Should DRSPs bid consumer demand response?

Dr Martin Gill

Demand Response will play a vital role in Australia's energy future. Unfortunately including consumer demand response in the Generator Bid Stack faces significant challenges. Until viable solutions are found to these challenges the inclusion of consumer demand response in the bid stack risks higher, rather than lower, prices.

Introduction

For over two decades demand response services have formed an integral part of Australia's complex electricity market. These schemes have seen large industrial electricity users reduce their electricity use freeing generation capacity for other electricity users.

The Australian Energy Market Commission (AEMC) intends to formalise the role of demand response in the National Electricity Market (NEM). Changes will recognise a new market participant, the Demand Response Service Provider (DRSP) [Ref 1]. DRSPs will be allowed to bid demand response, with these bids treated in exactly the same way as those from traditional generators.

If DRSPs can find sufficient capacity, and are prepared to bid it at a lower price, then DRSP bids might lower wholesale electricity prices. In a theoretical competitive market, lower wholesale prices result in lower retail prices (or in Australia's broken electricity market, greater profits for participants).

The more likely financial benefit flows from DRSP incentive payments for demand response. Note this benefit *only* applies to consumers choosing to participate.

Bidding demand response from large industrial users is far simpler than bidding capacity obtained from small domestic consumers. This article discusses some of the challenges. Until solutions to the challenges are found the AEMC should not allow DRSPs to bid consumer demand response.

Important Point of Clarification

Consumers will continue to benefit from offering demand response even if reductions are not included in the bid stack. Current retailer schemes rewarding consumers for reducing consumption at peak times will continue to be offered.

Summary of Submission

Measurement is fundamental to the correct operation of Australia's energy market.

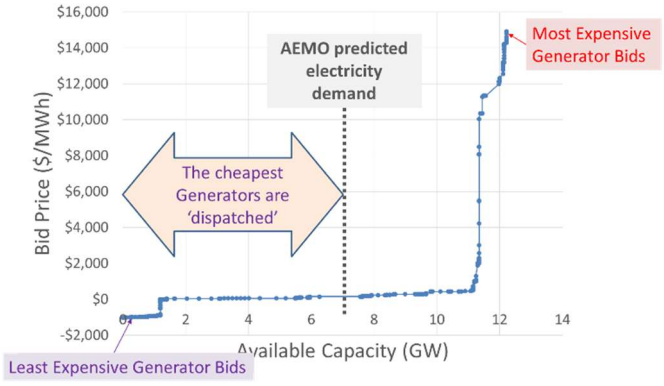
- Measurements are used to forecast demand
- Measurements validate dispatched generation is delivered
- Measurements are used to pay generators for the capacity they deliver

Consumer demand response *cannot* be measured. Developing viable and robust methods to replace actual measurements is complex. Until viable methods are developed the AEMC's decision to exclude consumer demand response from the energy market is considered prudent.

An overly simplistic description of the "bid stack"

The AEMC rule change allows DRSPs to bid capacity into Australia's Generator Bid Stack. Generator and soon DRSP bids give the offered capacity and a price for that capacity.

Starting from the least expensive bid, the Australian Energy Market Operator (AEMO) places the bids in a stack adding up the offered capacity. The AEMO bid stack looks something like:



AEMO then predicts electricity demand. Starting from the least expensive generator they *dispatch* sufficient generators to meet predicted electricity demand.

Constraints

The above description of the generator bid stack is overly simplistic. Most of the time constraints do not allow AEMO to dispatch the cheapest generators. For example insufficient capacity on transmission networks means electricity from the cheapest generators cannot get to where it is required. To meet constraints AEMO dispatches more expensive generators. WattClarity suggest simple bid stack processing only occurs 10% of the time [Ref 2].

Knowing where the "generator" is located

A critical constraint AEMO considers when selecting generator bids is knowledge of exactly where each generator is located. For traditional generators their location is well known and does not change.

Similarly AEMO can include network constraints when considering demand response of large industrial loads. The location of these large loads is well known. The same cannot be said for consumer demand response.

Consider a DRSP bidding capacity delivered by turning off domestic pool pumps. These pool pumps are spread widely across the network, making it difficult for AEMO model the effect should they dispatch the bid.

A closely related issue is estimating transmission losses as electricity flows through the network. Marginal Loss Factors are maintained by AEMO and their application is straight forward *provided* the location of the generator and/or large load is known.

