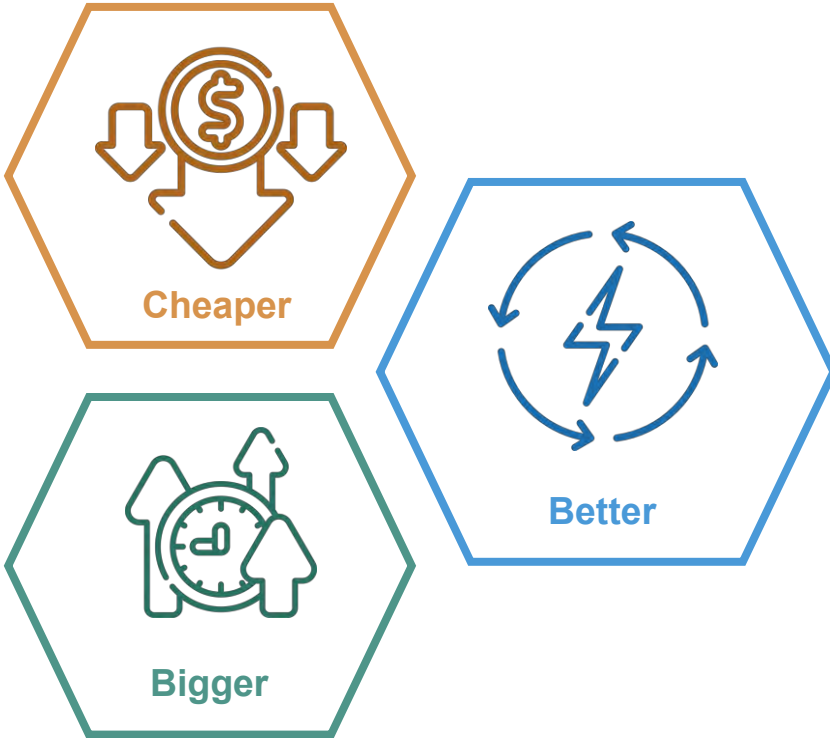
3. DEIP overview

Craig Chambers

DEIP Public Forum agenda

#	Item	Who	Description
1	Introduction	Darren Miller (ARENA)	- Welcome and introduction
2	ESB Post-2025 recommendations	Kerry Schott (ESB)	- ESB update on Post-2025 and implications for DER and DEIP - Implementing DER reform agenda
3	DEIP overview	Craig Chambers (ARENA)	- DEIP Overview and outline today's purpose & agenda
4	Dynamic Operating Envelopes workstream	Anthony Seipolt (ARENA) Bryn Williams (SAPN)	- Workstream overview and status update - Case study: SAPN Flexible Exports for Solar PV Trial - Q&A
5	Interoperability workstream	Lachlan Blackhall (ANU) Bill Tarlinton (ZepBen)	- Workstream overview and status update - Case study: evolve DER Project - Q&A
6	EV Grid Integration workstream	Kate O'Callaghan (ARENA) Robert Colson (AGL)	- Workstream overview and status update - Case study: AGL Vehicle Orchestration Trial - Q&A
7	Q&A Panel with DEIP Secretariat	Various	- General Q&A from the audience

The challenge / opportunity



Customer

- Fairness
- Transparency
- Sustainability
- Cost

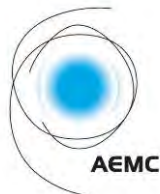
Technical

- Supply / Demand Balance
- Uncertainty, stability and variability
- Standardisation
- Cybersecurity

Market

- Participation
- Protection
- Efficiency

DEIP Steering Group



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.

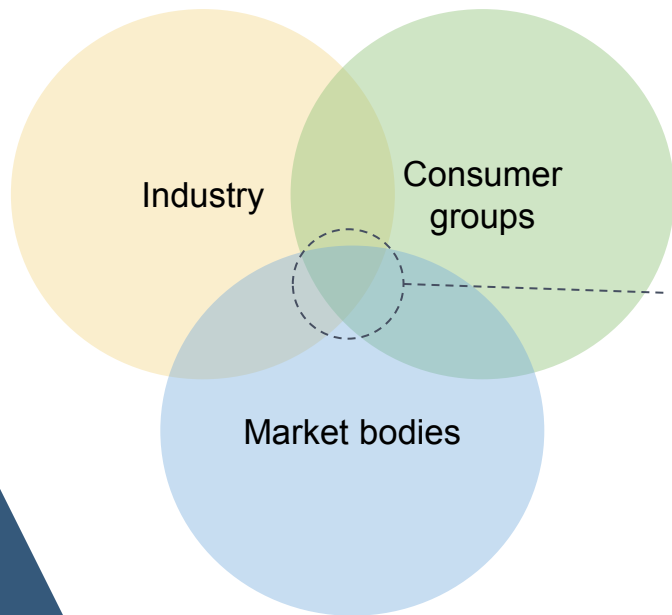
VISION

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.

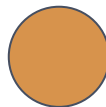
DEIP drives collaboration in areas of shared interest



Collective leadership, DEIP operates on discretionary support and leadership from a variety of stakeholders. No one party can affect systemic change in isolation and DEIP supports consensus building.



Collaboration, an openness to work with others and consideration of alternative perspectives.



Resources, support from member organisations is essential to progress objectives. DEIP will build on existing work and use the best practices for each task.



Outcome focused, DER has traditionally not been a high priority for the sector and alignment with policy and customer outcomes needs greater focus. DEIP operate in 1 year sprints.



Innovation, the integration DER and more renewables is likely biggest challenge the energy system will face in our generation and a commitment to ongoing innovation will help this transition.

