REVIEW

Australian Energy Market Commission

DIRECTIONS PAPER

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

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About the AEMC

The Council of Australian Governments, through its Ministerial Council on Energy (MCE), established the Australian Energy Market Commission (AEMC) in July 2005. The AEMC has two principal functions. We make and amend the national electricity and gas rules, and we conduct independent reviews of the energy markets for the MCE.

Executive Summary

Efficient markets are characterised by effective participation of both the supply and demand side. Opportunities for efficient operation of demand side participation (DSP) in the national electricity market (NEM) are not as well developed as supply side opportunities. The purpose of this review is to improve the opportunities for DSP.[1]

While there is some evidence of uptake of DSP in the NEM over recent years, opportunities to maximise efficient DSP could be improved. Electricity demand, particularly peak demand, has grown over recent years. Significant new investment (and access to capital) is needed across the supply chain in order to meet further projected increases in peak demand over the longer term. Enabling consumers to make informed choices about the way they use electricity can help achieve efficient investment across the demand and supply sides. If the costs of supplying electricity outweigh the value consumers derive from consuming it, a reduction or shift in demand will be efficient.

While DSP opportunities provide benefits, there are also likely to be costs in taking up DSP options by consumers and other parties. These include the loss in value from changing consumption, the form of upfront costs and costs when DSP options are exercised. Those costs need to be weighed against the benefits that DSP provides. The market will operate efficiently when the lowest cost combination of DSP and supply options is used to meet consumers' demand for electricity services.

The review

The Ministerial Council on Energy[2] asked the Australian Energy Market Commission (AEMC) to undertake a further review of DSP in the NEM. It follows previous studies into DSP in electricity markets, which has seen some reforms over time to improve uptake of DSP in the NEM.[3]

The purpose of this review is to identify opportunities for consumers to make informed choices about the way they use electricity. Consumers require information, education, incentives and technology to make efficient choices. This will also require incentives for network operators, retailers and other parties to facilitate and respond to consumer choices in a manner that results in lowest cost service delivery.

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1 DSP refers to the ability of consumers to make informed choices about how much electricity they use at different times. These choices should efficiently reflect the value they obtain from using electricity services. Examples of DSP can include, but are not limited to, such measures as electricity conservation, peak demand shifting, fuel switching, utilisation of distributed generation and energy efficiency.

2 The Standing Council on Energy and Resources (SCER) was established in late 2011 and replaces the previous Ministerial Council on Energy (MCE). SCER is now responsible for progressing key energy reform elements of the MCE.

3 MCE Terms of Reference are available on the AEMC website: http://www.aemc.gov.au/Media/docs/MCE%20Terms%20of%20Reference-35e6904a-e39d-4348-8ad5-1a7970af354d-0.pdf.

A key outcome for the review will be to recommend the possible changes needed to the existing market and regulatory arrangements that ensure efficient demand side options are properly considered and correctly valued in both the planning and operation of the NEM.

This directions paper

This paper identifies the suite of market conditions needed across the supply chain for uptake of DSP by consumers and a range of other parties. The directions paper also sets out the issues and identifies opportunities to improve and support promotion of the market conditions. Our assessment has been based on issues raised by stakeholders, submissions to the review, and evidence gathered through supporting reports. In undertaking our work, we have been informed by the National Electricity Objective (NEO) which is our overarching guiding criteria for the review.

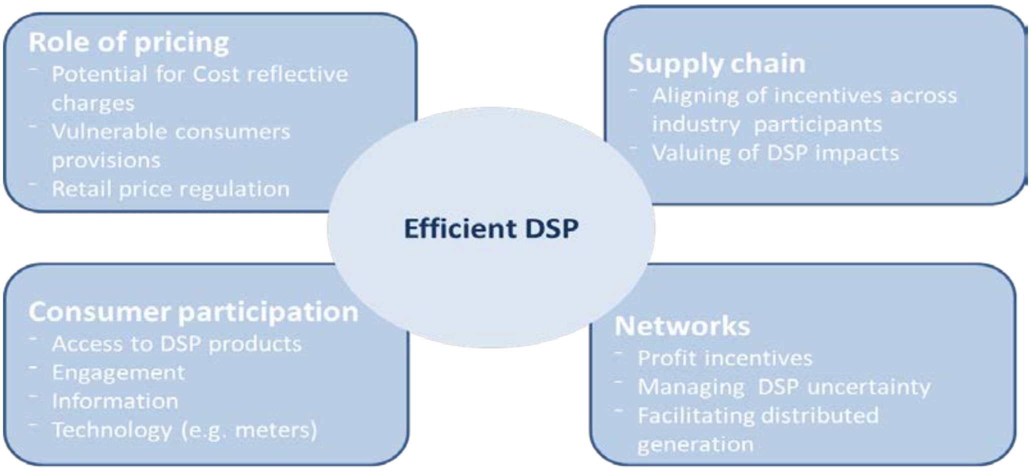
Facilitating efficient DSP

We are of the view that there are a number of opportunities to improve and support the market conditions necessary to deliver efficient DSP in the electricity market. That is, there are a number of issues that we will investigate further to ensure that segments of the market and the supply chain are collectively incentivised to value DSP and support consumer decision making. Realising such opportunities will help consumers to receive the right level of information and products and services. This will enable consumers to make informed consumption decisions consistent with their own preferences and circumstances. Figure 1 summarises the key areas of focus and issues identified in the directions paper.

A number of themes are emerging for the review. These relate to the current uptake of DSP options across the market and the tools consumers and other parties need to capture the benefits DSP provides. These are outlined below. The way forward provides the key actions we intend to progress for the next phase of the review. These will be informed by stakeholder feedback to the directions paper.

As part of the review, we have also considered the interaction between energy efficiency measures and policies and DSP in the NEM. We discuss our approach for assessing the effectiveness of these measures and interactions with DSP in section 5 of this paper.

Figure 1 **Summary of key issues and opportunities for enabling efficient DSP**



The themes emerging at this stage of the review include:

- There are various forms of DSP. Each has different characteristics and thus uptake will differ based on the preferences of the implementing party. DSP options can generally be grouped into two categories, each having different costs and benefits for different parts of the supply chain: contracted DSP (such as network support payments or direct load control); and uncontracted DSP (such as changes in electricity use based on price e.g. time sensitive retail tariffs).

- Different market conditions will enhance different types of DSP. The nature of energy use in Australia is changing and advancements in technology mean that the role of DSP is changing in the market. This could enable different consumer sectors to better capture the value of DSP.

- There are aspects of the current market arrangements that promote DSP. This is evidenced by some parties taking up DSP opportunities where it has been cost effective to do so.

- There are also an increasing number of pilots and trials underway which are testing how to best capture the value of DSP and understand consumer response. A key consideration is how to transition from the pilots and trials to large scale deployment of such initiatives.

- For consumers to be able to make more informed decisions about how and when they use electricity, there is a need for better information. How market participants (such as retailers, network businesses and other parties (e.g. Energy service companies (ESCOs) and aggregators) engage with consumers has been raised as important, and we consider that this should be investigated further.

- If consumers wish to more actively participate in the market, and to capture the value of DSP opportunities, they need to have access to a range of products and services. While there is more choice in the industrial and manufacturing sectors, such choices are currently limited in the residential and small business sectors. A key theme for this review is how to incentivise the market to provide appropriate products to consumers.

- The current network and retail tariffs do not necessarily reflect cost of supply and delivery of electricity. Hence, most consumers currently do not have options to capture the value of DSP actions. There are a number of reasons for this which we are investigating further.
- As more consumers participate in the market, and take up innovative products and services, there may be an increasing role for ESCOs to facilitate those choices. How the existing arrangements enable these companies to operate in the market will be reviewed.
- Metering is an important enabler in supporting DSP. Currently, a large proportion of the residential and small business sector do not have access to appropriate metering technology to facilitate the offering and uptake of a number of DSP options. While we are considering how the arrangements support investment in technology, we are also investigating ways to facilitate choices to take up DSP in the absence of such technology.
- Retail and network businesses play a key role in promoting DSP outcomes. We have found that there are opportunities to improve incentives and remove restrictions for these market participants.
- There are opportunities to facilitate distributed generation in the market. We note that there are a number of processes in train to review issues raised for connecting distributed generation. We intend to consider the incentives on network business to facilitate distributed generation.
- A key element of the review is to ensure each part of the supply chain sees the costs and benefits of DSP options and aligns the commercial interests of the participants with an efficient market outcome. An important question to consider is to what extent cost-reflective tariffs support greater co-ordination across the supply chain.

Way forward

We have outlined a suite of issues that require further consideration, and also offer some directional comments on opportunities to facilitate efficient DSP in the market. For the next stage of the review, we intend to consider those issues and assess potential options for reform across a number of key areas. These relate to opportunities to facilitate efficient DSP in the electricity market in the longer term, and other improvements that can be made to the existing rules to better facilitate uptake of DSP in the short term. The key areas we will be considering include:

- **Consumer participation:**
  - information, avenues for engagement, and access to wholesale market by third parties (acting on behalf of consumers);
  - how the market offers products and services; and
  - access to and utilisation of technology.
- **Role of price signals:**
  - arrangements for the market to provide prices that better reflect the costs of supply and delivery of electricity services;
  - potential for cost reflective prices to promote consumer uptake of DSP; and
  - arrangements for vulnerable consumers, where required.
- **Networks:**
  - distribution network profit incentives and ability to manage risks of DSP projects.
- **Supply chain interactions**:
  - incentives across industry participants and how the supply chain captures the value of DSP impacts.

Other considerations

As part of our work program we will also further consider the broader issues for distributed generation and how energy efficiency programs impact on the NEM and integration with DSP policies. A summary of the key areas and our considerations is provided in Table 1.

Making a submission

We welcome stakeholder feedback to our directions paper through written submissions, bilateral meetings and other forums. We particularly welcome any evidence that can be provided which may assist us in assessing the issues and developing potential options for change as the review progresses.

We will be holding a public forum for stakeholders to present their views and provide the AEMC with feedback on the key considerations for the next stage of the review. The public forum will be on 19 April 2012 in Sydney.

Submissions to the directions paper close on 4 May 2012.

Table 1 Summary of key areas and consideration for next stage of the review

Market conditions	Actions for next stage of review
Consumer participation	
Engagement and information	- The changes required to provisions in rules so that consumers can have timely access to their consumption data (and whether new role of information service providers is required) - The role of network business, retailers and other third parties to engage with consumers - how dialogue can take place in a transparent manner when offering different products and services - Provision for market participants to provide better information to AEMO regarding DSP capability - Approaches to better facilitate the role of aggregators to participate in the wholesale market and how wholesale contract market supports these service providers. We will hold a specific industry workshop on this topic in April 2012.
Technology	- The role and rights of consumers regarding ownership and usage of technology to enable DSP - Approaches to assist consumers when they consider making investments in technology - Arrangements to facilitate commercial investment in metering technology
Role of price signals	
Cost reflective pricing	- The impact of time-sensitive tariffs on different types of consumers and consider additional protections required for vulnerable consumers - The drivers of network costs, ability and incentives for network businesses to charge cost-reflective prices

	- Commercial restrictions on retailers to capture value of DSP - Extent to which retail price regulation may impose restrictions on retailers to allow flexibility in pricing and changes that may be required - Merits of better load profiling for residential consumers on accumulation meters
Networks	
Distribution network incentives	- Options to provide the appropriate commercial incentives for distribution network businesses to invest in DSP - Options for special transition arrangements that help the distribution network businesses to manage any additional risks from DSP (For example, possible exemption from the service standard incentive scheme, and merit of developing common acceptable methods and best practice standards on how DSP should be value and estimated)
Supply chain interactions	
Capturing the value of DSP	- The reasons why DSP programs which could deliver multiple benefits across the supply chain are not being implemented - The extent to which cost reflective prices promote co-ordination across multiple market participants - Options to achieve co-ordination between multiple parts of the supply chain – role of energy service companies and/or need for alternative approach – (i.e. single actor option) - Approaches to be used to value and forecast the costs and benefits of DSP (i.e. the extent of demand reduction)

Other considerations	
Distributed generation	- The incentives on distribution network businesses to connect and engage with DG installations in an efficient and timely manner, including the merits of possible additional schemes (e.g., a fee for advice scheme and a distribution network businesses revenue adjustment mechanism) - Options which enhance the ability of a DG installation, and other forms of DSP, to sell their demand response services to parties other than their existing retailer (the portability of DSP)
Energy efficiency measures	- Considering the interaction between energy efficiency regulatory policies and operation of the NEM and take up of efficient DSP

Contents

1 Introduction and background

On 29 March 2011, the former Ministerial Council on Energy (MCE)[4] directed the Australian Energy Market Commission (AEMC) to undertake a review of demand side participation (DSP)[5] in the National Electricity Market (NEM). The review is entitled Power of choice - giving consumers options in the way they use electricity.

The review is to identify the market and regulatory arrangements needed across the electricity supply chain to facilitate the efficient investment in, operation and use of DSP in the NEM. It has broad focus and considers how the national electricity rules, other national and jurisdictional regulations, commercial arrangements and market behaviours can collectively facilitate economically efficient DSP.

Terms of Reference

The Terms of Reference (ToRs) specifically require the AEMC to consider the following key areas:

- the efficient operation of price signals, which includes the tariff setting process and incentives for operating and capital expenditure;
- the market frameworks required to maximise value to consumers from services enabled by new technologies (such as smart grid/smart meter and load control capability); and
- the effectiveness of regulatory arrangements for energy efficiency measures and policies that impact on or seek to integrate with the NEM (such as retailer obligation schemes).[6]

The AEMC will also consider other matters relevant to the objectives of the review.

Stakeholder engagement

We are engaging with stakeholders in a number of ways, including through bilateral discussions, public forums, consultation papers and with our Stakeholder Reference Group.[7] We are seeking to gather and build empirical evidence on the market

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4 The Standing Council on Energy and Resources (SCER) was established in late 2011 and replaces the previous Ministerial Council on Energy (MCE). SCER is now responsible for progressing key energy reform elements of the MCE.

5 For the purposes of this review, DSP refers to the ability of consumers to make informed decisions about the quantity and timing of their electricity use, which reflects the value that they obtain from using electricity services.

6 MCE Terms of Reference for the Review: http://www.aemc.gov.au/Media/docs/MCE%20Terms%20of%20Reference-35e6904a-e39d-4348-8ad5-1a7970af354d-0.pdf.

7 The SRG comprises representatives from all sectors of the electricity industry, electricity users, environmental and consumer advocacy groups, market institutions, relevant government agencies and academics. The first meeting of the SRG was held on 8 June 2011. A second meeting was held on 24 October 2011. Outcomes of the meetings and a full list of the SRG membership can be found

conditions needed and, if required, options for improving market and regulatory arrangements.

As part of the review, we commissioned a number of consultancy reports to inform considerations in this directions paper. These were released on 21 December 2011 and include:

- *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, Ernst and Young (EY);
- *Investigation of existing and plausible future demand side participation in the NEM*, Futura Consulting; and
- *Investigation of the efficient operation of price signals in the NEM*, PricewaterhouseCoopers (PwC).[8]

We note that there is a range of other work programs underway that intersect with our review. We are taking these into account to ensure synergies are maximised. Other work programs include those undertaken by the AEMC,[9] the SCER,[10] other energy market institutions, and broader processes external to energy market reforms by Australian state and territory governments.[11]

The timetable for the review is provided in table 1.1.

Table 1.1 Timetable for consultation

Document	Purpose	Date
Issues paper	Set out, and sought views on, the issues considered to be relevant to the review – i.e. the factors affecting consumer electricity use	Submissions closed on 26 August 2011

under 'Stakeholder Reference Group and Public Forums' at http://www.aemc.gov.au/Market-Reviews/Open/Stage-3-Demand-Side-Participation-Review-Facilitating-consumer-choices-and-energy-efficiency.html.

8 The three reports are available at: http://www.aemc.gov.au/Market-Reviews/Open/Stage-3-Demand-Side-Participation-Review-Facilitating-consumer-choices-and-energy-efficiency.html.

9 Relevant AEMC work includes, but is not limited to, the review of Energy market arrangements for electricity and natural gas vehicles; the Transmission frameworks review; the 2011 Annual market performance review; the Distribution network planning and expansion framework rule change; the Potential generator market power in the NEM rule change, and the Economic regulation of network service providers rule change.

10 For instance, the SCER review of customer protection and safety arrangements under the National Energy Customer Framework and the potential SCER response to AEMC advice on cost-recovery of mandated smart metering infrastructure.

11 Of particular relevance: the Australian Government's Smart Grid, Smart City initiative (and work of the Strategic Policy and Regulatory Steering Committee); and the Australian Government's work under its Clean Energy Future package to undertake further work to develop a national energy savings initiative.

Document	Purpose	Date
	(quantity and timing).	
Directions paper	Provides an assessment of the potential for DSP in the NEM, confirms the market conditions required to promote efficient DSP, and highlights areas for improving market and regulatory arrangements for further consideration under the review.	Submission close on 4 May 2012
Public forum	To seek stakeholder input regarding the findings in the directions paper.	19 April 2012, Sydney
Draft report	Seeks to identify the set of feasible reform options based on market conditions that need to be in place across the supply chain.	June 2012
Public forum	To seek stakeholder input regarding the findings in the draft report.	During the consultation phase on the draft report
Final report	Provides our findings and recommendations to the SCER. An implementation plan and timeline for action will also be provided.	September 2012

Making a submission

Stakeholders are encouraged to provide submissions and participate in bilateral and public forum processes to ensure all issues are canvassed and considered. The closing date for submissions to this directions paper is **4 May 2012**. Submissions should quote project number EPR0022 and may be lodged online at www.aemc.gov.au or by mail to:

Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

In providing submissions to the review, stakeholders are encouraged to give evidence, data and any other information (for example, case studies) to support any issues raised. We recognise that this material might contain information that is confidential in nature. All information, including confidential information, will be treated in accordance with the AEMC's submissions guidelines which can be viewed at www.aemc.gov.au.

Structure of the directions paper

This paper is divided into four main parts:

- Chapters 1 to 3 provide the context to the review by discussing the rationale for DSP in the NEM and the range of DSP options. Chapter 2 presents the Commission's methodology and assessment criteria.

- Chapters 4 to 6 look at market conditions needed to support consumer participation in the markets around the three main themes – awareness and participation, pricing signals, and technology.

- Chapters 7 to 11 cover issues relating to how the various segments of the supply chain – wholesale, network, retail – interact with DSP. Chapter 7 looks at how the supply chain as a whole values the costs and benefits of DSP. Chapter 11 separately covers distributed generation issues.

- Chapter 12 covers issues relating to the SCER request for advice on the effectiveness of regulatory arrangements for energy efficiency measures and policies that impact on, or seek to integrate with, the NEM.

An overview summary has been provided for stakeholders. This is available at http://www.aemc.gov.au/market-reviews/open/power-of-choice-update-page.html

Key terms

This paper uses the following concepts in discussing the main categories of market conditions that can contribute to facilitating and promoting efficient DSP:

- **Parties in the electricity market** include consumers, retailers, network businesses, aggregators, energy service companies (ESCOs), generators and others involved in making decisions affecting electricity supply or use.

- **DSP options** are the actions that are available to consumers – or to intermediaries acting as agents of consumers – to reduce or manage their electricity use. Examples of DSP by consumers can include (but are not limited to) peak shifting, electricity conservation, fuel switching, utilisation of distributed generation and energy efficiency.

- **Efficient DSP** is an action by consumers (either independently or via an intermediary) to manage or reduce electricity consumption which delivers a benefit (e.g. lower costs of electricity) that is greater than the loss in value and costs of the DSP action incurred by the consumer as a result of the decision to change their consumption.

- **Market conditions** are features that need to be present in the electricity market to enable all parties in that market to make and implement informed decisions, while recognising that it is the consumer who makes the final consumption decision. These market conditions can include appropriate information, systems, pricing structures, and technology.

- **Market and regulatory arrangements** refer to the measures that facilitate the market conditions. These can include legislation, regulations, commercial arrangements and incentives that help to achieve the necessary market conditions by influencing the behaviour and informing the choices of participants (including consumers) in the electricity market.

- **Contracted DSP** promotes consumer participation through a direct compensation payment or incentive. The consumer agrees to curtail their electricity use under certain defined circumstances in return for an explicit payment. DSP resources which can supply capacity, ancillary services and energy reduction with a high degree of certainty tend to be covered by such payments. Examples include network support agreements and direct load control.

- **Non-contracted DSP** or price responsive DSP links prices in retail and wholesale markets, with retail consumers receiving a price signal reflecting the costs of supply and delivery of electricity. When high energy prices are correlated with reliability problems or local network constraints, actions taken by consumers to reduce load can have a positive impact on reliability in addition to reducing overall costs. Such DSP can be achieved without prior knowledge by the system operator, retailer or network businesses.

1.1 Context for DSP

This next section seeks to provide the context and rationale for promoting efficient DSP in the NEM. The information presented in the following sections has been informed by the work undertaken by EY, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*.[12] The information and data provided in this directions paper builds on the information provided in our issues paper. In the following sections, we consider:

- who the key energy users are;
- what is driving their use; and
- where could DSP efficiently help meet energy market challenges and contribute to an economically efficient balance between demand and supply in the NEM.

Australia's electricity supply sector is undergoing change and is facing a range of challenges. This includes the need for significant new investment (and access to capital) across the supply chain in order to meet projected increases in demand and to implement low cost responses to address climate change policies. In addressing these challenges and other issues that the market is likely to face, it is important to consider the demand side of the electricity market in addition to the supply side.

DSP may offer benefits to many participants in the electricity supply chain. For example, consumers may see a reduction in their electricity bills where energy efficiency measures help to reduce their overall electricity consumption. Also reducing the peak demand for electricity will in turn, decrease the requirement for additional network infrastructure. Contracting for DSP may offer the opportunity to households or businesses to shift a proportion of their electricity usage to cheaper, off peak times and enable network service providers to improve the efficiency of their investments. For retailers, DSP may offer an opportunity to reduce exposure to pool price risks or capitalise on information advantages in regard to energy efficiency, load management or local generation.

DSP can also offer commercial opportunities for intermediary agents such as ESCOs and aggregators. ESCOs act as a facilitator of DSP by offering services to businesses and households to assist in managing energy use.[13] These services can include providing advice, conducting energy audits, or a more holistic approach where the ESCO identifies, sources, installs, and manages technological solutions or new operating processes on behalf of their customer to improve energy use.

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12 See the AEMC website: http://www.aemc.gov.au/Media/docs/EY%20Final%20Report%20-%20clean%20amended%20for%20website-1295dc06-199b-4b09-b9d7-8e52ca564492-1.PDF

13 The Prime Minister's Task Group examined the role of ESCOs and the sector's potential expansion in Australia in report on energy efficiency, available at: www.climatechange.gov.au.

Aggregators are another type of intermediary that act as the agent on both sides of the DSP opportunity - as an agent of energy users offering DSP into the market or as an agent of a market participant that is looking to secure DSP aggregated from various market sources.[14]

DSP can offer a range of benefits but can also pose some costs. The costs can include, for example, the costs of new materials and equipment, the costs of changing behaviours and processes, or the opportunity costs when foregoing a unit of electricity consumption. The degree by which a person or organisation will benefit from DSP depends on the type of DSP action undertaken and the ability of the market environment to capture the value of that action. The effectiveness of the supply chain in valuing and capturing the benefits is a key element of this review and is further discussed in chapter seven.

1.2 Drivers of demand

To assess the opportunities for DSP in the NEM, it is worthwhile considering the current drivers of electricity demand and where the bulk of future demand for electricity is likely to come from in the short and medium term.

In Australia, total energy consumption has had periods of substantial growth. While demand has increased, Australia's energy intensity[15] has declined with the adoption of more energy efficient technologies and practices, and a shift in the economy towards less energy intensive activities.[16] This economic shift is relevant when looking at which sectors may influence demand for electricity in the NEM and where DSP could promote greater efficiencies in the future.

As part of their work, EY examined the drivers of the demand for electricity in Australia. This included the influence of different economic sectors on electricity demand and the influence of different activities (such as the use of electrical appliances). When considering drivers of demand, it is also important to distinguish between average demand and peak demand.

- Average demand represents the average load on a section of network or generation plant over a period of time (e.g. average daily demand or average annual demand). For example, the amount of electricity that is typically demanded by consumers over a period of time to conduct their daily activities in their homes and businesses.

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14 An example of an aggregator is EnerNOC (formerly Energy Response). According to the Futura report prepared for the AEMC as part of this review, EnerNOC has been active as a third party aggregator providing access to peak demand load reduction response market participants in the NEM since the mid 2000s.

15 Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP.

16 Australian Bureau of Agricultural and Resource Economics (ABARE), *Energy in Australia Report*, 2011, p.11-12.

- Peak demand represents the maximum load on a section of network or generation plant over a defined time period. For example, on very hot days in summer when people turn on/up their air conditioners at the same time of the day (i.e. maximum demand may occur between 3pm and 6pm in a specific location).

Since 2005, average demand has grown by around 0.5 per cent, while peak demand has grown by around 1.8 per cent.[17]

Average demand, when combined with peak demand, can provide a useful measure of the utilisation of network and generation capacity and of the volatility of peak demand. When peak demand grows faster than average demand, the load factor decreases and there is less efficient use of the installed infrastructure. This is because infrastructure is built to ensure that electricity can be reliably supplied to consumers under peak demand conditions, which occur relatively infrequently. Assets are built to handle peak demand but, at most times, are required to provide much less electricity under average conditions and are therefore inefficiently utilised. There has been a significant decline in the load factor across all NEM states over the past ten years.

The next section looks at electricity consumption by sector, states and then focusses on peak demand.

1.2.1 Electricity consumption by sector

Demand for electricity is a derived demand where the electricity is used as an input for creating goods and providing services within different sectors of the economy. For example, the demand for electricity in the manufacturing sector is in part derived from the level of demand for Australian steel domestically and internationally.

Figure 1.1 provides an overview of Australian electricity consumption by sector in 2009-10 as a proportion of total energy consumption. As indicated, approximately 75 per cent of total electricity consumption in 2009-10 was used to produce goods and services, primarily in the manufacturing sector and the commercial and public services sector. The residential sector accounted for about 25 per cent of consumption in 2009-10.

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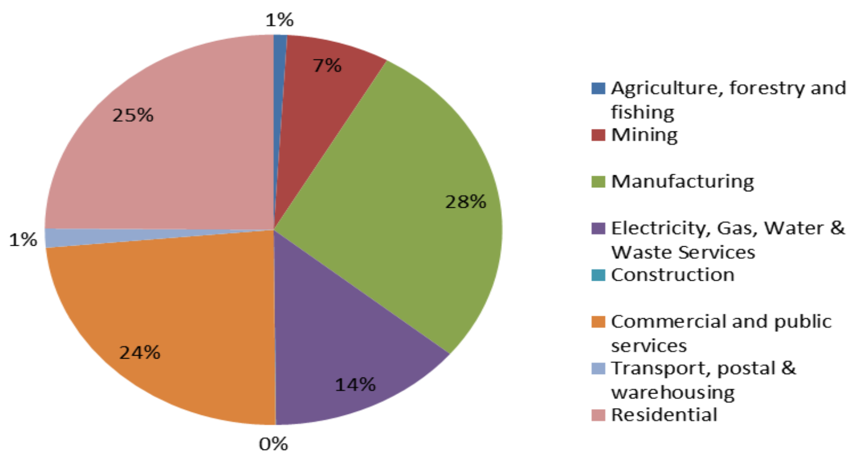
17 We note that the AEMO has released an update to its 2011 ESOO Report. The update provides revised forecasts for maximum demand. AEMO forecasts show that maximum demand is growing, but at a slower rate than what was published in 2011 ESOO. The update report can be accessed at http://www.aemo.com.au/planning/esoo2011.html

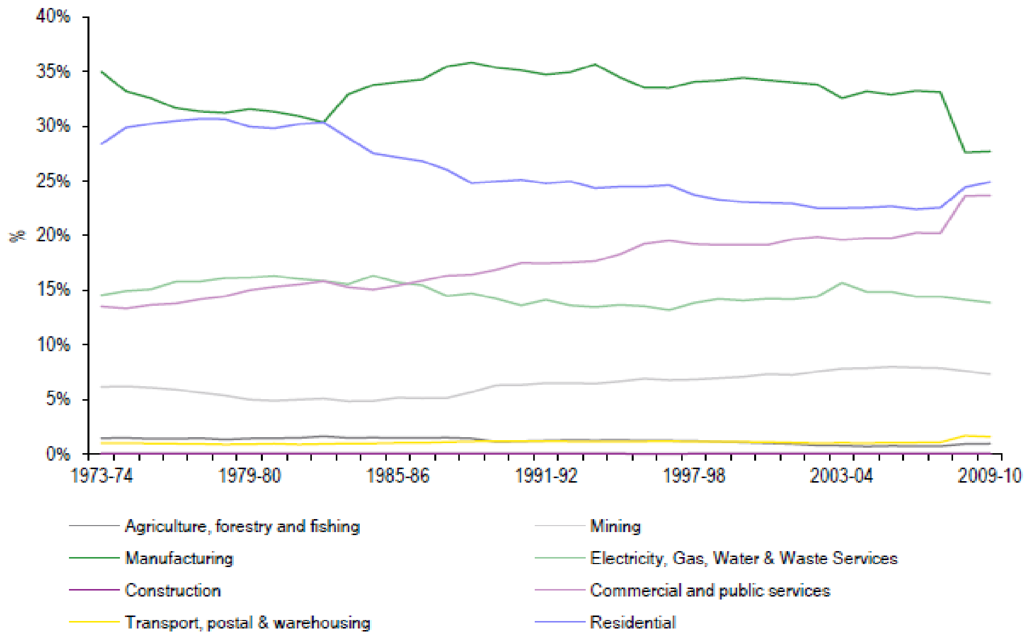
Figure 1.1 Australian electricity consumption by sector, 2009-10



Source: Ernst and Young, Rationale and drivers for DSP in the electricity market, 2011, p.14.

Figure 1.2 shows the change in the relative proportions of Australian electricity consumption by sector from 1973-74 through to 2009-10 as a proportion of total electricity consumption. This shows that over the last 35 years, the commercial and public services sector experienced the largest growth in the share of consumption, while there was a gradual decline in the residential sector's share,. This trend was reversed in the last three years, where the residential sector share has risen.

Figure 1.2 Australian electricity consumption by sector, 1973 to 2010[18]



Source: Ernst and Young, Rationale and drivers for DSP in the electricity market, 2011, p.16

EY highlight that in their view (noting any unknown exogenous events), the trends represented in Figure 1.2 to continue at least in the short to medium term. For example:

- The commercial and public services sectors share of total electricity consumption is likely to continue to increase, as there is a shift to less energy intensive industries.
- If the current level of activity in the mining and resources sector continues, this sector's share will also increase from its current level of seven per cent.
- The manufacturing sector may see an increase in its share of total electricity consumption in the short term following a recovery from the global financial crisis. In the medium term the manufacturing sector's share will likely continue to gradually decline. This may be also in part due to an expected continuation in the shift towards less energy intensive activities in the Australian economy.[19]
- The residential sector is likely to remain a large consumer of electricity, but its proportionate share of total energy consumption may be relative constant or even revert to the long term trend of a gradual decline. This due in part to an expected

18 EY have used the definitions set out in the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC) for different consumer sectors. It is noted that the commercial and public services represents an aggregation of a number of the ANZSIC sectors consistent with the international energy statistics conventions. This aggregation was performed by ABARE in its Australian Energy Statistics - Energy Update 2011.

19 Ernst and Young, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, 20 December 2011, p.16-17.

increase in energy efficient appliances and buildings over time as well as increases in roof-top solar panel systems or panel installations.

1.2.2 Peak electricity demand

Peak electricity demand is important in the context of DSP as investment decisions for all network infrastructure are designed to safely and reliably meet the level of demand at peak times. As noted, peak demand represents the maximum load on a section of network or generation plant over a defined time period- peak demand can vary by time, year and season.[20] Consequently, peak demand reductions can, in some cases, be alternative to infrastructure development at various points in the supply chain. It can also mitigate price volatility at peak times as a potential competitor to peaking generation.

Establishing what drives peak demand can provide useful guidance on the role that DSP can have in reducing peaks and the potential benefits that can be achieved through DSP. EY as part of their work analysed peak demand trends by state and by sector, and highlight in their report which states and sectors are expected to experience the highest growth in peak demand over the period to 2030.

EY's analysis shows that there are some parallels in the drivers of electricity consumption and the drivers of peak demand. For example, in all NEM regions, except Queensland,[21] growth in peak demand for the commercial sector is expected to outpace peak demand growth in the industrial sector. This is consistent with EY's view that there is to be an increase in the share of total electricity consumption for the commercial and public services sectors with a continued economic shift towards less energy intensive industries in Australia.[22]

EY forecasts that the residential sector will be the key sector driving peak demand in all states.[23] In most states, peak demand for the residential sector was far higher than for the commercial and industrial sectors in terms of the total amount of electricity demanded during peak times and the growth rates of peak demand for each sector. The only exceptions were New South Wales and South Australia where the commercial sector growth rates outpaced the residential sector growth rates.[24]

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20 The decision to invest in additional capacity is made to ensure that the peak demand on the existing infrastructure does not compromise network security or safety standards and obligations.

21 The exception for Queensland is most likely due to the significant levels of industrial activity in support of the state's growing resources sector.

22 Ibid, p17.

23 The load characteristics of the residential sector tend to be more "peaky" in the NEM, whereas the industrial, commercial and public service sectors have a relatively constant demand profile during daylight hours.

24 For NSW, the annual peak demand growth rate for the commercial sector (2.2 per cent) exceeded the growth rate for the residential sector (2 per cent); however the overall quantum of peak demand in the residential sector exceeded the commercial sector. The same applied for South Australia where the annual peak demand growth rate for the commercial sector (2.16 per cent) exceeded the growth rate for the residential sector (1.24 per cent).

Our consultants were unable to provide data on the relative share of peak demand across the different sectors. We note that anecdotal evidence from distribution network businesses appear to support the hypothesis that peak demand is largely driven by the residential sector. Ausgrid estimate that their small customers[25] contribute 64 per cent of the winter peak demand and cite residential customers' activity as a key contributor to overall peak demand, including their use of air conditioning and behaviours such as returning home from work to cook dinner.[26] DNSP regulatory proposals to the AER also indicate that residential use of appliances and air conditioning is significantly contributing to peak demand.[27]

Possible drivers of peak demand growth

To gather further evidence of what is driving peak demand in the residential sector and in other sectors of the economy, EY analysis considered a range of factors that could potentially influence peak demand.[28] The factors which EY considered included:

- temperature;
- rate of population growth;
- number of persons per household trend;
- household income growth; and
- the use of air conditioning and electrical appliances.

EY's analysis specifically focussed on peak demand drivers at a regional level, rather than looking at peak demand from a NEM wide level. This is because peak demand varies across regions in terms of demand levels and timing, and each region is expected to differ in terms of the local factors influencing demand (e.g. climate, industry structure). Infrastructure planning decisions are also not made at a whole of NEM level, hence regional differences are important if DSP is to efficiently delay or reduce the need for additional infrastructure. EY provides some commentary on retail electricity prices as a driver of peak demand growth but did not undertake detailed analysis given the wide variety of retail tariffs available within each sector and within each state, and that these tariffs have changed in number and structure over time.

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25 Ausgrid defines 'small customers' as residential and non-residential that use less than 40MWh per annum.

26 Ausgrid 2011, submission to the AEMC discussion paper on strategic priorities for energy market reform, p.4.

27 Ernst and Young, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, 2011, p.41.

28 A detailed discussion of EY's methodologies and findings is contained in their report: Ernst and Young, Rationale and drivers for DSP in the electricity market, 2011. The report is available at: http://www.aemc.gov.au/Market-Reviews/Open/Stage-3-Demand-Side-Participation-Review-Facilitating-consumer-choices-and-energy-efficiency.html.

Evidence on drivers of demand

We note that there is likely to be other factors which drive peak demand and we welcome further stakeholder feedback or evidence, where available on these factors. We also welcome feedback in response to EY's general findings as presented below.

Summarised below are the finding of EY in relation to the potential drivers of peak demand as identified in their report.

Temperature

Figure 1.3 provides the distribution percentage of peak half hourly periods by state and season. The maximum peaks refer to the top 100 half-hourly peaks over the period 1999 to 2011.[29] EY indicate that temperature appears to be a key factor for driving peak demand, however the effects of climate differ across states. Typically, the peak periods across all states, other than Tasmania[30] occur in summer. The highest share of peak demand peaks for each state during summer do not fall within the same month. For instance, Victoria (67%) and South Australia (80%) highest months are in January, whilst Queensland (32%) and New South Wales (62%) highest months are February. This means that the drivers of peak demand growth do not tend to affect all states in the NEM at the same time. Further analysis of relationship between temperature and electricity consumption is provided in section 2.5.1 of EY's report.

Figure 1.3 Percentage of peak demand "peaks" by season 1999 to 2011[31]

Seasons	New South Wales	South Aus-tralia	Victoria	Qld	Tas
Summer	%	%	%	%	%
- Dec	0	0	0	27	0
- Jan	18	80	67	25	0
- Feb	62	16	18	37	0
- Mar	0	4	15	5	0
Winter	20	0	0	0	96

Source: Ernst and Young, Rationale and drivers for DSP in the electricity market, p.29.

Population growth

The EY analysis indicates that the rate of population growth may not necessarily correlate with peak demand growth.

Figure 1.4 shows the percentage of peak demand by state and year, for the top 100 half hourly periods. This is for the period 2000 to 2011. EY highlight that the rate of

29 EY have based the analysis on AEMO data.

30 Tasmania peak periods typically occur in winter.

31 Note: Maximum peaks refer to the top 100 half-hourly peak demand over the period 1999 to 2011

increases in population does not necessarily correspond with the frequency of occurrence of demand 'peaks' for all states. This is because it found that population growth was stronger in the first half of this period (2000 to 2005) than the latter half. Hence, based on this analysis, EY advises that population growth may not be primary driver of peak demand growth.

Figure 1.4 Percentage of peak demand 'peaks' by year

Seasons	New South Wales	South Australia	Victoria	Qld	Tas
2011	53%	19%	7%	8%	1%
2010	10%	17%	26%	44%	8%
2009	17%	60%	51%	43%	1%
2008	8%	4%	16%	-	29%
2007	12%	-	-	5%	53%
2006	-	-	-	-	4%
2005	-	-	-	-	4%

Source: Ernst and Young, Rationale and drivers for DSP in the electricity market, p.34.

Persons per household and household income

EY provides some analysis of changes in average persons per household in accordance with peak demand. EY note that the average persons per household in NEM states have continued to decline since 2005, and while there has been a slight decline in the number of average persons per household since that time, the proportion of peak demand peaks has not necessarily reflected that trend. EY consider that this may reflect that the use of energy intensive appliances may be a stronger driver than household size alone. Discussion of penetration of household appliances is discussed below and in detail in the EY report.

EY also indicate that changes in household income may also not be necessarily correlated with trends in increases in peak demand. EY highlight that in periods of significant real income growth across the NEM, there was little change in peak demand, and therefore higher real household income may not imply that ownership of higher levels of energy intensive appliances.

Air conditioning and appliance use

As noted, the penetration of air conditioning and other high energy using appliances and equipment are considered important drivers of residential peak demand growth. EY indicate that televisions are forecast to generate the greatest amount of total demand by 2020 of all household appliances, followed by water heating, lighting and refrigerators. Air conditioners are forecast to be the sixth largest energy consuming appliances by 2020 in terms of total annual demand; however air-conditioners are likely to have a higher impact on peak demand relative to many other large energy using appliances due the observed relationship between temperature and peak demand.[32]

EY's findings illustrate that the drivers of peak demand may vary across NEM regions. Efforts to influence peak demand from a top-down, whole-of- NEM level could therefore have different results in different locations. The drivers of peak demand may differ within regions, depending on the specific location's population and sectoral composition. While peak demand trends at a regional level may provide useful information in terms of regional DSP options, DSP options targeting certain market challenges (such as distribution network congestion) may need to be tailored to the local market characteristics.

DSP options may also need to be tailored to account for potential temporal differences in demand. For example, if DSP was to focus on the commercial sector, it may have a greater impact on peak demand if it focussed on shifting commercial demand away from the 3-6pm weekday time period as opposed to shifting demand from the 12-3 pm period (when commercial demand is understood to have less of an impact on peak demand).[33]

1.2.3 Potential for DSP across sectors

While there will continue to be opportunities for DSP in large energy-using sectors such as the manufacturing and residential sectors, the growth in the commercial and public services sector means that there may also additional DSP opportunities that could be explored in that sector. Given the differences in consumer sectors, the potential for greater uptake of DSP in the NEM can be considered from various perspectives. Some options for each sector are outlined below.

Potential for DSP - commercial and public service sectors

Currently, there is limited evidence regarding the level of DSP occurring in these sectors and it's possible that there are a suit of opportunities that could be taken up, where cost -effective to do so. We note however, that this sector maybe taking up initiatives such as the National Australian Built Environment Rating System (NABERS) and other energy efficiency measures as part of Commonwealth or state programs.

Given the relatively constant demand profile for these sectors (i.e. less "peaky" than the residential sector), there may be merit in DSP initiatives that are targeted at reducing overall power consumption.

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32 This is based on anecdotal evidence from EY's review of regulatory proposals provided to the AER by DNSPs. Air conditioning was also the most quoted driver of demand among all appliances in the Australian Government's 2008 report, Energy Use in the Australian Residential Sector.

33 EY found that the timing of peak demand differs for each region and each sector. For example, residential and commercial demand combine to generate peak demand periods from 3-6 pm in New South Wales, South Australia, Victoria and Queensland. See Ernst and Young, *Rationale and drivers for DSP in the electricity market*, 2011, p.28.

Uptake of DSP in the commercial sector may have a greater impact on distribution infrastructure than transmission infrastructure.[34] This is because the:

- differences in the size of the loads and the load profiles of customers in these sectors;
- connection characteristics of customers in these sectors; and
- ability to contract with other parties.

As noted by EY in their report, the range of DSP initiatives that could be considered, among others for these sectors could include greater penetration of energy efficiency, power factor correction and greater adoption of stepped demand and capacity tariffs. DSP measures in these sectors could also potentially contribute to peak demand reductions in some cases. For example, DSP options could be effective in this sector if they targeted demand during 3 to 6 pm on weekdays in New South Wales, South Australia, Victoria and Queensland when there is simultaneous demand in the industrial and residential sectors.[35]

Potential for DSP - industrial sector

The industrial sector remains a large consumer of electricity in the NEM and DSP measures aimed at this sector may produce significant market benefits. DSP in the industrial sector may reduce localised constraints on the transmission network and may also, if significant, delay generation investment.

In some cases there may be potential to shift industrial loads out of peak demand periods to reduce the system peak and reduce the need for infrastructure to deal with peak periods. For example, EY analysis shows that DSP options in the industrial sector may have potential to reduce peak demand if they reduced industrial demand during 3 to 6 pm on weekdays in New South Wales, South Australia, Victoria and Queensland.[36]

Small and medium industrial consumers are generally connected to the distribution network but in the case of very large industrial consumers (such as smelters) they can be connected directly to the transmission network. Industrial demand, in combination with the underlying demand of the commercial and residential sectors, have a greater impact on the transmission network. While the load on the transmission network is less "peaky" than that experienced at a distribution level, growth in underlying demand drives the need for transmission network augmentation. Hence, DSP aimed at those large industrial businesses may have greater impact on transmission investment than distribution investment.

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34 Commercial businesses tend to be connected to distribution network and hence load profile tends to impact the local distribution network more directly than the transmission network

35 This assumes that the current demand trends identified by EY persist.

36 Ernst and Young, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, 20 December 2011, p.28.

Potential for DSP – residential sector

DSP in this sector is similarly likely to impact the local distribution network more directly than the transmission network. Residential customers have relatively "peaky" demand and DSP initiatives in this sector are likely to have a greater impact on mitigating price volatility and may reduce the need for additional peak generation and network infrastructure.

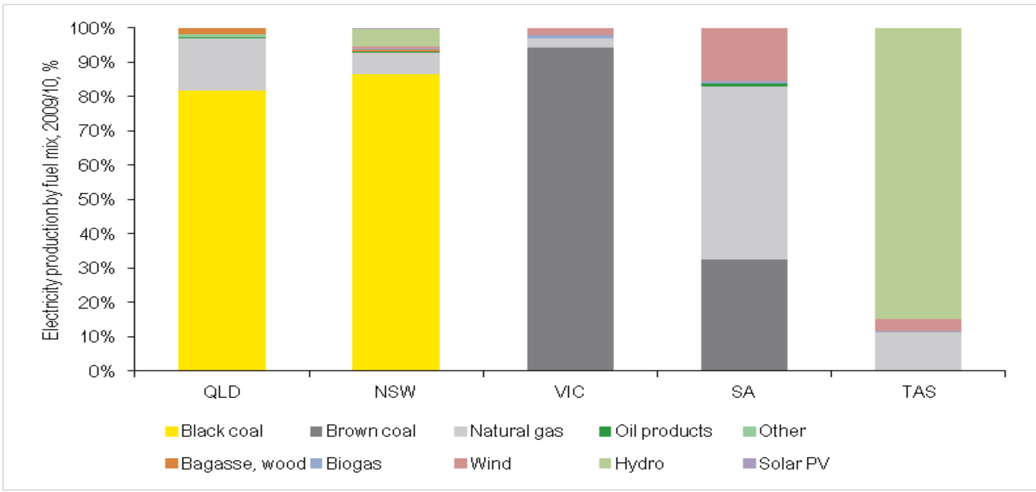
DSP initiatives for the residential sector could be aimed at options that reduce the use of energy-intensive appliances and air-conditioning during peak times (i.e. promoting energy efficient appliances and air-conditioning systems). However as EY has found that temperature is a driver of peak demand, any DSP option would need to maintain an acceptable level of comfort of the consumer. This will be necessary in order for the consumer to want to participate in the DSP option. Due to the current retail tariff structures, the prices that most of the residential sector pays for electricity generally do not reflect the changes in spot price at different times of the day or week and may not reflect the true cost of supplying and delivering electricity. There may be potential for more cost-reflective pricing to help inform consumers of the true costs of their electricity consumption at different times and enable the residential sector to better manage their consumption, particularly during peak times. Chapter five discusses the efficient operation of electricity price signals in further detail.