Generators typically make multiple bids for each generation unit. A lower cost bid for running the generator at its most efficient, and other higher price bids offering additional capacity. The higher prices are reasonable since the generator is no longer being operated at maximum efficiency, potentially increasing maintenance costs and even shortening generator lifetime.

Similarly if DRSPs offer consumer demand response they are likely to make multiple bids. Different levels of consumer incentive payments may mean different consumers are involved. Accurate modelling probably requires AEMO to estimate and use different Marginal Loss Factors depending on which DRSP bids are dispatched. This is much more complex than the existing modelling they perform.

Marginal Loss Factors ensure traditional generators and demand response from large industrial loads is accurately modelled and fairly rewarded. Until similar levels of confidence are available to consumer offered demand response these bids should be excluded from the generator bid stack.

Validating promised capacity is actually delivered

The stability of electricity networks requires sufficient electricity generation to meet electricity demand. Traditionally this is easily achieved by using electricity meters to measure generator output. The measurements validate each generator delivers promised capacity.

While not measureable, turning off a significant industrial load provides a well-known and predictable result. This predictable result can be accurately factored into network planning. The same *cannot* be said for domestic demand response.

The following shows the typical benefits claimed from domestic demand response against those obtained from actual measurement.

Appliance	Claimed Demand Reduction	Measured Demand Reduction
Air Conditioner	750W	50W
Hot Water Heater	3600W	300W
Pool Pump	1000W	200W

Without measurements DRSPs must be paid using *estimates* of the demand response. The above table highlights basing payments on estimated demand response, rather than measured demand response, risks overestimating benefits by a factor of 15!

Paying for capacity which is not delivered leads directly to higher electricity prices

The Claimed Demand reductions are taken from the Australian Government's consultation paper proposing the mandate of Australia's unique demand response interface [Ref 3]. Appendix A of this submission presents evidence justifying the "Measured Demand Reductions".

Existing domestic electricity meters cannot measure the demand reduction (not even so called 'smart' meters). Domestic meters are only required to measure total household electricity use, not the consumption of individual appliances. Validating domestic demand response may involve major changes to current metering arrangements and costs.

The Demand Response must be unique

How does the market ensure consumer demand response is only counted once?

Multiple trading relationships mean consumers will be allowed to sell demand response from their hot water heater to one DRSP, from their pool pump to another and from their air-conditioners to yet another. Each DRSP is then given access to the consumer's smart meter data which (hopefully) shows reduced demand. Unfortunately the meter data does not show which DRSP delivered the reduction. In the worst case the same demand reduction could be bid by all three DRSPs. Paying for the same capacity three times leads directly to higher prices for all consumers (and may compromise the stability of the entire electricity network).

So bidding consumer demand response requires a method able to accurately estimate the demand response delivered by individual appliances. This is far more complex than simply estimating household demand reduction.

Consumer Protection

Far from delivering lower prices the introduction of competition to Australia's energy market has been blamed for doubling electricity prices (with price rises continuing for the foreseeable future).

As electricity prices rise consumers desperately seek any solution to lower cripplingly high electricity costs. A range of companies are offering solutions. Unfortunately not all of these companies represent the interest of consumers.

For example the Consumer Action Law Centre has found vulnerable consumers are being encouraged to sign up for solar systems with "no upfront costs". The systems may provide short term relief from cripplingly high energy prices, before prematurely failing due to inferior quality. Unfortunately the companies charge exorbitant interest rates creating further financial hardship for these consumers.

The AEMC rule change will see a range of companies claiming to reduce consumer energy costs. Consumers with no knowledge of this new market will be enticed by attractive incentive payments. But buyer beware!

The AEMC does not believe in monitoring the behaviour of market participants. Their annual reports simply count the number of companies offering the new services and discuss how (a minority of) consumers *might* benefit. These reports ignore the numerous consumers left worse off. The AEMC cannot be allowed to let this to happen yet again.

The recent AEMC rule change allowing Metering Coordinators to turn smart meters into dumb meters (by disabling the remote communications) revealed the AEMC has the power to force market participants to provide detailed information to consumers.

The AEMC must require DRSPs to provide details of exactly how they will estimate and reward demand response. If nothing else the documentation will simplify subsequent legal action by the ACCC against those DRSPs making blatantly false claims.

