# Mandating AS4755 only in South Australia

#### Dr Martin Gill

An independent Government review of a 2019 proposal to mandate Australia's demand response standard identified significant short comings, including claimed benefits were overstated. The same flawed analysis is now being presented in an attempt to justify an SA only mandate. Better outcomes can be delivered by a modified proposal.

#### **Summary of Submission**

The consultation paper fails to justify mandating a single expensive standard. If SA still wants to proceed a far better outcome is achieved by legislating a requirement, leaving the market free to offer a range of different (cheaper) technical solutions.

A proposal to mandate Australia's AS4755 series of standards was presented in a 2019 consultation paper. The Office of Best Practice Regulation's (OBPR's) review of the 2019 consultation paper found it overstated benefits and under-estimated costs. While this criticism is well known the SA consultation paper makes no attempt to address the deficiencies identified by the OBPR.

Analysis presented in the consultation paper uses an invalid method to value demand reductions. It incorrectly assumes all demand reductions avoid network augmentation. Forecasts show existing SA network capacity is sufficient until at least 2031, so the mandate does not deliver ANY benefits until at least 2031. The invalid method claims significant financial benefits are delivered in 2026.

# The majority of benefits claimed in the consultation paper DO NOT EXIST

If the SA Government still wants to proceed with a legislated mandate then they have already shown far better consumer outcomes can be achieved by specifying a requirement rather than mandating a single solution. A requirement leaves the market free to offer a range of different technical solutions. Significantly all (the invalid) benefits presented in the consultation paper can already be delivered by a wide range of different technical solutions.

The SA consultation paper describes this approach, but only for EV chargers. Exactly the same approach should be applied to all appliances. Existing international standards can already support all identified benefits (most at a lower cost). This contrasts with no products currently complying with the proposed (still only in draft) technical solution.

### A far better solution

If the SA Government still wants to proceed then they should legislate a requirement, not mandate a single technical solution

In September 2020 the SA Government demonstrated the consumer benefits of legislating a requirement rather than a single technical solution. The requirement was 'all new solar systems installed in SA support remote turn off'.

Almost 50 companies are already meeting the requirement, many offering additional benefits and services. For example many can support future solar system dynamic export limits.

The SA Government could have chosen to meet their requirement by legislating use of AS4755 (all solar inverters must support it). However if they had mandated the use of this single standard they would have lost many of the additional benefits.

The same approach should be employed here. The SA Government should legislate consumer appliances support remote demand management, leaving the market free to offer a range of different solutions.

# Introduction

The SA Government is considering mandating the AS4755 series of standards independent of the rest of Australia. If SA proceeds with the proposal all airconditioners, pool pump controllers, hot water heaters and Electric Vehicle chargers sold in SA would require manufacturers developed products only suitable for the SA market.

This proposal is supported using flawed financial analysis asserting ALL demand reductions result in financial savings. It incorrectly assumes SA networks are seeing continuous peak demand growth. Analysis clearly shows SA network demand peaked in 2010 and AEMO forward forecasts predict minimal future demand growth.

# Claimed savings do not exist.



The presented analysis ignores highly successful Government energy efficiency initiatives which have stopped peak demand growth. It incorrectly assumes network peak demand continues to grow at pre-2010 rates. As the above figure shows, SA demand peaked in 2010 and has remained flat for over a decade.

The SA proposal also exaggerates available demand reductions. A breach of Standards Australia Committee-in-Confidence obligations reveals the proposed standard will not deliver anywhere near claimed demand reductions.

The proposal recognises the mandate increases the cost of appliances. As a single state mandate the suggestion SA consumers will choose to pay more for an extremely limited number appliances in stores, when the full range of cheaper (non-compliant) appliances can be ordered online is at best naïve.

#### Demand Reductions are (grossly) over-valued

The consultation paper uses the cost of expensive network upgrades to value demand reductions. This grossly over-values the benefits.

Analysis supporting the consultation paper presents table after table of demand reductions in MW. It then values these demand reductions using the cost to add the same MW capacity to the network. Expanding network capacity is expensive including the cost of major work to install new transmission lines and larger transformers at substations, etc. A note shows the consultation paper claims savings of \$675,000 for every MW of demand reduction. This analysis is deeply flawed.

The following uses an analogy to explain how the consultation paper has calculated benefits. This is followed by a description of how the benefits of demand reductions should be calculated.

#### **Network Augmentation Analogy**

The consultation paper values all demand reductions at the cost to build new infrastructure. This analysis is deeply flawed.

A theoretical analogy is presented to reveal why analysis presented in the consultation paper is invalid.