1.3 Electricity supply and infrastructure needs

Electricity generation

Coal-fired generation provides the majority of electricity in the NEM.[37] Figure 1.5 provides Australia's electricity production by fuel type in 2009-2010.

Figure 1.5 Electricity production by fuel type, 2009-10



Source: Ernst and Young 2011, Rationale and drivers for DSP in the electricity market, p.48.

37 ABARE, *Energy in Australia Report*, 2011, p.21.

The Australian Government is implementing a Clean Energy Future package, which includes a carbon price to commence on 1 July 2012. This policy is expected to drive a change from the current energy mix depicted in Figure 1.5 to increase the share of lower-emitting generation sources, such as gas and renewables, over the period to 2050. AEMO do not expect that the Clean Energy Future package will have a material impact on the installed generation mix prior to 2015. AEMO do, however, anticipate a need for greater investment in the short to medium term to meet projected capacity shortfalls.[38]

It is worthwhile noting that the investment challenge is greater than simply meeting projected capacity shortfalls. Investment is required to maintain the reliability and security of the system as both peak and average demand grows and, in the medium and long term, to increase the baseload, peaking and network infrastructure for a higher proportion of lower emissions energy in Australia. To achieve these goals, the Investor Reference Group estimated that over $240 billion in new investment may be required by 2030 for new electricity infrastructure, including new generation plant, gas pipelines and networks.[39]

Transmission and distribution network expenditure

In the past decade there has been significant capital expenditure in electricity networks in the NEM, with approximately $42 billion invested in distribution networks and $11.5 billion invested in transmission networks in the period 2002 to 2012 (these expenditures represent total capital expenditure and hence include growth and replacement related capital expenditure).[40]

Network investment typically covers the following areas:

- demand driven augmentations: expenditure driven or pulled by expected demand;
- replacement: expenditure to replace ageing assets to ensure the security of the current system;
- compliance/security: expenditure to meet safety, technical or environmental legislation; and
- business support infrastructure: expenditure to support the integrity and efficiency of the system. These projects may involve IT, communications or improving the functionality of the system.

Of the capital expenditure categories above, compliance/security and business support are generally non demand driven. Replacement of assets is also classed as non demand driven although this is likely to be dependent on the timing of the expenditure.

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38 AEMO, *Electricity Statement of Opportunities (ESOO)*, 2011.

39 The Investor Reference Group Report, *A Report to the Commonwealth Minister for Resources and Energy*, April 2011, p. 4.

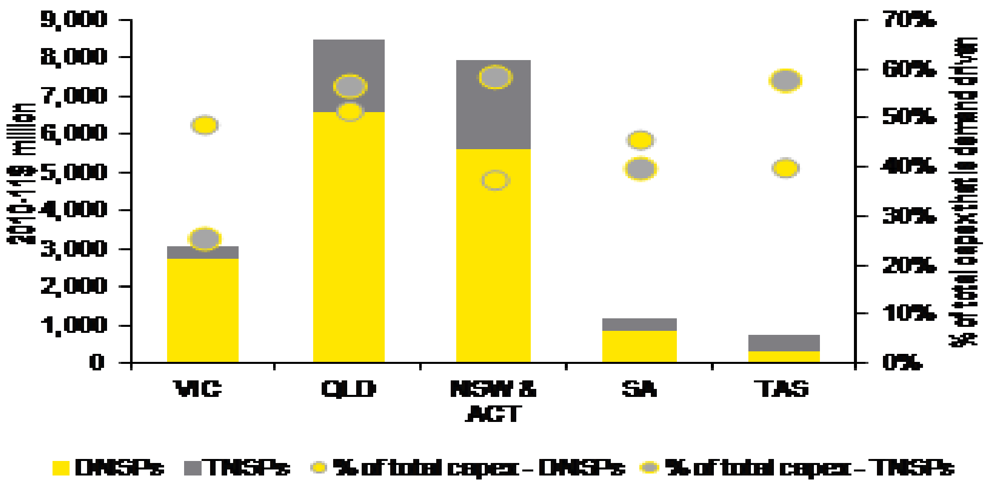
40 AER, *State of the Energy Market*, 2010.

It is expected that in the medium to long term, network investment are likely to continue to be driven by peak demand growth and growth in new customer connections. In addition, network expenditure is also likely to be required for the ongoing upgrade or replacement of aged network assets installed 30 to 50 years ago.

As noted above, peak demand growth is considered by network companies as a key driver of demand driven capital expenditure. Figure 1.6 provides the demand driven portion of the forecast capital expenditure by jurisdiction.[41]

Figure 1.6 shows that meeting peak demand growth is a common issue across all proposed network investment programs in the current regulatory control periods for each distribution network service provider (DNSP) and transmission network service provider (TNSP), driving approximately $16 billion in demand driven capital expenditure for DNSPs (44.7 per cent of total expenditure) and $5.3 billion of transmission capital expenditure (52.5 per cent of total expenditure).

Figure 1.6 Growth related capital expenditure by jurisdiction



Source: Ernst and Young 2011, Rationale and drivers for DSP in the electricity market, p.59

Figure 1.6 also illustrates that DSP may provide an opportunity to reduce future localised peak demand and peak demand growth at a distribution network level, particularly in Queensland and NSW. Given that almost half of the total capital expenditure for all DNSPs is driven by demand growth, DSP initiatives that minimise residential peak demand growth could potentially defer a significant number of projects aimed at addressing localised network constraints. There may also be an opportunity for DSP initiatives to reduce industrial sector demand and hence the need for transmission network augmentation, particularly in Queensland and NSW.

Targeted DSP initiatives, in combination with broader DSP initiatives at the distribution level, could potentially defer the need to invest in additional transmission

41 Demand driven expenditure includes network augmentations and customer initiated capital expenditure.

network capacity in the long term. However, given the size of the network constraints at a transmission level compared to the distribution level, DSP initiatives would need to have a significant impact on demand in order to materially defer transmission network augmentation. In light of this, DSP may offer limited opportunities to defer transmission network augmentation in the short term (i.e. within the next two years).

We note that the AEMC is examining broader issues for transmission under its transmissions frameworks review. That work will assess the current arrangements for transmission services in the NEM to consider whether the incentives for investment and operating decisions are effectively aligned to deliver efficient overall outcomes.[42]

1.4 Retail electricity prices

Retail electricity prices have risen by a nation-wide average of around 30 per cent over the last three to four years and are expected to continue to rise by around 37 per cent in nominal terms out to 2013/14. This is equivalent to a nominal price increase in the total residential electricity price of 8.34c/kWh between 2010/11 and 2013/14.[43] Figure 1.7 demonstrates the projected increase in retail electricity prices in the next few years and the factors contributing to these increases. The drivers behind the increases vary across jurisdictions. While increasing network investment expenditure, higher wholesale electricity prices, and government schemes are common factors, their relative influence differs across jurisdictions.

Figure 1.7 National residential electricity price increases by composition including carbon price

Total price comparison:			Contribution of each component to price increases:	
2010/11 price (c/kWh)		22.41	Transmission	6.0%
2013/14 price (c/kWh)		30.75	Distribution	33.6%
Total c/kWh increase		8.34	Wholesale	40.2%
Total nominal % increase (2010/11 to 2013/14)		37.2%	Retail	12.1%
			Feed-in tariff	2.8%
Carbon impact:	c/kWh	Percentage	LRET	3.8%
2012/13	1.64	5.6%	SRES	-0.8%
2013/14	1.74	5.7%	Other state based schemes	2.3%

Source: AEMC, Information sheet, Possible future retail electricity price movements: 1 July 2011 to 30 June 2014, p.2.

From a nationwide perspective, the wholesale component of electricity prices is responsible for the largest proportion (40.2 per cent) of the projected increase due to the expected changes in sources of electricity generation, higher capital and operational costs for generation, and higher financial market hedging costs. A price on carbon will also increase the wholesale electricity component. This is closely followed by distribution network expenditure (33 per cent) due to increased levels of capital

42 Further information on the AEMC Transmission frameworks review is available at: http://www.aemc.gov.au/Market-Reviews/Open/Transmission-Frameworks-Review.html

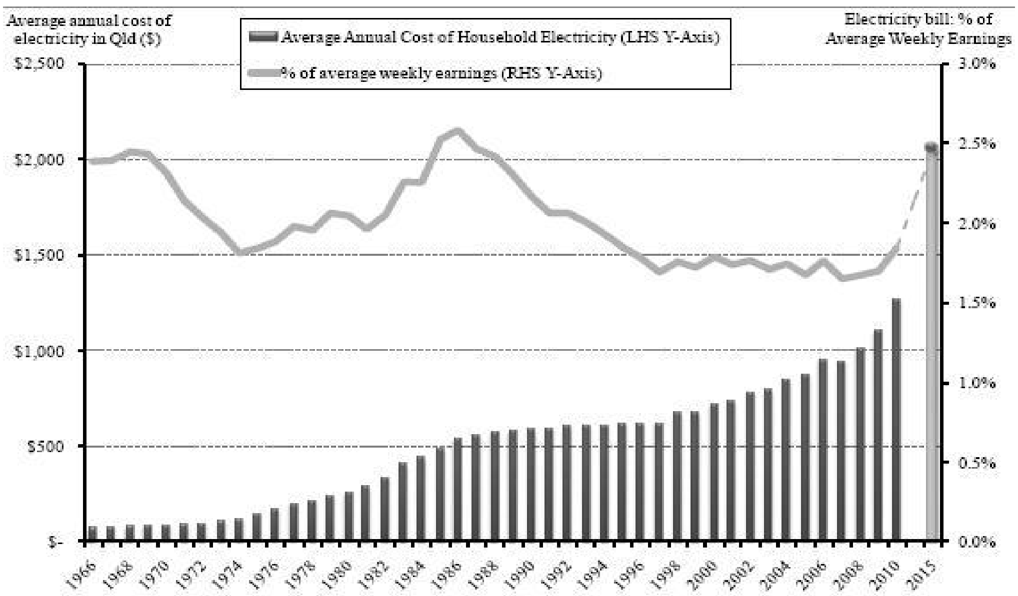
43 AEMC, *Possible future retail electricity price movements: 1 July 2011 to 30 June 2014*, 25 November 2011, p.19.

expenditure to meet peak demand and replace ageing assets, as well as higher weighted average costs of capital.

If the current levels of DSP in the NEM can be efficiently augmented to a level that results in the deferral of additional network and generation infrastructure and that helps to reduce the price volatility in the wholesale market, this could result in price increases that are lower than the current projections.

Figure 1.8 illustrates the past and projected relationship between the proportion of weekly household income that is represented by an electricity bill against the average annual household cost of electricity.

Figure 1.8 Average annual electricity bill vs average weekly earnings



Source: P Simshauser, D Downer, Limited form dynamic pricing: applying shock therapy to peak demand growth, AGL Applied Economic and Policy Research, Working Paper No. 24 - Dynamic Pricing, February 2011, p.3.

Figure 1.8 shows that the electricity bill currently represents just below 2 per cent of average weekly earnings and it is projected that this will grow to 2.5 per cent of average household income by 2015. It should be noted, however, that the electricity bill can represent a much higher percentage of weekly income depending on the household. It is recognised that the percentage could be, on average, around 7% for pensioners.[44] DSP options that lead to a material reduction in electricity prices are likely to be welcomed by many consumers, provided that the benefit of the price reduction outweighs the cost of the change in behaviour (including the transaction costs) for the consumer.

44 For example, the Independent Pricing and Regulatory Tribunal (IPART) estimated that four per cent of NSW households will face bills that represent more than ten per cent of their disposable income. Eight per cent of households in NSW will face electricity bills that are between six and ten per cent of their disposable income. Further information is contained in the report: IPART, *Changes in regulatory electricity prices from 1 July 2011* - final report, June 2011.

2 Methodology and assessment approach

Summary

This chapter sets out the AEMC's methodology and assessment approach for this review. We outline our definition of efficient DSP and our approach to evaluating the necessary market conditions needed in the market. Our methodology and assessment criteria aims to facilitate the rigorous, consistent and transparent analysis of any changes that may be needed to market and regulatory arrangements, in accordance with the National Electricity Objective.

2.1 Efficient demand side participation

To ascertain the potential circumstances where DSP can be efficient, and hence in the interests of consumers, it is important to understand how consumers value their electricity use and the range of the costs and benefits DSP options have on the electricity markets. We discuss each of these below.

2.1.1 How consumers value their electricity use

The demand for electricity from consumers is a derived demand. That is, the electricity will be used as an input into providing services or making goods. Consumers are not necessarily concerned with units of electricity per se as it is not required for direct consumption, but rather the amenities that electricity provides (e.g. heat, light, and other goods). The value of electricity to a consumer therefore is a function of the value derived from its use.

Assessing what tools are required to enable each category of consumer to understand the value of their electricity consumption and hence to assess how that value would change as they reduce or manage their consumption is an input into this review. As members of the Stakeholder Reference Group highlighted, heuristics and habits will impact on how consumers make decisions about electricity use. This will lead to a variation in the preferences among consumers for investment in more efficient appliances and equipment, and will affect the rate of adoption of measures that require capital investment.

This derived nature of electricity demand (and the requirement for complementary appliances) will impact on the flexibility of consumer demand and choices. The consumer is likely to consider, along with other factors, both the cost of appliance and the electricity prices when making consumption decisions. This may mean that the more expensive the appliance is, the less responsive the consumer would be to changes in prices.[45]

45 As the energy cost is less than 100% of the cost of the service, this dilutes the impact of changes in energy prices on the final price to which consumers respond. This is further complicated in that, although the marginal cost of consuming the product may be substantially made up of the

As explained in the issues paper, in order to participate in the market, consumers must have an incentive, ability and willingness to adjust their consumption pattern. However to date, most consumers have been passive receivers of information in the electricity markets. There has been limited involvement of consumers in either the setting of the reliability standards which drive network investment or the AER regulatory determination which approves network expenditure. The need to encourage consumer understanding of their energy use and hence bills and involvement in the electricity markets was raised by submissions. This is further discussed in chapter four.

2.1.2 Benefits and costs of DSP

Beyond the broad improvements in market efficiency and market linkages, DSP creates multiple, specific benefits for market participants and for the operation of electricity markets. The following list of potential benefits encompasses many of the benefits referenced in this paper:

Participant benefits

Consumer adoption of DSP is generally based on the expectation of some level of financial or reliability benefits:

- Financial benefits may include cost savings on consumers' electricity bills from using less energy when prices are high, or from shifting usage to lower-priced periods, as well as any explicit financial payments/rewards the consumer receives for agreeing to or actually curtailing usage in a demand response program.

- Reliability benefits refer to consumer perceived benefits from the reduced likelihood of being involuntarily curtailed (turned off) and incurring even higher costs (i.e. due to loss of production).

Market and system benefits

One goal in implementing DSP is to create market reliability, and market benefits, including:

- Short-term market impacts - savings in variable supply costs brought about by more efficient use of the electricity system, given available infrastructure. For example, price responsiveness during periods of scarcity and high wholesale prices can temper prices spikes and price volatility. Decreases in price spikes and volatility should translate into lower wholesale and retail prices. The amount of savings from lowered wholesale market prices depends on the amount of energy traded in spot markets and how the contract prices are linked to the wholesale spot price.

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electricity tariff, individuals may only consider the average total cost (possibly due to pre-commitment to use the product once purchased). Hence the final price of the good/appliance which requires electricity to be used is what consumers in general perceive, rather than just the price of the electricity.

- Long-term market impacts – these are associated with the ability of DSP to:

  — Reduce system or local peak demand, thereby displacing the need to build additional generation, transmission, or distribution capacity infrastructure; and

  — Adjust the pattern of consumer loads, which may result in a shift in the mix of peak versus baseload capacity.

- Operational and capital cost savings - occur as the market benefits from avoided generation costs as well as avoided or deferred transmission and distribution costs.

- System reliability benefits - by reducing electricity demand at critical times (e.g. when a generator or a transmission line unexpectedly fails), demand response that can be dispatched by the system operator on short notice may help return electric system (or localised) reserves to pre-contingency levels.

Additional benefits created by DSP

There are a range of other DSP benefits that are more difficult to quantify as their magnitude will likely vary by type of DSP option and specific application. Generally, the perceived value of each of these benefits can be subject to debate. These additional benefits may include:

- More robust retail markets: DSP promotes and creates additional options in retail markets. For example, default-service real-time pricing could stimulate innovation (e.g. alternative index-based products or curtailment products) by retailers. It could also add to competitive pressure on retailers.

- Risk management: Demand response allows consumers and retailers to hedge their risk exposure to system emergencies and price volatility. Retailers can hedge price risks by creating callable quantity options (contracts for demand response) and by creating price offers for consumers who are willing to face varying prices. Industrial/commercial consumers can explicitly incorporate demand response into their operations and electricity purchases on an individual facility or enterprise basis.

- Market performance benefits: Demand response could also play an important role in mitigating the potential for generators to exert market power in wholesale electricity markets. During periods of high demand and inadequate supply, market-clearing prices can escalate to high levels as more expensive-to-operate generation is dispatched. In the absence of price-response mechanisms to lower demand as market-clearing prices increase, the potential for supplier market power abuse (such as capacity withholding) could increase.

- Possible environmental benefits: Demand response may provide conservation effects, both directly from load reductions (that are not made up at another time) and indirectly from increased consumer awareness of their energy usage and costs.

When a consumer changes or decreases their consumption, the value derived from electricity also changes or decreases. The consumer will weigh up this loss in value compared to the potential benefits and payments received when deciding whether to participate in DSP.

It is important to recognise that there will also be costs involved in uptake and implementation of different DSP options. These include the administrative and technology costs involved in running the DSP options.

DSP may also create transfers between different market participants; for example, generators to consumers when DSP decreases the wholesale price. Also any additional payment to the consumer who participates in the DSP option may be recovered from other consumers. Such transfers will not affect the overall efficiency of the market but will influence the motivation particular market participants will have towards DSP.

While demand response is a way for market participants to reduce the need for large capital expenditures, and thus keep tariffs lower overall, there is an economic limit to such reductions because consumers lose the productive or convenience value of the electricity not consumed. Thus, it may be misleading to only look at the cost savings that demand response can produce without also considering what the consumer gives up in the process and the costs that creates.

Quantifying the benefits of DSP

Assessing the effectiveness of the market in identifying and correctly valuing such costs and benefits is important. Performing a quantitative assessment of the existing and future benefits, however, can be quite complex. This is in part due to the difficulty of quantifying intangible benefits (e.g. distributed generation providing greater certainty for residential consumers concerning their reliability) or quantifying benefits that vary according to where and when the DSP occurs.[46]

Measures of DSP benefits tend to focus on the value of capital costs of both generation and network which are either deferred or avoided as a result of the DSP. Submissions to our issues paper also provide some estimates including:

- South Australian Department for Transport Energy and Infrastructure noted that the value of $3m per MW of reduced demand is currently used in national Regulatory Impact statements for demand response activities.

- Ausgrid estimates a value of $2.6m - $4.5m per MW of avoided peak demand growth. This is broken into: distribution costs of growth related capital

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46 An example of where benefits may vary according to where and when the DSP occurs can be provided for an energy efficiency measure such as home insulation. Programs promoting home insulation could have varied benefits in terms of deferring infrastructure requirements, depending on the area where the insulation is installed and whether it leads to behaviour that materially reduces electricity consumption at times when peak demand occurs in that area.

expenditure is $1.2m -$4m per MW; transmission, $0.4m -$1.1m per MW of growth; and peaking generation costs of $0.75m to $1.5m per MW.[47]

Overall most submissions recognised the difficulties in accurately measuring the benefits given differences in location, application and in overall impact on load in the NEM. Other parties commented that while most of the costs are upfront and can be quantified, it may take considerable time for some of these benefits to be realised and also that the range of benefits can be spread across different parties across the supply chain.

Ernst and Young report included an analysis on the potential benefits of DSP. Their analysis involved projections for peak demand in half-hourly periods and ranking the periods in terms of the highest quantum of electricity demanded. EY found that by removing the top one per cent of the peak half hourly periods, there was a material reduction in the overall peak demand projected for a year. In Victoria, for example, if the top one per cent of peak demand periods were removed from peak demand projections, total peak demand for a year reduces by 18.8 per cent. This was estimated to equate to around 2,279 MW of demand removed from the Victorian system in 2020.

If the top one per cent of peaks was removed from overall peak demand, EY estimates that between $3.4 billion and $11.1 billion in network costs could be avoided in the NEM over the period 2011-2030.[48] Translating these avoided network costs into savings for consumers may not be readily achievable. This is because there is a complex relationship between network costs and network charges. The exact disaggregation and timing of the avoided costs, by TNSP and DNSP within each state, would need to be known in order to model the price impact. Chapter five of this paper contains further discussion of retail electricity prices.

Ernst and Young also found there is an industry precedent for using notional values for avoided infrastructure to rank DSP opportunities. The industry precedent provides for a range of $90/kVA to $300/kVA for avoiding network expenditure.

2.1.3 Defining efficient DSP

The purpose for this review is to identify the market and regulatory arrangements which ensure that such demand side options are properly considered and correctly valued in both the planning and operation of the NEM. The goal is for the market to achieve an efficient balance between the costs incurred in supplying electricity to consumers (e.g. network infrastructure and generation plant) and the benefits received by consumers when they use electricity.

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47 Ausgrid, submission to the AEMC Strategic Priorities paper, 2011.

48 It should be noted that this potential benefit of avoided network cost does not take into account the costs associated with implementing DSP measures. It also does not take into account other potential benefits of reducing peak demand such as the avoided costs of generation plant and gas pipeline infrastructure. See chapter four of Ernst & Young, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, 20 December 2011,

If there are actions which result in consumers changing their electricity consumption at times when the reduction in its value is less than the cost savings incurred in supplying the electricity, then the market and regulatory arrangements should be working in a manner which ensures that such demand side options are enacted.

In order to define when demand side options are efficient, it is important to distinguish between how the individual consumer decides to adapt their electricity use and how that decision will affect the wider market. A consumer will make a decision to reduce or manage its electricity use, if they consider that the loss in value gained from consuming electricity is less than the cost savings the consumer received from not consuming electricity. This is efficient from the consumers own perspective as the individual benefits outweigh the individual costs (which this review defines as cost effective DSP). From the wider market perspective, an individual consumer's decision can impact on other consumers and market participants, as shown by the range of benefits in section 2.1.2. The consumer's decision to adapt its electricity use could deliver either cost savings or extra costs to other participants.

We define efficient DSP as an action by consumers (either independently or via an intermediary) to manage or reduce their electricity consumption which delivers a net benefit on the wider market (i.e. lower costs of supply) which is more than the loss in value incurred to the consumer. The optimal use of resources from a market viewpoint will occur when the lowest cost combination of DSP and traditional supply options is used to meet total demand. This will occur when the all the opportunities for efficient DSP are captured.

For this to occur there is the need for a number of fundamental market conditions, that is:

- consumers (or their agents) would need to be able to compare the value they place on electricity services with the costs incurred in providing those services and also to understand the value of benefits and costs of DSP;
- market participants (such as retailers, networks, ESCOs and aggregators) need to be able to identify opportunities for efficient DSP and to facilitate and encourage the appropriate action; and
- the need for alignment of the incentives influencing the consumer in deciding upon a DSP action and the wider impacts on the electricity market.

2.2 Application of the National Electricity Objective

In assessing the range of issues, the AEMC is required to have regard to the National Electricity Objective (NEO). The NEO is set out in section seven of the National Electricity Law (NEL), which states:

> "The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to -

(a) price, quality, safety, reliability and security of supply of electricity; and

(b) the reliability, safety and security of the national electricity system."

The NEO will therefore form the overarching principle for the assessment framework used to evaluate potential changes to market and regulatory arrangements. This will require identifying and assessing the ability of such changes to promote efficient DSP.

Assessment of how to achieve efficient market conditions may include considering various combinations of market and regulatory arrangements. This will take into account assessing which participants are best placed to implement the arrangements and will consider aligning incentives so that the whole electricity supply chain is geared to delivering products and services that assist consumers in making choices as to the quantity and timing of electricity use.

The framework involves considering the costs and benefits of achieving market conditions to support DSP options. Any recommendation arising from this assessment will be technology neutral. The response itself and its timing would ultimately be based on the consumers' and other participants' assessment of benefits they could achieve.

2.3 Assessment approach

The issues paper set out our proposed approach to identify gaps in the market conditions and required changes to the market and regulatory arrangements needed to address those gaps. This approach was generally supported by stakeholders. To clarify, there are two phases to how we are approaching the MCE's ToR objective. The first stage, and the focus of the directions paper, has included considering:

- how consumers value their electricity use and participate in the electricity market;
- lessons on the current application of DSP options in the NEM drawing on evidence from the current pilots and trials;
- what market conditions are needed to support consumers in exercising the choice to reduce or manage their electricity consumption;
- the impacts - costs and benefits - for both the consumer and the wider market when the consumer makes a decision to change his electricity consumption and the appropriate methods to valuing such costs and benefits;
- the appropriate role of the various organisations along the supply chain - market operator, network businesses and retailers - in facilitating DSP; and
- consideration of how the various segments of the supply chain interact and support such consumer choice.

This phase has drawn on existing evidence and information to better inform our understanding of how to facilitate the efficient development, operation and use of DSP in the NEM. Based upon the understanding of the factors as outlined above, and having proper regard to stakeholders views on these matters, we will:

- identify possible areas where the market conditions could be improved to better facilitate consumer choice;
- assess whether there are gaps in how the various segments of the supply chain interact and support such consumer choice;
- based upon steps above, develop a range of reforms to market and regulatory arrangements which would address the identified issues including to consider, the cost and benefits of such options against the NEO; and
- recommend a desired range of market and regulatory arrangements and develop an implementation plan.

This directions paper sets out our initial thinking on the first phase and identifies those market conditions that could be improved. We also provide some directional comments on our views of how to deal with the gaps in market conditions and also how we intend to use the evidence and analysis to develop our recommendations and implementation under the second phase.

Under the MCE ToR, we are required to consider and assess energy efficiency measures and policies that impact on or seek to integrate with the NEM. Therefore, in addition to the NEO test outlined above, we will assess those energy efficiency measures and policies in terms of their cost effectiveness in achieving their program or policy objectives. Further discussion of our approach for energy efficiency is given in section 2.4 and chapter 12.

Submissions to the issues paper stressed the need to have proper regard to how the market conditions for DSP can differ between residential and non-residential consumers. There was some concern that the issues paper focussed on the residential sector, while the most potential for increased DSP could be with the industrial and commercial sectors, as these sectors account for around 75 per cent of total electricity consumption. We have sought to properly differentiate the issues between the various consumer categories in this paper.

As noted, we have indicated that we will base our assessment on the assumption that consumers will always make the best decision from their viewpoint, based on the prices they face, the technology and equipment they have access to, the information they have and their individual transaction costs. The Consumer Action Law Centre argued that this was a flawed assumption and considered that evidence points to consumers departing from what the rational choice is in a systematic and predictable way.

While we note some stakeholder comments, we continue to consider that this assumption is appropriate for this review. The review is about identifying what needs to be done to the electricity market to enable consumers to choose how they use electricity. This means that we will not be presuppose consumer decisions on how, when and how much they should be consuming at a given price level. We consider that it is not appropriate for this review to consider options which mandate how consumers should behave. Consumers, given the right information and tools, will be in the best position to decide what course of action is best for themselves. Understanding consumers' preferences and behaviour is a key part to this review and this is discussed further in chapter four.

We note that some submissions to the issues paper raised concerns that we may assess the costs and benefits of various technology based market conditions which could be a large and potentially unnecessary task and could be duplicating other assessments.[49] We agree with these concerns and consider that it is not our intention to conduct a cost-benefit analysis of particular DSP technologies. Instead the purpose of our analysis will be to test the ability of the reform options to promote the necessary conditions for efficient DSP opportunities to be captured. In terms of DSP technology, this means the ability of market and regulatory arrangements to promote a supportive environment for investment decisions and ensuring that the benefits of any DSP technology can be optimised.

2.3.1 Scope of the review

This review has a broad remit and will consider all the market conditions - and means to promote the necessary market conditions - that have the potential to impact on DSP. However given the scope and timing of the review, there will be some areas that will not be covered. While we will not directly investigate these areas, we shall nevertheless take note of relevant issues raised during the course of the review. The areas that are not directly in scope for the review include:

- Reliability and security standards for the NEM. There is an established process for setting these and any changes should be made as part of that process.
- Review of reliability planning and service standards for networks (jurisdictional arrangements). The DSP stage 2 review found that probabilistic planning standards are likely to be more consistent with efficient use of DSP compared to deterministic standards. The SCER has recently asked the AEMC to review distribution reliability outcomes and standards and therefore this review will not investigate this matter.[50]
- Gas Markets. We note that some submissions raised concerns on the ability of the existing gas infrastructure to support the growth in co-generation and asked for a national study into competition and accessibility in gas supply. Given that the scope of the MCE ToRs is limited to electricity markets we do not intend to investigate this matter under this review, but instead note that we are monitoring

49 Energy Networks Association, issues paper submission, p.6.

50 See the AEMC website: http://www.aemc.gov.au/Market-Reviews/Open/Review-of-distribution-reliability-outcomes-and-standards.html

the performance of the gas markets as part of our on-going Strategy Priorities project.

- Technical generator and network (losses) efficiency.

We note that the economic regulation framework for network businesses is subject to a rule change proposal raised by the AER. Therefore this review will not cover matters directly covered by that rule change but will assess the ability of the economic regulation frameworks to provide commercial incentives on network businesses to facilitate and use DSP. This matter is discussed in chapter nine.

2.4 Coordination between energy efficiency and demand response

For the review, we have defined DSP as the ability of consumers to make informed decisions about the quantity and timing of their electricity use, which reflects the value that they obtain from using electricity services. Consequently, this covers a range of actions by consumers including energy efficiency (EE).

Energy efficiency generally refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way: It includes using less energy at any time, including during peak periods. In contrast, demand response entails consumers changing their normal consumption patterns in response to changes in the price of energy over time or to incentive payments designed to induce lower electricity use when prices are high or system reliability is compromised.

It is important to recognise there are differences in how DSP and EE actions are perceived in the market and mind-sets of policy makers. Because most demand response programs in effect today are event driven, consumers tend to assume that demand response events occur for limited periods that are called by either the network or system operator. Energy efficiency is seen as leading to a gradual, permanent adjustment to energy consumption growth in the long term.

Therefore there are significant differences in how energy efficiency and demand response are measured, what organisations offer them, how they are delivered to consumers and how they are rewarded in the market.

Reducing these differences and coordinating energy efficiency and demand response programs could be beneficial. Better coordination of energy efficiency and demand response programs at the provider level could bring about cost efficiencies and a more rational allocation of resources for both program providers and consumers. This coordination could help consumers, as they could be receptive to an integrated, packaged approach to managing their energy usage. Greater consumer willingness could also increase demand response market penetration and capture energy savings and consumer bill-reduction opportunities that might otherwise be lost. Over the long term, smart grid investments in communications, monitoring, analytics, and control technologies will reduce many of the distinctions between energy efficiency and demand response and will help realise the benefits of this integration. Chapter 12 provides more on our approach to reviewing energy efficiency programs for this review and the interaction with facilitating uptake of efficient DSP in the NEM.

3 DSP options

Summary

DSP options refer to the actions that are available to consumers (or their intermediaries acting as agents of consumers) to reduce or manage their electricity use.[51]

There are various forms of DSP options, some of which have typically focussed on load-shifting away from periods of 'peak' demand to avoid costly operation or incremental investment in expensive peak generation or network capacity. Over time, programs have sought to include greater incentives for DSP, including more direct financial incentives and 'rewards' for participating consumers.

For this chapter, we outline the range of potential DSP options that are either currently available, or may be available in the future (i.e. with appropriate enabling technology or pricing structures/incentives). We also outline the potential opportunities that those DSP options may deliver and highlight those parties that are likely to be involved in undertaking such measures.

3.1 Existing and potential DSP options in the electricity market

In our issues paper, we outlined that there is some evidence that DSP is occurring in the NEM, however, it is difficult to determine the actual volume of participation due to confidentiality around existing commercial contracts and limited data availability more generally.

Investigations by Futura as part of their report highlighted that AER investigations into high-price events in the wholesale market have identified evidence of probable demand response at times of high prices. For example, there were multiple apparent demand reductions in 2010, including reductions of up to 265 MW in NSW following a price spike of over $6,200/MWh on 10 August 2010. A more recent demand response of approximately 20 MW to 25 MW was apparent on two consecutive days in the combined Victoria and South Australia region during 31 January 2011 and 1 February 2011 where prices exceeded $100 per MWh and reached the market price cap of $12,500 per MWh.[52]

Evidence suggests that opportunities have been found across the supply chain to use DSP where it is cost effective. Futura investigated the suite of DSP options in the NEM including curtailable load arrangements, direct load control (for hot water and pool pumps), pricing strategies, thermal energy storage, energy conservation and efficiency, residential fuel substitution, power factor correction programs and distributed

51 Australian Energy Market Commission, *Power of choice review*, issues paper, AEMC, 15 July 2011.

52 Futura Consulting, *Investigation of demand side participation in the electricity market*, report for the Australian Energy Market Commission, 8 December 2011, p. 47.

generation. In total, they estimated around 2900 MW of dispatchable (contracted) and non-dispatchable (non-contracted) DSP available in the NEM as at December 2011.[53]

Of the DSP measures available, Futura found that the energy conservation and energy efficiency measures offered the greatest quantum of support to manage average demand (estimated at 8,965 annual GWh). For peak demand management, households participating in direct load control for hot water are having the greatest impact, with around 1750 MW shifted from peak load in summer and 2500 MW shifted in winter annually (representing around 4 and 6 per cent of total peak demand respectively).[54]

DSP options

Table 3.1 outlines the range of potential DSP options that are or could be available for uptake in the electricity market. These options are grouped into the following categories:

- Peak load management – activities that seek to reduce demand at the time of the system or network peak.[55] Network load management projects can be deployed strategically in geographical areas where network constraints occur at the system peak or can be implemented in particular locations to reduce peak demand on a specific network element. Retail load management activities are market-driven demand responses related to high wholesale pool price events.

- Energy conservation and efficiency - programs, technologies and measures that reduce the energy used by specific end-use devices or systems without reducing the quality of services provided, i.e. same or improved service for less energy.

- Fuel substitution - actions which change the type of fuel source (e.g. from electricity to gas for cooking).

- Distributed generation (including standby generation, small scale renewables, and co-generation/trigeneration) - small, modular units connected on the 'customer's side of the meter' that can generate energy for the owner or provide energy back to the grid.

- Distributed storage - deliver stored electricity to the electricity grid or an end-user (distributed storage technologies are often located at or near the point of use).

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53 Cogeneration and residential fuel substitution are not included in this estimate.

54 Futura Consulting, *Investigation of demand side participation in the electricity market*, report for the AEMC, 8 December 2011, p. 60.

55 For the purposes of this review, system peak is defined as the highest level of instantaneous demand for electricity during the year on the system (as defined by State, NEM-wide or DNSP network).

A comprehensive overview of the DSP options outlined in Table 3.1 is provided in the supporting report by Futura Consulting.[56]

DSP measures vary across multiple dimensions. Parties that are implementing DSP must make a choice for each of these options:

- customer segment: residential, commercial, industrial, government;
- signal to the end-use customer: incentive-based or price-based;
- trigger for the demand response event: reliability versus price;
- response requirement: mandatory versus voluntary;
- dispatchability: dispatchable versus non-dispatchable;
- notification: day-ahead versus day-of notification;
- control: utility-controlled versus customer-controlled; and
- type of incentive payment: fixed versus market-based.[57]

Further discussion of these is provided in Appendix A.

56 Futura Consulting, *Investigation of existing and plausible future demand side participation in the electricity market - Report for the AEMC*, 8 December 2011. See http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF .

57 The Brattle Group, *Bringing demand-side management to the Kingdom of Saudi Arabia*, final report, 2011.

Table 3.1 DSP options and opportunities

DSP option	Mechanism/s	Consumer impacts	Other party potential impacts	Parties most likely involved in measure	Available in the market
Peak Load Management	Interruptible supply contracts based on consumers shedding interruptible loads (e.g. facility shifting production to periods outside high pool prices, or at night). Arrangements can be either through: • **availability payments**, which electricity consumers receive for nominating a DSP resource that they can commit; or • **dispatch payments**, which electricity consumers receive if they actually shed load in response to a request.	Potential cost savings for businesses. Some costs to businesses for implementation of technology and infrastructure	Retailers - provides an alternative to hedge against high wholesale pool prices NSPs - may provide a mechanism to defer network augmentations, reduce load at risk, or improve supply quality and reliability	Very large industrial energy users Retailers NSPs Specialist third party DSP aggregators[58]	Yes
	Direct load control of appliances such as hot water, air conditioners and pool pumps – typically through contracts with consumers to enable cycling/shut down on short notice	Potential cost savings for businesses and residential consumers	Costs for networks to establish programs NSPs - may have some network augmentations savings	Commercial and residential consumers NSPs	Direct load control (DLC) hot water in households has been occurring since 1960's

58 Third party aggregators - engaged by one or more parts of the electricity value chain to secure DSP for their use, and can also act as the agent of customers capable of offering DSP into the market.

DSP option	Mechanism/s	Consumer impacts	Other party potential impacts	Parties most likely involved in measure	Available in the market
					DLC trials underway to test pool pumps, and air conditioners
	Thermal storage - uses air conditioning chillers or an industrial refrigeration plant to store cool water or to build ice during off-peak hours to serve part or all of an on-peak cooling requirement	Potential cost savings for businesses	Reductions in need to expand the network to meet constraints. Some costs to establish	Consumers - commercial and industrial facilities	Ergon Energy implemented a thermal energy storage project through a partnership with James Cook University
	Price based approaches utilising different tariff arrangements: • time of use (TOU) - cost-reflective pricing in which the day is divided into time bands and different prices are charged during each time band (i.e. peak, off-peak and shoulder). • seasonal time of use (STOU) - aim to better reflect the differing seasonal costs of electricity supply, and therefore to apply a different TOU price schedule at different times of year.	Timely energy consumption information Price signals for customers which would allow them to more effectively manage their peak electricity usage and reduce costs	Network potential for deferring network capital expenditure for peak demand period capacity. Some increased costs due to IT systems and interactions with consumers Retailers - benefits for competition and innovative product and service options Some cost impacts - advanced billing systems and customer management	Currently technology enabled in large commercial and industrial ©& I) businesses Some small to medium business and residential consumers Retailers NSPs	Ausgrid trialling of TOU tariffs for mass market customers since 2004 At present STOU tariffs are in the trial stage in Australia DPP tariffs for the Australian residential sector are primarily in the trial and pilot stage

DSP option	Mechanism/s	Consumer impacts	Other party potential impacts	Parties most likely involved in measure	Available in the market
	• DPP - seek to more closely mirror supply and demand conditions where for a few hours each year the cost of electricity supply is highly skewed from the average. • PTR - alternative form of dynamic peak pricing where customers are paid a rebate for reducing energy use during specific dispatch events.				Limited wide scale application of DPP for small to medium C&I businesses PTR - Currently being offered by Endeavour Energy
	Power factor correction measures that reduce losses and current by installing capacitor banks	Improved power factor Potential cost savings	Peak demand reductions Network augmentation savings	Medium to Large C&I facilities NSPs	EISA Utilities, Ausgrid, Endeavour Energy, and Ergon Energy have all implemented PFC programs to actively manage peak demands for network services
Energy Efficiency	Actions that consumers can utilise to improve their energy use. Such as installing more efficient appliances, lighting, water heating and space conditioning systems to minimise	Potential cost savings More efficient consumption and appliances/equipment	Reductions in overall demand for electricity Some cost impacts for retailers for managing	Commercial and Industrial facilities Residential consumers	EEO programs State and territory white certificate schemes

DSP option	Mechanism/s	Consumer impacts	Other party potential impacts	Parties most likely involved in measure	Available in the market
	either annual energy use or shift their energy use to off-peak periods	Some cost impacts for investments made	schemes	Retailers Networks Generators	Appliance and building rating schemes (CBERS)
Fuel Substitution	Though use of equipment and technologies to replace electricity as end use energy source with another fuel (e.g. substitution of electric resistance heating for solar hot water)	Improved efficiency of energy use Improved efficiency of appliances/equipment Some cost impacts for investments made Potential cost savings	Potential impacts on grid and hence network augmentations Potential impacts on retail competition	Residential consumers Commercial and industrial facilities	Phase-out will apply to greenhouse intensive hot water systems No evidence of large uptake in C&I sector
Distributed generation	Use of: • standby generators that are installed in customers premises to provide backup supply in the event of a loss of mains power; • small scale renewables, notably rooftop PV installations; and • co-generation and trigeneration units.	Enhance reliability of supply Potential cost savings Some costs to implement	Improve reliability and security of supply Potential savings from deferring need for generation and network augmentation Some costs to implement	Retailers NSPs Residential consumers Commercial and industrial facilities	Yes, through standby generators, small scale renewables and cogeneration for example

DSP option	Mechanism/s	Consumer impacts	Other party potential impacts	Parties most likely involved in measure	Available in the market
Distributed storage	Technology designed to store electricity to provide to the electricity grid or an end-user	May increase power quality and reliability for residential, commercial, and industrial customers by providing backup and ride-through during power outages	Load levelling and peak shaving	Networks Industrial and commercial facilities Consumers	Battery storage is an emerging area. Some pilots and trials

4 Consumer engagement and participation

Summary

An important factor for greater uptake of cost effective DSP is to ensure that consumers are provided with knowledge, tools and options that facilitate informed choices about how and when they use electricity. Improving the opportunities for consumers to better engage in the electricity market is also a key factor for third parties (such as retailers, ESCOs, aggregators, and network businesses) to capture the value of flexible demand and offer different and innovative services and products in the market. In this chapter we discuss:

- consumer engagement in the electricity market across all sectors and the factors which drive and inhibit choices and decision making; and
- key issues relating to information to facilitate consumer choice and market information about the value of DSP.

Generally consumers want to reduce their bills and hence consumption. However, current consumer understanding of energy use and what they need to know for smarter energy consumption decisions is quite low. Better information and incentives (value in DSP for consumers), utilising consumer motivations and drivers, are needed to help reduce complex decision making.

Directions

For the next stage of the review we will consider:

- the role of network business, retailers and other third parties to engage with consumers - how dialogue can take place in a transparent manner when offering different products and services; and
- possible changes required to provisions in rules so that consumers can have timely access to their consumption data, taking account of other work in this area.

4.1 Consumer participation and drivers for decision making

Consumers generally expect affordable, safe and reliable electricity services. As outlined in chapter two, consumer participation in the electricity market is a key factor if the benefits of DSP are to be realised. Traditionally consumers have been passive participants in the electricity market, although in recent times consumer interest and motivation to manage electricity use and control costs has increased.[59] This has been

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59 The Energy and Water Ombudsman Victoria (EWOV) submission to the review issues paper indicated that consumers today are more likely to check and seek information regarding cost changes to their bills. The Clean Energy Council (CEC) also indicated in their issues paper submission that their Auspoll research found that while 95 per cent of people surveyed said they

particularly in the context of rising electricity prices, advancements in technology, communications and the introduction of climate change policies.[60]

This chapter outlines a range of DSP opportunities available to consumers to manage electricity consumption and bills. Such actions can include consumers directly modifying their consumption or engaging their retailer (or other third party) to provide energy services to help manage or reduce consumption. While there are opportunities available, consumer interest, motivation and willingness to manage electricity use and costs is likely to depend on a range of different factors. These include current and future retail electricity prices, individual preferences, circumstances and the perceived benefits that the DSP option may offer.[61] Other factors may also include size and composition of households or businesses and social expectations, habits and norms.[62] Many stakeholder submissions highlighted that it is important to recognise that consumers' capacity and choices of the type of DSP option taken up is likely to be quite diverse and vary across and within sectors.[63] For example:

- The industrial, manufacturing and commercial sector currently accounts for approximately 75 per cent of Australia's total electricity consumption.[64] Very large industrial facilities are more likely to have the capacity to manage their electricity consumption. This is because they tend to have the appropriate technologies (i.e. real-time metering), sophisticated energy management systems and skill-sets in house. These factors allow those businesses to either participate in the wholesale market, enter into contracts with a service provider that provides exposure to variations in wholesale electricity spot prices,[65] or engage in DSP where cost effective to do so. Small to medium enterprises (SMEs) however do not necessarily have specialised personnel with dedicated skills for managing electricity consumption, nor in some cases the enabling technology (such as real time metering). These businesses therefore may face larger transaction costs to participate in the wholesale market, and hence may rather choose to engage ESCOs to provide energy assessments and consider upgrading

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were concerned by rising energy costs and 89 per cent said they were willing to take action to use less energy, half knew little or nothing about the key aspects of their energy use.