2021 DEIP program governance

Strategic review
Collective leadership
Coordination



Interoperability Steering Committee

Working Group



Dynamic Operating Envelopes

Working Group



EV Grid Integration

Working Group



Delivery

DEIP achievements & outcomes

Outcomes

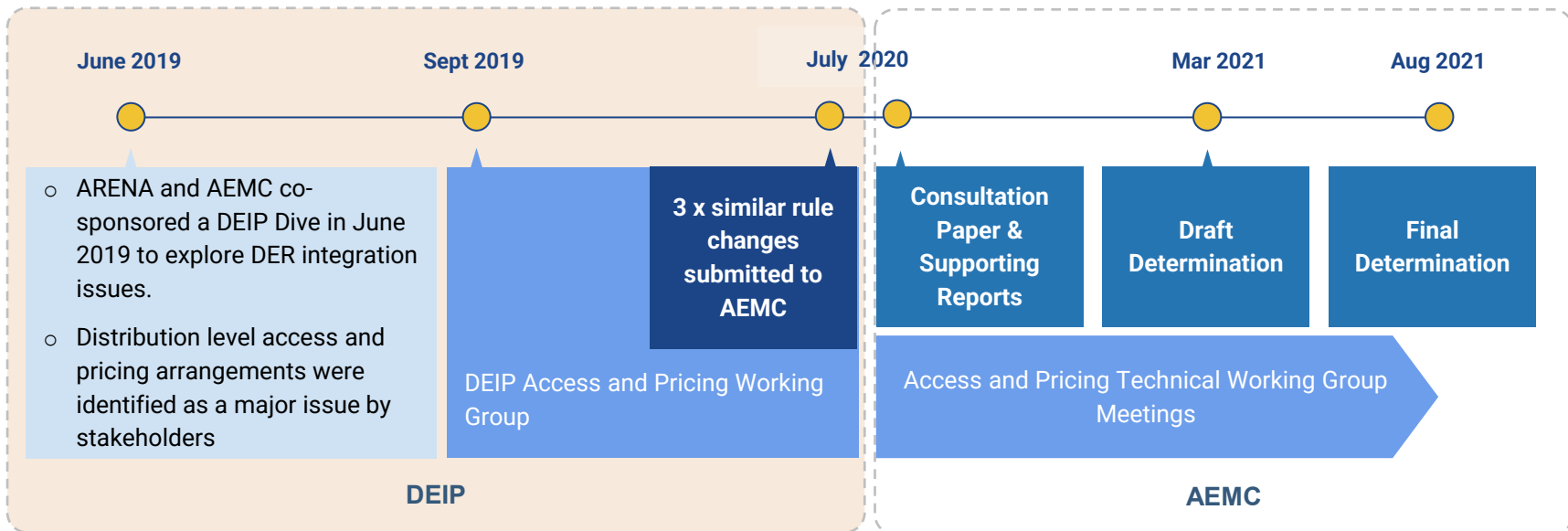
- ✓ Multiple Events & Workshops
- ✓ Targeted working groups
- ✓ Knowledge sharing
- ✓ Targeted resource allocation
- ✓ Cross stakeholder group collaboration

Achievements

- ✓ Access and Pricing Reforms
- ✓ Supported New Energy Compact
- ✓ Australian Implementation Guide for IEEE2030.5 (CSIP-Aus)
- ✓ Supporting national consistency of dynamic operating envelopes
- ✓ Published reports on EV data availability, standards and customer insights

Case study: Reforming DER access and pricing

CHALLENGE: Current pricing and access arrangements do not support investment and operation of DER services for equitable and efficient outcomes for all energy users.



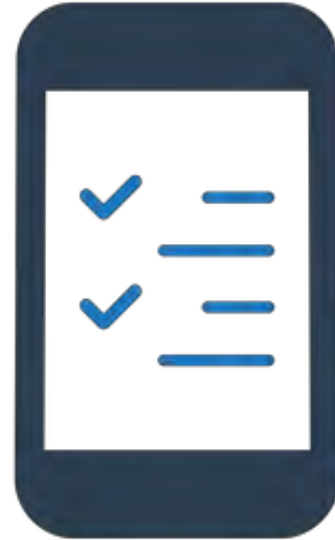
Q&A via Slido

Slido will be used for Q&A

Go to: slido.com

Enter event code: **#DEIP**

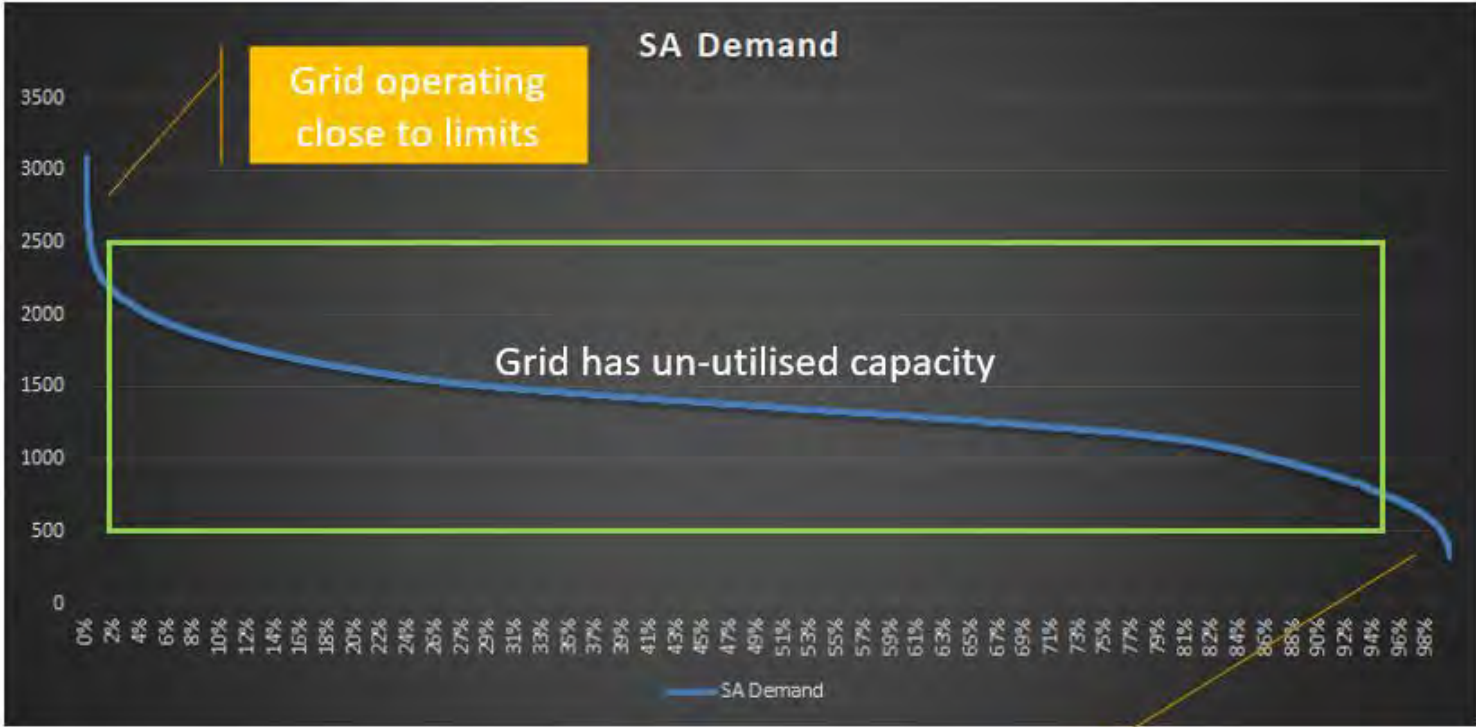
Please include your name when registering in the event we need to clarify your question after the session.