A local council claims the value of a bus service anticipated to remove 100 vehicles from local roads at peak times is \$20 million.

#### Method:

State transport publishes the cost to undertake various road building projects across the state. The figures include the additional capacity enabled by the projects. Using these state wide figures the council calculates a cost to support each additional vehicle.

Total expenditure increasing vehicle capacity	\$20billion
Addition vehicles supported by the expenditure	100,000
ASSUMED cost to support additional vehicles	\$200,000

The council then (incorrectly) asserts EVERY vehicle removed from existing local roads during peak periods avoids spending \$200,000 on building new roads.



Removing cars from underutilised roads does not avoid the cost of building new roads

#### Analysis:

There are multiple problems with the declared "value". The most significant is the assumption every vehicle removed from existing local roads can be valued at the cost to build a new road for that vehicle. The vast majority of local roads will be operating below capacity, where removing vehicles provides **none** of the claimed savings.

The consultation paper uses exactly the same flawed method to value (claimed) demand reductions. It takes the high cost of adding capacity to distribution networks and applies this to ALL (claimed) demand reductions. Evidence shows the vast majority of demand reductions do not avoid network augmentation, so provide NO SAVINGS.

# Correct method of valuing the benefits of demand management

Savings shown in the consultation paper should be reduced to the current interest rate or around 2% of claimed values

NERA Economic Consulting describes how to value demand reductions:

• Use forecast demand growth and estimated demand reduction to calculate number of years network augmentation can be delayed

# The following figure depicts this step



The above figure depicts demand reductions delaying expensive network upgrades. The delay only occurs in those areas where demand growth will exceed existing network capacity.

NERA then uses the number of years network augmentation can be delayed to value the demand reduction:

# • Savings are the avoided interest payments for the number of years upgrades are delayed

The demand management scheme **does not avoid the expenditure** as depicted in the following figure:



NERA correctly notes savings are NOT the cost of network upgrades (as used in the consultation paper). Savings are the interest payments on the cost of any network upgrades. Also note interest payments are only avoided for the number of years the network upgrade is delayed.

Analysis presented in the consultation is deeply flawed because it:

- Fails to understand savings can only be claimed where demand reductions actually delay network upgrades (a small percentage of the network)
- Fails to understand savings are not the cost of the network upgrades, but only the (low) interest payments on the cost of upgrades
- Fails to understand these savings only start once network expenditure would have been required

Critical to the calculation of potential benefits is when forecast network peak demand is anticipated to exceed network capacity. Government energy efficiency initiatives mean demand growth is virtually zero. Most of the claimed demand reductions will deliver NO SAVINGS as even without a mandate no network augmentation will be required.

# Predicting when network upgrade is required

Flat demand growth shows savings claimed in the consultation paper do not exist

The following analysis plots SA peak network demand for the past 20 years along with AEMO's 2018 forecast future demand growth (Note: the AEMO figures do not include the effects of Covid).



The analysis clearly shows existing network capacity is sufficient until AT LEAST 2031 (assuming the network operated at capacity in 2010 and negligible capacity has been added over the past decade (some capacity will have been added). AEMO's 2019 statement of opportunities describes demand growth as flat:

# Maximum demand over the next five years is forecast to remain **relatively flat in** [...] **South Australia**

The conclusion is minor network upgrades may start in 2030. Before this date demand reductions result in no savings. The consultation paper incorrectly claims significant benefits are already being delivered in 2026. These savings DO NOT EXIST as no network augmentation is required before 2030. From 2032 to 2038 the AEMO forecast shows an annual demand growth of 1%. In any year only 1% of any demand reductions have the potential to delay network investments. Instead the consultation paper claims ALL demand reductions immediately deliver savings. These savings DO NOT EXIST.

A note clarifies AEMO's forecast of demand growth after 2030 is due to EV charging. It was unclear if this assumes controlled or uncontrolled charging. Consumer incentives to accept controlled charging strongly suggest even without a mandate most EV charging will be controlled.

### Consequences for the aggressive rollout timeframe

Demand forecasts show no growth in the short to medium term. Without demand growth early adoption does not deliver additional benefits

The consultation paper advocates the SA Government undertaken an early adoption of the mandate. This is "supported" with the (flawed) analysis suggesting the aggressive rollout delivers significant savings in 2026. AEMO forecasts show NO network demand growth over the short to medium time frame. Existing network capacity can meet forecast demand until 2031. As such 2031 is the earliest any mandate might deliver savings. There is no financial justification for an aggressive early rollout.

