Demand Management Incentive Scheme

Dr Martin Gill

The Australian Energy Regulator is considering providing Distribution Network Service Providers incentives to implement demand management. They shouldn't.

Summary

The Australian Energy Regulator (AER) should not provide incentives to Distribution Network Service Providers (DNSPs) to implement demand management programs.

(a) The Australian Energy Market already supports the efficient implementation of demand management programs
(b) Providing DNSPs incentives continues to promote the inefficient demand response schemes they are currently deploying

"The proposal"

The AERs consultation paper [Ref 1] is seeking feedback on their proposal:

To provide Distribution Network Service Providers with an incentive to undertake efficient expenditure on relevant non-network options relating to demand management

In those areas where network peak demand is approaching the capacity of the network DNSPs are offered two alternatives. They can invest in expensive network augmentation to increase the network capacity or they can invest in schemes intended to reduce network peak demand.

The effective cost of DNSP demand management schemes are currently estimated. The following suggests the estimated benefits are overstated revealing the cost of their schemes is significantly higher than presented.

Historical demand response programs

Historically Australian DNSPs have offered demand response programs. In exchange for cheaper retail electricity rates the DNSP controls when customers can heat their hot water (and some other appliances).

The majority of these demand response programs use time clocks. The time clock only allows the water heater to run overnight. This ensures water heaters cannot contribute to network peak demand typically occurring around 4pm to 7pm.

Time clocks are dumb, they cannot respond to actual demand on the distribution network. So DNSPs have attempted to expand their control to include consumer owned air-conditioners and pool pumps.

Example of a DNSP demand management program

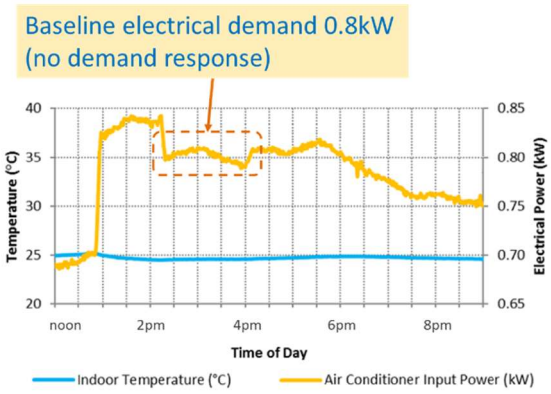
Appendix 17 of Energex's 2015-2020 Regulatory Proposal [Ref 2] provides details of their Demand Management Program. The proposal indicates at the end of 2015 they were controlling 27,000 air-conditioners reducing network demand by 20.1MVA.

While 20.1MVA is an impressive figure it is important to note this demand reduction is an estimate. The Australian demand response standard DNSPs have developed cannot be used to validate the demand reduction.

The AER is encouraged to question the demand reduction being estimated by distributors

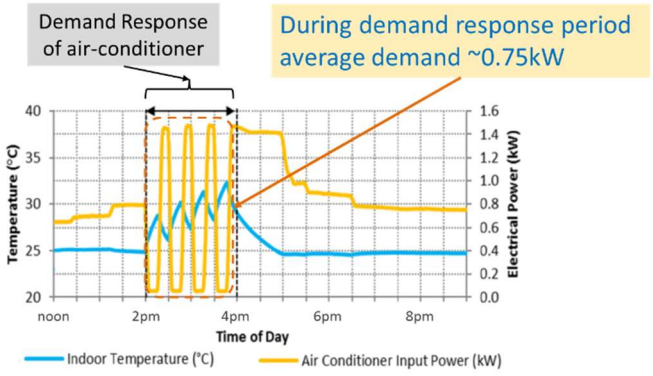
While Australia's energy labelling scheme is supported by accurate laboratory measurements, Australia's demand management standard, AS4755 [Ref 3] is not. A 2014 report published by the CSIRO and University of Newcastle [Ref 4] includes independent laboratory testing of a modern air-conditioner complying with Australia's demand response standard.

The CSIRO's laboratory testing simulates an outdoor temperature around 35°C. During the testing accurate measurements of the air-conditioner's electricity demand and the indoor temperature are made. The report starts with a baseline to determine the electrical demand. Figure 3 from the CSIRO report is shown below.



A note added to the above figure highlights between 2pm and 4pm the air-conditioner is using 0.8kW while maintaining a constant indoor temperature of 25°C.

