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141 Osborne Street
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Australia

Ms. Jessica Shaw MLA
Chair
Economics and Industry Standing Committee
Parliament House
4 Harvest Terrace
West Perth
Western Australia 6005

Our Ref: JC 2018-067 16 April 2018

Dear Ms. Shaw,

S&C Electric Company written evidence on the Inquiry into Microgrids and Associated Technologies in Western Australia

S&C Electric Company welcomes the opportunity to provide written evidence to the Western Australia Economics and Industry Standing Committee Inquiry into Microgrids and Associated Technologies in Western Australia.

S&C Electric Company has been supporting the operation of electricity utilities in Australia for over 60 years, while S&C Electric Company in the USA has been supporting the delivery of secure electricity systems for over 100 years. S&C Electric Company not only supports the “wires and poles” activities of the networks, but has delivered over 8 GW of wind, over 1 GW of solar and over 45 MW of electricity storage globally, including batteries in Australia and New Zealand. We have also deployed over 30 microgrids combining renewable generation, storage and conventional generation to deliver improved reliability to customers.

S&C Electric are particularly interested in facilitating the development of markets and standards that deliver secure, low carbon and low-cost networks and would be very happy to provide further support to the Economics and Industry Standing Committee on the treatment and potential of emerging technologies and approaches.

Yours Sincerely

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General Comments

We strongly support the option of using microgrids to deliver reliable and secure electricity to both customers in remote, grid-edge, locations and in urban centres, particularly built on campuses. We were also strongly supportive of the Rule Change proposed by Western Power (Alternatives to Grid Supplied Services, 2016, ERC0215). While the Australian Energy Market Commission were fully supportive of the technical approach of using Stand-alone Power Systems (SPS, isolated mircogrids), the rule change was not progressed. This is disappointing given the broad potential of SPS in Australia to improve life for many dispersed and remote communities.

The various trials run by both Western Power and Horizon Power in Western Australia have led the way in developing microgrids for remote applications and Western Australia has the benefit of sitting outside the regulations of the NEM and we encourage both the Western Australian Government, through the COAG Energy Council, and the Networks to continue to provide leadership to wider Australia on microgrids. While the networks in Western Australia may be able to deploy SPS, the fact that an SPS is not “connected” to the wider network means that strictly within regulatory definitions, a SPS is not part of the distribution network and therefore:

- Doesn’t count towards the regulated asset base
- May make it complicated for a DNSP to operate a SPS.

The SPS trials at Ravensthorpe have demonstrated significantly improved reliability for customers with the potential for to not only reduce costs for those directly connected to the SPS, but also the wider customer base, who also benefit from reduced costs. Network costs are socialised across the entire customer base, so delivering electricity reliably to grid edge customers, without the cost of maintaining long and vulnerable power lines benefits all customers on that network. SPS also keep customers connected for longer during severe weather events since customers are no longer reliant on long vulnerable power line. SPS are also likely to reduce both the potential for electricity networks to start fires, as well as ensure, as with storms, that customers have a more robust supply due to the absence of long wires.

Clarification of the regulatory position on a range of issues will be needed before SPS can be deployed more widely in Australia. The current regulatory position is a significant barrier to an approach that will save all customers money, while delivering increased reliability to customers that have typically had a pretty flaky connection with their network.

Response

a) The potential for Microgrids and associated technologies to contribute to the provision of affordable, secure, reliable and sustainable energy supply, in both metropolitan and regional WA;

Microgrids offer increased reliability and efficient use of low carbon generation in a variety of situations. Western Australia has led the way with the isolated microgrid for remote locations, but microgrids are equally applicable to urban locations, such as city suburbs or campuses, to deliver secure electricity and to provide resilience during severe weather events.

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The Ravensthorpe SPS withstood a major storm in January 2017 and customers on the SPS experienced better reliability than those connected to the "traditional" network. This can be applied to campuses and suburbs and is an approach taken in a variety of locations in the USA.

Many universities in Australia are exploring the role microgrids can play in not only delivering secure electricity but meeting the sustainability aspirations of both students and executives. Following Hurricane Sandy in New York, which resulted in extensive flooding, microgrids are being deployed to ensure that the city and its people are ready for future severe weather. It is, of course, challenging to retrofit a microgrid into an existing grid, but where new suburbs are being developed, ensuring that plans facilitate the deployment of a microgrid either as part of current development or as a future option should be considered.

b) Opportunities to maximise economic and employment opportunities associated with the development of Microgrids and associated technologies, including (but not limited to):

i. Development of raw material resources/primary commodities

Microgrids typically incorporate batteries and currently Lithium-ion batteries dominate the market. Western Australia is a source of lithium and so this is a critical resource to manage and exploit.

ii. Research and development

Western Australia, both the Government and networks, are already playing a significant role in the development and demonstration of microgrids (and many other innovative approaches in the electricity industry). Western Australia should continue to leverage that leadership role to affect real change in the NEM, by supporting development of microgrids beyond the state boundary. There is a tendency for NSPs to want to "do it themselves", rather than efficiently take the established learnings from other NSPs.

iii. Design, engineering and construction

No comment

iv. Advanced manufacturing

No comment

v. ICT

No comment

vi. Ongoing asset operations

No comment

c) Key enablers, barriers and other factors affecting Microgrid development and electricity network operations, including:

i. Regulatory barriers

<u>**Ownership of Microgrids.**</u>

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Current regulations limit the incorporation of a SPS into the assets of DNSP, because the strict definition of a distribution network requires the network to be connected to a higher network. The use of microgrids should not only be an option to replace current networks in remote locations, but should also be an option for new communities. Western Australia has many new communities associated with resource activities, some of which may be temporary, but regardless, these communities tend to be remote and would benefit from the SPS approach.