Perhaps even more significant when considering the proposed aggressive rollout, NO APPLIANCES are available meeting the yet to be published standard being promoted in the consultation paper. After the publication of the standard significant product development time frames are necessary. If the SA Government does require solutions *today* then multiple international solutions supporting equivalent capabilities are already available.

# If there is a genuine urgent requirement for demand response capabilities in SA, then mandating AS4755 does not meet that requirement

#### **Recognising international solutions**

Since AS4755 was first proposed numerous international demand response standards have emerged supporting similar (or more) benefits

A significant proportion of the (claimed) benefits are associated with control of Electric Vehicle (EV)

chargers. Since there is no specific AS4755 standard covering EV chargers, the consultation paper suggests:

# An equivalent international standard [...] that provides equivalent capabilities to AS 4755.

Several international solutions can be readily identified. In their submission to the original consultation the Australian Electric Vehicle Association suggested units complying with Open Charge Point Protocol, IEC 15118 and IEC 61850-90-8 are available all capable of offering equivalent capabilities.

This provides the SA Government with an opportunity. Rather than try to choose one specific standard, invariably limiting EV charging solutions offered to the Australian market and risking choosing the wrong standard, the SA Government could instead document a requirement leaving the market free to offer a range of different solutions. This is the solution the SA Government has chosen for control of solar systems, so why not EV chargers?

Similarly air-conditioner manufacturers can already provide multiple solutions offering demand response capabilities all without the need to mandate a unique expensive Australian solution. These solutions are capable of delivering the same benefits with none of the costs and risks associated with mandating an Australian specific solution. These solutions offer additional benefits not supported by AS4755 (as discussed in an Appendix).

#### **Demand Reductions are overstated**

A breach of Standards Australia Committee-in-Confidence obligations reveals air-conditioner demand reductions are overstated.

The AS4755 series of standards were developed, and are maintained by, a Standards Australia committee. Standards Australia requires all committee members sign a confidentiality agreement including an obligation they are not to disclose draft standards. In a clear breach of this obligations the consultation paper includes the statement:

### • the lack of models complying with AS/NZS 4755.3.1:2014, and **the latest draft of AS 4755.2**, which defines DRM2 as a reduction to 50% of power at rated capacity.

The breach of Standards Australia obligations is extremely useful as it provides insights into demand

reductions supported by the current draft of AS4755.2. Specifically demand reductions will be equivalent to those in the superseded version of AS/NZS 4755.3.1:2012.

The CSIRO explains the implication of the change in their 2014 journal article:

Under the [2012] standard, oversized systems may seldom run at or close to rated capacity, and hence may only reduce their demand by a small amount (if at all)

The CSIRO article presents laboratory testing of an airconditioner complying with the 2012 standard. Severe test conditions are used including installation in a thermally inefficient room with an outdoor temperature exceeding 35°C. The testing measures electrical demand and indoor temperature both with and without AS4755 control signals applied.



From noon to 2pm the testing confirms even under severe conditions a modern 1500W (energy efficient) air-conditioner is using far less power than its rated capacity. In this case somewhere between 650W and 800W.

At 2pm CSIRO applied the AS4755 control signal commanding the air-conditioner lower demand to 50% of its rated capacity. The testing shows average demand for the next 2 hours is 750W.

The testing confirms the CSIRO's assessment the 2012 standard "only reduces [...] demand by a small amount (if at all)" in this case the demand reduction is less than 50Watts and for most of the time, nothing.

Even the 2019 AS4755 consultation paper found a similar result. It discusses the results of a field trial of AS4755 air-conditioner control finding 50% of operational air-conditioners "were running under the reference power level and so did not deliver load reductions". The inescapable conclusion is the 2012 version of the standard delivers significantly less

demand response benefits than claimed in the consultation paper.

The consultation paper asserts once AS4755.2 is released air-conditioner manufacturers will be forced to comply with this standard. The breach of Standards Australia Committee-in-Confidence obligations highlights these air-conditioners will then not deliver demand reductions anywhere near the levels claimed in the analysis. The breach confirms demand reductions are over-estimated (this applies to all appliances as discussed in the appendix).

# Conclusion

The SA Government has already shown far better consumer outcomes are achieved by legislating a requirement rather than a single technical solution. Legislating a requirement leaves the market free to offer a range of different solutions and capabilities. This option can be implemented faster and with far lower costs than presented in the consultation paper. A clear benefit to SA consumers.

