

DEIP

DISTRIBUTED ENERGY
INTEGRATION PROGRAM

DEIP DIVE 2023

EVENT SUMMARY



Australian Government
Australian Renewable
Energy Agency

ARENA

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GLOSSARY

A/Prof	Associate Professor
AEMO	Australian Energy Market Operator
AI	Artificial intelligence
ANU	Australian National University
ARENA	Australian Renewable Energy Agency
C&I	Commercial and industrial (consumers)
CCS	Carbon capture and storage
DCCEEW	(Commonwealth) Department Climate Change, Energy Efficiency and Water
DEIP	Distributed Energy Integration Program
DER/CER	Distributed and consumer energy resources
DOE	Dynamic operating envelope
DMO	Distributed market operator
DSO	Distributed system operator
EV	Electric vehicle
FCAS	Frequency control ancillary services
ICE	Internal combustion engine
MVa	Megavolt-amp
NEM	National Electricity Market
NMI	National metering identifier
OEM	Original equipment manufacturer
OT	Operational Technology
PV	Photovoltaic
R&D	Research and development
SOE	Shaped operating envelope
UK	United Kingdom
USA	United States of America
V2G	Vehicle-to-grid
V2X	Vehicle-to-everything
VAC	Volts alternating current
VDC	Volts direct current
VPP	Virtual power plant
WEM	(Western Australian) Wholesale Electricity Market

INTRODUCTION

On 26 July 2023, the ARENA, on behalf of the DEIP, brought together 160 delegates in Sydney to explore the opportunities and challenges of integrating DER/CER into Australia's energy system.

The DEIP is a collaborative forum of government agencies, market authorities, peak industry bodies and consumer associations working together to maximise the value of DER/CER for all energy users. DEIP does this through research and consultation, and knowledge and resource sharing between members. The aim is to support a distributed energy system that is secure, reliable, affordable, and efficiently integrates DER/CER the benefit of all Australians.

› [Learn more about DEIP](#)

The annual DEIP Dive is an opportunity for representatives across the energy sector to come together to share their latest insights and discuss solve emerging challenges of an increasingly distributed electricity system.

This document summarises the key themes and takeaways from the 2023 DEIP Dive. Presentations and supporting reports from the day can be found linked throughout this document and are also available on ARENA's Knowledge Bank at arena.gov.au/knowledge-bank.



Audience participation during the keynote address.

KEYNOTE ADDRESS

› Keynote presentation



Keynote speaker Heather Smith.

HEATHER SMITH

Energy specialist and community energy expert, changing weather.

Heather Smith is an electrical engineer and energy futures specialist whose passion for community energy is underscored by a belief that we can find better ways to harness the power of markets and communities to deliver better outcomes for all Australians. In 2016, Heather was awarded a Churchill Fellowship to explore governance and community energy and travelled to the USA, Germany, Denmark, UK and Japan to investigate the changes in electricity markets that are being stimulated by community-led energy initiatives.

Heather's international experiences informed her keynote address, which explored how history, culture and institutions inform our energy systems and drive change. Heather shared valuable case studies demonstrating how those communities drove change within their unique contexts. She noted that Australia is currently at our own transformative crossroads characterised by rapid change and significant uncertainty. To ensure that this new future both includes and benefits all Australians, Heather encourages us to move at the speed of trust and work with communities to build a cooperative future.

ELECTRIC VEHICLES STREAM

› [See the EV Stream presentations here](#)

SESSION 1: V2X



Panel Members Laura Jones (ANU), Mahdi Jalili (RMIT), Chris Munnings (Engie) and Jon Sibley (enX).

The first session of the EV Stream explored the potential benefits of bidirectional charging and the challenges facing widespread adoption. Jon Sibley (Director, enX) opened proceedings with a presentation on key insights from a [new study](#) on the potential of V2X, which explored the value of V2X for consumers in different jurisdictions and outlined priorities for unlocking this value domestically. Jon noted that Australia has the potential to be a leader in V2G adoption due to our high uptake of solar PV and smart metering, advanced tariffs and strong consumer sentiment. To reach this potential, we must chart a course for standardisation, develop an Australian test scope, support product certification and improve network collaboration on tariff reform.