Consumers do not miss out

A number of retailers are already rewarding consumers for reducing their electricity demand at times of high pool prices. This is occurring without the complexity of forcing a new market participant to make generator bids in the hope AEMO dispatches them.

Given consumers will continue to benefit from offering demand response, and significant risks to Australia's energy market from including estimated consumer demand response in the market it is asserted DRSPs should not be allowed to bid this capacity.

Conclusion

Measurement is fundamental to the correct operation of Australia's energy market. Consumer demand response cannot be measured, creating challenges:

- Determining where the bid capacity is located
- Validating bid capacity is actually delivered
- Ensuring bid capacity is unique (to avoid double counting benefits)

Solutions to the challenges can be developed, but not in the time frame proposed for this rule change. Until viable and robust solutions to replace actual measurements are developed, and tested, then the AEMC's decision to exclude consumer demand response bids from the energy market is considered prudent.

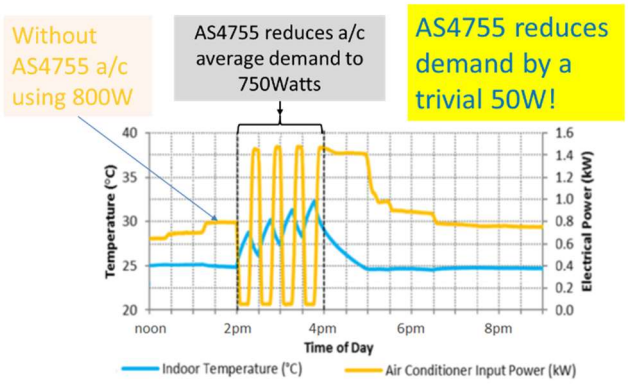
Appendix A – Measured Demand Response Benefits

Hot Water Heaters

Demand response systems have been used to control domestic electric hot water heaters for more than 50 years. The average hot water heater uses 3600Watts. This is not the actual demand response. Ausgrid measurements [Ref 4] show on summer days the average demand of uncontrolled hot water heaters is only 274Watts (measured between 5pm and 9pm). Demand response programs can only claim the 274W, or around 7% of the theoretical load.

Air-conditioners

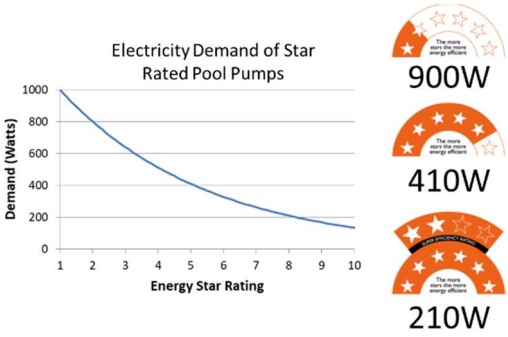
Bidding demand response by controlling domestic air-conditioners is likely to produce much lower benefits than predicted. CSIRO laboratory testing of a modern 1500W air-conditioner supporting Australia's demand response standard, AS4755, claimed a benefit of 750Watts [Ref 5].



The same testing shows in identical conditions, but without AS4755, the air-conditioner would only have been using 800Watts. The CSIRO testing therefore reveals the actual demand reduction is only 50Watts, or 6% of the claimed demand reduction.

Pool Pumps

Just over 10% of Australian households have a pool or spa pump (so around 1 million pumps are in daily use). Historically pool pumps used around 1000Watts. This is not the demand of modern pool pumps. The following figure plots the electrical demand of modern energy efficient pool pumps.



The inclusion of pool pumps in the Government's energy labelling scheme encourages consumers to install energy efficient variable speed pumps. In addition to significant energy savings (often exceeding $400 a year [Ref 6]). The above figure shows the more stars the lower the electrical demand. Highly rated pool pumps now uses less than 200Watts. Continuing to claiming a demand reduction of 1000W for each pool pump is no longer valid.

Citation

Please accurately attribute all quotes and references to this submission including the title "Should DRSPs bid consumer demand response?" It would be appreciated if references included the author's website drmartingill.com.au.

Comments or Questions?

The author is happy to receive comments or questions about this submission. 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 currently represents the interests of consumers on a range of Standards Australia working groups including metering, renewable power systems, battery storage and demand management.