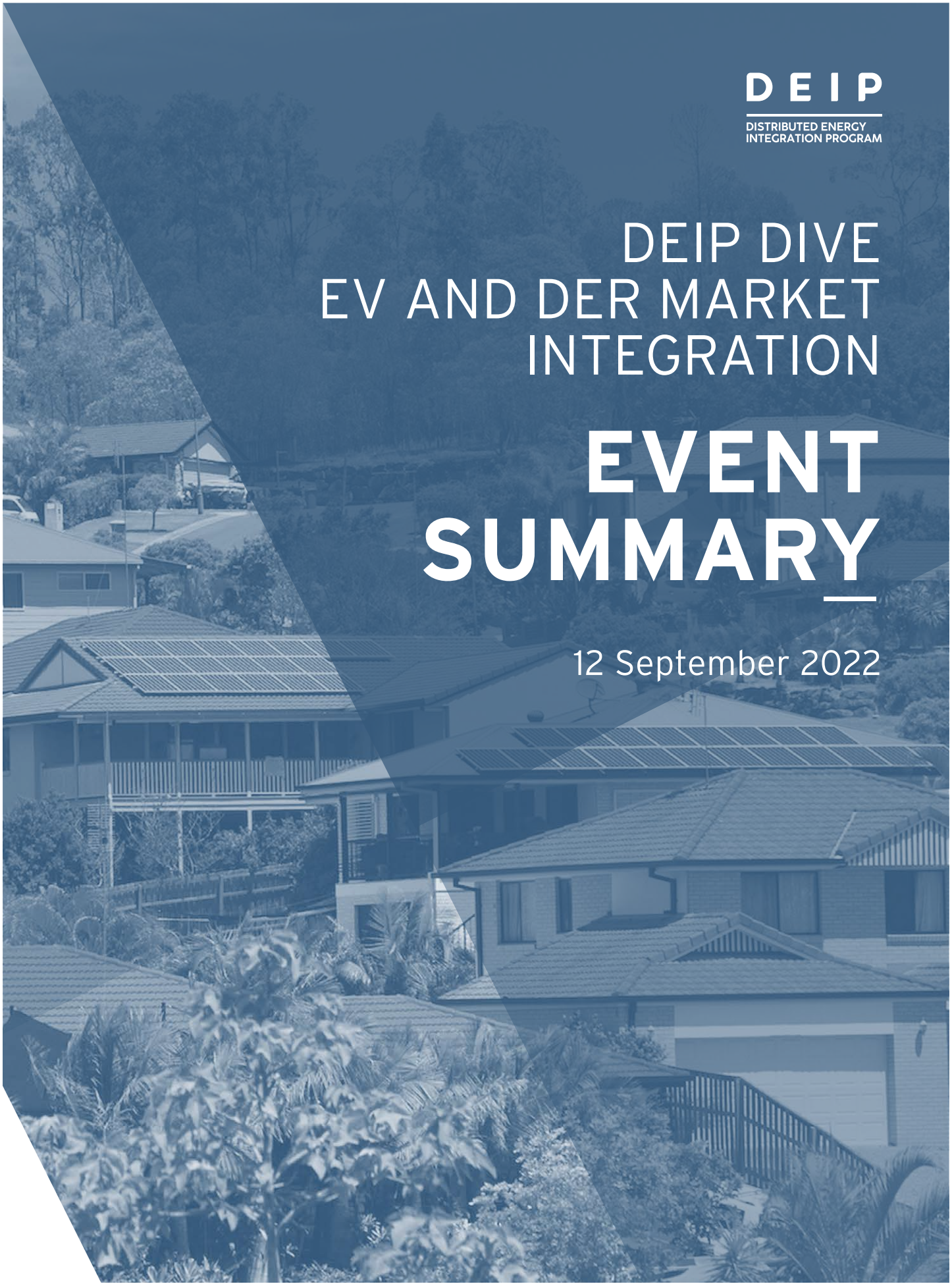


DEIP
DISTRIBUTED ENERGY INTEGRATION PROGRAM

DEIP DIVE
EV AND DER MARKET INTEGRATION

EVENT SUMMARY

12 September 2022

Australian Government
Australian Renewable Energy Agency

ARENA

Australian National University

Battery Storage and Grid Integration Program

CONTENTS

INTRODUCTION

On 12 September 2022, the Australian Renewable Energy Agency (ARENA) and the Australian National University (ANU), on behalf of the Distributed Energy Integration Program (DEIP), brought over 130 people together in Canberra to explore DER integration Australia's energy system.

