

ARENA Insights Forum Presentation Summaries & Key Points - DER Stream

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Australian Government
Australian Renewable
Energy Agency

ARENA

During the past seven years, ARENA has invested \$1.4 billion in accelerating Australia's uptake of renewable energy. One of the greatest returns we have on this investment is a wealth of knowledge that can help shape new business models and key market reforms in the energy sector.

Sharing knowledge effectively to fast track industry development is central to our mandate. Guided by this, we brought together 200 people from across the energy industry to share project insights and discuss topical themes.

The ARENA Insights Forum was held on 25 June 2019 and was split into two streams: large scale projects and distributed energy resources (DER). This summary presents the key messages and discussions during the DER stream, which focused on virtual power plants (VPPs), DER integration, and demand response (DR). Links to presentations on our Knowledge Bank are provided throughout.

SESSION 1: VIRTUAL POWER PLANTS: CREATING VALUE, OVERCOMING CHALLENGES AND WHAT COMES NEXT?

Session one explored the early successes, challenges and next stages of integrating VPPs into the grid. The session opened by introducing the audience to two projects exploring innovative ways that VPPs can provide value to local communities.

Key Takeaways:

- While VPP technology is developing rapidly, the technology is still in the early stages of development, and considerable education is needed along the value chain.
- Complex information and data sets across the industry need to be unified into formats that are best received by customers. The VPP sales process is resource-intensive and increased education with more accessible information can help make the industry more efficient.
- The industry requires hardware and connectivity standards, however, due to the fast paced development of the new technologies, these standards risk being outdated quickly.

Greg Abramowitz, Manager - Market Development, AGL: 'The Virtual Power Plant in South Australia'

- Defining and stacking VPP value streams in an equitable and efficient manner remains a nascent capability for the industry, but offers a lot of promise for customers. The sector continues to grow and learn quickly, including understanding what fleets of diverse DER assets can do and the value they can deliver to customers, networks and the market.
- The [AGL VPP project](#) has witnessed strong community interest and experienced swift customer uptake as a result of targeted marketing campaigns and attractive price offerings.
- There is still a lot to learn regarding attractive pricing strategies, as residential storage systems remain a considerable investment for households in spite of generous subsidies.
- AGL's sales process revealed a customer knowledge gap and a need to increase educational material on both residential storage and VPPs for customers.
- As a key installation quality metric, it's important to get battery metering right, as battery performance relies heavily on site metering. Installers that are proficient across multiple hardware types are highly valuable but relatively rare resources.
- The early stage of the VPP hardware market is such that most players use proprietary protocols for interconnection via API, though this is likely appropriate to the early stage of the market, with industry-wide standards beginning to garner significant support from all market sectors.

Mitch O'Neill, Strategy Lead, Reposit Power:

'Virtual Power Plants - Creating value, overcoming challenges and what comes next?'

- Reposit's Canberra VPP has been delivering frequency control ancillary (lower) services (FCAS) since December 2018, and can also provide fast FCAS at 20 millisecond metering.
- Forecasted dispatch doesn't always accurately reflect actual dispatch for a number of reasons, including inconsistent installation processes, variability in technology capabilities between proprietary systems, and accurate visibility in the grid.
- Improving visibility and coordination of small-scale batteries and PV is an essential first step to ensuring systems respond appropriately to network needs. Unorchestrated systems can be a disservice to the grid, with self-serving pricing algorithms causing systems to import during load shedding events.
- Coordinated systems can provide valuable ancillary services to the grid, such as stabilising grid frequency; however, the current AEMO processes make them unable to participate in FCAS raise markets. Next generation, fast-speed inverters are needed for future services.

Panel Q&A Key Takeaways

Panel Facilitator: Emma Fagan (Tesla)

Panel Members: Matt Armitage (AEMO), Bruce Thompson (GreenSync), Ben Wilson (Simply Energy), Dr Bryn Williams (SA Power Networks), Lorraine Akiba (former Commissioner - Hawaii Public Utilities Commission)

- Communication barriers continue to present a major challenge for many retailers, installers and customers, such as communicating how VPPs provide additional value to pre-existing rooftop PV systems.
 - A challenge to overcome is building and maintaining customer trust throughout the entire process of sales, installation, operations and troubleshooting.
- Installers are recognised as essential intermediaries between networks, retailers and customers, as they often have the most contact with households. Informative and reliable installation processes are therefore an essential first step in developing trust with customers, educating customers on the technology and value of DER and VPPs, and creating positive feelings about VPP participation.
- There is an ongoing need for hardware and connectivity standards to facilitate interoperability and orchestration, yet swiftly advancing technologies present the risk of quickly outdated standards. Therefore, a careful balance between regulation and market freedom needs to be considered to ensure the industry can remain agile and effective.
- The next big challenge is investigating how to unpack the complexity of VPP technology into a simple customer offering that reduces costs for all customers, not just those with installed DER.