4. Dynamic Operating Envelopes

Anthony Seipolt

Network limits



Grid operating close to limits

The DOE workplan started with a focus on customer delivery...

A: Design a national DOE framework

1. Develop national capacity allocation principles
2. Determine a preferred information architecture model with market participants and AEMO

B: Test and trial EMS

3. Advance the technology and commercial readiness of customer energy management systems

C: Prepare for implementation

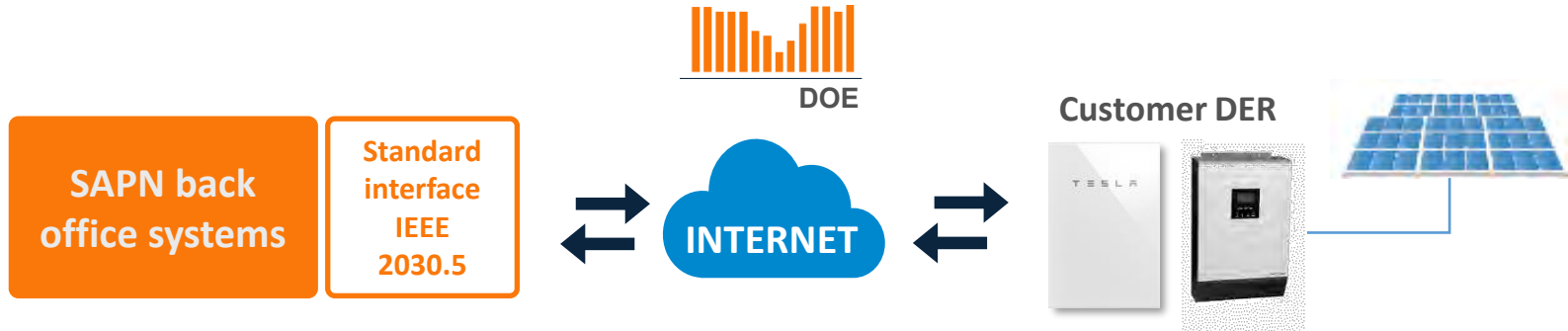
4. Gauge the status of DOE deployment by energy networks
5. Prepare a White Paper describing critical implementation pathways

Market Snapshot

The DOE workstream operates alongside numerous emerging industry projects, for example:

- **ARENA's Network Hosting Capacity round**
- **Evolve Project:** Zepben and ANU allocated dynamic hosting capacity to DER through more efficient dynamic operating envelopes
- **SAPN Flexible Exports for Solar PV Trial:** SAPN will produce a flexible connection option for solar PV systems that will enable solar customers to export more energy within dynamic constraints
- **Project EDGE:** Development of a Victorian DER marketplace enabling DER to bid network and market services into a co-optimised marketplace within the constraints of the distribution network in the NEM
- **Project SHIELD:** Redback and its partners will synthesise data from a range of traditional and non-traditional network sources and incorporate it into an LV state estimation and simulation tool to better estimate dynamic operating envelopes
- **CSIRO Taxonomy:** Producing the first national low-voltage network taxonomy that outlines the real-world characteristics of the distribution system in relation to the impact of higher levels of solar PV penetration
- **AER VaDER Study:** Recommended a methodology to determine the value of DER that can be used by networks in investment proposals to integrate DER into the grid
- And many more...

Case study: SAPN Flexible Exports for Solar PV Trial



DOEs in South Australia: from ARENA trials to business-as-usual



5 June 2020

SAPN \$32 million DER enablement program approved by AER

1 July 2022

SA Government requires 'DOE capable' for all new installs

End 2020

Publish initial findings

Mid 2021

Field trial

Mid 2022

Service launch

Late 2022

Full network availability

Advanced VPP grid integration trial

- Increase export limits for VPP
- ARENA, Tesla, CSIRO

Flexible exports for solar PV trial

- Extend to solar PV customers
- ARENA, Fronius, SMA, SolarEdge, SwitchDin, AusNet Services

Full flexible exports service

- Full offering for VPPs and solar PV

ARENA



Field testing – August 2021

- 7 installs with 4x solar retailers
- Test the installer experience and system performance