Jon's presentation was followed by a panel session with Laura Jones (Lead Analyst, ANU), Christopher Munnings (Technical Director of Green Mobility, Engie) and Mahdi Jalili (A/Prof AI and Electrical Engineering, RMIT). Key insights from the panel discussion include:

- The panel considered a question relating to the necessity of V2X and agreed that we have a responsibility to use resources to their utmost potential, and in the context of EV batteries, this includes utilising bidirectional charging to the value of all energy consumers.
- The panel was asked for a realistic timeframe on the mass commercial viability of V2X in Australia. The panel indicated that 2025 was the projected go-live date for CCS-based

V2X and that this was also the likely timeframe that testing standards, commercial availability and vehicle OEMs will be similarly ready. The panel also noted we will likely see a tipping point that all these standards fall into place and we will witness a rapid acceleration of uptake.

- The panel discussed how telematics show that, as expected, EV use is highly unpredictable. In an ideal world, EVs would charge in the middle of the day, so while the easiest approach would be to have resources scheduled, it is unclear whether this would be socially or practically feasible. The solution is likely to include EVs and other DER/CER in a VPP that can be regulated.
- The panel was asked why bidirectional chargers were so expensive relative to ordinary chargers, which the panel attributed to a combination of the hybrid inverter technology, including a two-way power conversion and galvanic isolation, plus the associated costs of R&D and marketing.
- The panel considered what an ideal bidirectional network tariff would look like and agreed that a tariff that charges users for increasing grid costs and passes on cost savings to users who decrease grid costs would be ideal.
- The panel was asked whether battery degradation was a significant concern for potential V2X consumers, with the panel noting that while it depends on the frequency and load of power the consumers draws, that in typical V2X long duration storage the power draw is not excessive and therefore EV battery degradation isn't a material technical concern.



Audience participation during the EV V2X session

SESSION 2: SMART CHARGING

Session two explored the real-world insights from three ARENA-funded smart charging trials. Monika Leliard (Senior EV Policy Officer, DCCEEW) opened with a brief overview of ARENA's smart charging trials prior to each of the project representatives sharing key findings from their respective trials.

Rob Colson (New Energy Projects, AGL) presented findings from the [AGL EV Orchestration Trial](#), which demonstrated a range of smart and managed charging solutions. Rob outlined key insights, including the difference in charging behaviours on the weekend and weekday, in households with PV and without PV, in regional and urban areas, and with more and less expensive vehicles.

Jeremy Marks (Product & Innovation Manager, Origin) shared the latest insights from the [Origin EV Smart Charging Trial](#), including the demonstrated benefits of, and barriers to, controlled smart charging for consumers. They identified that the standardisation of the ecosystem is a priority to improve the performance of hardware and software associated with smart charging and that there is a small window of opportunity to inform consumers of the benefits of smart chargers.

Rohan Smith (Marketing Manager, Jemena) presented insights from the [Jemena Dynamic Electric Vehicle Charging Trial](#), which demonstrated the use of hardware-based smart charging directed by signals from networks, as opposed to electricity retailers, with the aim of understanding consumer willingness for managed charging. Rohan noted that while the trial produced positive insights into managed charging and consumer behaviour, it was limited by connectivity issues with Wi-Fi and chargers and the homogeneity of participants, most of whom were energy-aware high-income earners.



Panel members Eric Kotopoulis (Energieia), Jeremy Marks (Origin), Rob Colson (AGL) and Rohan Smith (Jemena) (left to right).

The presenters then joined a panel session where they discussed the impact of EV charging on the evening peak load and the grid, consumer attitudes towards controlled charging, and potential incentives for the support of smart charging.

