ARENA Insights Forum
Large Scale Projects Summary

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ARENA

During the past seven years, ARENA has invested $1.35 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 ARENA's mandate. Guided by this, ARENA brought together more than 140 people from across the energy industry to share project insights and discuss topical themes relating to ARENA's Investment Priority 1 - Delivering secure and reliable electricity.

The Forum was held in November 2018 and was split into two streams; large scale projects and distributed energy resources. This summary presents the key messages and discussion trends from the large scale projects stream, as well as providing links to presentations on the ARENA Knowledge Bank.

GRID CONNECTION AND NETWORK IMPACTS

Session one focused on the opportunities and barriers associated with grid connection, and the impacts large scale renewables have on the grid.

Wayne Goodwin, Project Technology and Development, Edify Energy: 'Gannawarra Energy Storage System'

- Gannawarra Energy Storage System (GESS) provides a model for retrofitting a utility scale battery to an existing large scale solar farm. Managing two different technologies on one site, negotiating different ownership structures, and developing a first-of-kind long-term services agreement with Energy Australia were just some of the key challenges faced by the project.
- Given the existing solar farm had a long-term power purchase agreement (PPA), adding a battery presented a challenge given it would change the basis for the PPA.
- GESS has shown the importance of a collaborative approach with regulators to facilitate the integration of batteries into the NEM.
- Issues for reform include the requirement to purchase energy to charge the battery where it is only being imported to benefit the grid.
- To create the right structure to deliver the project, Edify had to register as a network service provider.
- GESS has also highlighted the financial and logistical benefits of using existing infrastructure.

Andrea Sutera, Renewable Energy Engineer, Elecnor: 'Barcaldine Solar Farm'

- Barcaldine Solar Farm (BSF) was the first large scale solar project connected to the Ergon network.
- BSF demonstrates the potential network benefit provided by variable renewable energy in fringe-of-grid locations, such as decreased network losses. It has also demonstrated the potential for additional revenue streams through network support arrangements.
- At certain times of day (generally 4-6 pm) Barcaldine Solar Farm has reduced network losses to zero due to generation matching demand.
- The gas generator adjacent to the solar farm has not operated since Barcaldine came online. ARENA is keen to learn how the gas generator and solar farm work together, if the opportunity arises.
- Minor reverse flow was observed without negatively impacting grid stability.

Session Panel Q&A Key Points

Q&A Panel Facilitator: Clare Paynter (Ekistica).

Q&A Panel Members: Simon Taylor (Powerlink), Thiago Costa (Canadian Solar), Rajesh Arora (AECOM), Lillian Patterson (Clean Energy Council).

- Negotiating the generator performance standards (GPS) and additional power system modelling requirements have been some of the key challenges of 2018.
  - Modelling has been further complicated by a lack of expertise and availability of resources within Australia.
  - Huge jump in connection applications (e.g. Powerlink increased from 1 to 15 connections in ten years, and ~140 enquiries in 2018).
  - One proposed approach could be developers submit a bond with the connection application that is refunded once successful completion/connection of the project occurs within an agreed timeframe.
- Developers are hesitant to invest in network infrastructure to support projects due to high cost, first mover disadvantage and (often) lack of property rights over the asset. There is a need to develop different solutions to overcome this barrier, such as those being considered by the ASIG (e.g. shared infrastructure and/or more visibility over other projects being considered in the region).

Things to look out for in 2019:

- As more large scale projects come online, including those with storage, generators and regulators will need to contend with issues around delays in grid connection, and how to best manage increasing demands on network operators.
- Opportunities for large scale renewables to find additional revenue streams through offering services to the grid.

THE FUTURE SERVICES OF RENEWABLES

Session two looked at how renewables can play a role in supporting the grid, including through potentially offering ancillary services currently provided by conventional generators.

Tom Geiser, Senior Market Manager, Neoen and Chris Mock, Principal – Centre for Innovation, AEMO: 'Hornsdale Wind Farm FCAS Trial'

- In the case of Hornsdale, by operating at reduced output, renewable generators can provide the most number of grid services, including frequency control ancillary services (FCAS).
- While conventionally curtailing output would be uneconomical, South Australia's high renewable energy fraction provided the perfect location to conduct the Hornsdale trial.
- Hornsdale demonstrated a greater ability to match the required output compared to thermal dispatchable generators.
- The trial could not fully assess all possible eventualities of contingency FCAS due to scarcity of events during enablement periods.
- Hornsdale was registered for six of eight FCAS markets. It was not registered for fast raise/lower services due to its inability to meet the reactive power support technical requirements (voltage ride-through capability is prioritised over frequency response due to the GPS). See knowledge sharing report for further information.
- Regulatory change to allow greater flexibility could alleviate some barriers and improve the economic case for intermittent generators to offer FCAS.
- ARENA's short term forecasting trial is expected to enable capability that may allow wind generators to work with more predictable headroom and less lost revenue to better allow for the provision of FCAS.

