

Harnessing customer participation to accelerate the uptake of renewable energy on embedded networks

Research Question

This research looks at the necessary transition for utility companies from the current modernist centralised electricity grid business model to a renewable distributed business model. This research is complementary to the recent and ongoing research about the technical barriers as it looks at the possible business and governance models, and particularly at how to best achieve the transition by giving choices to the customers and letting them participate in the risks and the rewards. Also, this research differentiates itself by focusing on commercial and industrial precincts fitted with an Embedded Electricity Network (EEN) where the network owner supplies electricity to its tenants who are considered “energy customers”.

These EEN are found, for example, in shopping centers, Universities, industrial precincts, ports and airports around the world.

Energy strategy and energy management in these EEN are mostly set-up to profit financially the Embedded Network Operator (ENO) whilst limiting its capital investment and any sorts of risk. Thus, these strategies do not give incentives to introduce low carbon energy generation solutions or promote energy efficiency.

When an ENO is forced to derive from the status quo - like it is the case with a change of regulation opening energy retail on the EEN to the competition - it will use a conservative approach: Find the best match between technologies, capital investment and pricing.

However, many opportunities for win-win solutions - for the ENO, the customers and the environment - are missed out because the decisions are centered on the energy business without involving the customers, and solutions involving Distributed (renewable) Energy Resources (DER) are usually pushed aside.

Methodology

The research is articulated around the following four sub-questions:

1. Is the transition to renewable energy a demand-driven disruptive innovation?
2. If so, what are the characteristics of a renewable and distributed energy supplied grid system?
3. Can the Business Model of an emerging renewable energy system be examined in a non-residential EEN?
4. What would be the Business Model options for this EEN and do they demand greater customer participation?

The first two questions will be attended to through literature review and personal reflection and observation of today's modernist centralised electricity grid business model (the Business-as-Usual scenario) and its origin.

The last two questions will use the EEN of the Perth Airport estate as part of an SBEnrc project as a case study to understand the forces, the risks, the barriers and the opportunities to introduce renewable DER with different levels of customer participation.

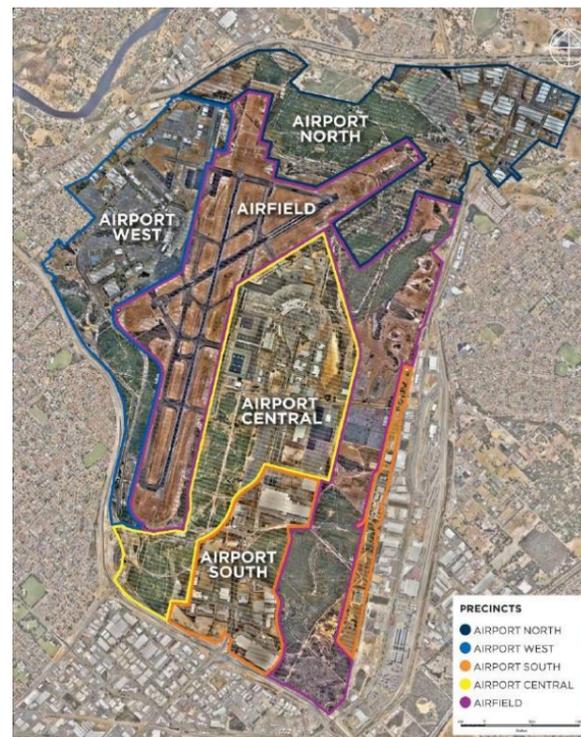


Figure 1: Perth Airport estate serviced by an EEN

Once a new methodology has been defined to identify the best level of customer participation in the introduction of a low carbon DER, it will be calibrated and tested on the EEN of the Perth Airport by simulating different business models.

Results

The research is on-going and no hard results or conclusions are available yet. The literature review is well underway and a new method is being defined with different levels of complexity and inspiration from theories such as *Disruptive Innovation*, *Transition*, *System-of-Systems* theories and the *Microgrid Reference Methodology*.

Conclusions

As there is a rising awareness about climate change, demand from customers, including industrial ones, to use renewable energy has been growing. However, ENOs, like Utility companies in general, are challenged to get out of their Business-as-Usual approach and, besides the technical difficulty related to intermittent renewable energy, they also struggle to find the right model to integrate shared DER on their network. This research will contribute to the transition by defining and assessing the benefits of customer participation, and accelerate the uptake of renewable energy.

Anticipated impacts

Though this research focuses on EENs and microgrids, the outcome should also be applicable to larger networks to assist the Australian energy sector transition from a centralised fossil fuel energy generation model to a decentralised low carbon energy generation and battery storage model.

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The case study of Perth Airport is part of a project being undertaken in collaboration with Australia's Sustainable Built Environment National Research Centre (SBEnrc) and its partners, working with Balance Utility Solutions.