- The panel considered the possibility that we may create an artificial overnight peak if we shift load to night and agreed that middle of the day charging, while more difficult to coordinate for residential dwellings, is ideal. They contemplated different types of incentives that could be structured to produce different results and noted that staggered starts to avoid overnight peaks would be a good area for future trials to explore.
- The panellists was asked to reflect on whether smart charging is necessary given that phone applications exist that do almost the same job. The panel noted that both can co-exist and ultimately it depends on the level of autonomy the consumer wants. The AGL EV Orchestration Trial revealed that 84% of consumers were happy with the smart charging plan and would participant it again, however, managed charging may no longer be necessary with the expansion of in-vehicle apps.
- The panellists shared their experiences with consumer feedback, with Jemena noting that large numbers of consumers opted out when they weren't home and AGL noting that early adopters were so engaged that staff responsible for communication had to increase their contact with participants.



SESSION 3: PUBLIC CHARGING

The final EV session of the day focussed on the topic of public charging. The session began with a presentation by Eric Kotopoulos (Managing Consultant, Energeia) who presented the latest analysis of data retrieved from ARENA's ultra-fast charging networks. Dan Gillick (Delivery Manager, Engie) followed with a presentation on lessons learned from the fast charging roll-out, focussing particularly on ways in which we can further promote accessibility, reliability and convenience for EV charging.



Audience participation during the EV Public Charging session

Following the presentations, facilitator Alex Grant (Business Development, ARENA) led a discussion between panellists Ross De Rango (Head of Energy and Infrastructure, Electric Vehicle Council), Dan Fish (EV Technical Specialist, EV Fire Safe) and Shawn Ticehurt (Director, IAG) on the opportunities and challenges of EV charging infrastructure in multi-occupancy homes.

- Panellists were asked whether EVs pose a higher fire risk and responded that, assuming all standards are met, EVs pose no more of a risk than any other electrical appliance, as they have in-built protection measures to avoid overheating, leakages, etc. The panellists did note, however, that there are some differences between EV and ICE vehicle fires, such as a higher heat release rate in EVs, and therefore different measures may be needed for emergency services to control EV fires. The panel noted that some states have mitigated this by requiring blue stickers be placed on EVs to help emergency services identify them in emergencies.
- Panellists were asked to comment on the importance of recycled batteries, with the panellists noting that EV batteries are expected to outlast the car and can be recycled or used as stationary storage devices as their performance begins to decline. This may be an area for future exploration and trials.

MARKETS STREAM

› [See the Market Stream presentations here](#)

SESSION 1: CONSUMERS



Panel members Josh Newton (Deakin), Jon Dore (Ausgrid), Anna Brandsma (Synergy) and Salman Stevenson (Evoenergy) joined by facilitator Phillipa Watson (ANU) (left to right).

The first session of the Markets Stream explored the latest social science research uncovered by the four market integration trials - AEMO [Project EDGE](#), Ausgrid [Project Edith](#), Western Power [Project Symphony](#) and Evoenergy [Project Converge](#). Building off last year's DEIP Dive, which provided an overview of the projects, this year's stream provided a deeper dive into key findings in relation to consumer engagement, values, and preferences. The session began with rapid fire presentations on project social science findings, followed by a panel discussion.

PROJECT EDGE

Josh Newton (A/Prof, Deakin University) presented on their comprehensive study into consumer priorities and questions arising from the Project EDGE social research, finding that potential consumers are interested in how VPPs can maximise the financial value and reliability of their assets. The presentation discussed the potential benefits of data transparency, including the availability of real-time information for consumers, networks and DSO/DMOs about VPP activity.

PROJECT EDITH

Jonathon Dore (DSO Services Lead, Ausgrid) presented the latest insights from Project Edith as the trial scales up. Project Edith is exploring dynamic network pricing that use time- and location-specific incentives to allow unused network capacity is available for DER/CER use by considering the cost to serve and operate the network based on operational conditions.

Project Edith is keenly interested with balancing broader community considerations into the project, such as ensuring efficiency, equity and transparency without burdening consumers with excess information or the network with complexity.

