



Australian Government  
Australian Renewable  
Energy Agency

**ARENA**

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Ed Chan  
DER Integration - Updating Regulatory Arrangements  
Australian Energy Market Commission  
[www.aemc.gov.au/contact-us/lodge-submission/...](http://www.aemc.gov.au/contact-us/lodge-submission/...)

GPO Box 643  
Canberra ACT 2601  
Tel: +61 2 9243 7773  
ABN: 35 931 927 899  
[www.arena.gov.au](http://www.arena.gov.au)

## **ARENA submission to Updating DER Regulatory Arrangements Rule Change Consultation Paper**

This submission reflects insights from projects funded by the Australian Renewable Energy Agency (ARENA) as relevant to the AEMC Distributed Energy Resources (DER) Regulatory Arrangements Rule Change consideration. Overall, ARENA supports the characterisation of the issues and approach presented in the AEMC consultation paper.

The 2020 Integrated System Plan's high DER scenario factors in rapid growth in DER including up to 43 GW of behind the meter solar and storage capacity by 2035 (i.e. equivalent to current NEM peak demand). Under all ISP scenarios, DER contributes significantly to reliable and affordable supplies of electricity. ARENA's DER trials and studies are testing ways to maximise the benefits from the significant customer-led investment in DER. ARENA agrees that the rules do not appropriately reflect the role of networks as facilitators of the supply of electricity and system services from low voltage (LV) customers to the broader market. This rule change process is an opportunity to address this issue and make the overall network access arrangements for DER future-ready.

It is appropriate to consider two-way tariffs where they reflect genuine cost pressures for a network business in facilitating a particular level of service and where new cost recovery approaches can deliver more efficient and fairer outcomes for consumers. It is important to acknowledge, however, that many parts of the LV network retain significant hosting capacity and as such, we expect that costs associated with facilitating DER exports (or other DER services) should be locationally specific, and comparatively low, in most cases.

Given that facilitating exports does not constitute an 'essential service' for customers (as opposed to ensuring reliability of supply) there seems little in-principle justification for 'postage stamp pricing' to recover the costs of hosting capacity improvements. DER customers will generally have smart meters which support more dynamic incentive arrangements and ideally, any export pricing will be able to evolve over time to reflect the location and timing of network constraints. This will support efficient investment *and* operational signals for DER and ensure

the best use of existing hosting capacity. ARENA projects are demonstrating how DER can respond to time and locationally varying price signals and operating envelopes issued by a distribution business. [Attachment A](#) provides summaries of selected projects with further relevant projects expected to be announced in the coming weeks. Our projects indicate that it will likely be retailers and aggregators, rather than customers themselves, that manage the additional associated complexity.

It is important that this reform process considers the challenge and opportunity of DER integration into networks holistically and produces a flexible framework for DER access and pricing that is able to support efficient investment in the long term. The rule changes put forward constitute a range of closely related reforms to network access arrangements for DER. We support the AEMC's approach to dealing with these changes as a package.

ARENA acknowledges the highly constructive engagement between the AEMC and industry and community stakeholders through the Distributed Energy Integration Program (DEIP) Access and Pricing working group process that has resulted in these rule change proposals being brought forward. Further outcomes from this consultation process are summarised in the Outcomes Report.<sup>1</sup> We look forward to continuing to contribute to this important reform agenda through DEIP and the rule change process.

Also as a result of the DEIP Access and Pricing workstream, ARENA is supporting the AER-led Value of DER (VaDER) Study. Updates to AER guidelines that result from this work will support networks when determining the business case (market benefit) for increasing hosting capacity.

## About ARENA

The Australian Renewable Energy Agency (ARENA) was established in 2012 by the Australian Government. ARENA's function and objectives are set out in the *Australian Renewable Energy Agency Act 2011*.

ARENA provides financial assistance to support innovation and the commercialisation of renewable energy and enabling technologies by helping to overcome technical and commercial barriers. A key part of ARENA's role is to collect, store and disseminate knowledge gained from the projects and activities it supports for use by the wider industry and Australia's energy market institutions.

