Contestability of Energy Services – Demand Response

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This submission suggests Distribution Network Service Providers (DNSPs) are overstating the benefits delivered by their Demand Response programs. The Australian Energy Market Commission does not require DNSPs to validate the delivered benefits allowing them to recover the cost of their inefficient demand response programs.

Rule Change Request

The Australian Energy Market Commission (AEMC) is seeking feedback on a rule change request to:

restrict distribution network businesses' ability to earn a regulated rate of return on assets that provide network support, demand response or are located on the customer's side of the meter.

Historically the AEMC has allowed Distribution Network Service Providers (DNSPs) to recover the cost of their demand response programs via a guaranteed (regulated) financial return on the assets. Allowing the DSNPs to recover the cost of their demand response programs gives them an unfair market advantage compared to non-DNSP companies wishing to offer similar demand response programs to customers.

Question 6 from the Rule Change Request

This submission only considers Question 6 from the AEMC's Consultation Paper [Ref 1]:

Is there a problem with DNSPs having service delivery discretion in relation to demand response, network support and other inputs derived from assets located 'behind the meter'? If so:

i. What is the problem?
ii. How material is it?
iii. Provide examples of the problem

"The problem"

In those areas where network peak demand is approaching the capacity of the existing distribution network DNSPs are offered two alternatives. They can invest in network augmentation to increase the capacity of the network or they can invest in demand response (to avoid the cost of network augmentation).

All Australian DNSPs undertake network augmentation. DNSPs detail the cost of these programs in their Regulatory Proposals. The Australian Energy Regulator (AER) uses the cost per MVA of added capacity as an effective measure of the efficiency of the DNSP's expenditure. The AER allows DNSPs to recover the cost of *efficient programs*.

The benchmarking allows the AER to quickly identify inefficient network augmentation. It can then encourage efficient investments by reducing the claimed cost of inefficient DNSP programs.

Benchmarking the cost of various DNSP demand response programs is far less accurate. While the cost of a demand response program may be well known the amount of demand reduction is at best an estimate. Knowing the AER uses the cost per MVA of demand reduction to determine cost recovery DNSPs are provided an incentive to overstate the demand reduction.

Without validation there is no penalty when DNSPs overstate demand reductions

The problems are therefore

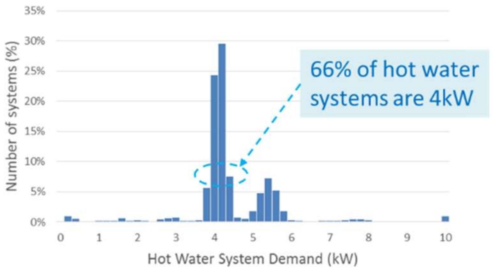
- DNSPs are not required to validate the amount of demand reduction delivered by their demand response programs.
- Without validation the DNSPs are under no pressure to deliver the claimed benefits.
- When the demand response programs fail to deliver the claimed benefits the cost of network augmentation is added to a future regulatory proposal and the DNSP is allowed to earn a return on the cost of *both* the network augmentation and the ineffective demand response program.

The problem starts with a lack of validation of the achieved demand response benefits so the next section considers the network benefits provided by "well proven" DNSP control of hot water systems.

Benefits of controlling Hot Water Systems

DNSPs claim their control of off-peak hot water systems provides major demand response benefits.

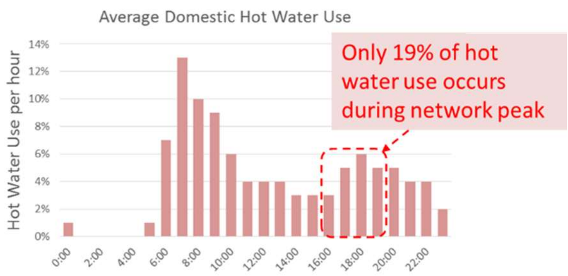
A hot water system is a constant load on the network. The following shows the maximum 30 minute demand for 3400 household hot water systems [Ref 2].



The figure shows the typical electricity demand for a domestic hot water system is 4kW. The figure *suggests* a DNSP controlling 250,000 hot water systems can claim their demand response program is providing 1GW of network benefits – **Or can they?**

The benefit of DNSP hot water load control is limited to the average use of uncontrolled hot water systems occurring during periods of peak network demand.

The Residential Water Heater Baseline Data Study [Ref 3] provides an average daily profile of domestic hot water use.



The average profile shows 19% of hot water use occurs during the network peak, taken here as 4pm to 8pm on weekdays.

Average daily electricity use by hot water systems from the 3400 households [Ref 2] is 6.5kWh/day. Calculating average hot water demand during the 4 hour network peak reveals.

$$Average\ Demand = 6.5\ \times 19\%/4\ hours$$
$$= 0.31\ kW$$

While DNSP hot water demand response programs control 4kW loads, the average network benefit of that control is 0.31kW (or 7.5% of the claimed value).

Increasing Costs without increasing benefits

Roughly half of Australia's DNSP hot water demand response programs use a switch (relay) controlled by a time clock. The clock simply ensures the hot water system is turned off during the network peak demand period of 4pm to 8pm.