Standard interface
IEEE
2030.5



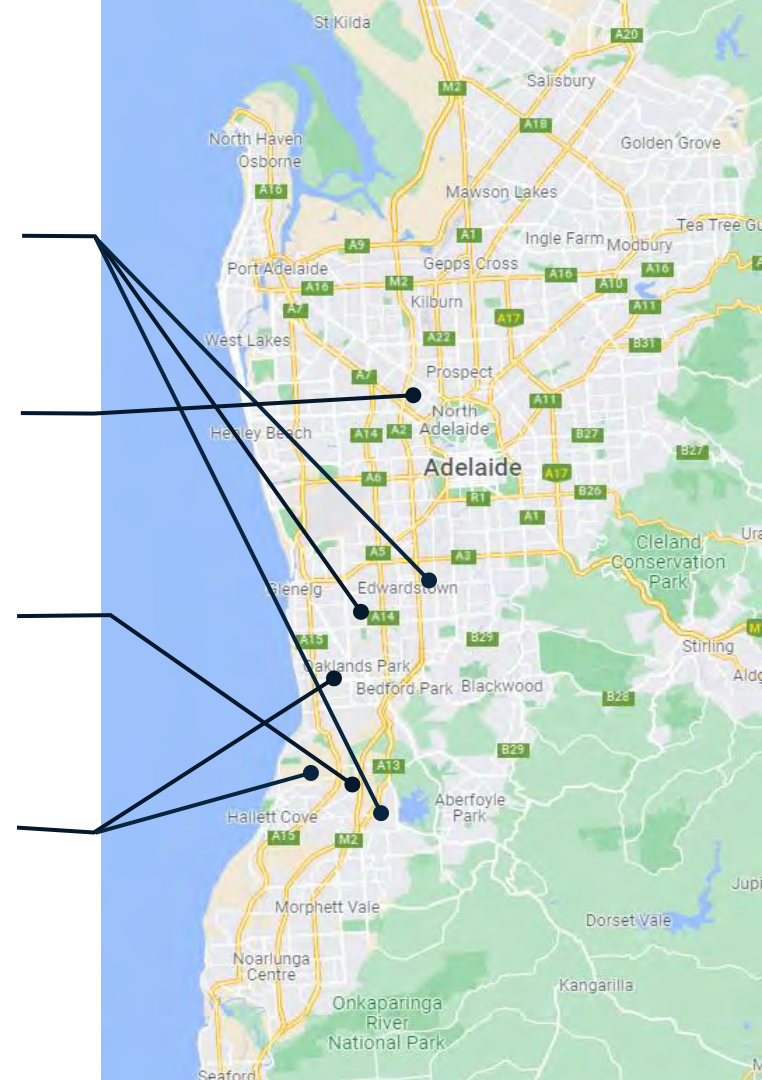
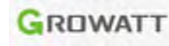
SwitchDin
droplet



Fronius
Primo



Growatt
MIN-TLX



Site performance dashboard

Flexible Exports Site Performance



Substation, TF ID, NMI

Search

- Select all
- CROYDON
 - AP355H-20715
 - 20016900447
 - AP355H-35
- CUDMORE PARK
 - SM402D-30071
- HAPPY VALLEY DISTRIBUTION
 - NL210E-TC62488
- MORPHETTVILLE
 - SM410B-30
- NEW RICHMOND
 - ME347F-48
- PORT NOARLUNGA
- SEACOMBE
- SHEIDOW PARK

Performance

Value Unlocked (kWh)

272

Comms Uptime

93%

Compliance

Export Limit Breached

0%

Voltage above 255V

1%

Constraints Engine

Time at 10kW

97%

Time at 10kW - 5kW

1%

Time at 5kW - 1.5 kW

1%

Time at 1.5kW

1%



8/15/2021 9/24/2021



South Australia is a world leader in renewable energy



100% of the State has been powered by solar energy - a world first!



1 in 3 South Australian homes currently have solar

Our Goal: To double the amount of Solar on our network by 2025

But it's a challenging goal.

Too much solar energy exported to the grid on mild, sunny days can lead to:

- ⊖ unstable electricity supply
- ⊖ local voltage issues
- ⊖ potentially wider outages



The Solution: Flexible Exports

Solar exports automatically adjust to match the available capacity on the network.

CURRENT CUSTOMERS

Stay the same

Export up to

05.00kW

NEW and UPGRADING CUSTOMERS

connecting in overloaded areas can choose between:

FLEXIBLE EXPORTS

Export up to

10.00kW

Analysis shows export limits typically will be 10kW 98% of the time.*

FIXED

Export up to

04.50kW

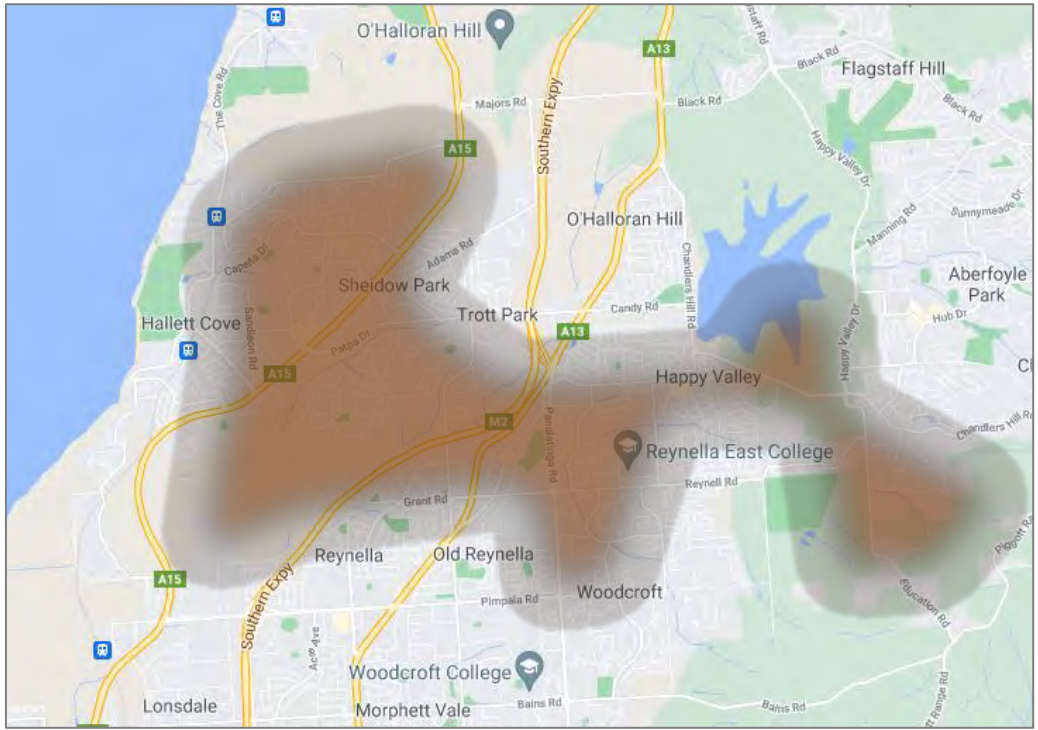
Flexible Exports

- ✔ greater exports into the network
- ✔ variable exports up to 10kW per phase
- ✔ safer and more reliable electricity supply
- ✔ allows more people to benefit from solar
- ✔ world-leading technology
- ✔ more renewable energy in South Australia