The Distributed Energy Integration Program (DEIP) is a collaborative forum of government agencies, market authorities, peak industry bodies and consumer associations working together to maximise the value of distributed energy resources (DER) for all energy users.

› Learn more about DEIP

The ANU opened proceedings with a plenary session that explored the role of public interest technologies in the energy system. Session 1 was split into two streams and shared insights into ARENA's smart charging EV portfolio and DER market integration trials.

The EV Integration Stream shared knowledge on how technology, service providers and end users can unlock the full economic and grid benefits of vehicle-to-grid services. The DER Market Integration Stream shared the latest developments from DER market integration trials investigating how DER can operate and deliver services in energy markets.

Session 2 explored the role of EVs and DER in future energy markets and systems. Using an interactive format and panel discussion, participants shared insights, experiences, and perspectives on this theme from multiple dimensions, including the roles of value, trust, data, and technology integration.

This document summarises key themes and takeaways from the DEIP Dive. Presentations and supporting reports from the day are on ARENA's Knowledge Bank at arena.gov.au/knowledge-bank/

DEIP Dive event.

PLENARY SESSION

OPENING REMARKS

The role that technology will play in the 21st century cannot be overstated. Whilst technology can provide a myriad of benefits to society, the role of governance overarching these new technologies can be some of the most challenging questions of our time. These questions require the interplay of technologists and social scientists working together in the interests of the public good. Setting the scene for the day, the plenary session explored the emerging topic of public interest technologies and the energy sector.

ANU Opening Remarks – Lachlan Blackhall, BSGIP

Lachlan Blackhall, Head of Battery Storage & Grid Integration Program (BSGIP) at the ANU, presented the opening remarks on behalf of the ANU. Foreshadowing his later keynote address, Lachlan emphasised the importance of bringing together different entities and consortia to successfully navigate the present challenges pertaining to DER integration, as well as the energy transition more generally. He highlighted the critical role of social sciences in this transition in its ability to engage the public and thereby ensure the inclusion of everyone in society during this period of rapid 'socio-technomic' change.

DEIP Opening Remarks – Rachele Williams, ARENA

Rachele Williams, General Manager of Project Delivery at ARENA, presented the opening remarks on behalf of DEIP. Rachele highlighted the invaluable role of DEIP in bringing together key representatives from across the energy sector to collaborate on pre-policy outcomes and address the knowledge gaps and challenges of DER integration. Referencing the recent turbulent times within the electricity market, she noted DEIP's importance in meeting the present appetite for change and committed DEIP to ensuring that everyone across the energy system is included in the transition towards net zero.

KEYNOTE ADDRESS

Hedda Ransan-Cooper, Research Fellow at the ANU, presented the keynote address alongside Lachlan Blackhall, which focused on the importance of social sciences in the energy transition.

Keynote speakers Lachlan Blackhall (BSGIP ANU) and Hedda Ransan-Cooper (BSGIP ANU) joined by facilitator Rachele Williams (ARENA, centre).

PRESENTATIONS

Lachlan Blackhall

Entrepreneurial Fellow and Head, BSGIP ANU

Lachlan Blackhall began by describing the energy transition as a journey, not a destination, and emphasised the importance of the methodologies used to achieve outcomes. He identified public interest technologies as a model example due to the alignment of the technology and social science perspectives to produce something that is designed and regulated in a way that protects and improves the lives of people. He described three challenges facing the incorporation of public interest into technology:

1. Technologists have insufficient **training** to understand how to include public interests into their technological designs, leading them to neglect the social considerations of socio-technomic change.
2. The energy industry lacks sufficient **diversity** to ensure the inclusion of everyone in the energy transition.
3. There is insufficient inclusion of **social sciences** within the broader energy framework, leading to outcomes that are commercially viable but at odds with public interest technology outcomes, such as equity issues and distrust in the energy sector.