Once the hot water heater is turned off between 4pm and 8pm virtually no additional network benefits can be claimed. Despite this several DSNPs significantly increase the cost of their demand response programs by installing the time clock remotely from the customer premises and using 'ripple signals' sent along the mains to control the switch. Despite providing no additional network benefits these DNSPs are allowed to recover the additional cost of the ripple equipment installed at substations and customer premises.

Ripple signals are notoriously unreliable often resulting on consumer complaints for cold showers. A typical DNSP response is to reprogram the expensive customer ripple equipment to act as a dumb time clock. Externally it is impossible to determine if the expensive customer ripple equipment is actually being used as a dumb time clock. Even when the customer equipment is only used as a dumb time clock the DNSP continues to recover the cost of the more expensive ripple equipment.

Efficiency of demand response programs

The AER reviews DNSP regulatory proposals to ensure network augmentation only occurs in areas where peak demand is approaching the network capacity. This is intended to prevent DNSPs receiving a regulated income for unnecessary network augmentation.

The AER is unable to apply the same checks to DNSP demand response programs. This is largely because the AER is unable to validate the achieved demand reduction.

Appendix 17 of Energex's 2015-2020 Regulatory Proposal [Ref 4] provides details of their Demand response Program. The proposal indicates at the end of 2015 they were controlling 27,000 air-conditioners reducing network demand by a claimed 20.1MVA.

The 20.1MVA of demand reduction is only an estimate. Energex does not measure the achieved demand reduction making it impossible to validate the estimate.

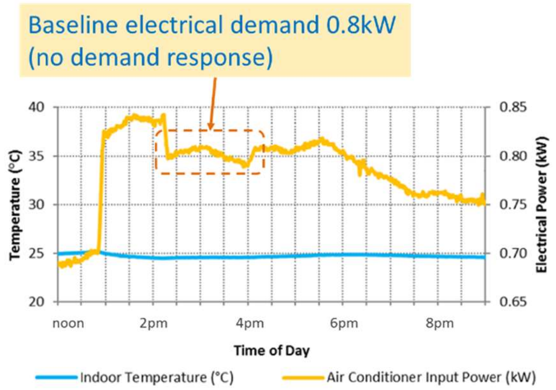
Australia's Demand Response Standard

Energex have assisted in the development of an Australian specific demand response standard, AS4755 [Ref 5]. This standard does not require validation of the stated demand reduction. Appliances may claim they provide 'a 50% demand reduction', but there is no guarantee they actually do.

A 2014 report published by the CSIRO and University of Newcastle [Ref 6] presents laboratory testing which can be used to validate the actual demand response when AS4755 is used to control an air-conditioner.

Using room-in-a-room testing the CSIRO report presents the measured air-conditioner electricity demand and indoor temperature while simulating a controlled outdoor temperature of just over 35°C.

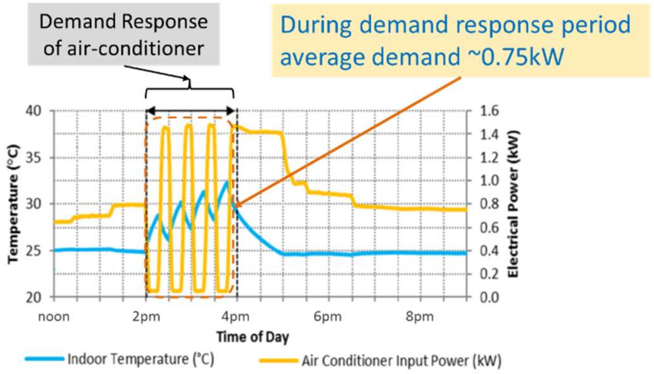
The testing begins by measuring the baseline result (no demand response). Figure 3 from the CSIRO report is shown below.



The important observation is between 2pm and 4pm the air-conditioner is using 0.8kW while maintaining a constant indoor temperature of 25°C.

Energex's regulatory proposal states "benefits are calculated based on 50% activation of PeakSmart capable (AS4755 – Demand Response Capable) appliances".

Conveniently the CSIRO laboratory testing presents the results of 50% activation of the air-conditioner. Figure 4 from the CSIRO report is shown below.



The above figure shows the Australian demand response standard AS4755 being used (in an attempt) to reduce demand by 50%. The measurements show the average 30 minute demand between 2pm and 4pm is 0.75kW. Compared to the baseline, 30 minute average demand has decreased by 6% (from 0.8kW to 0.75kW). It is emphasised this is *significantly* less than the *estimated* 50%.

In their Regulatory Proposal Energex estimated 50% cycling of air-conditioners results in a network benefit of 20.1MW. Independent laboratory testing shows using AS4755 and 50% cycling delivers a demand benefit of 6%. These validated measurements suggest Energex's demand response program is delivering a network benefit closer to 2.5MVA (12.5% of the original value).

