REVIEW

Australian Energy Market Commission

DRAFT REPORT - APPENDICES

Power of choice review – giving consumers options in the way they use electricity

6 September 2012

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Draft Report

A Demand response mechanism

A.1 Introduction

This appendix outlines the operation of the demand response mechanism that pays consumers via the wholesale market. The first section describes how the mechanism works when a demand response interval is activated, and includes the financial transactions of each of the parties involved including the consumer, the retailer and AEMO.

The second section provides two examples of the payment mechanism, which demonstrates the financial responsibilities of each party and shows that under the mechanism the retailer should be indifferent to the demand response actions of the consumer. In the first example, the spot price is unchanged during the demand response interval. In the second example, the spot price is reduced as the consumer enters into the demand response interval.

The last section covers in more detail the issues associated with calculating a consumer's baseline consumption including the different methodological approaches.

A.2 Description of demand response mechanism

In this section, we outline the key design components of the demand response mechanism, which include:

Contractual arrangements and the consumer's estimated consumption:

- A consumer providing a demand response must have a retail contract in place with a registered Market Customer[1] (i.e. a retailer).
- The retailer will be settled in the wholesale market based on the consumer's estimated baseline consumption.
- The consumer would be expected to pay their retailer according to its estimated consumption at the retail tariff.
- A consumer registers with AEMO their participation under the demand response mechanism.
- A consumer can choose to have its demand resources participate on a scheduled or non-scheduled basis, subject to any threshold requirements.

1 The rules define a Market Customer as "a customer who has classified any of its loads as a market load and who is also registered by AEMO as a Market Customer under Chapter 2". Typically, Market Customers are retailers and the primary interface between end-use consumers and the wholesale market and ancillary services market.

- The quantity of demand response a consumer delivers to the wholesale electricity market during the demand response interval is calculated as the difference between the consumer's estimated consumption and the actual metered consumption at the consumer's site.

- A methodology would need to be developed for calculating a consumer's estimated consumption.

Market operation, scheduling arrangements and the impact on the spot price:

- Subject to threshold requirements a consumer should be required to notify their retailer and AEMO of their intention of beginning a demand response interval by the start of the interval, and similarly at the end of the demand response interval.

- No change occurs in the dispatch process and the calculation of the spot price would continue as it does now where the marginal scheduled bands of generation or demand resource would be the basis for the spot price.

- *Non-scheduled demand resources.* If the demand resource is non-scheduled then the reduced demand may indirectly lead to a spot price that is lower or unchanged. Non-scheduled demand resources participating under this mechanism would be exposed to the same price volatility as a demand resource on a pass-through tariff.

- *Scheduled demand resources.* If the demand resource is scheduled it would appear in AEMO's dispatch process in the same way as scheduled demand does now and would be dispatched in accordance to its bid. This could result in the partial dispatch and price being set by the demand resource bid.

Settlement and the impacts on retailers and consumers:

- AEMO pays the consumer for the quantity of demand response delivered to the market during the trading interval at the spot price. Hence the consumer pockets the difference between the spot price and the retail price (energy component).

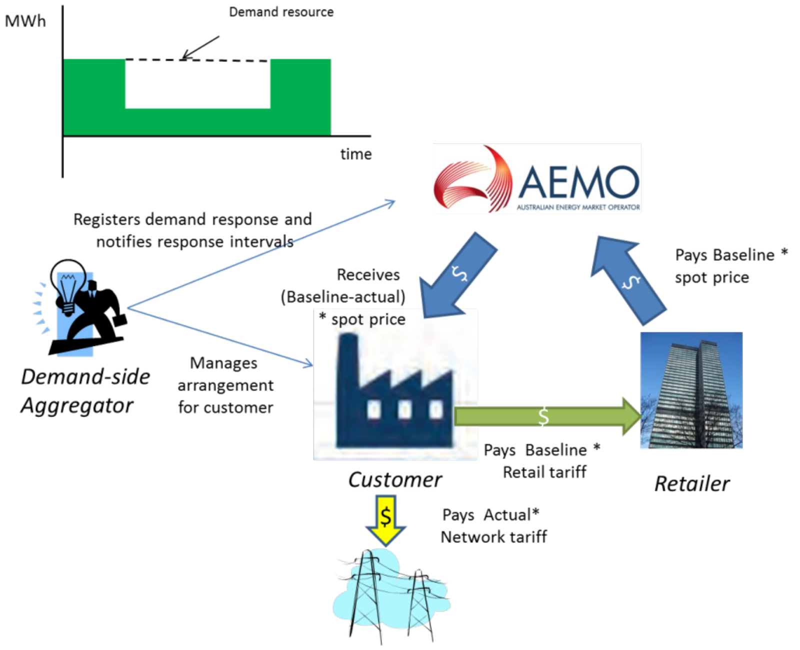
- A verification or auditing process may be required to confirm the amount of demand response delivered to the wholesale market by the consumer.

- Subject to detail on the accuracy of the consumer's estimated consumption, the retailer would be cost neutral to the arrangements. The consumer providing the demand resource would benefit from the difference between the retail tariff and the prevailing spot price net of any lost production.

- The consumer pays the network use of system charges based upon its actual consumption volume, not its estimated consumption.

Figure A.1 outlines the general design and economic relationships that would exist under the proposed demand response mechanism

Figure A.1 General design of demand response mechanism



Integrating consumer demand resources into AEMO's central dispatch process

A consumer should have the ability for its demand resource to be included as part of AEMO's centrally coordinated dispatch engine. Similar to generation, it would be dispatched when its bid is equal to, or less than the marginal bid. The marginal bid of a consumer's demand resource should reflect the opportunity cost of not consuming electricity. The consumer would receive the wholesale spot price for the amount of demand resource delivered to the market for the trading interval.

If a consumer's demand resource is not included as part of AEMO's centrally coordinated dispatch process, then the consumer would decide the timing of the interruption of supply in the same way a non-scheduled generator can decide when to generate. The consumer would receive the wholesale spot price for the each amount of demand resource delivered to the market.

Demand resource dispatch and the spot price

Under the mechanism, the spot price would continue to be calculated in the same manner that it currently is, where the marginal scheduled bands of generation or demand resource form the basis of the spot price.

Irrespective of whether a consumer's demand resource is included in the central dispatch process, it would receive the prevailing spot price for the quantity of demand response delivered to the market during the trading interval. The spot price may change if the consumer's bid into the market is the marginal bid which displaces the next available generator or demand resource in the bid stack. The spot price may also change if the reduced demand results in an efficient generator offer being marginal.

The quantity of demand resource delivered to the market is calculated based upon the difference between a consumer's actual metered consumption during the demand response interval, and its estimated baseline consumption. The estimated baseline consumption should reflect the consumption that would have occurred at the consumer's site had it not provided a demand response.

Table A.7 outlines the various types of methodologies that can be used to calculate a consumer's baseline consumption.

Financial liabilities of each market participant

A key design issue in developing the demand response mechanism is how the funds are raised to pay the consumer for their demand response. A variety of approaches are used internationally, each which depends on the structure of the electricity market.

Some approaches rely on either a capacity market or a day ahead market to pay the demand response, which is intended to give certainty to the consumer that they would be dispatched, and enough notification to prepare for the curtailment activity.[2] In other jurisdictions, funding of demand resources is accumulated through market participant fees, as the demand resource is viewed as delivering a net benefit to the market.

Under the proposed mechanism this issue is overcome by paying the consumer the spot price and by requiring all relevant parties to continue to fulfil their financial liabilities in the market in line with a consumer's estimated baseline consumption.

The following actions should continue to take place during the demand response interval and for the settlement process:

1. A consumer continues to pay its retailer for the supply of electricity at the retail contract tariff and at its estimated baseline consumption. This means that a retailer should not see a change in the level of consumption by a consumer during the demand response interval.

2. The retailer responsible for the supply of electricity at a consumer load site will be settled in the wholesale market based on the consumer's estimated baseline consumption.

3. Because the retailer and the consumer continue to fulfil their financial liabilities as though the demand response action had not taken place, AEMO would effectively over recover funds from the market. This is because the market is settled according to price and volume that takes into account the demand response interval, but AEMO is paid as though there is no change in volume.

4. At the conclusion of the settlement process AEMO is left neutral after paying the consumer for its demand response action. AEMO pays the consumer for the

2 In Chapter five we consider the implications of the demand response mechanism and whether a day ahead market is required to address price uncertainty.

amount of demand resource delivered to the market at the spot price during the trading interval. The amount of demand resource delivered to the market is calculated as the difference between the consumer's baseline consumption and its metered consumption during the trading interval.

Consumers would benefit from the market based transaction according to the difference between the **spot price and their retail tariff**. However, the total net benefit to the consumer would also take into account the opportunity cost of not consuming during the demand response interval.

- **Network charges**

A consumer's retail bill consists of energy costs and network charges. Under the proposed demand response mechanism only the network component of the bill would change in line with a consumer's actual consumption during the demand response interval. The consumer would continue to pay its retailer according to its baseline consumption.

This may necessitate some changes to a retailer's billing system to accommodate the different types of charges. However, separate line items for each component of a consumer's retail bill may assist consumers in understanding the value of the energy component of their retail tariff and their impact on the network.

It should be noted that the mechanism is initially designed for C&I users where network charges may already be separated from wholesale costs.

A.3 Examples

Example 1 – No change to spot price

The following worked example demonstrates how consumers are paid by the market for their demand resource. It also serves to demonstrate that the net position of a retailer and AEMO are unchanged at the conclusion of the settlement process if the spot price is unchanged by the consumer's demand response action. This worked example assumes that a consumer's demand resource is not the marginal bid and would therefore not have any effect on the spot price.

Table A.1 outlines necessary system and market participant information for calculating the amount that should be paid to the consumer for its demand response. In this example, a consumer's total estimated baseline consumption is 3MWh, and it can offer 2MWh of demand response into the wholesale electricity market for a period of one hour. The retail contract price is $40/MWh, and the spot price is $50/MWh.

Table A.1 Inputs - both examples

System and market participants parameters	Inputs
Overall system demand	100MWh
Consumer's baseline consumption	3MWh
Consumer's available demand resource	2MWh
Retail contract price	$40/MWh
Demand response interval	2MWh for 1 hour
Retailer continues to pay baseline consumption	3MWh
Spot price is unchanged	$50/MWh

Table A.2 calculates the changes in total system demand and each market participant's liability in the market, and their position at the conclusion of the settlement process. The demand response scenario is compared to the counterfactual scenario where the consumer does not provide any demand response into the market.