Lachlan concluded by encouraging the greater inclusion of social dimensions in the energy transition, such technology that complements community interests rather than commercial interests.

Hedda Ransan-Cooper

Research Fellow, BSGIP ANU

Presentation: What is 'social' about the energy transition?

Hedda Ransan-Cooper reinforced Lachlan Blackhall's comments and emphasised the role of social sciences in understanding contestation and conflict, anticipating issues, and delivering public benefit. Hedda argued that ignoring these three themes will obstruct the uptake of energy technologies and inhibit consensus and confidence in the broader energy sector. Hedda introduced 'social imaginaries' as an important technique for future-proofing technology by formalising policies, practices and approaches into a dynamic social process. She described three imaginaries relating to DER integration:

1. **Swarm** imaginary, in which all individuals are connected and absorbed into a single unified energy system, requiring them to cease control of their individual DER resources.
2. **Autarky** imaginary, in which individuals possess off-grid homes that rely minimally on the broader energy system.
3. **Local autarky** imaginary, in which individuals are included within local collectively owned energy systems which visualises energy as an essential service.

Hedda argued that understanding the underlying assumptions and social implications of each imaginary is critical for planning how people, businesses and government can come together to make this energy future transpire.

SESSION ONE: REAL-WORLD INSIGHTS

EV GRID INTEGRATION STREAM

Facilitated by Monika Leliard (ARENA), Chair of the DEIP EV Workstream, this stream presented lessons and analysis from ARENA's EV smart charging portfolio. Energeia, ARENA's knowledge sharing agent for the EV portfolio, began the session with aggregated insights from early trial data on smart charging performance, customer behaviour and value. Throughout the session, representatives from each project – Rob Colson (AGL), Jeremy Marks (Origin) and Saad Akbar (EV Grid) – provided additional insights and knowledge gained from their real-world trials.

The smart charging session was followed by a presentation from Laura Jones (ANU) about the Realising Vehicle-to-Grid Services project, which aims to unlock the full economic and grid benefits of V2G services in Australia. Laura presented an overview of the various challenges experienced in this first-of-its-kind V2G project in Australia, followed by a panel Q&A session.

PRESENTATIONS

Eric Kotopoulis

Managing Consultant, Energeia

Presentation: L2 Charging Data Key Insights – Knowledge Sharing

Monika Leliard (ARENA) and speaker Eric Kotopoulis (Energeia)

- Analysis of the aggregated baseline charging behaviour across the trials indicates that customer charging profiles are more evenly distributed across the day, rather than condensed into the evening peak as is generally assumed. The analysis further shows that customers with rooftop solar PV aim to coordinate their EV charging with the solar peak, and that customers naturally avoided the evening peak by plugging their EVs in around 9pm and charging overnight.
- Customer engagement in the trials is very high and, as such, opt-out rates from the trials are very low. Early evidence suggests that the incentives offered in various experiments undertaken in the trials are yielding the desired results, whether that was shifting charging to off-peak times or participating in managed changing events.

- Analysis of the aggregated data identified a noticeable spike in EV charging immediately following the curtailment of charging during evening peaks.
- The preliminary trial results appear to be promising in terms of their ability to demonstrate effective managed charging. However, notable caveats to the data are the nature of the trial participants, which represent a relatively homogenous demographic of early EV adopters. Furthermore, baseline data was largely gathered towards the end of 2021 and early 2022 when COVID-19 restrictions, including work-from-home recommendations, were in place in most of the geographies represented in the data.

Laura Jones

Senior Analyst, ANU

Presentation: The Bumpy Road to V2G

Monika Leliard (ARENA) and speaker Laura Jones (ANU)

- The V2G trial has overcome several technical and regulatory challenges and has yielded interesting insights into effectively communicating and managing the value V2G can provide for a fleet.
- The process of obtaining the chargers themselves, as well as the certification process to enable FCAS services, has been challenging and time consuming.
- Interesting behavioural and operational insights have been gained into how various fleets are managed, and the opportunities and challenges it poses for the potential of V2G in providing FCAS services.