Your installer will advise if you are eligible to enrol in Flexible Exports. Find out more: sapowernetworks.com.au/future-energy/solar

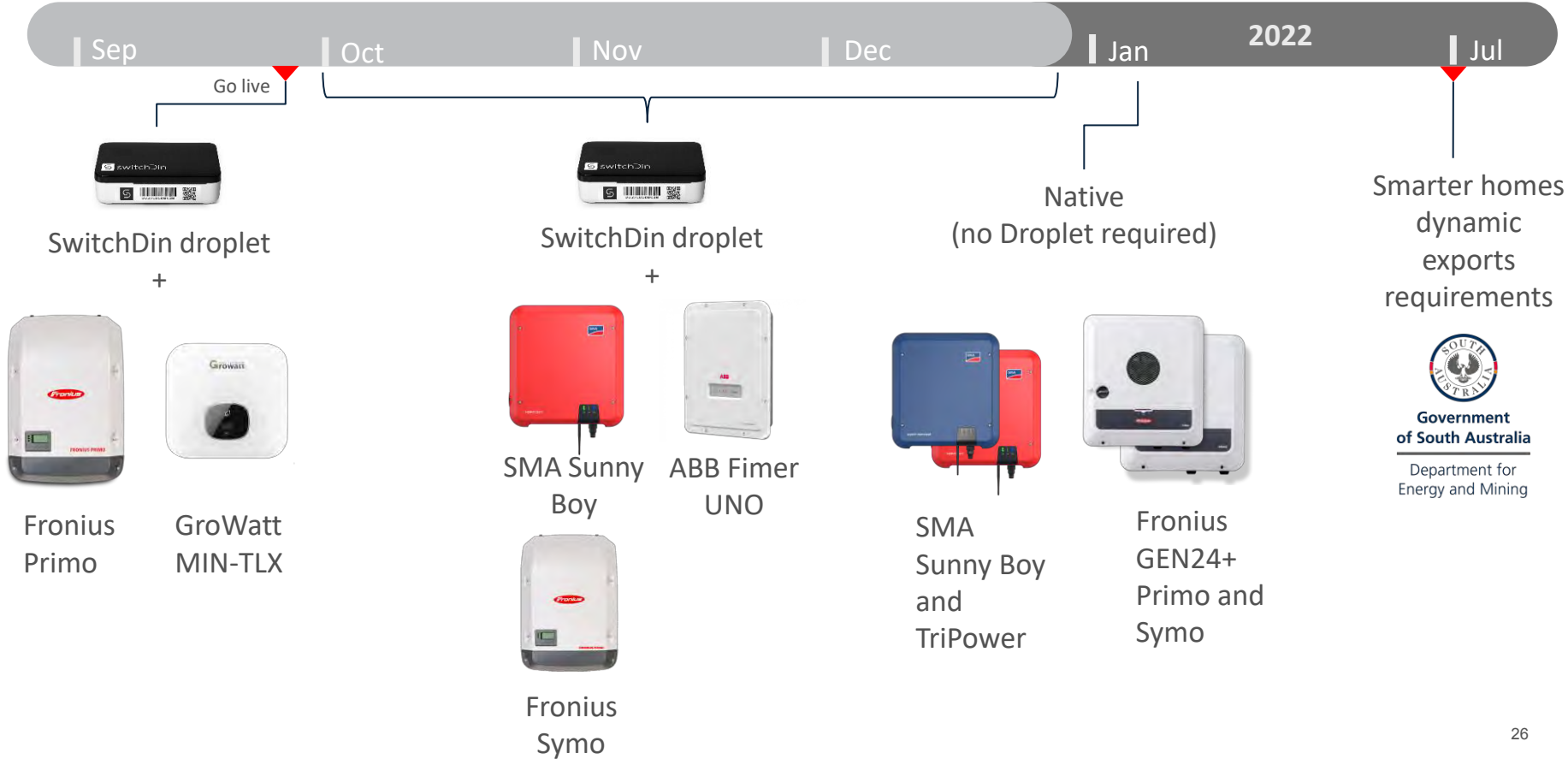
*Outcomes will vary with the location of the customer and the reliability of their internet connection. See FAQs at sapowernetworks.com.au/future-energy/solar for more details.

Trial launched 24 September 2021



Trial launched in initial congested area: Sheidow Park substation

Customer technology options



5. Interoperability Steering Committee

Lachlan Blackhall

Overview: Interoperability Steering Committee (ISC)

Background

Interoperability is the ability of different information technology systems, devices and software applications to **leverage two-way communication and to use, and exchange data accurately.**

The DEIP Interoperability Steering Committee (ISC) has been operating in various forms since May 2020 to support the **development and implementation of DER technical standards** with a focus on interoperability.

Problem and opportunity

Customers are driving a distributed energy revolution in Australia through the uptake of DER. However, **DER are contributing to dynamic two way flows of energy** which must be coordinated effectively,

New interoperability standards and capabilities are vital to **giving customers choice and certainty about their DER uptake and usage**, whilst ensuring energy reliability and energy security.

Unlocking value

The value unlocked by interoperability includes:

1. **Supports the rapid uptake of DER** for the benefit of consumers.
2. Simplifies system integration of DER and **enables existing infrastructure to be used in smarter ways.**
3. **Allows DER to create value for consumers** by supporting network and system operators.

May 2020

Delivery

Ongoing

- Established the DER Integration API Technical Working Group and the Cyber Working Group.
- Enacted terms of reference (ToR), work plans, and membership of the Interoperability Steering Committee, DER Integration API Technical Working Group and the Cyber Working Group.
- Recently published the Common Smart Inverter Profile (CSIP) – Australia (otherwise known as the Australian Implementation Guide for IEEE2030.5). Available from: <https://arena.gov.au/assets/2021/09/common-smart-inverter-profile-australia.pdf>.