Please contact Jon Sibley, Principal Policy Advisor ([jon.sibley@arena.gov.au](mailto:jon.sibley@arena.gov.au)) if you would like to discuss any aspect of ARENA's submission.

Yours sincerely

Darren Miller  
Chief Executive Officer, ARENA

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<sup>1</sup> <https://arena.gov.au/knowledge-bank/deip-access-and-pricing-reform-package-outcomes/>

## Attachment A - Summary of selected DER orchestration projects

These projects illustrate the range of innovative strategies that have emerged to manage DER integration including where they will respond to locational and/or realtime price signals or operating envelopes. Further related projects are due to be announced in the coming weeks.

Project	Summary
<a href="#">State of DER Technical Integration Study</a>	<p>ARENA is working with farrierswier and GridWise Energy Solutions to develop a framework and maturity assessment that helps industry stakeholders better understand the breadth and nature of key ARENA and non-ARENA distributed energy resource (DER) projects.</p> <p>This technical integration focus should complement the AEMCs consideration of changes to network access and cost recovery regulatory frameworks and illustrate how innovative technology is likely to respond to changes in incentives and facilitate efficient outcomes. It will also compare the maturity of alternative approaches networks could use to enhance, or make better use of existing, hosting capacity for DER.</p>
<a href="#">CONSORT Bruny Island Battery Trial</a>	<p>The primary task of the Network Aware Coordination (NAC) is to automatically coordinate household energy systems in a non intrusive way, enabling them to adhere to and alleviate network constraints. NAC consists of algorithms, techniques, and software for automatically coordinating DER in a way that both respects network constraints, and minimises the total cost to the network provider and the DER owners. In effect, it achieves optimal power flow for the distribution system. The NAC preserves participants' privacy and agency, and implements a distributed algorithm that enables it to scale to larger problems.</p> <p>The Bruny Island trial effectively demonstrated this approach to manage high renewable penetration and other constraints at a much lower cost than is conventionally possible. The NAC technology has been designed to not just solve the Bruny Island problem, but to also expand to a larger range of network conditions, to different types of DER including electric vehicles, and to enable load flexibility to the wider wholesale markets.</p> <p>See the <a href="#">NAC report</a> and <a href="#">Reward Structures report</a> for more information.</p>
<a href="#">University of Tasmania Optimal DER Scheduling for Frequency Stability project</a>	<p>This active project builds on the findings from the CONSORT Bruny Island Battery trial to demonstrate the frequency response capabilities of a range of inverter-interfaced DER and flexible loads, and the extent to which they can assist with frequency stability in power systems with decreasing conventional generation. The project will also develop optimisation software that enables fleets of DER in distribution networks to be operated so that this frequency response can be enabled while simultaneously respecting the physical constraints and limitations of distribution networks. Finally, the project will establish methods for and thus provide insights into how fleets of aggregated DER might actively participate in energy and FCAS markets in Australia so as to allow their frequency response capabilities to be harnessed in future.</p> <p>During the first year of the project, the team developed detailed models of inverter power electronics control for a number of DER types and inverter-controlled</p>

