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From EA Technology

DER and LV management: Finding the least-cost strategy

Background

Historically, SA Power Networks' electricity network was designed to meet the needs of customers who only connected passive and predictable technology. But a significant shift was changing how customers connected to the Low Voltage (LV) network.

Customer uptake was rapidly increasing of Distributed Energy Resources (DER) via solar photovoltaic energy with behind-the-meter storage.

The traditional 'passive' approach to Low Voltage (LV) management would not be fit for purpose for the next regulatory period. After a competitive tender process, SA Power Networks decided to work with EA Technology to develop a strategy for the efficient management of their LV network.

The challenges they faced were:

- Customers continuing to install DER at increasing rates while maintaining Quality of Supply and minimising network augmentation.
- Customers making use of available value streams from their DER investment through participation in VPPs and access to markets for energy, ancillary services and network support.

Actions

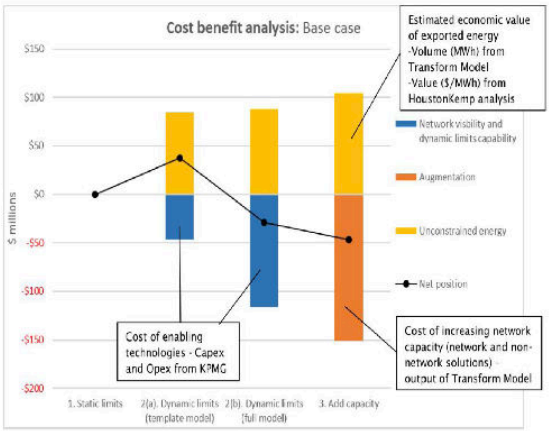
The project investigated a range of strategies which SA Power Networks could employ to respond to future challenges on the LV network. EA Technology identified the following management strategies to cater for the uptake of DER:

- Static limits - allocating a static maximum export limit to each new DER owner.
- The dynamic template model - understanding where capacity might be exceeded and issuing export limits based on representative network.
- The fully dynamic model - understanding where capacity might be exceeded and issuing export limits based on full network model.
- Network augmentation - increases the hosting capacity on constrained circuits by upgrading network infrastructure.

The System

After identifying representative LV circuits, EA Technology performed detailed power flow analysis to determine the DER hosting capacity of these circuits. Using the Transform Model, EA Technology's proprietary techno- economic modelling tool, the financial value of each of these strategies to SA Power Network's customers was assessed by investigating the cost to implement each strategy against the value created to the general mass of customers by avoiding DER curtailment caused by LV network limitations. .

Different growth scenarios were created, and net costs and investment regret was assessed to decide upon the final best approach.



From this it was found that the Dynamic Templates approach could achieve tens, or in some cases, hundreds of millions in customer savings over 15 years compared to the static limits strategy.

Case Study

Conclusions

This approach clearly allowed SA Power Networks to understand which of the possible strategies delivered the best value moving forward and represented least overall cost to both the network (augmentation expenditure) and the customer (energy curtailed).

SA Power Networks could then use the modelling outputs to communicate with customers about the options for investment going forward and to get their input and support their business plan.

SA Power Networks were also able to gain full support of their regulator AER and their full funds request granted as AER believed that the modelling work performed by EA Technology provided robust evidence. An extract from their determination states:

"In summary, we consider that SA Power Networks has demonstrated the need and that the Capex of the program is the least-cost solution. It has shown evidence of a potential voltage non-compliance issue. It has also developed a business case and a cost-benefit analysis. There is wide support from stakeholders for the program. On balance we find this proposal by SA Power Networks to be reasonable and prudent based on the best current information."

Testimonial

"We engaged EA Technology to undertake the modelling that underpins our approach. EA Technology was selected through a competitive tender process as they are recognised as leaders internationally for their expertise in this area. The modelling is extremely rigorous and takes into account a broad range of factors, including the mitigating impact of battery storage in absorbing some solar during the middle of the day, as well as the impact of local inverter Volt-VAr response, and the potential impact of tariff changes in shifting loads."

Bryn Williams – SA Power Networks

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Case Study