ARENA

ARENA INSIGHTS SPOTLIGHT: STATE OF DER TECHNOLOGY INTEGRATION: AN INTERVIEW WITH FARRIERSWIER

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Australian Government
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INTRODUCTION

In 2020, ARENA engaged farrierswier and GridWise Energy Solutions to examine the capabilities of 45 distributed energy resource (DER) projects and their contributions to the Australian power system.

Developed through consultation with leading organisations and subject matter experts across Australia, the study identifies and categorises what is required to integrate DER technologies into Australian electricity markets in a way that benefits all consumers.

The work focused on the technological aspect of integrating DER devices, how they communicate and connect with the electricity system, the data and evidence needed to understand how they behave, and the types of services they can offer to the energy market.

The final result, the State of DER Technology Integration report, provides a common framework through which various stakeholders can assess technology integration progress and challenges. The report also identifies how the projects will advance maturity for each functional area upon completion.

In this interview, lead authors Robert McMillan and Richard Owens from farrierswier discuss the approach, findings and impact of the State of DER Technology Integration report, as well as what challenges the industry can expect as Australia's power system continues to become increasingly decentralised.

INTERVIEW WITH:

ROBERT MCMILLAN AND RICHARD OWENS
DIRECTORS AT FARRIERSWIER

ARENA: WHAT MAKES THIS WORK IMPORTANT TO THE AUSTRALIAN ELECTRICITY SECTOR?

FARRIERSWIER: This work provides a valuable stocktake of what is needed and where we are in terms of integrating DER technology into the distribution and bulk power systems. Working with key organisations and leaders in their respective fields of this integration challenge, we were able to bring together all pieces of the technology integration puzzle.

This holistic and collaborative exercise allowed us to identify, label and describe the key aspects of the technology and data needed for effective DER integration. We could then map existing work against this integration framework to test progress and identify interdependencies.

ARENA: WHAT WILL DER TECHNOLOGY INTEGRATION MEAN FOR CUSTOMERS?

FARRIERSWIER: The aim of all of the policy, regulatory, academic and commercial attention going into DER integration should be to ensure that all customers benefit from Australia's transformation in how customers source, store, use and share electricity. Our work therefore adopted the same integration objective that market bodies are using for their DER integration work, namely: '*to enable DER to be utilised efficiently to maximise the benefits for all consumers regardless of whether they have DER*'.

We worked with Energy Consumers Australia to identify and describe the DER integration consumer benefits, explain who these accrue to, and then list them in our final report against each of the functional framework integration topics. The benefits of DER technology integration (whether they are realised by all consumers or those who chose to participate in DER) stem from removing barriers and limits to DER participation, increasing the benefits that consumers can realise from participating and by enabling DER to reduce total system costs for all consumers.

ARENA: HOW CAN GOVERNMENT AND INDUSTRY STAKEHOLDERS USE THE INTEGRATION FRAMEWORK AND CURRENT MATURITY FINDINGS?

FARRIERSWIER: We see the greatest value in use from this report being the role our DER technology functional framework can play in ongoing sector coordination. We all recognise that DER integration is complex and requires coordinated effort across many technical disciplines, diverse stakeholders, and multiple limbs of government.

Coordination requires common understanding and consistent communication. The framework can help by:

- Supporting policy work to be grounded in a robust understanding of the physical systems and data required for DER integration
- Enabling proponents of integration initiatives to explain the contributions of their work
- Allowing governments and funding bodies to identify capability areas of relative immaturity or critical constraint that warrant greater focus.

ARENA: WHAT IMPACT DO YOU HOPE THIS WORK WILL HAVE ON INDUSTRY?

FARRIERSWIER: We hope this work will help stakeholders to see who is currently doing what for advancing DER integration, how it all fits together, and what areas need more attention and effort.

We also hope that policy makers and market bodies will be able to see the current status of the technology preconditions for some of the reforms they are contemplating, as well as the impacts those reforms can have on the services DER can provide and incentives for providing those services.

ARENA: STAKEHOLDER ENGAGEMENT WAS CENTRAL TO THIS WORK. WHY DO YOU THINK IT WAS SO IMPORTANT?

FARRIERSWIER: Broad stakeholder engagement was critical to this work. The desired outcomes of the work and getting across the detail of the 45 sampled projects necessitated extensive engagement. However, it was also important because many stakeholders are already working on aspects of integration and yet they may often only be viewing integration from their own sometimes narrow lens. A huge amount of work is underway on DER integration issues, but most people aren't aware of all of the work that is being done by others.

We identified many ways this project could have attempted to break down and organise the DER integration functional framework. Stakeholder feedback showed that the appeal of different framework designs often depended on how each stakeholder interacts with the existing electricity supply chain.

Our engagement helped us establish a 'capabilities view' of what's needed for effective DER integration, and avoid the traditional linear supply chain view. Our resulting functional capabilities reflect how the one-to-many integration needs of DER will often break the traditional linear supply chain. This will increasingly require parties and energy assets who have not previously interacted directly with each other to do so.

ARENA: WHAT DO YOU FORESEE AS THE SEQUENCE OF MATURITY FOR THE FUNCTIONAL AREAS OVER THE NEXT 5 – 10 YEARS?

FARRIERSWIER: We hope to see advancement in those functional areas that are foundational to other integration capabilities. In particular:

- Communications and interoperability is the least mature integration topic. Yet having interoperability between devices and between devices and systems will be critical to realising DER's grid support capabilities and to trading DER services with networks and energy markets. For these reasons, we hope to see the sector focus near-term effort on agreeing what information will be exchanged and how, deploying data exchange technology, and establishing DER cyber security capabilities.
- DER visibility is a precondition for DER modelling, network hosting, protection and control, and distribution system reliability and power quality. While we saw lots of small-scale trial projects for DER visibility, DER visibility needs to become business-as-usual for networks and the market operator. Current rule changes being considered by the AEMC could advance this through explicit recognition of export services by updating service definitions and adding new obligations and planning requirements. AER guidance on cost-recovery for networks' DER integration investments and operations should also help advance the deployment of this capability.

We note that the objective is not to achieve full maturity in all areas as soon as possible across all parts of Australia. An assessment of costs and benefits is required to assess whether it is efficient to close identified maturity gaps. We expect the efficient level of maturity that assessment will vary across different locations and functional areas depending on factors such as the level of DER penetration.

ARENA: WHAT EMERGING CHALLENGES DO YOU SEE AS HAVING THE MOST IMPACT ON INTEGRATING DER INTO THE POWER SYSTEM?

FARRIERSWIER: Maintaining system security whilst transitioning to a world where millions of customers with DER will affect that security and the costs of achieving it, will necessarily present challenges. In the past we controlled generation to meet largely unconstrained load. The growing scale of DER fundamentally challenges that paradigm.

Key challenges, beyond the foundational capabilities flagged in the question above, stem from the likely path dependency and geographic variation in the way some capabilities are achieved and the extent of maturity needed. These challenges reflect the fact that:

- The nature and extent of customer participation in DER markets and the business models that will facilitate that participation are highly uncertain, yet these will affect the scale and cost efficacy of a range of capabilities. This challenge is driving opposing schools of thought between mandating device capabilities and facilitating DER service markets.
- Future market reforms currently being progressed by the ESB, AEMC and AEMO will affect the optimal mix of integration capabilities, particularly those that are affecting the services DER can provide and the incentives for providing those services.

Further information is available at
arena.gov.au

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