Table A.2 Calculating compensation for demand response interval – no change to spot price

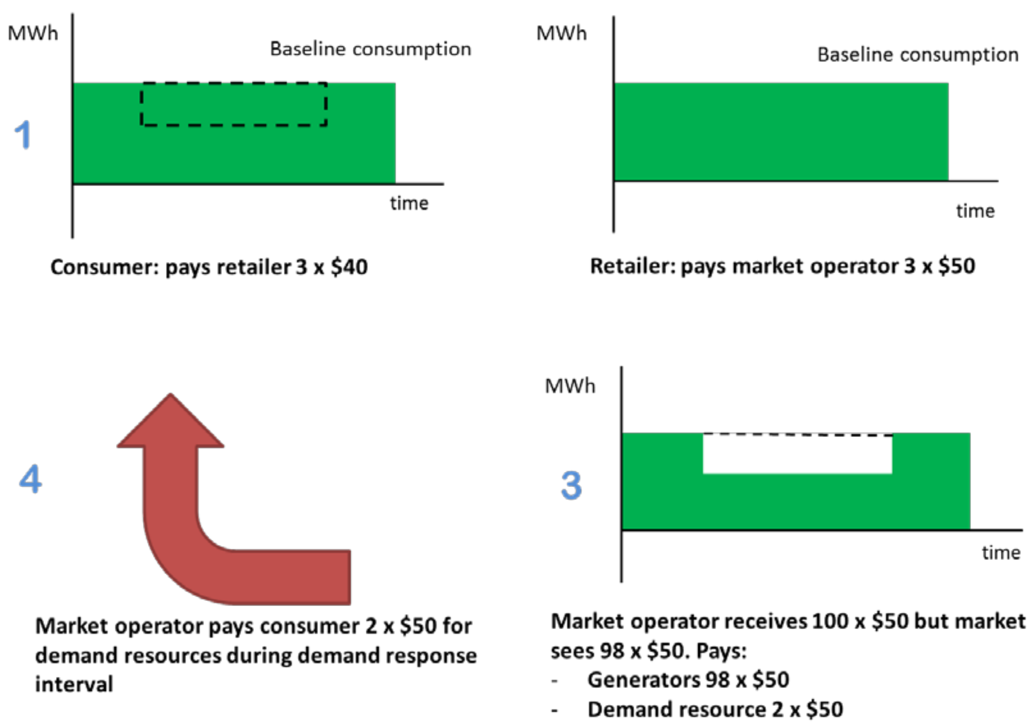
No change to spot price		Counterfactual (no DR)	Scheduled demand response
Changes to system demand during demand response interval			
1	Consumer baseline consumption	3	3
2	Demand response	0	2
3	Consumer's load during demand response interval	3	1
4	Total system demand	100	98
5	Total demand settled by market	100	100
6	Spot price	$50/MWh	$50MWh
Wholesale market settlement process after demand response interval			
7	Retail contract tariff	$40/MWh	$40/MWh
	Consumer pays retailer **(1 x 7)**	$120	$120
	Retail payment to AEMO **(1 x 6)**	$150	$150
	AEMO pays consumer **(2 x 6)**	$0	$100

No change to spot price		Counterfactual (no DR)	Scheduled demand response
Changes to system demand during demand response interval			
	Consumer net position in market **(spot price minus retail contract tariff per MWh)**	-$120	-$20
	Retailer net position in market **(spot price minus retail contract price per MWh)**	-$30	-$30

In this example, it is clear that the consumer is better off by undertaking the demand response action in the market. In total, the consumer is better off by $100 less the loss in value of not consuming. The consumer continues to fulfil its financial liabilities to the retailer, but is also paid by the market. In the counterfactual scenario, the consumer continues to fulfil its financial liabilities to its retailer, but is not paid by the market. The difference between the consumer's net position in the market without the demand response is -$120 compared to -$20 with the demand response.

Without a mechanism for paying a consumer for its demand response action, a consumer can only benefit by reducing its consumption and avoiding the retail contract tariff. In this example, if the consumer reduced its consumption by 2MWh for one hour it would save $80 (2MWh x $40). Its benefit for this action would be -$40 (liability under its retail contract tariff plus the avoided cost of consumption, i.e. -$120 + $80). Under the demand response mechanism, the consumer is better off by $20 (liability under the retail contract tariff plus its payment from AEMO, i.e. -$120 + $100).

Figure A.2 Financial liabilities – no change to the spot price



Example 2 – Change to spot price

The wholesale electricity spot price would only change if a consumer's bid into the market is the marginal bid, which displaces the next available generator or load in the bid stack or reduced demand changes the marginal generator. This type of scenario is more likely to arise where there is a significant difference in the marginal cost of supply between two resources in the bid stack, or the consumer can offer substantial volumes of demand resources which displaces the next available generator.

In this example, the consumer's dispatch of 2MWh of demand resources is the marginal bid and impacts on the spot price. **During the demand response interval the spot price is reduced from $50/MWh to $45/MWh.** The retail contract tariff is unchanged in this example and remains at $40/MWh.

Table A. 3 outlines necessary system and market participant information for calculating the amount that should be paid to the consumer for its demand response.

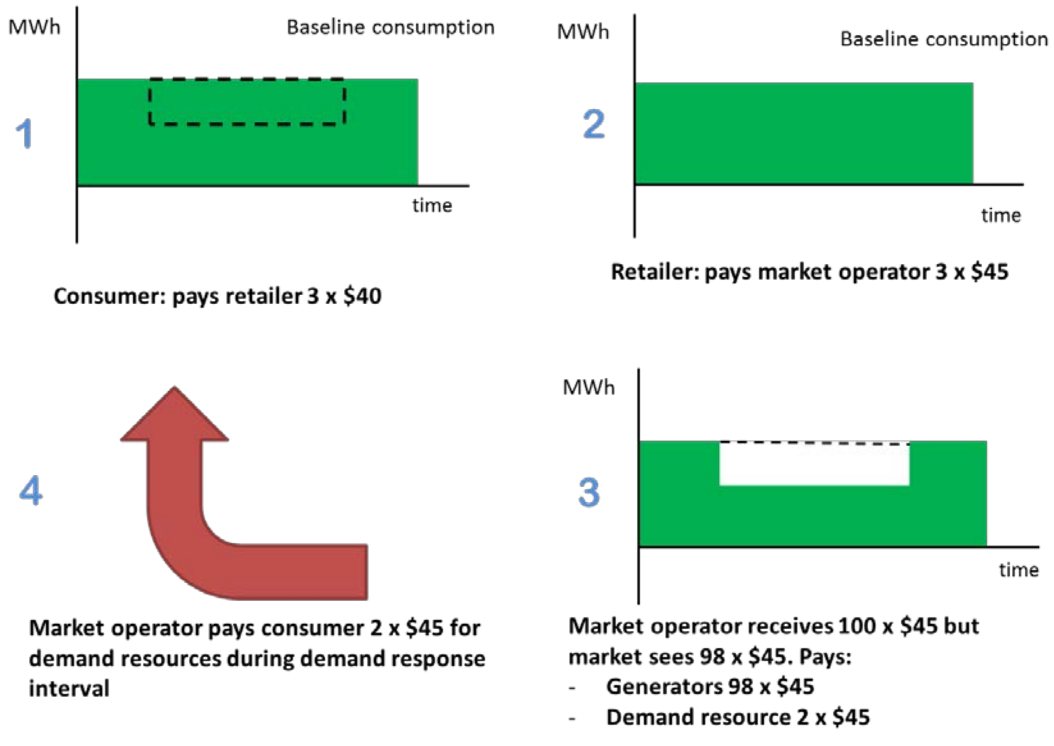
Table A.3 Calculating compensation for demand response interval – change to the spot price

	No change to spot price	Counterfactual (no DR)	Scheduled demand response
Changes to system demand during demand response interval			
1	Consumer baseline consumption	3	3
2	Demand response	0	2
3	Consumer's load during demand response interval	3	1
4	Total system demand	100	98
5	Total demand settled by market	100	100
6	Spot price	$50/MWh	$45MWh
Wholesale market settlement process after demand response interval			
7	Retail contract tariff	$40/MWh	$40/MWh
	Consumer pays retailer **(1 x 7)**	$120	$120
	Retail payment to AEMO **(1 x 6)**	$150	$135
	AEMO pays consumer **(2 x 6)**	$0	$90
	Consumer net position in market (spot price minus retail contract tariff per MWh)	-$120	-$30
	Retailer net position in market (spot price minus retail contract price per MWh)	-$30	-$15

In this example, it is clear that the consumer is better off by undertaking the demand response action in the market. The consumer is better off by $90. The consumer continues to fulfil its financial liabilities to the retailer, but is also paid by the market. However, because the spot price has changed the amount the market pays the consumer per MWh is less than in the previous example. The difference between the consumer's net position in the market without the demand response is -$120 compared to -$30 with the demand response.

In this example, the retailer pays AEMO for the consumer's baseline consumption but at a lower spot price. While the retailer is indifferent to the actions of its consumers demand response, it may benefit from the reduced spot price as the difference between the retail contract price and the spot price has tightened. The extent to which a retailer would benefit from the reduced spot price would also be determined by their hedging arrangements. Irrespectively, the retailer's net position in the market improves when there is a fall in the spot price (-$15) compared to when there is no change in the spot price (-$30) as was the case in example 1.

Figure A.3 Financial liabilities – change to the spot price



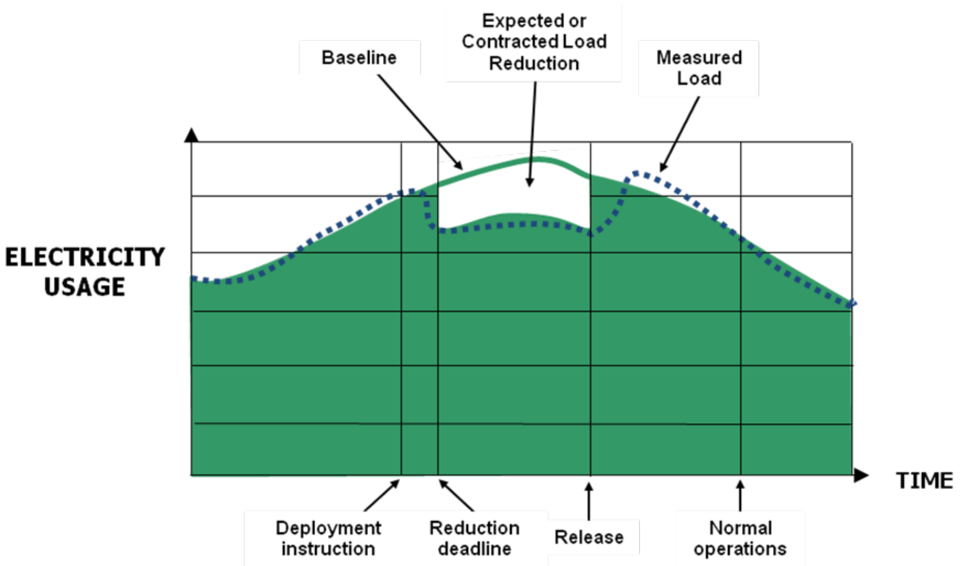
A.4 Baseline consumption methodologies

An important component of a demand response mechanism is calculating a consumer's baseline consumption to determine the amount of demand resources delivered to the market during a demand response interval. Typically, the amount of demand resource delivered to the market by a consumer is calculated as the difference between a consumer's actual metered consumption during the demand response interval and their estimated consumption had they not provided the demand response.

Determining a consumer's estimated consumption – otherwise referred to as a consumer's baseline consumption – is a key design element of a demand response program that pays consumers for their demand response. An accurate consumer baseline should mirror as closely as possible the likely behaviour of that consumer had they not been dispatched during the demand response interval.

This principle is demonstrated in Figure A.4[3].

Figure A.4 Calculating baseline consumption



Typically, the baseline consumption calculation is made up of two different components. The first component with the greatest weight relates to the consumer's consumption over a period of days or weeks and represents the consumer's consumption as a longer term average. The second component considers the consumer's consumption immediately prior to the demand response and is called a baseline adjustment. The weighting of each of these components would vary from amongst approaches to most accurately reflect a consumer's baseline consumption.

Determining an appropriate methodology for calculating a consumer's baseline consumption is a matter that has been extensively explored in the United States as demand response programs have been introduced into some electricity markets. The North American Energy Standards Board (NAESB) was tasked with developing standards for the different types of methodologies that can be used to calculate a consumer's baseline consumption.

The NAESB identified four different techniques for calculating a consumer's baseline consumption. Each methodology uses a different set of parameters to accommodate

3 See Recommendation to the NAESB Executive Committee, *Review and develop business practice standards to support DR and DSM – EE programs*, proposed standards, October 3, 2008. We note that the diagram represents arrangements for scheduled demand resource, and does not represent arrangements for non-scheduled demand resources, or reflect 5 minute intervals that are used in the NEM.

different load characteristics, as well as the specific objectives of a demand response program. These are outlined in Table A.7.[4]

Selecting a baseline consumption methodology that would accurately reflect the behaviour of the load is a complex matter and would depend on a number of factors such as the characteristics of the load and the objective of the demand response program. For example, if load is characterised by high variability or is highly weather dependent then a baseline consumption calculation that relies on an average dynamic load profile may not be suitable. This is likely to result in consumption prior to the demand response event either being over or under-estimated. Instead, a more appropriate methodology would rely on metering before/metering after, or a Maximum Base Load approach.

