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ARENA submission to the Select Committee into Fair Dinkum Power

Thank you for the invitation to provide a submission to the Select Committee into Fair Dinkum Power. This submission provides background information and insights from projects funded by the Australian Renewable Energy Agency (ARENA) as relevant to the Committee's terms of reference.

In summary -

- ARENA acknowledges the focus on consumer-owned energy assets like solar, batteries and demand response. While these resources can be higher cost than large-scale resources, they have the potential to provide a wide range of services including, for example mitigating peak demand and voltage issues on low voltage networks.
- Distributed energy resources (DER) such as residential solar and battery systems are forecast to constitute a significant share of new generation investment. Customer investment patterns are being shaped by a range of market signals, including electricity tariffs, that may not be sustainable in the long term. Important reforms are being developed to ensure DER services can be more fully valued. It is also important to ensure the cost of using the electricity network to import or export electricity is fairly allocated and encourages efficient end-user behavior.
- The technology and regulatory solutions required to support very high penetrations of renewable energy are at very different stages of maturity. ARENA is working with industry stakeholders through the Distributed Energy Integration Program (DEIP) and investing in studies and proof-of-concept demonstrations to smooth the transition to higher penetrations of DER in the grid.

About ARENA

ARENA was established to make renewable energy solutions more affordable and to increase the supply of renewable energy in Australia.

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.

DER can provide valuable services to the grid

ARENA recently published a report, *Empowered Consumers: Distributed Energy Resources Portfolio Update* which we commend for the Committee's consideration.¹

ARENA's interest in DER is based on an expectation that a large amount of solar PV and distributed batteries are likely to be deployed in Australia. Our efforts are focussed on making the best use of these resources and addressing broader system costs associated with their uptake.

Flexible resources like batteries, demand response and smart solar inverters can be aggregated to form virtual power plants (VPPs) which can provide a range of services including:

- Smoothing out network peak and minimum demand
- Managing network voltage to keep it within standard limits
- Providing support to wholesale markets during periods of tight supply-demand balance
- Providing power system security services such as contingency Frequency Control Ancillary Services (FCAS)
- Increasing the self-consumption of roof-top solar to reduce customer energy and network charges.

It is important to note that not all forms of DER are equally valuable to the power system or their owners. For example, ARENA's experience is that while small scale batteries can provide valuable services to the grid, upfront costs are unlikely to be repaid over the useful life of the batteries with revenue streams currently available. Conversely, while the services that can be provided by rooftop solar are more limited, they are generally more cost effective for customers due to their relatively low capital cost and because of the way retail tariffs are structured.

DER can provide consumers with a sense of empowerment and can contribute to lowering their power bills. Certain premium battery configurations can also provide backup power supplies. The contribution of DER to reducing system costs is a more complex story and is the subject of a number of recent reviews and reform processes. ARENA trials have demonstrated that emerging DER technologies and business models give consumers more choice and control over their energy usage. When combined with more variable and locationally specific energy

¹ https://arena.gov.au/assets/2018/10/AR_024_DER-Portfolio-Update.pdf

pricing or incentives, to incentivise efficient energy use, they can provide valuable support to the grid.

ARENA has recently led the formation of the Distributed Energy Integration Program (DEIP) which is a collaboration of government agencies, market authorities, industry and consumers groups aimed at maximising the value of customers' DER for all energy users.²

Making the best use of limited network resources

A key challenge for the electricity industry is developing ways to use DER without exacerbating issues such as overvoltage or network peak demand. The maximum rate of import from, or export to, the network without breaching operating limits on voltage or peak demand can be thought of as the 'hosting capacity' of the local network area.

ARENA has committed \$9.6m in funding to network hosting capacity projects and studies.³ A key theme of these projects is testing methods to keep track of what's happening in the distribution network in real time, which has not been needed to date. Greater visibility can then inform control strategies to allow DER to participate in energy services markets up to network operating limits. Other projects look at the value that can be realised by networks investing in increased network hosting capacity and when it could be cost effective to do so. ARENA expects these initiatives to inform the development of more advanced investment and control strategies which will allow all consumers to realise the greater value from DER deployed in the grid.