SESSION 2: DER INTEGRATION: CHALLENGES AND OPPORTUNITIES

Session two explored the challenges and solutions of DER integration into the grid. The session was introduced by two ARENA-supported projects which presented their successes and lessons learnt on innovative methods for DER integration.

Key Takeaways:

- Data opportunities and challenges continue to be a major source of discussion, from accessibility, capture and collection, privacy and trust, formatting and use, and storage. It was widely agreed that the next steps involve improving data systems.
- Increasing DER penetration and two-way operational flows now require distribution businesses to have greater visibility over their networks to manage operational conditions and make informed decisions about planning and connections, network management, and investment.
- Building and maintaining trust with customers, and ensuring all end-users receive equal value in the DER transition, may require government intervention with standards and regulations.

Olav Krause, Senior Lecturer, University of Queensland:

'Solar Enablement Initiative - Distribution State Estimation'

- The University of Queensland have [applied a proven state estimation technique \(SEA\)](#) that assists distribution businesses by generating an estimate of the operational conditions and performance of their network (e.g. voltage, power losses, marginal loss factors).
- This increased visibility of the networks can facilitate higher DER penetration in the grid by allowing distribution networks to adopt a less conservative approach to assessing and approving additional DER connections.
- The project involves three network providers, each selected for having very different measurement systems at the transmission level and requiring a range of network topologies.
- The project delivers real-time value for distributors with informed and improved operational decision making (e.g. dynamic export/import limits, controllable network devices), and future value for assessing asset utilisation and connection applications, assisting regulatory compliance and reporting, and informed planning and investment.

Scott Ferraro, Program Director, Monash University:

'Monash Smart Energy City: Creating Grid Interactive Precincts (Monash Net Zero Initiative)'

- With an annual electricity consumption of almost 100 GWh, Monash University's [Net Zero Initiative](#) plans to reach net zero emissions by 2030 through a combination of purchase power agreements (PPAs) with renewable energy generators, electrifying operations to move away from natural gas, and integrating its own DER assets into an intelligent energy network that enables the university to have more control over its electricity generation and use.
- The [Indra Monash Microgrid](#) incorporates 20 buildings across the Clayton campus with diverse energy load profiles and 3.5 MW peak demand, alongside 1.5 MW of solar capacity, electric vehicle charging, and a 1 MWh battery storage system - one of the largest behind-the-meter batteries in Australia.
- The smart microgrid is designed to work in three layers - DER integration, active grid management, and transactive energy management - to deliver value to all microgrid participants.
- The next stage of the project involves integrating the remaining DER, developing a building flexibility strategy, and assessing cybersecurity needs.

Session Panel Q&A Key Takeaways

Q&A Panel Facilitator: Craig Chambers (ARENA)

Q&A Panel Members: Rachel Bunder (Solar Analytics), Carolyn Moore (CSIRO), Laura Jones (TasNetworks), Bill Tarlinton (Zepben), Lawrence Law (RACV)

- Effective engagement with customers and expectation management is needed to help them understand the value (e.g. VPPs) and the costs and impacts of DER penetration on their households, communities and local network service providers.
- A result of the limited community awareness surrounding DER technology, services and integration is that households are also unaware of the opportunities and risks involved in data collection, use, and storage. However, the industry needs to be savvy when communicating legitimate data concerns with customers to manage undue customer concern about scenarios that are unlikely to eventuate.
- Opportunities for networks to invest in data collection and quality without increasing operations costs include: installing sensors, appropriately valuing data services to build better business cases, and better understanding the critical mass of data necessary to achieve the same outcome.
- The next big challenge is developing innovative solutions to appropriately value DER services.

SESSION 3: DEMAND RESPONSE: RERT & BEYOND

ARENA introduced session three with the latest successes and lessons learnt from the joint [ARENA and AEMO Reliability and Emergency Reserve Trader \(RERT\) trial](#). The audience was able to engage with representatives from a number of ARENA-supported DR projects in two Q&A panels - residential DR and commercial DR.