The objective of a demand response program may also require closer consideration to the type of baseline adjustments that may be used. For example, if the objective of the program is to manage peak load during summer periods, then a baseline adjustment that adjusts the baseline consumption both upwards and downwards may result in perverse behaviour on behalf on the consumer. As EnerNOC points out, if a demand response has been called over two consecutive days, and the third day is likely to be the hottest, the customer might need to start up operations during the baseline adjustment period just to avoid a baseline compromise. If the baseline adjustment was symmetrical (i.e. only adjusted upwards) then the consumer could have cancelled the whole shift and not worried about baseline erosion.[5]

Even where load characteristics are predictable there is a need to closely monitor the effectiveness of the selected baseline methodology to ensure that the baseline consumption methodology delivers accurate results. A study by KEMA in 2011 examined the accuracy of baseline assessments in the USA's New England electricity market. The study found that a number of distortions in a consumer's baseline consumption can unintentionally arise where "continuous event days cause the accuracy of the baseline to degrade over time as there is little or no recent data to refresh the baseline. Consequently baselines can become 'stuck' and based on old data that does not provide an accurate estimate of current load consumption patterns". Therefore, additional mechanism may be required to ensure that data is frequently refreshed and the consumer's baseline consumption remains current and reflective of their behaviour.[6]

A.5 Estimating commercial and industrial users potential demand response

We asked Oakley Greenwood (a consulting firm) to provide an estimate of the indicative materiality of demand side participation in the NEM for C&I users. Using

4 See Recommendation to the NAESB Executive Committee, *Review and develop business practice standards to support DR and DSM – EE programs*, Proposed standards, October 3, 2008 and EnerNOC, *The Demand Response Baseline White Paper*, 2011

5 See EnerNOC, *The Demand Response Baseline White Paper*, 2011, p. 16

6 See KEM, *Analysis and Assessment of Baseline Accuracy*, final report, August 4, 2011

secondary sources, such as survey results from Australia and internationally, Oakley Greenwood estimate that a demand response mechanism may have the potential to capture between 2,100 – 2,800MW from C&I users.[7] This figure is achieved by assuming that peak demand is around 35,000MW in the NEM, and that six to eight per cent of this amount could be reduced in the form of a demand response.[8]

In the near term, C&I users are estimated to account for almost all of the potential demand response, and up to 80 per cent in the mid-term. We understand that already 280 MW of demand response is available from C&I users in the NEM during summer period.[9] Therefore the demand mechanism is likely to build on this amount in the mid-term.

Estimates of DSP potential in the NEM

The following section summarises the Australian and international surveys that were used to provide a guide as to the potential demand response available from C&I users.

Table A.4 Summary of demand response studies in Australia

Study	Focus	DSP impacts
Victorian Distribution Network Service Providers (1999)	Victoria	• Technical potential[10]: 499MW • Economic potential[11]: 253MW • Likely market potential[12]: 193MW
Assessment of Demand Side Management	NSW	• Technical potential: 516MW (medium to large industrial)

7 Energy efficiency measures programs in the C&I sector omitted to limit the scope of the question and to focus on measures that are dispatchable and therefore can be used in ways similar to generation resources to (a) meet aggregate demand (b) increase competition (c) assist in meeting system reliability standards.

8 See EnerNOC presentation to the Fourth Stakeholder Reference Group meeting on 28 May 2012, available on the AEMC website.

9 See the AEMC website for Futura report, *Investigation of demand side participation in the electricity market*, p. 9, 8 December 2011.

10 **Technical potential** - the level of peak demand reduction that would result if all homes and businesses adopted the most efficient, commercially available technologies and measures, regardless of cost. This limits potential only by technical feasibility. See Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (EPRI) for more information regarding definitions.

11 **Economic potential** – the level of peak demand reduction that would result if all homes and business adopted the most efficient, commercially available and cost-effective measures. Cost-effective was defined in the study as any case in which the present value of the lifetime benefits of the measure exceeds the present value of the costs of that measure.

12 **Achievable market potential** – is an estimate that seeks to incorporate likely customer behaviour by considering the various organisational, market, financial, political, and regulatory barriers that may keep the level of demand side activity undertaken below that which would be justified on a strictly economic basis.

Study	Focus	DSP impacts
Opportunities in NSW		• Technical potential: 290MW (medium to large commercial) • Market potential: 220MW (medium to large industrial) • Market potential: 47-151MW (medium to large commercial)
Australian IEA Task XIII Study	All NEM	• Callable C&I users (winter): 2289MW • Callable C&I users (summer): 1580MW Estimated DR potential as a per cent of forecast system peak demand: • C&I user demand response reduction: 2439MW • Maximum summer demand: 4.0 per cent • Average summer demand: 4.8 per cent

Estimates of DSP in international jurisdictions

United States

- ***Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.* (EPRI).** This survey found that the achievable potential of demand response of C&I users is around 4.7 to 6 per cent of system peak demand.[13]

- **EnerNOC, *Demand Response (DR) in the WEM*, presented to the MAC Meeting, 11 July 2012.** A number of US jurisdictions have had arrangements in place for some time to encourage DSP. Market arrangements with price levels like those within the NEM should be able to provide some boundary conditions on the amount of DSP likely to be available in the NEM. See Table A.5 below which provides information on four US electricity markets.[14]

13 EPRI, *Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.* (2010 – 2030), January 2009, pp 5-4 to 5-10.

14 EnerNOC, *Demand Response (DR) in the WEM*, presented to the MAC Meeting, 11 July 2012.

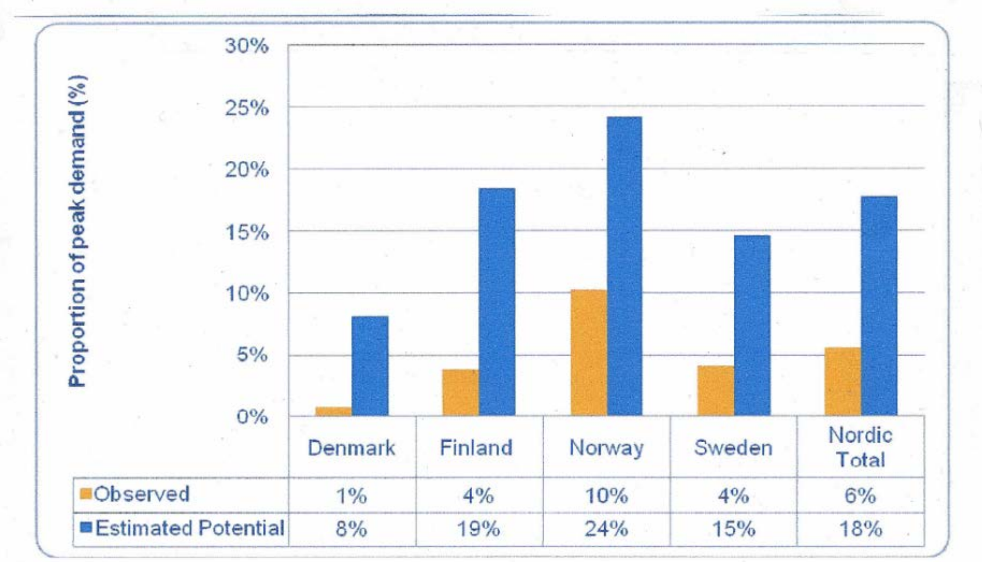
Table A.5 Demand response in US electricity markets

Market	DR (MW)	DR (% of system peak demand)
PJM (Pennsylvania/New Jersey/Maryland)	14,118	7.6%
ISO-NE (New England)	2,164	6.6%
MISO (Midwest Independent System Operator)	(N/A)	8.1%
NYISO (New York)	2,248	6.5%
Average		7.2%
WEM 2012-13 (Western Australia)	499	8.2%

Northern Europe and Europe

- **The International Energy Agency (IEA), in its October 2011 information paper entitled *Empowering Customer Choice in Electricity Markets*, cites a 2005 study by Nordel.** Industrial processes, electricity space heating and water heating are considered to provide the greatest potential for further demand response. The study estimates that an increase of 18 per cent of peak demand was possible across the region. See Figure A.5 for observed and potential demand responses estimated for Nordic countries.

Figure A.5 Estimated actual and potential demand response in the Nordic region



Source: Prepared by the IEA based on Nordel (2005)

- **Capgemini, in collaboration with vaasaETT and Enerdata, published a study in 2008 entitled Demand response: a decisive breakthrough for**

Europe. The study assessed the potential for demand response under two scenarios:

- Scenario 1: Moderate scenario that assess DR outcomes if current market trends continue
- Scenario 2: Dynamic scenario that seeks to quantify the fullest potential of DR throughout Europe

Table A.6 Key impacts of demand response in Europe

Impact	Scenario 1	Scenario 2	Dynamic scenario as % of EU 2020 targets
Energy savings	59 TWh	202 TWh	50%
CO2 emissions reductions	30 Mt	100 Mt	25% (50% of electricity industry obligation)
Peak generation capacity avoided	28 GW (equivalent to 56 x 50 MW thermal plants)	72 GW (equivalent to 150 x 50 MW thermal plants)	
Avoided investment	E 20 billion	E 50 billion*	
* Based on an average of 400ME per GW of thermal plant and taking into account an average difference between demand and gross generation of 15%, plus 50% additional savings for T&D infrastructure. This amounts to 700ME per GW avoided.			

Source: VaasaETT

A.6 Summary of rules changes required to implement mechanism

In order to implement the demand response mechanism we expect that the following rules changes would be required:

- Changes to the settlement process to allow retailers to pay AEMO according to their consumer's baseline consumption, and for AEMO to pay consumers for their demand response via the funds recovered from retailers.
- Agreed methodology for calculating a consumer's baseline consumption including minimum metering standards.
- Arrangements that allow a consumer to provide a demand response under this mechanism on either a scheduled or non-scheduled basis.
- A new sub-category of market generator to facilitate the entry of consumers in the wholesale electricity market as part of the demand response mechanism.

- Changes so that network charges can be separated from energy only costs by retailers. This may also require a change to retailers' billing systems, although some retailers' systems may already have this capability in place.

Table A.7 Methodological approaches for calculating baseline consumption estimates

Methodology	NAESB definition	Description[15]
Maximum base load	*A performance evaluation methodology based solely on a demand resources ability to reduce to a specified level of electricity demand, regardless of its electricity consumption or demand at the time of deployment.*	This type of methodology does not require calculating a consumer's load profile on a dynamic basis but instead calculates a consumer's expected maximum energy usage. The general characteristics are as follows: • Baseline shape is static; • Data meter from each individual site and from the system is utilised in the baseline consumption calculation; and • Relies on historical meter data from the previous year. The amount of demand response delivered during a demand response interval is equal to the consumer's maximum energy usage minus the committed capacity of a customer. Under this type of methodology a consumer is required to drop their consumption to its committed capacity (its consumption baseline), and not by a certain amount. In some cases, a consumer may already be at their committed capacity when entering into a demand response interval.