While AS4755 was among the first attempts to describe appliance demand response capabilities, it is no longer the only technical solution. Significantly NO PRODUCTS support the unpublished standard being promoted in the consultation paper. The suggested urgent need for a demand response capability in South Australia is not satisfied by a mandate of the AS4755 solution. *Demand response capabilities can be delivered today by legislating a requirement.* 

The consultation paper uses a fundamentally flawed method to value demand reductions. This method over-values exaggerated demand reductions. The analysis fails to include the consequences of slowing demand growth. Slow demand growth means the vast majority of demand reductions NEVER deliver savings. Despite this the flawed analysis still claims benefits. *Claimed savings DO NOT EXIST!* 

#### Citation

Please accurately attribute all quotes and references to this submission including the author's name and title of the submission "Mandating AS4755 only in South Australia".

#### **Comments or Questions?**

The author is happy to receive comments or questions about this submission. He can be contacted at <u>martin@drmartingill.com.au</u>

#### Clarification

This submission reviews arguments presented in the consultation paper prepared in support of a South Australian mandate of AS4755. It is not a review of the AS4755 series of standards.

#### Appendices

#### Analysis of claimed benefits

The SA consultation paper refers to the earlier 2019 consultation paper. Table 15 in that document presents *assumed* appliance demand reductions.

#### Hot Water Heaters

The consultation paper assumes "100% of hot water heaters will be operating at time of maximum demand". This fails to consider existing demand response systems including smart meters and time switches will continue to be used to control hot water heaters. The consultation paper then incorrectly claims benefits delivered by these existing systems. The consultation paper should only claim benefits from the small percentage of hot water heaters moving from uncontrolled to controlled as a result of any mandate. This will be a fraction of the claimed 100%.

The consultation paper over-estimates available demand response. e.g. Ausgrid measurements reveal on summer days the average demand of uncontrolled hot water heaters during peak hours is only 274Watts.

The consultation paper should be modified to exclude controlled hot water heaters and to reduce the size of claimed demand reductions.

Note: The unquantified benefit of being able to increase load is also significantly less than asserted with smart meters able to deliver a similar benefit (discussed below).

#### Air-conditioners

The consultation paper recommends forcing airconditioner manufacturers develop models complying with the new standard AS4755.2 (when released). The breach of Standards Australia Committee-in-Confidence obligations reveals this standard adopts demand reductions documented in the superseded AS/NZS 4755.3.1:2012 standard. Laboratory testing shows this standard delivers minimal (or even no) demand reductions. The consultation paper then incorrectly claims demand reductions of 450W, or 10 times more than testing suggests.



There are other issues including not all consumers will enrol their air-conditioners in demand response programs. Even among enrolled units many will not be operating, for example the earlier 2019 consultation paper reported field trials found less than 50% of airconditioners are being operated at time of maximum demand. The consultation paper's assumption 80% of air-conditioners deliver benefits at time of peak network demand is **far** too high.

The Office of Best Practice Regulation review of the 2019 consultation paper noted it incorrectly claimed benefits for all air-conditioners when a large number of compliant units would be installed even in the absence of a mandate. A similar error exists in the current consultation paper.

The consultation paper should be modified reducing the number of air-conditioners providing benefits and to reduce the claimed demand reductions.

#### Pool Pumps

The consultation paper assumes adding the interface to pool pump controllers delivers a benefit of 900Watts. This is not the demand of modern pool pumps. The following figure plots the electrical demand of modern energy efficient pool pumps.



The result of Government supported energy efficiency initiatives means over the time frame of the analysis the majority of pool pumps will be using around 1/3<sup>rd</sup> the power claimed in the consultation paper.

Demand reductions assigned to pool pump controllers in the consultation paper should be reduced by a factor of at least three.

Note: energy efficient pool pumps also reduce the unquantified benefit of increasing daytime load. Any attempt to value this benefit should also use the lower demand value. It is also predicted many consumers will shift pool filtering to the middle of the day to take advantage of SA's solar sponge tariff. The value of the AS4755 mandate is trivially small.

#### Electric Vehicles

Studies show high levels of consumer acceptance of controlled EV charging. Voluntary registration of controlled charging driven by significant savings by utilising cheaper electricity to charge are likely to be the norm (e.g. SA's solar sponge tariff). This suggests the vast majority of benefits claimed in the consultation paper will be delivered even in the absence of a mandate.

The consultation paper claims all benefits for controlled charging of EVs. It should only claim benefits where the mandate prevents an uncontrolled EV charger from adding demand to the network peak. This will be a far smaller percentage than assumed.

#### Example of benefits from legislating 'requirements'

If the SA Government legislated appliances provide demand response capabilities, rather than support a specific standard, they will find many existing appliances are already compliant and available to deliver benefits.