60 Public Interest Advocacy Centre, issues paper submission, p.3; Westfarmers, issues paper submission, p.1; Clean Energy Council, issues paper submission, p.3.

61 It is recognised that price is a necessary but not sufficient condition for consumer decision making and behaviour change.

62 Accenture 2010, *Engaging the New Energy Consumer, Accenture perspective - operational imperatives for energy efficiency*, 2010, p.14, IBM, *Survey of New Type of Energy Concern: Lack of Consumer Understanding*, http://www-03.ibm.com/press/us/en/pressrelease/35271.wss

63 Power of choice review stakeholder reference group meeting, 24 October 2011 - http://www.aemc.gov.au/Media/docs/Synopsis%20-%20Second%20Meeting-7bd6c778-9f3c-4089-a16d-c47f0c522e77-0.PDF.

64 Ernst and Young 2011, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, December 2011, p.14.

65 AEMC, *Power of choice - giving consumers options in the way they use electricity*, issues paper, 15 July 2011, p.23.

existing equipment for their business operations.[66] Retailers may also work with these companies to offer different products and services to suit businesses operations.

- Residential consumers represent approximately 25 per cent of Australia's total electricity consumption.[67] Generally, small consumers are considered to not have adequate information or knowledge on costs of their consumption (e.g. running the air conditioner) and/or the appropriate enabling metering technology that provides for a greater level of information on their usage profile.[68] Smaller consumers may also lack the capability (and financial capacity) to directly take up some DSP options that may be available. Therefore, householders may choose DSP options that involve directly modifying their consumption patterns such as turning off lights or installing wall or ceiling insulation.[69] Households may also wish to enter into a contract with a retailer or other party (e.g. networks or ESCOs) to manage high electricity use equipment during peak times when prices are higher.[70]

Engaging consumers

In order to maximise decision making, consumers need to be sufficiently engaged, have adequate information about consumption patterns, costs, and the products and services that may be available in the market so that they can adjust consumption and behaviour patterns to maximise their welfare.[71] If consumers are not sufficiently aware, the appropriate level of information is not available, or existing arrangements are seen to be too complex and costly to make a decision (i.e. unable to understand implications of decisions and investment choices), then there is a risk that consumers (or some groups of consumers) will neglect cost effective opportunities that may be available.[72]

Empowering consumers with the knowledge and skills to make informed choices can provide for more efficient electricity use. For example, increasing understanding of the

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66 Energy Users Association of Australia Energy efficiency workshop held on 16 August 2011; Australian Government Energy Efficiency Opportunities Program case studies at http://www.ret.gov.au/energy/efficiency/eeo/pages/default.aspx; International Energy Agency (IEA), *Empowering Customer Choice in Electricity Markets*, October 2011, p.49.

67 Ernst and Young 2011, *Rationale and drivers for DSP in the electricity market - demand and supply of electricity*, December 2011, p.14.

68 Victorian rollout of smart meters, and those installed by other distribution businesses such as Ausgrid may help to provide more information to customers on their usage profiles.

69 Such actions do not necessarily depend on metering capability.

70 Futura Consulting, *Investigation of existing and plausible future demand side participation in the electricity market*, a report for the AEMC, 8 December 2011, chapter three.

71 It is noted that even when good information is available, individuals/businesses may not make decisions in an optimal way and which maximises their welfare (due to situational circumstances - constraints on time, resources, ability to process information) and hence may still neglect opportunities. Public Interest Advocacy Centre (PIAC), issues paper submission, p.9.

72 Energy Efficiency Council National Conference, presentation by ClimateWorks Australia http://www.eec.org.au/events/National_Conference_2011.

impacts of consumption on bills and the cost of supply (including the ability to quantify the impacts of decisions) can allow for deployment of new approaches/services in the market, so that third parties can better assist consumers to reduce demand where cost effective to do so.

Consumer behaviour, attitudes and opinions play an important role as to why consumers may take up or make investment decisions regarding DSP. Such consumer perceptions and values can be influenced by a variety of factors that include: the ability to process information; price of products and services; knowledge of the issues (i.e. energy costs); availability of time; access to finances; and general appetite/commitment to change.

Given the complexities of consumer decision making, some stakeholder submissions to the issues paper indicated that any approach for engaging consumers in the market should take into account those known factors that shape and constrain peoples' choices toward energy management and programs.[73] Other stakeholders also highlighted that parties across the supply chain need to become more innovative and play a coordinated role in how they engage and empower consumers if existing barriers, habits and social norms toward electricity use are to change. Issues regarding how market participants (for example networks and retailers) engage with consumers is discussed in chapters nine and ten.

Over recent years, there have been numerous studies and research to understand consumer attitudes and social norms toward energy use.[74] In the following list we highlight some observations taken from a series of research reports about consumer attitudes and preferences.[75] Generally, the research found that consumers:

- Have a low level of interest as electricity is not necessarily considered as a priority “product" to manage in the context of household/business expenditure etc.

- Do not necessarily understand electricity and pricing and therefore there is a knowledge gap between what consumers know and need to know.

- Prefer measures (such as enabling technology) which they can customise, are easy to use and have "set and forget" capabilities (e.g. pool pumps).

- Are likely to be more interested in learning about electricity and DSP programs at specific times. For example, in response to price increases, when signing up for electricity services or purchasing new appliances and household electronics.

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73 Ethnic Communities Council of NSW Inc., issues paper submission, p.1; Energy and Water Ombudsman Victoria, issues paper submission, p.7; Consumer Action Law Centre, issues paper submission, p.3-4; Public Interest Advocacy Centre, issues paper submission, p.1; Energy Supply Association of Australia, issues paper submission, p.6; AusGrid, issues paper submission, p.13.

74 The focus of this research has mainly been in the residential and small to medium business sectors given that they have tended to be passive participants in the market.

75 We note that this is not a comprehensive list and there is likely to be other research which is also relevant to consumer decision making.

- Prefer a range of service offerings to consider the value and take up of electricity management programs. That is, price alone is not considered a driver to encourage electricity management as consumers tend to place different levels of importance on product offerings (e.g. consumers are more likely to respond if rebates/reward programs are part of the package).

- Prefer pricing products and services tailored to match priorities (e.g. the right tariff for their load or profile).

- Prefer simple, relevant and consistent information that is targeted to their personal needs and situation.

- Have different levels of confidence in the various parties delivering information (i.e. retailers, networks, government and others).

A full list of surveys, studies and reports and their relevant findings on consumer research is provided in Appendix B.

4.2 Issues with the current market conditions

For the review, we consider that information is a key condition for improving consumer choice and incentives for the efficient take up of DSP. We therefore consider it is important to investigate the:

- information required to enhance and facilitate consumers' ability to make informed choices (including market information required to identify and capture the value of that DSP); and

- arrangements needed in the market so that there is sufficient flexibility for consumers (and third parties) to be appropriately informed.

As noted, the information needs of consumers can differ depending on many factors. Hence, we have sought to distinguish between the role of education - ensuring consumers are informed prior to the time of making a decision and improving consumer energy literacy,[76] and provision of information – providing consumers with the capacity to make choices about electricity services that meet their needs and maximise their welfare.

Currently there is a range of information and programs that seek to provide ways for consumers, across all sectors, to manage energy use. These programs have typically been designed to minimise existing information and behavioural barriers and build capacity within different sectors of the market (i.e. increase awareness of energy use and promote ways that energy can be saved). Programs and measures generally

76 For example, understanding of how energy is used, impacts of consumption, enhancing skills (improving their ability and willingness to make choices).

include education campaigns,[77] energy efficiency programs for businesses and households,[78] and regulations such as appliance rating schemes and minimum energy performance standards.[79]

We note that there have been a number of reviews regarding existing programs and campaigns, most recently the Prime Minister’s Task Group on Energy Efficiency,[80] and the Productivity Commission's review of energy efficiency measures and policies.[81] Given the numerous reviews undertaken to date, we do not intend to comment on those existing programs. However, we do note a number of stakeholder submission commented that, while there is a range of information available to consumers, the quality, quantity and coordination of existing programs and messages needs to be improved.

Also, the information currently in place needs to be better targeted according to the consumer groups, as with the potential benefits of DSP options. Overall, many stakeholders did raise a number of specific issues that should be considered in the context of this review. These include a need to:

- improve consumer understanding and awareness about costs and impacts of consumption given the current level of understanding of energy consumption is still quite low; and[82]
- improve consumers' access to their actual energy consumption patterns (i.e. know their load use profile) and ability[83] to act on energy savings opportunities;[84]

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77 Programs such as Black Balloons in Victoria, http://www.saveenergy.vic.gov.au/blackballoons.aspx and or Australian governments living greener website, http://www.livinggreener.gov.au/.

78 For example, the Australian Government's Energy Efficiency Opportunities Program (EEO) and state government white certificate schemes.

79 The Equipment Energy Efficiency Program (E3) can be accessed at http://www.energyrating.gov.au/programs/e3-program/.

80 See Department of Climate Change website: http://www.climatechange.gov.au/publications/energy-efficiency/report-prime-ministers-taskforce-energy-efficiency.aspx

81 See Productivity Commission website: http://www.pc.gov.au/projects/study/carbon-prices

82 Clean Energy Council, issues paper submission, p 4; Energy and Water Ombudsman Victoria, issues paper submission, p. 1; Department of Climate Change and Energy Efficiency, issues paper submission, p. 6; Public Interest Advocacy Centre, issues paper submission, p. 8; Exigency, issues paper submission, p.4; Energy Efficiency Council, issues paper submission, p.9.

83 Some consumers, even though they are willing, are unable to participate because of socioeconomic circumstances (e.g. tenants with limited decision-making power or low income households unable to afford more efficient appliances).

84 Ethnic Communities Council of NSW Inc., issues paper submission, p.3; Energy and Water Ombudsman Victoria, issues paper submission, p.3; TRUenergy, issues paper submission, p.4; Energy Supply Association of Australia, issues paper submission, p.8; Consumer Action Law Centre, issues paper submission, p.2; Alinta, issues paper submission, p.5; Wesfarmers, issues paper submission, p.1-2; SA Department for Transport, Energy and Infrastructure, issues paper submission, p.8.

- improve market information on the benefits of DSP; and
- provide more education on the operation of DSP and arrangements for the electricity market generally.

4.2.1 Information to facilitate consumer choice

Provision of consumers' energy consumption and load profile data

Currently consumers are able to take certain DSP actions that help to either reduce their electricity consumption or modify consumption at different times. These actions do not necessarily depend on the availability of specific consumption information (e.g. purchasing more efficient appliances or changing times for using certain appliances or equipment). However, if consumers have, and are able to easily access information on their actual energy consumption over the day (load profile),[85] this is likely to provide a better understanding of existing usage patterns and awareness of the other potential opportunities that could be taken up to maximise benefits and welfare. Consumer access to such information is also likely to promote greater innovation in the energy sector that will improve market competitiveness and services/contracts to consumers from third parties.

Electricity consumption data can be provided to consumers in a number of ways. For example, use of web based customer portals, phone applications or in-home displays. For this review, we are not commenting on the approaches that should be made available, as consumers and the market are likely to drive preferences. We do note however, that the depth and quality of available data to deliver potential benefits will depend upon the consumer's meter capability.

As noted, currently consumers across the industrial sector have the appropriate technology that provides both historic and real time data that allows for a range of DSP opportunities to be considered. However, many consumers across the small to medium, commercial and residential sector currently do not have the technology that allows easy access to their real time consumption data. This is likely to limit the extent of DSP opportunities that may be available to them. The issues regarding the role and purpose of enabling technology are further discussed in chapter six.

Currently, under the National Electricity Rules consumers can access their current electricity consumption data through a retailer.[86] There are also provisions under the National Energy Customer Framework (NECF) regarding other parameters of information that should be available to consumers.[87] While these arrangements exist, some industry and third party stakeholders engaged in the review indicate that there

85 EnerNOC, issues paper submission, p.19; Major Energy Users (MEU), issues paper submission, p.17; Billcap, issues paper submission, p.1-4.

86 See clause 7.7 (a) of the rules.

87 More information on the NECF can be accessed at http://www.mce.gov.au/emr/rpwg/default.html

are currently practical limitations with the existing rules.[88] Specifically, when billing or data information is required from retailers, some consumers experience time delays, or the data that is provided is sometimes aggregated and hence is difficult to decipher. It was also noted that the existing provisions may be preventing DNSPs from providing metering data to consumers. Generally it is considered that these limitations are making it difficult for consumers or third parties to understand consumption profiles or offer appropriate DSP packages in the market.

We consider improvements could be made to the existing rules to clarify and provide guidance on the provision of consumer energy consumption load profiles. This would provide certainty to consumers that they can access their data, engage with third parties and undertake appropriate investment decisions. Such information would also assist third parties to develop those innovative products and services.

We note some stakeholders have suggested amendments to the rules such as creating a new category of NEM participant (i.e. information service providers) who would have access to AEMO information and oblige distributors to give such providers access to information after consumer consent,[89] or changes to AEMO procedures to allow third parties who have consumer authority to have direct access to meter data.[90] Additional suggestions included a potential central information repository, with multi party access, akin to the approach in the United Kingdom as part of its roll out of smart meters to all consumers by 2019.[91] We also note that the Australian Government's work under the Clean Energy Future Package, to scope the potential for an "energy information hub" to improve information disclosure and that would provide consumers with easier access to their energy information currently held by retailers and distributors. We are seeking stakeholder views on these, and other proposals for improving existing access and information provision of consumption data to consumers.[92]

Consumers should have the right to access their own consumption data, and if they choose to consider managing consumption, should also be able to decide whether to grant access to their load profile information (with the appropriate consent provisions) to third parties. For example, if they choose to engage ESCOs or aggregators to help them understand their existing electricity consumption and costs. The consumer should in such cases, know the data exists, be able to elect to have the data, and know how the data shall be used. Consideration of access, privacy and data ownership issues relating to introduction of improved technology (such as smart meters) is currently

88 Billcap, issues paper submission, p.4; Essential Energy, issues paper submission, p.16; EnerNOC, issues paper submission, p.3; Energy Efficiency Council, issues paper submission, p.26; and Major Energy Users Inc, issues paper submission, p.32.

89 Billcap, issues paper submission, p.5.

90 Enernoc, issues paper submission, p.9.

91 The UK Government intends to appoint a Data and Communications company to manage all communications of smart metering data to and from domestic premises.

92 See Department of Resources and Energy website: http://www.ret.gov.au/Department/Documents/clean-energy-future/ELECTRICITY-PRICES-FACTSHEET.pdf

being addressed under the SCER national smart meter program, consumer protection and safety work program.[93] We will consider any outcomes of that work in considering any changes required to existing market arrangements as part of this review.

Questions Access to energy consumption - load profile data

1. **What should be the arrangements for consumers (or third parties acting on their behalf) to access their energy data?**

2. **Do you consider that there could be a role for an information service provider in the market as a mechanism to provide consumption data to consumers?**

3. **Should amendments be made to the current NER clause 7.7 (a) to facilitate consumer access to consumption information? If so, how?**

Costs of consumption decisions

For consumers to make informed investment decisions, they need to be able to quantify the impacts of their decisions and have the ability to convert price into costs. This would allow consumers (and other parties acting on their behalf) to understand the cost impacts of their consumption decisions (e.g. the cost impacts on bills of operating dishwashers, TVs, air conditioners or high energy use equipment in businesses), and financial risks for undertaking certain DSP investments (e.g. payback periods for investments).

Generally, most SMEs and residential consumers receive monthly or quarterly electricity bills, which is some time after their consumption decision has been made. This is unlike other commodities such as food where consumers are very aware of the purchase price of a product. Stakeholder responses to the review considered that given the time lags and lack of information of energy usage of certain products, this may be limiting some consumers and other parties to take up certain DSP measures.[94]

Various options for improving awareness and information on costs of consumption have been put forward, including considering measures to enhance existing appliance labelling schemes (i.e. including average cost per hour of using the appliance) or potentially increasing the frequency of the billing cycle.[95]

We note each of these potential options and consider that arrangements for improving cost information to consumers and third parties is important for take up of cost effective DSP.

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93 More information on smart meters can be accessed at http://www.ret.gov.au/Documents/mce/emr/smart_meters/default.html .

94 Energy Efficiency Council, issues paper submission, p.9.

95 Energy and Water Ombudsman Victoria, issues paper submission, p.8; Energy Efficiency Council, issues paper submission, p.6.

Question	Costs of consumption decisions
4.	**What information provisions could be put in place to improve awareness of the costs of consumption and the use of particular appliances/equipment, so that the benefits of taking up different DSP options can be realised?**

Pricing and product offers

A common theme for consumers to be better engaged and informed, is for information on products and services to be simple, easy to understand and provide compelling offers to encourage more efficient electricity use.[96] In addition, the content and delivery should be focussed on who the end user will be.[97]

Consumers bodies and industry organisations such as the EUAA have raised concern that the existing level of information about products and services is often difficult to understand and inconsistent. This includes the various pricing offers (or contractual arrangements) that are currently available in the market, which are complicated or may not contain sufficient provisions to inform consumers of potential demand reduction opportunities that may be available.[98] Given the information or transaction cost issues for some consumers, some stakeholders have noted the importance and requirement for a third party or independent source (i.e. a party other than their electricity retailer) to provide information to consumers about energy products and offers.[99] We note the above issues and further discuss retailer business approaches to pricing and product offers in chapter ten.

4.2.2 Market information on value of DSP

Value of DSP decision and market information

Market information about the value of DSP is important for parties across the supply chain to understand and have certainty of potential benefits and impacts of investment decisions both in the short and long term.

Aggregators and other stakeholders participating in our review have highlighted that currently there is a lack of transparency and available information on:

96 Business Council of Australia, AEMC Strategic Priorities for Energy Market Development directions paper, submission p.9.

97 Power of choice, stakeholder reference group meeting 24 October 2011.

98 Major Energy Users workshop on Energy Efficiency.

99 Billcap, issues paper submission, p.1-4; Energy Efficiency Council, issues paper submission, p.1; Energy Users Association of Australia, issues paper submission, p.17.

- costs, reliability and potential that demand management offers (i.e. value of DSP);[100]
- access to information about potential network constraints and future peak load predictions at the distribution network level;[101] and
- market information on access to wholesale market data in relation to forecasting spot prices.[102]

The issues regarding the need for better understanding of the benefits of DSP and market data generally for DSP are further discussed in chapter seven, which looks at how the supply chain collectively operates to use DSP, and hence are not further canvassed in this chapter.

In relation to information on network constraints, the AEMC is currently considering a rule change on the Distribution Network Planning and Expansion Framework. This rule change is looking at improvements to distribution network businesses existing annual planning and reporting processes, the introduction of a demand side engagement strategy and the introduction of a new regulatory investment test for distribution (RIT-D). This rule change is also considering what provisions will be needed in relation to improving transparency and information about distribution network constraints, specifically, that DNSPs will be required to report on system limitations in the new Distribution Annual Planning Report (DAPR). We consider the issues raised in this review relating to information transparency and gaps on network constraints can be addressed by that work.

Ensuring consumers and industry are well informed of the way the market works, the existing market arrangements, rules, roles and responsibilities of different players is important if they are to consider accessing the wholesale market, or undertaking DSP. We consider improving consumers and industry understanding of existing market arrangements and rules, particularly those wishing to take up DSP and access the wholesale market should be facilitated as appropriate.

4.3 Way forward

Educating consumers of the impacts of their electricity consumption on bills and costs of supply and providing sufficient, timely and useful information is a key condition for more informed decision making and hence take up of cost effective DSP. There is a large amount of information/programs available to consumers on ways to manage their consumption; however it is considered that this is sometimes confusing and inconsistent given the multiple parties involved. It is recognised that given the

100 EnerNOC, issues paper submission, p. 8; Power of choice review, stakeholder reference group meeting 24 October 2011.

101 My Home Power, issues paper submission, p.5-6; Energy Efficiency Council, issues paper submission, p.4; EnerNOC, issues paper submission, p.9.

102 South Australian Department for Transport Energy and Infrastructure, issues paper submission, p. 8; Department of Primary Industries Victoria, issues paper submission, p.1.

different capacities and preferences across and within consumer sectors, there is a need to consider a variety of approaches to deal with consumers and to deliver electricity products and services. This is likely to require new partnerships between all parties across the supply chain to educate and encourage greater participation and uptake of DSP responses.

We note that increasing awareness and providing better information may not be enough to encourage better choices and hence other market conditions are also required.[103] For the next stage of the review, we will consider the following issues:

- the role of network business, retailers and other third parties to engage with consumers - how dialogue can take place in a transparent manner when offering different products and services; and
- possible changes required to provisions in rules so that consumers can have timely access to their consumption data, taking account of other work in this area.

103 Even when good information is available, individuals may not make decisions in an optimal way (due to situational circumstances and lifestyle) and hence may still neglect opportunities – constraints on time, resources ability to process information. Public Interest Advocacy Centre (PIAC), issues paper submission, p.9.

5 Efficient operation of price signals

Summary

Pricing is a key element in signalling the value of DSP to consumers and other market participants. While price will only be one component of a decision on when and how much to consume, if consumers have access to prices which reflect the costs of supplying electricity at different times of the day and/or year, many may choose to reduce or cease consumption in high demand periods, which may both reduce their bills and avoid the need for some investment which would otherwise be required in the long term.

Current prices to consumers do not in general closely reflect the costs of supplying electricity. Retail tariffs to the majority of residential consumers consist of a fixed component and a variable component which is either flat for every unit consumed or increasing in blocks with rising consumption. Retail tariffs for large consumers vary considerably since they are bilaterally negotiated between retailer and consumer.

Efficient DSP does not require all consumers to face time-sensitive tariffs. If consumers are able to respond to the price signals they receive, and have easy access to information about the impacts of their decisions, then the most efficient outcomes result from consumers having the ability to choose a tariff which best suits their individual circumstances and preferences. Efficient outcomes require:

1. prices created in the wholesale market to reflect the cost of producing electricity in each half hour;

2. network charges to accurately reflect the cost of building additional capacity; and

3. retailers to have an incentive to offer contracts which respond to their customers' preferences.

Changes to some market conditions may improve the ability or incentive on retailers and NSPs to reflect their costs in pricing structures:

- Pricing which varies by time of use is only possible for consumers with meters which can measure consumption at frequent, regular intervals (e.g. half-hourly). Currently only about 12 per cent of small customers in the NEM have meters providing interval data.

- Rules around network and retail pricing may be restricting the extent to which NSPs and retailers can reflect costs in their tariffs.

- Consumers who are familiar with current pricing structures may benefit from information and guidance to aid acceptance and understanding of new structures.

Directions

For the next stage of the review we will consider:

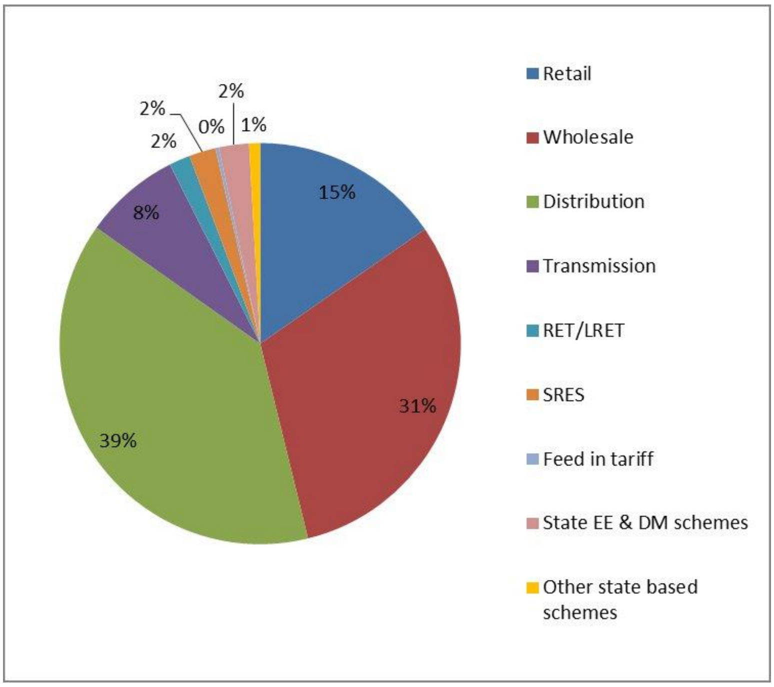
- the impact of time-sensitive tariffs on different types of consumers and any additional protections required for vulnerable consumers;
- the drivers of network costs and the ability and incentives for networks to charge cost-reflective prices;
- the ability of market participants to offer products which meet consumer demands; and
- the extent to which retail price regulation may restrict flexibility in retailers' pricing.

5.1 MCE terms of reference

The MCE ToR's ask the AEMC to "*assess the technical and administrative restrictions and barriers to the efficient operation of price signals in the NEM and their potential to promote efficient consumer DSP through enhancing consumers' ability to make informed choices concerning their use of electricity services, including the quantity and timing of their electricity consumption.*"

Pricing is one key element in signalling the value of DSP to consumers and other market participants. End prices to consumers are made up of the costs of wholesale, transmission, distribution, retail and government schemes. Figure 5.1 below shows the proportion of each element that made up an average residential consumer's bill in 2010.

Figure 5.1 Components of average residential consumer's bill, 2011-12



Source: Future Possible Retail Electricity Prices: 1 July 2011 to 30 June 2014, AEMC, Dec 2011.

This chapter looks at each of these elements in turn, comparing observed prices in the NEM with theoretically efficient prices.

5.2 Why are efficient price signals important?

A significant proportion of the costs of meeting demand for electricity are incurred in supplying the few highest demand periods. This suggests that a reduction in demand in only a few periods per year could create a proportionally greater reduction in costs. For example, the EY report projects that in Victoria in 2020, the top 1 per cent of forecast peak half hourly periods will equate to 18.8 per cent of Victorian annual peak demand. They estimate that between $3.4 billion and $11.1 billion in network costs could be avoided in the NEM over the period 2011-2030 if demand in the top 1 per cent of peak demand periods could be reduced (to the level of the next highest demand period). This would not constitute a direct saving as the costs of any measures used to reduce demand would need to be netted off, but demonstrates the potential savings available.[104]

Price will only be one component of a decision on when and how much to consume; other factors such as convenience, awareness and understanding will also determine consumption behaviour, as described elsewhere in this document.

If consumers have access to prices which reflect the costs of supplying electricity at different times of the day and/or year, many may choose to reduce or cease consumption in these high demand periods, which may both reduce their bills in the short term and avoid the need for some investment which would otherwise be required in the long term. Others may prefer the certainty of a flat tariff, even if that tariff includes a premium for the retailer to take on the price risk. Where tariff structures (including any risk premium) are transparent and consumers are informed about the options, any consumption choice they make will be equally efficient.

It is important for consumers to be able to choose the type of tariff they receive as some consumers would be worse off from cost-reflective tariffs, e.g. if they consume a lot at peak times and are unable to adjust their consumption behaviour. Some vulnerable consumers may have difficulty paying bills due to changes in tariff structures. It is important that protection is available for such consumers to help them choose the best tariff for them. If changes to tariff structures have negative impacts on vulnerable consumers, some form of support or protection may be appropriate.

Other consumers may benefit from more cost-reflective tariffs if they were able to invest in technology to take advantage of them. In such cases, some form of support may be beneficial. Some responses to the issues paper expressed concern about the impact of changes in tariff structures on vulnerable consumers. Others argued that

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104 Ernst & Young, *AEMC Power of Choice: Rationale and drivers for DSP in the electricity market – demand and supply of electricity*, 20 December 2011.

vulnerable consumers could benefit from more dynamic pricing (such as time of use tariffs).[105][106] For the purposes of the review, we consider that there are two basic elements that should be taken into account in defining the vulnerability of consumers to price changes. A vulnerable consumer is affected by changes to make pricing structures more cost-reflective because:

- there is a significant deterioration in the consumer's financial ability to pay their bills; and
- the consumer has a limited ability to respond.

Appendix D summarises a number of papers which look at how vulnerable consumers can be disadvantaged by price changes.

In the rest of this chapter we describe current observed prices in the electricity market, and compare them with theoretically cost-reflective price structures. We then explain the market conditions that may currently be acting as restrictions to achieving cost-reflective prices in practice, and consider whether current prices could be improved to provide more efficient signals. The PwC report published in December 2011 that was commissioned as part of this review looks at examples of observed prices at each level of the supply chain, focussing on the residential sector.[107] Parts of this chapter draw heavily from that report.

5.3 Current electricity tariffs to consumers

Residential

Electricity tariffs faced by residential consumers typically have a fixed charge per day and a charge for each unit consumed.[108] The unit charge is most commonly either a flat tariff, which prices every unit of electricity consumed equally, or an inclining block tariff, whereby the unit price increases once a certain consumption threshold has been reached within a given period. Some residential consumers also have the option of tariffs which vary by time of use, but these tariffs are only technically feasible for consumers who have interval meters. Currently about 12 per cent of small customers in the NEM have meters providing interval data, as shown in Table 5.1.

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105 Origin Energy, issues paper submission, p. 5; SmartGrid Australia, issues paper submission, p.7; Essential Energy, issues paper submission, p.10; SP Ausnet, issues paper submission, p. 11.

106 The National Electricity Customer Framework does not include the term 'vulnerable consumer'. It only refers to hardship customers. Hardship customers are defined as "someone who, though willing to pay their energy bills on time in accordance with our usual payment terms, is experiencing financial difficulties that mean they cannot pay on time"

107 PricewaterhouseCoopers Australia, *Investigation of the efficient operation of price signals in the NEM*, December 2011.

108 Appendix C describes the range of possible tariff types that could be offered to consumers.

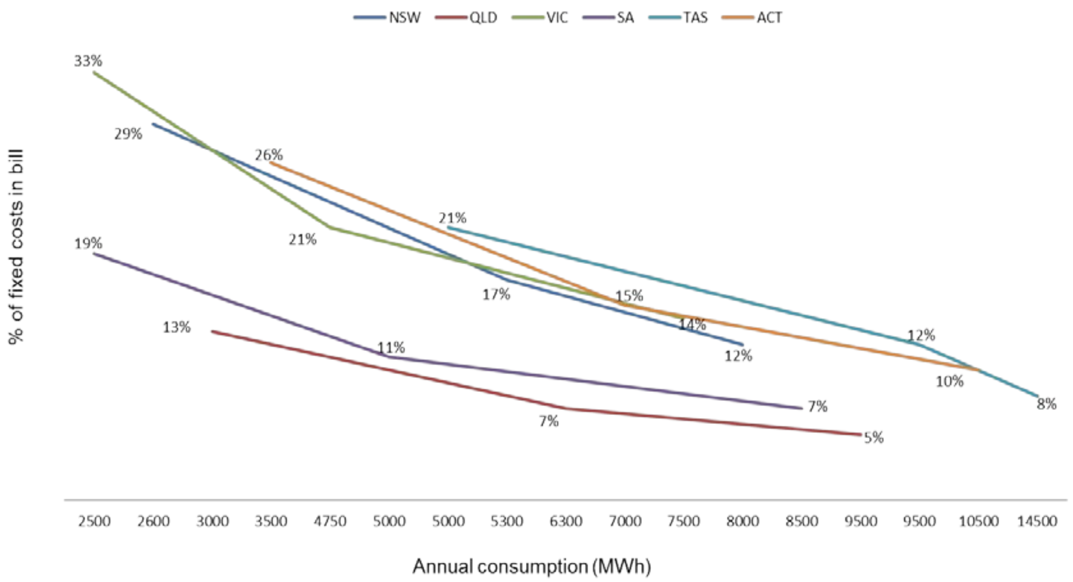
Table 5.1 Meters in the NEM providing interval data[109]

	Small Customers		Large Customers	
	Number of meters providing interval data	Number of meters providing accumulation data	Number of meters providing interval data	Number of meters providing accumulation data
Totals	1019819	7265384	67363	11363
Percentages	12.2	86.9	0.8	0.1
Percentage of that size	12.3	87.7	85.6	14.4

Source: AEMO data

Figure 5.2 shows the average proportion of residential bills made up of fixed charges for different consumption levels in each state of the NEM. On average, 14 per cent of a medium consumer's bill is made up of fixed charges.

Figure 5.2 Average fixed charge as proportion of residential bill by state



Source: AEMC analysis

While inclining block tariffs are common, the levels of consumption at which prices change (i.e. the size of the blocks) and the relative prices between different blocks vary

109 The annual consumption boundary which defines large and small consumers varies by state. In Queensland it is 100MWh, in Tasmania 150MWh and in all other NEM states 160MWh. The data may exclude some interval meters which are currently read as accumulation meters.

considerably across retailers and states. The PwC report contains a number of examples.[110]

PwC has found evidence that the structure of retailers tariffs tends to follow the structure of the network tariffs for those consumers. Where the network tariff is flat, the retail tariff is flat. Where the network charge is made on an inclining block basis, retail pricing tends to follow the same consumption blocks. Where the network charge is time-sensitive, and interval meters allow it, retail tariffs are also time-sensitive.

Commercial and Industrial

There is less transparency around the exact nature of prices faced by large consumers, as tariffs tend to be bilaterally negotiated, but time of use tariffs are much more prevalent for these consumers. Futura found that some retailers offer contracts to larger consumers which include direct exposure to wholesale prices. Furthermore, many commercial and industrial consumers pay for electricity based on their peak demand (measured in kW) rather than their volume consumption (measured in kWh).[111]

For smaller businesses, some time of use tariffs are available, but tariffs are generally similar to those available to residential consumers.

5.4 What are efficient prices?

Perfectly efficient electricity prices would mean that for each unit of electricity a consumer consumes, they are charged the full costs (and no more) that are incurred in supplying that unit of electricity. This means that (a) suppliers recover the costs of providing electricity and (b) consumers spend no more than they need to on the services that electricity provides. Where prices are higher than the cost of provision, some consumers will choose not to consume an extra unit even though they would be willing to pay the cost of producing that unit.

The competitive process - or in the case of the natural monopoly elements (i.e. networks), the regulatory process - should provide an incentive on companies to price their part of the electricity supply service at the level it costs them to provide it. In most markets, suppliers will charge a price for their product which recovers the costs of providing it and reflects the relative levels of demand and supply at the time, and consumers will look at the price of the product and decide how much of it to buy. In the electricity market, the vast majority of consumers do not make active consumption decisions in response to price, and the price to end consumers tends to be fixed for several months at a time. However, as we describe below, the costs of supplying electricity can vary significantly over the course of a day and a year.

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110 The St Vincent de Paul Society has also carried out analysis of residential tariffs in Victoria and New South Wales, which can be found at www.vinnies.org.au

111 Futura Consulting, *Investigation of existing and plausible future demand side participation in the electricity market - a report for the AEMC*, 8 December 2011

In determining whether it is efficient to make changes to tariff structures, the costs of making the changes need to be taken into account – including the costs of installing infrastructure, providing information, and transaction and administrative costs. Even if prices are cost-reflective, they will not be efficient if the costs involved in putting them in place and in enabling a consumer response outweigh the long term benefits of lower costs of provision.

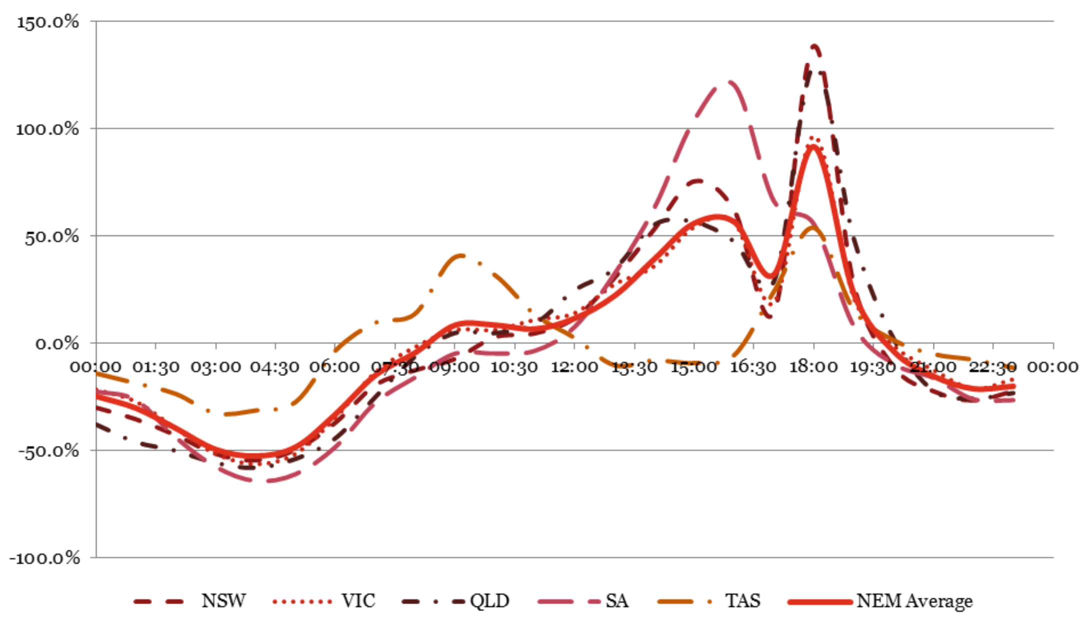
5.5 Wholesale market

Prices in the wholesale market are determined by a combination of bids submitted by generators and the level of demand for each half-hour period of the day. This section briefly looks at how wholesale prices vary throughout the day and year reflecting changing demand and supply conditions.

5.5.1 Wholesale prices

Retailers purchase the electricity to supply their consumers from the wholesale market. They can do this through entering contracts with generators directly or purchasing from the spot market, or some combination. Prices on the spot market vary in each period they are set - i.e. each half-hour of the day - as demand and supply conditions vary. However, they tend to display a broadly similar pattern, or shape, from day to day and week to week, reflecting mainly the shape of demand over the day. Figure 5.3 shows the average shape of wholesale prices over the day for all days from 1999 to 2010 for each NEM jurisdiction.

Figure 5.3 Relative hourly prices in the NEM by jurisdiction (1999-2010)

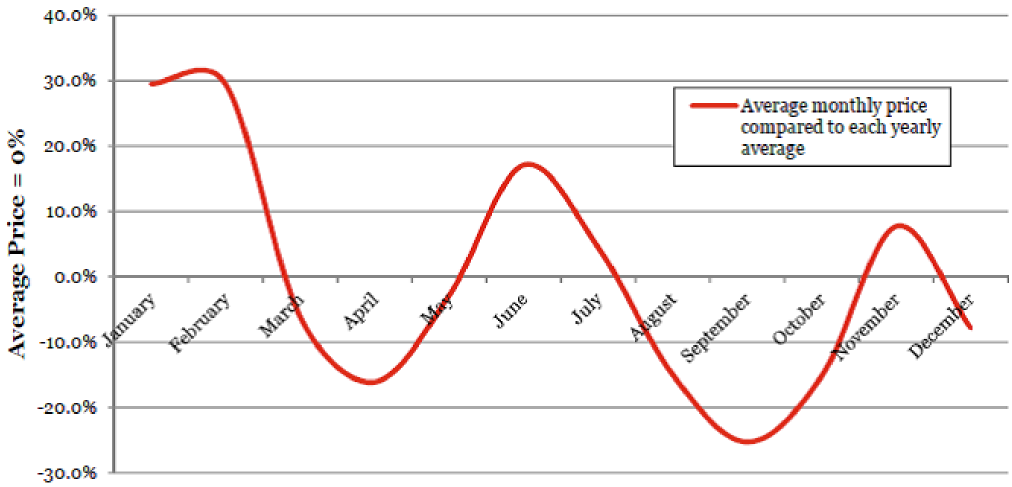


Source: PwC report

A similar pattern is seen in each state, with the slight exception of Tasmania, which has a flatter shape overall, with a morning peak that the other states do not have, but without the same afternoon peak. This is likely to be driven by the cooler climate, causing more demand for heating in the winter mornings, and less demand for cooling in the summer afternoons.

There is also a typical pattern of prices varying by time of year, as a significant proportion of demand is driven by heating and cooling requirements. Figure 5.4 below shows the average annual shape of prices since the start of the NEM, across all jurisdictions.

Figure 5.4 Relative monthly prices in the NEM (1999-2010)



Source: PwC report

5.5.2 Wholesale costs

Prices in each period will essentially be determined by the level of demand and the availability and costs of different types of generators. Higher prices are driven by a need to dispatch higher priced power stations in order to meet demand and therefore, as with all competitive markets, one would expect higher demand and lower supply to increase price (and vice versa).

The effectiveness of the wholesale market in translating underlying market conditions into prices is not being considered as part of this review, and we assume that the prices in each region (known as regional reference prices or RRPs) are an efficient price for that region.[112] Section 5.7 looks at the extent to which retailers pass on these prices in their contracts with end consumers.

112 The widespread use of long term contracts in the sale and purchase of wholesale electricity can act to mute the extent to which wholesale prices faced by retailers (and others) in practice reflect the costs of generating power in any given period. However, such contracts are likely to be an efficient response to the large fluctuations in prices, and are likely to lead to lower costs overall.

5.6 Networks

Transmission and distribution network service providers (NSPs) look to recover the costs of building and operating the electricity networks in their charges to retailers and some very large consumers. This review is concerned with whether the charges faced by the demand side of the market (being retailers and consumers) are providing efficient price signals.

5.6.1 Network prices

The AER regulates the prices that NSPs can charge their customers, through capping either prices or revenues, based on proposals submitted by the businesses.[113] Tariffs usually apply to all consumers in a given size category within a distribution service area. PwC's report shows a range of tariff types within the NEM. For large consumers who have a direct contract with the NSP, a capacity charge based on peak demand in a year is common, but the most common structure of charges involves a daily service charge and an energy consumption charge.[114] For most consumers, NSPs charge a flat price for each unit consumed. For consumers with interval meters, tariffs often vary by time of day or year.

Figure 5.5 Non-time of use network tariff usage across distribution areas

Network tariff type	Description	Where Applied (small consumers only)
Flat tariff	One price for all energy consumption	- **VIC:** Jemena, United Energy - **NSW:** Essential - **QLD^:** Energex, Ergon
Block tariff	Energy prices vary for each block of marginal volume of consumption (usually inclining where price for each block increases as consumption increases)	- **SA:** ETSA Utilities (4 blocks) - **VIC:** Citipower (2 blocks)*; Powercor (4 blocks)*, SP AusNet (2 blocks) - **NSW:** Ausgrid(2 blocks)*; Endeavour (2 blocks)

Source: PwC report

113 A NSP's customers are either large, directly-connected consumers or retailers, who will include these network prices in some way in the tariffs they charge to end-consumers

114 See Section 5.6.3 below for a discussion of capacity and energy charges

Figure 5.6 Time of use network tariff usage across distribution areas

Network tariff type		Description	Where Applied (small consumers only)
			- **TAS:** Aurora (3 blocks)
Time of use:	peak / off peak only	Energy prices vary based on the time of day that consumption occurs. Tariffs comprise a peak rate and an off-peak rate.	- **VIC:** SP AusNet, United Energy, Jemena - **QLD:** Energex
Time of use:	peak / off peak with inclining block tariff	Energy prices vary based on the time of day that consumption occurs. Tariffs comprise a peak rate and an off-peak rate. During the peak times, there is an inclining block tariff structure	- **VIC:** Citipower, Powercor
Time of use:	peak/ shoulder/ off peak	Energy prices vary based on the time of day that consumption occurs. Tariffs comprise at least three separate prices – peak, shoulder and an off-peak rate.	- **NSW:** Ausgrid, Essential, Endeavour - **VIC:** SP AusNet
Seasonal tariffs		Energy price varies on a seasonal basis. Usually the summer months are priced at a higher rate than other months, in some cases winter months are also priced at a higher rate.	- **VIC:** United Energy (includes summer and other rates, used with peak/ shoulder/ off-peak tariff); SP AusNet (includes Summer, winter and other months rate, used with peak/shoulder/off-peak tariff) - **SA:** ETSA

*Only available to existing consumers
Source: Distribution businesses published tariff schedules

Source: PwC report

5.6.2 Network costs

The vast majority of the costs of owning and operating a network come from large capital investments in the physical infrastructure (poles and wires etc.), and the operational costs of maintaining the infrastructure. As such, once the infrastructure is built, the incremental costs of transmitting electricity (within the capacity limits of the infrastructure) are negligible. However, once the capacity limit of a part of the network is reached, the cost of transmitting the next unit of electricity is substantial, as the infrastructure would have be increased or upgraded to accommodate that extra unit.[115]

The network charge should therefore reflect the cost of increasing network capacity at peak times. A theoretically pure network price would then not charge for any units flowed up to the capacity of the relevant part of the network, but would charge the entire costs of reinforcement or upgrade to the consumer who consumed the first unit above that capacity. However, a similar price signal can be achieved if a NSP charges each unit at the long run marginal cost (LRMC) of increasing network capacity at peak times.