The benefit is still overstated

Energex pays a $400 bonus to consumers adding PeakSmart demand response to their air-conditioner [Ref 7]. Online forums suggest consumers can then unplug the PeakSmart controller ensuring no network benefits are delivered [Ref 8].

Unlike hot water systems the electricity use of air-conditioners is not separately measured. The DNSP cannot reliably detect the PeakSmart unit has been disabled. Despite no longer delivering any network benefits the DNSP continues to earn a regulated return on the cost of their demand response system.

There is also evidence some customers are using the Energex bonus payment to install a larger air-conditioner [e.g. Ref 9]. The larger air-conditioner places greater demand on the network further reducing the benefits of the DNSP demand response program.

Materiality of the examples

The AEMC does not require the DNSP to validate the network benefits. The two examples suggest these benefits are significantly less than proposed in regulatory proposals. Even when DNSP demand response programs fail to deliver forecast network benefits they continue to recover the full cost of these programs.

DNSPs install demand response programs across their entire distribution network area. From a purely economic viewpoint benefits should only be claimed where demand response programs avoid expensive network augmentation. In any regulatory period only a small percentage of demand response programs actually defer network augmentation. Put another way approximately 95% of the costs of DNSP demand response programs do not deliver network benefits. Despite this DNSPs are allowed to recover 100% of the costs.

The most significant cost for consumers is when DNSP demand response programs fail to deliver network benefits. Rather than penalising the DNSP for overstating the benefits the current rules reward the DNSP.

When DNSP demand response programs fail to deliver promised benefits the DNSP simply applies for additional funding to augment their network

Where peak demand starts to approach the network capacity the DNSP adds the cost of necessary network augmentation to their regulatory proposal. The AER then approves the expenditure guaranteeing a regulatory return on the investment. The DNSP receives a regulated return on *BOTH* the network augmentation and their inefficient demand response program.

A level playing field

Non-DNSP market participants currently offering demand response programs generate income from the amount of demand reduction they achieve. These payments are based on validated (usually measured) demand reductions. As discussed DNSPs are not required to validate the demand reduction their schemes achieve.

Non-DNSP market participants wishing to deploy a demand response system are responsible for the full cost of their demand response program. Their business case requires them to deliver forecast demand reductions. By comparison DNSPs are guaranteed to recover the cost of their demand response programs even when they fail to deliver estimated benefits.

The differences highlight the AEMC treats DNSPs very differently. While DNSPs are under no pressure to deliver efficient demand response programs other market participants must. When a DNSP demand response program fails to deliver estimated benefits the DNSP uses existing cost recovery mechanisms to apply for network augmentation and recover the cost of *both* the network augmentation and their inefficient demand response programs. Other market participants are not offered the same protection and would suffer financial consequences if they were to deploy inefficient demand response programs.

Summary

In response to Question 6 of the AEMC's consideration of Contestability of Demand Response Energy Services.

What is the problem? DNSPs are not required to validate the actual benefits delivered by their demand response programs. Without validation DNSPs are provided a financial incentive to overstate the benefits of their programs.

How material is it? Continuing to support inefficient DNSP demand response programs results in higher electricity bills for all consumers. Ineffective demand response programs fail to avoid expensive network augmentation. Consumers are forced to pay for unnecessary network augmentation and all costs associated with the inefficient DNSP demand response program.

Provide examples of the problem. Two examples are provided including the traditional DNSP control of hot water systems and more recent innovations using a DNSP developed Australian demand response standard controlling air-conditioners. In both cases analysis shows the delivered benefits are *significantly* less than estimated.

Conclusion

DNSPs should no longer be given preferential treatment to implement demand response programs. Existing market rules do not require validation of delivered benefits with simple analysis showing the benefits are being overstated. Worse perverse market incentives encourage DNSPs to implement inefficient schemes.

Efficient demand response programs have the potential to lower electricity costs for all consumers. Strong financial incentives already exist in the National Electricity Market to support these programs. The AEMC should consider allowing DNSPs to offer these programs, but only if DNSPs are unable to earn a regulated return on the assets they install.

References

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3. Department for Manufacturing, Innovation, Trade, Resources and Energy, Residential Water Heater Baseline Data Study, 2014.
4. Energex Regulatory Proposal 2015-2020 Appendix 17 Demand response Program October 2014.
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6. Residential Air Conditioning and Demand Response: Status of Standards in Australia and Future Opportunities, J.Wall and A.Matthews, International Journal of Application or Innovation in Engineering & Management, Vol 3, Issue 6, June 2014
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About Dr Martin Gill

Dr Martin Gill is an independent consultant specialising in the provision of consumer advice. This advice is based on a deep understanding of the Australian energy industry and strong analytical skills. As a consultant he has prepared advice for consumer advocates, government regulators, electricity distributors, electricity retailers, asset operators and equipment vendors.

Dr Gill is a metering expert. During the National Smart Metering Program he facilitated the development of a specification for Australian smart meters. Innovative metering products developed by his teams have been externally recognised with the Green Globe Award, NSW Government's Premier's Award and Best New Product by the Australian Electrical and Electronics Manufacturers Association.

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Citation

Comments or Questions?

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