	<p>resistive loads. The models demonstrated the capability to provide fast responses with less frequency deviation and smaller settling time, particularly in power systems with decreasing levels of physical inertia. The project team is also developing network constrained bidding optimisation strategies to support and coordinate the participation of aggregators of DER in the electricity (wholesale energy and frequency reserve) markets.</p>
<p><a href="#">Zepben evolve DER project</a></p>	<p>This active project is developing mechanisms to orchestrate the operation of DER assets by continuously providing 'operating envelopes' to the DER assets via integration with aggregator systems. The project includes integrating Zepben's existing Energy Workbench platform with DNSP partner systems to obtain MV and LV network models and measurement data that will be used as inputs into the algorithms to calculate the operating envelopes. The operating envelopes will ensure that the secure technical limits of electricity distribution networks are not breached, and will allow for greater integration of DER assets into the grid.</p> <p>A common information model (CIM) standard-based data platform (designed to marshal network asset models and data) has been developed and made available via open source: <a href="https://bitbucket.org/account/user/zepben/projects/OS">https://bitbucket.org/account/user/zepben/projects/OS</a> <a href="https://zepben.bitbucket.io/docs/cim/zepben/">https://zepben.bitbucket.io/docs/cim/zepben/</a></p> <p>Zepben's principle project partner, the ANU, is building the aggregator-facing API that will be used to register DER assets with the evolve platform, as well as designing the operating envelope engine. The first end-to-end testing commenced in July 2020.</p>
<p><a href="#">Solar Enablement Initiative</a></p>	<p>Queensland University of Technology led a consortium of technology specialists and DNSPs to build tools to forecast solar exports as an input into constraints calculations using limited and dispersed data sets. The project focused on increasing the visibility of distribution networks to enable DNSPs to approve more customer photovoltaic connections. It developed the state estimation algorithm (SEA) to identify network operational conditions. SEA was trialled on seven medium voltage (MV) distribution feeders in South-east QLD, VIC and TAS using MV level data. The project helped DNSPs operate their networks more effectively to maintain safe loading of their distribution networks and facilitate more efficient network investment planning decisions.</p>
<p><a href="#">AEMO VPP trial</a></p>	<p>The AGL VPP is a centrally-managed network of behind-the-meter battery systems that can be controlled to deliver multiple benefits. The battery is charged and discharged to maximise the benefits to the consumer, while ensuring that the network and retailer can also realise value from the battery during specific network or wholesale events. The ability of the VPP to realise multiple benefit streams can ultimately reduce the costs of the system to the end customer, while reducing the energy charges of all grid uses by making the most efficient use of the battery as a DER.</p> <p>AEMO's <a href="#">first lessons learnt report</a> illustrates how the AGL VPP provided fast FCAS response during three frequency events last summer. Other registered FCAS aggregators are demonstrating the ability of DER to respond to locally detected frequency events while optimising benefits for end-customers. Although FCAS is not the subject of the current review, this demonstrates the versatility of DER in terms of being able to respond to dynamic network pricing.</p>

<a href="#">Realising Electric Vehicle-to-grid Services (REVS)</a>	<p>The REVS project will install 51 bi-directional chargers and deploy a fleet of 51 V2G capable vehicles in the ACT. A system will monitor charger and vehicle availability, as well as a range of electrical parameters, which will enable the delivery of market contingency Frequency Control Ancillary Services (FCAS) at a fleet scale.</p> <p>This project focuses on demonstrating frequency support services from EVs including 6-second raise/lower services. EVs could be well suited to providing contingency response considering they are based on capacity payment rather than requiring continuous battery cycling. The project demonstrates that EVs could be a contributor to frequency stability including in major under frequency events. This could, in principle, be extended to UFLS if appropriate incentives were created.</p>
<a href="#">Solcast - Gridded Renewables Nowcasting Demonstration over South Australia</a>	<p>Solcast aims to enhance existing weather forecast services by demonstrating a forecasting tool which will track and predict renewable output in real time. Solcast's forecasting tool will aim to predict up to six hours ahead in five-minute increments, distributed into 1-2km grids across SA.</p> <p>With regard to the DER standard proposal, this project is developing the ability to predict the net solar generation at the substation level thereby informing dynamic power system management strategies, without the need for device-level real-time telemetry. Solcast's progress to determine the spatial distribution of installed distributed &gt;30MW solar PV capacity across South Australia will be published by the end of July). This forecasting approach can utilise static data collected through the DER Registry.</p>
<a href="#">Reliability and Reserve Trader (demand response) Trial</a>	<p>In 2017, ARENA and AEMO entered into a Memorandum of Understanding to jointly develop 'proof of concept' demand response projects to enhance energy reserves. While not focussed on system security, the project highlights that incentives can be effective in enabling fast-acting demand response and some of the issues associated with recruiting, retaining and measuring capacity across different market segments.</p> <p>The role of demand response, and demand side management more broadly, will become an increasingly important resource for the power system in the transition to renewables, including in managing minimum demand, frequency and voltage issues. DER standards are likely to realise the economic potential benefits of demand response in enhancing system security unless corresponding incentives are established (E.g. incentives to address minimum demand and UFLS issues).</p>