For example multiple air-conditioner manufacturers already offer WiFi connected models. Once connected to consumer WiFi networks they support enhanced consumer comfort and convenience (avoiding costs to provide necessary communications). Remote control of these units is then supported via a manufacturer provided web-portal.

Once the air-conditioner is connected to the webportal it can be programmed to lower energy costs. For example automatically adjusting thermostat settings in response to outdoor temperatures. Multiple highly successful trials, including a number in Australia, have demonstrated this benefit. The failure to support this benefit is discussed in the 2021 Victorian Smart Thermostats Issues Paper. Victorian excludes AS4755 solutions noting they do not 'reduce consumer energy usage'. Allowing consumers to install technology shown to lower electricity bills will result in far higher uptake than the proposed mandate.

Highly relevant for SA is the ability to program the airconditioner to take advantage of the solar sponge tariff. The 2014 CSIRO journal article shows the positive network and consumer benefits of precooling. This testing shows pre-cooling can halve electricity demand (network benefit). Reducing electricity use when electricity is more expensive (outside the solar sponge period) lowers energy costs (a consumer benefit). This is not supported by AS4755

If the SA Government legislated a demand response requirement (rather than a single expensive standard) manufacturers could offer access to their existing web-portal. This solution to be deployed in a short time frame (relatively minor modifications to existing portals). Even more significantly the benefits can be delivered by existing WiFi connected air-conditioners. Delivering benefits using existing solutions avoids lengthy delays required to develop new products meeting specific requirements detailed in an unpublished standard.

Clarification: A WiFi connected air-conditioner is NOT automatically AS4755.2 compliant. Functionality currently described in AS/NZS 4755.1 must be implemented in compliant appliances. Once a product is designed and developed it must be tested to confirm it correctly implements required functionality.

#### Other smart appliances

A major reason peak demand stopped growing is the huge success of the Government's Minimum Energy Performance Standards. For example an airconditioner installed today is 50% more efficient than one installed only a decade ago (from the E3 website). Savings from more efficient fridges, TVs, pool pumps and washing machines can be even more significant.

AEMO agrees with their forward forecast noting Maximum Demand "growth in underlying residential and business load is offset by increasing energy efficiency".

If the SA Government were to legislate a requirement they may find other appliance manufacturers are prepared to offer control of their smart appliances. This could include delayed start of dishwashers, clothes dryers and washing machines. These products are not included in AS4755.

#### Addressing the solar trough

The consultation paper implies the mandate provides a solution to 'too much solar generation'. Unfortunately the deeply flawed financial analysis presented in the consultation paper chooses to ignore far lower cost solutions which are already in place.



The above figure taken from the consultation sessions slide pack clearly shows a large increase in electrical demand just before midnight. This is caused by existing technology turning on off peak hot water heaters. As noted on the figure this existing technology could be adjusted *today* to shift significant amounts of load to use excess solar generation.

The AEMC smart meter rollout has already supplied 20% of homes with a smart meter. These smart meters support EXACTLY the same benefits as claimed in the consultation paper. The difference is this solution avoids the high cost of the proposed mandate. Over the time frame considered in the consultation paper virtually all homes will be supplied with a smart meter providing further evidence the vast majority of benefits claimed in the consultation paper will be delivered (far more cheaply) even without the AS4755 mandate.

#### Difference between AS4755.3.1:2012 and 2014

The 2014 CSIRO Journal article discusses the difference between the 2012 and 2014 versions of AS4755.3.1. The difference is the reference level used to calculate demand reductions.

The 2012 standard uses the rated capacity of the airconditioner (a fixed value). Calculating demand reductions from a fixed value is straight-forward and easily verified in testing. Daikin's submission to the 2019 consultation paper notes international demand response standards use the fixed rated capacity, c.f. EchoNET. Alignment with international standards and simplicity mean air-conditioner manufacturers have been able to develop and release multiple airconditioner models complying with the 2012 standard.

The 2014 standard changes the reference level to a variable value. Compliance requires air-conditioners measure their energy use over the last 30 minute period and use this variable value to calculate demand reductions. This is more complex to implement requiring air-conditioners accurately measure their energy use. To further complicate matters rather than specify standard test conditions the 2014 standard requires the demand reduction be available from any temperature/humidity value ensuring it is virtually impossible to test. Cost, complexity and deviation from international standards helps explain why the consultation paper notes there is a lack of air-conditioners complying with the 2014 version of the standard.

#### 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 currently represents the interests of consumers on a range of Standards Australia working groups including metering, renewable power systems, battery storage and demand management.