Response to AER's Options Day discussing the Demand Management Incentive Scheme

Dr Martin Gill

The Australian Energy Regulator (AER) is considering a Demand Management Incentive Scheme (DMIS). Under the DMIS Distribution Network Service Providers (DNSPs) would receive bonuses for choosing Demand Management (DM) over traditional network solutions. Unfortunately the DMIS does not support the principles of the AEMC's Power of Choice and would restrict the development of a free and fair DM market.

Summary

This submission analyses various options presented during the Australian Energy Regulator's (AER) Options Day. This analysis reveals Demand Management (DM) schemes are ***more expensive*** than traditional network solutions. Incentive payments would only make them even ***more expensive***.

Introduction

The Australian Energy Market Commission (AEMC) has asked the AER to develop a scheme providing incentives to Distribution Network Service Providers (DNSPs) choosing DM programs over traditional network solutions [Ref 1].

The AER hosted an Options Day allowing participants to discuss their submissions to the AER's Consultation Paper [Ref 2].

The first slide of the AER presentation asked [Ref 3]:

Should there be a scheme?

Participants were unable to agree on this point. This is not surprising with the AEMC directive also indicating not all DNSPs will be eligible for incentive payments:

The AER is able to decide **whether**, and if so how, to apply the incentive scheme […] to individual distribution businesses.

The AEMC directive requires the AER to develop an incentive scheme, however it places no obligation on the AER to make incentive payments to DNSPs. Incentive payments should only be made when DNSPs validated measurements demonstrate their expenditure on DM results in savings for consumers.

Net cost savings v Efficient Expenditure

The original directive from the AEMC states:

The scheme should reward DNSPs for implementing relevant non-network options that **deliver net cost savings to retail customers**;

The AER's stated objective for the scheme differs from the AEMC's directive:

To provide DNSPs with an incentive to undertake **efficient expenditure** on relevant non-network options relating to DM

From a consumer perspective the difference is disappointing. While the AEMC requires "net cost savings to customers" the AER only requires "efficient expenditure".

The difference is significant. Consider a DNSP running an open tender process resulting in efficient expenditure on network infrastructure. While the open tender process supports efficient expenditure the investment is never intended to deliver cost savings to customers.

The AER should retain the AEMC's requirement of verifiable "consumer savings" rather than an assessment of "efficient expenditure".

Incentive calculations must use measurements of consumer savings

Apples and Oranges

The implicit assumption underlying the DMIS is DNSPs can employ DM to deliver additional network capacity at a lower cost than network solutions.

A significant issue is the cost of non-network solutions is rarely directly comparable to network solutions. During the Options Day several participants suggested this was like comparing 'apples and oranges'. Any DMIS must ensure consumer savings are calculated using equivalent (comparable) costs.

The following sections draw from several examples discussed during the Options Day.

Asset Lifetime

Network solutions typically have a guaranteed lifetime of 50 (or more) years. In contrast most DM solutions offer a fraction of this lifetime.

Take the current DNSP practice of providing DM by controlling customer air-conditioners. The typical lifetime of a domestic air-conditioner is 15 years. A meaningful comparison requires the cost of enrolling the air-conditioner in the DM scheme three times in order to achieve (roughly) the same lifetime as a network solution.

The cost to provide savings over the lifetime of the network solution should be used for the calculation of consumer savings

Risk Management

The National Electricity Objective requires DNSPs to provide a reliable and high quality network. DNSPs meet this obligation using low risk (conservative) approaches. Once a network solution is installed it provides guaranteed network capacity which is always available. So network solutions are low risk.

The benefits of DM schemes are less certain. At the Options Day the representative from the Energy Efficiency Council (EEC) noted DM schemes should employ a "certainty factor". The certainty factor takes into account risks associated with the availability of DM benefits.

For example large demand aggregators often contract 120 to 150% of the required demand reduction, equivalent to a certainty factor of 0.67 to 0.83. DNSP DM of domestic air-conditioners only delivers benefits if the air-conditioner is turned on so has a higher risk. The EEC suggested a certainty factor as low as 0.25.