15 See EnerNOC, *The Demand Response Baseline White Paper*, 2011 for a fuller description of each of the different types of baseline consumption methodologies

Methodology	NAESB definition	Description[15]
Meter before/meter after	*A performance evaluation methodology where electricity consumption or demand over a prescribed period of time prior to deployment is compared to similar readings during the demand response interval.*	This type of baseline methodology is typically used in circumstances where the demand response interval occurs for a very short period of time, or at very short notice. The general characteristics are as follows: • Baseline shape is static; • Utilises meter data from each individual site; and • Relies on small day of time or historical meter data.
Baseline type I	*A baseline performance evaluation methodology based on a demand resource's historical meter data which may also include other variables such as weather and calendar data.*	This type of baseline calculation is used in most US electricity markets with a demand response program. While the types of methodologies can vary under this approach (averaging, regression, rolling average and comparable day) the general characteristics are as follows: • Baseline shape is the average load profile; • Utilises meter data from each individual site; • Relies upon historical meter data from days immediately preceding the demand response event; and • May use weather and calendar data to inform or adjust the baseline. The baseline can be adjusted in a number of ways, and is done so to reflect load conditions immediately prior to the load reduction event. Baseline adjustments can be varied in the following ways: • A consumer's consumption is compared to the day prior to the load event and is adjusted either on a percentage or actual kW basis; • Variation to the baseline adjustment can be restricted to only upward adjustments (asymmetric) or adjustments in both directions

Methodology	NAESB definition	Description[15]
		(symmetric); and • Using any of the above techniques, the baseline adjustment can be either capped or uncapped as a percentage of the baseline consumption.
Baseline type II	*A baseline performance evaluation methodology that uses statistical sampling to estimate the electricity consumption of an aggregated demand resource where interval metering is not available on the entire population.*	This methodological approach is utilised where individual historical consumer data is not available for the consumer site or there is not a strong economic case for installing appropriate metering and telemetry at the consumer sites. However, where the information is available on a more aggregated basis, and the load profiles are roughly predictable in behaviour, a baseline consumption can be derived for a group of consumers. Typically, this type of methodology would be used for residential demand response programs.
Metering generator output	*Baseline is set as zero and measured against usage readings from behind the meter emergency back-up generator. This type of baseline is only applicable for facilities with on-site generation.*	

B Efficient price structures under cost reflective prices

Tariff	Description
Time-of-use (TOU)	A rate with different unit prices for usage during different times the day. In a basic TOU tariff the day is divided into peak and off peak (with a higher price during peak period). The tariff can be expanded to include shoulder periods between the off-peak and peak periods; and seasonal peaks (a higher price for summer and winter peak periods). These tariffs tend to reflect only the average cost of generating and delivering electricity to consumers during those times of the day.
Critical Peak Pricing (CPP)	CPP is a real-time rate that is applied during periods when supply and demand conditions become very tight. Typically, such a rate gives consumers a predictable price (flat or TOU) during all but a limited number of hours per year, when (much higher) rates (the CPP) would be charged. Generally, consumers are notified about a CPP event in advance through various communication media tools – telephone, e-mail, SMS and messages in home displays. Notification can be 2 hours to 24 hours before the CPP is called. In this way the consumer can choose to avoid the higher prices by reducing their consumption during those times.
Variable Peak Price (VPP)	A variation on CCP where the CCP is not a fixed price but the real time price applying during the critical peak period.
Peak Time Rebates (PTR)	Only relevant for networks. Least time varying option. Consumers generally receive an incentive payment in the form of a $ per Kwh rebate for reducing energy use during peak periods. Typically, consumers are assured that their bill will not increase, and that there is no risk of incurring higher prices if they fail to reduce their use in response to a peak period dispatch event, hence can be more appealing to consumers for take up. For PTR there is a need to verify each consumer’s load reduction by comparing their half hourly usage during a peak demand dispatch event to a ‘baseline’ usage profile. This option is therefore more complex to implement, and issues arise with respect to how to calculate the baseline.
Capacity or demand based charge	This charge applies to networks only. A capacity or demand charge means setting a price that reflects the peak demand or utilisation at a particular point in time. There are different types of capacity charges in use that have different implications for metering. They can be based on a consumers own maximum demand (kW or KvA) recorded during the peak period over a working week day or on use by that consumer at times of system peaks:

Tariff	Description
	• For example, the charge could be based on a kW/MW or KVA recorded during the peak period of 5 nominated working weekdays over the previous 12 months or in a particular month (consumer peak demand); or alternatively the average half-hourly max demand when system demand was highest between 11am and 7 pm during previous 12 months (system peak approach). • A variation of the system peak approach option is for the charge to reflect the consumer's use during the "expected" peak period (that is, known in advance). This charge would be more forward looking.

C Measures for assisting vulnerable consumers

C.1 Introduction

This appendix gives greater consideration to the issues and arrangements in place to assist consumers meet their electricity needs in Australia. The types of arrangements include rebates and emergency payments and are determined and delivered by jurisdictional governments in the form of community service obligations (CSOs). The range of CSOs and rebate levels are largely consistent across jurisdictions.

Electricity customers that may require assistance are typically identified through social services arrangements, such as whether they receive a commonwealth government allowance which entitles them to a commonwealth concession card. Holding a commonwealth concession card is the key eligibility factor that jurisdictional governments use to determine who should receive an energy concession.

The task of identifying what type of electricity consumer may need assistance in meeting their electricity needs and costs is challenging. In this appendix we have summarised Australian and international studies that have sought to better understand the characteristics of electricity customers that may need assistance in this regards. In Australia, these types of customers are categorised as 'vulnerable consumers'. It should be noted that in Australia there is currently no operational definition used by governments to define vulnerable consumers. The National Energy Customer Framework does not define vulnerable consumers, although it provides a regulatory process for retailers to implement hardship programs for customers experiencing temporary or more permanent difficulties in meeting energy payments.

A recent, major review in the United Kingdom has attempted to better understand the characteristics of the types of consumers that may need assistance in meeting electricity costs. A 'fuel poverty' indicator is used to identify these types of consumers, and is a term defined in legislation. The review considered whether the current definition of 'fuel poverty' adequately captured these types of consumers, and the types of policies that are best used to target and reach out to these consumers.

We have not attempted to define 'vulnerable' consumers as part of the power of choice review. Understanding which consumers may need assistance in meeting electricity costs is an important social policy objective, for which governments are best placed to define.

These above issues are discussed in the appendix and are grouped into three sections:

- **Section C.2:** Outlines the current arrangements for assisting customers to meet their electricity needs and costs. Some consumers are able to access energy concessions to help meet their electricity needs, which are generally in the order of $200 - $400 per year. A range of other types of assistance are available for customers with special medical needs, or emergency payments. This section also outlines the MCE CSO framework that describes the high level principles for developing non-distortionary CSOs. We also consider the South Australian Residential Energy Efficiency Scheme where elements of this scheme are specifically targeted to vulnerable customers.

- **Section C.3:** Summarises a number of surveys conducted by the New South Wales Independent Pricing and Regulatory Tribunal in relation to electricity consumption in that state. The survey results provide some insights into understanding the characteristics of electricity consumption by households and individuals, including electricity customers in lower income brackets. The survey results show that for low income households median spending on energy will range from 5 to 8 per cent of disposable incomes, which is more than the median spending on energy by higher income households (typically around 2 to 4 per cent of disposable income).

- **Section C.4:** Summarises the findings of a recent United Kingdom study on 'fuel poverty'. A key recommendation stemming from the review was to amend the current definition of fuel poverty. The report found that the current official indicator of fuel poverty, which is based on required energy expenditure exceeding a threshold of income of 10 per cent of income, had some strengths but also serious weaknesses including its undue sensitivity to energy prices and the way it define which households are fuel poor.

C.2 Community Service Obligations

CSOs are created by jurisdictional governments to assist consumers to meet their electricity needs and costs. Typically, a CSO might involve either subsidising the retailer to provide non-commercial service or concession on energy bills for a customer that meets certain eligibility requirements. The range and level of CSOs is determined by each state government and accounts for government spending as part of a broader range of concession programs relating to health, transport, education, etc.[16]

CSOs can be delivered to consumers in a number of different ways. They can either be provided directly to consumers as a rebate, through their retailer as a discount to their energy bill, or sometimes through community welfare organisations in the form of emergency payments. Table C.3 outlines jurisdictional government concession schemes for the NEM and includes information regarding eligibility requirements and the level or amount of concession. For most energy-related concession schemes, the concession amount is not determined according to the consumption threshold amount and is an absolute figure.

16 It should be noted that in Australia there is currently no operational definition employed by governments to define vulnerable consumers. The National Energy Customer Framework does not define vulnerable consumer, although it provides a regulatory process for retailers to implement hardship programs for customers experiencing either temporary or more permanent difficulties in meeting energy payments.

With the exception of Victoria, most energy-related concession schemes are paid as lump sum, irrespective of consumption levels.[17] In Victoria, energy concession schemes are provided as a percentage discount (around 18 per cent) of the total energy bill. As discussed below, the MCE CSO framework provides high level guidance on the design of CSOs to ensure that they have a non-distortionary impact on the market and do not blunt price signals.

Eligibility for most ongoing energy CSOs is usually determined according to whether the consumer receives a commonwealth government allowance, and therefore is eligible for a variety of commonwealth concession cards, including a Commonwealth Pension Concession Card (CPCC) or a Commonwealth Health Care Card (CHCC).

For the majority of jurisdictions, eligibility for either of these two types of concession cards results in eligibility for jurisdictional energy concession schemes. In some instances, jurisdictional governments may broaden eligibility requirements to include a range of other commonwealth concession cards that may not apply a strict means test (for example, the Commonwealth Seniors Health Card). Most jurisdictions set their own specific conditions for receiving energy concessions for medical purposes.

Eligibility to receive a commonwealth allowance, and therefore commonwealth concession card, is typically tested through a combination of income and asset tests ('means tested'). CPCCs are available to a core group of government welfare recipients including job seekers, single parents and carers, age pensioners, and disability pensioners. A broader group of government welfare recipients are eligible for a CHCC, and generally includes individuals receiving a commonwealth allowance but who are not eligible for a CPCC. Table C.1 outlines the number of card holders for CPCC, CHCC, and other concession cards.

Table C.1 Number of concession card holders

Concession card type	No. card holders
Health Care Card	1,130,512
(Low Income) Health Care Card	435,745
Pensioner Concession Card	3,617,579
Commonwealth Seniors Health Card	282,186
Total	5,466,022

Table C.2 outlines the income thresholds to receive various commonwealth government allowances, and therefore concession cards. It should be noted that these

17 The impact of CSOs and their ability to capture 'vulnerable' consumers is considered in detail in a recently published paper by Paul Simshauser and Tim Nelson, *The Energy Market Death Spiral – Rethinking Customer Hardship*

figures are approximate only, and are based on that rates for singles, and therefore excludes couples and families.

Table C.2 Eligibility and income thresholds to qualify for Commonwealth Government allowances

Concession card	Eligibility	Income test
CPCC	Automatically issued to those receiving specific government allowances that are means tested.	For full to part pension rates an individual can earn up to $36,972 per year.
CHCC	Automatically issued to people who do not qualify for CPCC but who are receiving specific government allowances	Depending on government allowances can earn up to $18,532 per year.
CSHCC		Must have an income of less than $50,000 per year.
Low Income HCC		Must have an income of less than $30,429 per year.

The typical income range for eligibility for commonwealth allowances and therefore access to a concession card ranges from $18,000 to $36,000 for a single person. For couples the threshold roughly doubles from between $36,000 to $72,000. For pensioners, the threshold ranges from between $30,000 to $50,000.

MCE CSO Framework

In 2008 the MCE developed nine high level principles to underpin the design of energy concession schemes implemented by jurisdictional governments. The high level principles are non-binding.[18]

In its policy statement on the issue the MCE considered that energy CSOs are services that governments require energy businesses to provide to sections of the community to fulfil government social policy objectives.[19]

1. Energy CSOs should only be used if the service would not be in the commercial interests of an energy business to provide, or if it would only be provided commercially at higher prices than would be consistent with government and social welfare policies.

18 See the Ministerial Council on Energy website for more information: http://www.ret.gov.au/Documents/mce/_documents/MCE_Energy_Community_Services_Obligation20080929151353.pdf

19 The MCE note that this definition of a CSO is based on a definition used in a 2002 National Competition Council staff discussion paper *Competitive Neutrality: scope for enhancement*. See http://www.ncc.gov.au/pdf.PIReCn-001.pdf, p31

2. The obligation to provide the community service would be clearly specific by the government in publicly available documents.