Prices based on LRMC will encourage efficient long term consumption decisions, including where to locate as well as production or appliance choices. The short-run marginal cost of existing capacity is very low, therefore prices for use of existing capacity would also be low most of the time. However, these short-run signals can still

115 Network Control Ancillary Services (NCAS) can provide a small amount of additional capacity for a short period of time. Their use is only cost effective if used occasionally; if they are required frequently, it is likely to be more efficient to build an additional line, or reinforce the existing line, to accommodate the additional capacity

be provided to consumers, for instance, where there are unplanned outages or other short-term constraints on network capability.

The PwC report explains that the marginal costs of network services will vary based on a number of factors, including differences between consumers and their locations, times of use, types of use. The amount of infrastructure - and therefore the investment costs - needed to supply different groups of consumers varies depending on their location relative to power stations and the main transmission networks. Consequently the costs of supplying different load centres varies. A fully cost-reflective price would vary between small areas of customer. As an illustration, Figure 5.7 shows the demand profiles of three different zone substations within Aurora's network:

Zone substation profiles, Aurora Energy network

Figure 5.7 Bellerive Zone Substation Daily Profile

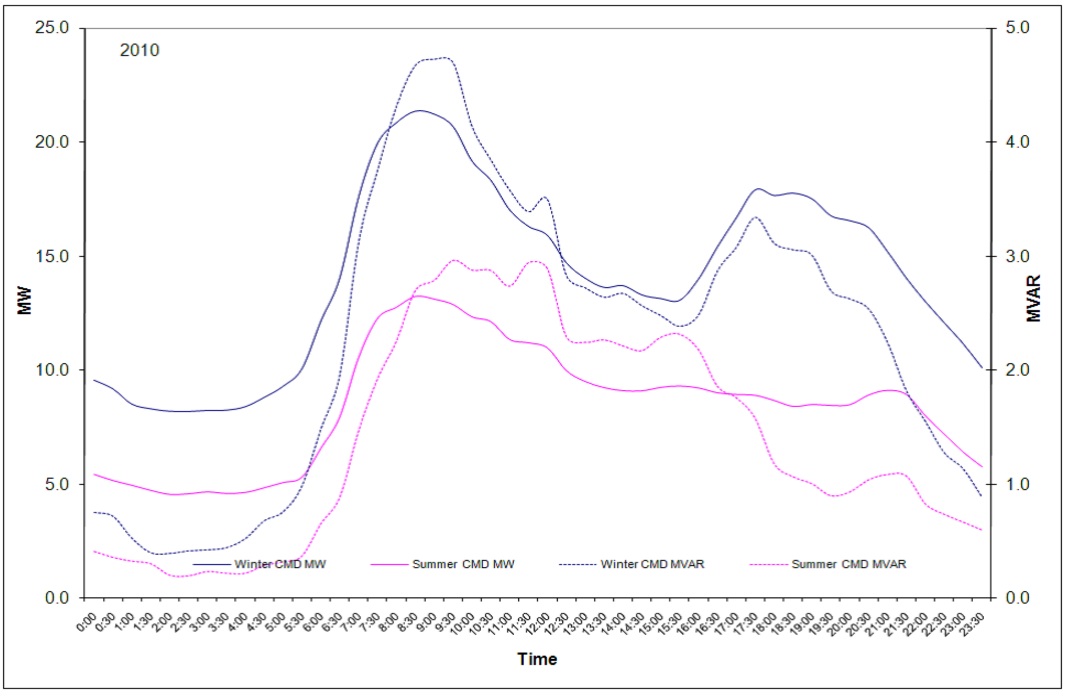


Figure 5.8 Cambridge Zone Substation Daily Profile

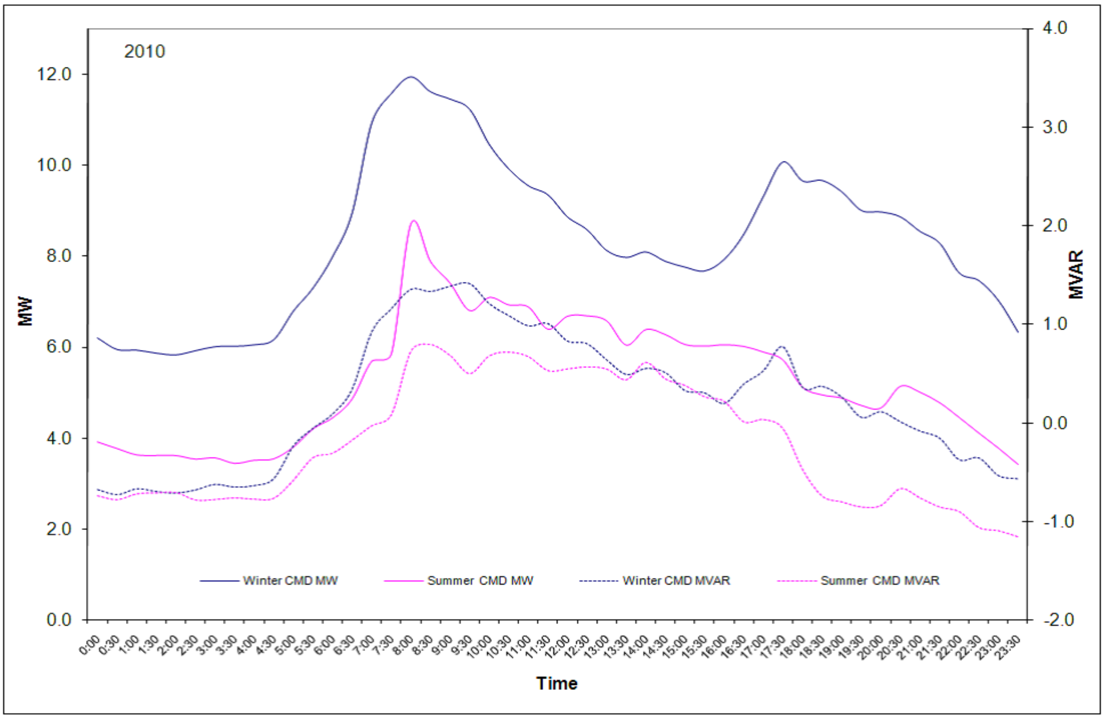


Figure 5.9 Claremont Zone Substation Daily Profile

Source: Aurora Distribution System Planning Report 2011

While these examples are only illustrative, they demonstrate that looking at demand on a state-wide basis is likely to provide only a rough indication of the costs incurred by each individual network business. DNSPs have to ensure they provide sufficient capacity to meet demand in every part of their network, so differing demand patterns in different locations can have a substantial impact on costs. A tariff which provides appropriate signals in one of the three areas above would provide incorrect signals in the other areas.

Given the nature of network investment, pricing on the basis of long-run marginal costs may lead to a network business not recovering all of its allowed costs. The costs that would not be recovered through long-run marginal cost prices are, by implication, not influenced by consumption decisions. Economic principles therefore suggest that such costs should be recovered in a manner that has the least effect on usage. The most straightforward means of doing this is to recover such costs through fixed charges, for example, a standard annual charge for each consumer.

5.6.3 Capacity or energy charges?

This chapter generally refers to "units" of electricity. But the units that drive wholesale costs may not be the same as those that drive network costs. Whilst there are wholesale (generation) costs involved in producing each kWh of electricity, the required capacity of the network infrastructure is determined by the size of the peak demand, i.e. the highest coincident level of consumption at any one time. Consequently, the costs that each consumer imposes on a network are linked to its highest level of demand in a day or year, rather than the total amount consumed. It may therefore be efficient for network charges to be based on a kW, rather than kWh, measurement. A kW of consumption will affect a NSP's costs in a different way depending on the period in which that consumption occurs - i.e. the extent to which it coincides with the system peak. Efficient network pricing would charge more for consuming at times of system peak demand than in times of low demand.[116]

While “capacity meters” are available, a standard interval meter, which measures demand on a half-hourly basis, is likely to be sufficient for the purposes of valuing the impact on the network of any individual consumer’s consumption.

In submissions to the issues paper most NSPs supported a move towards a greater proportion of costs being recovered through fixed capacity based charges than through volume charges, saying that network costs are driven by capacity requirements.[117] One NSP, SPAusNet, disagreed, arguing that consumers understand volume more

116 Some NSPs advocated charging on the basis of kilowatts (kW - real power); others on the basis of kilovolt-amperes (kVA - apparent power). The difference depends on the extra loading associated with the flow of reactive power (usually defined by the power factor). The power factor for most electrical devices ranges from 0.6 to 0.95, which means that consumption of 1 kW requires more than 1 kVA of power. For definitions, see Chapter 10 of the NER. For further explanation, see for example, Federal Energy Regulatory Commission, *Principles for Efficient and Reliable Reactive Power Supply and Consumption*, FERC, 4 February 2005.

117 Energex, issues paper submission, p.4; Essential Energy, issues paper submission, p.7; Ergon Energy, issues paper submission, p.6.

than demand and there is a strong correlation between a consumer's peak demand and its total energy consumption.[118]

Questions	**Network pricing and incentives**
5.	**Should network charges vary by time of use?**
6.	**Should NSPs charge on a volume or capacity basis?**
7.	**What changes are needed to market conditions to facilitate more cost-reflective network pricing?**

5.7 Retail

Retailers have the role of packaging all of the costs involved in supplying electricity to end consumers into retail tariffs (and other contract terms). As well as passing on (in some form) the wholesale and network charges they face, they incur costs in transacting with generators and NSPs, and in acquiring and servicing consumers.

5.7.1 Retail prices

Different jurisdictions within the NEM place different levels of regulation on retail pricing, from a fully regulated market with no choice of supplier for small consumers in Tasmania, to full deregulation of retail pricing in Victoria. Queensland, New South Wales, Australian Capital Territory and South Australia have at least one mandatory regulated tariff. Most retailers therefore have to offer a regulated tariff, which has a structure mandated by the relevant jurisdiction. Except in Tasmania, retailers also offer at least one unregulated tariff ("market offer"), which they are free to structure as they choose.

Regulated tariffs

The PwC report outlines a number of retailers' regulated tariffs. An allowance is calculated for wholesale costs, using different approaches in each jurisdiction. An allowance is also made for retailers’ own costs, which are estimated by the regulators. The treatment of network charges varies across jurisdictions. In most cases, the retailer is allowed to recover the total cost of its network charges.

The marginal price of most regulated tariffs depends only on the level of consumption and does not vary by time of use, but in Queensland and New South Wales regulated tariffs are offered which vary according to the time of consumption. In Queensland peak prices apply from 7am to 9pm on week days, and off-peak prices at all other times. In New South Wales, the three largest retailers offer 3-part time of use tariffs, as shown in Figure 5.10.

118 SPAusNet, issues paper submission, p.11.

Figure 5.10 Regulated time of use tariffs in NSW

	Peak	Shoulder	Off Peak
Energy Australia	2pm to 8pm on working weekdays	7am to 2pm and 8pm to 10pm on working weekdays, 7am to 10pm on weekends and public holidays	All other times
Country Energy	7 am to 9 am and 5pm to 8pm on weekdays	9am to 5 pm and 8pm to 10 pm on weekdays	All other times
Integral Energy	1pm to 8pm on business days	7am to 1 pm and 8pm to 10pm on business days and 7am to 10pm on weekends and public holidays	All other times

Source: PwC report

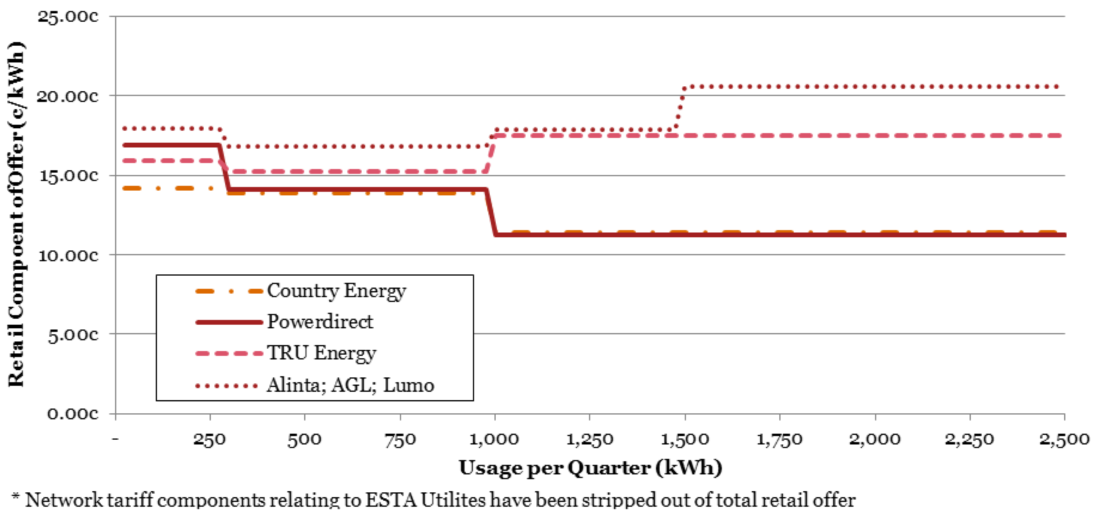
If a consumer wants to move to a regulated time of use tariff but does not have an interval meter installed, they will usually have to pay a charge to have the meter installed.

Market offers

While in most states retailers must offer a regulated tariff, in all NEM states except Tasmania they are also free to offer tariffs of any form and structure they choose ('market offers') alongside any regulated tariff. A range of market offers is available. However, PwC found that in jurisdictions where there are regulated tariffs, market offers tend to mirror the structure of those tariffs, usually with a small discount (3-5 per cent) on the price.

PwC found that non-time of use market offers often follow the structure of network charges that the retailers face - where the network charge is a flat price, the retail market offers are also flat; where the network charge is made on an inclining block basis, retail tariffs tend to have varying unit prices based on the same consumption blocks. A number of market offers do not follow the structure of either the regulated tariff or the network charge. For example, in South Australia the network charge is an inclining block tariff, but the retail element of the price falls with increasing consumption blocks.

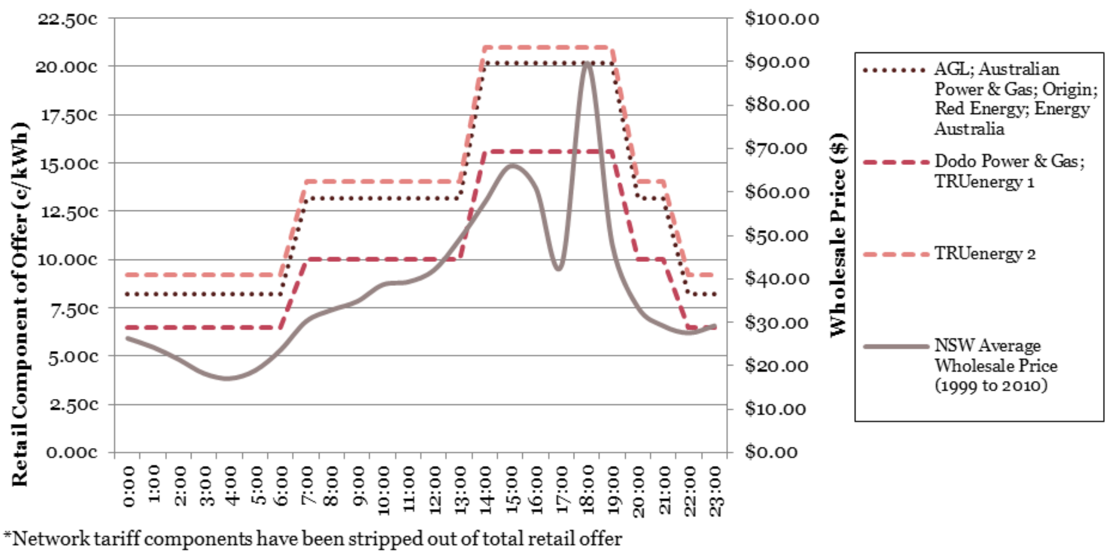
Figure 5.11 Retail component of market offers in ETSA distribution area)



Source: PwC report

PwC also identified a number of time of use tariffs available to residential consumers. As stated above, there is a limited market for such tariffs since an interval meter is required to measure the time of consumption. Of the one million meters providing interval data for small consumers in the NEM, as identified in Table 5.1, more than one third (approximately 370 000) are in Ausgrid's distribution area. A number of retailers in that area offer tariffs that are higher at times of peak demand and lower at off-peak, as Figure 5.12 shows.

Figure 5.12 Retail component of market offers in Ausgrid distribution area



Source: PwC report

5.7.2 Retail costs

Retailers' principal role in the market is to act as an agent for consumers in contracting for energy services and packaging them to meet consumers' requirements. Where this is done efficiently, retailers will be able to pass the costs of the wholesale electricity and the network charges onto consumers.

Where retail markets are open to competition, the majority of a retailer's direct costs will be the costs of marketing to and acquiring consumers, and administering their accounts (billing, call centres etc.). Consequently, changes in a retailer's costs are driven largely by the number of customers they serve, rather than the volume of electricity those consumers consume (or their peak demand). Costs will tend to be lumpy, however, as the addition of a single customer will have a negligible impact on costs, but once the IT/billing systems used to service consumers reach capacity, a significant investment may be required to replace or upgrade the systems. In practice, retailers are likely to forecast the number of consumers they think they will acquire in a given time period, and invest in systems appropriate to that number. They will then spread the cost across all of their consumers.

As described above, prices in the wholesale market for electricity change every half-hour throughout the year to reflect differing market conditions. Generation companies, whose core business is to operate in the market, are able to continually monitor the market and adjust their operations accordingly. On the other hand, consumers, with the exception of the very largest consumers, do not have sufficiently high electricity consumption to justify devoting resources to interacting with the market so actively. By spreading the costs of interacting with the wholesale market across a large portfolio of customers, retailers can interact with the wholesale market on consumers' behalf.

In order to minimise costs of purchasing electricity, retailers (and other purchasers of wholesale electricity) have an incentive to minimise the volumes of wholesale electricity that they purchase at peak prices. Since electricity cannot currently be economically stored, they can only do this if their customers reduce their consumption at the times that peak prices occur. In theory, the most efficient consumption decisions should be brought about by exposing consumers to the costs of supplying them with electricity at all times. This would mean that electricity is supplied to all consumers who are willing to pay the cost of producing it at any given time, but nobody would pay more than the value they place on consuming electricity at that time.

The majority of consumers are likely to prefer not to face the volatility of prices that vary every half-hour, and would prefer to pay a premium for a flatter pricing structure. Retailers can hedge themselves against excessive variation in prices through contracting arrangements with generators or third parties. While this means the signals of half-hourly price variations are not directly felt by most market participants, efficient decisions should still be signalled, as the magnitude of the price spikes will affect the terms of the contracts between sellers and purchasers of electricity.

In recent years retailers have also been given the role of recovering the costs of government schemes, such as the renewable energy target (RET) and energy efficiency schemes. Whilst the direct charges associated with schemes account for around 5 per cent of consumer bills, the additional costs incurred by retailers in administering the schemes are likely to be small.[119]

Questions — Retail pricing and incentives

8. **Do retailers have the right incentives to pass through appropriate wholesale costs and network charges to consumers?**

9. **Do retailers have an incentive to minimise the costs of their customers' consumption?**

5.8 How do current tariffs compare to cost-reflective tariffs?

Wholesale

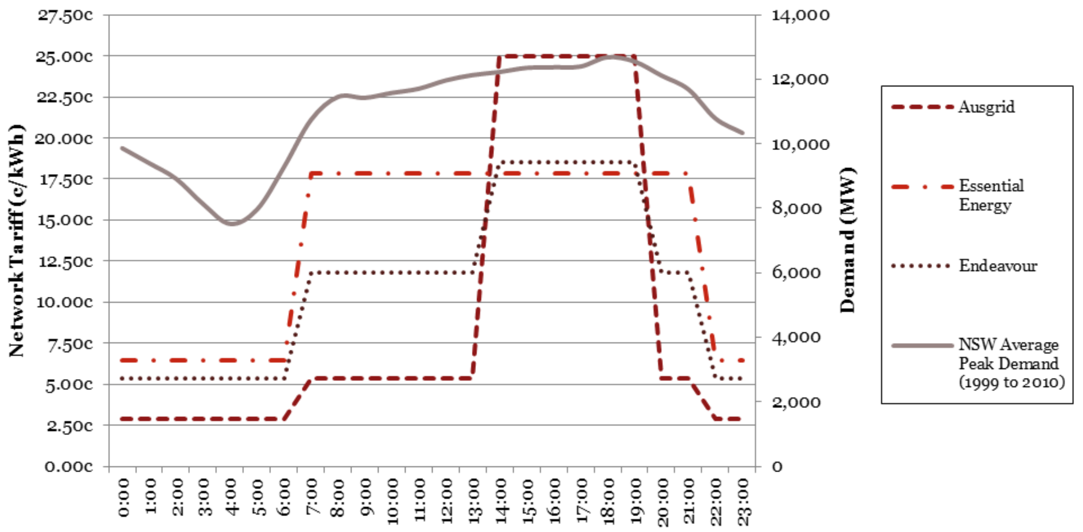
As noted above, the effectiveness of the wholesale market in translating underlying market conditions into prices is not under consideration as part of this review, and we assume that the prices in each region (regional reference prices – RRPs) are an efficient price for that region.

Network

While we do not have sufficient information to estimate how closely NSPs' charges are based on their LRMCs, PwC matches the shape of some existing time of use tariffs against average peak demand levels across a day, which demonstrates that some tariffs are sending a signal which should encourage consumption at off-peak times (and discourage it at peak times).

119 AEMC, *Future Possible Retail Electricity Price Movements: 1 July 2010 to 30 June 2013*, June 2011

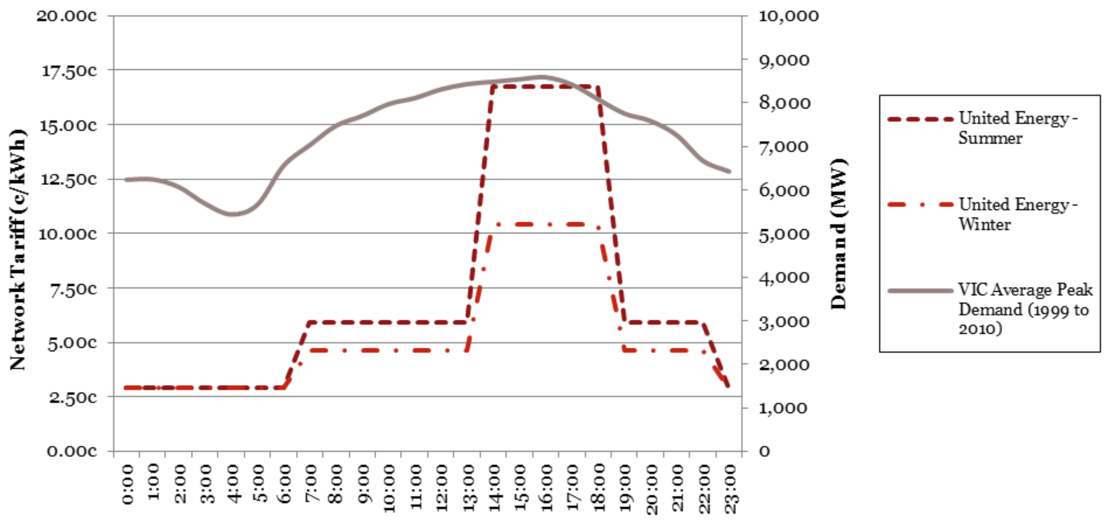
Figure 5.13 NSW Network tariffs (time of use)



Source: PwC report

PwC also show the seasonal tariffs offered by United Energy and SP Ausnet, which have a lower price in winter and in off-peak periods during the day. Figure 5.14 illustrates the United Energy seasonal tariff.

Figure 5.14 Time of use network tariff offered by United Energy



Source: PwC report

It is clear then that some NSPs are signalling to some extent the changes in their costs over the day and over the year. United Energy's tariff shows a significant differential between the peak winter price – at around 17c/kWh – and the off-peak summer price – at around 3c/kWh, providing a strong signal to minimise use of the network in peak times. However, these are selected examples and are only available for consumers with interval meters; network tariffs for most consumers have much flatter structures.[120]

Retail

While a range of tariff structures is offered by retailers, the majority of residential consumers are on flat or inclining block tariffs. The typical structure of these tariffs has two elements:

- a fixed component (usually a daily charge); and
- a variable component (either flat for every unit consumed or increasing in blocks with rising consumption).

Retail tariffs for large consumers vary considerably since they are bilaterally negotiated between retailer and consumer. The negotiation process provides an opportunity for consumers to receive cost reflective tariffs where they wish to, as long as retail competition is sufficiently effective to reward retailers who are best able to meet consumers' requirements. Therefore there may be more potential for cost-reflective pricing in this segment of the market. However the business rationale for the consumer could be to lock in a fixed energy price to remove any risks/uncertainty from price fluctuations. Providing such a tariff could also be a source of value for the retailer.

The analysis in this chapter indicates that a theoretically cost-reflective retail tariff would reflect the following underlying cost drivers of the retailer:

- a variable component which varies by time of use to recover **wholesale energy costs** (this could include a critical peak price element to signal short term, high cost events such as generator outages or network constraints);
- a network LRMC component which varies by location to signal the need for **network investment**; and
- a fixed component to recover **fixed network costs** and **retail costs**.

From a consumer's perspective, a cost-reflective tariff is likely to continue to appear on their bill as a fixed component and a variable component, as many do now, but with a key difference that the variable component would vary by time and by location. The relative size of each component may also be different.

Efficient DSP does not require all consumers to face time-sensitive or location-sensitive tariffs. If consumers have the capability to respond to the price signals they receive, and have easy access to information about the impacts and consequences of their decisions, the most efficient outcomes result from consumers having the ability to choose a tariff which best suits their individual circumstances and preferences. As we

120 Some accumulation meters may have two registers, so that they effectively act as two meters measuring consumption at different times. However, in the absence of information to show that a significant number of such meters exist in the NEM, for the purposes of this directions paper we assume an interval meter is required to measure consumption by time of use.

noted above, many consumers (particularly residential and other small consumers) will prefer to face a flat tariff. Such tariffs are likely to include some form of risk premium to compensate the retailer for its increased exposure to price fluctuations (compared to a tariff which passes some of those fluctuations onto consumers). As long as the risk premium included in flatter tariffs is transparent to consumers – and is an accurate reflection of the retailer’s risks – any choice the consumer makes will be equally efficient. The retailer will still have incentives to minimise the electricity it purchases at peak times in order to minimise its costs.

Cost-reflective tariffs would not necessarily be identical in all parts of the NEM. The fixed element is likely to vary slightly depending on which distribution area the consumer is in. The variable wholesale component would differ for each region of the NEM (but would be the same within each region for a given retailer). The LRMC component could vary significantly between relatively small areas. This implies that tariffs could have a different 'shape' across the day in different areas. In some areas, the peak on the network may occur at around the same time as the peak in the wholesale market. In those circumstances, there is likely to be a substantial differential between the price at that peak time and the price at other times (particularly if that part of the network is close to capacity). In other areas however, the network and wholesale peaks may occur at different times. In those cases, the cost-reflective tariff may in fact provide a relatively flat price signal, as the two peaks are spread out.

Consumer response may differ considerably between two such tariffs. For example, consumers may be more likely to alter consumption in the face of a 'short, sharp' price peak than a longer, less severe peak, even if equal savings could be achieved by reducing or avoiding consumption over either peak period. Chapter 3 and the report by Futura discuss consumer preferences and habits.

Questions Cost-reflective tariffs

10. Would a tariff with a fixed, variable and network LRMC element as described in section 5.8 closely reflect the costs of supplying electricity?

11. What are the restrictions on retailers offering such a tariff?

5.9 Potential for price signals to promote efficient consumer DSP

Prices are one way of signalling the value of DSP to consumers and other market participants. Trials of different pricing options provide evidence that prices which vary by time of use have the potential to bring about material shifts in consumption patterns which can create significant savings in the costs of supply. Critical peak price and dynamic peak price tariffs appear to provoke the largest response, with peak demand reductions of up to 30 to 40 per cent observed.[121] Trials of simple time of use prices

121 Futura Consulting, *Investigation of existing and plausible future demand side participation in the electricity market - a report for the AEMC*, 8 December 2011

have tended to induce less material consumption shifts, with low single figure changes in demand typical.[122]

However, the results vary significantly across different trials, which demonstrates that price is only one factor in promoting DSP. Other factors include how informed consumers are of the potential benefits, the type of consumers targeted by the trials, and the form in which a price change is offered (e.g. lower prices, a rebate, or an incentive payment). Appendix B discusses in more detail the evidence on the effectiveness of price-based DSP.

There is evidence that methods other than price may be effective in terms of the level of DSP they bring about. For example, some forms of direct load control have been shown to achieve shifts in consumption of around 30 per cent.[123] However, the magnitude of a change in consumption is not necessarily a measure of the efficiency of DSP. A reduction or shift in consumption is only efficient if the value to the consumer of the service provided by that electricity is outweighed by the cost of supplying it at that time.[124]

There are two principal ways in which a consumer can gain value from price-based DSP. They can simply reduce their consumption when prices are high, in order to reduce their bill. Alternatively, they may be able to sell their flexibility (possibly through a third party such as an aggregator) as a service to a retailer or NSP, who may be able to use that flexibility to avoid costs such as purchasing wholesale power or building additional infrastructure.

The value of flexible demand to a retailer or NSP is likely to depend on the "firmness" of that flexibility – i.e. the extent to which a given reduction in demand is guaranteed to happen when it is required. For example, if a NSP decides the capacity of its existing network is sufficient as long as a certain level of demand reduction occurs at peak times (and in specific locations), it must be able to rely on that demand reduction taking place in order to meet its obligations with respect to reliability standards (and therefore to avoid blackouts).

If DSP can be provided through a contract – with penalties for non-compliance, it is therefore likely to provide greater value than DSP which is simply a response to high prices. However this distinction is not always clear-cut, as over time the level of demand response from uncontracted price-based DSP services may become predictable with a degree of confidence, or the NSP could apply probability factors in estimating the extent of demand response.

Question	**Potential for price signals to promote DSP**
12.	**Can efficient levels of DSP be achieved without cost-reflective prices?**

122 Ibid

123 Ibid

124 Chapter four discusses the ability of consumers to assess whether they are likely to benefit from different tariffs.

What considerations are needed to achieve this?

5.10 How can prices be made more cost-reflective?

Cost-reflective prices alone will not bring about efficient outcomes in terms of consumer choices. Consumers must also have the capability to respond to the price signals they receive, and must be informed about the impacts and consequences of their decisions. However, the Commission's view is that efficient, lowest cost outcomes require:

1. prices created in the wholesale market to reflect the cost of producing electricity in each half hour;
2. network charges to accurately reflect the cost of building additional capacity (being LRMC); and
3. retailers to have an incentive to offer contracts which respond to their customers' preferences.

Under these conditions, depending on their customers' preferences, retailers may choose to offer tariffs which pass through wholesale and network costs directly, flat tariffs, and other tariffs which offer a balance of those two extremes.

This review assumes that wholesale prices closely reflect the costs of production. The analysis in this review so far has found that there are currently some examples of network charges reflecting costs, but more examples where they do not. The PwC report shows some retail tariffs which appear to provide a balance between cost-reflectivity and simplicity (e.g. some time-of-use and critical peak pricing tariffs), but the vast majority of residential consumers, and a large number of non-residential consumers, are currently on tariffs which do not appear to provide cost-reflective signals.

Changes to some market conditions may improve the ability or incentive on NSPs and/or retailers to reflect their costs in pricing structures:

5.10.1 Technology

Currently, the consumption of 88 per cent of small consumers (and 14 per cent of large consumers) in Australia is measured on an 'accumulation' basis, that is only aggregate consumption levels in the period between meter reads are measured.[125] However, varying prices by the time of electricity use requires the ability to know how much consumers use at different times of the day (and/or year), for which meters which can measure consumption in at least two time periods (e.g. peak and off-peak or summer and winter) are required. PwC's report explains that interval meters are both necessary

125 Small customers are defined as those with annual consumption of less than 100MWh in Queensland, less than 150MWh in Tasmania, and less than 160MWh in other NEM states.

and sufficient for the purposes of time of use tariffs.[126] However, other technologies may also be useful in enabling consumers to make efficient choices in response to price signals. Chapter 6 explains the role of technologies in DSP and provides a discussion on the issues for this review.

5.10.2 Network pricing rules and NSP incentives

Whether NSPs will offer tariffs which are cost-reflective will depend partly on the provisions in the rules governing how they set their tariffs. Currently, the rules effectively set a cap, allowing for some flexibility in how tariffs are structured. The commercial incentives on NSPs to price at the level of efficient cost are therefore likely to be a more important factor in how tariffs are structured. The incentive to price at marginal cost will depend upon how changes in consumption will affect the business's costs and hence its profit.

The rules currently set out a framework and provide a number of principles governing how the network businesses set their tariffs. These rules differ between transmission and distribution. The rules are more extensive in transmission, which could be in recognition that TNSPs are subject to a revenue cap rather than a price cap, which somewhat dampens the link between changes in consumption and profit.

PwC provided an initial assessment of both the incentives and the current rules, which found that:

(a) NSPs under price cap regulation have an incentive to encourage consumption in the periods in which their costs are lowest and discourage consumption in the periods in which their costs are highest. While NSPs under revenue cap regulation also have incentives to discourage consumption at peak times (as this will minimise their total costs), the incentive to set cost-reflective prices is diminished, since prices can be set independently of the costs in any particular period;

(b) the key pricing principles in the distribution rules direct DNSPs to price at the LRMC of supply;

(c) the cap on the expected weighted average of revenue raised from a tariff class in a particular year places some restriction on pricing. However, it does not restrict tariff adjustments for consumers within a tariff class;

(d) due to the limited incentive for efficient pricing under a revenue cap, the rules for transmission tend to be more prescriptive;

(e) the rules direct TNSPs to price on the basis of LRMC;

(f) locational transmission use of system (TUOS) prices at any particular location are not allowed to be changed by more than 2 per cent per annum compared with

126 We note that some accumulation meters may be able to measure consumption in at least two time periods.

the average price in the region.[127] This means changes of greater than 2 per cent in the costs caused by consumers in a particular location cannot be reflected in prices; and

(g) the NER currently require charges for non-locational transmission services to be made on a "postage stamp" basis, which means the price per unit must be the same regardless of how much energy is used by the consumer and regardless of the location in the transmission network of the consumer.

In practice, the incentive on network businesses to price at marginal cost may be complicated by how network costs are treated under the regulatory arrangements. This issue is discussed further in the chapter nine. The paper on NSP incentives published alongside this directions paper also explores in more detail how price regulation affects the incentives on NSPs to undertake and invest in DSP. It suggests the incentives are complex, but do not necessarily reward NSPs appropriately for DSP activities.[128]

There may also be some jurisdiction-specific limitations on pricing. For example, in Victoria, where a government mandated roll-out of smart meters has led to a higher prevalence of interval meters than in other states (24 per cent of small consumers' meters currently provide interval data), the Victorian Government has placed a moratorium on NSPs charging on a time of use basis until 2013. Retailers do not therefore currently face a network charge which reflects the cost of building additional capacity.

The link between change in consumption and change in costs may be complicated by the time it will take for changes in peak demand to feed into new investment. We intend to consider this further and appreciate stakeholders' views on this.

We note PwC's view about possible restrictions due to the transmission pricing rules. Aspects of the pricing methodologies for TNSPs are currently being considered under the inter-regional transmission charging rule change and therefore we do not intend to consider this further in this review.[129]

5.10.3 Retail price regulation and retailer incentives

In a competitive retail market, retailers will have commercial incentives to price electricity to reflect the costs they incur in procuring, transporting and selling it. However, if the competitive pressure is not sufficient, their incentive will be to price above cost in order to maximise profits. In such circumstances, retail price regulation may be required.

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127 A region is defined as a particular part of the transmission network containing one or more major load centres or generation centres or both

128 http://www.aemc.gov.au/market-reviews/open/power-of-choice-update-page.html

129 See http://www.aemc.gov.au/Electricity/Rule-changes/Open/inter-regional-transmission-charging.html

Some level of retail price regulation exists in all states of the NEM except Victoria. Queensland, New South Wales, Australian Capital Territory and South Australia have at least one mandatory regulated tariff. Most retailers therefore have to offer a regulated tariff, which has a structure mandated by the relevant jurisdiction.

Regulated tariffs must be made available to all consumers within the relevant jurisdiction. They therefore act as a relatively easy basis for comparison for consumers, and consequently PwC found that regulated tariffs tend to act as 'markers' around which market offers are based. While ease of comparison can be beneficial for consumers, the existence of regulated tariffs in most jurisdictions may be limiting the extent to which retailers are willing to offer different types of tariffs. Regulated tariffs may also limit the ability of new entrants (including retailers or other parties such as ESCOs) to enter the market and offer new tariffs and products.

In responses to the issues paper, some DNSPs doubt whether retailers would pass through cost reflective network tariffs, while other DNSPs are of the view that retailers will be forced to so, in order to properly hedge themselves.[130] Effective competition in the retail market should ensure that consumers have access to cost-reflective network tariffs where they wish to.

A number of responses to the issues paper suggested other reasons that retailer incentives may not currently be conducive to offering price signals which encourage efficient DSP. For example, some pointed to emerging strategies that under time of use pricing, retailers increase the fixed element of the tariff in order to increase cashflow certainty which time of use pricing erodes, or alternatively average costs across consumers to manage contractual risk (so consumers who shift their load to lower cost (off-peak) periods are not rewarded).[131] Chapter ten considers further the incentives on, and opportunities for, retailers to facilitate and promote DSP.

5.10.4 Consumer acceptance

As described in Chapter four, responses to the issues paper were generally in agreement that, although recent price rises have led to an increased awareness of electricity costs, residential consumer understanding of electricity costs and the impacts of their use is still very low. Retail tariffs to the majority of consumers have been of a similar structure for many years, and active consumer participation in the market has been low. Consumers are familiar with existing tariffs, and, fuelled partly by incomplete information, are likely to display a degree of inertia in accepting new types of tariffs.

Even where retailers offer contracts which would help consumers to reduce their electricity bills, consumers may not have the information available to assess whether

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130 Essential Energy, issues paper submission, p.7; Aurora Energy, issues paper submission, p.6; SP AusNet, issues paper submission, p.9; Energy Networks Association, issues paper submission, p.11.

131 Progressive Green, issues paper submission, p.3; Major Energy Users Inc, issues paper submission, p.19.

they can benefit from those contracts. They are likely to benefit from information and guidance to aid acceptance and understanding of new price structures.

5.10.5 Transaction costs

It is not always possible, or at least practical, to provide perfectly efficient price signals in such a way that consumers can respond to them. For example, in order for a price to act as an effective signal to which consumers can respond, consumers need to know in advance what the price will be. High wholesale prices do not always correlate with high demand; sometimes they are driven by supply shortages. As these costs are often caused by sudden, short-term events (most commonly the outage of a generator) they may not be predicted sufficiently in advance to be able to signal them effectively to consumers. Similarly, it may not be practical to charge different network prices for consumers on each individual street. In these circumstances, NSPs and/or retailers are best placed to determine an efficient balance between cost-reflectivity and simplicity, taking into account the transaction costs involved. Changes to some of the market conditions outlined above, such as technology, may help to reduce transaction costs.

Questions Market conditions required for DSP

13. What other market conditions need to change to enable cost-reflective prices? Will the benefits from improving the cost reflectivity of price signals outweigh the costs of the actions to improve them?

14. Are changes to the current regulatory arrangements required to provide stronger incentives on NSPs and/or retailers to align price with cost?

5.11 Way forward

In order to investigate possible options for making pricing more cost-reflective, we plan to carry out further work on the following questions:

- the impact of time-sensitive tariffs on different types of consumers and any additional protections required for vulnerable consumers;
- the drivers of network costs and the ability and incentives for networks to charge cost-reflective prices;
- the ability and incentive for market participants to offer products which meet consumer demands; and
- the extent to which retail price regulation may restrict flexibility in retailers' pricing.

As outlined in chapter six, we also plan to carry out further work on the incentives on different parties to install interval meters.

A number of potential changes are identified in this chapter which may realise a benefit in terms of increasing the cost-reflectivity of price signals. Such price signals will only produce efficient outcomes, however, if the benefits they bring outweigh the costs of putting them in place. Given the existence of transaction and implementation costs, the optimal outcome may be a set of prices and other market conditions which, whilst not theoretically perfect, still provide consumers with appropriate incentives, information and ability to manage their electricity consumption where they see a benefit from doing so. Market participants should still have incentives to reduce transaction and implementation costs over time.

In addition to pricing, this review looks at a number of other conditions which may be required for enabling an efficient demand-supply balance in the NEM (such as technology and consumer information). It will be important to ensure that any recommendations made about pricing complement recommendations on these other market conditions.

6 Technology and system capability

Summary

Technology and the capability of the energy and network systems can assist the consumer to manage and adjust their electricity consumption through a variety of means, for example, through providing real time information or facilitating automated responses to power system events. This chapter explains the role of technologies on the demand side and discusses the issues relating to how the current arrangements support investment in DSP technology.

New technologies are becoming increasing available and the question is how best to facilitate investment in and leverage these technologies in a way that captures the value of DSP. While it is appropriate to leave it to the market to determine the most appropriate range of DSP technologies, we have identified a number of challenges. These relate to how the current environment both supports efficient investment decisions by various parties (consumers, retailers and distribution businesses) and ensure that the value of technology is optimised.

We also recognise there should be open standards and a gateway to make it possible for consumers to purchase in-home control and information devices that would automatically communicate with their meter and that, in turn, would help automate or otherwise increase their demand response:

Directions

For the next stage of the review we will consider:

- role and rights of the consumer regarding ownership and usage of DSP technology;
- approaches to assist consumers when they consider making investment in technology which enables DSP (i.e. to help alleviate issues such as uncertainty about returns, short payback periods and concerns about technology redundancy); and
- arrangements to facilitate commercial and consumer investment in metering technology to support DSP products. This includes whether the current arrangements adequately facilitate consumer choice to change its meter.

We will feed in issues raised in the review about the legal and regulatory frameworks governing smart metering (such as questions of data access, consumer protections and contestability) and open standards/gateway to existing SCER work programs on smart meters and consumer protection and safety.

6.1 Role of technology in demand side participation

A key requirement for some demand response programs is the availability of enabling technologies. Examples of enabling technologies include:

- meters with the capability to allow consumer electricity bills to reflect their actual usage pattern rather than an average load profile for that consumer class;
- whole house gateway systems that allow multiple devices to be similarly made price sensitive, for example, smart thermostats that respond to high prices with an automated adjustment to their setting;
- multiple, user-friendly communication pathways to notify consumers of load curtailment events;
- energy-information tools within the household that enable near real-time access to interval load data and provide analysis of actual performance relative to baseline usage;
- storage facilities - either thermal or electric - that are optimised to meet differing high-price or electric system emergency scenarios;[132]
- load controllers and building management control systems that are optimised for demand response and which enable automated load curtailment strategies at the consumer level; and
- distributed generation, used either for emergency back-up or to meet primary power needs of a facility.[133]

Forms of these technologies have been in operation in the NEM for many years (i.e. ripple control systems installed and operated by distribution businesses). However advances in control systems, and communications technologies have significantly increased the functionality of smart metering and demand response technologies. The costs of such technology have fallen significantly over the past ten years just as their capabilities have been rising. These advances have the potential to provide more power system and societal benefits, allowing both greater consumer receptivity and higher confidence that consumers can and will respond to price-based demand response. Given these developments, the SCER asked us to assess energy market frameworks that would maximise the economic value to consumers of services enabled by smart meter/smart grid technologies, including load control technologies.

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132 Thermal storage is more cost effective than electric storage, especially for large commercial buildings, but electric storage is becoming more cost effective as battery technology improves. A number of submissions also raised the potential of storage options as an efficient DSP option and its role to provide support greater deployment of renewable generation. These parties considered that such options are technologically feasible but are not commercially viable due to poor regulations and market design.

133 Submissions from a number of parties including the Clean Energy Council, Exigency and the Energy Efficiency Council pointed to a number of problems with deployment of distributed generation as a demand side technology. These issues are discussed in chapter 11.

Smart meter/grid technologies have the potential to significantly expand the range of functions that traditional meters can provide, thereby enabling new products, services, and markets. To assist this review, the AEMC commissioned KEMA to provide a report into the regulatory barriers for the uptake of services enabled by smart grid technology.[134] Smart metering technology has the potential to improve the interaction between the individual consumer and the network and retail businesses. A smart grid goes a step further and seeks to transform the traditional electricity network by adding better enabling technology across all aspects of the network, including generation and storage systems. Smart grids provide real-time information about the network to help reduce interruptions, support more renewable energy and gives households greater control over their energy use. The Australian Government's Smart Grid, Smart City Initiative is testing large scale deployment of such technology and is gathering information about the costs and benefits.

Table 6.1 details some of the differences between conventional based demand response and smart grid technology demand response.