Campus microgrids tend to operated by the owner of the campus, with a connection to the wider network. There are no barriers to this approach. It would be interesting to understand how performance and reliability standards would apply to a campus microgrid as it is not run by a regulated entity. Independent DNSPs in the UK, have more flexibility that the larger highly regulated DNSPs, but the customers on a campus should experience the same quality of service as those off-campus.

Suburban microgrids should be possible under current regulation, since normally the microgrid will be supported by the wider network and only isolated if there is a fault on that wider system.

Service and Reliability Standards

In all cases the service standards and reliability standards for a microgrid when isolated (disconnected from the main distribution network) are not yet defined. It will be critical to provide enforceable and incentivised standards for customers connected to a microgrid.

Competition

The ability to change Retailer in a SPS will be limited and fair electricity prices will need to be monitored. As we responded to the Western Power Rule Change (ECR0215), we believe that the DNSP can provide both the network and retail functions and this is managed effectively in other Australian jurisdictions (e.g. Queensland) and in other international jurisdictions (e.g. UK, Scottish Islands).

If a separate Retailer is required then the DNSP could issue a tender to secure a retailer for a specified contract term (2-3 years).

Electricity Storage

Electricity storage is treated as generation in Australia. This may restrict a DNSP from owning and operating a battery, which is essential to provide back-up in the absence of renewable generation (no wind or sunshine) or while a high carbon generator starts up. A battery is also essential for a “seamless” transition from wider grid supply to microgrid only supply. The battery supports the load until the high carbon generator starts up and is synchronised with the load. The battery again supports the load as the microgrid is synchronised with the electricity supply outside the grid and then reconnects to the wider grid supply.

However, there are examples in other jurisdictions where the DNSP does own and operate generation and does so under regulation and without issue (e.g. Queensland and the UK).

ii. Technical factors

A microgrid needs a controller to manage the “seamless” transition from gird supplied electricity to microgrid supplied electricity. This controller may also “balance” the various loads and generation on the microgrid to maximise the time "offgrid" by efficiently using renewable generation and battery export to support load, or using a high carbon generator (such as a gas engine). Load shedding is another option.

This controller needs to be technically advanced and highly secure, as it controls energy security within a microgrid (and some sites may need absolute energy and cyber-security). The controller may access customer data (load) to better manage the performance of the microgrid and so this controller needs to meet very high security and performance standards.

iii. Workforce planning and development

The workforce will need to understand that an outage in one location, may not necessarily mean no electricity in a microgrid, since microgirds are designed to be "always on". This is a key safety and training issue.

iv. Social factors

some customers may be resistant to microgrids, particularly SPS, because it is a "disconnection" from the wider distribution network, so care is needed to engage successfully with and educate customers. An Ausnet microgrid trial has worked around the non-participation of some customers on the feeder. But a fully engaged community can significantly manage an outage, by load shedding ,to ensure that generation resources and/or a battery can extended the period those on the microgrid can operate without electricity from the wider grid. See: https://reneweconomy.com.au/ausnet-takes-suburban-street-off-grid-almost-24-hours-91549/, where a single customer's desire for air conditioning shortened the time off the grid.

However, a project in Canada, using a battery in "islanded" mode ran off the battery for longer, because the members of the community were engaged via social media and actively managed their loads to prolong the anticipated discharge time of the battery.

v. Electric Vehicles

Electric vehicles (EV) are essentially a load that would have to be managed if connected to a microgrid. Charging of an EV battery can be controlled to help manage the wider system (e.g. frequency response), but this may have negative consequences on the lifetime of the battery.

Vehicle-to-Grid and Grid-to-Vehicle approaches where the actual battery of the EV provides system support by discharging in particular or charging, have been suggested as an opportunity for EVs to better integrate into the network and earn money for their owners via providing a service. However, any battery has a finite number of charge-discharge cycles in its lifetime and using a cycle to support the electricity system is one less cycle for driving the EV (its primary purpose).

A study by the Transmission System Operator in GB, National Grid, assessed the potential for EVs to deliver frequency support services. Taking control of the charging of EVs was found to be a good source of frequency support (the control was fast enough to deliver a meaningful frequency response) and for full control of the EV when connected at home, National Grid were prepared to pay GBP25 per year per EV (AUD46, or 7 % of the electricity component of an average dual fuel bill or 3.5% of the full annual energy costs for a household). This value is unlikely to fully compensate an EV owner for the loss reduction in lifetime of the battery. The value also does not take into account the cost of delivering a rapid frequency response service over the distribution network, to the transmission network, which may mean there is a

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need to reinforce the distribution network (http://nationalgridconnecting.com/fresh-thinking-on-frequency-response/).

d) Initiatives in other jurisdictions to facilitate the development, and maximise the value of, Microgrids and associated technologies.

Links have been provided throughout to relevant projects in other jurisdictions.