Terms of Reference

1. That a select committee, to be known as the Select Committee into the Resilience of Electricity Infrastructure in a Warming World, be established to inquire into and report on, by 10 February 2017, the following matters:
    (a) the role of storage technologies and localised, distributed generation to provide Australia's electricity networks with the resilience to withstand the increasing severity and frequency of extreme weather events driven by global warming;
    (b) recommend measures that should be taken by federal, state and local governments to hasten the rollout of such technologies in order to:
        (i) create jobs in installation, manufacture and research of storage and distribution technologies,
        (ii) stimulate household and business demand for storage technologies,
        (iii) anticipate the rapid deployment of localised distributed generation through changes to market rules,
        (iv) drive the reduction in technology costs through economies of scale, and
        (v) seize on the opportunities to be a global leader in deploying storage technologies because of Australia's high fixed electricity tariffs and significant penetration of rooftop solar; and
    (c) any other relevant matters.

Electrical Storage for network Resilience

Response to Terms of reference (a) role of storage and localized DG's to provide networks with resilience to extreme weather events and (b ii& iii) market rules and stimulating uptake of storage.

FROM

Prof Gerard Ledwich Power Engineering , Science and Engineering Faculty, Queensland University of Technology

Expertise

I have a history of research on electricity networks interacting with distribution and transmission network issues. Current Federal funded research is looking at the role of batteries in networks and the development of neighbourhood markets for trading electricity

Submission

(a) role of storage and localized DG's to provide networks with resilience to extreme weather events

At the first level of response to extreme weather events the widespread deployment of storage to individual households would permit some level of continued operation of lights and fridges so that individuals could continue to live in their homes after a cyclone or the like had cut the distribution network. This mode of operation would provide resilience for individuals but not necessarily for their neighbours.

The next level of operation would be where clusters of houses or suburbs or retirement villages could continue to operate. This can be used to provide for a graceful degradation of network as a bushfire or flood removes part of network.

One of the modes of operation of storage and demand management, is to respond to major network disturbances by changing the power drawn from the network. For example in the recent events in South Australia there were indications that the loss of one connector and the level of shedding of wind generation was stressing the remaining transmission link to Victoria. If the level of line stress triggered many storage elements in SA to start exporting and to trigger a shut off of non essential loads in customer premises then this separation event could have been avoided and a 20% penetration of batteries could have been a significant aid for the entire state. It is this active control based on "line stress" that can make the biggest difference for the lowest cost while not significantly compromising the ability to support the individual premises if the overall system does fail.

(b ii &iii) stimulate demand and assist deployment through market rules.

One of the ways to significantly ramp up the attractiveness of distributed storage is to provide a reward for battery owners who operate their batteries to the benefit of the wider community. There are 4 paths of benefit to the use of storage/demand management

1. Electricity markets: where households export power in periods of high market prices then there needs to be a path for these customers (or their agents) to be given a reward
2. Distribution line/transformer overloads : at times of peak load in a feeder there can be a high demand on the network that would normally force new investment in the poles and wires. Where customers have storage and/or the ability to load respond then a reward need to be available
3. Interstate stability: Major events can cause severe transients on interstate links. Dynamic response of customer loads/generation can significantly affect the chance of blackouts
4. Similar to the above when there is a major loss of generation the system frequency can start to fall and can lead to major blackouts. Loads and local generation responding quickly to frequency falls can make the grid backbone much more resilient

Where these 4 streams of reward are possible then the economic attractiveness of storage can significantly increase beyond the ability to look after myself if my power is lost. Where a benefit for storage becomes visible the local market will rapidly o fill with suppliers willing to assist you to enter this market. At the moment only aspect 1) is being captured by Reposit.

Summary

Storage and demand management can aid to resilience of networks at different levels

1. Individual customers
2. Neighbourhood
3. National grid

Providing mechanisms for a reward to customers or their agents covering the widest scope, is the best mechanism for accelerated uptake of storage and demand response. Creating a reward path will facilitate the growth of businesses to facilitate or aggregate customers, and thus the uptake of storage and the control mechanisms.