In their regulatory proposal Energex state "benefits are calculated based on 50% activation of PeakSmart capable (AS4755 – Demand Response Capable) appliances". During the development of Australia's demand response standard it was assumed if the air-conditioner compressor is turned off for 50% of the time then electricity demand is reduced by 50%. Conveniently the CSIRO presents the results of 50% cycling (their figure 4).



The above figure shows AS4755 being used between 2pm and 4pm (in an attempt) to reduce the demand by 50%. The figure clearly shows the measured peak demand is 1.45kW. Compared to the baseline electricity demand has ***increased*** by 0.65kW or over 80% (not decreased 50%).

A slightly better result is achieved by considering the average demand during the event. Compared to the baseline average demand calculated over 30 minutes has decreased by 6% (from 0.8kW to 0.75kW). This is *significantly* less than the *estimated* 50%.

Why is the result so much less than was predicted?

The Australian demand response standard was first proposed in 2005, before the introduction of Australia's strict Minimum Energy Performance Standards (MEPS). To meet Australia's strict MEPS air-conditioner manufacturers must include energy management systems. These management systems are unable to operate efficiently when AS4755 is used.

Drawing an analogy consider driving a car at a constant speed along a flat highway. In the baseline case an energy management system gently adjusts the accelerator to maintain a constant speed. In the second run the driver attempts to maintain the same average speed but is only allowed to slam the accelerator pedal to the floor or lift off completely, unsurprisingly the fuel consumption will be much higher. What is surprising is AS4755 uses the second method but expects the fuel consumption to be lower.

Implications of the result for Energex

Energex estimates their control of 27,000 air-conditioners reduces demand by 20.1MVA. This value is an estimate because the Australian demand response standard installed by Energex cannot measure the actual demand reduction.

Energex bases their estimate on 50% cycling reducing demand by 50%. The CSIRO testing reveals using 50% cycling only reduces 30 minute demand by 6%. This suggests the actual demand reduction of the Energex program is closer to 2.5MVA!

Energex is not penalised for failing to deliver 17.7MVA of demand reduction. The demand response program simplifies their application for additional funding

In areas where network peak demand starts to approach network capacity the DNSP includes the cost of network augmentation in their regulatory proposal. The AER then assesses the merits of the expenditure and looks favourably on their (feeble) attempt to reduce network demand. Once approved the DNSP increases consumer electricity bills to recover the cost of the "necessary" network augmentation while still recovering all costs associated with the inefficient demand response program.

Implications for the AER

Demand response programs only deliver network benefits where the resulting demand reduction avoids network augmentation. In any regulatory period this is

only a small fraction of the total distribution network area. For the following it is (generously) assumed 10% of the distribution network potentially benefits from an efficient demand response program.

DNSPs typically offer demand response programs to all their customers even though only 10% actually delivers benefits.

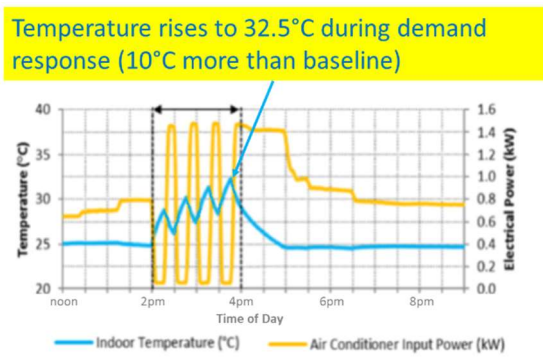
Put another way 90% of the DNSP's expenditure on demand response programs fails to deliver network benefits

In their regulatory proposal Energex estimate the benefits (cost to serve) of their residential demand management program is $817/kVA. Assuming 10% of the expenditure delivers network benefits suggests the actual cost to serve is $8170/kVA.

Energex's cost to serve uses the estimated 50% demand reduction rather than the 6% achieved in laboratory testing. Energex's proposal does not present enough information to accurately adjust the cost to serve when the demand reduction is only 6% but a figure exceeding $50million/MVA seems likely. Viewed in this light DNSP demand response programs are more expensive than network augmentation.

Implications for Consumers

Unlike overseas demand response initiatives the Australian standard demand response system chosen by DNSPs does not allow *ANY* customer control. Customers choosing Energex's PeakSmart solution surrender all control of their air-conditioner. A consequence of the loss of customer control is also revealed in the CSIRO laboratory testing.



Comparing the indoor temperature in the above figure to the baseline (no cycling) reveals the indoor temperature has risen to an unbearable 32.5°C. This is almost 10°C more than if AS4755 had not been used to cycle the air-conditioner.