PROJECT SYMPHONY

Anna Brandsma (Senior Product Manager DER, Synergy) from Project Symphony reflected on the importance of transparency, timely communication and engagement for the pilot's success with consumers. Project Symphony revisited its engagement approach between Phase 1 and Phase 2 of the pilot, with the introduction of dedicated communication tools to keep consumers' informed and engaged. Project Symphony credited this as a key factor behind the improved consumer experiences between the two phases of the pilot.

PROJECT CONVERGE

Salman Stevenson (Lead Future Network Engineer, Evoenergy) from Project Converge outlined the two distinguishing features of the project and how this impacts consumers. Firstly, while the use of SOEs has not been noticed by consumers, the project team predict that SOEs will be critical to supporting the equitable roll out of DER/CER. Secondly, the combination of opt-in and opt-out consumer recruitment has greatly increased participation, whereby one-third of consumers opted into the trial and two-thirds were automatically included with the option to opt-out.

PANEL SESSION

- The panel highlighted the most common mistakes the energy sector makes about consumers, including remembering that real people are behind these assets, assuming consumers don't know what they want, and remaining disconnected from consumers. The panel noted that two-way flow of information with consumers is essential.
- The panel considered the regulatory challenges of flexible pricing arrangements and agreed that industry should prioritise exploring ways to use pricing to unlock consumer flexibility before network augmentation, and to ensure oversight and transparency of price changes for consumers.
- The panel reflected on how the industry can build trust with consumers beyond those the early adopter segment of the pilots and trials. The panel agreed there is a balance needed between information that is robust and complete, and information that is accessible.
- The panel shared differing views on the priorities of future investments, with one panellist maintaining that investment in long-term energy storage would solve a lot of existing problems, and another believing that more money should be dedicated to marketing and engagement programs to improve the relationship between the industry and consumers, while another believed that investing in research into social equity is an immediate priority.
- The panel agreed that mandatory changes for VPP consumers are a considerable risk to trust and transparency in the absence of education and a careful conversation around balancing energy network and consumer needs.

SESSION 2: RETAILERS AND AGGREGATORS

The second session of the Markets Stream discussed the role of retailers and aggregators in the scaling of advanced VPPs and DER/CER market integration.



Anoop Nambiar (AusNet) presenting on Project EDGE.

PROJECT EDGE

Anoop Nambiar (Distributed Energy Lead, AusNet) findings from Project EDGE that while aggregators' bidding and dispatch can conform to the export and import limits at each NMI, forecasting DER/CER behaviour at the NMI level is computationally expensive and translating this to a fleet-level response requires significant optimisation to scale to hundreds of thousands of consumers. Anoop shared that while it is easy to look at this as a technical problem, we must also consider how we can create social licence and further involve consumers.

PROJECT EDITH

Alan Reid (Head of Operations, Reposit Power) discussed the key role of retailers and aggregators in articulating the value proposition of VPPs to consumers in a way that is simple and accessible, and talked about the importance of mutual benefit sharing between all parties throughout the value chain.

PROJECT SYMPHONY

James Giblin (Head DER and OT Technologies, Synergy) shared findings from Project Symphony that DER/CER can be orchestrated to provide network services, and while the trial experienced was some failure rate in the provision of market services initially, its

optimisation has improved over time. Project Symphony also observed that the consumer journey is becoming increasingly complex, which the pilot mitigated by ensuring a consistent message was shared with consumers throughout the product chain.

PROJECT CONVERGE

Richard Vowles (Head of Sales, Evergen) shared key challenges and opportunities Project Converge had identified in relation to harnessing interoperability to ensure consumers have access to services that suit their needs and aligning the business priorities and models of networks and retailers to integrate a broad product strategy.