3. Energy CSOs should be delivered transparently.

4. Wherever possible energy CSOs should be directly funded by governments.

5. CSOs should be designed to achieve their social policy objectives in a cost-effective manner.

6. An energy CSO should not be delivered by a mechanism employing cross-subsidies from one set of consumers to another.

7. CSOs should not materially impede competition, particularly in upstream (generation and gas production) and downstream (including retailing and demand side response) markets.

8. Energy CSOs should target identified sections of the community and minimise their effect on general consumption patterns.

9. Governments should conduct regular, transparent reviews of the performance of the provision of energy CSOs and of the continued need for individual CSOs.

South Australian Residential Energy Efficiency Scheme

In 2009 the South Australian Government introduced a Residential Energy Efficiency Scheme (REES) aimed at assisting households reduce greenhouse gas (GHG) emissions. The program requires that retailers with 5,000 or more residential customers provide an incentive to achieve GHG reductions and potentially lower energy bills through reduced energy consumption.[20]

Under this scheme, incentives may include, for example, free items provided by a retailer such as draught proofing tapes, energy efficient light globes and water efficient shower heads. In addition to this, energy providers can also offer a rebate for installation of ceiling insulation, efficient hot water and other upgrades to improve the energy efficiency of heating and cooling systems.

Under this scheme low income households are eligible for a free energy audit. The eligibility requirements for these consumers are similar to those for receiving jurisdictional energy concessions. Free energy audits extend to:

- Consumers receiving a South Australian Government CSO;
- Consumers that hold a CPCC, CHCC, Department of Veteran Affairs concession card (DVA CC); and

20 See South Australian government website for more information: http://www.sa.gov.au/subject/Water%2C+energy+and+environment/Energy/Energy+rebates%2C+concessions+and+incentives/Energy+saving+incentives+from+energy+providers

- Those consumers participating in an energy retailer's hardship regime, for which there are not strict eligibility requirements.

Therefore, the major difference in eligibility requirements for this scheme, compared to energy concession eligibility, is that it also includes those customers on a retailer's hardship program who may or may not also be eligible for an energy concession, or who may be in temporary hardship.

Table C.3 Jurisdictional energy concession schemes including eligibility and levels of compensations

Jurisdiction	Concession	Eligibility	Calculation	Concession
ACT	Energy Concession	CPCC, HCC, VAPCC	Calculated on daily basis; 44.69 cents per day (1 Nov to 31 May) and 164.34 cents per day (1 June to 31 October).	**$266.20 per year**
ACT	Utility Concession	CPCC, HCC, VAPCC	Rebate added to existing energy concession.	**$80 per year ($346.20 max combined value of both allowances)**
Tasmania	Electricity Concession	CPCC, HCC, VAPCC	Rebate increases in line with electricity price increases. Rebate covers Aurora Pay As You Go Customers.	**Approx. $407 per year (1 Jul 2011)**
Tasmania	Heating Allowance	CPCC, HCC, VAPCC. Must not have more than $1,750 in cash assets; married de facto partners must not have more than $2,750.	Payments of $28 made in May and September.	**$56 per year**
Tasmania	Life Support Machine Rebate	Eligible on medical grounds and have a life support machine installed, or lives with someone who uses a life support machine.	Approved life support systems and per day discounts as at 1 July 2011 range from 14 – 80 cents per day.	**Range: 14 – 80 cents per day**
Queensland	Electricity Rebate	CPCC, VAPCC, DVA Gold Card, QLD Government Seniors Card		**$230.46 per year**

Jurisdiction	Concession	Eligibility	Calculation	Concession
Queensland	Medical Cooling and Heating Electricity Concession Scheme	Person cannot self-regulate body temperature and holds and is a Queensland resident. Applicant or legal guardian of a minor with a qualifying medical condition must hold either CPCC, HCC, VAPCC.		**$230.46 per year**
Queensland	Home Energy Emergency Assistance Scheme	Eligible customers must have either a concession card or maximum base income that is no more than the Commonwealth Government's maximum income rate for part-age pensioners	Scheme can provide up to $720 per eligible household per year. Assistance can be provided for a maximum of two consecutive years.	**$720 per year**
Queensland	Electricity Life Support Concession Scheme	Eligible users must have been medically assessed in accordance with eligibility criteria determined by Queensland Health. People who use certain approved medical equipment at home.	Scheme offers a monthly concession (paid quarterly).	**Between $314.31 and $469.36 per year**
Victoria	Annual Electricity Concession	CPCC, HCC, DVA Gold Card	Discount of 17.5 per cent off household electricity bills all year round. From 1 July 2012 the concession will not apply to the first $171.60 if a concession card holder's annual electricity bill.	**17.5 per cent discount per year**
Victoria	Service to Property Charge Concession	CPCC, HCC, DVA Gold Card	The concession provides a reduction on the supply charge for concession households with low electricity consumption.	The concession is applied if the cost of electricity used is less than the supply (or service) charge. The charge is then reduced to the same price as the electricity usage cost.

Jurisdiction	Concession	Eligibility	Calculation	Concession
Victoria	Non-mains Energy	CPCC, HCC, DVA Gold Card. Non-mains customers who use an alternatives fuel and/or are individually metered for electricity but who pay caravan park or accommodation proprietor.	The amount of the rebate depends on the annual amount of non-mains energy purchased and the rebate amount is increased annually in line with inflation.	**Range: $42 - $297**
Victoria	Medical Cooling Concession	CPCC, HCC, DVA Gold Card	Combined with Annual Electricity Concession, recipients receive 35 per cent discount off electricity bills effective 1 March 2011.	**17.5 per cent per year**
Victoria	Off-peak Concession	CPCC, HCC, DVA Gold Card	Off-peak concession provides a 13 per cent reduction on the off-peak tariff rates on all quarterly electricity bills.	**13 per cent per year**
Victoria	Electricity transfer fee waiver	CPCC, HCC, DVA Gold Card	Full waiver of the fee that is normally payable to the electricity retailers when there is a change of occupancy at a property.	**See calculation column**
Victoria	Life Support Machine Electricity Concession	CPCC, HCC, DVA Gold Card	No further information provided.	
South Australia	Energy Bill Concession	DVA Gold Card, HCC, Commonwealth Seniors Health Care Card, receive eligible Centrelink allowance.	Concession deducted from electricity account or in some cases by cheque. A further 5% increase from 1 July 2012 will take the concession to $165 per year.	**$158 per year**
South Australia	Medical Heating and Cooling Concession	Person cannot self-regulate body temperature	Introduced 1 January 2012. No further information provided.	
New South	Low Income	CPCC, HCC, DVA Gold Card	$200 a year credited in quarterly amounts	**$200 per year**

Jurisdiction	Concession	Eligibility	Calculation	Concession
Wales	Household Rebate		on electricity bills. Rebate will increase to $215 a year on 1 July 2012.	
New South Wales	Medical Energy Rebate	Person cannot self-regulate body temperature and holds CPCC, DVA Gold Card, HCC.	$200 a year, credited in quarterly amounts on electricity bills. (The rebate will increase to $215 a year on 1 July 2012).	**$200 a year**
New South Wales	Life Support Rebate	People who use certain approved medical equipment at home that is necessary to sustain life.	$20 - $600 per year (depends on equipment and its usage), credited in quarterly amounts on electricity bills.	**$20 - $600 per year**
New South Wales	Energy Accounts Payment Assistance Scheme	Households struggling to pay their energy bills due to a crisis or emergency situation.	Scheme delivered through vouchers that provide part-payment of electricity and natural gas bills. Community Welfare Organisation assesses situation for eligibility for vouchers.	
C/wealth	Household Expenses Allowance	Commonwealth Seniors PCC		**$214 per year**
C/wealth	Utilities Allowance	Recipients of the Age Pension		**$105 per year**

C.3 Independent Pricing and Regulatory Tribunal - Analysis of consumer behaviour

The Independent Pricing and Regulatory Tribunal (IPART) have undertaken numerous consumer surveys, which also inform their retail electricity determination process.[21] More recently as part of the regulatory determination process for retail electricity prices IPART released "Changes in regulated electricity retail prices from 1 July 2012, Final Report" that included analysis of the impact of their decision on electricity consumers. The final and draft reports provide some useful insights into the consumer consumption patterns according to a range of factors including income levels and geographic location.

In terms of understanding how energy costs impact on consumers, the report indicates that across all income levels, the median household spending on energy costs will be around 4 per cent of disposable income. However, when the analysis is segmented across a number of income categories, the median household spending varies widely:[22]

- For the middle and higher income categories (more than $46,000 per year), median household spending on energy will range from about 2 to 4 per cent of disposable income.
- In the two low-income categories ($38,000 or less per year), median spending on energy will range from 5.5 to 8 per cent of disposable incomes.

The distributional analysis of median household spending on energy by income level shows that for the 10th percentile, energy costs account for approximately 4 per cent of disposable income. For the 90th percentile, energy costs account for approximately 14 per cent of disposable income.[23] This result is illustrated in Figure C.4 below.

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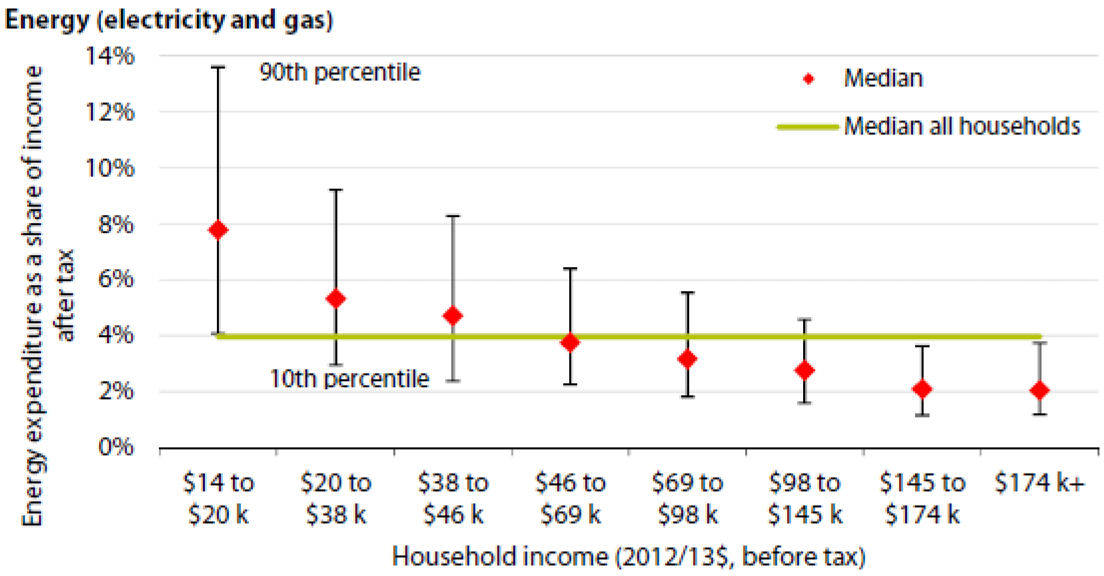
21 See IPART website for *Changes in regulated electricity retail prices from 1 July 2012*, Electricity – Draft Report, April 2012.

22 Ibid, page 69. Also see *Residential energy use in Sydney, the Blue Mountains and Illawarra: Results from the 2010 household survey*, Electricity, Gas and Water – Research Report, December 2010.

23 IPART note that a percentile is the value below which a certain percentage of observations fall. For example, the 10th percentile is the value below which 10 per cent of the observations may be found. In the above diagram, 10 per cent of customers in each income band would fall below the bottom of the vertical line (paying less than that amount) and 10 per cent of customers would pay more than the top of the vertical line.