The certainty factor must be included when comparing the cost of network and DM solutions

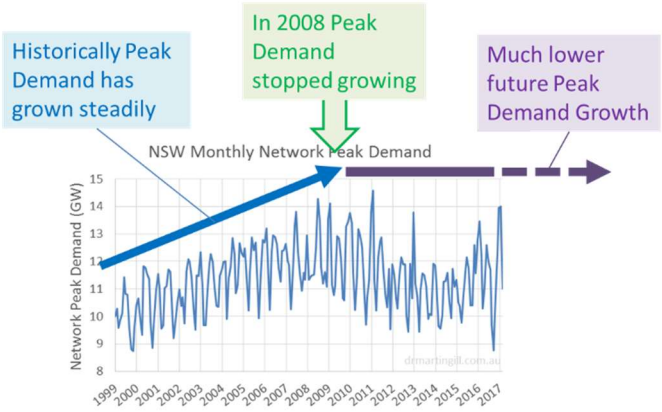
Installed only where required

DNSPs install network solutions exactly where they are required. Where peak demand is approaching the installed network capacity the DNSP upgrades the capacity to meet their reliability targets. This ensures every dollar spent on network solutions delivers network benefits.

The same cannot be said of DM programs. These programs are offered to all customers, even in areas with no network constraints. For example DM programs controlling off-peak hot water heaters, pool pumps and air-conditioners are offered to all customers across the distribution area.

Historically offering DM to all customers was considered beneficial. Forecasts predicted continuous growth of network peak demand. These (incorrect) forecasts meant DM expenditure would eventually delay DNSP investments needed to supply additional network capacity. This argument is no longer valid.

The following shows 17 years of monthly network peak demand in NSW [Ref 4]



The above figure shows up to 2008 the long term trend of steady growth of network peak demand. Then around 2008 peak demand suddenly stopped growing. Since 2008 network peak demand has not grown (in fact some predict it will continue to fall). The conclusion is significant: **Expenditure on DM can no longer be claimed to defer network investments.**

The extra capacity delivered by installing DM systems in areas where there is already sufficient network capacity does not result in consumer cost savings. This expenditure must be excluded from the DMIS.

Only expenditure providing consumer cost savings should be included in the DMIS

Worked Example using the above adjustments

The cost of DM of air-conditioners is considered low at $2,000/kW.

- *Lifetime*: The air-conditioner lasts 15 years compared to the 50 year lifetime of network solutions. Scaling the DM cost to a 50 year lifetime raises the cost to $6,667/kW (ignoring inflation).
- *Risk*: Not all air-conditioners are available during all events. Applying the certainty factor of 0.25 suggested by the EEC reveals the comparable cost of the DM scheme as $26,667/kW.
- *Targeted*: With peak demand forecasts now predicting minimal peak demand growth the calculation (generously) assumes 10% of expenditure defers network augmentation. This increases the final cost to $266,667/kW.

The AEMC requires incentive payments to be based on consumer savings. These saving must be calculated only after adjusting DM costs so they can be meaningfully compared to the cost of network solutions. Applying these adjustments results in the attractive (but idealistic) cost of $2,000/kW rising to a realistic (but unattractive) $266,667/kW.

DM is more expensive than network solutions

An example proposed during the Options Day

The following figures were mentioned during the Options Day. It is not suggested these figure represent an actual DNSP project.

A DNSP is comparing spending $1million on a network solution or spending $0.5million on a DM solution. The DM solution requires 30% of the consumers to participate in the DM scheme.

Social Equity Arguments

Several Options Day participants discussed how potential cost savings might be shared between the 30% of consumers participating in the scheme and the 70% of consumers who benefit despite taking no part. The AEMC's introduction of cost reflective network pricing [Ref 5] was not discussed.

The AEMC requires DNSPs to introduce cost reflective network pricing. Under cost reflective pricing the 30% of consumers participating in the DM scheme will pay less. The flip side of cost reflective pricing threatens the 70% of consumers "choosing" not to participate in DM schemes with higher electricity prices.

This assumes the 70% of consumers deliberately "choose" not to participate. In practice not all of the 70% will be eligible to participate. For example consumers unable to afford expensive battery storage systems, solar systems and modern appliances offering DM functionality. Many of these consumers have lower incomes and/or do not own their home.

The DMIS risks increasing electricity prices for those least able to afford it

Consumer Rewards (just) for enrolling

The alternative to penalising the 70% of consumers unwilling or unable to participate in DM is to directly reward the 30% choosing to participate.

Consumers enrolling in DNSP DM programs are already receiving financial rewards. For example Energex offers consumers up to $400 just for agreeing to enrol their new air-conditioner in the PeakSmart program [Ref 6]. This payment is made regardless of the network benefit.

