Cracking the distributed energy management challenge for Australia's largest regional utility

Client • Horizon Power
Location • Onslow, Western Australia

Background

Western Australia's regional utility Horizon Power is rolling out new and innovative ways to provide its customers with more sustainable and affordable energy, with a number of active projects across its 38 separate power systems servicing its vast regional network. Knowledge developed through Horizon Power's work is helping inform the state's response to the widespread consumer uptake of Distributed Energy Resources (DER). It also aligns with the state's DER Roadmap, which outlines the actions being taken in Western Australia to realise the integration of DER into existing networks to provide customers with a safe, reliable and efficient electricity system.

Optimising the value of DER for both the utility and prosumers on a tightly constrained microgrid - by maximising flexibility

The microgrid in Onslow, Western Australia relies on a mix of rooftop solar, a solar farm, modular gas powered generation, as well as large grid connected battery energy storage and home batteries. With a local population of about 900, Horizon Power was constrained by the amount of renewables it could connect to the Onslow grid. A high volume of unmanaged renewables could result in microgrid instability, potentially causing power outages and power quality issues for local residents. Without the capability to manage customers' solar resources, the Onslow grid could host approximately 850 kilowatts of rooftop solar. Horizon Power recognised it had the potential to triple managed capacity on the Onslow grid with the right technology in place.

Conscious that renewable energy is a cleaner and increasingly cheaper energy source, and that there are more customers wanting solar systems than some microgrids across its service territory could allow, Horizon Power launched the Onslow DER Project as a pilot to advance renewables and support greater customer choice beyond existing technical limits. To test this, the program provided an incentive for homeowners and businesses to purchase solar photovoltaic (PV) panels and

batteries which could be remotely managed by the utility; this orchestration capability would become the key to overcoming technical limits and unlocking greater shared value.

Andrew Blaver, Manager for Customer Solutions at Horizon Power said, *"Distributed energy resources hold great potential for regional communities, particularly where traditional fuels such as diesel often contribute to a high cost to serve electricity. A high DER energy system for the future needs to be open, secure and reliable. It is our responsibility as an operator to meet the needs of our customers. This includes their aspirations for cleaner energy, in a way that is safe, reliable and efficient. As Onslow is showing, we could quite possibly achieve this with the help of using some customer owned assets such as rooftop solar, batteries and major appliances."*

Significantly, the Onslow DER Project is one of the first instances of a 'business as usual' approach to utility management of DER assets in Australia, using an end to end DER management system which includes SwitchDin's mature, proven technology and global best practice. The Onslow model is in contrast to 'zero export' and system size limitation measures that could be enacted on other constrained networks in response to the massive popularity of solar PV in Australia.

Establishing a universal standard for solar connections: Australia's first implementation of the international 'smart grid' standard

Having to manage a range of battery and solar PV inverters from different manufacturers on its network, Horizon Power sought to implement a universal communications standard for behind-the-meter assets. This approach allows them to monitor and securely issue control commands to DERs for feed-in management, demand management, reactive power management and battery management for individual sites.

SwitchDin provided enhanced Droplet controllers that were deployed by Horizon Power as Secure Gateway Devices compliant with the international IEEE 2030.5 'smart grid' standard for inverter control. Droplets are both communications gateways and smart energy managers that allow companies to incorporate behind-the-meter solar, batteries and key loads into projects and programs to support DER on their network whilst maximising value for consumers. Through this initiative, Horizon Power became one of Australia's first utilities to leverage the IEEE 2030.5 client functionality for DER management.

"We needed a very reliable and secure protocol to manage highly distributed energy resources. Many appliances and the range of solar and battery inverters in Australia operate on different communication standards. The IEEE 2030.5 provided us with a good mechanism to integrate DER into our grid and help them become more active assets. Ultimately, we expect this approach will benefit our customers and create a more efficient energy system," said Blaver.

To date, 40 percent of Onslow's 500 households and businesses have Droplets installed to manage their DER, with more than 50 percent expected to be connected by September 2020. Blaver said, *"This winter, we will test how we can effectively manage our network with high DER using our management platform. At times we will need to manage the Onslow microgrid with high solar generation during periods of low electricity demand. We could even reach a tipping point where we may well turn off our gas fired power station and meet our energy requirements for parts of the day purely from our solar farm and our batteries together with customers' rooftop solar and their home batteries."*

Working with SwitchDin to make assets manageable - and customers happy

One of Horizon Power's main goals with the Onslow Project was to demonstrate the ability of its network to manage solar penetration levels over 50 percent. Horizon Power had previously worked closely with SwitchDin on a real-time 'virtual power plant' DER management project in Broome called Smart Sun, the outcomes of which it is currently evaluating.

Blaver said, "SwitchDin is providing us with visibility on DER assets and preparing customers to become active participants in our energy system.

Residents in Onslow are becoming aware that having too much solar energy flowing back onto the grid can destabilise their energy supply. With the help of SwitchDin, our Onslow customers are happy they can connect rooftop solar and reduce their energy bills, something that many of them would not previously have been able to do."