Figure C.4 Annual spending on energy as a share of disposable household income – Sydney and surrounding regions, 2012/13[24]



Note: The income for the middle of each band is used to calculate disposable income. Disposable income as a share of household income is derived from ABS household income distribution data for 2009/10. Income for each band is inflated to 2010/11 using the change in average weekly earnings. Income forecasts for 2011/12 and 2012/13 use NSW Treasury's forecast increase in the average wage index of 3.5%. Disposable income in 2012/13 is further adjusted for the impact of the carbon compensation package. Distributions are presented without weighting survey responses. Customer bills are net of the Low Income Household Rebate. We have assumed that gas prices will increase by around 13% on 1 July 2012. This is based on an application from AGL to pass through the impact of the carbon price and likely increases in distribution prices. IPART is conducting a separate review of regulated gas prices.

Source: IPART, Changes in regulated electricity retail prices from 1 July 2012, Electricity – Final Report, July 2012, page 73.

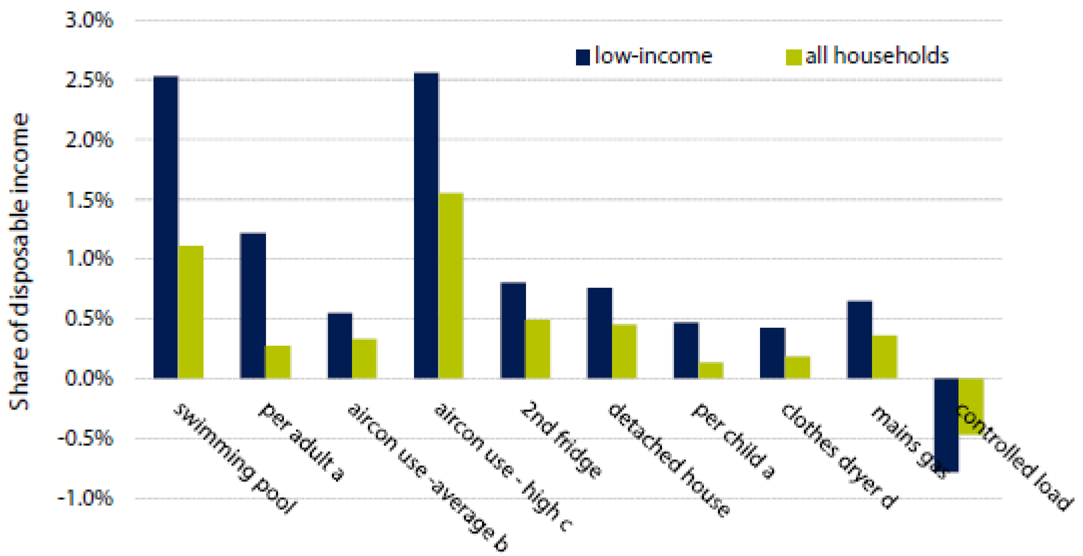
The report also looked into the drivers of variations in energy bills aside from differences in income. Looking at the factors that drive energy use for low income households, IPART found that the most important factor was the number of people in the household (particularly adults). These were followed by:

- having a swimming pool;
- how often the air conditioner is used;
- how often the clothes dryer is used; and
- having a second fridge.

IPART also note that the type and size of the dwelling have an important impact on how much energy a house uses, as illustrated in Figure C.5.

24 This report uses the results from the IPART Household Surveys 2008 and 2010. See the IPART website for these reports.

Figure C.5 Proportion of disposable income that different energy uses 'cost'[25]



a An adult means a person older than 15 years and a child means a person 15 years or younger. These variables capture uses for energy other than those already accounted for in the regression model, eg, TVs, computers, cooking.
b Average use means the equivalent of 3 days per week, 3.5 hours per day for 6 months of the year.
c High use means the equivalent of 7 days per week, 7 hours per day for 6 months of the year.
d For using a clothes dryer once per week.

Source: IPART, Changes in regulated electricity retail prices from 1 July 2012, Electricity – Final Report, July 2012.

For low income households, the study found that a high proportion of such households comprised of only one person or are couples without children. In fact, these types of households account for almost 70 per cent of households in the lowest income quintile. In addition to this, around 88 per cent of the lowest income quintile households received a government pension or allowance.

C.4 Case study – Fuel poverty and the United Kingdom experience

The United Kingdom has recently undertaken a review of its fuel poverty target and the indicators it uses to describe fuel poverty. The review also considered that, given the available resources, what are the most effective policies for tackling the underlying drivers of fuel poverty. The final policy recommendations are outlined in "Getting the measure of fuel poverty: Final Report of the Fuel Poverty Review" by John Hills.[26]

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25 The data source for this is the IPART Household Surveys 2010. See the IPART website for this report.

26 See United Kingdom Department of Energy and Climate Change, *Hills Fuel Poverty Review*, http://www.decc.gov.uk/en/content/cms/funding/Fuel_poverty/Hills_Review/Hills_Review.aspx

A key recommendation stemming from the review was to amend the current definition of fuel poverty used in the United Kingdom. The official measurement of fuel poverty states that a household is fuel poor if it would need to spend more than 10 per cent of its income to achieve adequate energy services in the home (the definition is outlined in the UK Fuel Poverty Strategy 2001). The report found that the current official indicator, based on required energy spending exceeding a threshold of 10 per cent of income, has some strengths but also has serious weaknesses including its undue sensitivity to energy prices and the way it identifies which households are fuel poor.

The final report took into account the underlying factors that drive fuel poverty, notably changing income positions and rising fuel costs. The review recommended that households should be considered fuel poor if:

- they have required fuel costs that are above the 'contemporary' median level; and

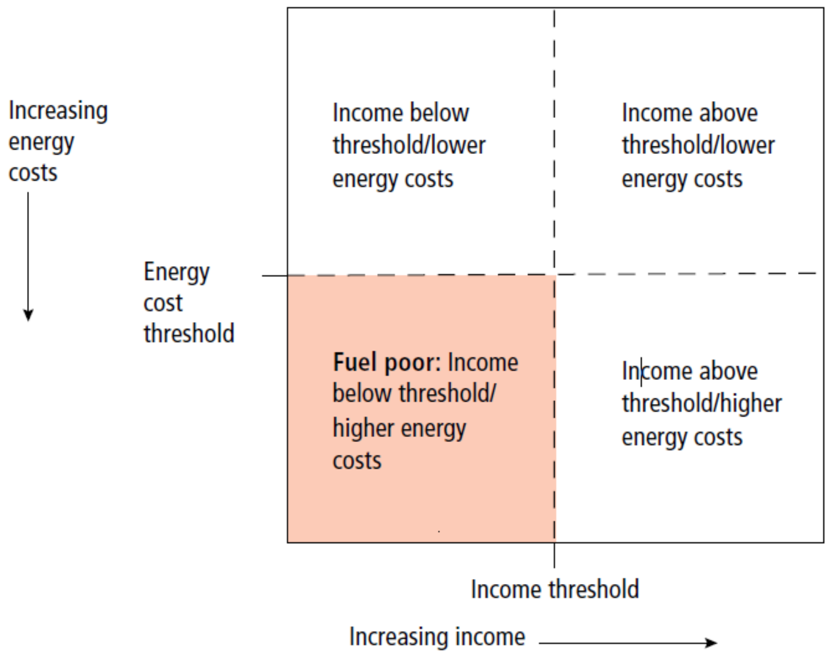
- were they to spend that amount, they would be left with a residual income below the official poverty line.

The report also considered a range of different policy pathways for reducing fuel poverty. Each of the policy pathways relates to the typical drivers of fuel poverty: thermal (energy) efficiency; income and energy prices. The report further analysed the cost-effectiveness of the policy pathways aimed at addressing each of these drivers of fuel poverty and their effectiveness at reducing fuel poverty.

The effectiveness of each of these approaches is measured according to changes in the drivers of fuel poverty – changing income levels and rising fuel costs, as illustrated in Figure C.6. For example, households are defined as fuel poor where their household income is low and where their required energy spending in order to achieve an adequate standard of warmth is above a specified threshold. Fuel poverty is therefore represented by the shaded area in Figure C.6.

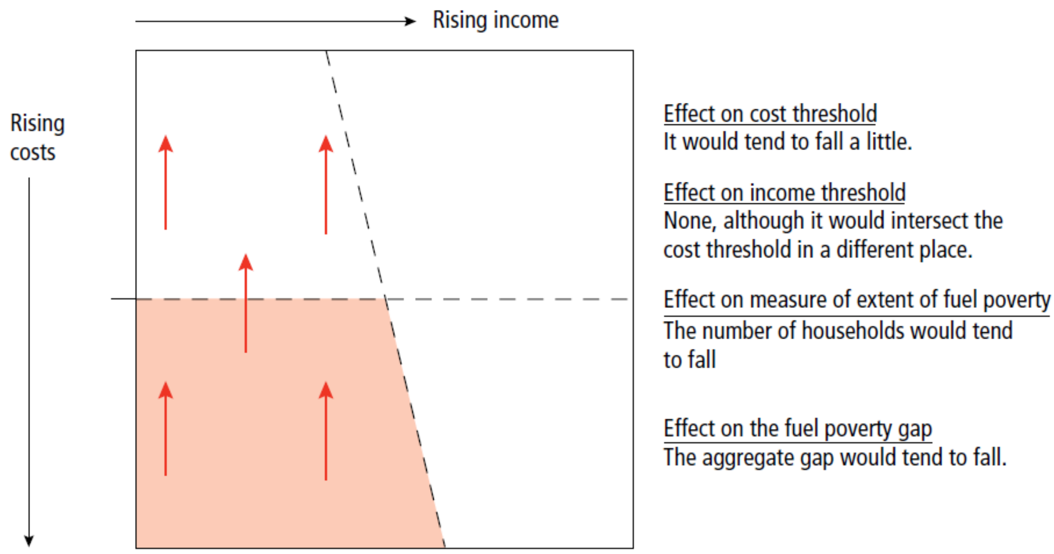
The aim of a cost effective and efficient policy is such that only the fuel poor are lifted from fuel poverty, and the policy pathway does not change the position of a broader subset of consumers.

Figure C.6 Fuel poverty defined as the overlap between low income and high energy costs



1. *Price- based measures.* Policies to reduce prices and/or bills for poorer households specifically would be expected to bring some of them out of fuel poverty, reducing both headcount and fuel poverty gap indicators. The overall effect of these types of policies is to lower energy bills and is income neutral

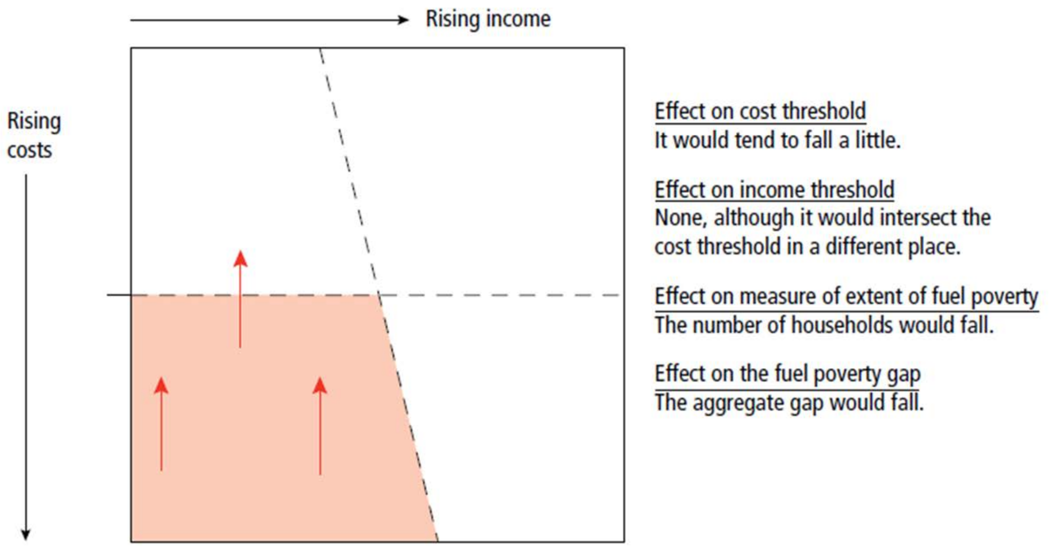
Figure C.7 Impact of bill rebate targeted at low-income households