PANEL DISCUSSION

- The panel agreed that VPP orchestration is attractive to retailers and aggregators because retailers can control spot market exposure through negative prices and orchestration provides a lower cost portfolio to all consumers.
- The panel contemplated how we can help consumers better understand these emerging technologies and agreed that we must start with the value proposition by emphasising how those benefits will make a difference to their everyday life or expenditure.
- The panel highlighted that setting realistic expectations about the value of VPPs with consumers is essential to ensuring they have a positive experience with these new products and services.



Audience participation during the Markets Integration Retailers and Aggregators session

SESSION 3: WHAT'S NEXT

This session examined the future of DER/CER market integration by exploring the gaps between these projects and the emerging challenges of scale-up.



Eddie Thanavelil (Evoenergy) sharing the latest insights from Project Converge.

PROJECT EDGE

Luke Barlow (Group Manager Future Energy System, AEMO) identified two key areas of development for Project EDGE: the first being the progressive adoption of DOEs and emergency backstops across distribution networks, and the second being the improvement of secure, standardised and reliable data sharing across industry to support DER/CER participation.

PROJECT EDITH

Jonathon Dore (DSO Services Lead, Ausgrid) emphasised that Project Edith is in the process of scaling up its operations, with the goal of reaching 1,000 consumers by 2024 and reaching maturation by 2029. The project is in the process of scoping activities to better understand the interaction between consumer and dynamic network prices, investing in core dynamic services and investigating required rule changes.

PROJECT SYMPHONY

Andrew Blaver (Head of Changing Energy Solutions, Western Power) stated that by 2027 Project Symphony seeks to achieve scalability. This will require ensuring that the pilot is not only technically feasible but viable, sustainably financed and with consumers participating in multiple services. To achieve this, a key priority is to quantify and communicate the actual value of VPPs to the market and consumers.

PROJECT CONVERGE

Eddie Thanavelil (Future Networks Portfolio Lead, Evoenergy) discussed how Project Converge is in the process of developing a real-time investment decision framework that will help inform network investments by providing transparency on the location of DER/CER and network constraints. Project Converge will also be moving to a merit order-based allocation of DOEs with the aim of exploring diverse ways of shaping DOEs.

PANEL SESSION

- The panel was asked what level of engagement we are seeing in relation to the wholesale demand response mechanism from C&I consumers. The panel revealed that while there is growing interest in the mechanism, C&I consumers are concerned about the downstream impact on their assets and customer base. The panel also discussed a trend towards the uptake of dynamic connections by C&I consumers, such as the connection of assets or augmentation of the network.
- The panel discussed the merits of flexible imports, noting that more work is needed to define the concept and explore the opportunities, consequences and alternatives to imports. The panellists agreed that flexible imports may offer potential benefits consumers but these are yet to be fully explored.
- The panel discussed ways the NEM can build the same level of cohesion, momentum and urgency around the scalability of DER/CER market integration similar to what has been created in the WEM. The panel agreed that while the NEM lacks some of the policy and regulatory opportunities of the WEM, the NEM benefits from hosting a diverse range of product offerings, participants and a larger grid. Panellists agreed that the most significant barrier currently facing DER/CER market integration in the NEM is reaching agreement between the policy, regulatory and market bodies on what the future looks like.



Audience engagement and participation in the final Markets Integration session

SITE VISIT: NEXT GENERATION BUS DEPOT

On 25 July, the day before the DEIP Dive, delegates had the option to tour the innovative Leichardt Next Generation Electric Bus Depot trial in Sydney's inner west. The trial showcases 40 electric buses coupled with smart charging software, on-site solar PV and battery storage.

The tour was led by Zenobe Energy, the battery storage group delivering the project in conjunction with Transgrid. Attendees were awarded an explanation of the display data at the bus depot, revealing a range of information on the buses charging state and potential range. Participants then explored the charging station and saw 31 400VAC chargers and five 150-950VDC dual gun chargers, which could charge two buses at the same time. Finally, participants visited the 1.5MVA substation and the underground inverters.

› [Learn more about the Next Generation Bus Depot trial here.](#)



Attendees at the Leichardt Next Generation Electric Bus Depot site visit.

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