Key Takeaways:

- The proponents of the RERT trial successfully delivered a combined average of 355 MW of reserve capacity across the two years of testing periods, which is exceeded their contracted megawatts by 107%.
- Ongoing work is needed to effectively engage with customers. Research and experience from the trial suggest that various recruitment methods and retention incentives are needed to inspire different customer segments to participate in DR programs.
- There is still room for improvement - RERT systems are in their infancy in the Australian market and human, technology and communication errors do occur.

Kiya Taylor, Knowledge Sharing Manager, ARENA: [‘Demand response RERT trial’](#)

- The Demand Response RERT trial is a joint initiative between ARENA and AEMO, with the NSW Government providing support to state-based projects. The initiative was launched in 2017 and is scheduled to operate for three years until 2020.
 - Eight businesses were selected to deliver short-term demand response capacity in 10 projects targeting residential and commercial and industrial (C&I) customers across New South Wales, Victoria and South Australia.
- The ARENA / AEMO RERT trial has shown that proponents can successfully recruit and mobilise their DR programs when called upon with short notice - Year 1 delivered an average 164 MW against a contracted 143 MW goal across the two trial periods, while Year 2 achieved an average of 191 MW for the two testing periods compared to the 188 MW contracted.
- Behavioural DR (BDR) programs typically delivered higher levels of customer participation than controlled load programs due to a combination of factors, such as mitigating the necessity for program-specific technology (e.g. controllable air-conditioning units, retrofitting household equipment, challenging standards) and a sense of autonomy perceived by the customer over their energy use.
 - However, the trial reinforced the concept that both BDR and controlled load programs have strengths and weaknesses that are suitable to different situations.
- Commercial and industrial (C&I) participants often need little additional incentives to participate in DR programs, as there is already a strong business case.
 - However, each C&I participant has unique operating environments that influence if, how and when they participate in DR activations.
- Further details can be found in the [Demand Response RERT Trial Year 1 Report](#) available on the [ARENA Knowledge Bank](#), along with the Knowledge Sharing Reports from each of the trial proponents.

Session Panel Q&A Key Points: Residential DR Panel

Q&A Panel Facilitator: Kiya Taylor (ARENA)

Q&A Panel Members: Lauren Kane (Powershop), Rob Colson (AGL), John Riedl (Pooled Energy), Dan Adams (Amber Electric), Steven Humphries (AEMO), Tim Hoban (Monash University)

- Customer communication needs to be tailored to different demographics and customer segments in order to educate and engage customers on the technology and benefits of DR.
 - Communicating the post-event results to individual residential customers can be challenging for a variety of reasons, including restricted access to data and challenges with baselines.

- The extreme conditions necessary for a RERT event to be called are largely due to supply shortages, so AEMO's preference is to have the market solve this before intervening with RERT activations - the fewer activations that are called the better, as a RERT event indicates market failure.
- BDR programs have the potential to empower customers to increase ownership of the energy usage and can create a more engaged customer base; however, relying on BDR exclusively for load management may not lead to the best outcome due to a poor understanding of motivations and incentive structures by industry.
- Building trust and receiving a social licence to automatically operate household equipment is essential to the success of direct load control (DLC) programs.
 - Experience has shown that residential customers are supportive of DLC, so long as they're not being significantly impacted and their comfort remains high.

Session Panel Q&A Key Points: Commercial DR Panel

Q&A Panel Facilitator: Jon Sibley (ARENA)

Q&A Panel Members: Liz Fletcher (Flow Power), Christine Young (EnergyAustralia), Mark Mignone (InterCast & Forge), Rodney Bray (United Energy), Lance Hoch (Oakley Greenwood)

- Installing rooftop PV systems and PPAs are not suitable for some businesses, so there is a strong business case for many C&I customers to participate in DR programs, especially those that are high energy users and their competitiveness is impacted by rising electricity prices.
 - Additional incentives are not always needed for C&I customers that are proactively responding to market signals, and so the role of retailers is to enable and inform C&I customers to participate.
- Before considering whether to participate, C&I customers should consider whether the business activities are suited for DR, what technology is needed to participate and whether participation will significantly disrupt business productivity and delivery of products and services.
 - There is commonly a disconnect in incentives between the executive level and operations level of businesses, such that it is important to secure support along the management line - from the chief financial officer, to procurement and sales, to on-site operations managers - in order for participation to be successful and valuable.
- DR can deliver value for networks service providers - the most obvious being increased capacity - however, as networks are currently limited to charging customers for load (and not export), significant regulatory changes are needed to unlock the value for networks.
- Voltage reduction trials are best suited for intermittent and situational use, as permanently and equally reducing the voltage across the network can create new difficulties, such as increased current that impacts network assets and areas falling below the operational envelopes.