2021 - 2022 Activity Plan

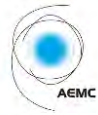
Interoperability

- **December 2021** - Working with Standards Australia to publish CSIP – Australia as a Standards Australia Handbook.
- **Early 2022** - A **testing guide, use cases and data** to allow stakeholders and vendors to validate conformance to **CSIP – Australia**.
- **Ongoing** - **Formal engagement with the IEEE standards committee** providing a pathway for updating the underlying IEEE2030.5 standard to accommodate Australian extensions.
- **Other Activities** – Supporting coexistence of interoperability standards and EV interoperability and integration standards.

Cyber Security

- **September 2021** – Cyber Working Group established and engagement with key federal and state departments and organisations including: DISER, Home Affairs, ACSC, Cyber Security CRC.
- **December 2021 - early 2022** - A **DER Cyber Security no-regrets technical work plan** that identifies the communications, cyber security, computation and control infrastructure requirements that support the integration and participation of DER.
- **Other Activities** – Responding to **industry queries related to cyber security implementation** (i.e. certificate issuance).

Working group:



Market Snapshot

The ISC workstream operates alongside numerous industry projects, for example:

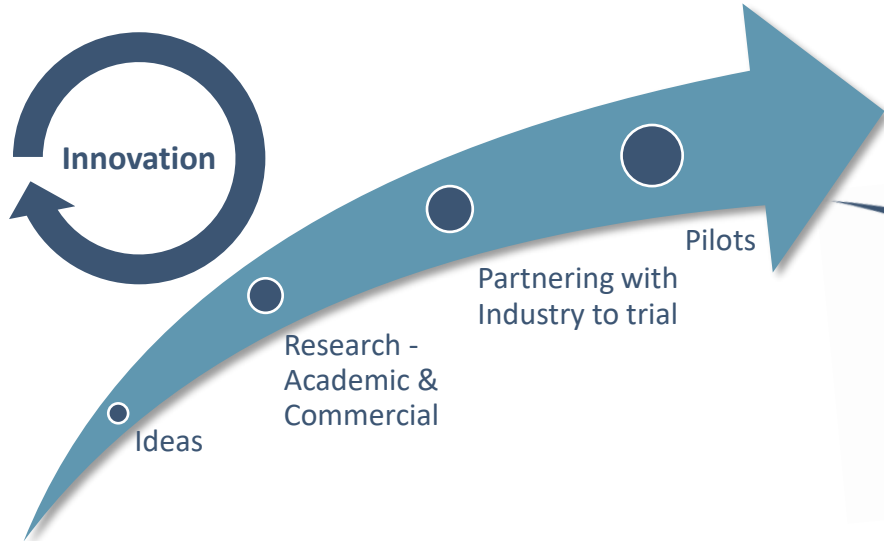
- **Evolve Project:** Zepben and ANU allocated dynamic hosting capacity to DER through more efficient dynamic operating envelopes
- **CONSORT:** ANU's project on Bruny Island that used the Network-Aware Coordination (NAC) software to support a constrained electricity network (that experiences low-quality electricity supply) across 34 solar plus storage residential installations
- **AEMO VPP Demonstrations:** Demonstrating the capability of VPPs to deliver Frequency Control Ancillary Services and building an interface between VPPs and AEMO to forecast and dispatch services
- **Pooled Energy:** Pooled Energy provides swimming pool demand management through encrypted VPN communications and responding to forecasts from SCADA systems, NEM and Weather Bureau data
- **Simply VPPx:** Tesla, Greensync deX, SAPN and Simply Energy provided greater connectivity between energy and network services through the deX/Tesla platform and a common API to provide greater visibility of behind the meter battery storage and greater access to address local network constraints
- **DER Integration API Technical Working Group:** Supporting the development of standard APIs for programmatically sharing DER related data
- And many more...