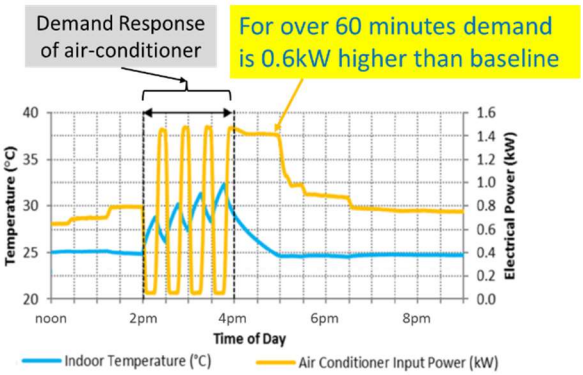
As stated customers are not able to return the air-conditioner to normal operation. This probably explains the numerous complaints raised on online discussion forums [Ref 5]. For example:

I went to disable the darn thing by unplugging the Rj45 connector between the aircon and the DRED. This effectively stop the aircon from entering demand response mode.

The Australian demand response standard is unable to detect when dissatisfied consumers unplug the system. DNSPs choose this solution because even when unplugged they are entitled to recover the cost of the system through higher electricity costs for all consumers.

On the topic of higher electricity costs

Another problem arises after the DNSP stops cycling the air-conditioner. Referring to the CSIRO testing:



The testing shows using AS4755 has resulted in demand increasing by 0.6kW (compared to the baseline) for over an hour after cycling ends. This result is anticipated as the air-conditioner is forced to run harder to cool the room.

The problem is the introduction of demand tariffs by DNSPs. On a demand tariff consumers pay a fee associated their maximum demand in any month. For example Energex's Tariff Schedule [Ref 6] states:

The demand charge ($/kW/month) is based on a single peak over a 30 minute period between 4pm and 8pm on workdays during a monthly billing cycle.

The Energex demand tariff charges $15.68/kW/month so the extra 0.6kW (compared to the baseline) potentially increases Energex's monthly income per controlled air-conditioner by $10 (when the retail component is included customer's will pay even more).

Goals outlined in the Power of Choice

The AEMC's Power of Choice [Ref 7] hopes to increase the number of companies offering demand response programs. Unlike programs offered by DNSPs the AEMC does not provide a mechanism for operators of these systems to pass the cost to consumers.

In the National Energy Market [Ref 8] prices can exceed $13/kWh. Efficient demand response programs use these financial incentives to recover the cost of the program. For example demand aggregators have been successfully using these price signals to implement efficient demand response programs.

It is suggested the AER's demand management incentive program fails to meet the goals of the Power of Choice. Firstly DNSPs are not exposed to the price signals in the National Electricity Market. Secondly paying one market participant to deploy demand management programs gives them an unfair advantage compared to other market participants.

There is another issue: The proposed incentives maintain the historical dominance of (inefficient) demand response programs offered by DNSPs. Consider a new market participant hoping to offer demand reduction via control of hot water systems. There is almost no business case because DNSPs have already installed dumb clocks turning off hot water systems during peak periods.

Providing incentives to DNSPs so they can attempt to control other domestic appliances including air-conditioners, pool pumps, solar systems and battery storage systems negatively affects the business case for companies wishing to offer superior demand management programs.

Reminder DNSPs are under no pressure to deliver efficient demand management programs. When their programs fail to deliver estimated benefits they use existing cost recovery mechanisms to pay for network augmentation while continuing to claim the cost of their inefficient demand management programs.

Conclusion

There is no justification for providing incentives to DNSPs to implement demand management. The Australian standard they have developed and intend to use fails to provide network benefits and is designed to hide this failure by not supporting validation.

Independent laboratory testing of the Australian Standard developed by DNSPs reveals the demand reduction is significantly less than *estimated*.

In summary providing incentives to DNSPs will result in the installation of systems which

- deliver minimal benefits (so do not avoid network augmentation),
- are paid for by consumers (both the inefficient demand management system and network augmentation needed because the chosen systems don't work) and
- DNSPs can use the system to increase consumer electricity bills.

The inefficiency of DNSP demand management programs increases electricity costs for all consumers.

Rather than consider providing DNSPs with additional incentives the AER should be reviewing the generous funding already given to support existing inefficient demand management schemes.

Citation

Comments or Questions?

The author is happy to receive comments or questions about this article. He can be contacted at martin@drmartingill.com.au

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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.

He has a broad technical background having personally developed advanced communication modems, burglar alarms, electricity meters, high voltage fault monitors and power quality analysers.