TECHNOLOGY CASE STUDY:
DENMAN PROSPECT PROJECT, ACT

ActewAGL Distribution sees many opportunities to improve services to customers over time, through the development of smart electricity networks supported by the roll-out of smart metering. As a first step towards better understanding the implications of diversified energy generation and the need for a smart network, we have initiated a trial as part of Stage 1 of the Denman Prospect residential estate.

Denman Prospect is the first residential suburb in Australia to be planned with mandated solar photovoltaic (PV) panels installed on the rooftop of every dwelling as part of an 'all inclusive' offering by the developer. Stage 1 of Denman Prospect will comprise 400 dwellings with an average of 3kW PV generation panels per dwelling and will include a percentage with battery storage systems. This is an exciting opportunity for Canberra to be at the forefront of energy innovation and presents a unique opportunity for ActewAGL Distribution to better understand the implications of embedded generation, energy storage and electric vehicles on the broader electricity network.

The ACT has almost 17,710 homes with small-scale energy generation capacity from rooftop PV panels[1]. Such a large concentration of energy generation in one suburb has new implications for the long term operation of our network. The electricity network was originally designed to distribute electricity in one direction; from the national electricity grid, through our high voltage transmission lines, to large substations, to local substations and through the low voltage distribution network to the homes and businesses of Canberra. Delivering electricity through this network requires careful management of electricity flow, load and voltage to ensure the network operates safely and to protect equipment within the network and within customers' premises. The significant uptake of solar PV in the ACT now requires the electricity network to be capable of distributing electricity in two directions – from the grid and to the grid. Generating power within the network requires the network to monitor and control load and generation flow at a customer level and possibly modify the network to ensure Canberra can safely utilise surplus electricity created by Denman Prospect.

In response to these changes in network requirements, ActewAGL Distribution is seeking to transition to a 'smart network' that allows the movement of electricity in two directions and enables a range of supporting communications capability, such as remote monitoring and operation and smart metering. In the ACT we have a unique opportunity to build a multi-utility smart network incorporating electricity, gas and water.

WHAT IS SMART METERING?

A smart meter is a new type of meter that sends metering information digitally to the network business, rather than collecting the information manually on the premises. There will be additional information provided by smart meters which will enable customers with smart meters to access a wider range of network tariffs.

In the ACT, the terms 'smart meter', 'advanced meter' and 'type 4 meter' all refer to the same type of meter.

This will benefit customers by:

- allowing the development of trading platforms that enables ActewAGL Distribution to actively manage energy flows on its system to limit future capital expenditure.
- limiting future costs by allowing dynamic operation of the network; for example, allowing higher power flow on colder days and avoiding network augmentation through more sophisticated demand management.
- increased customer control with information through mobile applications.

A smart network requires new equipment both within the customers' premises as well as across the broader network; equipment such as smart meters, charging stations for electric vehicles, monitoring and control devices for renewable resources, grid sensors, distribution automation equipment and load control devices. This new equipment comes at a cost.

The trial in Denman Prospect is being delivered as part of the current five year plan. Building on the outcomes of the trial, it is anticipated that there will be a need to expand the smart network and to continue to invest across Canberra to facilitate and support our customers who wish to install generation equipment and battery storage and own electric vehicles.

1. ACT Government, "2015-16 Annual Feed-in-Tariff Report", December 2016, page 7.

Recovering the costs imposed by distributed solar PV generation

ActewAGL Distribution aims to set network prices in an economically efficient and fair manner. This involves setting prices that reflect the actual cost of providing network services to customers. The network component of the cost of servicing customers is generally driven by peak usage, which dictates the capacity we need to build into our infrastructure.

Any departure from efficient pricing can result in cross-subsidies between customer groups. Where there is a cross-subsidy, one group of customers is paying for benefits enjoyed by another group. This raises equity and fairness issues.

Currently electricity customers with solar PV generation are being subsidised by those without solar PV generation. The cross-subsidisation arises because the majority of network costs are currently recovered from customers through usage charges (on the amount of energy used) – rather than demand charges which better reflect the costs of network expansion. Although solar PV customers may have lower peak usage in some cases, often the difference is not marked since solar PV arrays do not reduce winter peak usage, which occurs after dark when solar PVs are not generating electricity.

The ability of solar PV customers to reduce their usage, but without materially reducing their peak demand, means that their bill reductions are greater than the benefits they provide by reducing the need for network expansion.

The cross-subsidy is even greater when additional network monitoring and load control costs, which are required to serve solar PV customers, are taken into account. As embedded PV generation continues to grow, we will need to continue to spend on monitoring and control devices, grid sensors, distribution automation equipment and load control devices to maintain quality of supply in the network and ensure both the network and PV arrays can operate together. These costs could potentially add to the existing cross-subsidy if not carefully managed.

How do we reduce cross-subsidies?

We need to consider efficient and fair ways to reduce the cross-subsidies, while remaining compliant with the National Electricity Rules. One option to address cross subsidisation is through further network tariff reforms, as discussed below.

In a 2014 working paper, Professor Paul Simhauser proposed a three-part demand tariff as one way to improve efficiency and reduce the current level of cross-subsidy by reducing the dominance of the usage charge.[2] The proposed tariff comprises:

- a fixed charge – designed to cover fixed costs
- a time-of-use usage charge – consumption is charged at different rates depending on the time of day electricity is used
- a demand charge – covers sunk costs based on coincident maximum demand – ideally set at the long run marginal cost of network expansion

Using data from Southeast Queensland, Professor Simhauser found that such a demand tariff, with the fixed and usage charge each recovering 20 per cent of total revenue and the demand charge recovering the remaining 60 per cent, produced a substantially more efficient outcome (ie, lower cross-subsidies) than the standard two-part tariff. Moreover, under this tariff, customers face costs that better reflect their use of the network.

WE WANT YOUR FEEDBACK

How should we support customers with solar PV generation?

What issues are most important when considering the network infrastructure requirements that result from solar PV generation?

2. P. Simhauser (2014). Network tariffs: resolving rate instability and hidden subsidies. AGL Applied Economic and Policy Research, Working Paper no. 45 – Demand Tariffs. A paper for the SAP Advisory Customer Council – Utilities, Heidelberg, Germany, 16 October 2014.