Bert Herteleer, Renewables Engineer, Ekistica: 'Services from Variable Renewables'

- Increasing renewable penetration in the market and shifts towards an asynchronous grid is making curtailment inevitable. Asynchronous grids can be reliable and safe, but a paradigm shift is required on issues such as curtailment, which have typically been viewed within industry as an obstacle to overcome.
- A system with a high renewable power fraction will inevitably include a high proportion of variable renewable energy combined with storage to maximise capacity and provide grid services. Within such a system, curtailment is an opportunity to unlock more services for the grid, and could create long-term opportunities, if accompanied with rule changes to allow greater flexibility for such services.
- In some cases, a degree of curtailment can help inverter-based generators more precisely follow loads than conventional synchronous generation.

Session Panel Q&A Key Points

Q&A Panel Facilitator: Lucy Cooper (ARENA).

Q&A Panel Members: Rick Haines (Woolnorth Wind Farms), Hugo Klingenberg (ElectraNet), Tom Butler (AEMO), Chris Gwynne (Hydro Tasmania).

- There has been a shift over the past decade from a "power and go" approach to a requirement for new generators to improve power quality in addition to quantity of power (e.g. there is a renewed focus on system strength and requiring generators to guarantee smooth output).
- Ancillary services provide an opportunity for generators to push into revenue streams and technologies that go beyond capacity provision, towards proving that inverter-based technology can provide services to the market in the way synchronous technology has in the past.
- Tasmania is a unique example of a system which has never been reliant on coal generation, and has relied on a number of small hydro generators previously, and is now integrating wind and pumped hydro for the best whole-of-system solution. As a result, Tasmania is ahead of the curve on demonstrating some of these key issues.
- Australia is itself unique due to the rapid emergence of distributed energy resources, aging coal fleet, and vast distances that need to be covered.

Things to look out for in 2019:

- Variable renewables shifting towards offering more grid services, and using these as additional revenue streams.

COMMERCIAL CONSIDERATIONS

Session three looked at the influence of commercial considerations on the penetration of renewable energy in the grid.

Clément Viaud, Asset Manager, Neoen: 'Hornsdale Power Reserve'

- Through carefully considered integration of storage into the grid, storage provides both system-wide and commercial benefits.
- There is a need to focus on how we can make investments in network-benefitting infrastructure economical without government intervention. While battery storage can provide enormous financial benefits to the grid, there is insufficient financial reward for doing so at present.
- Battery storage can provide quicker and more precise FCAS than conventional generation.

Chris Lee, CEO, Climate-KIC Australia: 'Business Renewables Centre Australia'

- The largely untapped corporate Power Purchase Agreement (PPA) market in Australia presents a huge opportunity to large scale renewable developers.
- Many businesses are unaware of their energy profiles and/or lack the resources and expertise to be able to investigate the power purchasing options available to them. There is a clear knowledge gap to be filled to drive take-up of corporate PPAs in Australia.
- The Business Renewables Centre offers an online portal offering educational resources while providing a hub to connect renewable projects with corporate buyers.

Session Panel Q&A Key Points

Q&A Panel Facilitator: Paul Ebert (WorleyParsons).

Q&A Panel Members: Monique Miller (CEFC), Kirsty Norris (AGL), Simon Kidston (Genex), Lenny Quong (Bloomberg New Energy Finance).

- Assessing the ongoing value of generation has been hampered by a combination of oversaturation in the market, and political uncertainty, which is a barrier to proactive approaches. This has led to a more defensive approach to investment and uncertainty as to the ongoing value of all forms of generation.
- Battery technology is now relatively well understood, considered low risk, and can offer grid support services. Major barriers to increased penetration of battery storage are on the revenue certainty front, which can be improved by adding optionality to power purchasing agreements at the front end.
- Small scale generation is both a threat and a benefit to large scale projects. The build out of decentralised storage could undermine the value of large scale utility assets, but if considered together the growth of distributed energy resources can help both grid stability and more rapid decarbonisation of the energy sector.
- Decarbonisation needs to be industry-led. Relying on consumers alone to drive greater renewable penetration is unlikely to succeed as energy is highly price sensitive.

Things to look out for in 2019:

- A growing interest in battery storage due to grid support and reliability benefits it can provide. Network operators, project proponents and regulators considering potential commercial benefits of battery storage.
- Businesses playing a more active role in considering their energy purchasing arrangements.