Widespread deployment of technology that supports distributed energy resources

Standardisation

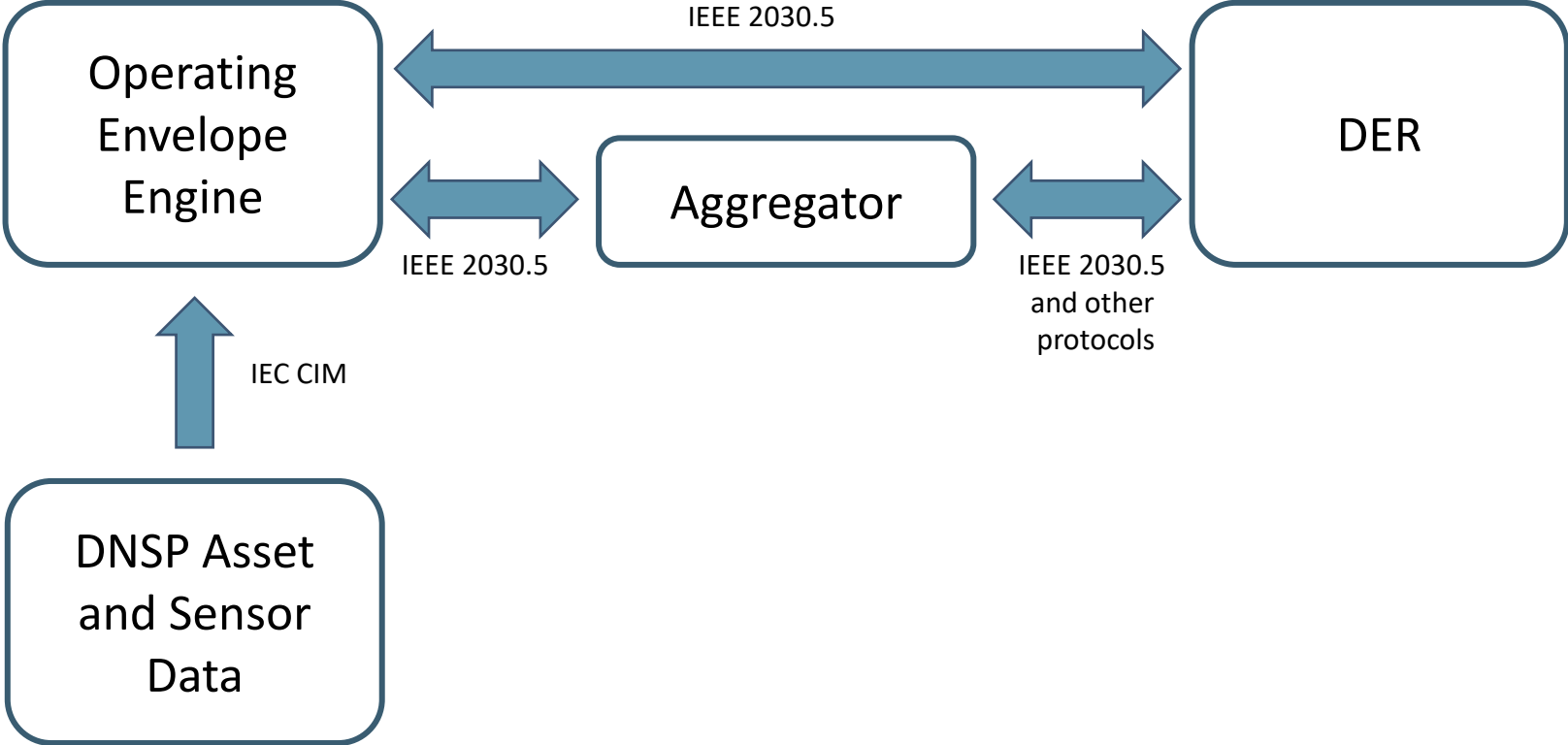
Adoption and real world implementation



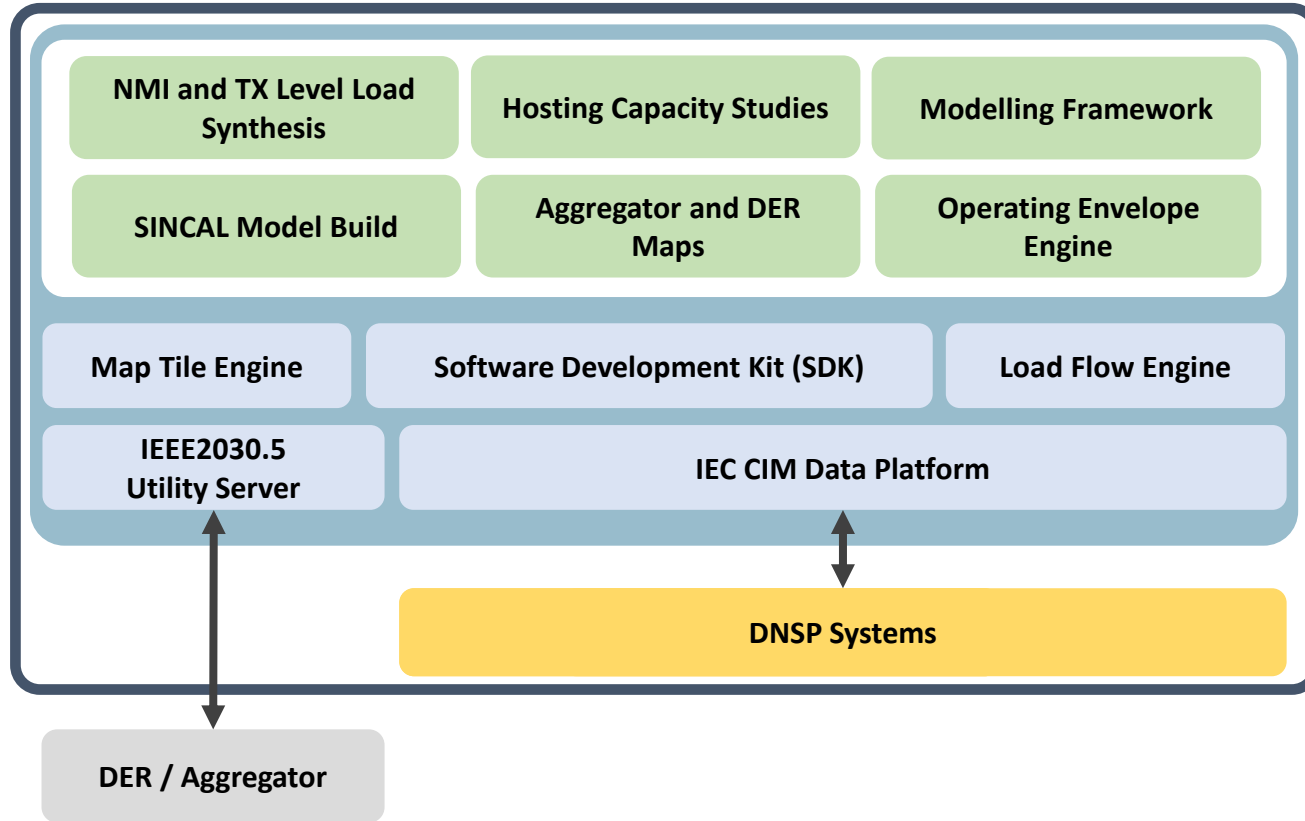
The problem...
19th century energy system

Without standardisation we remain stuck in “proof of concept” mode

Evolve Project → Simple Concept



Evolve Project → Evolve Platform



Principles

- Standards based
- Open source
- Layered approach
- Extensible
- Scalable
- Flexible

6. EV Grid Integration

Kate O'Callaghan

Context: EV Grid Integration

- EVs are predicted to be the **fastest growing demand category** in the NEM from mid 2020s
- EV demand forecast to **add >1TWh new consumption each year** from late 2020s, approaching the level of total residential consumption by 2050
- Spatial **distribution of EV demand** will be 'lumpy', not uniform
- **DER but different** – mobile and primarily viewed by the owner as a transport asset

These **next years are critical** to put in place initiatives that help to avoid a material increase in peak load, and maximise the potential of EVs for consumers



Purpose: EV Grid Integration Workstream



Facilitate the **efficient integration of EVs** into existing networks and markets



Forum for industry and government stakeholders to **collaborate and coordinate** EV activities



Approach EVs from an **energy sector perspective**



Promote **policy and regulatory development** before wide scale EV adoption begins

Scope of work
= initiatives that helps to prepare for increased EV penetration, rather than initiatives to increase the uptake of EVs



Progress to date: EV Grid Integration Workstream



The **EV Data Availability Taskforce** identified EVSE standing and operational data, as well as vehicle standing data as the most immediate data needs, and put forward a number of recommendations for coordinating data across industry



The **Vehicle-Grid Integration Standards Taskforce** focused on charging interoperability, energy and services market integration and disturbance performance and grid support services