It is important to note however that the hosting capacity of any electricity network area is a limited resource and it will not always be cost effective to increase hosting capacity to support increasing penetrations of DER. This will present increasing limits to DER penetration over time, although methods to estimate the precise limits in any particular network is the subject of ongoing research and development. Where the total desired imports or exports from DER exceed the hosting capacity, new processes could be required to allocate limited network access rights to customers. These issues are also the subject of ENA and AEMO's Open Energy Network consultation.⁴ The consultation paper and submissions made through this process provide an excellent summary of these issues and the alternative approaches currently under consideration. Specifically, the Open Energy Network consultation is exploring whether market-based approaches can be used to allocate distribution network access rights.

While consumers might own a DER device, and receive payment for providing DER services, the real-time nature of electricity demand and supply will require devices to be automated, with new platforms being used to exchange the value of DER between market participants. These innovative approaches are being informed by ARENA-funded initiatives exploring how DER can respond to variable price signals or power system needs. Examples include the ARENA-funded Bruny Island Trial⁵ and deX project.⁶

² <https://arena.gov.au/where-we-invest/distributed-energy-integration-program/>

³ <https://arena.gov.au/news/distributed-energy-projects-awarded-nearly-10-million/>

⁴ [https://www.aemo.com.au/\[...\]/Open-Energy-Networks-joint-consultation-with-Energy-Networks-Australia](https://www.aemo.com.au/[...]/Open-Energy-Networks-joint-consultation-with-Energy-Networks-Australia)

⁵ <https://arena.gov.au/projects/consumer-energy-systems-providing-cost-effective-grid-support-consort/>

⁶ <https://arena.gov.au/projects/decentralised-energy-exchange-dex/>

Supporting a reliable and secure power system

Providing power system reliability and security requires that energy supply and demand is able to be balanced across all timescales, and that power supplies remain within power system technical limits. Reliability is typically characterised as having enough generation, demand-side and network capacity to supply customers with the energy they need, when they need it, with a very high degree of confidence. Security is achieved when the power system is able to operate within defined technical limits, such as frequency and voltage, even if there is an incident such as the loss of a major transmission line or large generator.⁷ ARENA's DER trials and studies are demonstrating their potential to support power system reliability and security and identifying opportunities for positive reforms to market rules.

The ARENA-AEMO demand response trial is illustrating the potential for DER to support the power system when it is under stress. The trial, initiated in 2017, will provide up to 200 MW in emergency reserve capacity, across NSW, Victoria and SA under the Reliability and Emergency Reserve Trading (RERT) scheme by 2020. The trial is generating information about demand response recruitment and performance across residential, commercial and industrial customer groups. This is building an understanding of the potential for demand response to support a reliable and secure power system. The results to date confirm that demand response can be a reliable resource where customer load is flatter and more predictable - a characteristic of some industrial and commercial loads participating in the RERT trial. The trial is also showing that segments of mass market residential customers can be engaged to contribute through behavioural programs. ARENA and AEMO continue to explore how demand response can be measured with reasonable accuracy for all customer segments.

Outcomes from the RERT trial have recently been summarised in ARENA's submission⁸ to the AEMC's wholesale demand response mechanism rule change process.

ARENA is funding a number of large-scale and DER projects that are demonstrating how system security can be delivered in a high-penetration renewables grid. One example is the Solar Analytics project which will enable provision of highly granular data on the behaviour of rooftop solar PV during system disturbance events through to AEMO. This will assist AEMO with its modelling of contingency events. Similarly, in 2018 ARENA initiated its short term forecasting initiative. The objective of this program is to improve the accuracy of generation forecasting by solar and wind farms, enabling AEMO to better match supply with demand, reducing the likelihood of system frequency variations. ARENA notes that there is early participation of VPPs in some frequency control ancillary services (FCAS) markets, and AEMO is planning a trial of a more streamlined approach that would make this easier in future.

Access to customer interval data

ARENA further notes and supports the 'Power of Choice' reforms⁹ including an industry-led roll-out of smart meters and cost reflective network tariffs. This is being complemented by initiatives such as the Consumer Data Right which is critical to ensure that consumers have the

⁷ [https://www.aemc.gov.au/\[...\]/keeping-energy-system-secure-and-reliable](https://www.aemc.gov.au/[...]/keeping-energy-system-secure-and-reliable)

⁸ [https://www.aemc.gov.au/\[...\]Australian%20Renewable%20Energy%20Agency%20%28ARENA%29.pdf](https://www.aemc.gov.au/[...]Australian%20Renewable%20Energy%20Agency%20%28ARENA%29.pdf)

⁹ [https://www.aemc.gov.au/\[...\]/better-choices-and-protections-for-consumers](https://www.aemc.gov.au/[...]/better-choices-and-protections-for-consumers)

information they need to shop around for the best deals, make informed DER investments and manage their energy bills on an ongoing basis.