Table 6.1 Conventional versus Smart Grid Technology Demand Response

	Conventional Technology Demand Response	**Smart Grid Demand Response**
Participation	Targeted, to specific residential and large commercial/industrial	All consumers
Who controls	Mostly distribution network businesses	Increase control to consumers
What is controlled	Water heating, specific interruptible commercial loads	All loads available
Control equipment provision	Provided by distribution network businesses	Could be either by network business or consumer
Incentives	Possible TOU tariffs Fixed participation payments for consumers (mostly commercial/industrial)	Range of retail dynamic prices Separate payments for performance and ancillary services
Demand Response Products	Load reduction/shifting and reliability	Peak demand reduction/shifting for price management, hedging risk and reliability. Also ancillary services/congestion management payments
Integration with Energy Efficiency schemes/ Renewable energy	No	Facilitates link between wholesale and retail markets

134 KEMA, *Services Enabled by Smart Grid Technology*, November 2010. Available on the AEMC Power of choice review website.

Submissions recognised that better metering capability is necessary to allow for monitoring and billing of power consumption on an interval basis.[135] Without such capability, it is not possible to allocate the costs and benefits of demand response directly to consumers. However some stakeholders questioned the net value of this information to the consumer (hence questioning the merit of introducing such technology) and pointed to load control technologies as more cost effective. These submissions questioned the need for large scale roll out of smart metering technology and point towards direct load control, MEPS initiatives and demand limiting switches as example of cheaper, more effective DSP options.

A number of stakeholders pointed to the benefits of two-way communications systems for sending price or other control signals to consumers. Internet communications (and the relatively small bandwidth) required can reduce the costs of implementing such communications systems and it is considered that economies of scale may allow such costs to be reduced significantly. A number of DNSPs sought approval from the AER for such communication programs in their recent determinations. However other parties argued that an automated response mechanism is also required. These stakeholders consider that sending an SMS and expecting consumers to respond would be unrealistic, whereas triggering the start and stop of equipment would be workable and could deliver more certain benefits. Hence this could be commercially valuable, providing the consumer accepted the benefits of this technology.

We note that some submissions to the issues paper did comment on their preferences on which range of technologies would best support efficient DSP. However this review is not about assessing the viability of existing technology solutions nor will assume a particular range of technology types. Technology is constantly changing and developing policy based upon particular mechanisms may run the risk of blocking new, more efficient solutions and lead to stranded costs for market participants and consumers.

6.2 Issues with current market conditions

Decisions with respect to investing in DSP technology can be taken by either consumers themselves, third parties on behalf of consumers or either by market participants (network or retail businesses). Hence we need to consider frameworks governing both technology upstream of consumer and also technology which the consumer may want to install in its household. In the section, we discuss the issues relating to how current market supports investment in DSP technology. The issues are organised into the following matters:

- whether the current environment supports efficient investment decisions;
- supporting commercial driven investment in smart metering technology; and
- ensuring that the value of technology and system capability is optimised.

135 An interval in this context may be 30 minutes (to match the NEM settlements processes) or a longer duration, such as one hour (to reduce the volume of data presented to a consumer).

6.2.1 Supporting efficient investment decisions in DSP technology

An environment which would adequately support efficient investment decisions in DSP technology would have the following characteristics:

- the right information being easily accessible and easily understood by consumers;
- appropriate access to capital;
- certainty about future conditions and pay-offs;
- clear rules on DSP technology usage, including distributed generation;
- clear rules on the role of DSP technology service providers and their offer rights and obligations;
- clarity on the connection point, embedded connection point and financial responsibility for these points;
- ensuring that the benefits of the technology can be accrued to the investing party; and
- transaction costs are minimised.

The issues paper discussed some market characteristics that inhibit investment in demand side opportunities. Common examples include the split incentive barrier, where the economic benefits of increased DSP do not accrue to the decision-maker (e.g. the landlord or commercial developer who is not responsible for paying the ongoing energy bill), and the transaction cost barrier, where the costs associated with making the investment (such as acquiring information and evaluating risks) inhibit investment. Transaction cost barriers can affect individual and small business decision-making regarding investment in demand side opportunities.

Submissions also commented on consumers requiring short periods in which the cost savings from the investment must cover the initial cost of that investment (e.g. more energy efficiency appliances). This means that consumers are requiring a higher rate of return from the investment than the interest rates to borrow money and therefore may not be capitalising on all profitable DSP investments.[136] This could be a response to the risk of investing, or a lack of certainty about future streams of benefits. Crucially, this seems to be common in both residential and commercial/industrial sectors.

There are a number of aspects to an investment decision that may impede the efficient choice. These aspects include, first, the irreversible nature of many capital investments since their initial costs are at least partially sunk and cannot be recovered following a change of mind. Second, there is uncertainty about how future changes in information

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136 If companies and consumers behave perfectly rationally, they implement all projects that generate a positive net present value at a discount rate equal to the lending rate of commercial banks.

and technology will affect future rewards from a chosen investment relative to existing or future alternatives. Third, there is some flexibility about the timing of investments as most can be postponed to await for additional information. Fourth, concerns were also raised about access to capital, especially in the low income and rental sectors.[137]

In addition, often investment in DSP is seen as not a priority and discretionary which means that it may not be treated strictly on its merits. This applies to both commercial/industrial and residential consumers. Even for a commercial business, prioritising energy cost savings may come at the expense of sales enhancing strategies or operational investments. For residential consumers, opportunities are missed as a consequence of a lack of awareness and interest for the reasons discussed in chapter five. Constraints on time, resources and ability to process information are common to all consumers.[138]

These issues are complex and interrelated. Market barriers, in particular access to capital due to high up-front, are among the most important barriers to investing in DSP technology, especially for the residential sector. By contrast, consumer attitudes are perhaps amongst the most challenging to address as changing behaviour and lifestyle is very difficult. These issues are well known and there currently exists a series of government programmes aimed at addressing these issues (e.g. green loans programs).

This review will give further consideration to:

- DSP technology ownership and usage arrangements. The most important ownership question is around the role of the consumer and the rights of that party, as well as the rights of all other parties recognised by the rules. Once the ownership question is clarified, the next matter is the usage arrangements available to the owner/user of the DSP technology.

- Additional mechanisms which could help alleviate barriers to consumer investment in DSP. One possibility is to have special fixed tariffs (for an initial period) for peak shifting technologies in order to reduce tariff risk and improve the certainty of return. Other possible ideas relate to the low income and rental sectors. In Germany for instance, tenants are eligible for rebates on their rent if the landlord does not comply with some building codes. Some building labelling systems are combined with the issuance of mortgages hence addressing financial

137 The Victorian Energy and Water Ombudsman submission states that mechanisms should be looked at that overcome significant and entrenched barriers: it relates to low quality household rental accommodation where demand and supply constraints produce a seller's market with no real incentives on landlords to provide any attractive features for a property.

138 We note that the investment costs for a number of systems which can enhance residential consumers' ability to save energy or shift their peak consumption are relatively minor. For example, remote control powerboards cost around $15; timers for appliances ($10); ceiling fans ($40 plus installation; fans ($30); and in home display units ($90).

barriers, while increasing awareness.[139] We seek feedback from stakeholders on any practical mechanisms.

- The role of third party intermediaries such as Energy Service Companies (ESCOs) in addressing these issues, including high level principles on their rights and obligations. ESCOs provide a range of business models aimed at capturing the market's potential to respond to consumer demand for increased DSP. Such companies take over the technical and commercial implementation and operation risks associated with DSP technology investment and provide some guarantee and comfort for the end-consumer, while minimising transaction costs. The ESCO industry is an expanding business in various parts of the world and the potential role of such companies in fostering greater energy efficiency was recognised in the report of the Prime Minister's Task Group on Energy Efficiency. This review will explore the potential for such companies to foster investment in DSP technology and other elements of DSP (such as creating leasing arrangements for DSP technologies) and assess how best to encourage the development of ESCO sector in Australia.

- Consumer capturing the full value of DSP technology. Market based decision making produces optimal outcomes when the decision maker internalises all the costs and benefits (including social costs and benefits) associated with a particular decision. In respect to facilitating investment in DSP enabling technology, this means that the party making the investment receives appropriate rewards for the benefits other parties received due to the technology. The issue of how the market values and provides the benefits arising from DSP across the supply chain, is discussed in chapter seven.

Questions Supporting efficient investment decisions in DSP technology

15. Are there any practical additional mechanisms that could help alleviate the barriers to consumer investing in DSP technology?

16. What should be the role of intermediaries such as ESCOs in addressing the barriers to efficient consumer investment and what factors could be impeding the development of these parties?

6.2.2 Investing in metering technology

The SCER is currently applying a staged approach to facilitating a national roll-out of smart metering technology in areas where the benefits outweigh the costs. It has provided for mandated smart meter roll-outs to be exclusively performed by DNSPs, as it considered that the potential benefits of a roll-out are split between various parties

139 For instance, in the US, the Home Energy Rating System (HERS) is used to guide energy efficient investments, to obtain energy efficiency mortgages, and to check for compliance with buildings standards.

in such a way that individual parties are unlikely to independently establish a positive business case for investing in a roll-out.

To facilitate this, amendments have been made to the National Electricity Law (NEL) to enable Energy Ministers in participating jurisdictions to make a determination to require DNSPs (operating predominately in their jurisdiction) to roll-out smart metering services to consumers within their jurisdiction.[140] A review of the smart meter program is scheduled to occur in June 2012. The SCER will then assess jurisdictional plans for the roll-out of smart meters and consider whether any further analysis or reviews are required.

The mandated roll-out does not preclude market participants from installing metering technology on their own accord which is referred to as a commercial roll-out. This could be either on their own initiative as a measure to capture DSP or in response to a consumer request. We note that some distributors have installed a large number of interval meters as part of introducing more time sensitive tariffs (e.g. Ausgrid) and that retailers have in certain circumstances facilitated replacing existing meters with smart meters (i.e. during the installation of solar panels).

The legal and regulatory frameworks governing smart metering are critical factors affecting the nature and timing of meter deployment. There are a number of issues specific to smart meter technology and smart grids that need to be addressed to foster investment in such technology:

- the classification of smart meters as part of a metering installation type under the NER and whether metering installations that contain smart meters are contestable (outside of a mandated roll-out);
- the rights of a consumer (or property owner) to influence the components of a metering installation, including the meter, at its installation or upgrade;
- rules governing the nature and scope of services created by the smart meter and smart grid technologies;
- role of metering providers and AEMO;[141]
- rules governing access to meter data and its use;
- role of metering data providers;[142]
- balancing economic efficiency with social equity through appropriate consumer protection arrangements;

140 To help inform this process, the amendments to the NEL also enable a Minister to direct a DNSP to conduct trials and undertake an assessment of the costs and benefits of SMI and other related technologies, including direct load control.

141 It is noted that all meter settings must be deployed by Metering Providers after authorisation by AEMO, rule 7.8.3.

142 The issue of data ownership is discussed in chapter five.

- risk of stranded investments if consumer changes premises; and
- mitigating the risk of technological obsolescence.

There already exists a series of work programs addressing some of these issues. The National Stakeholder Steering Committee (NSSC) has developed proposed access and contestability principles and the SCO has recently released a policy paper regarding national smart meter consumer protections, as part of its National Smart Meter Program.[143] While to date, this work has been focused on facilitating the mandated roll-outs of smart meters, these issues apply regardless of whether the smart meter is installed as part of a mandated roll out or through a commercial roll out.

This review will investigate possible gaps in the current arrangements that could be impeding commercial investment in smart metering technology. For example, differences across jurisdictions in the framework for meter provision may impede the development of national business models. Competition concerns have been raised about the data services arising from smart meters if the network businesses have a privileged position compared to other parties. There is some uncertainty about the various roles and responsibilities of different parties regarding smart meter technology and the market framework for competition which may also be limiting investment.

The reminder of this section steps through the various scenarios relating to commercial or consumer investment in metering technology and provides some initial commentary on the key issues. Metering technology refers to both interval and smart meters as both could play a role in supporting DSP options based upon time sensitive tariffs (see Box 6.1). We seek stakeholder views on what amendments are required to the metering arrangements to facilitate commercial and consumer investment such technology.

Box 6.1: Metering Technology

An interval meter means a meter that records energy data on a time interval basis. In the NEM such interval meters can either be capable of electronic communication of this data (Types 1-4) or requires to be manually read (Type 5).

Smart meters are capable of two-way communications and can allow real time data and instructions to flow to and from the market participants to the consumers site. Hence such smart meters can have additional functionality that can allow for a range of actions to manage electricity demand and the grid (smarter operation of grids). Such additional functions could include remote connection and disconnection and direct load control.

143 SCER, *National Smart Meter Consumer Protections and Pricing*, Draft Policy Paper Two, December 2011.

Question	Commercial driven investment in DSP technology
17.	**What amendments to the metering arrangements in the NEM are required to facilitate commercial investment in metering technology which supports time sensitive tariffs?**

Investment by network businesses

Network businesses making investments in DSP technology will seek to recover the costs through the regulatory determination process. A key condition for them is certainty on cost recovery. However currently there is no consensus on how to value the benefit streams that should be included in an investment appraisal for demand response programs with enabling technology. Developing a common understanding on how to value and assess investment in DSP enabling technology will be important and there may be a the need for consistent tools and methods that network businesses and the AER can use to develop and assess such projects. This issue is explored further in chapter seven.

The current application of the regulatory determination process may also dampen investment in DSP technology. We note that the relatively short asset lives of smart meters (approximately 15 years) and IT and communications assets (approximately 7 years) will significantly increase the proportion of any gain or loss retained by a DNSP relative to normal network assets.[144] This magnifies the expenditure risk for the DNSP if the approved expenditure from the AER proves to be too low. Given that such technology is relatively new, there is a relatively high level of uncertainty on what the appropriate costs are, which could add to this risk. Therefore this aspect of the regulatory expenditure framework may impede the deployment of smart metering and other DSP technologies by network businesses.

We note that DNSPs argue that the rules currently discourage the distributor from making any investment in smart metering given that these meters are subject to metering contestability because of how they are read and possibly have a limited useful life.[145] Therefore we will assess the incentives for deployment and the appropriate mechanism for recovering investment costs in the situation where the regulated network businesses make the decision to invest in smart meter and smart grid technologies (i.e. not under a Ministerial determination to mandate a roll-out) and

144 Under the current treatment of depreciation in rolling forward the regulatory asset base (RAB), DNSPs may retain nearly 70 per cent of any under spend in capital expenditure as profit, where assets have an asset life of 7 years and this underspend is achieved in the first year of a regulatory control period. The roll-forward of the RAB for the purposes of depreciation on the basis of actual or forecast capital expenditure is determined by the AER under clause 6.12.1(18) of the rules. As a result, the AER is able to determine whether there should be a stronger incentive for efficiency in capital expenditure. Re-calculating depreciation on actual expenditure means that an under (or over) spend in capital expenditure will result in less (or more) depreciation being deducted in rolling forward the RAB than the amount that was allowed for in regulated revenues during the previous regulatory control period. Thereby resulting in a benefit (or penalty) to the DNSP.

145 United Energy, issues paper submission, page 16.

also in other demand response technologies such as capacity and load control schemes.[146]

Investment by retailers

In this scenario, the retailer would pay for the smart or interval meter and seek to recover that cost from the consumer. Hence for retailers to voluntarily install such meters they would require consumers to agree to have the interval meters installed. However for a number of reasons, retailers may only have limited incentives to voluntarily roll-out interval meters so to provide consumers with more cost reflective prices:

- costs of identifying and marketing interval meters to consumers who will agree to interval meters could be significant;
- risk that the retailer is exposed to stranded costs if the consumer changes premises or changes retailers; and
- increased data management costs from interval meters. The extra costs would result from the volume of data that would be collected as well as the costs associated with analysing the data to set prices for consumers. The retail business may have uncertainty about recovering such costs or allowance for such costs may not have been included in the regulated price cap.

Introducing more interval or smart meters into the market could affect the nature of competition and retail pricing, since consumers who have interval meters, the retailer will be settled on the basis of actual load profile usage rather than the net system load profile. This will inform the retailer which consumers they are serving at a loss and which consumers they are serving at a profit. The retailer will need to be prepared to offer a better price to the latter group as they will be vulnerable to other retailers. Also the price offer to the former group will go up, as the retailer will not want to knowingly serve customers at a loss.

When there is a mix of consumers on time-interval meters and accumulation meters it would be expected that the consumers with the 'best' load profiles would be attracted first to interval meters, and consumers with the worst load profiles would remain on the net system load profile. This in turn would imply that the net system load profile would deteriorate and (absent any regulatory barrier) the prices to consumers without an interval meter would rise over time. In turn, more consumers could be encouraged to take up such meters.

Contestability in smart meters and related services

The incentives for either network business or retailers to invest in smart meter technology will be affected by:

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146 The AEMC has provided advice to the former MCE in relation to the cost recovery for smart metering infrastructure under a Ministerial Determination. See AEMC, *Request for Advice on Cost Recovery for Mandated Smart Metering Infrastructure*, final report, 30 November 2010.

- how the metering service associated with the technology are treated under the regulatory arrangements; and
- the framework for the related services that could be provided with smart metering technology (which could include supply capacity limited services, smart metering data services, and remote load control services).

This is because how such services are treated under the rules, and the extent to which competition is permitted, will influence the value that these businesses perceive can be captured from their initial investment.

The ENA states that there is a need to clarify the arrangements in the rules in relation to metering installation types so as to enable distribution businesses to undertake a smart meter deployment, if they determine appropriate, in accordance with their business and regulatory case.[147] Stakeholders also raised a concern that the boundaries between monopoly and competitive parts of the energy delivery chain of smart metering services remain unclear. We recognised that a full review into the contestability of smart metering services is required and that the MCE intends to request the AEMC to conduct such a review in the near future. Therefore as part of this review, we intend not to explore the contestability issues in great depth. However we consider that this review provides an opportunity to have an initial discussion on this matter and to consider the contestability matter within the wider framework of promoting efficient DSP. This will help set the groundwork for the separate review and would build upon the work of NSSC.

Consumer choice in meters

A residential consumer may seek to install an interval or smart meter in a new premise to perform the function of a revenue meter (or replace an existing revenue meter with a smart meter) to take advantage of time sensitive tariffs or to interact with household appliances.[148] It is not clear how such a request would be handled under the existing arrangements or whether the retailer is obliged to facilitate such a choice. There are a number of question on this scenario:

- should the retailer be mandated to offer such a choice?
- should the consumer have independent rights to exercise this choice?
- who would be responsible to maintain the smart meter?
- how should the consumer with the smart meter interact with the network business to maximise the benefits?; and

147 The ENA issues paper submission mentions 'meter type' but the AEMC considers that this is meant as a reference to 'metering installation type', as per Table S7.3.2.1 in rule S7.3.2.

148 'Revenue meter' in this paper refers to the meter that is also known as the tariff meter and the billing meter for residential customers.

- what other matters would need to be addressed if the consumer was given ownership rights to the revenue meter?

An aspect to this is whether metering charges should be unbundled from the network use of service charges. Separating out the costs of providing metering services into a separate tariff, would allow the consumer to choose their own metering service. In NSW and QLD, small consumers do not have access to a network tariff which separates the metering charges from the network use of system charges. This means if a small consumer in NSW and QLD seeks to use an alternative metering provider, they may end up paying for metering twice: once from their metering provider and once in their network tariff.

We seek feedback from stakeholders on whether there is merit in facilitating consumer choice in metering and exploring the above issues further.

Question Consumer choice in metering capability

18. Are the current arrangements sufficient to facilitate a consumer's decision to install their own meter as a revenue meter? If not, what changes to the current arrangements are required?

19. Are any amendments to the arrangements required to encourage either the network businesses or retailers in invest in metering capability in order to support DSP options?

6.2.3 Optimising the value of technology and system capability

Energy smart technologies are rapidly evolving and becoming more available to consumers. This is creating an issue of how best to integrate these technologies into energy networks and consumer installations to deliver the most economically efficient outcomes. This would be particularly important if a consumer had rights to upgrade existing revenue meter with some sort of smart meter.[149] There are a number of challenges in optimising the value of technology and system capability to facilitate an efficient level of DSP, including:

- interoperability and open standards (i.e. manner in which various technologies, such as meters and in-home enabling technologies, communicate between different market participant systems);
- defining the boundaries between a consumer's home system with DNSPs, retailers and other third parties systems; and
- ensuring security of the supply chain by minimising risks to networks (e.g. against hacking).

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149 The functionality and capability of smart meter will change technology improves. A 'smart meter' in 2012 may not be the same as a 'smart meter' in 2020.

Consumer appliances are starting to be manufactured with the capability to respond to curtailment requests and price signals. Web based portals can give the platform on which to provide consumers with actionable information and insight to motivate them to participate in demand response more frequently. Improving understanding and acceptance of such energy smart technologies and how best to integrate these technologies into energy networks and consumer installations will require the involvement of a wide range of interested parties. Some applications may be straightforward. For example, the DNSP providing consumers with a web-based application to program their thermostats. For other technologies, appropriate standards and analysis tools, will need to be developed. The goal will be to develop suitable domestic control systems with user friendly interfaces.

Trials to date have found that in-house displays (IHDs) only have a limited additional impact on consumer response compared to households without displays. With the Endeavour Energy trial, IHD usage dropped from 85 per cent at the start of the trial to only 55 per cent two years later. Ausgrid found that a significant number of customers who had received the technology in their trial did not even bother to plug them in. At face value, the low customer acceptance of IHDs seen in these trials combined with the relatively high cost of the technology may limit such technology being deployed on a mass scale.

We consider that there should be open standards and a gateway to make it possible for consumers to purchase in-home control and information devices that would automatically communicate with their meter and that, in turn, would help automate or otherwise increase their demand response. Open standards might also reduce costs by encouraging competition among technology providers.

As part of the SCER National Smart Metering Program, the NSSC provided advice on the minimum functionality specification for smart metering infrastructure including specification for the consumer's home area network. SCER Ministers endorsed a national minimum functional specification for smart meters and have asked officials to advise them on implementation and transitional arrangements. Also, the House of Representatives Standing Committee on Infrastructure and Communications is currently conducting an inquiry into smart infrastructure.[150] Given these initiatives, the Commission does not intend to do any further investigation into these matters.

The communication gateway (being the interface in the home), could be used for designing energy services with a certain degree of automation. It is clear that consumers cannot be instantly active all the time, but on the basis of predefined offers designed to react to price signals and installed automation, they can adapt their consumption. Educating the consumers on how to use such automation and addressing any of their concerns is important. Hence any DSP education program should also include explanations of how to utilise such technologies.

Regarding the privacy and security of metering data, chapter five presented our view that the consumer should be in control of its own consumption data. That chapter also

150 http://www.aph.gov.au/house/committee/ic/smartinfrastructure/index.htm

commented on the work SCER is currently conducting on appropriate consumer protection provisions from smart meters.[151]

Question	**Optimising the value of technology and system capability**
20. Are there aspects to the arrangements regarding the integration of DSP technologies into energy networks that requires further consideration under this review?	

6.3 Way forward

A key requirement for some demand response programmes is the availability of enabling technology. As explained in chapter six, consumers will need meters that record usage on a more frequent time interval basis to support pricing signals through time-based tariffs. Alternatively introducing other demand technologies such as smart thermostats would increase the amount of load that could be reduced under a demand response scheme.

The issue is not about the availability of technical capability but how best to facilitate investment in and leverage these technologies in a way that captures the value of DSP. While it is appropriate to leave it to the market to determine the most appropriate range of DSP technologies, we have identified a number of challenges relating to how the current environment supports efficient investment decisions and how it aims for the value of technology and system capability to be optimised. We will seek to address the following matters in this review:

- DSP technology ownership and usage arrangements;
- any possible amendments to the existing arrangements which would better support investment decisions by consumers;
- the role of ESCOs in promoting DSP technologies;
- the appropriate arrangements for encouraging innovation and investment in DSP technologies by market participants, especially network businesses under a commercial roll-out; and
- improving the ability of the market (including the consumer) to value and forecast the benefits of DSP technology.

This review will also comment on the legal and regulatory frameworks governing smart metering, including the questions of data access, consumer protections and contestability, in order to assist and feed into existing and planned work in this area. We also note that the need to consider policies that encourage increase deployment of

151 With more frequent metering readings being recorded, and thus more granulated data being stored and transmitted between market players, the issue of data security will become even more important than before.

smart metering technology depends upon considerations regarding the need for more efficient price signals.

We also note that DSP is going through rapid technological change and the stage in the process of technological change will differ across the various technologies.[152] Some technologies are ready for use, while others are still in the development phase. It is important that policy makers have a forward looking perspective on how consumer participation in the energy markets will develop based upon the emerging technologies in considering how best to manage the integration of DSP technologies into the NEM. We consider that there will be a need to continually monitor developments and that evidence will be gathered from the Smart Grid, Smart City Initiative on these matters.

152 There are four stages in which technology evolves - invention, innovation, diffusion and product use. A typically S shaped curve is commonly used to describe the path of technology diffusion.

7 Supply chain interactions

Summary

DSP will create different costs and benefits for different parts of the supply chain, from the wholesale market to the retail sector. Stakeholders have commented that the supply chain does not act in a collective, co-ordinated manner consistent with achieving an efficient demand-supply balance for two possible reasons:

- the differences in commercial incentives across market participants (split incentives); and
- the possibility of participants benefiting from a DSP action without contributing towards its costs (free-rider).

This chapter explores how the supply chain interacts in the NEM and raises some considerations regarding how to increase co-ordination across the supply chain. We found that the current arrangements do not promote co-ordination across the supply chain in a manner which overcomes these issues. We found that different parts of the supply chain may value the benefits of DSP in a different way. For example, the Regulatory Investment Tests permits some benefits which may not be available for DSP service providers participating in the wholesale sector.

Directions

The key focus going forward will be assessing whether these issues impede efficient DSP opportunities, and to what extent can cost-reflective tariffs and third party intermediaries (e.g. energy service companies) support greater co-ordination across the supply chain. For the next stage of the review, we will consider:

- assess the reasons why DSP programs that deliver multiple benefits across the supply chain are not being implemented;
- the potential of cost reflective prices to potential co-ordination across multiple market participants;
- ways to achieve co-ordination between multiple parts of the supply chain, including the role of energy service companies and/or assigning overall procurement responsibility to a single party; and
- the appropriate approaches to be used to value and forecast the costs and benefits (i.e., the extent of demand reduction).

7.1 Nature of DSP

Before discussing the ability of the supply chain to support the deployment of efficient DSP projects, this section recaps on the nature of DSP as the necessary market conditions can vary across the different types of DSP. Chapter three provides a summary of the various DSP options and describes how they can differ by their characteristics - i.e. purpose, penalties, payments, triggers or type of load. In summary, DSP tends to be divided between two broad categories:[153]

- Contracted DSP promotes consumer participation through a direct compensation payment or incentive. The consumer agrees to alter their electricity use under certain defined circumstances in return for an explicit payment. DSP resources which can supply capacity, ancillary services and energy reduction with a high degree of certainty tend to be covered by such payments. Examples include network support agreements and direct load control.

- Non-contracted (price responsive) DSP links prices in retail and wholesale markets, with retail consumers receiving a price signal reflecting the costs of supply and delivery. When high energy prices are correlated with reliability problems or local network constraints, actions taken by consumers to reduce load can have a positive impact on reliability in addition to reducing overall costs. Such DSP can be achieved without prior knowledge by the system operator, retailer or network business.

Contracted DSP tends to be more suitable for including in the NEM dispatch system. This is because this option tends to be based on contracts with penalties for non-compliance, which can provide greater certainty that the required behaviour will take place. In theory, price responsive DSP could be integrated into the NEM dispatch system. This would require more dynamic prices and the consumer having automated technology that enables load response to defined price movements.[154] A key issue is how to forecast the likely consumer response with a degree of confidence to factor its potential into network and system planning.

There is a difference of opinion amongst stakeholders on the potential value of price responsive DSP compared to contracted DSP. ETSA Utilities concluded that the most appropriate mechanism to effectively reduce peak demand within the South Australian environment is residential Direct Load Control. This is because peak electricity demand in South Australia is primarily driven by domestic air-conditioning and consumers are unlikely to respond to high prices on heatwaves.[155] Other stakeholders

153 There is also passive DSP, which differs from all the other DSP options as it is a by-product of an end-use technology which requires no interaction from anyone (either the end user or the supply chain) once the technology is installed. This could be as simple as the effect of a high efficiency air conditioner, which will alter the consumer's load profile and the system load duration curve.

154 Chapter five provides more detail on dynamic prices in a discussion of efficient price signals in the NEM.

155 ETSA Utilities, issues paper submission, p 5.

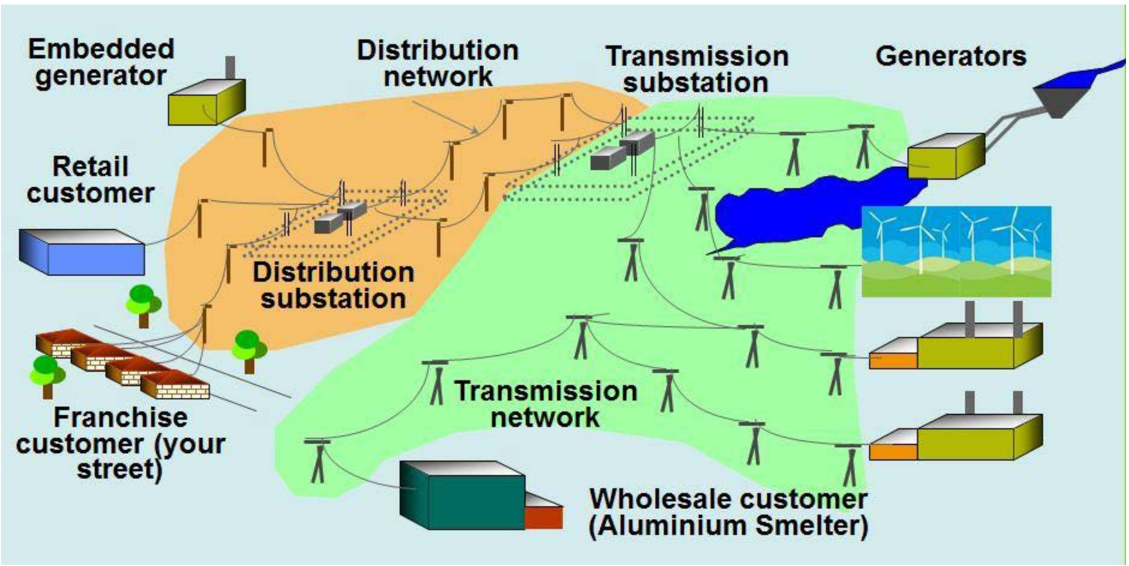
pointed to the costs involved in providing metering capability to support price responsive DSP and the effort required by consumers to understand price signals.

7.2 How should the supply chain support efficient DSP

Essentially all forms of DSP can be viewed as a transaction. At the core of all forms of DSP, the consumer is willing to offer a service of changing its electricity consumption pattern, in return for some form of reward as compensation for the loss of value. In contracted DSP, that reward could be a direct payment plus the savings in retail bills, while in price responsive DSP, the compensation comes in the reduction to electricity bills. The efficiency of price signals is also important for the arrangements for contracted DSP as the price signals will influence the extent of the payment required for the consumer to agree to be curtailed.[156]

In chapter two, we defined efficient DSP as an action by consumers (either independently or via an intermediary) to manage or reduce their electricity consumption which delivers a net benefit to the wider market (e.g. lower costs of supply) which is more than the loss in value incurred to the consumer. Hence, efficient DSP should occur when the compensation offered to the consumer for its DSP reflects all the costs and benefits for the whole supply chain from that DSP option.

Figure 7.1 Supply chain and DSP



Where a DSP option creates multiple specific impacts in the NEM, each market participant will make a decision whether to facilitate or impede that DSP option based upon its own commercial position. These multiple impacts include benefits and costs for market participants and for the general efficiency and operation of the NEM.

The buyer of the DSP option – which could be the wholesale market, or participants along the supply chain – does not consider the broader market impacts of the DSP

156 Chapter six finds that current retail tariffs are not cost reflective and discusses the range of issues that need to be addressed in considering any move to more cost reflective pricing signals.

option. The buyer will purchase the service if the price demanded by the consumer is equal to, or less than the value which the buyer places on that service (i.e. the change in consumption pattern provided by the consumer).

Hence, for efficient DSP to occur, the supply chain should work in a manner which aligns the commercial interests of the buyer with the wider impact of the DSP option on the market. The ideal scenario is for each party through the supply chain to receive a positive share of the benefits arising from an efficient DSP option. In this scenario, each party along the supply chain would act to enable the DSP option.

However, in another scenario where one party along the supply chain is exposed to a net cost, but there is a net benefit to the market, then that party may act in a manner to impede the efficient DSP option. In this case, cost reflective prices, or in the absence of such prices, contracts could work in a manner to correctly compensate that party to remove any impediment to efficient DSP.

Therefore this review will investigate:

- opportunities for a DSP option to deliver a net benefit to the market and a net benefit to each party of the supply chain, and the reasons why such opportunities are not being captured today;
- the potential for cost reflective pricing to improve co-ordination among market participants along the supply chain; and
- ways to achieve co-ordination between multiple parts of the supply chain, including contracting mechanisms and the role of energy service companies.

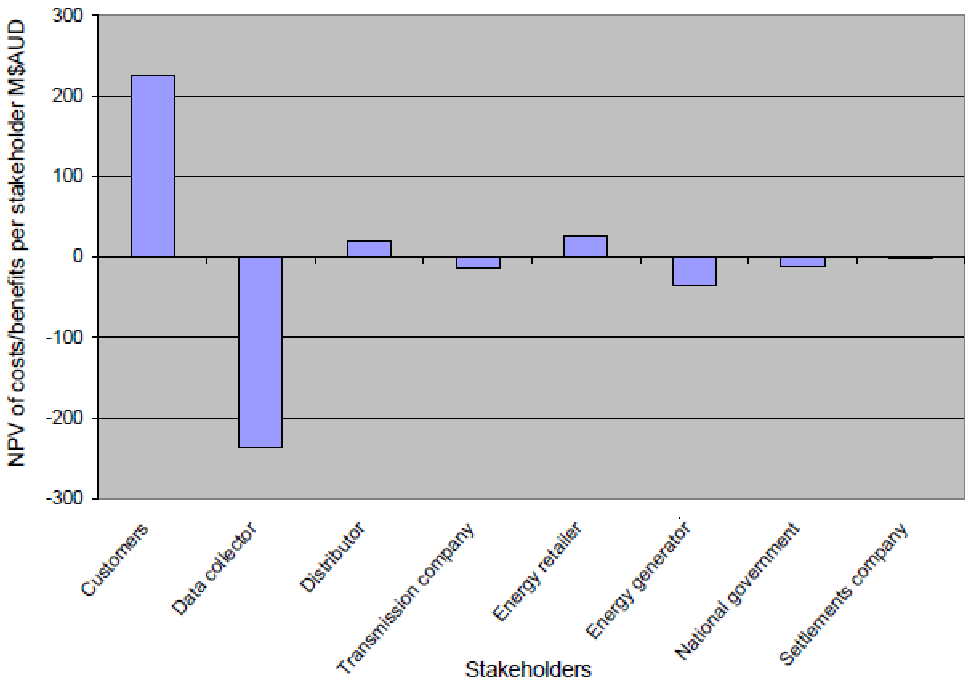
In doing so, we need to consider:

- How market participants value the costs and benefits of a DSP option. Differences in opinion on the value of DSP may impede co-ordination and contracts.
- How the costs and benefits of DSP are distributed between market participants and consumers.
- The difference between the market impact of DSP to that part of the supply chain and the impact on the commercial profit to the relevant market participant. For example, the benefit to the network sector of a DSP option which removes the need for network augmentation, will be the avoided capital expenditure (net of any costs of the DSP option). However the effect on the network business' commercial profit may not be same.

This chapter looks at whether the current arrangements ensure that the supply chain works in such a manner. The subsequent chapters will discuss each part of the supply chain and comment on the incentives and limitations in the current arrangements that could affect the identification and deployment of efficient DSP options.

Figure 7.2 Example of a DSP option affecting supply chain participants

The chart below illustrates the distribution of costs and benefits for a smart meter roll out scenario for South Australia. The allocation of costs and benefits amongst different stakeholders was extensively modelled by ETSA Utilities. The accrual of costs and benefits for smart meters indicates that the consumer is the prime beneficiary and the distributor benefits slightly. Costs are borne principally by the data collector. However in the current regulatory regime the data collector would in all likelihood be the distributor. In this example, there is an overall slightly positive net benefit to the market, but however for certain parts of the supply chain the DSP option could have a negative impact.[157]



Question	Distribution of DSP impacts across the supply chain
21.	**Can you provide a practical example of a DSP option which could deliver a net benefit to the market and also to the various parts of a supply chain. What are the reasons for such opportunities not being captured today?**

7.3 Issues with the supply chain

There could be a number of market issues that prevent the supply chain coordinating in the right way to enable efficient DSP. Stakeholders identified the following issues:

- differences in interests between participants and consumers prevent efficient investment in DSP (split incentives);

157 ETSA Utilities, Demand Management Program Interim Report No.3, June 2010. p.43.

- some parties will benefit from the DSP option but will not be required to pay a share of the costs (free-riding);
- there is a misalignment between market participant profit and the benefits to the supply chain (perverse incentives); and
- transaction and information costs preventing efficient co-ordination and contracts between parts of the supply chain.

A number of different examples of these issues have been raised:

- Owners of rental properties being driven by the capital cost of building development and maintenance, giving renters limited influence over their ability to shape their energy profile other than energy conservation and purchasing energy efficient small appliances.
- Appliance manufacturers (residential and industrial) have little incentive to invest in improving the efficiency and energy management capability of their appliances over cost reductions and product features.
- Networks needing to deal with peak demand at feeder and transformer level while retailers focus on aggregated off-peak, peak and shoulder pricing frameworks set by periods in the day. Consequently, the incentives for both to pursue DSP do not always align due to variation in pricing signals and available solutions.
- Misalignment between the drivers of a network business's profit and the value of DSP options (this issue is discussed further in chapter nine).
- Multiple retailers servicing a local network area would benefit from a DSP option applied to that area but may not be prepared to contribute to the costs of the DSP option due to the possibility of other retailers free-riding or uncertainty about recovering the costs from their consumers.
- Existing feed-in tariffs could be encouraging the shifting of consumer loads away from afternoon consumption and into night time network peaks, in an effort to realise maximum income from the scheme.
- A DNSP investing in DSP to reduce peak demand will potentially benefit a TNSP by deferring the need for transmission network upgrades. In this example, the TNSPs will receive additional profit but will have provided none of the funding to achieve the reduction of demand.

There is another example, in relation to the impact on wholesale prices. Any decrease in the wholesale price caused by load reduction is effectively shared across all consumers and the value of which is not paid to the consumer providing the DSP option. Ausgrid states that this can create a somewhat perverse incentive. In such circumstances, the value to the consumer providing the DSP option is in the opportunity to arbitrage the spot price. However the value of any arbitrage will depend upon keeping the spot price high, therefore the incentive would be to limit their demand response actions so as to avoid reducing the spot price.[158]

However we note that the same effect occurs when new generation enters the market and reduces the spot price. In both situations, the total benefit of reducing wholesale prices is not captured by the party that causes the reduced prices.

Co-ordination between parts of the supply chain

Where there are benefits arising from a DSP option for a number of different parties, in theory it should be in the interests of such parties to come together to ensure that the DSP option is utilised, since each party would receive a benefit. Hence, in the case of DSP options that are contract based, that contract should be a joint agreement across the multiple parties. However DSP will have differing impacts (benefits or costs) on different parts of the supply chain. Stakeholders recognised that the existence of different incentives can prevent such contracts from occurring and that the disaggregation of the industry into component parts has made it difficult for any one participant in the value chain to act as the buyer and deliver the full value chain benefits to consumers.

To date in the NEM, such DSP contracts are between the consumer and one market participant. From our discussions with large consumers and DSP service providers, it seems to be very difficult for a consumer (or a third party provider on its behalf) to negotiate with multiple parties (e.g. both a DNSP and retailer) for the same DSP option. We recognise that the correlation between spot prices and network prices is not perfect and hence the value of demand response will differ in different situations. However, it should be possible in theory that a DSP provider can capture the value it provides across the supply chain. One question for this review is how to move from the current bilateral state of DSP contracts to multilateral arrangements.

For such contracts to be effective it will depend on the appropriate sharing of risks, the alignment of incentives and determining how the benefits of DSP should be shared between consumers and market participants. Also it will depend on how rights for utilising the DSP option are allocated across multiple parties. The presence of split incentives and differences in the commercial drivers between the parties (for example, in certain circumstances, reducing demand could potentially disadvantage a retailer) may lead to conflicts between the parties. Transaction costs and information advantages between the parties may also act as a barrier towards such contracts.

To understand the extent of the lack of co-ordination in the NEM the next section looks at how the current arrangements treat DSP options and values their benefits. It also looks at the extent to which these arrangements promote the right co-ordination between parts of the supply chain.

158 Ausgrid states that in these situations, where the DSP option only produces such arbitrage benefits (i.e., avoidance of pool price obligations without affecting the pool price) it constitutes a wealth transfer from generators to retailers and/or the consumers providing the DSP option.

7.4 Current NEM arrangements

Table 7.1 provides a high-level description of how the current market arrangements value the benefits and allocate the costs arising from a DSP option. The table separates the impacts between the supply chain parties, the consumers that participate in the DSP option and the consumers that do not.

There are two dimensions to participation: getting consumers to enrol in an opt-in DSP option; and then also getting the response from the enrolled resource. For this table, we are assuming that participants provide a response and receive a direct payment for doing so. We recognise that benefits will vary by location as different regions face varying levels of peak events as well as divergent costs in terms of asset investment.

The purpose of this table is to give an indication on how effectively the electricity market manages the interactions between the various parts of the supply chain in relation to capturing the full value of DSP options.

Table 7.1 How DSP benefits are valued and captured across the NEM

Type of DSP Benefit	Who get the benefits	How the benefit is valued	Any supporting incentive scheme?	Impact on supply chain parties	Impact on participants in the DSP option	Impacts on non-participants
Reduction in wholesale price	On all consumers within region	Not valued as the counterfactual of the dispatch price without the DSP option is not calculated therefore hard to correctly estimate benefit due to demand reduction	NO	Negative impact on profit for generators Could affect future investment decisions	Direct Payment plus savings in bill	Cost of DSP option plus no immediate impact if consumer is on fixed retail tariffs Possible long term change in wholesale price should feed into lower electricity prices
Reduction in transmission network expenditure	Consumers connect to transmission network	Value of deferred project minus any costs of DSP option however no standardised approach and may depend upon TNSP	NO	May be negative impact on retail profits (i.e. lower volumes) and network profits - this issue is discussed in the respective chapters	Network support payment plus savings in TUOS charge (depending upon how TUOS is calculated)	Savings in TUOS depending upon how TUOS is calculated minus cost of network support payments and how benefits are allocated between network DSP providers and other consumers
Reduction in distribution network expenditure	Consumers connect to distribution network	Value of deferred project minus any costs of DSP option however no standardised approach and may depend upon DNSP	YES - Demand Side Incentive Scheme (Application varies by DNSP)	May be negative impact on retail profits (i.e. lower volumes) and network profits - this issue is discussed in the respective chapters. DSP Incentive schemes may provide some compensation	Direct payment + savings in DUOS charge	Savings in DUOS depending upon DUOS calculation minus cost of the DSP and how benefits are allocated between network DSP providers and other consumers

Reduced volume risk and consequent lower additional hedging costs for retailer	Retailers only	Reduce amount of hedge cover that needs to be purchased (and potentially lower risk premiums)	NO		Incentive payment by retailer + potential lower retailer bills depending upon competition	Potential lower retailer bills depending upon competition plus covering the costs of the DSP option
Lower electricity consumption/ peak shifting	Only on those consumers who are DSP participants	Retail prices	NO	Load shift is likely to have different impacts on DSP providers and buyers than would peak lopping Magnitude of difference would be a product of the amount of shift and the proportion of prices in different periods Negative profit for peaking generators	Savings equals change in volume multiple by retail price. Need to offset savings with lose in value from changing consumption	May suffer from a higher proportion of fixed costs recovery being transferred onto them
System reliability benefit	On all consumers within region	Negotiation/tender through the NSCAS or RET procedures	NO	AEMO compliance with reliability requirements	Incentive payment Advanced notice of curtailment	Greater system reliability Costs recovered via AEMO funding procedures
Energy Efficiency	Economy	Depends upon the value determined for each state based scheme	POSSIBLE YES - State based energy savings scheme (NSW, VIC, SA only)	Lower volumes may mean lower profits for networks and retailers Retailers face penalties if target reduction is not met	Incentive payment towards costs of EE plus lower electricity bills	Costs of scheme recovered from all consumers - impact of net effect of DSP on average unit price of electricity

The analysis set out in table 7.1 highlights that the key issues emerging from this table include:

- There is no common methodology for valuing the costs and benefits of DSP across the supply chain and these can be treated differently depending on the part of the supply chain and how the DSP option is used.

- The opportunities for a consumer to capture the benefits from a DSP option are based mostly on negotiations with a market participant. Hence the expertise and commercial bargaining skills of the consumer, or a third party intermediary on its behalf, will determine whether the DSP option receives the appropriate price for its benefits.