For example the author's air-conditioner has never contributed to peak network demand (it is only ever run after 8pm). He would happily accept $400 towards a new unit knowing it provides no network benefits. The author also knows after accepting the $400 he can unplug the equipment used to control the air-conditioner confident this tampering will not be detected by the DNSP.

Similarly providing DNSPs with incentives just for installing DM fails to meet the AEMC's directive of delivering consumer cost savings.

DNSP incentive payments must be based on cost savings from **delivered** benefits

The problem arises because the current rules allow the DNSP to recover the cost of the DM system (including the upfront financial payment). This is discussed in the section "Alignment with the Power of Choice".

Putting it altogether (earlier example)

Using the Long Run Marginal Cost it is possible to estimate efficient expenditure of $1million on a network solution would add (at least) 100kW[1] of network capacity [Ref 7]. It is assumed this network investment lasts 50 years.

Ideal (unrealistic calculations)

Taking the estimated average DM of an air-conditioner as 0.75kW [Ref 8] indicates 133 units must be enrolled to deliver network benefits of 100kW. The cost to enrol each air-conditioning unit is $1500 (including hardware, communications modem and customer sign on bonus). This suggests the cost of a DM solutions is only $200,000.

Assuming the DMIS shares the savings equally via a financial incentive suggests the DNSP receives $400,000 if they choose the non-network (DM) solution. Consumers save $400,000.

Adjustments to make the costs comparable

The lifetime of each air-conditioner is 15 years before comparing the cost of the DM solution to the network solution requires the cost of the DM system to be multiplied by 50/15. The total cost increases to $666,667 (ignoring inflation).

When the extra network capacity is required not all air-conditioners will be turned on and available to contribute to peak demand savings. Additional air-conditioners must be enrolled in the DM program to meet the required target. The 'certainty factor' takes this into account. On the Options Day the EEC suggested a figure of 0.25 increasing the non-network cost to $2,666,667.

The DNSP offers the air-conditioner DM program across their entire network with most customers falling outside areas requiring network augmentation. Using the earlier figure that 10% of the expenditure eventually delivers network benefits increases the cost of the non-network solution to $26,666,667.

A DMIS only has merit when attempting to compare "Apples and Oranges". Once costs are made comparable it becomes clear **the DMIS represents an additional cost to consumers of around $26million**.

[1] For simplicity we assume unity power factor

Validated benefits

The above calculations use the *estimated* benefit of using Australia's demand response standard [Ref 11]. Australian DNSPs are using this standard as the basis of their DM programs. The Appendix of this submission presents the results of CSIRO laboratory testing of this standard.

While the DNSP *estimates* the network benefit as 0.75kW CSIRO testing reveals the actual network benefit is only 0.05kW. To **deliver** a network benefit of 100kW the total cost of the DNSP DM scheme increases to $400million! (for completeness the Appendix also presents LRMC calculations)

Excessive costs can be managed by requiring all DM providers to measure the effectiveness of their programs. This is required for non-DNSP provided DM schemes but not for DNSP provided schemes.

All DM schemes must make valid **measurements** (not *estimates*) of cost savings

Do we require Demand Management?

Australia's energy industry is undergoing rapid change. Traditional approaches of building more centralised generators and larger distribution networks are less important than the efficient management of distributed energy sources.

For consumers these energy sources include solar generation, battery storage and "negative watts" delivered by Demand Management. So DM will play a significant role in Australia's energy future. So:

"Does Australia need DM?" **"YES!"**
"Who should offer DM schemes?" **"ANYONE!"**

A free and fair market should be used to decide which DM operators provide consumers the best value for money. This is the principle outlined in the AEMC's Power of Choice.

Alignment with the Power of Choice

The AEMC's Power of Choice [Ref 9] represents a major reform of Australia's Electricity Market. These reforms intend to empower consumers to make energy choices including the choice to participate in DM programs. It is therefore surprising that during the

Options Day the Power of Choice was only mentioned in passing.

Major reforms have already been undertaken as a consequence of the Power of Choice. For example the AEMC felt a key enabler of the goals outlined in the Power of Choice was the rollout of smart meters. They introduced reforms making all metering services competitive. This required changes to remove DNSP monopolies over the provision of consumer metering services. Under these changes DNSPs can still provide metering services, but to ensure free and fair competition DNSPs are no longer allowed to earn a regulated return on their metering assets.

Under the Power of Choice the AEMC wants to see more companies offering DM programs. Free and fair competition requires all these companies to be treated equally. This is currently not the case. DNSPs are the only DM providers allowed to add the cost of their DM programs to their regulatory asset base and earn a regulated return.