Learn more about ActewAGL Realising Electric Vehicle-to-Grid Services.

PANEL DISCUSSION

Panel members Rob Colson (AGL), Jeremy Marks (Origin), Saab Akbar (EVGrid), Laura Jones (ANU) and Monika Leliard (ARENA) joined by panel facilitator Eric Kotopoulis (Energeia).

- The panel discussed some of the challenges to the roll-out of managed chargers to the mass market, including the cost of managed chargers. The panel agreed that technology innovation may be able to reduce the cost to customers. The panel also noted that tariffs need to be appropriate to facilitate the mass roll-out of managed chargers.
- The panel agreed that effective communication and customer relations strategies are needed to maintain the same level of engagement as experienced in the trials.
- The panel reiterated the barriers needed to overcome before V2G technology is widely implemented, including technical standards, complexity of DNSP integration, and the value proposition for customers whilst balancing range anxiety and battery warranty, as well as the current prohibitive cost of chargers. It was noted that anecdotally the panel have seen evidence of interest from customers for vehicle-to-home capability and discussed the possible of there being more value in these capabilities for residential customers than for commercial customers.

Find out more about the ARENA-funded projects and available resources from this session:

- Origin Energy Electric Vehicles Smart Charging Trial
- AGL Electric Vehicle Orchestration Trial
- Jemena Dynamic Electric Vehicle Charging Trial

DER MARKET INTEGRATION STREAM

Facilitated by Caitlin Sears (ARENA), Chair of the DEIP Markets Workstream, this stream presented an overview of a suite of end-to-end market integration trials and pilots testing how DER can deliver services and operate in energy markets, all while adhering to the physical limits of the system and ensuring that consumers' needs and preferences are satisfied.

Mitch O'Neill from Grids Energy opened the stream with a brief overview of the DER market integration trials and their respective approaches to DER integration. Nick Regan, Business Lead for Project EDGE at AEMO, delved into the integration of DER to provide wholesale services and local network support using Project EDGE's local services exchange. Andrew Blaver, Program Manager for Project Symphony at Western Power, shared lessons from the WA policy landscape, particularly regarding the roles and responsibilities necessary for DER orchestration and integration. Alida Jansen van Vuuren, Head of Distributed System Operations at Ausgrid, discussed the impact of network services on VPPs and the development of Project Edith's dynamic network pricing. Eddie Thanavelil, Future Networks Portfolio Lead at Evoenergy, shared insights into the evolution of shaped operating envelopes from Project Converge.

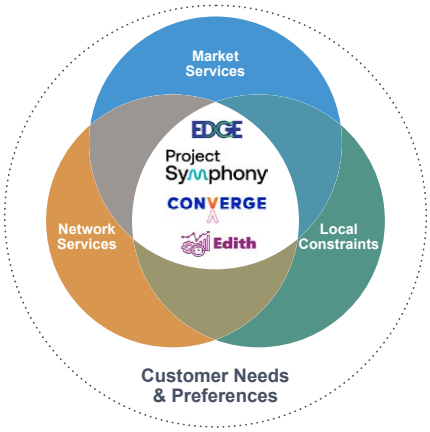
PRESENTATIONS

Mitch O'Neill

Principal Consultant, Grids Energy

Presentation: DER Market Integration

DER Market Integration Stream.



- Areas of commonality between trials and pilots tend to be where there has been a large amount of industry collaboration and common understanding, such as the use of dynamic operating envelopes (DOEs) for communicating local network hosting capacity, and the Common Smart Inverter Profile Australia (CSIP-AUS) as a protocol to communicate that capacity.
- Areas of diverging approaches between the trials occur in less explored areas, such as how network services are procured or whole-of-system data architectures.

Read the DEIP DER Market Integration Summary Report.