2. *Energy-efficiency measures.* These types of measure impact on energy costs. Sufficiently large improvements in energy efficiency could result in sustained longer term solutions. In this regard, energy efficiency programs need to the

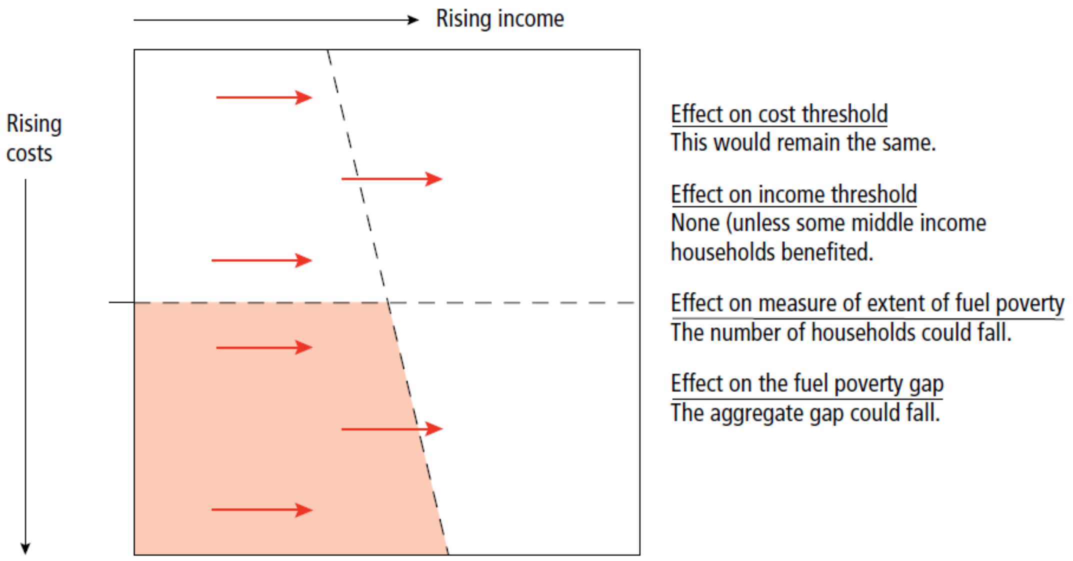
focussed on low income households otherwise fuel poverty rises if only taken up by high income households. The impact of these types of policy measures is to lower energy costs and remains income neutral.

Figure C.8 Impact of an energy efficiency improvement policy targeted at low income households with low energy efficiency



3. *Income-based measures.* These types of policy measures improve a household's position relative to median energy expenditure. Energy costs remain neutral as income increases.

Figure C.9 Impact of an income improvement policy targeted at low-income households



The analysis concluded that the most cost-effective policy measure was to improve the thermal efficiency of the housing stock. This type of policy measure delivers persistent benefits in reducing fuel poverty, reducing GHGs and has very substantial net societal benefits.

D Summary of stakeholder submissions to directions paper

ISSUE	COMMENT	STAKEHOLDERS
CONSUMER ENGAGEMENT AND PARTICIPATION		
Access to information	Support consumer access to energy consumption data.	AEMO, Ausgrid, Energex, ETSA Utilities, United Energy, Essential Energy, International Power GDF Suez, EnerNOC, MEU Government of South Australia, ESAA, AER, Clean Energy Council, Smart Grid Australia.
	Existing Rules allow customers sufficient access to their information. Existing arrangements do not require amendment.	ERAA , AGL, Origin.
	Support for 3rd party information providers. Relevant rules governing third party information providers should be clarified.	Powercor Citipower, Ausgrid, Energy Networks Association, ETSA Utilities, MEU, Energy Efficiency Council.
	3rd parties accessing customer information must be subject to customer protection measures. Explicit customer approval must be obtained.	Powercor Citipower, EnerNOC, ESAA.
	Support a central information hub / information service provider.	Clean Energy Council, Listening Post
	No need for a central information hub / information service provider.	ERAA, Origin, ETSA Utilities, Energex.
	Enabling technology (including smart meters, in home displays and web portals) may help facilitate provision of information to consumers.	Ausgrid, ETSA Utilities, Landis + Gyr, Smart Grid Australia,

ISSUE	COMMENT	STAKEHOLDERS
		Powercor Citipower, Energex
Improving consumer awareness and education	Support for broad based consumer DSP education and engagement programmes. Need to obtain community "buy in".	Ausgrid, ESAA, Essential Energy, Energy Networks Association, United Energy, ETSA Utilities, ERAA, TRUenergy, AGL, Simply Energy, International Power, Consumer Action Law Centre, EUAA, Clean Energy Council
	Consider alternative voluntary programmes for energy reduction, such as those based on water use reduction programmes.	Consumer Action Law Centre, Clean Energy Council, EUAA, Theresa Pun
EFFICIENT OPERATION OF PRICE SIGNALS		
Network charging methodologies	Support for time of use charging structures.	Powercor Citipower, Ausgrid, SP Ausnet, Essential Energy, Alinta, Energex, United Energy, ERAA, International Power GDF Suez, MEU
	Support for capacity charging/tariffs, noting potential challenges of implementation.	Ausgrid, SP Ausnet, ERAA, MEU, Origin, Essential Energy, ESAA, International Power GDF Suez, Private Generators, ETSA Utilities
	Potential for critical peak pricing noted, acknowledging extensive timeframe for implementation.	Energy Efficiency Council, ETSA utilities, Powercor Citipower
	DNSPs should have flexibility in setting tariff structures.	Powercor Citipower, ETSA Utilities, United Energy

ISSUE	COMMENT	STAKEHOLDERS
	Different tariff structures will be more appropriate in different jurisdictions.	ETSA Utilities
	Calculating a network tariff with a fixed, variable and LRMC element will be complex.	Ausgrid, Powercor Citipower, Energex, United Energy, Essential Energy
Cost reflective pricing	Support for some degree of cost reflective pricing, noting: • full cost reflectivity of prices may not be viable; • supporting measures are important; and • cost reflective tariffs may not deliver firm load reduction.	Powercor Citipower, ETSA Utilities, Energex, ERAA, ESAA, ENA, Origin, International Power GDF Suez, TRUenergy, AGL, Private Generators, Tom Geiser, MEU, Alinta, Ausgrid, SP Ausnet, United Energy
	Metering technology and ability to access data will help facilitate cost reflective pricing and DSP generally.	Powercor Citipower, Essential Energy, Energex, Jemena, TRUenergy, EnerNOC, AGL.
	Consumer education is also required to drive take up of more flexible tariff arrangements and DSP more generally.	Powercor Citipower, ETSA Utilities, TRUenergy, Simply Energy, AGL, ERAA.
	The market should be allowed to determine optimal tariff structures. Customers should have the right to revert to a flat tariff.	Origin, United Energy, ERAA.
	Unbundled bills that separate the components of customer charges would improve consumer awareness.	Powercor Citipower, Essential Energy, MEU.
	Need to end moratorium on TOU pricing in Victoria.	ESAA, Powercor Citipower
Alignment of price with cost and pass through	Retailers should have capacity to choose whether they pass through costs and structure their prices as they see fit.	Origin, ERAA.

ISSUE	COMMENT	STAKEHOLDERS
costs	Retailers may not have incentives to pass through costs.	EnerNOC, Government of South Australia, MEU
	Impediments that prevent retailer pass through of costs should be removed.	Powercor Citipower
	Given effective retail competition, retailers should offer the services their customers want, including developing innovative approaches to pass through of network costs.	Ausgrid, United Energy.
	Retail price regulation prevents alignment of prices with cost.	ERAA, Origin
TECHNOLOGY AND SYSTEM CAPABILITY		
Barriers to consumer investment in DSP technology	DSP must be easy to use. The decision making process in adopting DSP must be simple and reliable.	Ausgrid, Government of South Australia, Energex
	Cost reflective pricing will help drive investment in DSP technology.	Energex
	Standardisation of DSP technology is necessary and will improve portability for consumers.	United Energy, Origin.
	Network tariff metering and service charges should be unbundled.	AGL, Origin, Betterplace
	Current arrangements are sufficient to facilitate a consumer's decision to upgrade their meter.	Energex, United Energy
	Current arrangements are not sufficient to facilitate a consumer's decision to upgrade their meter.	ERAA, Betterplace
Role of third parties	Lack of information, access to customers and the absence of an effective marketplace acts as a barrier to ESCOs	Essential Energy, EnerNOC, MEU, Total Environment Centre
	Third parties such as ESCOS should be subject to the same regulatory obligations as	Simply Energy, Origin, ERAA,

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	existing participants. NECF may require clarification.	AGL, TRUenergy.
	Third parties can capture and recognise the value of DSP.	Alternative Technology Association, MEU
Metering arrangements in the NEM	Supports a national rollout of smart meters. Develop an incentive mechanism to encourage DNSP deployment of smart meters.	Landis and Gyr
	Support for allowing multiple FRMPs / parties to service the same meter / connection point	Betterplace, AEMO, AGL, Total Environment Centre, Alternative Technology Association, Energy Efficiency Council
	Meter provision should be non-exclusive and competitive, through retailers or other providers.	Ceramic Fuel Cells, ERAA, AEMO, TRUenergy, AGL, Origin, International Power GDF Suez, EnerNOC, Betterplace
	DNSP are best placed to rollout and maintain metering technology.	Essential Energy, ETSA Utilities
	Need for development of national metering standards and minimum functionalities.	Ausgrid, United Energy
	Current regulatory arrangements governing metering do not require amendment.	AGL, Origin
	Regulatory framework for subtractive metering should be amended or clarified.	AEMO, Betterplace
Integrating DSP technology into energy networks	Operational / technical frameworks and industry standards are required.	Energex, Essential Energy, ERAA
	Increased penetration of DSP technology will have implications for the development and function of distribution networks. Innovation and utilisation of smart technologies can help address these challenges.	Energex, ETSA Utilities, United Energy
SUPPLY CHAIN INTERACTIONS		

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Examples of DSP options that deliver net market benefits along the supply chain	AMI can provide net benefits to the market.	Powercor
	Ausgrid has utilised DSP to defer capital upgrades.	Ausgrid
	DG has been installed address peak demand.	Essential Energy, MEU
	Energex has developed an energy efficiency pool pumps programme.	Energex
	Load curtailment with a specific trigger, sold as a cap to hedge wholesale prices.	AGL
Current market arrangements	Existing market arrangements do not facilitate co-ordination across the supply chain.	MEU, Alternative Technology Association, Powercor Citipower, AGL.
	Provided that effective price signals are allowed to arise, the market can deliver co-ordination and efficient DSP. Emphasise importance of "organic development" of a market for DSP.	ERAA, Origin.
	Retailers / NSPs have no interest in cooperating in utilising DR for net market benefit. Allowing third parties to procure DR would address this.	EnerNOC
Wholesale and market valuations of DSP	Where DR is used for multiple purposes, there is no requirement for it to be valued consistently for those different purposes..	EnerNOC
Fully cost reflective pricing	Fully cost reflective pricing appears unfeasible.	Origin, EnerNOC
	Cost reflective prices may be an effective mechanism to deliver efficient DSP, including peak demand reduction.	Powercor Citipower, Essential Energy
	Cost reflectivity is not sufficient in itself, other mechanisms will be necessary.	Ausgrid, AGL
Dynamic network charging	Relating network tariffs to consumption provides effective signals for participants to	MEU, Betterplace, ETSA Utilities