The AEMC is currently considering a rule change to address this discrepancy. Under the contestability of energy services [Ref 10] the AEMC asks should they:

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.

The earlier decision on meter contestability provides a strong hint towards the AEMC's final determination. DNSPs will be free to offer DM programs but to promote free and fair competition they will no longer be allowed to earn a regulated return on the assets they install. Nor will they be allowed to receive incentive payments.

The DMIS conflicts with the goals of the AEMC's Power of Choice

The alternative is **all** DM programs are eligible for incentive payments ***regardless of who offers them***.

Further consequences of the Power of Choice

One topic raised by the AER requires special attention. During the Options Day the AER suggested DNSPs could be encouraged to share information needed to efficiently implement DM schemes.

The implication is DNSPs prepared to share information would receive incentive payments and those choosing not to share information receive nothing.

While the AER carefully use the term 'incentive' what they are actually suggesting is DNSPs be allowed to "sell" network data. This data includes consumer data. This leads directly to concerns the sale of the data may breach consumer privacy legislation. Designing a system allowing third party DM operators access to this information while simultaneously protecting consumer privacy would prove challenging.

There is another issue with the AER's proposal. Under the AEMC's metering contestability reforms the DNSP no longer has access to timely customer meter data. This information is only available to the retailer appointed metering coordinator.

Existing DM schemes have been restricted to commercial and industrial electricity users, all of whom already have remotely read contestable meters. The AEMC's metering reforms are already providing necessary data, without the need for additional incentive payments to DNSPs.

DM of battery storage

Consumers able to afford the cost of battery storage solutions and prepared to surrender control can already receive additional financial benefits. Under these schemes when the pool price of electricity rises the battery system is commanded to send energy to the network. The owner of the battery system receives a higher price for electricity sent to the network when pool prices are high.

Benefits flow to all consumers. Generation from multiple battery storage systems is bid into the electricity market at a lower price (that is why it is dispatched) which helps lower the pool price. As more consumers install battery storage more electricity can be supplied further lowering the pool price.

No incentives payments are required. The DM operator recovers costs from the price difference between consumer credits and the market pool price. Further 5 minute market settlements will make these schemes even more financially attractive.

Under the DMIS the DNSP would only be obliged to dispatch the battery output when demand in a small geographic area approaches the capacity of the network. Such a narrow focus risks distorting the future development of a DM market

Peak network demand only occurs for a few hours per year in small geographic areas. High pool prices occur much more often and affect everyone who buys electricity. DNSPs do not buy electricity so are unaffected by high pool prices. A DM scheme operated by DNSPs cannot be assumed to deliver lower pool prices. This raises an interesting question "Is the DMIS providing incentives to the right market participant?"

Conclusion

There is no justification for a Demand Management Incentive Scheme (DMIS). Electricity prices are no longer rising due to DNSP investment in network solutions. The DMIS is an attempt to solve a problem that no longer exists.

This submission has shown no evidence to justify the assertion non-network solutions offer consumers cost savings compared to network solutions. To meaningfully compare consumer savings requires the cost of non-network to be adjusted for:

- Lifetime
- Certainty Factor and
- Application only where required

Once these adjustments are applied non-network solutions are typically more expensive than the traditional network solutions.

Of concern is the DMIS does not align with the principles outlined in the AEMC's Power of Choice. In the interest of free and fair competition the AEMC is currently investigating reducing the preferential treatment which allows DNSPs to earn a regulated return on DM assets.