- Within the current arrangements there are two types of regulated interventions applied to promote efficient DSP (Demand Management Incentive Scheme and energy savings schemes). However, under both of the regulated incentive schemes the consideration of system wide benefits is not permitted. The demand management incentive schemes are limited to only network capital expenditure savings. Likewise the energy saving schemes are limited to energy efficiency savings, although we note that DCCEE is currently examining the possibility of including a peak demand component into a national energy saving scheme.

- Prices are very important as the means to promote consumer participation and also for determining how the benefits and costs of DSP are shared across parties.

The RIT for transmission and distribution[159] is the only mechanism that facilitates consideration of the system benefits.[160] However, there are a number of points to be made with respect to these tests:

- These project consultation and assessment tests do not determine the allowed expenditure for the network business. Instead expenditure is determined as part of the regulatory revenue determination process. The AER has the discretion to substitute a different expenditure level and take a different view of system benefits if it considers such changes better achieve the expenditure objectives in the rules.

- Simply being able to consider the benefits does not enable proponents to access additional funds to cover costs of such projects within the regulatory period. If the network business initially proposes to do a capital investment project at the start of the five year regulatory period, but during the period the RIT project assessment identifies a DSP alternative which delivers more net benefits to the market, the costs of the DSP project must be funded from the existing revenue allowance. This means that the DSP option must still be paid for through the

159 The RIT-transmission has been in place since 1 August 2010. The RIT-distribution is currently being developed as part of the rule change on the national framework for electricity distribution planning and expansion.

160 The framework for the national transmission planner also requires it to have regard to system wide market benefits in its planning.

difference between the value of deferred capital (return on and return of capital) included in the revenue allowance during the period, and the additional operating costs required (in addition to the allowance) to facilitate and operate the DSP project. At no point can a network access a separate funding stream to help pay for the project even though the benefits that may arise from the project may be spread through the market and more than outweigh the costs.

- In order for third party providers of DSP services to access this potential source of funding, they would be are required to go through network businesses.

There could potentially be an inconsistency between the RITs and the dispatch system in how benefits from DSP are treated.

Consumers who participated as scheduled load in dispatch get their reward from not consuming the avoided wholesale price (see chapter eight). The value of the wholesale price in the NEM reflects the whole costs of generation, including the cost of providing capacity. Therefore the savings in avoiding paying this price is the 'payment' for demand reductions.

Under the RITs, additional classes of benefits (e.g. competition benefits, option value, potential capital savings if new generation projects are delayed) could be included for a DSP option which reduces wholesale prices. Hence, in theory the DSP option may be able to receive value for such additional benefits by being implemented by the network business, instead of directly participating in the wholesale market.

In practice, this may not be a material problem, as it will depend upon how network businesses and the RITs guidelines consider the impacts on the market of options which reduce wholesale prices. However it could affect the development of DSP products and the potential for DSP service providers to enter the market. This is because the network companies would be, in effect, the portal through which DSP for application across the supply chain is facilitated. We appreciate stakeholder views on this and also how the current market arrangements promote co-ordination across the supply chain.

Questions Co-ordination across the supply chain

22. How do the current market arrangements promote co-ordination across the supply chain to promote efficient DSP? What potential improvements should be considered?

23. Do you consider that there is inconsistency between how the wholesale and market sectors value DSP impacts? If so, is this a material problem to be addressed?

7.5 Considerations

This chapter has so far discussed the effectiveness of the current arrangements in supporting co-ordination along the parts of the supply chain and identified potential impediments. This section contains some initial discussion of issues that need to be considered regarding any potential improvements to promote greater co-ordination. These include:

- the role of cost reflective tariffs;
- ways to achieve co-ordination between multiple parts of the supply chain (i.e. via third party intermediaries); and
- potential merit in standard approaches for valuing and forecasting the impacts of DSP to overcome the transaction costs and information asymmetries between parties.

This review will also need to consider whether the issues being raised are significant enough to justify new market based mechanisms being implemented in the supply chain and we appreciate stakeholder views on this. This section also discusses the option of building upon the existing mechanisms to promote better consideration of system wide DSP costs and benefits. The next chapter discusses potential mechanisms in the wholesale market.

Question **Effectiveness of the supply chain at capturing efficient DSP opportunities**

24. Can market mechanisms be improved to facilitate supply chain interactions for efficient DSP? If so, what options should be considered by this review and what considerations should be taken into account?

7.5.1 Role of cost-reflective tariffs

To some extent, the need for DSP as an organised activity (e.g. through market contracts or supported through regulation) is required because the demand-side of the market does not necessarily get accurate cost-reflective price signals. If all consumers received fully cost-reflective price signals, the value of DSP would be clear and transparent.[161]

The relevant issue is whether fully cost-reflective price signals would enable the supply chain to act in co-ordinated manner towards efficient DSP opportunities. Our initial

161 Examples of fully cost-reflective price signals include real-time wholesale market prices and fully nodal demand-based network charges. Further discussion of cost-reflective pricing is contained in chapter five.

view is that an economically efficient level of DSP would not automatically occur as other issues will persist in the market. Issues include a potential lack of clear information available to consumers, high transaction costs, insufficient access to capital, materiality and split incentives.

Fully cost-reflective prices would communicate value, thereby allowing consumers to make an explicit choice about the value of electricity consumption at different times as compared to its cost and available alternatives. Cost reflective prices will likely improve the environment for DSP service providers to emerge and to enter into market contracts across the supply chain. Hence they could decrease the need of any regulatory mechanism or influence the design of such mechanisms. However cost reflective pricing may be a necessary but not sufficient condition for efficient DSP.

Box 7.1 provides a description of an approach in New Zealand where a network business developed and imposed cost reflective tariffs on retailers to better align the incentive to achieve DSP across the supply chain. We are interested in understanding whether a similar approach could be applied in the NEM. We recognise that this would depend upon whether it would be practicable for network businesses to develop cost reflective tariffs based upon metering data at sub-station level and how retailers would react to such tariffs. Any benefits from changing consumers' load profile in a local area would be spread across the retailers serving that area. The possibility of free-riding may discourage any retailer to make investments and incur costs which would promote the consumer to change its consumption patterns.

Box 7.1: Orion New Zealand application of dynamic prices

Orion New Zealand Limited (Orion) is the electricity distribution network supplying Christchurch and the Canterbury region in New Zealand. It has run a dynamic pricing strategy targeted at increasing its system load factor for some 18 years and achieved considerable success.

In 1993/94, Orion could see that peak demand growth would trigger a major upgrade in transmission capacity in the South Island for very little initial return for consumers. It was also apparent that the very poor load factor of that demand growth (weather sensitive) was driving substantial future investment in distribution capital.

This prompted Orion to investigate the potential application of more cost reflective pricing. This led it to develop and implement dynamic pricing – initially to the major consumers in the region but later to all consumers. This ultimately meant that more than 50 per cent of the electricity price that large consumers paid was based on the costs associated with meeting peak network demand. This pricing was transparent to these consumers, since they had separate connection agreements at the time.

This pricing was then developed for all voltage levels and was charged to retailers directly using grid exit point settlement data (as is effectively the case in Australia for NEM settlements). The use of the net system load profiles with dynamic pricing (charged monthly not instantaneously) has since prompted retailers to install interval meters due to both the increased pricing risks posed by cost reflective distribution tariffs, and for associated competitive purposes.

The development of dynamic, more cost-reflective prices was complemented with an extensive demand side support program aimed at assisting consumers to make the transition to the new regime. The program was very successful in stemming peak demand growth even though economic growth continued to be very healthy throughout the region. It also enabled the upgrade of the transmission system to be deferred by at least 15 years.

Introducing more cost reflective pricing could potentially assist in overcoming some of the other issues with contracts discussed in section 7.2. For example, third parties interested in selling products or services that would allow consumers to manage their consumption profile could develop their value propositions based on transparent costs. These third parties could, in the first instance, identify consumers whose usage pattern is less peaky than the average and educate them about the savings to be made (with little or no changes in their consumption) from seeking a more cost-reflective price offer. Parties offering these services already exist and operate in the larger consumer sector. These or other third parties would also be better placed to demonstrate to consumers how changes in consumption – and technologies that assist in this regard – could save money and achieve attractive paybacks.

One possible issue with an increase in cost reflective tariffs is that it could increase the uncertainty surrounding the potential pay-offs for consumers who choose to participate in DSP. If there is uncertainty about future electricity tariffs, consumers may hesitate to support new investment in long-lived, capital intensive DSP. Hence this could reduce the pool of consumers wanting to participate in the DSP option, to those consumers who can manage such risk. Therefore, while locking the consumers reward into a certain defined value may be inefficient as costs will change over time, it may be required to get the consumer to participate in the program in the first place.[162]

Questions Role of cost reflective pricing

25. Would fully cost-reflective price signals enable the supply chain to act in a co-ordinated manner towards efficient DSP opportunities or would additional amendments be needed?

26. Would applying a network tariff scheme, similar to Orion's approach, be effective in the NEM?

162 For certain schemes, the consumer may be required to forecast the frequency of peak events to assess pay-off. A consumer is likely to be unsure of peak times and also the frequency of peak events.

7.5.2 Achieving co-ordination between multiple parts of the supply chain

The supply chain would work effectively if there were opportunities for both retailers and network businesses (and in some cases, AEMO) to come together and work jointly on a DSP action. Such coordination will require addressing the issues concerning: (a) the primacy of generator dispatch against a potentially limited number of opportunities to dispatch any given demand side resource; and (b) how to avoid the potential for one party to free ride on the exercise of DSP by another party.

The relevant question is not who is the best party to control the DSP load but whether contracts can be developed which allow multi-parties to access the same DSP resource and enable all the DSP benefits to be captured. Some stakeholders noted that retailers and network businesses will need to work collaboratively to promote DSP options as they become available. One aspect of this is to outline the appropriate framework for engagement with consumers. The market is increasingly complex with more market actors to deal with than before and new offers to consider. As such, there is an increased need for the consumer to be and feel secure and trust the market and its participants. This review will consider this matter further.

It may not be possible for all the market parties along the supply chain to be able to achieve the co-ordination and commitment necessary to act as a single body. There are two possible methods to address this. Firstly, third-party intermediaries could act between consumers and the various parties of the supply chain. Networks and retailers could contract separately with the third party who would then be responsible for offering a contingent contract to the consumer. Such third party intermediaries could take many forms (e.g. ESCOs or aggregators) and may take on some commercial risk themselves. We note that increased competition from such parties could be a way of introducing innovative program designs and marketing channels for DSP. In chapter six, we requested stakeholder views on factors which could be impeding the development of these parties.

Community led initiatives is another example of such a third party intermediary. Local councils or community organisations work to bring together a diverse range of interests towards a common project. Submissions recognised that in international markets, such projects can make a significant impact on peak demand and energy efficiency (e.g. United Kingdom and Denmark).

The second approach is to impose some mechanism or rules on the various parts of the supply chain. For example, the rules framework governing the procurement and deployment of NSCAS between TNSPs and AEMO ensures co-ordination between market participants to support the efficient use of these services. A regulatory peak demand incentive scheme on market participants is an example of a mechanism that supersedes current market arrangements and provides a form of payment to market participants as a means to overcome some of the split incentive issues. Effectively, under this approach one market participant is assigned the responsibility of managing co-ordination.

Both approaches are valid and could work in parallel. We appreciate stakeholder views on possible approaches to achieving the required level of co-ordination across the supply chain.

Question Co-ordination across the supply chain

27. What are your views on possible approaches to achieving co-ordination across the market participants in the supply chain?

7.5.3 Valuing the benefits of DSP

Understanding how the supply chain collectively values the different benefits is important. Accurate estimation of the financial value of peak reductions induced by demand response is essential to understanding and quantifying demand response benefits. However, there is not a universal acceptance of how to value the benefits of DSP and there is likely to be disagreement across stakeholders as to what should and should not be included in such assessments.

For example, wholesale electricity price reductions are widely cited as a benefit of increased demand response efforts. However, as this is often considered to be a short-term benefit, it is unclear as to the time horizon over which these benefits should be included. Further, others argue that this benefit is simply a transfer of wealth from generators to consumers and should not be included as a benefit of demand response at all. Other parties may propose using the capacity cost of peaking generation as a proxy for the wholesale benefit of DSP.

There may be disagreement on the type of benefits associated with DSP for the full value of demand response to be recognized. For example, some parties argued that, demand response has an "option" value where, regardless of whether it is used, it can be depended upon for reliability and planning purposes. These parties argue that if DSP is only compensated when it is dispatched and receives no availability payment then its full value may not be captured. However, we note that many network programs do pay availability payments to DSP options. While the buyer would like to only pay on dispatch, the reality is that, like capacity or even a cap contract, what the buyer is purchasing is an option. The value of DSP as a physical option has to do with how useful it is.

Stakeholders in their submissions to the issues paper supported the development of standardised values for DSP benefits. Ergon supported consideration of developing a value that can be used in business cases to reflect the economic value within the entire supply chain in providing DSP benefits to consumers, yet allows DNSPs to recover their appropriate costs. Ausgrid considers that an independent valuation of market benefits from DSP, particularly in the wholesale energy market, would be beneficial to all participants. It would limit the review the AER undertakes to the DNSP business case itself rather than necessitate a debate about the appropriate values of non-DNSP benefits. Ausgrid advises that a deemed value of benefits and the certainty that costs will be recovered through the building blocks will lead to significantly more DSP projects being undertaken in the NEM. They also suggest adapting this to permit some sharing of the market benefits between the NSPs and consumers in order to incentivise the NSPs to do efficient DSP projects.

A separate concern with valuing DSP benefits is the difficulty in estimating the change in electricity consumption behaviour. The perception that some participants in demand response programs will "game" the system may undermine the effectiveness of DSP options that require the estimation of a participant's baseline consumption level. This could make it difficult to accurately value the DSP benefit.

For example, a large industrial consumer that is bidding demand reductions into a wholesale demand response program would have the incentive to increase its baseline in order to appear to provide larger demand reductions. A similar incentive would exist in retail programs such as peak-time rebates (PTR) for residential consumers, where consumers are paid based on how much they lower their usage with reference to an unobserved baseline. There are methods for reducing the ability of participants to artificially inflate their baselines, for example using different estimation methods for different consumer types (e.g. making a distinction between weather-responsive and non-weather-responsive consumers) and relying on an entire season of historical load data.[163]

Question Value of DSP benefits to the market

28. What should be the approach to quantify the value of DSP options?

7.5.4 Ability to forecast the impacts of DSP

For demand response to be valuable as a resource to address peak demand, it must be dependable and predictable. In other words, when a program operator "pushes the button" they need to know that they will get the amount of demand reduction that they are expecting. Today, there are concerns that demand response is not as reliable as a supply-side resource. This is largely due to a lack of historical evidence (or at least data) showing consistent impacts from demand response resources or estimates of what demand response resources will provide under various event conditions. This is particularly true for economic programs such as dynamic pricing, for which there have been many robust pilots that have quantified the impacts, but for which there is not yet a significant history of full scale deployment.

Estimating demand impacts can be difficult. However, collecting data on load shapes at both the consumer level and DSP program level allows for better estimation of such impacts. Hence this shortcoming should decline over time as more empirical evidence is developed and made available to the industry.

163 Verification approaches applicable to different types of end-use patterns have been developed in the United States.

Challenges with forecasting may be derived partly from the voluntary nature or many demand response programs. These programs do not require that enrolled consumers provide peak reductions during critical events – they simply offer payments if the consumers respond. By putting control of the program in the hands of the participant, there is no guarantee that the load reduction will be provided. However, a noteworthy counter-argument to be made is that while a specific consumer may or may not respond to an event on any given day, what matters is the aggregate response from all consumers enrolled in a program. To the extent that this aggregate number is statistically predictable, then the program does serve as a reliable resource.

To accurately assess the benefits of demand response, it may be necessary to have acceptable, standardised practices for measurement and verification of demand reductions. Currently in the NEM, such practises are often unclear, inconsistent or missing across the states. This could have negative impacts on demand response contract negotiation and settlement, revenue approvals for network businesses, and long term network planning.

Therefore we suggest that there is a need for more co-ordination and assessment of the results emerging from the various DSP trials and pilots. We recognise that the Australian Government's Smart Grid, Smart City Initiative will improve understanding and provide a platform of test data. There could be merit in establishing a process for data sharing and assessment, with the objective of improving data collection and developing standardised approaches for evaluating DSP actions. We appreciate stakeholders' views on this concept. The aim could be to develop common, acceptable standards that could be used in network planning across the NEM.

AEMO will be responsible for factoring in the short term impact of DSP in the dispatch engine and the long term impact of DSP in its operational system planning. AEMO has stressed the need for better data collection on the available DSP capability in the NEM, especially for non scheduled embedded generation (e.g. solar panels). We also note that AEMO has initiated a National Electricity Forecasting Project with its aim to produce market wide, consistent electricity demand forecasts.[164] This issue is discussed further in chapter eight.

Question Methods to forecast the impacts of DSP option

29. Should standardised, common methods to forecast the impacts of DSP be developed? Is there a need for common approaches between network and operational planning?

7.5.5 Expand mechanisms to cover system wide DSP benefits

Introducing possible compensation mechanisms via the wholesale market may increase the complexity of dispatch and settlement and add to the costs of the system operator. An alternative to this approach would be to assign responsibility to a market

164 AEMO, National Electricity Forecasting, Information Paper - December 2011.

participant (e.g. distribution network business) to procure and invest in DSP options that pass some form of cost effectiveness test and which would be funded by consumers.

Effectively the market participant will become a single actor with the responsibility of identifying and capturing opportunities for efficient DSP. In doing so, such a mechanism would overcome the split incentives and free-rider problems. Whether such a mechanism would also address the issue that not all the benefits of the DSP action can be captured by the consumer who wishes to sell the DSP option, depends upon how the benefits of DSP are valued under such a mechanism. Such an approach would be an extension of the existing Demand Management Incentive Schemes and could address some of the issues relating to the regulatory investment tests discussed above.

In its submission to the issues paper, Ausgrid put forward an example of such a regulation mechanism, where the network business becomes the single actor. It states that a performance incentive could be designed to reward DNSPs for improvements in managing peak demand on their networks. The scheme would apply as a factor in the calculation of the WAPC or revenue cap calculation in a similar way to the manner in which the NSW D-factor and service standard incentive schemes factors apply. Ausgrid also proposes that the mechanism includes an incentive on the network business to invest in DSP options by allowing the business to keep a share of the net benefits to the market arising from the DSP option. We note that some DSP schemes applied in US provide businesses with a financial incentive above and beyond their normal rate of return on investments, as a way to better incentivise the business to promote DSP.[165]

We recognise that such a single actor does not necessarily need to be the network business. Also we note that the Australian Government is currently investigating possible designs for a National Energy Savings Initiative. Under the Clean Energy Future Plan, the Australian Government stated that any national energy efficiency scheme would need to create an incentive, or a requirement to create certificates, for ways which reduce peak demand. Such a scheme could include incentives or a requirement on specific market participants to reduce peak electricity demand.[166]

Question **Single actor option**

30. If the required co-ordination across the supply chain cannot be achieved, should a market participant be assign with the responsibility to procure DSP options? If so, what issues need to be considered in the design of such an approach?

165 See KEMA, *Review of Demand Management Programs*, report to Ausgrid, November 25, 2011.

166 Australian Government, issues paper - National energy saving initiative, December 2011.

7.6 Way forward

The issue being explored in this chapter is whether the current arrangements encourage a collective view of the disparate nature of costs and benefits across the supply chain in a manner that supports efficient DSP. We recognise that there could be a number of market issues that prevent the supply chain coordinating in the right way.

In the absence of cost reflective tariffs, contracts between multiple participants across the supply chain could promote the right level of co-ordination with the consumer. However, DSP will create different costs and benefits to different parts of the supply chain. The differences in commercial incentives across market participants (split incentives) and the possibility of participants seeking to benefit from a DSP option without contributing towards its costs (free-rider) means that the supply chain does not act in collective, co-ordinated manner. Stakeholders provided a number of examples of these issues occurring in the NEM.

We found that different parts of the supply chain may value the benefits of DSP in a different way. For example, the Regulatory Investment Tests permits some benefits which may not be available for the wholesale sector. This could disadvantage certain types of DSP and the relevant service providers as it means that certain types of DSP options may not be able to capture the value of all the benefits they provide.

This review will consider whether the issues being raised are significant enough to warrant making amendments. In our assessment we will consider the role of cost reflective tariffs and mechanisms to promote better co-ordination, via energy service companies for example. We will also consider developing standardised approaches to value and forecast the benefits of DSP as a means to overcome some of the transaction costs and information advantages between the parties, which may also act as a barrier towards such contracts.

These are complicated issues and we intend to consult with stakeholders on this matter during the next phase of this review, including whether a new regulatory mechanism is required. This review will consider whether the issues are material to require building upon the existing mechanisms to promote appropriate consideration of system wide DSP costs and benefits.

8 Wholesale and ancillary services markets

Summary

Access to the wholesale market would enable DSP options to capture value for their impact on demand and in doing so, could deliver wider benefits to the market through reducing peak prices. This chapter considers the issues in the wholesale energy and ancillary services markets that have the potential to impact DSP.

A number of stakeholders raised significant amendments to the current wholesale arrangements as a means to better facilitate DSP. Such options range from introducing an uplift payment, increasing the market price cap, paying DSP resources at their bid prices, and introducing a day-ahead market or capacity markets.

Our current position is that such mechanisms may not be the most effective means to achieve an efficient demand/supply balance. These options have been reviewed in other processes and have been rejected due to their economic implications, cross subsidies and complexity of design and compliance requirements. We agree that there is a risk of increase complexity and cross subsidies. Furthermore, as such changes would represents a significant reform to the current market, they would require a major separate study on their own. Such assessments are outside the scope of this review.

Directions

For the next stage of the review we will consider:

- additional obligations on market participants to provide information to AEMO regarding DSP resource capability in order to assist in demand forecasts;
- ways to better facilitate the role of aggregators and the ways in which they may directly access the wholesale market. We will hold an industry workshop on this topic; and
- other potential improvements to existing processes to better facilitate DSP into the wholesale market, including the effectiveness of the financial contract market.

8.1 DSP participation in the wholesale market

A functioning electricity market incorporates dynamic supply and demand forces. An potential issue with the current wholesale market arrangement is that the demand side of the market is not significant, thereby creating the potential for supplier market power and higher prices. Enabling demand side responses as well as supply-side responses could increase economic efficiency in electricity markets and improve system reliability.

The wholesale energy market arrangements of the NEM provide for generators to sell electricity and participants to purchase electricity from the wholesale pool. Predominantly such participants are energy retailers, who purchase electricity to then sell to businesses and households.[167]

Participants who control potential demand side resources have greater flexibility than equivalent sized generators. Demand side resources have a choice to either participate as a scheduled load, register as a market customer without registering as a scheduled load, or simply to respond to the published wholesale price and negotiate a pass-through tariff with a retailer.

While generators can make offers to sell energy into the wholesale pool, consumers in the NEM can also bid to provide demand side response. Consumers wishing to participate in this way would need to be registered participants of the NEM and would have to comply with relevant market operating requirements and obligations. Box 8.1 provides a description of how DSP can be dispatched as a scheduled load through the current NEM process.[168]

Box 8.1: Scheduled DSP in the NEM Dispatch Process

Scheduled load in the NEM is a load registered with AEMO and is managed in a way analogous to that of scheduled generation. For the purposes of economic scheduling of electricity to meet demand, scheduled loads are essentially treated on equal terms with scheduled generating units. In the central dispatch process scheduled load and scheduled generation have similar requirements - each must be able to respond with an acceptable degree of accuracy to dispatch instructions and have appropriate telemetry to communicate with AEMO systems.

In its bid the consumer must submit the maximum capacity registered for that scheduled load in the form of ten price bands. Each price band associates a quantity of electricity consumption with a price for the scheduling of that quantity of electricity. The price specified for a price band is interpreted in the central dispatch process as the market clearing price, at or below which the scheduled load will increase electricity consumed by, up to the MW increment specified in that price band.

Remuneration for scheduled loads in the settlement of the spot market is on the basis of avoided liability for energy payments, that is, through a reduction of

167 Additional background information on the NEM arrangements can be found in the AER 'State of the Energy Market' publications.

168 Parts of a scheduled load may include a generator located behind the consumer connection (metering) point.

cost, not additional revenue. As the market clearing price rises, scheduled loads will progressively be switched off in response to dispatch instructions; and as the market clearing price falls, scheduled loads will progressively switch back on. Hence the value to a scheduled load from participating in the dispatch process will depend upon:

- the volume of load not consumed, multiplied by the price that would have observed had the load been taken, less the value the foregone energy would have derived; and
- the share of any savings that is negotiated between the consumer and a market participant (i.e. if a retailer's requirement to purchase from the spot market is reduced, or a network, if the scheduled load helps to address an intra-regional network limitation).

As market dispatch is on a 5 minute basis and settlement is on a 30 minute basis, it is possible that scheduled load is dispatched (i.e. instructed to turn off) for only some 5 minute intervals, even though the 30 minute price is below its bid price. However this settlement risk is a feature of the market that scheduled generators also need to manage.

Historically, the only loads to have registered as scheduled in the NEM are hydro pumping facilities (typically 50MW and greater) and in the early years of the NEM, some aluminium smelter loads (typically 100-200MW). Currently there is no load operating as scheduled in the NEM.

8.2 Role of the system operator

There are two areas where the role of AEMO will impact on how market and regulatory arrangements promote the use of DSP:

- estimating the level of demand side participation in both long term forecasts and short term dispatch, which is an important consideration to ensure that DSP is correctly valued; and
- as a procurer of DSP through the markets for ancillary services (e.g. Reliability and Emergency Reserve Trader (RERT), network support and control ancillary services (NSCAS) and frequency control ancillary services (FCAS).[169]

Accurate demand forecasts will:

- allow operating margins on network constrains to be reduced which should lead to a more efficient use of existing network infrastructure;

169 Ancillary service markets are considered in section 8.7.

- allow more accurate dispatch of scheduled units to meet non-scheduled demand, thus reducing the cost of dispatch; and
- lead to more accurate pricing of electricity, thus improving the efficiency of the market.

The ability to forecast and incorporate demand response for near-term operations varies as a function of the type of demand response. Specifically, reliability- or event-driven, dispatchable DSP are more easily forecasted than demand response offerings that are price driven - subject to consumer decisions and actions. In practice, price responsive DSP is not explicitly modelled in the NEM dispatch system. However AEMO would monitor changes in demand patterns and have regard to the potential of DSP when estimating demand levels.

Experience gained with DSP trials and pilots should offer insight into how consumers react to different types of demand response offerings and how different offerings affect energy use levels. Thus, in the future there should be enough data to create more accurate algorithms and methods for forecasting demand response impacts on loads, and for incorporating different types of demand response resources into grid operations. There may be a need for more co-ordination between AEMO and the network businesses on how to incorporate DSP into the wholesale electricity markets and network planning processes.

AEMO needs to be able to accurately capture demand side availabilities in its forecasting process to ensure the accurate calculation of reserve conditions and dispatch outcomes. This requires AEMO to receive relevant and up-to-date information from DSP providers. In its submission on the issues paper, AEMO noted that it should be provided with accurate and timely data by market participants on their expected behaviour in all the timeframes applicable to AEMO's forecasting roles.[170] Regarding this, the Commission notes that appropriate confidentiality arrangements may need to be developed in order to protect the commercial interest of participants. We appreciate views from stakeholders on whether additional obligations are needed on market participants to provide information to AEMO regarding DSP capability.

In some circumstances, AEMO intervenes in the market, such as to procure reserve capacity when there is a predicted shortfall. In these circumstances, DSP could be a service provider to AEMO. This is particularly relevant because AEMO interventions tend to be limited to the short term, which preclude options that involve new investment. Effective use of DSP is likely to reduce costs as it improves efficiency by enabling AEMO to intervene effectively, such as to avoid involuntary load shedding, and by enhancing the range of options available to AEMO.\

170 AEMO, issues paper submission, p. 5.

Question	Load forecasting incorporating DSP
31.	**Should there be additional obligations on market participants to provide information to AEMO regarding DSP capability?**

8.3 Issues for this review

The issues of relevance to this review are whether the current wholesale market arrangements provide for a transparent, working market for DSP providers to bid into the wholesale market and receive value for their services; and whether there is a level playing field between the demand side and the supply side. We note that we are not considering any changes to the fundamental market design. Any changes to the fundamental market design would have broad implications and should not be considered from the perspective of promoting DSP alone.

In response to submissions on the issues paper, issues relevant to the wholesale energy and ancillary services markets are discussed further as follows in this chapter. We have considered issues including access to the wholesale market, factors that affect price certainty, and the value and benefits of DSP. Access to the ancillary services markets by DSP providers is also considered.

8.4 Access to wholesale market

To provide demand side response through reducing electricity demand in response to a wholesale price change, a DSP provider would need to have access to the wholesale market. In this sense, we consider 'access' to mean the ability to participate in the market by being able to receive, and respond to, wholesale price signals. In this chapter we consider accessing the wholesale market from the perspective of consumers or loads. Distributed generation issues are considered in chapter 11.

End-use consumers can currently access the wholesale market to provide demand side response by changing the quantity and timing of their energy use in one of two ways:

- directly, by becoming a registered participant; or
- through a retailer.

The implications for becoming a registered participant or participating in the wholesale market via a retailer are considered below. We also consider the role of aggregators, particularly to assist consumers to provide demand side response in the NEM.

8.4.1 Becoming a registered participant

By becoming a registered participant, a consumer could respond to wholesale market prices directly. A registered participant is able to make offers to the wholesale pool and respond to dispatch instructions from AEMO. However, in addition to meeting technical requirements, a registered participant faces a number of costs.[171] These costs include an once only registration cost and on-going participant fees.[172]

A registered participant may be subject to the prudential obligations under the rules and could be required to develop and maintain expertise in managing wholesale market risks. Managing these risks, including forecasting wholesale prices, would incur operational costs. Although this cost is faced by all participants in the electricity market, managing risks in the wholesale market is not necessarily the core business of consumers providing demand side response. Particularly, smaller commercial and industrial consumers may have limited awareness of the ways in which they may contribute to DSP. Consideration of consumer awareness and understanding is further discussed in chapter four.

The findings from the DSP Stage 2 review were that the costs to participate as a registered participant were considered appropriate so as to allow AEMO to effectively preserve a secure and stable market environment.[173] Although these costs might represent a manageable cost for many businesses, the high transaction costs associated with the prudential requirements and risk management mean that the option of becoming a registered participant is likely only feasible for large end-use consumers.[174]

There will be other transaction costs of participating in the wholesale market as a scheduled load. The installation and operating costs of the required communication and dispatch telemetry mechanisms could be quite significant. Chapter six discusses the issues relating to consumer investment in DSP technology.

In its submission on the issues paper, the Energy Users Association of Australia (EUAA) noted that consumers were not prepared to accept full exposure to the spot market price volatility on an ongoing basis (by becoming a registered participant) and preferred to exercise DSP within a flexible contract arrangement with a retailer or aggregator.[175]

From the perspective of businesses, particularly small to medium consumers, it is likely that the costs associated with becoming a registered participant (particularly the costs associated with managing wholesale price risk and price volatility) would outweigh any potential cost savings from managing load and providing demand side

171 Specific requirements for registering as a market consumer are explained in AEMO's 'NEM Customer Registration Guide' available from AEMO's website. This document sets out the requirements for the registration process.

172 Currently the registration fee for a market consumer is $5,000. There are also ongoing participant fees that are charged at rates in accordance with a market customer's load. Additional costs to establish membership in Austraclear and set up appropriate communication equipment may also be incurred. Details are set out in AEMO's budget and fees statement available on AEMO's website.

173 AEMC, *Review of demand side participation in the electricity market*, final report, 27 November 2009, p.55.

174 The certainty of the value of DSP is discussed further in section 8.6 below.

175 This is based on information provided by respondents to a survey conducted by the EUAA, as outlined in its submission, pp. 2-3.

response.[176] For these consumers, as well as small end-use consumers generally, an alternative is that demand side response could be provided through retailers.[177] However, we note that some stakeholders have raised the concern that smaller consumers may have limited bargaining power in their negotiations with retailers.

We welcome any comments on this issue and where appropriate, will further investigate any areas of concern.

Question	Becoming a registered participant for DSP
32.	**Are there issues relating to the costs and processes for becoming a registered participant in the NEM that require to be considered further in this review? If so, why?**

8.4.2 Accessing the wholesale market through retailers

An alternative way for consumers to obtain access to the wholesale market is through contract arrangements with their retailers, such as contracts where there is full or partial pass-through of the spot price. In this way, the consumers would be exposed to the fluctuations in the wholesale market while certain risks are managed on their behalf by their retailer.

As noted by Futura in its report on existing and plausible future demand side participation in the NEM:[178]

> "Retailers also offer full or partial pool pass-through contract arrangements to their large consumers. Consumers that enter into these arrangements tend to have flexible loads that can be utilised to respond quickly to market prices and the time, skills and resources to monitor and manage the risk associated with direct exposure to the market. Progressive Green, a relatively new retailer in the market, offers pool pass-through contracts with a market monitoring and alert service. This product is attracting smaller industrial consumers with flexible loads to take up pool pass-through arrangements that would otherwise not do so due to lack of internal skills and resources to monitor market prices. From feedback and discussions with retailers it is estimated that there is an additional 40 MW of DSP from consumers on pool pass-through arrangements that are curtailing load in response to full or partial exposure to pool prices."

Although there are niche retailers entering the market to provide specific DSP based solutions, it appears that generally contracts with retailers are more readily available to

176 The value of demand side response is discussed further in section 8.6 below.

177 Small end-use consumers such as households would not have the option of becoming a registered participant as they would not be able to meet the technical and registration requirements.

178 Futura, *Investigation of existing and plausible future demand side participation in the NEM*, report to the AEMC, 16 December 2011, p. 45.

larger consumers.[179] Larger consumers may also have greater ability to negotiate favourable terms and conditions compared to smaller consumers. A reasonable level of operational monitoring would still be required by the consumer to monitor its electricity consumption and wholesale price outcomes.

The findings from the AEMC DSP Stage 2 review considered that the spot price pass-through contracts with a retailer afford consumers similar benefits to benefits available from being a scheduled load with the potential for lower costs and greater flexibility.[180] However, it is questionable whether businesses other than large users would find these contracts beneficial. This raises the issue of whether there is a greater role for aggregators in the market.

8.4.3 Role of aggregators

Aggregators differ from retailers in that aggregators act specifically on behalf of users to provide and coordinate demand side responses. In most cases, the core business of aggregators is developing DSP programs and working directly with end-use consumers on DSP mechanisms, potentially providing additional choice and flexibility to consumers.

Under the current market arrangements, in order for an aggregator to have direct access to the wholesale market, it would need to become a registered participant and take on the financial responsibilities of a retailer. This could limit the ability for aggregators to participate in the NEM. That is, currently an aggregator's access to the market is through arrangements with retailers. In its submission on the issues paper, EnerNOC noted:[181]

> "Without direct access to the spot market, demand-side participants cannot use energy revenue to back the sale of financial hedges. This is the mechanism used by generators to convert volatile energy market revenue into predictable capacity revenue, essential for a sustainable business; it is inaccessible to demand-side participants."

In this review we will further consider ways in which smaller consumers may access the wholesale market and whether specific provisions should be made to improve the way in which aggregators may provide benefits to the facilitation of DSP in the NEM. We will consider whether there is a requirement to introduce a new category of market participant for aggregators and the scope of such provisions including whether aggregators are subject to the same risks and liabilities as other market participants. For example, given their role in providing a 'negative load', aggregators may not need to meet the same level of prudential requirements as retailers.

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179 In addition, we note that Progressive Green currently operates in Victoria only.

180 AEMC, *Review of demand side participation in the electricity market*, final report, 27 November 2009, p. 60.

181 EnerNOC, issues paper submission, p.3.

We also note that in the Aggregation of Ancillary Services Loads Rule change, the issue that aggregation businesses need to be retailers was raised. In the Commission's final determination on that Rule change, the Commission noted that it would address this issue separately from the Rule change.[182] The AEMC proposed to hold a workshop with industry to discuss the relevant issues including the rationale for a new form of market participant. Some of the issues to be addressed in the workshop include: what provisions and registration requirements should apply to such a new form of market participant; changes to metering rules and metrology procedures to allow participants to have access to metering data; and information and system requirements to ensure market arrangements are able to accommodate the new market participant. We intend to hold a workshop on these matters in April 2012.[183]

Question The role of aggregators in wholesale markets

33. What issues should be considered regarding the role of aggregators in the NEM? Should there be a new category of market participant for aggregators?

8.5 Price certainty

When a consumer (or aggregator) participates in the wholesale market by making bids to withdraw capacity once the pool price reaches a certain level, the consumer will bid in at a level where it is beneficial to reduce or stop consumption to avoid paying for electricity at that time. As decisions to reduce load in many cases must be made a number of hours in advance, this requires the consumer to have a good understanding of potential price outcomes and an ability to forecast wholesale prices. That is, a consumer would need to make its decision based on a forecast price which could be different from the settlement value. This presents a risk to DSP providers, as well as to all other market participants (i.e. generators).

Some stakeholders considered that demand side response would be promoted if there were higher levels of price certainty, as this would reduce the risks faced by DSP providers. One option to improve price certainty is introducing a 'day-ahead' market which enables contracts for electricity to be settled the day before it is delivered (and a spot market is then used on the day of consumption to allow for differences between contracted amounts in the day-ahead market and actual outcomes).

8.5.1 Day-ahead market

As a day-ahead market provides for trading to take place on the day prior to the delivery of electricity, it creates financial commitments about price, load and generation ahead of the time of delivery. As a result, a day-ahead market provides

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182 AEMC, *Aggregation of Ancillary Services Loads*, final rule determination, 9 September 2010, Sydney, p. 22.

183 Details on this workshop will be circulated shortly.

greater certainty for participants in the market.[184] DSP may be promoted by allowing DSP providers to determine and lock-in the value of the demand side response and reducing their exposure to price fluctuations in the spot market. A day-ahead market could also provide other benefits such as improving the price discovery process and providing greater flexibility to market participants by offering an additional contracting option. We note that a day-ahead market is not a capacity market where capacity markets set an explicit requirement for a certain level of capacity to be maintained.

Day-ahead markets exist in a number of international markets including the Pennsylvania-New Jersey-Maryland (PJM) and ISO New England markets. However, it is noted that in many cases, the multi-settlement market design was implemented to address other market conditions such as the management of inter-pool trade or management of ancillary services, many of which are not applicable to the NEM.[185]

Although day-ahead market arrangements could promote DSP, developing and implementing a day-ahead market would impose costs on the market. There would also be broader implications on the market such as impacts on the risk management environment in the NEM, affecting existing contract arrangements and potentially impacts on asset values. At this stage, we do not intend to further investigate a day-ahead market mechanism, which would need a separate review, given that it would have wider implications outside of promoting DSP.

At the time of the AEMC DSP Stage 2 review, the Commission concluded that the short term financial contracts market would provide the same benefits as a day-ahead market.[186] However, stakeholders have raised concerns about the effectiveness of the current financial contracts market for electricity contracting both in terms of liquidity and transparency. EnerNOC considered that the ability of smaller consumers to participate in the short-term financial contracts market may be more limited. We will instead consider the effectiveness of the financial contract market provisions for smaller consumers and the role of aggregators in the short-term financial contracts market. We appreciate stakeholder views on this matter.

Question Access to short term financial contract markets

34. How effective are current financial contracts markets at providing a hedge against price risk for DSP options?

8.6 Value of DSP action

DSP potentially provides a number of benefits to the market as a whole. These benefits stem from the theory that DSP may provide a reduction in peak demand. At the

184 CRA, *Short-term Forward Market*, 30 June 2004, p. 1.

185 CRA, *Short-term Forward Market*, 30 June 2004, p. 3.

186 AEMC, *Review of demand side participation in the electricity market*, final report, 27 November 2009, pp. 62-63.

generation level, a reduction in peak demand reduces the requirement for additional investment in peaking plant and increases the utilisation of the existing portfolio. DSP may also more broadly change load requirements into the future, impacting the number and types of plants needed to meet the forecast load. The load factor consequently improves and leads to a greater proportional use of more cost-effective base load plant.

DSP may also improve system reliability and reduce the amount of unserved energy. These impacts would result in lower average energy prices. The strategic use of demand flexibility may also dampen volatility in market prices, leading to lower risk management premiums in the retail sector.

The decision of a consumer to change their consumption to provide demand side response depends on the benefits that these consumers receive from consuming electricity compared to the savings from demand reduction. Under the current arrangements, any direct participation in the wholesale market by DSP providers would value DSP action at the wholesale price. Whether the wholesale price is reflective of the value of DSP or whether DSP providers should receive an additional payment for providing services to the wholesale market (such as an uplift or a capacity payment) has been raised.

We note that setting the wholesale price, in particular the market price cap (MPC), and capacity market design issues both have broader implications for the market than just impacts on promoting DSP. Assessing the MPC mechanism and consideration of introducing capacity market arrangements must be considered from the perspectives of the market as a whole, which is beyond the scope of this review. As noted in the AEMC Strategic Priorities Paper, we do not consider that there is currently any evidence to suggest substantial changes to the fundamental market design are required.[187] However, in response to issues raised in submissions to the issues paper, these considerations are discussed in more detail as follows.

8.6.1 Wholesale price

As explained above, the NEM does not provide any such standardised additional payments to contracted DSP resources. This assumes that if a consumer chooses to participate in DSP and enters into a contract to offer a guaranteed demand response, the reduction in its electricity bills and any direct payment from the contract counter-party (i.e. network, retailer) is sufficient to off-set the loss of value the consumer experiences in changing its consumption and in recognition of the system benefits resulting from DSP. The direct payment from either market participants will depend on what value of the DSP option can be captured.

In the US, some states have implemented schemes where the system operator makes additional uplift payments for controllable load reduction. In March 2011, the Federal Energy Regulatory Commission made a decision which requires system operators to

187 AEMC, *Strategic Priorities Paper 2011*, October 2011, p. 19.

pay any DSP measure participating in the wholesale markets the dispatch price when two conditions are met:

- the first condition is that the demand response resource has the capability to provide the service – that is, the resource must be able to displace the generation source; and
- the second condition is that the payment of the dispatch price must be cost effective, as determined by a net benefit test.

The justification put forward for such regulatory schemes is that such DSP resources act against generator market power and therefore promote effective competition in the wholesale sector. This could deliver wider benefits to all consumers through providing more supply options, encouraging new entry and innovation, and spurring on the deployment of new technologies.[188] Such schemes recognised the possibility that resulting movements in the wholesale prices may not be sufficient to attract the desired load response, that is, the savings in tariffs do not provide sufficient compensation to offset both the loss in value from consumption and any of the costs of the DSP for the consumer.[189] There is also the possibility that consumer retail bills are not reflective of the wholesale price, and therefore consumers are not provided with the correct signal.

The question to consider is whether such an uplift payment mechanism would better promote achieving an efficient demand/supply balance for the NEM.

Uplift payments to scheduled loads can be a difficult matter to implement. Changes would be required to the Rules for determining:

- the type and volume of scheduled load that would be entitled to an uplift payment;
- the price at which the payment is made (this was a contentious issue in the design of the US schemes);
- the amount of uplift payment;
- recovery of uplift payment from participants; and
- potentially, additional monitoring of compliance with rebidding provisions and dispatch instructions.

While uplift payments would be attractive to demand side resources, its use to fund payments for DSP has been reviewed a number of times (e.g. Parer Review, DSP2). In each of these reviews it has been decided not to introduce uplift in the spot market

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188 USA Federal Energy Regulatory Commission, *Demand Response Compensation in Organised Wholesale Energy Markets*, March 15, 2011, Docket number RM10-17-000; Order No. 745.

189 For example, incentives or rates derived from actual wholesale market prices may not provide consumers with sufficient financial incentives to install expensive equipment or make changes in operations for the limited purpose of reducing load for less than 100 hours in the year

settlement in light of the economic implications and complexity of design and compliance requirements.

In the final report of the DSP Stage 2 review, we noted that consumers will factor in any change in the wholesale price before deciding to offer their DSP to the market; therefore any additional payment would be higher than the cost of providing DSP.[190] We also noted that to the extent that DSP results in a reduction in the wholesale prices, in aggregate, the remaining load will pay less and remaining generation will in turn be paid less. For these reasons, we concluded that this results in a wealth transfer between consumers and generators and as a result, there is no overall improvement in efficiency.[191]

The introduction of a payment for not consuming would introduce considerable complexity to settlement as it would be necessary to determine the level of "non-consumption" responding to the dispatch signal that would be entitled to receive a payment and to determine an efficient mechanism to recover these costs from consumers. The value of the wholesale price in the NEM reflects the whole costs of generation, including the cost of providing capacity. Therefore the savings in avoiding paying this price should be the appropriate payment for demand reductions.

At this stage, we are not convinced that such an uplift payment would contribute to achieving a more efficient dispatch. There is a risk that the costs of funding uplift payments would be more than the possible benefits for consumers (who do not participate in the DSP resource) of any reduced price outcomes, and therefore would be an cross subsidy. This would depend upon whether the DSP resource can lead to a permanent reduction or shift in the generation capacity, thereby reducing the overall costs of the power system. Furthermore while we recognise that increasing elasticity of demand could contribute to addressing any potential market power, it is also possible that measures that depress peak prices will only result in higher off-peak and shoulder prices.[192] We also question whether it is appropriate to introduce a mechanism into the dispatch process which treats DSP favourably compared to generation resources.