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(the Orion scheme)	change behaviours and engage in DSP.	
	May be merit in trialling the Orion approach in the NEM.	Essential Energy
	Dynamic network pricing will only change consumer behaviours if retailers accordingly change their retail charges. Not all retailers will do this, reducing the effectiveness of dynamic pricing.	ERAA
	Orion approach may be useful for the non-household sector but it is not clear if it would work for a large population across multiple networks.	Origin
Valuation of DSP	A standardised approached for quantifying the value of DSP across the supply chain may be required. May take the form of an approach guideline. May be included in the Demand Management Incentive Scheme (DMIS).	Essential Energy, Energex, ERAA, United Energy, ETSA Utilities, ENA.
	DNSPs are best placed to undertake analysis of the localised benefits of DSP. However, the AEMC should calculate standardised values for long term benefits of peak demand reductions in the transmission and generation sectors.	Ausgrid
	May be merit in using spatially or temporally smoothed values of DSP.	EnerNOC
	The development of a market for DSP products and services will lead to the development of an efficient price, hence value, for DSP.	AGL
Forecasting the impact of DSP	DNSPs are best placed to assess the impacts of DSP.	Powercor Citipower, Ausgrid
	Forecasting methods should recognise jurisdictional differences.	United Energy
	DNSPs should not alter demand forecasts or network planning for uncontracted DSP until they are able to develop a robust understanding of the potential reduction in demand.	Energex
	Supports development of standardised, common methods to forecast impacts of DSP.	Origin, ETSA Utilities

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Single agent procurer of DSP	No need for a single agent procurer of DSP. The market will identify efficient DSP.	Energex, AGL, MEU, Ausgrid, Origin
	If co-ordination across the supply chain cannot be achieved it may be appropriate for a single market participant, namely the DNSP, to deliver the benefits of DSP.	Essential Energy
	A single actor procurer model may reduce innovation. Also unlikely to recognise and account for the inter-regional nature of the NEM.	AER, ERAA
	There may be benefits associated with a single actor approach, in certain circumstances.	ETSA Utilities
	May be some merit in having market operator procure contracted DR.	EnerNOC
WHOLESALE AND ANCILLARY SERVICES MARKETS		
Provision of information to AEMO regarding DSP capability	A framework is needed to allow AEMO to incorporate data from non-scheduled demand side response.	AEMO
	Given the nature of DSP, DNSPs may not be able to provide AEMO with better information.	Ausgrid
	Market participants should provide their DSP capability to AEMO. May be limited to DSP capability above a particular threshold or to contracted DSP.	Essential Energy, ERAA, EnerNOC, MEU, United Energy.
	No need for any additional requirement on market participants to provide information regarding DSP capability to AEMO.	AGL, Origin
Registration costs and processes	Costs and risk are significant. Most participants operate through a retailer.	MEU
	Costs of becoming a market participant should be considered by all potential participants. They are a necessary part of market function.	Essential Energy, Origin Energy

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	Costs and processes for becoming a registered participant should be transparent and non-discriminatory to all participants	ERAA
Role of aggregators	Support entry of aggregators into wholesale market. Some stakeholders supported creation of new category of market participant. Aggregators can provide co-ordination across the supply chain.	United Energy, EnerNOC, MEU, Alternative Technology Association, Energex, Total Environment Centre, Government of South Australia, Clean Energy Council.
	Any new participant category should be required to comply with the Rules and should not impose any costs on existing participants.	TRUenergy, ERAA
	Aggregators should operate in the market as intermediaries under the existing Rules. There is no need for a new category of market participant	AGL
	Parties should be able to sell DR to networks, potentially overseen by AER to address network monopoly power issues	Energy Efficiency Council
Provision of DSP to the wholesale market	Support allowing demand response and scheduled load to be sold directly into the wholesale market.	Energy Efficiency Council, Total Environment Centre, AGL
Effectiveness of current financial contract markets at providing a hedge against price risk for DSP options	Financial contract markets do not provide an effective hedge for DSP options.	EnerNOC
Side payments to DSP providers	No need for any new stream of payments to DSP providers.	ERAA
	Opposed to any mechanism which gives preference to DSP over conventional generation.	International Power

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	Introduction of capacity market has merit however its value in assisting DSP is not sufficient reason alone for making the change.	MEU
	Demand response targets or capacity payments should be considered.	Alstom and UISOL
NETWORK INCENTIVES		
Current arrangements incentives and regulatory solutions	Support the introduction of incentives for DSP. Some stakeholders specified that this scheme should apply to DNSPs.	Ausgrid, Powercor Citipower, SP Ausnet, United Energy, Essential Energy, Energex, ENA, ETSA utilities, Betterplace, United Energy, Alternative Technology Association, Total Environment Centre
	Support for targets or obligations on DNSPs to acquire or prioritise DSP.	Alternative Technology Association, Total Environment Centre, Energy Efficiency Council, Alstom UISOL
	DMIS does not recognise full supply chain benefits.	Ausgrid, ETSA Utilities
	DMIS incentivises DSP that provides broader market benefits. Existing DMIS should be expanded.	AER, Government of South Australia.
	Incentive mechanisms must not distort market outcomes or provide any party with a specific advantage.	International Power, Simply Energy
	Other factors affecting DNSP involvement in DSP include: • capex vs. opex incentives;	EnerNOC, Betterplace, ENA, Essential Energy, Powercor Citpower, United Energy, AER, Origin, Simply Energy

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	• decreasing DSP incentive during regulatory period; • ability for DNSPs to include rebates/rewards within annual pricing proposals; • incentives for research and development; • certainty regarding whether within-period incurred DSP capex will be included in RAB; and • equalisation of arrangements for distribution and transmission networks.	
	Decoupling revenue from network investment and energy throughput will promote DSP.	Total Environment Centre, Energy Efficiency Council
Estimation and forecasting of DSP impacts	Support for a consistent approach to the assessment of DSP demand impacts for the purposes of planning and revenue determinations.	United Energy, Essential Energy, Energex, MEU, ERAA, Origin
	Formalised or codified approach to forecasting DSP impacts not supported.	Ausgrid, SP Ausnet
	DNSPs should only consider impacts of DSP where the DSP where the DSP project has demonstrated firm load over time.	Citipower Powercor
	Support clarification of the Rules regarding what market benefits can be considered when assessing expenditure for DSP.	AER
Service target exemption	Impact of less certain DSP projects on service standard outcomes acknowledged. Some support for exemption of DSP projects from the STPIS, in the trial or developmental stage of the project.	Citpower Powecor, ETSA Utilities, SP Ausnet, United Energy, Origin, EnerNOC, Energex, Essential Energy, AER
	Some opposition to exemption from STPIS for DSP projects.	Ausgrid, ERAA
DNSP engagement with	Support allowing DNSPs to provide information and engage with consumers, in specific	Citipower Powercor, Ausgrid,

ISSUE	COMMENT	STAKEHOLDERS
consumers	circumstances.	ETSA Utilities, United Energy, Essential Energy, United Energy, MEU, AER
	DNSPs should not provide information or otherwise directly engage with consumers.	ERAA, International Power
	DNSPs should only engage directly with consumers to provide information in a targeted manner for specific projects.	Origin
	A third party information services provider is a better solution to providing consumers with information and DSP services	EnerNOC
RETAILERS		
Settlement profiles and consumption patterns	Moving to more accurate load profiles for settlement will allow for more cost reflective tariffs and facilitate DSP.	United Energy, Essential Energy, ERAA, Origin
	Using more accurate load profiles will not facilitate DSP	MEU
	Use of load profiling could provide a lower cost DSP alternative to roll out of AMI.	SACOSS
Retail price regulation	Retail price regulation does not inhibit a retailer's ability to offer innovative tariffs and to facilitate DSP	Essential Energy, MEU
	Removal of retail price regulation will allow for more innovative tariffs and facilitation of DSP.	ERAA, Origin, United Energy, TRUenergy, AGL, LoyYang, Infrastructure Partnerships Australia
	Retail price regulation should not provide any certainty of cost recovery for retailers.	EnerNOC
Role of retailers	Retailers have a central role to play in educating and informing customers about DSP.	ERAA, Origin, Ausgrid, United Energy

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	Other parties such as government, regulators and DNSPs should also have a role informing consumers about DSP.	United Energy, Essential Energy
	Public education campaigns are also needed to inform customers about the benefits of DSP.	International Power GDF Suez
	It is important to ensure that retailers cannot prohibit their customers from participating in DSP.	EnerNOC
DISTRIBUTED GENERATION		
Distributed generation	The AEMC should conduct a review into DG and distributed energy. A new distributed energy market, with appropriate regulatory frameworks, should be developed.	Australian Photovoltaics Association
Incentive mechanisms	Support for an incentive mechanism to facilitate connection of DG.	Citipower Powercor, Ausgrid, EnerNOC, Total Environment Centre, SP Ausnet
	Support for a fee for service model, with some conditions raised by different stakeholders: • fees should be transparent and cost reflective; and • fees should be regulated as an alternative control service.	Energex, Essential Energy, Origin, EnerNOC
	No support for incentive mechanism for DG.	ERAA
	DNSPs should release more information, go out to tender for DG solutions to required augmentations and provide standardised connection processes.	Origin
DG impact on networks	DG connection has distribution network security implications. Charging DG on a locational or time varying basis may address this.	Essential Energy, Energex

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Avoided TUoS and network support agreement payments	Rules relating to pass through of network support payments should allow for pass through via annual pricing proposal process.	SP Ausnet
	DNSPs should be given a share of the value of deferring a network augmentation where a DG unit is utilised.	United Energy
	National network support payment scheme for the first 3000MW of co-gen in Australia.	Energy Efficiency Council
	Need a standardised approach to calculating avoided TUoS.	Origin
Feed in tariffs	Support for a national, consistent feed in tariff scheme.	Ceramic Fuel Cells, AGL, Energex
	Various stakeholders commented on potential design changes to Feed-in Tariffs (FiT) arrangements including: • market based feed in tariffs are preferred; • FiTs should be time sensitive; • FiTs should be net and not gross; and • existing FiT arrangements do not encourage export at times of network constraint.	Citipower Powercor, Energex, ETSA Utilities, Origin
	Existing FiT arrangements do not encourage export at times of network constraint.	ETSA Utilities
	FiTs are not supported.	Ausgrid, International Power
Portability of DG and metering arrangements	The regulatory framework for subtractive metering should be clarified and formalised.	AEMO
	Installation of smart metering is preferable to determining multiple small customer load profiles.	AEMO

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	Additional costs are associated with portability of DSP. Cheaper to use a single on-market meter and an off-market child meter.	Energex
	Support for gross metering, in preference to net metering, for DG.	Essential Energy
	Parent child metering and shared NMI changes will be costly.	Origin
	Jurisdictional metering requirements should be revised.	EnerNOC
Ring fencing	DNSPs should be capable of bidding DG into the wholesale market.	ETSA Utilities
	Distributors should not be prevented from participating in the DSP market.	SP Ausnet
	There is no need for network initiated DSP activities to be undertaken by a separate ring fenced entity.	ENA
	Ring fencing provisions are appropriate. A clear separation of monopoly and regulated competitive elements is appropriate.	ERAA, AGL, Origin
ENERGY EFFICIENCY REGULATORY MEASURES THAT INTEGRATE WITH OR IMPACT THE NEM		
Energy efficiency and DSP	While EE policies deliver different outcomes to peak demand reduction, they may also complement one another.	Ausgrid, ERAA, Origin, Citipower Powercor, Energex
	EE policies should sit outside the regulatory framework for distribution businesses.	Citipower Powercor
	Support for a nationally consistent energy efficiency mechanism.	Origin, ERAA, ESAA
	No need for any further subsidies for EE, the market can deliver.	International Power GDF Suez
	Governments should legislate for minimum efficiency standards in electrical equipment.	International Power GDF Suez

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Consumer differentiation of DSP and EE	Consumers are unlikely to differentiate between Energy Efficiency and DSP.	Powercor Citipower, ETSA Utilities, Essential Energy, ERAA , AGL, MEU
	Better consumer education is required.	Powercor Citipower, ETSA Utilities