Citation

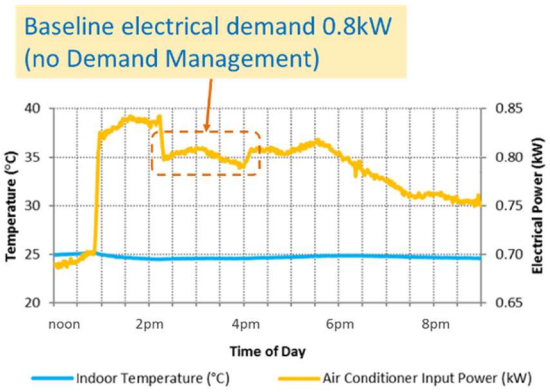
Appendix

Analysis of network benefits of air-conditioner DM

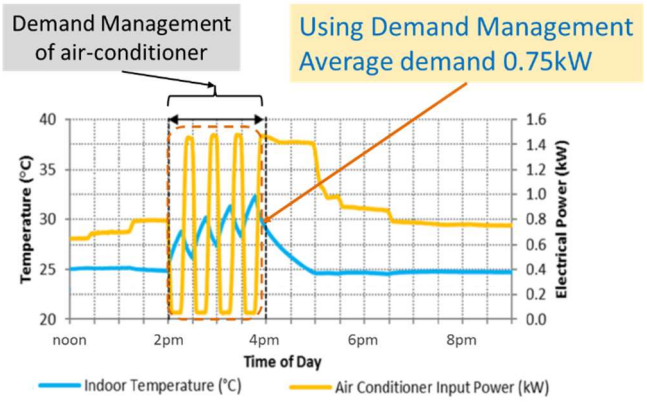
The PeakSmart program uses Australia's DM standard, AS4755 [Ref 11]. CSIRO testing of the effectiveness of this standard is presented in a 2014 report [Ref 8].

The CSIRO testing uses laboratory conditions to create an outdoor temperature of 35°C. Accurate measurements of the indoor temperature and air-conditioner electricity demand are made throughout the testing.

To calculate the network benefits it is necessary to compare network demand with no DM against network demand when using the DM scheme.



Without DM the above figure (Figure 3 in the CSIRO report) highlights between 2pm and 4pm the air-conditioner is using 0.8kW while maintaining a constant indoor temperature of 25°C.



The above figure (Figure 4 in the CSIRO report) shows AS4755 being used between 2pm and 4pm (in an attempt) to reduce network demand by 50%. The figure reveals the average demand over a 30 minute period has reduced to 0.75kW.

The measurement reveal the actual network benefit of air-conditioner DM is 6% (from 0.8kW to 0.75kW). This is *significantly* less than the *estimated* 50%.

Each PeakSmart installation costs Energex around $1500. This cost includes the upfront incentive payment and the hardware used to control the air-conditioner (consumers are required to pay to have the hardware installed).

Calculations using the LRMC

The AER uses the Long Run Marginal Cost (LRMC) to assess efficient expenditure on network solutions.

PeakSmart air-conditioning control attempts to reduce demand by 50% in the above case 0.75kW. The cost[2] of the estimated network benefit is therefore.

$$Estimated\ Network\ Benefit = \frac{\$1500}{0.75kW} = \mathbf{\$2000/kW}$$

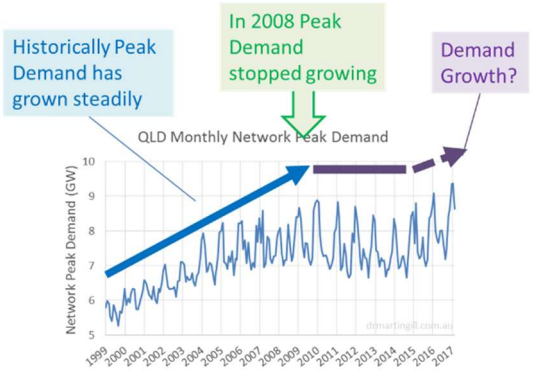
Independent testing shows AS4755 DM only achieves a demand reduction of 0.05kW.

$$Validated\ Network\ Benefit = \frac{\$1500}{0.05kW} = \mathbf{\$30,000/kW}$$

Not all air-conditioners will be running during DM events. This is taken into account using a Certainty Factor. During the Options Day the EEC suggested a Certainty Factor of 0.25.

$$CF\ Network\ Benefit = \frac{\$1500}{0.25\ \times 0.05kW} = \mathbf{\$120,000/kW}$$

Unlike other distribution areas there is some evidence of demand growth in Queensland [Ref 4].



It is generously assumed 25% of the DM investment defers network investment over the 15 year lifetime of the air-conditioner.

$$Delivered\ Network\ Benefit = \frac{\$1500}{25\% \times 0.25 \times 0.05kW}$$
$$= \mathbf{\$480,000/kW}$$

Taking the lifetime of the air-conditioner as 15 years reveals the LRMC is around $32,000/kW/year (ignoring adjustments for inflation).

The LRMC of efficient network investments [Ref 7] is $160/kVA/year. Even assuming a power factor of 0.85 **the DM scheme is 170 times more expensive than a network solution**. The investment is not efficient.

Comments or Questions?

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

[2] Allowing for Power Factor this figure is almost identical to the $1531/kVA shown in the Energex proposal [Ref 6]

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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.