Nick Regan

Business Lead for Project EDGE, AEMO

Presentation: Project EDGE (Energy Demand & Generation Exchange)

Nick Regan joined by Project EDGE partners John Theunissen (AusNet Services) and Anoop Nambiar (Mondo).

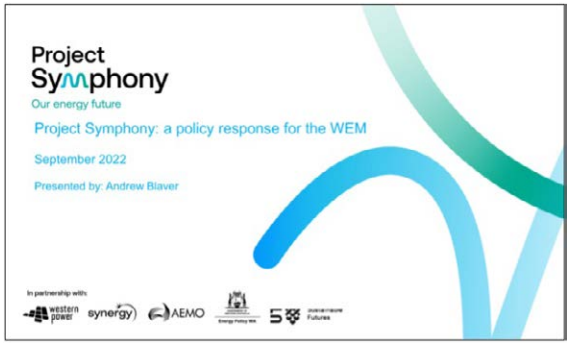
- Project EDGE is trialling a two-sided DER marketplace designed to provide evidence-based insights for reforms in line with the National Electricity Objective (NEO).
- A key aspect of Project EDGE is exploring how different parties can exchange data with each other, and to test the hypothesis that a data hub that allows parties to connect once is more efficient and preferrable at scale to alternative architectures such as point-to-point with standards.
- Project EDGE is testing both centralised and decentralised data hubs for data exchange between industry participants – the centralised data hub is conceptually similar to AEMO's existing e-Hub, while the decentralised data hub allows many parties to host the hub as a 'node', and data can be sent to any node in the system and then forwarded to the intended recipient.
- Efficient data exchange poses a challenge to the scalability of the trial. The aggregators' ability to access and exchange data in a reliable and cost-effective way is key.
- Another challenge to scaling the trial is the use of dynamic operating envelopes (DOEs), including deciding how to allocate the available capacity. Project EDGE is exploring a variety of allocation methods and early modelling indicates that maximising services based on DOE methods resulted in improved outcomes for all customers, not just customers with DER.

Learn more about AEMO Project EDGE.

Andrew Blaver

Program Manager for Project Symphony, Western Power

Presentation: A Policy Response for the WEM



Andrew Blaver (Western Power) joined by panel members Eddie Thanavelil (Evoenergy) and Alida Jansen van Vuuren (Ausgrid).

- The key point of divergence for Project Symphony is its geographical perspective, which is focused on the isolated and self-reliant wholesale electricity market (WEM). Energy retail the WEM is State-owned, and thus energy policy is uniquely positioned to set guidelines for which DER can be integrated. This contrasts to the NEM, where energy policy typically lags commercial development.
- Project Symphony stands out by embedding policy into the pilot, which has led to the efficient development of clear guidelines surrounding DER integration and regulation.
- Project Symphony is focused on customer engagement and social science research as part of the pilot. The customer engagement models encourage customers who have invested in DER assets to come with the network on a journey.
- Project Symphony has been able to connect with customers by comparing DER service provision to the 'Uber model' of monetising an unused asset. This requires significant trust from the customer, as they must have confidence that the network is utilising their asset with their best interests in mind.

Learn more about Western Power Project Symphony.

Alida Jansen van Vuuren

Head of Distributed System Operations, Ausgrid

Presentation: Project Edith

Alida Jansen van Vuuren (Ausgrid).

- A key point of differentiation lies in Project Edith's innovative economic model. The dynamic tariff offers pricing signals that reflect the current operational conditions on the network, letting customers know where and when it may be high or low cost to use the network.
- Dynamic pricing is supported by dynamic operating envelopes (DOEs) which provide the guardrails with respect to network limits. Customers can opt in to a subscription which provides a minimum DOE based on their DER capabilities need for certainty.
- Aggregators are not dispatched by the DNSP, but would simply take the prices and DOEs into account when making bids/offers in markets.

Learn more about Ausgrid Project Edith.

Eddie Thanavelil

Future Networks Portfolio Lead, Evoenergy

Presentation: Project Converge

Eddie Thanavelil (Evoenergy).