The **Residential Tariffs Taskforce** sought to identify opportunities for tariff design that accommodate EVs in the Australian electricity system



A new **EV Grid Integration Reference Group** was established - a monthly **knowledge sharing group** to share information and test ideas about grid integration initiatives

We are at a reset point
Work is underway to develop a new workplan that builds on the findings of the previous taskforces



ARENA Portfolio Overview

	ActewAGL (REVS)	Origin	AGL	Jemena
Technology	V2G (commercial users)	Smart Charging (via hardware)	Smart Charging (hardware and software) V2G (Residential users)	Smart Charging (via hardware)
# of EVs	51 EVs V2G	150 EVs	300 EVs (200 smart charge, 50 API, 50 V2G)	176 EVs
Funding	ARENA: \$2.403m Total: \$6.263m	ARENA: \$0.84m Total: \$2.91m	ARENA: \$3.086m Total: \$8.918m	ARENA: \$1.559m Total: \$3.287m

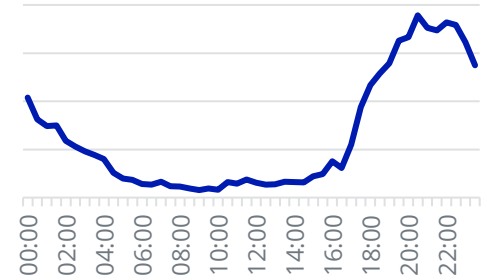


AGL ARENA EV Orchestration Trial



Trial Objective

To accelerate the development of EV charging orchestration to realise benefits for customers and the electricity supply system.



Value Pool Investigation

An assessment of EV orchestration benefits and trade-offs using smart chargers installed in homes.

200 participants

Emerging Technology Evaluation

Assess two emerging EV orchestration technologies:

- Vehicle API integration (50 participants, now being extended to 100)
- Vehicle-to-Grid charging (50 participants)

TOU Control Group

To assess performance differences between customers on managed charging and those incentivised on price alone.

100 participants

Phase 1 Recruit and Build 2021

Recruit participants in all streams
Install all chargers
Develop software
End-to-end testing
Two ARENA reports

Phase 2 Operate 2022

Field testing of all streams
Customer research
Two ARENA reports

Phase 3 Close out H1 2023

Transition participants from the trial
Final ARENA report

Project Partners

DNSP Partners



Technology Providers

Smart chargers and installation:



V2G chargers and installation:



Charger aggregation software and customer app:



Vehicle API charge control and customer app:



Technology Outcomes

Drive the development of improved, more cost-effective charging hardware and orchestration software systems.

Evaluate the ability of vehicle API technology to reduce charger costs and manage charging wherever the vehicle is, and identify the outstanding technical and customer issues.

Validate the performance of V2G charging/discharging in the residential environment and identify the technical, regulatory and customer hurdles to be overcome for commercialisation.

Customer Outcomes

Cheaper vehicle charging from lower wholesale energy costs and reduced grid augmentation.

Improved supply reliability from management of EV charging within network and system capability envelopes.

Research into customer behaviour, perceptions and impacts during the trial will inform the design of commercialisation pathways using customer responsive approaches.

Assess the relative performance of TOU tariffs vs controlled charging on customer outcomes.

Energy System Outcomes

Inform retailers, DNSPs, AEMC, AEMO, DEIP and other industry bodies of the potential of EV charging orchestration, real world benefits and commercialisation pathways.

Detailed engagement with DNSPs during the trial will encourage the development of a future network value pool.

Enable greater integration of renewables into the grid through management of EV charging as a firming energy resource.

Enable EV charging as a “solar soak” at household, network and NEM levels to improve voltage control and system stability.

7. Q&A with DEIP Secretariat

Panel – DEIP Secretariat

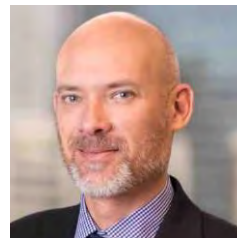
Market
bodies



Ed Chan
AEMC



Matt Armitage
AEMO



Mark Feather
AER



Phil Blythe
ESB

Workstream
leads



Anthony Seipolt
Dynamic Operating Envelopes



Kate O'Callaghan
Electric Vehicles



Lachlan Blackhall
Interoperability

slido

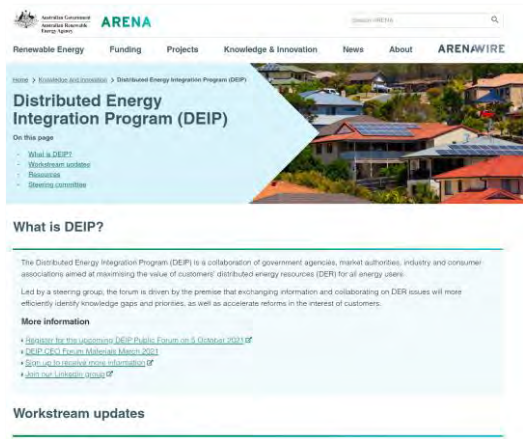


Audience Q&A Session

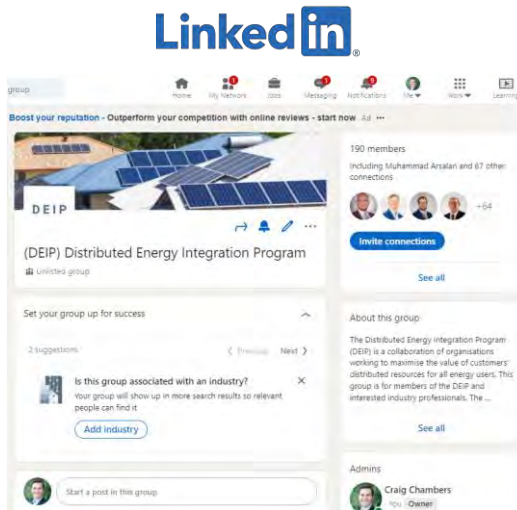
① Start presenting to display the audience questions on this slide.

Further feedback or information

How to stay involved and connected with DEIP



<https://arena.gov.au/deip>



<https://www.linkedin.com/groups/10414227/>



DEIP@arena.gov.au