What's next: Implications for the rest of Australia - and beyond

With the Onslow DER Project, Horizon Power aims to create a transferable model for the integration of DERs into its core mission of delivering reliable electricity supply - while allowing more customers to take advantage of clean, affordable energy.

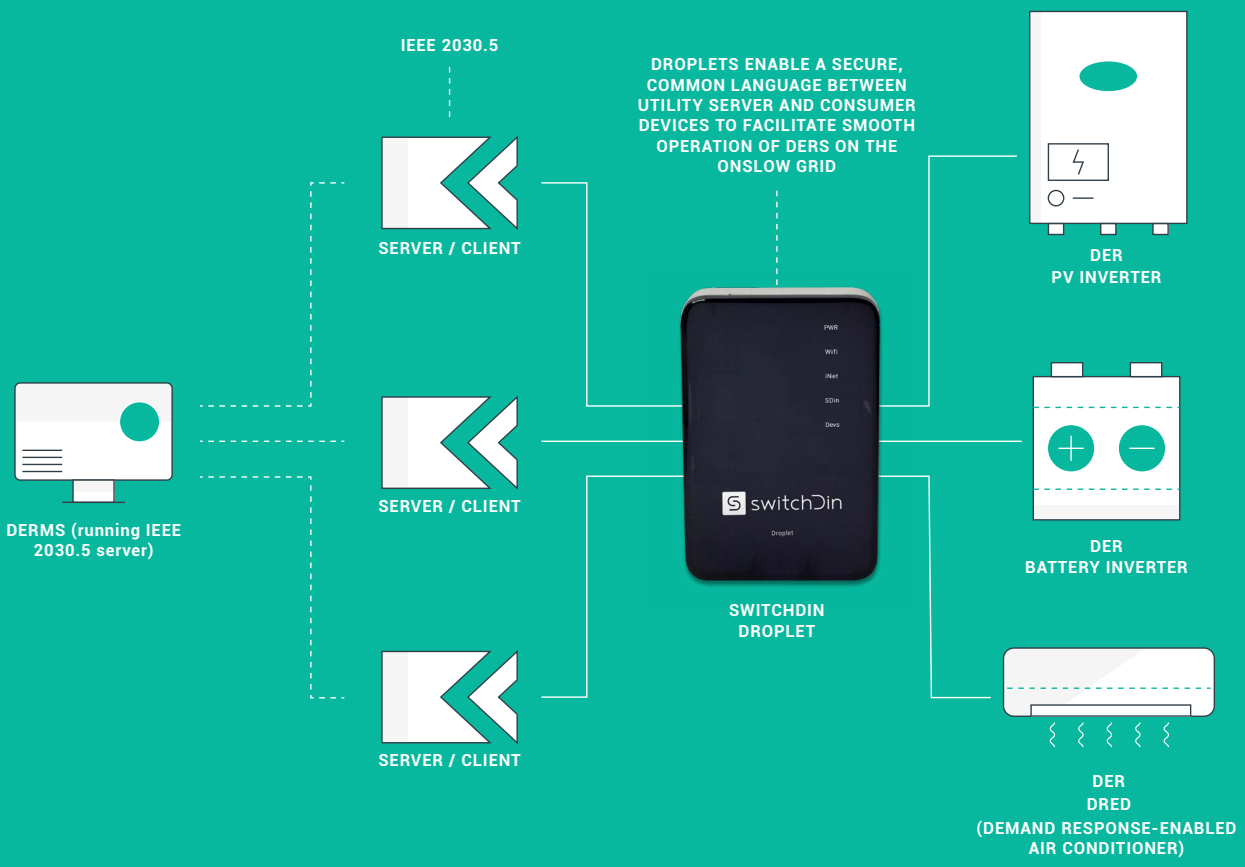
"The line between customers investing in energy infrastructure and utilities investing in energy infrastructure is fast blurring. SwitchDin has helped us show how utilities and customers can work together to share the costs of energy infrastructure in a way that can provide mutual benefit.

Architecture overview:

In the Onslow DER Project, SwitchDin Droplets act as secure gateway devices (SGDs) that are compliant as clients under the international 'smart grid' standard IEEE 2030.5. These Droplets allow Horizon Power to securely manage distributed solar PV inverters, batteries and key loads on the local Onslow grid through their distributed energy resource management system (DERMS), which runs an IEEE 2030.5 server. The Droplets translate controls from the DERMS into appropriate signals to the real hardware.

This approach is one way in which SwitchDin's platform enables orchestration of diverse DERs.

High level block diagram: How the SwitchDin Droplet interfaces with the Distributed Energy Resource Management System (DERMS) and customer Distributed Energy Resources (DERs) in Horizon Power's Onslow DER Project.



SwitchDin Pty Ltd
Building B, 91 Parry Street, Newcastle West NSW 2302
(02) 4786 0426 | info@switchdin.com | switchdin.com

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