A consumer chooses to participate in DSP and enters into a contract to offer a guaranteed demand response. The reduction in the consumer's electricity bills and any direct payment from the contract counter-party (i.e. network, retailer) is sufficient to off-set the loss of value the consumer experiences in changing its consumption and in recognition of the system benefits resulting from the DSP. As discussed in the previous chapter on supply chain interactions, the appropriate reward for DSP could be achieved through contracting arrangements. To date, such contracting has been limited. However, it does not seem appropriate or efficient to address this through introducing an alternative and parallel mechanism into the wholesale market. Improvements in terms of the amount of DSP available to participate in the wholesale

190 AEMC, *Review of demand side participation in the electricity market*, final report, 27 November 2009, p. 62.

191 Ibid

192 This is because generators are dependent on wholesale prices above their short run costs in order to recover their costs.

market may be better achieved through addressing some of the other material issues being raised in this paper.

Some submissions also referred to allowing DSP resources to be paid as bid. This would be an alternative mechanism to the uplift payment scheme. The problem with pay as bid is that the result is not an optimal dispatch based upon efficient short run marginal costs, acknowledging that at peak times of constrained supply relative to demand bids, the dispatch price is also likely to depart from the short run marginal costs. Also, like the uplift scheme, it would add complexity to the dispatch process and require a mechanism to recover the costs from consumers. This is because any extra payment to DSP based on its bids would not be recovered from the dispatch settlement process.

8.6.2 Market price cap

Direct participation in the wholesale market by a DSP provider values the demand side response at the avoided cost of a reduced load with respect to the wholesale price. However, as the current MPC is $12,500/MWh, in its submission on the issues paper, the Victorian Department of Primary Industries considered that the existing price cap arrangements act as a disincentive for direct involvement of DSP. This is because the MPC could limit the potential profitability of DSP participation.[193] Given that the value of consumer reliability (VCR) for commercial and industrial consumers are much higher than the MPC at $36,070/MWh and $90,760/MWh respectively, the Victorian DPI considered that there is risk that direct DSP participation would be inhibited.[194]

The MPC is one of the key mechanisms in the NEM to incentivise investment in generation to meet the reliability expectations of consumers. Investment in generation would be dependent on the opportunities to earn revenue and respond to the MPC. When the level of the MPC changes, it affects the revenue potential for generators from the spot and financial contract markets.

The MPC, as a component of the reliability standard and settings review, is reviewed by the Reliability Panel (Panel) every four years. The Panel undertakes this review in accordance with the rules consultation procedures, which sets out specific requirements for public consultation. In conducting the review, the Panel must have regard to the impact of the reliability settings on spot prices, investments in the NEM, the reliability of the power system and impacts on market participants. The Panel must also have regard to any value of customer reliability determined by AEMO that the

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193 Department of Primary Industries Victoria, issues paper submission, p. 2.

194 These VCR values were explicitly estimated for Victorian consumers, based on information obtained in 2010, although they are broadly relevant to other jurisdictions. It is noted that the VCR for residential consumers is closer to the MPC at $13,250/MWh. Discussion of the use of VCR in Victorian planning arrangements is outlined in the AEMC's Final Report for the Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, which was published in May 2010. AEMO has been considering issues relating to calculating a national VCR. The latest information may be found at http://www.aemo.com.au/planning/vcr.html.

Panel considers to be relevant.[195] This is a comprehensive and robust process to provide for the Panel to review the MPC on a regular basis and any proposed changes would be assessed by the Rule change process.

In the last review, the Panel noted that demand side capacity is taken into consideration in assessing the bulk electricity supply. It also noted that the level of the MPC provides an important signal to participants concerning both supply-side and demand-side investment and usage. In carrying out the review, the Panel sought comments from stakeholders on a number of issues including on whether increasing the MPC would result in 'additional demand side response'.

While increasing the MPC may increase the incentives for buyers to seek additional DSP, the Commission is not convinced that a higher MPC would necessarily bring more demand side resources into the market in the longer term. This is because a higher market price cap would also be likely to bring additional generation to the market. Also a higher MPC may increase the risks for consumers. Also it is likely that consumers who want to participate in the wholesale market would do so at a level less than the current MPC. Improvements in terms of the amount of DSP available to participate in the wholesale market are more likely to be achieved through addressing some of the other issues being raised in this paper.

We consider that the current framework for determining market price cap ensures appropriate consideration of the role of DSP as an efficient alternative to generation.

8.6.3 Capacity markets

Whether or not to introduce a capacity markets mechanism would be a question about the fundamental design of the market. The impacts of such a level of change would have wide-ranging impacts including potential significant changes to existing risk profiles and contract arrangements of market participants. Such a fundamental change is beyond the scope of this review. In addition, we note that the evidence considered by the Commission in other reviews suggests that there are no significant failings in the current market design.

Our considerations for this review with respect to wholesale market issues is whether there is a transparent working market for DSP proponents to offer services and to receive the right value for these services. Some stakeholders have suggested significant amendments to the current arrangements to better facilitate DSP options. For the reasons expressed above, we do not consider that such amendments require further consideration.

However we recognise that there could be possible amendments within the current dispatch system which could improve participation by DSP. For example, we note that one of the recommendations from the Review of the Effectiveness of the NEM Security

195 Clause 3.9.3A of the Rules. If the Panel concludes from the review that the reliability standard and/or settings should be changed, it must submit a Rule change proposal to the AEMC (clause 3.9.3A(g) of the rules).

and Reliability Arrangements in light of Extreme Weather Events was that the process for determining the Reliability Standard and Settings should be changed to have an explicit requirement for the standard and settings to reflect the level of reliability valued by consumers.[196] We appreciate stakeholder views on any other potential improvements to existing processes and other means to better facilitate DSP into the wholesale market.

Question **Remuneration for providing DSP in the wholesale market**

35. Given the discussion regarding the appropriate payment to DSP resources in the NEM, are there any other issues that should be considered by the Commission in regard to this matter? Are there any potential improvements to existing processes and other means to better facilitate DSP into the wholesale market that require consideration?

8.7 Ancillary services markets and RERT

DSP providers may also participate directly in the wholesale market for the provision of ancillary services in the NEM. These additional ancillary services markets, where DSP providers would receive benefits and payments for services they provide, may act as a catalyst for fostering DSP. The revenue from providing ancillary services could provide the critical mass of revenue needed to establish commercially viable and sustainable DSP projects. In the NEM, market ancillary services are acquired by AEMO through the spot market and the prices are determined through the dispatch algorithm.[197] Separately, AEMO also acquires non-market ancillary services under agreements following a call for offers. Prices for non-market ancillary services are determined in accordance with the relevant ancillary services agreements.

Currently, in order to participate in the ancillary services markets, a consumer would need to be a registered participant, which would incur costs to the consumer as discussed above in section 8.4.1. In the DSP Stage 2 review, we considered that the costs were appropriate as to allow AEMO to effectively preserve a secure and stable market environment. However, a minor barrier regarding the aggregation of ancillary service loads for the provision of market ancillary services was identified.[198] Since that time, we note that a Rule change has been made to address this issue where the process for aggregating ancillary services loads has been simplified.[199]

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196 AEMC, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events*, final report, 31 May 2010, p. iv.

197 The dispatch algorithm is the algorithm used to determine central dispatch, which is developed by AEMO in accordance with the requirements under the rules.

198 Ibid.

199 National Electricity Amendment (Aggregation of Ancillary Service Loads) Rule 2010, removed the requirement for market loads forming part of an aggregated ancillary services load to be classified as scheduled loads. Instead, Market consumers who wish to aggregate their market loads for the purposes of central dispatch must apply to AEMO to do so. AEMO must approve applications for aggregation for relevant ancillary services loads as long as certain conditions relating to system

We also note that a Rule change has been made in relation to the provision of network support and control ancillary services (NSCAS), which are non-market ancillary services. This rule change, which is to apply from April 2012, increases the competition for acquiring NSCAS by allowing AEMO to procure NSCAS from non-registered participants instead of from registered participants only. To ensure that parties that are not registered participants are able to provide services in a safe and secure manner, the framework provides that AEMO must consult on the obligations and standards to apply. These obligations and standards would then be formalised in any contracts for services. In general, this amended framework supports DSP as it removes the requirement for a DSP provider to be a registered participant to provide NSCAS.

The effectiveness of the new arrangements for procuring NSCAS should be tested prior to considering any further amendments to the framework for procuring ancillary services. For this reason, we will not further consider issues relating to ancillary services markets in this review, however we welcome any relevant issues to be raised and discussed at the workshop to be held in April 2012 as discussed in section 8.4.3 above.

The provisions for the Reliability and Emergency Reserve Trader (RERT) mechanism provides an additional opportunity in which DSP providers may provide services in the NEM. The RERT mechanism provides for AEMO to manage the reliability of the NEM by allowing AEMO to enter into contracts for 'standing reserve' up to nine months ahead of time.

The Reliability Panel submitted a rule change to defer the RERT's expiry for one year until 30 June 2013, and to remove the obligation on the Reliability Panel to review the RERT a year prior to its expiry. The Commission recently published its final rule determination, which was to make a more preferable rule to postpone the RERT's expiry for four years to 30 June 2016.[200] The new rule also removes the need for the Reliability Panel to review the RERT a year prior to its expiry.

The Commission's reasons for postponing the RERT's expiry relate to the energy market transitioning to new external policy settings, and the need for more time to implement demand side participation policies, including outcomes from this review. The Commission had considered whether the RERT creates a market distortion but is of the view that the benefits of maintaining the RERT are likely to outweigh any market distortions or costs, which are considered to be minor.

8.8 Way forward

This chapter considers the issues in the wholesale energy and ancillary services markets that have the potential to impact DSP.

security and reliability of supply are met. Details of the Rule change and the Commission's determination can be found on the AEMC website.

200 See Australian Market Energy Commission, *Expiry of the Reliability and Emergency Reserve Trader*, final rule determination, 15 March 2012, Sydney

For the review, we will further consider the ways to better facilitate the role of aggregators and the ways in which they may directly access the wholesale market. This will include considering the scope and requirements for a new form of market participant for aggregators. The question to be addressed is whether this would be an appropriate and proportionate response to improve the efficiencies under the current market framework. We will facilitate discussions on this issue through an industry workshop, to be held in April 2012.

9 Networks

Summary

Managing peak demand at specific locations is one of the key drivers of network businesses costs. In certain circumstances, DSP can provide a cheaper alternative to network investment as a means of managing these peaks. This chapter looks at the role that distribution network businesses can play in achieving an efficient level of DSP. While some DNSPs are actively pursuing DSP, we have identified two main issues with the current arrangements that could be discouraging distribution network businesses from pursuing efficient DSP projects:

- the current economic regulation arrangements may fail to provide the right incentives for distribution network businesses to explore demand side solutions as an alternative to network investment; and
- given that the market for DSP options is developing and the technology emerging, the arrangements may not adequately recognise the additional uncertainties and risks associated with DSP.

The network business involvement in DSP will depend upon the potential to make profit. For a number of reasons, the current arrangements may fail to provide the right incentives even if it is efficient to do so. Such reasons include:

- how operating expenditure for DSP is treated compared to capital expenditure for DSP;
- that network profits may not depend upon the relative cost difference between network and DSP projects (e.g. the cheaper projects does not necessarily make the most profit for the business);
- a potential lack of compensation from the loss in profit caused by reduction in volumes; and
- limited recognition of additional risks associated with DSP projects.

We also recognise the role that network businesses play in facilitating consumer participation in DSP, even when the DSP option does not provide any direct reduction in network costs. This could be through cost reflective tariffs and publishing planning information. The implementation of the national framework for electricity distribution planning will improve the current obligations in this area.

Directions

For the next stage of the review we will consider:

- options to provide the appropriate commercial incentives for distribution

network businesses towards DSP options;

- given the existing early stage of DSP in the market, possible temporary arrangements which help the DNSP to manage any additional risks. These include a possible exemption from the service standard incentive scheme, development of an industry group to share data and further research, with the view of developing common acceptable methods and best practice standards on how DSP should be value and estimated; and
- the role of network businesses in engaging with consumers in relation to DSP products.

9.1 Networks' Role in DSP

Investment by network businesses is generally driven by the need to build sufficient network capacity to meet peak demand and any reliability standards (with an acceptable level of redundancy for unexpected contingencies). In certain circumstances, demand management programs can mitigate the need for capital investment by dampening the peak. To do so, the network business can either purchase a DSP service from a DSP service provider or develop its own DSP product in house.

The value of DSP to the network will be determined by the value of the capital investment it is replacing. It will also depend upon two key variables. Firstly, whether it only temporarily delays or permanently removes the need for network investment. Secondly, whether the DSP solution can be sufficiently relied upon, from an operational and planning perspective to provide the required demand response.

Network businesses distinguish between 'firm' DSP and 'non-firm' DSP. Firm DSP is where there where is certainty on the ability of the DSP solution to provide the required service (often due to DSP service being be based upon contracts with penalties for non-compliance). Non-firm DSP is where the consumer is left to decide whether or not to respond (e.g. critical peak pricing). The distinction between ‘firm’ and ‘non-firm’ demand reductions can be important as it influences the network business’s assessment of the DSP option's ability to meet its network reliability standards and hence its preference for certain types of demand response. However this distinction is not always clear-cut, as over time the level of demand response from DSP services which are not based upon contracts may become predictable with a degree of confidence or the network business could (as it already does for load) apply probability factors in estimating the extent of demand response.

Factors influencing network business involvement in DSP will differ across businesses and jurisdictions as it will depend upon climate conditions, available network capacity and remaining asset lives, forms of regulation and the degree of government involvement at the state level.[201] A key factor is how the cost differences between the

201 SPAusNet also considers that the current financial crisis has put pressure on private sector DNSPs to control need for external funding and hence to look to ways to reduce capital expenditure. There

DSP project and the network investment impacts on the network business profit, which is determined by the regulatory revenue determination arrangements. It will also depend upon the nature of the various projects and their respective ability to meet a system limitation in a timely and reliable manner.

The characteristics of peak demand for a network business will differ by location and season. Individual areas within the network may be summer or winter peaking and may have different proportions of residential versus commercial and industrial loads, leading to different peak demand profiles. Also the value of demand response for a network business will depend on its stage of the investment cycle. A network business which is going through a replacement stage is likely to have a lower marginal cost of increasing capacity, thereby decreasing the relative potential value of DSP. Hence there is often the need for DSP project to meet both a right place and a right time criteria.

The Futura report provides a description of current use of DSP by network businesses. It found that DNSPs, to varying degrees, are involved in the implementation and trialling of new cost reflective pricing and incentive based DSP initiatives. Furthermore, DNSPs are continuing to support legacy DSP initiatives such as voluntary TOU pricing options and controlled loads. There is also evidence to indicate that where incentives and/or government support are available, network businesses will undertake and invest in DSP activities, such as in leading roles played in Solar Cities projects and the scale and breadth of DSP activity currently underway in Queensland. However how to move from the pilot and trial stage to mass deployment of DSP is a pertinent question for network businesses and this review.

Network business also have a role to play in facilitating DSP, even though the DSP services may not provide any value in terms of deferring network investment. This could be through providing cost reflective tariffs, publishing information to assist potential DSP projects or in how it engages with potential DSP providers. There needs to be a mix of appropriate obligations and incentives on the network businesses to support this role. Another aspect to this is that network business may want to have a degree of control over DSP services on their network to ensure consistency with network safety and stability. This may lead to conflicts with DSP service providers. A question for this review is how to ensure that network business are properly incentivised to facilitate DSP.

9.2 Issues with current market conditions

In this section we discuss the issues that have arisen in the review in relation to distribution network businesses' ability and incentive to offer and promote DSP products. The issues are organised into four areas:

- profit incentives on network businesses;
- inclusion of demand management into the network planning process;

is also starting to be a recognition by some DNSPs that continuing to build bigger networks is not a viable long term solution.

- reliability obligations and service incentives; and
- engagement with consumers.

Issues relating to how DNSPs facilitate distributed generation installations and DNSPs' role in deploying smart grid technology are discussed in the technology (chapter six) and distributed generation chapters (chapter 11) respectively. The pricing chapter also evaluates the current framework for network pricing. Most of the issues raised by stakeholders relate to distribution businesses given that they are a step closer to the consumer end than transmission businesses, and this chapter focuses mostly on distribution businesses.

9.2.1 Profit incentives for network business to pursue DSP

One of the main reasons put forward by stakeholders to explain the low uptake of DSP in the NEM is the lack of a profit incentive on network businesses to pursue DSP under the existing arrangements. Several submissions pointed to the revenue regulatory framework as a barrier for DSP and even some DNSPs noted that there are insufficient incentives on them.[202] There is a danger in making general statements about network investment decisions, as such decisions will depend on the unique characteristics of the investment need and possible options. However we find that in practice the current arrangements may fail to provide the right incentives for the network business to undertake DSP projects which could contribute to achieving a more economically efficient demand/supply balance in the electricity market.

In conjunction with this directions paper, we have released a supplementary paper which discusses the various ways in which distribution network businesses can make a profit under the existing rules and then evaluates how this affects the incentives on these businesses to pursue DSP options.[203] That paper sets out the factors with the current arrangements which could prevent the distribution business from investing in and using efficient DSP projects. In summary:

- There could be a bias towards capital expenditure in favour of operating expenditure, both in terms of the potential to make profit and certainty about cost recovery. Therefore, other factors being equal, operating expenditure on DSP may be at a disadvantage compared to capital expenditure. This does not necessarily act as a barrier to all forms of DSP, given the developments in DSP technology will means that an increasing proportion of DSP projects will require capital investment.[204] However it means that network businesses are likely to favour their own DSP options, which can be treated as capital expenditure,

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202 Essential Energy, issues paper submission, p.8.

203 AEMC, *Profit Incentives for Distribution Network Businesses and Demand Side Participation*, supplementary paper to the Power of choice review, 20 March 2012.

204 This is reflected in the outcomes of recent regulatory determinations in Queensland and South Australia where the distribution network businesses sought and received funding for a number of capital related DSP projects

instead of purchasing solutions from DSP service providers, which is likely to be treated as operating expenditure;

- There could be a misalignment between the impact on the network business profit and the cost differences between a network project and a non-network project such that the business is not incentivised to pursue DSP projects which are more cost effective over the life of the projects. A network business does not capture all the costs savings from avoiding a network augmentation nor does it incur all the additional costs of a DSP option. Instead the business profit will depend upon how the costs of such projects are treated under the arrangements. There could be situations where the savings in capital expenditure allowance may not suffice to fund DSP projects, even when it is more efficient from the market perspective to do the DSP option.

- In some cases, DSP only defers the need for a capital project. This could create additional risk for the businesses in having to explain the need for that capital project again to the regulator at the next regulatory reset.

- There is additional revenue risk for a network business operating under a price cap form of regulation associated with DSP project which may not be properly compensated for under the current arrangements. For example, some DSP options might create capital savings through load management via time sensitive tariffs rather than load reduction. The price cap controlled network businesses could be exposed to a revenue risk where the basket of tariffs had assumed more peak time units at higher prices and the load management scheme results in these being transferred to a lower price off-peak tariff.

- Although the rules provide the same treatment between network capital expenditure and DSP capital expenditure, there are characteristics of DSP capital projects - such as shorter asset lives and increased uncertainty about future costs - which may limit the network business' appetite to seek the approval for such expenditure given the current regulatory determination arrangements.

For the regulatory framework to correctly facilitate DSP as an alternative to network investment, it needs to appropriately consider all the costs and benefits of the DSP project and also compare the relative total lifetime costs of the DSP project to the capital asset costs. Such conditions would ensure that DSP projects which are efficient from the wider market perspective are identified. It would then be necessary to align a network business's profit incentive to ensure that the network business is motivated to implement such socially efficient projects. In summary, the current arrangements may fail to do this for a number of reasons.

We also note that the AER may not be in a position to enforce DSP options onto network businesses, in the sense that it cannot in practice replace a capital augmentation project with a DSP project even if it considers that a DSP project would be more efficient. Therefore the development of DSP is very dependent upon the motivation of the network businesses to pursue such projects, which for the reasons outlined in the supplementary paper is currently limited.[205]

DSP incentive schemes seek to complement the current arrangements and to promote network businesses to consider DSP. However these schemes are not intended to provide the main source of funding for DSP projects and for such schemes to be fully effective, network businesses still need to be motivated towards DSP in the first place. The issue is therefore not with the size or the design of such schemes but instead with the underlying incentives for DSP under the regulatory revenue determination arrangements. Also, as discussed in chapter seven, aspects of the demand management incentive schemes can limit consideration of all system benefits of DSP projects.

The impediments to efficient DSP projects may not only be with the five year regulatory determination process but also with the annual pricing process. It may be difficult to accurately forecast the costs of certain types of DSP programs over a five year period. For example, if the DSP program involves a peak time rebate, the network business would have to forecast the number of times such rebates will be triggered over the period. Instead of seeking expenditure in the five year determination, an alternative mechanism for recovering such costs could be through the annual pricing proposal. However, Essential Energy raised a concern that there is no clear mechanism for a DNSP to include such rebates or rewards within its annual pricing proposal.

In addition, chapter seven raises the related issue where the business conducts a regulatory investment test assessment within a regulatory period which identifies a DSP project which delivers more net benefits than the original approved capital investment, but which has an annual cost more than the approved annual allowance for the capital project. Under the current arrangements, the business cannot access a separate funding stream to cover the difference in the DSP option and the annual capital allowance.

Submissions to the issues paper touched on some of these issues and suggested amendments.[206] EnerNoc proposed introducing an equalisation incentive which establishes parity in the incentive power and treatment of capital and operating expenditure. Other options include expanding the existing demand management schemes, permitting the network business to keep all the savings of any capital expenditure project which is avoided by a DSP project, provide more certainty on how DSP expenditure is treated in the Rules, and extending the regulatory control period past five years. The EUAA considered that any changes in DSP incentives for network businesses should be in the form of additional obligations. Options to address these issues will be explored in the next stage of this review.

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205 In its final decision on the Queensland distribution determination, 2011-11 to 2014-15, May 2010, p. 293, AER comment that the rules may not give it the ability to impose DSP options. This issue may not be whether the Rules actually permit the AER to substitute the proposed expenditure for capital investment with the costs of a DSP option but instead the practical difficulties the AER faces in independently developing its own efficient cost estimates of DSP options, especially if the costs of the DSP project depends upon contract negotiations with the DSP provider.

206 International Power stated that as regulated businesses earning a fixed return on a regulated asset base, distribution businesses are incentivised to commit capital to expand their networks.

Aspects of how the current regulatory determination process promotes efficient expenditure are currently being evaluated under the rule changes on economic regulation of network service providers. Those rule changes are investigating how the current arrangements provide incentives for efficient capital expenditure and how the allowed rate of return is determined. Hence any amendments on this aspect may affect the balance of incentive between capital and operating expenditure.

While we recognise there is overlap between these rule changes and the issues being raised under this review, we do not consider that it is appropriate, nor consistent with the provisions of the NEL, to expand the scope of those rule changes to consider these issues related to DSP. The matters raised in this paper and the range of potential reforms require further consideration and consultation with stakeholders. Therefore we will proceed to consider such matters as part of this review and in doing so, will have regard to the outcomes of the rule determinations on economic regulation. In making determinations on those rule changes, the Commission must have regard to the National Electricity Objective and therefore will consider how possible amendments promote efficient investment by network businesses.

Some DNSPs stressed that they want to own embedded generation but consider that the rules make this difficult (e.g. cost recovery arrangements, ring-fencing provisions). Also SP AusNet stated it is not clear whether DNSPs can sell energy generated by DG back into the market.[207] We note that the AER is currently consulting on ring-fencing guidelines for electricity distribution network businesses.[208]We appreciate stakeholder views on whether the current arrangements need to be clarified in regard to DNSPs involvement in distributed generation, and if so, what are the appropriate amendments.

Questions Profit incentives on network businesses

36. Do you consider that the current regulatory arrangements could prevent network businesses from pursuing efficient DSP projects which could contribute to achieving a more economically efficient demand/supply balance in the electricity market?

37. What options for reforming the current regulatory arrangements should be explored under the next stage of the review?

38. Do the current arrangements need to clarify distribution network businesses' involvement in distributed generation and if so, how?

9.2.2 Inclusion of demand management into the network planning process

How network businesses value and assess demand management projects compared to traditional supply side investments will be a key factor in the level of DSP deployed in

207 Both SPAusNet and Ergon Energy made a point that the Rules make it difficult to own distributed generation.

208 AER, *Electricity Distribution Ring Fencing Guidelines Review*, discussion paper, December 2011.

the market. Also if information about the need for, and nature of, network investment is not provided in a timely and accurate way, it will be more difficult for demand-side alternatives to be developed. DSP service providers need sufficient time to consider the identified need, determine if DSP can address the identified need, and determine the costs and benefits of participation.

Therefore there is a need for formal opportunities for third parties with expertise in DSP to participate in the development of options and propose alternative DSP options. If demand side proponents are not aware of options for them to contribute, or are not adequately consulted about opportunities, potential efficient demand-side opportunities may be missed. Therefore, the obligations on DNSPs for planning are relevant to the ability of DSP proponents to participate.

The AEMC is currently conducting a rule change on the National Framework for Electricity Distribution Network Planning and Expansion. That rule change is assessing the appropriate range of information which the DNSPs must publish in an annual planning report and the development of a Regulatory Investment Test for Distribution (RIT-D) for assessing various options to address a system limitations. The proposed framework also an requirement for the businesses to develop a Demand Side Engagement Strategy. The Demand Side Engagement Strategy would involve distribution businesses publishing a demand side engagement facilitation process document, establishing and maintaining a database of non-network case studies and proposals, and establishing and maintaining a Demand Side Engagement Register. This recommended framework is in recognition of the importance of proactive engagement by both DNSPs and demand-side providers to develop potential solutions to system limitations.

We will not investigate the matters relating the distribution network planning and assessment which are being developed through that rule change. Instead there are two detailed aspects to how a network business evaluates the potential value of DSP projects which we would to raise for comment and further consideration.

One aspect of the network planning process is the methods used by network businesses to estimate the response from DSP services which are not directly controllable (i.e., non-firm DSP). Extra uncertainty or difficulty in assessing the likely demand response could lead to DSP products being seen as less reliable than network augmentation solution, thereby create the bias against them. ETSA Utilities stated that given that network businesses have mandatory reliability obligations and that consumers interest in reducing air-conditioner demand during heatwaves is low, only DSPs measures which deliver firm load reductions during peak times can defer investment in network capacity. Ergon noted that non-firm DSP measures will need to include generous diversity factors as networks are required to meet demand on successive peak demand days.

It is recognised that DSP measures may be harder for network businesses to implement compared to capital investments. Additional difficult in estimating the extent of any demand reduction and associated risks, may further impede the implementation of DSP options.

We recognise some DNSPs are conducting trials on price based DSP products and that some consistency in the results are emerging. However when moving from a trial based scheme to a large scale deployment the results may not hold. There may be merit in establishing an industry forum which encourages discussion, shares data, promotes research and further collaboration with the view to developing common acceptable methods and best practice standards on how DSP should be valued and estimated. Such collaboration could be funded through increasing the demand management incentive allowance. In chapter 7, we discuss the idea to have acceptable, standardised practises for measurement and verification of demand reductions from DSP and request stakeholder views. In the context of network planning, we also appreciate views on how should DNSPs estimate the impacts from a DSP option.

Another relevant aspect of the network planning arrangements is how the network business has regard to the potential of DSP in developing its demand forecasts. Forecasts on peak demand and total consumption will influence the businesses approved costs as part of its revenue determination processes. Forecasting methodologies that accurately recognise the potential contribution of DSP to demand are needed to ensure that the benefits of DSP are captured for consumers. Hence this is important for how the AER assesses the businesses demand forecasts as part of its five-yearly regulatory determination process. Again we appreciate stakeholder views on whether further consideration should be given to this during this review.

Questions — Research into estimating potential demand reduction of non-contracted DSP

39. How should network businesses estimate the potential demand impacts associated with DSP? Should there be consistency in approach across the business and should arrangements provide guidance on how to do such estimation?

40. What should be the framework for recognising the impacts of DSP in the forecasting methodologies used during the regulatory revenue determination process?

9.2.3 Reliability obligations and service incentives

DNSPs stated that the current jurisdictional and legislative requirements in relation to network security and reliability of supply limit the incentives to deploy DSP options given that some DSP options carry a greater risk than traditional supply side solutions in relation to reliability. Energex suggested that DNSPs legislative requirements regarding reliability may need to be reviewed as part of promoting more DSP.

There are two types of regulation that relate to network service and reliability: mandatory standards; and discretionary standards. The mandatory standards are reliability planning standards. These are jurisdictional licence requirements on network owners to ensure there is appropriate capacity and redundancy in the network to support the delivery of reliable electricity to consumers. The discretionary standards are service standards for which financial incentives apply. These service standards are over and above the mandatory standards and are based on performance against specific measures. The network owner is not obliged to achieve them but their profits can be impacted depending on whether they are achieved or not.

The AEMC is currently conducting a separate review into the mandatory reliability standards for distribution businesses and we do not intend to consider this further under this review. We have instead set out some initial thoughts on the service standards incentive schemes.

We note that service standards incentive schemes can impact on the amount of revenue earned by network businesses by allowing rewards or imposing penalties for varying levels of service performance.[209]SPAusNet proposed the introduction of a DSP specific exclusion from the Service Target Performance Incentive Scheme (STPIS) schemes penalties. They argued that this is justified because of the early stage of development of demand management sector results in:

- counter-parties that are unable to take on the appropriate reliability risk on their own balance sheet either due to size (e.g. venture capital start ups) or nature (e.g. public sector) leaving it with the DNSPs; and
- the research and development nature of many demand management programs.

The service standards incentive schemes allow network owners to appropriately compare levels of reliability and continuity of supply associated with potential projects with likely penalties or benefits. In the context of these schemes, a network business will compare the contribution to performance measures provided by a non-network option with the likely penalty or benefit it will receive from the service incentive scheme should the DSP improve or reduce service performance. That is, service incentive schemes encourage network businesses to compare the likelihood of outages between network and DSP options.

Hence the service standards incentive schemes encourage network businesses to consider the expected financial penalty from the levels of service they provide and compare it to the cost of service improvement projects. Therefore they play an important role in signalling to a network business that consumers place a value on the quality of the service provided (as reflected in the measures determined by the AER). In principle, the service standards schemes should not act as an impediment to efficient DSP. Rather it ensures that network owners appropriately consider the relative impacts on reliability and continuity of supply between network and demand side alternatives.

209 The service standards incentive schemes for transmission and distribution differ. The purpose of the transmission scheme is to ensure that there are incentives to make the network available at times that it is most valued by the market (clause 6A7.4(b) of the rules). For distribution the a proportion of a DNSP's annual revenue may be adjusted up or down according to its performance relating to reliability of supply, the quality of supply, and the standard of consumer service provided.

However, we recognise SPAusNet's comments that in the early development of the DSP industry, the extent of the demand reduction is difficult to predict with certainty or the network businesses cannot appropriate deal with the risk through appropriate contracts. The risk of a financial penalty under the service standards scheme could discourage the network business from deploying a non-network option given the extra level of uncertainty associated with that option and may lead the business to be conservative towards how it assessed DSP. Hence this could prevent the network business moving from the phase of doing limited pilots and trials of DSP projects to a wider deployment of DSP across its network. It will also limited the ability for the DSP market to foster and for DSP service providers to enter and develop products.

Given these reasons and also that some distribution businesses themselves have raised it as a potential impediment we intend to further consider a possible exemption arrangement for DSP related projects. However, the design of any exemption cannot lead to any perverse incentives or remove any consideration of the relative reliability and quality of supply impacts of DSP projects. We appreciate stakeholders' views on this and possible designs of such an exemption.

We also note that the introduction of smart grid technology across networks may enable the parameters for service incentives scheme to be more targeted and precise. The rules permit the AER to amend and replace the schemes and therefore we consider this is a matter for its consideration.[210]

Question Exemption from Service Standard Incentive Schemes

41. Is it appropriate for network businesses to be exempt from the service standard incentive scheme during the initial development phase of DSP projects? What factors need to be taken into consideration in designing such an exemption?

9.2.4 Engagement with consumers

Network businesses consider that it is important that they have the ability to engage directly with consumers in order to help develop and offer appropriate DSP products. Essential Energy goes further and states that DNSPs could have a direct financial link with consumers which would allow them to offer monetary rewards for cutting back demand and changing their load profile (i.e. demand buyback schemes).

To date DNSPs have had limited need for such engagement with consumers but are starting to recognise the need to have effective community and service provider engagement models for DSP.[211] However there submissions revealed some disagreement between retailers and network businesses about which party is appropriate point of contact and the degree of dialogue between residential consumers and network businesses.

210 National Electricity Rules, clauses 6.6.2 (c) and 6A.7.4 (f).

211 Ergon Energy, issues paper submission, p.8.

ENA stated that DNSPs need the right and ability to provide energy management services directly to consumers. They state that requiring retailers to serve as the implementation agents of network businesses' DSP activity would subject them to very high transaction costs, as they would potentially need to deal with the technical and commercial requirements of a number of small retail programs. Network business also stressed that they have a number of advantages over retailers in terms of DSP product development and expertise. Retailers take the opposite view with AGL arguing that monopoly businesses should have no contact with consumers.

Consumers who wish to look for ways of managing their electricity use are likely to require access to information about their usage volumes and patterns. Also currently residential consumers do not have ability to negotiate network tariffs and hence has limited possibilities to act. While the NECF will formalise a triangular relationship between consumer, retailer and DNSP, the retailer is likely to remain a consumer's first point of contact for queries about billing and energy use. However distribution businesses noted that they have access to the meter data relating to each end-use facility within its service territory and consider that they can provide access to and independent analysis of that information for consumers. In chapter 5, we noted that other parties called for a new third party intermediary, recognised in the NEM as an 'information services provider'.

The appropriate framework for consumer engagement is important in facilitating consumer choice and is a matter for further consideration under this review. What is crucial is that any disagreement between network businesses and retailers about their respective roles do not act as a barrier for consumers wanting to choose appropriate demand management programs. It is important that such engagement does not lead to consumer confusion and increased complexity.

Questions Engagement with consumers

42. Should network businesses play a greater role in informing consumers about the potential benefits from DSP and various DSP products? If so, how should they do so?

9.3 Way forward

Distribution network businesses may prefer to make investments in their own assets. Investment in physical assets is likely to provide the business with greater degree of risk management and control than demand side alternatives especially where network reliability and security of supply issues are paramount. Also demand side solutions may take longer and more resources to develop and it can be easy to procure network augmentation solutions quickly as there is a mature market of suppliers, products and contractors of supply side solutions. There is an established track record of being able to deliver network solutions on time and on budget.

However network businesses are starting to increase their involvement in demand side solutions and explore potential innovative products. This is driven by a number of factors, including technology advancements, and the declining trend in asset utilisation. The pertinent question for this review is how should the arrangements encourage network businesses to move from the pilot stage to a large scale deployment of DSP as the means to address peak demand. Our initial assessment has identified two main issues that could be preventing this step forward.

Firstly, there are a series of factors with the current arrangements for regulatory revenue determinations that limits the incentives on network businesses to pursue efficient DSP projects. The balance between potential profit and risk for demand side solutions is different than that with traditional supply side solutions. We will explore potential options to address this in the next stage of the review.

Secondly, given the immature nature of the market for DSP options there is:

- difficulty in getting appropriate counter-parties to accept the reliability risk for contractual DSP; and
- uncertainty about the extent of demand response arising from non-contracted DSP (i.e. price based DSP options) and how to value the impacts of such types of DSP.

To address this, the review will investigate possible special temporary arrangements which help to foster the development of the market. These include a possible exemption from the service standard incentive scheme, development of an industry group to share data and further research, with the view of developing common acceptable methods and best practice standards on how DSP should be valued and estimated.

In circumstances where DSP may not provide a direct value to the network businesses in terms of deferring network investment, the business still has a role to play in facilitating demand management. For example, through providing cost reflective network tariffs and relevant planning information. There needs to be a mix of appropriate obligations and incentives on network businesses to support this. The implementation of the national framework for electricity distribution planning will improve the current obligations. We raise the suggestion of a specific incentive for distributed generation in chapter 10.

There is a need for cultural and organisational support for DSP across all key functional areas of the network business including financial, regulatory, planning and operations management that see DSP as a viable component of an integrated approach to planning and managing the network. Some stakeholders perceived that there is problem with the organisational culture with network business in the sense that the businesses are conservative in their planning and biased against the demand side. We do not consider that there is an inherent opposition to DSP within network businesses.

However it is essential to provide the right incentives with respect to demand side options and to support the development of the DSP market. If network business consider that they can make a profit from demand side management and that such options can deliver the required demand reduction, then DNSPs will be motivated to capture the benefits of efficient DSP. Furthermore, as these businesses develop more experience and expertise in DSP, they will gain a better understanding of the likely response from DSP options.

10 Retailers

Summary

This chapter looks at the role of retailers in the electricity supply chain and the role they can play in facilitating an efficient level of DSP. We identify a number of issues that could be considered to improve the extent to which retailers have an incentive or ability to engage with consumers as noted above.

A retailer can be a direct buyer of DSP as a financial hedge. It can also facilitate DSP through offering services, appropriate tariffs and providing information. Retailers' action in facilitating DSP will be driven by their commercial incentives which in turn are influenced by the extent of competition in the market.

Existing pricing and marketing strategies, plus concerns about impact on cashflows and uncertainty about recovering costs associated with DSP (e.g. IT billing changes) may mean that a retailer's business strategy is not consistent with DSP. Also the use of load profiling for consumers on accumulation meters means that the retailer is not necessarily rewarded for encouraging such consumers to change their consumption behaviour.

Directions

For the next stage of the review we will consider:

- Commercial restrictions on retailers capturing the value of DSP;
- Whether changes to state based retail price regulations could enhance the role of retailers in facilitating uptake of DSP by consumers (for example, providing certainty on cost recovery); and
- Merits of better load profiling for residential consumers on accumulation meters.

We will not be undertaking a review of retail competition. There is a separate process under the AEMA for the AEMC to assess and publicly report on the effectiveness of retail competition in electricity and gas retail markets in the NEM.

10.1 Retailers' role in DSP

Retailers' principal role in the market is to act as an agent for consumers in contracting for energy services and packaging them to meet consumers' requirements. As the key interface between consumers and the rest of the supply chain, the retailer's contract with consumers can offer both the means for consumers to participate in DSP where they wish to, and a route by which consumers can be compensated for those DSP actions (for example through the price structure and conditions of the contract, or side payments for specified actions).

Retailers can play an important role in DSP, both as a direct buyer of DSP and also in how they facilitate DSP. A retailer can engage and deploy DSP as a commercial tool to optimise its own financial position. The potential value to the retailer from DSP initiatives is through reduced risk management costs (where the DSP leads to lower or more predictable wholesale market price volatility). DSP can also substitute for wholesale market contract cover, which can be useful at times when the contract market is tight.

Besides purchasing DSP as contract cover, retailers can also facilitate DSP. We have identified three principal avenues in which they can play a role in enabling DSP in the NEM, which includes:

- in design of retail tariff structures in order to provide signals to consumers on the value of DSP (including how the retailer decides to pass through network charges);
- offering contracts, products and services that enable DSP if demanded by consumers; and
- to act as a gateway for enabling consumer engagement in and awareness of DSP (for example through providing information as part of its billing process or marketing campaigns).

Retailers' behaviour towards facilitating DSP will be driven by their commercial incentives, which in turn are influenced by the extent of competition in the market. If incentives are correctly aligned, the retailer should be in a position to support the deployment of DSP options where that is more efficient than purchasing and transporting additional electricity. In submissions, retailers thought that it is in the interests of both retailers and distributors to develop market and system approaches that support the take up of DSP by consumers, although it needs to be recognised that the benefits for each of these businesses will differ, and will not be additive in all instances.[212]

The Futura report highlights a number of examples of retailers trialling or offering products which aim to encourage consumers to alter their consumption patterns in order to (ultimately) reduce the costs of supply.[213] This chapter first discusses the commercial incentives for retailers to facilitate DSP under current market conditions and then steps through each of the principal avenues and identifies issues which may limit the retailer's ability to support efficient DSP in the market.

212 Origin Energy, issues paper submission, p.6; TRUenergy, issues paper submission, p.8.

213 Futura Consulting, *Investigation of existing and plausible future demand side participation in the electricity market*, 8 December 2011.

10.2 Issues with current market conditions

In this section we discuss the issues that have arisen in the review in relation to retailers' ability and incentive to offer and promote DSP products. We cover the following matters:

- incentives on retailers towards DSP;
- retailers developing retail tariffs which support DSP;
- offering DSP flexibility in services and contracts; and
- engagement with consumers.

10.2.1 Retailer incentives

A number of submissions to the issues paper raised a concern that a retailer earns revenue for each unit of electricity it sells to its consumers, and the basic incentive for retailers is therefore to sell as many units of electricity as possible.[214]However, the way in which the majority of retail contracts with residential consumers are structured means that retailers may not necessarily profit from every unit sold. As outlined in chapter five and the accompanying PwC report,[215] most residential consumers currently pay the same price for every unit of electricity consumed, no matter when (i.e. what time of day or year) it is consumed.[216]

The price of units of electricity in the wholesale spot market, however, changes every half-hour throughout the year, with prices in some periods many times higher than the price of a typical residential tariff. Consequently, where retailers purchase directly from the spot market, the price they receive for electricity consumed in peak periods will be below the price they pay for that electricity. Whilst retailers can hedge themselves against full exposure to price spikes through contracting arrangements with generators or third parties, the magnitude of the price spikes will affect the price of those contracts. The incentive should still exist therefore, to minimise the volume of wholesale electricity purchased in those high priced periods, in order to maximise their margins (and/or reduce prices and win consumers from their competitors).[217]

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214 Billcap issues paper submission, p. 4; Major Energy Users issues paper submission, p. 7.

215 PwC, *Investigation of the operation of efficient price signals in the NEM*, December 2011.

216 A number of consumers are on inclining block tariffs, which means the price per unit increases once consumption reaches a certain consumption threshold, but the price does not vary by time of use.

217 Besides purchasing energy costs, the other main costs of retailers are their administrative and marketing costs. A proportion of such costs will be fixed and therefore average costs will decline as sales increase. This may give the retailer an incentive to increase volumes. However the energy costs represent a larger proportion of the retailer's total costs compared to its administrative and marketing costs.

Some stakeholders considered that the 'gentailer' model (the co-ownership of generation and retail businesses) is an impediment to efficient DSP.[218] They argued that where a retailer is under the same ownership as a generator, the retailer does not have the same incentive as an independent retailer to minimise its wholesale costs, as a high wholesale price should benefit its upstream generation business. It has also been argued that in Australia, the incentives for retailers to pursue DSP have been limited due to long-term energy contracts that do not expose them to price spikes and short-term price volatility.[219]

We recognise that having its own generation will provide financial risk management to a retailer and hence limit the need to directly purchase DSP as insurance for contract risk, which may in turn limit the retailer's business interest in DSP. However, where competition is effective in retail markets, this 'perverse incentive' should not exist because competitors at the retail level would be able to gain a competitive advantage by contracting for DSP in order to hedge against wholesale price spikes, and pass on those cost savings to their retail consumers.

Consequently, retailers should have an incentive to encourage their consumers to consume less in the periods where the wholesale prices are highest (and to consume more in the periods of low prices). However, in practice, this will depend upon whether changes in consumers' demand are reflected in the NEM settlement process. Where consumers have an accumulation meter, their total volume of electricity consumed over a period of time can be measured by reading the meter, but their pattern of consumption within that period is not measured. Hence, for the purposes of charging second tier retailers the pattern is assumed to match an average daily profile. Therefore retailers will attempt to purchase electricity in the wholesale market to match the average consumption profile, and any over- or under-contracting will be charged against that profile. As a result, retailers do not benefit from consumers shifting consumption from peak periods where those consumers have accumulation meters.

Given the limitations in the metering platform, there may be a case for trying to develop consumption profiles which more accurately reflect the consumption patterns of different types of consumers, so that retailers are more likely to be charged against the actual consumption pattern of their consumers. The use of any such deemed profile suffers from the issue that it removes the incentive on consumers to alter consumption behaviour. That is, even if each consumer had their own individual profile, once that profile is set, there is no incentive to shift consumption to off-peak periods, for example, as charging will always be made against the profile regardless of actual consumption. However, depending on how the profiles are determined and how often they are updated, an incentive could be created for retailers to encourage their consumers to shift demand to off-peak periods.

218 Ceramic Fuel Cells Limited, issues paper submission, p.7; Energy Users Association of Australia, issues paper submission, p. 17.

219 The Brattle Group, *Bringing Demand Side Management to the Kingdom of Saudi Arabia*, May 27 2011, p.18.

Some submissions also point out that retailers adopt pricing strategies to manage their contractual risk, such as averaging costs across consumers.[220] This makes it difficult to reward consumers who engage in DSP and hence those retailers' existing business model may not be supportive of DSP.