- Project Converge is focused on network and grid optimisation to increase the benefits created by DER without breaching the physical and operational limits of the distribution network. Two of the tools being tested are shaped operating envelopes (SOEs) and a real-time RIT-D system.
- SOEs represent an incremental change from DOE architectures and approaches – they can anticipate the rapid scale up of energy demand, preferentially allocate network capacity to certain DER assets according to the price of energy, maximise the amount of energy a VPP can provide, improve network congestion management, and improve DER market bidding.
- Project Converge anticipates SOEs will play a significant role in lowering the cost of energy and improving operating capacity of the network. While DOEs will likely be suitable for most customers, SOEs have the potential to deliver additional value and maximise capacity allocation for those customers who wish to take up the offer.
- Project Converge is also exploring a 'real-time RIT-D' process which may result in the more cost-effective procurement of non-network solutions for smaller constraints. This includes identifying opportunities for DER to provide network support in a shorter time, streamlining commercial engagement processes, and improving operations of constraint management mechanisms.

Learn more about Evoenergy Project Converge.

PANEL DISCUSSION

Panel facilitator Andrew Fraser (ANU)

- The panel discussed the common space that these projects are working in, and all the threads therein, and that there is **no one-size-fits-all solution** to DER integration. The solution will likely comprise the best ideas from all trials. The panel agreed on the benefits of each trial focussing on a niche element (as opposed to simple replication) to test and compare the various approaches and solutions to DER integration.
- The panel highlighted the **importance of sharing knowledge** and lessons with one another as we all work towards the same goals and are striving to overcome similar challenges. There was agreement on the need for all industry parties and jurisdictions to make time to self-organise, come together, and collaborate on solutions. The panel discussed the need to publish pragmatic, accessible documents that provide relevant and valuable information to the various industry segments. Active involvement of the trials in sharing their real-world lessons with policy makers was also discussed as critical to supporting policy makers making informed decisions about the future of DER integration.
- The panel agreed that consumer needs and preferences are central to the success of DER integration and optimisation. Traditional marketing and engagement strategies will need to be refined, and **simplicity and transparency are fundamental to building customer trust**. The panel discussed the large focus on social science research in their respective trials and the various approaches being trialled for customer onboarding and engagement.

SESSION TWO: FUTURE ENERGY SYSTEMS

The final session invited participants to explore practical and philosophical questions relating to the future of DER integration. Using an interactive format, participants shared insights, experiences and perspectives on the role of EVs and DER in future energy markets and systems from multiple dimensions. Discussion topics included the roles of trust and values in the energy industry, as well as the importance of data management and privacy. Table discussions were followed by a panel which relayed the key themes and takeaways from each table.

Panel members Phillipa Watson (ANU), Laura Jones (ANU), Emma Fagan (Tesla), Lachie Simpson (Telstra) and Marlon Leicester (Reposit Power) joined by facilitator Rachele Williams (ARENA).

KEY TAKEAWAYS

- Australia's energy system is moving from a traditional system with unidirectional flows and relationships to a more complex environment, for both the providers and consumers of electricity. This presents a new opportunity for more participation from consumers, but to achieve this requires industry to support and **enable trust, information and value** in the evolving system.
- Effective communication will be underpinned by reliable data, for which the first step is to achieve consistency over what is available. Whilst Australia has good data transparency, there is still work to be done to enable consistency and reliability of this data to maximise the benefits at a reasonable cost. **Consistent and accurate data will help deliver effective communications** to build the knowledge and trust consumers need.

- Technology is playing a critical role in the transition, but with it come risks that need to be managed to **avoid unintended negative consequences**. Ensuring interoperability, enabling the right technical standards, and strengthening cybersecurity measures are critical to maintaining a safe and reliable energy system, whilst balancing cost and ensuring consumers have both an understanding and trust in the system.

SITE VISIT TO THE DERLAB

Facilitated by BSGIP ANU, attendees toured the state-of-the-art testing facility which mirrors the energy grid.

Learn more about BSGIP and the DERlab.

Site visit to the DERlab (ANU).

Visit ARENA's **Knowledge Bank** to learn more about the featured projects and access supporting reports and resources from the DEIP Dive.

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