Systems to support customer and third party access to metering data are immature in the NEM and provide a material barrier to the development of new services. This has been a particular issue in the RERT trial (described above) with the issues detailed in ARENA's submission to the Facilitating Access to Consumer Energy Data consultation process.¹⁰ In summary, parties often need to go through lengthy and manual approval processes to get their interval metering data and this provides a material barrier to consumers accessing third party services like demand response aggregation. Overall, ARENA sees potential for growth in third party DER-based services and a growing need for secure (permissioned) third party access to customer data. This will need to be underpinned by the development of modern industry-wide data transfer platforms and services that are currently not present in the market.

Electricity tariff reforms

Cost-reflective electricity tariffs provide a central role in ensuring customer investments in DER and DER usage and control strategies contribute to system reliability and security and reduced system costs. The roll-out of smart meters, combined with enhanced operational visibility of network constraints, provide a basis for new forms of pricing or incentives which better reflect the locational and temporal value of DER services and demand. This could encourage greater demand side participation and, by increasing the utilisation of network and generation assets, reduce costs for all electricity customers.

Reforms to tariffs are complex and often contentious due to the potential to affect the value of consumer investment and the limited capacity of some consumers to actively manage their demand in response to more variable pricing. ARENA considers that tariff reform should remain a focus for government, industry and consumer groups. In particular reforms are needed to ensure DER services are fairly valued and that the costs of operating networks are fairly allocated to customers whether they have invested in DER or not. It is important that tariffs reflect the long-run costs associated with providing customer access to the network (to either consume or produce electricity), as well as the value of the services that DER owners can provide as described above.

Peer-to-peer trading

ARENA has funded a number of studies and trials that have explored the potential for peer-to-peer energy trading. Examples include AGL Virtual Trial of Peer-to-Peer (P2P) Energy Trading, White Gum Valley Project and University of Technology Sydney local electricity trading.¹¹ While these studies are of keen interest to a number of groups in industry, ARENA considers the potential for peer-to-peer as a longer-term prospect, potentially building on market place architecture established to resolve distribution level constraints as discussed above.

¹⁰ <https://arena.gov.au/assets/2018/09/submission-customer-energy-data-consultation-paper.pdf>

¹¹ See: <https://arena.gov.au/knowledge-bank/?project-value-start=0&project-value-end=500000000>

Longer terms considerations for the design of the NEM

Across the electricity sector there is a growing appreciation of the equivalence between demand side and supply side energy services and consideration of a more symmetrical system of incentives and obligations. ARENA considers that this will become an increasing area of focus as the demand side becomes more dynamic, less predictable and responsible for providing a greater share of power system services.

Solar and energy storage have tremendous potential to increase across all sectors including in 'behind-the-meter' (BTM) battery applications. For example, Bloomberg predicts that the rate of commercial and industrial PV installations will exceed residential uptake in the mid 2020s with over 25 GW of BTM industrial PV installed by 2050.¹² Combined with residential solar and storage, this has the potential to contribute to a more dynamic and less predictable demand side that will have implications for AEMO's approach to operating the power system. Supporting this, demand response is playing an increasing role in frequency control and under the RERT mechanism. An increasing range of customers are getting to access spot prices through new retail products which will make their demand more variable as they respond to changing market conditions.

The current wholesale demand response rule change processes¹³ may result in demand response participating directly in electricity spot markets, potentially making some demand response schedulable. However, ARENA considers this is likely to represent only a small percentage of overall BTM flexibility and that reforms will be required to make the demand side forecastable - to support the reliability and security of the grid.

I would welcome the opportunity to provide the committee with any further information on the matters set out in this submission. Please contact Jon Sibley, Principal Policy Advisor (jon.sibley@arena.gov.au) as required.

Yours sincerely

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¹² Bloomberg New Energy Outlook, 2018

¹³ <https://www.aemc.gov.au/rule-changes/wholesale-demand-response-mechanism>