Competition in the wholesale and retail market is key to ensuring that retailers are incentivised to facilitate DSP. We consider that under competitive conditions, retailers should have a commercial incentive to facilitate the development of DSP in the market. However in practice this may only be for consumers who have interval meters as the retailer gets the benefit from such consumers changing their consumption. While we note that the current state of competition in the NEM may mean that opportunities for efficient DSP are missed, we will not undertake a review of retail competition as part of this review. The AEMC is required under the Australian Energy Market Agreement (AEMA) to review and publicly report on the effectiveness of retail competition in jurisdictions participating in the NEM. Policies to promote competition where it is not effective - and remove regulation where it is - are also part of the AEMC's retail competition reviews and we will continue to provide advice to the MCE on those issues. we will not assess the level of competition in retail markets as part of this review.

Question	Settlement load profile for residential consumers with accumulation meters

43. Do you consider that settlement profiles which more accurately reflect actual consumption patterns improve incentives on retailers and/or consumers to offer/provide DSP?

10.2.2 Developing retail tariffs which support DSP

The retailer in providing its service should offer products that are demanded by consumers. In this review we are considering whether retailers facilitate consumer choice regarding demand side products.

A number of submissions to the issues paper and contributions to the review's stakeholder reference group discussions have suggested that the majority of consumers prefer not to face the volatility of prices that vary frequently, and would prefer a flatter pricing structure, even if that may involve paying a premium.[221] As a result, retailers will often re-package wholesale and network costs to consumers as a fixed price tariff.[222] Managing and responding to consumers' requirements and preferences may therefore be a more important business objective than influencing end-use consumption behaviour. Also the acquisition and retention of consumers is paramount

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220 Major Energy Users Inc, issues paper submission, p.13.

221 Enernoc, issues paper submission, p.8; Energy Users Association of Australia, issues paper submission, p.8.

222 In doing this, retailers take on the risk of fluctuations in the price (the wholesale price in particular), for which they will need to charge a risk premium if they are to be confident of covering their cost.

to a retailers' business case and may be the key driver of pricing strategy, rather than maximising the margin from each individual consumer. Consequently, a retailer's business strategy may not always be consistent with promoting DSP.

With respect to the objectives of this review, this could still be an efficient outcome in terms of how the arrangements promote an efficient demand/supply balance, as long as consumers are making an informed choice reflecting their own value of consuming electricity. If consumers become more informed about their electricity consumption and want to explore opportunities for reducing their bills, there will be demand for a wider range of electricity services and products. This may create increasing opportunities for third parties to enter the market, and may trigger changes to current retailers' business strategies.

Whether the retailer faces appropriate commercial incentives consistent with its business strategy to facilitate DSP is only part of the issue. Responses to the issues paper also pointed to regulatory and technical restrictions which limit the extent to which retailers can offer cost-reflective tariffs to consumers. PwC explain in their report that time sensitive tariffs are not feasible for consumers who do not have interval meters. Points were also expressed in relation to increased cashflow risk and uncertainty regarding cost recovery plus restrictions due to retail price regulation.

Impact of DSP tariffs on retailers cashflows

Moving from the existing flat consumption tariffs to more time sensitive retail tariffs can increase volatility in revenues for the retailer. Such volatility will create revenue uncertainty for the retailer unless it has the capability and experience to accurately forecast how consumers will respond to such tariffs. The retailer may try to mitigate this risk by increasing the proportion of revenue to be recovered from fixed charges, which in turn may dampen the price signal from the time sensitive tariffs.

Consumers who choose to be on time sensitive tariffs are likely to be those who consider that they can save money, thereby potentially reducing retailers' revenues. If those consumers migrate to time sensitive tariffs and reduce their consumption at peak times, retailers may try to recover the costs of peak electricity from those remaining consumers who do not shift or reduce their peak consumption.[223] Some submissions suggested there is an emerging trend under TOU pricing that retailers will increase the fixed supply charge as a means to provide a more predictable cashflow.[224]

The practicalities of retailers' cashflows may diminish the incentive to offer cost-reflective tariffs, even where metering and regulation allows it. For example, retailers have obligations to pay network charges in certain timescales, and have prudential security requirements with AEMO to cover wholesale purchases. The need to recover revenues from their consumers in order to maintain cashflows in the business could potentially limit the retailer's flexibility in the types of tariffs and products it offers (e.g. seasonal TOU tariffs). It also may inhibit the incentive to

223 Alinta Energy, issues paper submission, p.5.

224 SPAusNet issues paper submission, p.9; Essential Energy, issues paper submission, p.5.

promote DSP, as some of the costs of the consumption that would be avoided or shifted may have been paid for in advance. In its submission, Origin stated that it supports cost-reflective network charges where there is an appropriate balance between prospective efficiencies and implementation costs.[225]

In many cases, retailers may have technical limitations to offering new tariffs. For example, their billing systems may have a limited capacity in the number of tariff structures they can process. Where this is the case, upgrading would be costly and carry reputational risk, as any errors created by teething problems are likely to be high profile (particularly for a large retailer). Upgrading is only likely to take place once there is significant demand for new or different tariffs and retailers have some certainty about recovering the associated costs. There is a possibility that when the consumer switches retailers, the retailer is faced with stranding costs associated with DSP, which may also limit a retailer's incentive to incur such upfront costs.

Retail price regulation

Chapter five describes the extent to which retail prices are regulated in each of the NEM states. As that chapter outlines, retail price regulation can act to limit to some degree the flexibility that retailers have to offer innovative tariffs and products to consumers. For example, due to the 'postage stamp' nature of regulated prices, whereby a single price applies across a certain geographic area, the variation in preferences and consumption patterns of different consumers is masked. Most retailers agreed in their responses to the issues paper that retail price regulation is a restriction and argued that it should be removed in order to allow them to offer tariffs which cater to the requirements of different consumers.[226] They argue that allowing more flexibility in retail pricing would enable consumers to choose different pricing structures so as to take advantage of load shifting opportunities and increase retailers' ability to manage wholesale market risk.[227] TRUenergy in its submission noted that the regulation of energy prices, as well as the associated terms and conditions, limit them from offering innovative DSP options to consumers who would value those options.[228]

We are not convinced that simply removing price regulation will result in all retailers offering a wide range of DSP products to consumers. Under the existing arrangements in states which have retail contestability, retailers are already able to provide diverse market offers, including innovative DSP related tariffs, to retail consumers. However, the Commission recognises that retail price regulation can add compliance costs and reduce flexibility, and that variations in regulation across states can limit the development of nationwide retail products and make it difficult for second tier

225 Origin Energy, issues paper submission, p.5.

226 AGL, issues paper submission, p.2; Origin Energy, issues paper submission, p.5; TRUenergy, issues paper submission, p.5; Energy Supply Association of Australia, issues paper submission, p.5.

227 Origin Energy, issues paper submission, p. 3. (However some consumer bodies advise that there is a risk in introducing more services or choice as it may have the opposite of the intended effect by leading to consumers becoming less engaged).

228 TRUenergy, issues paper submission, p.5.

retailers to enter into the market. We also accept the point made by PwC that the regulated standard offer in an area can act as a reference marker for such market offers. Accordingly there may be merit in considering removal or amendment of price regulation not only where competition is already effective, but also as a means of stimulating competition in retail markets. As well as allowing existing retailers to price flexibly in response to consumer requirements, new retailers or other parties such as ESCOs may find it easier to enter the market with new tariffs and products. Where the removal of price regulation is considered, it may be necessary to do so alongside complementary measures such as consumer education and continued monitoring.[229]

One possible benefit from retail price regulation is that it could provide some guarantee for retailers in their ability to recover any costs associated with facilitating DSP (e.g. billing system upgrades, education programs). However, as noted earlier, competition in retail markets is key to providing incentives on retailers to offer products and services that consumers want, including DSP products. Given the existing process under the AEMA, this review will assess possible improvements to the existing state regulations in the interim which would better support the role of retailers in facilitating DSP. [230] We seek examples from retailers on specific aspects of the existing state regulations which prevent them from marketing DSP tariffs and welcome suggestions for possible amendments to the existing state regulations that could better support retailers' role in facilitating DSP.

Questions State based retail price regulations

44. What are the specific aspects of state based retail price regulations that restrict retailers from offering innovative tariffs or products? What amendments to the regulations could better enable retailers and other parties to facilitate DSP?

45. Should retail price regulation provide some certainty for retailers in their ability to recover any costs associated with facilitating DSP?

Passing through network charges

Retailers are the vehicle through which consumers can respond to efficient network prices (subject to metering capability, billing systems etc.). A retailer may choose to simply pass through the network costs it faces to the consumer so that a retailer is indifferent to the period in which its consumers choose to consume. The relative price differences are also likely to have the effect of encouraging consumption in off-peak

229 The AEMC's review of the effectiveness of competition in the electricity retail market in the ACT recommended removal of price regulation as part of a package of policy measures to promote competition. See AEMC, *Review of the effectiveness of competition in the electricity retail market in the ACT*, stage 2 final report, 3 March 2011.

230 As set out in clauses 14.11(a) and (c) of the AEMA all state governments agree to phase out the exercise of retail price regulation for electricity and natural gas where effective retail competition can be demonstrated.

rather than peak periods. Alternatively, a retailer may choose to repackage network costs for its consumers. In responses to the issues paper, some DNSPs doubt whether retailers would pass through cost reflective network tariffs, while other DNSPs are of the view that retailers will be forced to so, in order to properly hedge themselves.[231]

As discussed in chapter five, the Commission's view is that retailers in a competitive market should respond to consumers' preferences. This may mean they pass through network costs to some consumers, and offer a flatter tariff to others.

10.2.3 Offering DSP flexibility in services and contracts

In addition to providing DSP related tariffs, a retailer can also facilitate DSP through including flexibility in contracts for consumers and offering DSP related products. The type and nature of contracts and products will differ between residential and industrial/commercial consumers. Some concerns have been raised about the current level of products being offered by retailers.

In relation to medium to large industrial and commercial consumers who are on negotiated contracts, the EUAA claimed that its members had encountered difficulty in negotiating the inclusion of DSP options in retail contracts where the retailer also owned generation capacity and one large member reported that major retailers in South Australia and Victoria declined to negotiate energy supply contracts with effective DSP clauses.[232] The EUAA's work in developing a standard retail electricity contract, informed by members' experiences, suggests that contracts need to have specific clauses in them to ensure the use of DSP. This includes coverage of matters such as property rights to the load, rights of access to the consumer's energy use data and, if DSP is not part of the retail agreement, a clause that allows the consumer to offer it to third parties.

This suggests that the issues outlined above may indeed be inhibiting the willingness of retailers to enter into contracts with their consumers for DSP services. Another potential reason for this is the current arrangements for metering and settlement. We recognise that this is an important aspect to how the current arrangements promote participation of the demand side in achieving an economically efficient demand/supply balance and needs to be progressed under this review. This issue is discussed further in chapter 11 in the context of distributed generation (and also in the AEMC's issues paper on electric and natural gas vehicles, published on 18 January 2012).[233]

For residential consumers, responding to consumer requirements and preferences may go beyond offering tariffs. There are some examples of retailers diversifying beyond purely selling electricity into offering a range of energy-related services, such as energy efficiency audits, efficient appliances and tailored energy information, all of which can

231 Energy Networks Association, issues paper submission, p. 11.

232 Enernoc, issues paper submission, p.9. In addition, none of the EUAA's members reported direct contact from DNSPs seeking DSP capacity.

233 AEMC, *Energy market arrangements for electric and natural gas vehicles*, Issues paper, 18 January 2012.

help consumers reduce their bills.[234] Retailers may benefit from this in terms of earning a return on the products and services they sell, increasing the loyalty of their customer base and attracting new customers.

Particularly as consumer bills rise, retailers may face competition from dedicated ESCOs, who do not sell electricity but offer a range of products and services to help consumers manage their consumption and bills. It remains to be seen whether a particular model will be more successful than others in this area. For the purposes of this review it is important to ensure that the market conditions do not unduly restrict any business model from being offered to the market.

10.2.4 Engagement with consumers

As we discussed in chapter nine, this review is assessing how the framework for engagement with consumers on DSP matters best promotes consumer choice. A key aspect of this is what the respective responsibilities of network businesses, retailers and DSP service providers should be, and how can dialogue with the consumer take place in a transparent manner.

A retailer may be in the best position to act as a gateway for enabling consumer engagement in and awareness of DSP, by providing information as part of its billing process or marketing campaigns. However, this would need to be carefully managed as a number of submissions suggested that consumers generally have a low degree of trust towards retailers.[235]

As described in chapter four, responses to the issues paper were generally in agreement that, although recent price rises have led to an increased awareness of electricity costs, residential consumer understanding of electricity costs and the impacts of their use is still low. This suggests that, even where retailers offer contracts which would help consumers to reduce their electricity bills, consumers may not have the information available to assess whether they can benefit from those contracts. Origin in its submission was of the view that there is significant scope to improve the quality and quantity of consumption information to consumers, including at the appliance level.[236] TRUenergy noted in its submission that education and information provision needs to be focused on consumer groups that can provide the largest benefit.[237]

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234 For example, AGL Energy operates a number of "AGL Energy Shops" which sell appliances etc.

235 Essential Energy submission to the Issues Paper, p.11. The Victorian Energy Ombudsman considers that consumers are not receiving the correct information about a retailer's energy products and recommends that regulators should take enforcement action for any non-compliance with the relevant law.

236 Origin Energy, issues paper submission, p.6.

237 TRUenergy, issues paper submission, p.6.

Question	Engagement with consumers
46.	**Should retailers play a greater role in informing consumers about the potential benefits from DSP and various DSP products? If so, how should they do so?**

10.3 Way forward

As a key interface between consumers and the rest of the supply chain, retailers are potentially well placed to offer contracts which enable consumers to be rewarded for consuming in a way which reduces the costs of supply (such as shifting consumption to off-peak periods).[238] However, this chapter has identified aspects of the current market conditions that limit the commercial incentives on retailers to support the use of DSP in the market. Large consumers and user groups have expressed during this review that they face difficulties in negotiating with retailers in getting demand response flexibility into their contracts.

Competition in retail markets is key to providing incentives on retailers to offer products and services that consumers want, including DSP products. Under competitive conditions, retailers should have a commercial incentive to facilitate the development of DSP in the market. However, responses to the issues paper also pointed to regulatory and technical restrictions which limit the extent to which retailers can offer cost-reflective tariffs to consumers. For example, in practice a profit incentive from DSP may only exist for consumers who have interval meters as the retailer gains some benefit from such consumers changing their consumption.

We are seeking stakeholder views on whether further consideration on developing load profiles which could better support DSP is warranted. However, the issue of load profiling appears to only be fully resolvable if interval meters are available for all consumers. Chapter seven describes an example of retailers in New Zealand choosing to install interval meters for their consumers in order to manage pricing risk and remain competitive after a DNSP introduced cost-reflective network charges. While the Commission's view is that the choice of meter and tariff should remain with consumers, we are interested in stakeholders' views on whether a similar approach could be applied in the NEM.

If residential consumers become more informed about their electricity consumption and opportunities for reducing their bills, there will be demand for a wider range of electricity services and products. As discussed in this paper, both information and technology can enable and foster such consumer engagement. Third parties such as ESCOs may be able to offer some of those services, and so retailers will have to be flexible with the products they can offer. This may require changes to current business

238 Experience with the state solar panel schemes shows that if a retailer considers that there is a profit opportunity to be captured, then it is prepared to enter the market and develop innovative services.

models. However changing business strategies can create costs and risks and in the absence of effective competition, such change may be slow.

We will look further at whether the current market and regulatory arrangements are preventing retailers adapting, and whether certain technologies can enable changes to business models and product offerings where they are required to meet consumer demands. We appreciate stakeholders views on the issues raised in this chapter.

11 Distributed generation

Summary

For this review we are considering distributed generation that is on the consumers side of the meter as a DSP option. There are a variety of distributed generation (DG) technologies that provide benefits to consumers and the market.

This chapter discusses the issues relating to how the current arrangements facilitate the use of DG and the role that it can play in the provision of DSP in the NEM. We also consider the connection framework and the ability of distributed generated units to capture the value of any DSP related services it provides.

Directions

For the draft advice, we will consider:

- whether arrangements provide the right incentives on DNSPs to connect and engage with DG installations in an efficient and timely manner. In doing so, we will investigate the merits of possible additional schemes (e.g., a fee for service scheme and a DNSP revenue adjustment mechanism); and

- efficient options which enhance the ability of a DG installation, and other forms of DSP, to sell their demand response services to parties other than their existing retailer (the portability of DSP).

Our consideration of the incentives facing DNSPs is in recognition of the current concerns about delays and information asymmetries in the existing connection processes. Also increasing the flexibility for DG to offer their services to a wider range of participants could also improve the ability of t DSP to participate in the market where it is efficient to do so.

The extent of the discretion permitted to distribution businesses and the possibility of having multiple minimum technical standards for DG units connecting to the network could impede efficient connection of DG. SCER has already requested that the Commission investigates the arrangements governing setting minimum technical standards for DG units. We note that stakeholders will shortly submit a rule change request on the issue.

11.1 Role of DG and connections framework in the NEM

This section outlines the role, application and classification of DG[239] and describes the regulatory framework for connecting a DG installation to the distribution network.

239 The term 'distributed generation' and the term 'embedded generation' are equivalent terms for the purposes of this review.

11.1.1 Role of DG

DG, as defined for this review, is generation on the consumer's side of the meter.[240] Given that DG installations are located close to the consumer load, they can provide reliability benefits, and reduce network losses, in addition to managing the consumer's demand for electricity. As a DSP option, DG has the potential to address peak demand and thus reduce the reliance on large scale generation and network investment to meet peak demand. Submissions, to the Issues Paper reinforced the view that DG is a significant means to address peak demand and improve the efficiency of the NEM.[241]

DG covers a wide range of technologies in the energy market, including:

- biomass;
- roof top solar photo voltaic units;
- wind generating units:
  - many large wind farms connected to DNSP
  - also wind units are small (max 3);
- use of batteries of electric vehicles to inject energy back into the grid; and
- co-generation (heat and power) and tri-generation (cooling, heating and power).

Given the wide applications of DG, it is helpful to classify the various types of DG. Table 11.1, provides a useful classification of the types of DG installations available.[242]

Table 11.1 Classification of DG installations

Classification	Technical definition	Typical Installation
Micro	Less than 2 kW and connected to low voltage network	Roof top solar PV
Mini	Greater than 2 kW and up to 10 kW single phase or 30 kW three phase	Fuel cells; combined heat and power systems

240 We note, however, that DG may be used as a supply side option.

241 Government of South Australia Department of Transport, Energy and Infrastructure, Submission to Issues Paper - Power of Choice Review, 2011, p 9. In this submission, the Government of South Australia used a proposed tri-generation plant in Bowden as an example of an innovative project.

242 Energy Networks Association, *Embedded Generation ENA Policy Framework Discussion Paper*, November 2008, p 15.

Small	Greater than 10 kW single phase or 30 kW three phase but no more than 1 MW	Biomass, small hydro
Medium	Greater than 1 MW but no more than 5 MW	Biomass, hydro, local wind generating units
Large	Greater than 5 MW	Co-generation, hydro, solar thermal Many wind farms are distribution connected

Total installed capacity of rooftop PVs in the NEM is approximately 630 MW.[243] This is estimated to have the potential to provide 190 MW of peak load reduction assuming thirty per cent output of rated capacity at summer peak times.[244] Modelling for the AEMC estimated that by 2019-20 there will be a total of 175,000 PV installations across Australia with a total capacity of 3,100 MW.[245] Meanwhile, the Clean Energy Council states that approximately 3338 MW of co-generation is installed in Australia and 593 MW of this is fuelled by renewable sources.[246]

It is difficult to estimate that current total level of DG in the market because many commercial consumers with stand-by generators do not export back into the grid and do not necessarily register their capability with AEMO. Futura Consulting estimate that there is potentially over 1000 MW of standby generation available in the NEM.[247] However, a question remains whether the benefits of such generation to address local peak demand constraints are being captured. For example, large commercial users have raised concerns that there are inefficient barriers to them from being able to export their own generation as a measure to alleviate peak demand constraints.

11.2 Issues with current market conditions

To promote the efficient use of DG as a form of DSP in the NEM, there are a range of issues to consider.[248] Specifically:

- the connection application process for a DG proponent to connect to the distribution network;

243 Futura Consulting, *Investigation of demand side participation in the electricity market*, report for the AEMC, p. 53.

244 Ibid.

245 See AEMC, *Impact of the enhanced Renewable Energy Target on energy markets*, 9 Dec 2011.

246 Clean Energy Council cogeneration project data, July 2011. Cited in Climate Works Australia, *Unlocking barriers to cogeneration: project outcomes report*, 2011, p. 14.

247 Futura Consulting, *Investigation of demand side participation in the electricity market*, report for the AEMC, p. 52.

248 We note that the Victorian Treasurer has directed the Victorian Competition and Efficiency Commission (VCEC) to conduct an inquiry into feed-in-tariffs arrangements and barriers to DG. The VCEC released an issues paper for this inquiry on 16 February 2012.

- the connection charges payable by a DG proponent to the DNSP for use of its network;
- the ability of a DG installation to export energy; and
- the ability of a DG installation to capture all the benefits of the services it provides.

Each of these issues are discussed in the subsequent sections. We note that some stakeholders raised concerns about whether the existing gas infrastructure is adequate to support the expected growth in cogeneration and called for a national study into competition and accessibility in gas supply.[249] As the scope of the SCER Terms of Reference is limited to electricity markets, this review will not investigate this matter further. However, as part of our ongoing Strategic Priorities project, we will continue to monitor the performance of the gas markets.

11.2.1 Connection application process

The connection framework applicable for DG can vary by the size and nature of the DG. Generators which are registered with AEMO, which tends to be those units sized 5 MW or greater, are obliged to follow the connection process prescribed in Chapter 5 of the rules. Generators with a nameplate rating of less than 5 MW currently may choose whether or not to follow the connection process in Chapter 5 of the rules. Those who choose not to follow this process do not have to comply with the technical standards set out in Schedule 5.2 of the rules, but must meet jurisdictional requirements. These jurisdictional arrangements will be replaced with the proposed Chapter 5A of the rules, which is to take effect from 1 July 2012. Box 12.1 provides a detailed explanation of the overall framework for the NEM.

We note that AEMO has submitted a rule change to the AEMC regarding small generation aggregators. This rule change seeks to create a new category of registered participant – a 'small generation aggregator'. This category of registered participant would conceivably apply to DG installations. This potentially means that a DG proponent may choose to be registered as a 'small generation aggregator' and as a registered participant, could be subject to the connections framework under Chapter 5 of the rules. Alternatively, the DG proponent may decide not to register with AEMO and instead seek to be subject to the connections framework under proposed Chapter 5A of the rules. This rule change is under consideration.

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249 Energy Efficiency Council, issues paper submission, p. 22.

Box 11.1: Connections framework of DG in the NEM

A generator that connects to the transmission or distribution system must register as a generator with AEMO, unless AEMO has granted that generator an exemption from such registration.[250] A generator that has registered with AEMO becomes a registered participant. Registered participants must comply with the rules, including those under Chapter 5 in relation to connecting to the network along with the technical or performance standards. Large DG installations (i.e. those with capacity over 5MW) would be registrable with AEMO and therefore those DG installations would be subject to the connections framework in Chapter 5 of the rules.

AEMO grants a standing exemption from registration to generators that have a nameplate rating of less than 5MW. In addition, a generator may apply for an exemption from registration if the nameplate rating of the generating system is between 5MW and 30MW and the generating system exports less than 20GWh in any 12-month period. An exemption means that those generating units are not required to pay participant fees and do not have to be scheduled or settled in the NEM.

DG installations classified as micro, mini, small and medium DG installations have a capacity of less than 5MW. These DG installations would automatically fall under the standing exemption from registration with AEMO. Therefore, they may connect to the distribution network in accordance with the connections framework described in the proposed Chapter 5A of the rules (and not Chapter 5 of the rules).[251] The proposed Chapter 5A of the rules sets out the connection framework (charges and application process) for micro embedded generators (i.e. solar PV) as well as for DG with a capacity of less than 5MW, and is to take effect from 1 July 2012.

The proposed Chapter 5A of the rules specifies the information required and the time frames for DG connection to the DNSP's network and introduces a standardised and negotiated connection service:

- A basic connection service has two classes: one class applies to retail consumers who are not embedded generators (e.g. households, small business); and the other class that applies to retail consumers who operate micro embedded generators (i.e. solar PV). Under this framework, a DNSP must develop a model standing offer for a basic connection service, which is then approved by the AER; and
- A standard connection service applies to a particular class of connection

250 Clause 2.2.1(a) of the rules.

251 Note, however, that even if a DG installation is not registered by AEMO (and therefore does not pay participant fees and does not get settled in the NEM) it may nevertheless decide to connect to the network pursuant to the requirements in Chapter 5 of the rules if it has made a connection agreement to this effect with a DNSP (see clause 5.1.2(b)).

applicant for which a model standing offer has been developed by the DNSP and approved by the AER.

A basic connection service and a standard connection service obliges the DNSP to make a connection offer to the applicant. The connection offer must be made within 10 business days of receiving the complete connection application and must be in accordance with the model standing offer.[252] This means that DNSPs are obliged to make a connection service (and adhere to the connection application timeframe) for:

- micro embedded generators (i.e. solar PV) because it would be eligible for a basic connection service; and
- mini, small and medium DG installations because these would be eligible for a standard connection service.

In addition to a basic or standard connection service, a connection applicant can seek a negotiated connection service. A negotiated connection services refers to where a connection applicant seeks to negotiate the terms and conditions under which a connection service is provided. A simpler (compared to Chapter 5 of the rules) negotiating framework is set in proposed Chapter 5A of the rules.

DG proponents have raised several issues relating to the connection application process to a DNSP's network.[253] In submissions, DG proponents argued for standardised connection requirements for DG installations to reduce barriers to entry and to develop reasonable connection costs.[254] The issues raised include:

- a lack of information on available network capacity;[255]
- some DNSPs neither engage constructively with the DG applicant nor have the expertise or resources to adequately process the connection application;
- a lack of a commercial incentive on the DNSP to facilitate DG;
- the connection process is too long and potential delays creates commercial risk for DG projects (especially in commercial property developments); and
- the possibility of multiple technical access standards for mini, small and medium sized DG projects.

252 Proposed clause 5A.F.1

253 For example, see Progressive Green, issues paper submission, p.2.

254 Energy Users Association of Australia, issues paper submission, p. 15.

255 For example, see MyHomePower, issues paper submission, p. 6.

Lack of information on available network capacity and DNSP engagement and expertise

DG proponents have raised issues with the lack of information on available network capacity to ascertain whether they are able to connect to a distribution network. In addition, there were concerns that DNSPs do not engage constructively with DG applicants and do not have the expertise or resources to adequately process the connection application.

The AEMC is currently undertaking the Distribution Network Planning and Expansion Framework rule change request.[256] This rule change request proposes a Demand Side Engagement Strategy which is designed to encourage DNSPs to proactively engage with non-network providers to develop potential solutions to network constraints. The proposed rule sets out the purpose, scope and requirements for a distribution network annual planning and reporting regime. The features of the proposed rule include:

- Carrying out an annual planning process covering a minimum forward planning period of five years. The planning process would apply to all distribution network assets and activities undertaken that would be expected to have a material impact on the distribution network.
- Publishing an annual planning report which includes forecasting information on capacity and load forecasts at the sub transmission and zone substation level, and, to the extent possible, primary distribution feeders. The annual report must also identify any expected system limitations over the planning period.[257]

The issues relating to both the information on available network capacity necessary for a DG project and DNSP engagement with DG will be assessed under this rule change, hence we do not intend to further consider these issues as part of this review. A final determination on the above rule change is expected by August 2012. We note that the Intelligent Grid Research Cluster program has developed a model which attempts to shows the value of DSP, by time and location, as a means to alleviate network constraints, in an accessible format.[258] The model aims to help DSP providers, including DG projects, understand in advance the geographical areas in which they should be looking to develop their projects in order to obtain the most benefit from their products.

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256 Further information available at www.aemc.gov.au

257 System limitations may result from forecast load exceeding total capacity, the need for asset refurbishment or the need to improve system security.

258 The iGrid Cluster is an Australian collaborative research venture between five universities, supported by the CSIRO Energy Transformed Flagship. The model is referred as the Dynamic Avoidable Network Cost Evaluation Model. For more information see www.igrid.net.au

Connection process is too long and potential delays creates commercial risk

DG proponents have raised issues with the length of the connection process and that potential delays can create significant commercial risks for DG projects, particularly for commercial property developments. These stakeholders argued that the framework in Chapter 5 and the proposed Chapter 5A of the rules (especially in regard to those connections which are classified as negotiated services) fail to recognise the commercial drivers and time constraints facing property and commercial developments. Delays in the connection processes could put at risk other project development time frames. These stakeholders argued that Chapter 5 of the rules is designed principally for large scale generation where the evaluation of the connection can and should be deferred until the design of the plant is substantially complete and the equipment specification agreed between the plant owner and network business.

For DG installations with a capacity under 5 MW (that is, micro, mini, small and medium DG), issues relating to the timeliness of the DNSP in processing a formal connection application are expected to be addressed under the time frames in proposed Chapter 5A of the rules.[259] Under the proposed Chapter 5A of the rules, DNSPs are required to provide an offer to connect a DG applicant within 10 business days if the connection service sought by the applicant is a basic connection service or a standard connection service.

Under the proposed Chapter 5A of the rules, there is no time frame for negotiated connection services. We recognise that there are difficulties in trying to place specific time frames because these connections tend to be unique and specialised. While this may not be a matter which we will focus on as we progress this review, we would nevertheless welcome stakeholder views on whether the negotiated connection service framework under Chapter 5A is adequate.

For large (greater than 5 MW) registered DG installations, we note that the connection process under Chapter 5 of the rules is being examined under the AEMC's Transmission Frameworks Review and, therefore, we do not intend to comment on this issue as part of this review.[260]

We acknowledge that delays in the connection process may not be caused by the DNSPs' time frames to process a formal connection application. Rather, the delays may refer to the time to prepare the formal connection application; that is, when the DG proponent is seeking assistance from the DNSP to design its project. The role of the DNSP during this initial period is likely to depend upon commercial incentives to assist DG proponents. This issue is discussed in the next section.

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259 Refer to proposed clause 5A.F.1 of the proposed Chapter 5A rules which will be inserted into the rules as part of the National Electricity (Retail Connection) Amendment rules.

260 For further information, please refer to: http://www.aemc.gov.au/Market-Reviews/Open/Transmission-Frameworks-Review.html

Lack of commercial incentive on DNSPs

Given the nature of DG and recognising that not all forms of DG may benefit the DNSP in terms of alleviating issues associated with peak demand, stakeholders have raised the option of having explicit incentives or side-payments to DNSPs so that DNSPs have a commercial incentive to support the implementation of DG projects.[261] Two different types of schemes have been suggested.

Under the first scheme DG proponents could pay DNSPs on a fee-for-service basis to work with them in a collaborative manner during the inquiry period prior to submitting the formal connection application process.[262] This period can be quite important as it is when the DG proponent establishes a working relationship with the DNSP to clarify the requirements while finalising the design of the DG project. Currently, the DNSP would have to seek some funding from the AER through the regulatory determination process to cover its costs of responding to such enquiries and assisting possible DG projects. Inclusion of the Demand Side Engagement Strategy obligation on DNSPs into the rules may make it easier to justify such costs in the regulatory determination process. However there would still be a profit incentive to under-spend any such allowance. A fee-for service model, which allows the DNSP to retain a proportion of profit, could potentially overcome this tendency.

The second scheme is a more explicit incentive payment to the DNSP which would reward the DNSP for each new unit of DG connecting to its network. The principle is that the DNSP would receive a fixed $ per kW of distributed generation and that the payment would be received by the business once the DG installation connects to its network and is only applicable whilst the DG installation continues to operate. Questions regarding the appropriate payment amount and what types of DG installations would be within scope would need to be addressed in designing such an approach. For example, whether the DG installation must have the capability to export back into the grid.

The payment would be funded from the consumer base and therefore an investigation is needed to assess whether such an scheme would deliver a net benefit to the market. In the absence of the scheme delivering a net benefit, it would result in an inefficient subsidy to DG installations from consumer who do not have DG installations.

A similar arrangement to the second scheme involving the use of an explicit incentive payment is already being applied in the UK.[263] In addition to a supplementary payment per kW, the DNSP is permitted a partial pass through of the costs incurred in augmenting the shared network to connect a DG installation. Ofgem recognised that given the significant uncertainty around the volume of DG that would connect during

261 See for example, MyHomePower, issues paper submission, p. 5.

262 ClimateWorks Australia, *Unlocking the barriers to cogeneration: Project outcomes report*, Melbourne, 2011.

263 The incentive rate is £1 per kW and was determined based on an additional rate of return of 1 per cent above the allowed WACC. In order to protect both the network business and also the DG projects against cost uncertainty, the UK scheme also has a cap and floor on the rate of return to the network business on its overall portfolio of distributed generation.

a regulatory control period, its generation type, location and voltage, it is very difficult to forecast the costs of connecting DG to the distribution network. Unlike the fee for service scheme, this second scheme could also incentivise the DNSP to provide on-going network access to distributed generators once they have been connected.

On the matter of incentives, SP AusNet questioned whether current incentives provide sufficient rewards for DNSPs to pursue DSP that generate benefits to society and noted that it was not clear whether a DNSP could sell energy generated by DSP back into the market. They stated that there should be appropriate incentives on DNSPs to connect DG installations.[264] The Victorian Department of Primary Industries noted that the need to provide incentives must be balanced against the costs that consumers are willing to pay for such incentives.[265]

The commercial incentive on DNSPs to promote, and use, DSP options is discussed in chapter nine of this directions paper. The analysis set out in that chapter found that there are factors within the current arrangements which could prevent a DNSP from pursuing efficient DSP. We also recognised that DNSPs have a role in facilitating DSP services even in circumstances where the DSP may not provide a direct benefit to the DNSP. These schemes could better support such a facilitation role and we intend to consider both schemes. We welcome stakeholders' views on both of these schemes.

Question DNSP Incentives schemes for DG

47. What incentives should be provided to DNSPs to ensure that they support DG projects? Is there merit in the proposal for DG proponents to pay DNSPs a fee-for-service to connect a DG installation? If so, how should this proposal be applied?

Possibility of multiple technical standards

Currently, the performance and technical standards for DG installations with a capacity of less than 5 MW are determined by an individual DNSP in light of their prevailing jurisdictional obligations. The proposed Chapter 5A of the rules will continue this practice where the DNSPs retain the right to set their own technical standards for the various categories of DG installations under a standard connection service. The exception to this will be for micro DG installations (i.e., solar PV) which will have their own technical standards determined by the AER. For non-micro types of DG installation, if the connection applicant fails to meet the technical requirements as determined by the DNSPs, then it cannot qualify for a standardised connection service and must instead seek a negotiated connection service. For DG greater than 5 MW, the technical standards set out in Chapter 5 of the rules (Schedule 5.2) would apply.

264 SP AusNet, issues paper submission, p.20.

265 Department of Primary Industries Victoria, issues paper submission, p. 3-4.

The AEMC's Stage 2 Review of Demand Side Participation found that the flexibility given to DNSPs to determine minimum technical standards is causing delays and increasing costs for DG projects. In that review, we recommended that the Reliability Panel be asked to consider the minimum technical standards that apply to DG projects less than 5 MW. The SCER supported this recommendation in its response to our Stage 2 Review of Demand Side Participation.

We note that ClimateWorks Australia argued that the current arrangements could result in forty four different technical standards across the NEM and also recommended that the AEMC (via the Reliability Panel) initiate a review defining a set of common minimum technical standards across the NEM.[266] It proposed that these minimum technical standards for DG installations be 'automatic access standards', which means that if the DG project satisfies such standards it would then have a right to be connected to the network. In effect, ClimateWorks Australia seeks to extend the concept of 'automatic access standards' (and therefore a 'right to connect') that will apply to micro DG under Chapter 5A and already applies to large generation (under Chapter 5) so that it also applies to 'mini, small and medium' DG installations, which includes co-generation.

ClimateWorks Australia also propose that a similar standardised regime would apply to negotiated connection services, where they propose minimum access standards for 'mini, small and medium' DG installations (similar to the minimum access standards for large generation under Chapter 5), which would then form a basis for negotiating a connection service.

From the DNSP's perspective, such technical standards are important to ensure that system security is maintained. For example, Aurora Energy noted that networks may potentially need to invest in measures to address the ramping up and down of DG (e.g. a cloud passing over a cluster of PV installations).[267] We consider that there is merit in considering the set of technical standards to apply to DG projects which are less than 5 MW (and therefore not covered by Schedule 5.2 of the rules). We understand that stakeholders will shortly be submitting a rule change proposal on this matter.

11.2.2 Connection charges

The connection of a DG installation creates costs for the DNSP that must be recovered through charges. However, the basis for allocating costs incurred between DG proponents and other users can determine the viability of DG proposals and the incentives to connect. In particular, whether generators that connect to the distribution network are treated the same as those connected to the transmission network can influence location incentives for generators who can connect to either type of network.

A connection charge applies to three components that constitute a typical connection:

266 ClimateWorks Australia, *Unlocking Barriers to Cogeneration: Project Outcomes Report*, September 2011.

267 Aurora Energy, issues paper submission, p 8.

- Direct connection assets – these are the premises' connection assets which run from the connection point to the point of supply and where applicable also include the consumer mains;
- Extensions – an augmentation that requires the connection of a power line or facility outside the present boundaries of the transmission or distribution network owned, controlled or operated by a network service provider; and
- Shared network augmentations –an augmentation of a distribution network means work to enlarge the system or to increase its capacity to transmit or distribute electricity, caused by the connection. This is all augmentations other than extensions.

The connection arrangements for large DG installations (greater than 5 MW) are subject to Chapter 5 of the rules and are being reviewed under the AEMC's Transmission Frameworks Review. Large DG installations are likely to be the only type of installation which have the choice of locating at either a transmission or distribution network. Both generators connected to the transmission network and large DG will pay for the assets they use, as well as any security of supply upgrades into the shared network that are necessary to achieve relevant technical standards.

In addition, generators connected to either network that cannot physically control their output would be required to fund augmentations to the network to accommodate their capacity. We also note that Schedules 5.1 and 5.1a (which relate to network performance and system standards requirements) do not distinguish between transmission and distribution and that the rules do not specify that transmission or distribution connected generators receive any specific transfer capability. Therefore, we consider that there is no bias towards connection on either network type. Given this and also that the Transmission Frameworks Review is evaluating Chapter 5 of the rules, we intend not to look further at arrangements for large DG in this review.

The proposed Chapter 5A of the rules will stipulate a national connection charging regime for micro, mini, small and medium DG installations. The AER is currently developing and consulting upon the connection charge guidelines to apply to connection charges payable under proposed Chapter 5A of the rules.[268]

Under the proposed Chapter 5A of the rules and the AER draft guidelines, the connection charging regime will have following aspects :

- Retail consumers (other than non-registered embedded generators or retail developers) who apply for a connection service requiring an augmentation cannot be required to make a capital contribution to the cost of the augmentation if it is a basic connection service or below a threshold set in the DNSP's connection policy.[269] This means that only consumers whose peak demand is

268 The AER released its explanatory statement and draft connection charges guidelines on the 22 December 2011. For further information, please visit: http://www.aer.gov.au/content/index.phtml/itemId/746777

269 Proposed clause 5A.E.1(b).

above the shared network threshold will be directly charged for the costs they impose on the shared network. Under the AER proposed guidelines, the DNSPs will have discretion to set multiple thresholds below which consumers will not be charged for the costs of augmentation.[270]However, the AER has proposed default thresholds to apply where a DNSP cannot demonstrate that alternative thresholds would satisfy the requirements of Chapter 5A.[271]

- If their peak demand is above the shared network augmentation threshold level, consumers will pay augmentation charges on all their demand (not just the proportion above the threshold).

- Retail consumers (which includes micro embedded generators) are required to pay connection charges relating to extensions of the network and for direct connection assets, even under a basic connection service.

- Non-registered embedded generators or retail developers may be required to make a capital contribution for a connection service requiring an augmentation (but only if these costs have not been included in DUOS charges).

- Embedded generators have a right to receive a refund where a dedicated extension asset originally installed for a single user becomes used by other consumers (within 7 years of its installation).[272]

In relation to non-registered DG installations, the AER's draft guidelines states that such generators should pay for the cost of removing specific output constraints, unless there is a demonstrable net benefit to other network users. To facilitate connection, the AER considers that DNSPs should be proposing constraint reduction services, such as a fault mitigation service, which relate to augmenting the shared network to reduce network constraints.

Requiring non-registered DG proponents to possibly pay for costs of augmenting the shared network will affect the incentives for DG projects, especially in Victoria. Currently DG projects in that state are only liable for shallow connection costs (i.e., direct connection assets and extensions). Also in relation to augmentations, it is difficult to distinguish the causes of the increased need of augmentation in a meshed network. The incremental DG project application that leads to the available fault level headroom/capacity being breached will be asked to meet the full costs of the required shared network augmentation. However if that DG project results in paying the total cost of shared augmentation there will be no corresponding entitlement or right to that

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270 This will allow DNSPs to distinguish between areas of the network which have different characteristics or capacity. In each area, the threshold must be set so that a customer below the threshold would not be expected to increase the load on the distribution network beyond a level the DNSP could reasonably be expected to cope with in the ordinary course of managing the distribution network.

271 The proposed default threshold set by the AER is whether the consumer has a peak demand of less than 100 Amperes 3 phase low voltage supply. Therefore some 'mini' and 'small DG projects could be classified as a basic connection service.

272 Proposed clause 5A.E.1(d).

increase in capacity. Under the current rules, the shared network must provide equal access to all users.[273] That is, no individual user is entitled to a defined share of the capacity. This means that the effectiveness of these proposed arrangements will depend upon how they are applied in practice, including the net benefit test and whether DNSPs offer constraint reduction services, and the transparency of connection cost estimates.

As the AER is currently consulting on its proposed guidelines, it is appropriate that the above issues are addressed through that process. We will have regard to the outcomes of the AER's work when preparing our final advice to the SCER for this review.

11.2.3 Ability for DG to export energy

Enhancing the ability of DG proponents to export the energy that it produces may encourage DG proponents to take a more active DSP role. However, there are several issues to be considered, including:

- portability, which refers to the ability to sell electricity to other participants besides the financially responsible market participant;
- terms of the connection agreement between the DG project and the DNSP;
- registration of DG installations with AEMO; and
- licence exemptions for retail and network activities.

Portability

In common with other DSP options, DG can provide benefits to a wide range of market participants, including both retailers and network businesses. However, under the current arrangements and where there is only one meter at the consumer premises, the demand response can only be sold to the retailer which serves that consumer. This is because the reduced throughput is automatically accounted for in that retailer's wholesale market settlement and contract positions. For example, in the scenario where the consumer decides to turn on its own generation units to reduce its consumption, its retailer will be settled at the net consumption level. Hence the value to the consumer of utilising its distributed generation is the savings in its retail bills. Some stakeholders are concerned that this prevents the consumer from being able to sell the value of its DG to other parties and get a better reward than its existing retail tariff.

The issue of portability thus refers to the ability of a DG proponent to be able to sell its energy output (or demand response service) to a range of market participants other than its host retailer. This is distinct from the ability of a DG installation to export energy into the wholesale market. The current arrangements would enable the consumer to sell the value of that energy to any party as long as there is adequate

273 With respect to transmission network access, similar issues have been raised as part of the Transmission Frameworks Review.

metering to measure the export volumes separately from the consumed load at the DG installation.

Conceivably, the DG proponent may sell its demand response service to the network business, subject to terms of its existing retail contract. However, it is likely that any resulting benefit that consequentially accrues to a retailer will not be taken into account in compensating the DG proponent for that service. Crucially, the current arrangements limit the ability of the DG proponent to negotiate with other retailers and market participants to get the best price for their demand response service.

Submissions, including from the Energy Efficiency Council, argue that a DG proponents should be able to sell the energy it generates to any retailer willing to purchase the energy as a form of DSP service, rather than only to the local retailer.[274] Other submissions point to the role of third-party aggregators in facilitating the participation of DG installations with retailers.[275]

We recognise that this is an important issue for this review because it relates to how the current arrangements promote DSP to achieve an economically efficient demand/supply balance. We also note that this question is relevant to the AEMC's review into energy market arrangements for electric and natural gas vehicles.[276]

In the NEM, consumers can sell their scheduled load reductions or DG output to the market under a number of conditions. The ability to sell DSP products to other retailers will depend upon having appropriate metering and settlement arrangements. This issue does not only relate to DG but could apply to other forms of DSP and therefore should be addressed in a consistent manner for small generators as well as loads. Also the investigation needs to consider the appropriate arrangements for both market and non-market generators.

There are a number of potential options to facilitate the portability of energy produced by a DG installation. This may include the use of subtractive metering (otherwise referred to as 'parent-child' metering or sub-metering) and/or establishing the ability to separate load from generation in a shared metering installation.[277] While subtractive metering (in the context of an embedded network) is currently allowed in the NEM, it is not universally endorsed by retailers and distributors due to the perceived complexities associated with defining the party responsible for metering at the 'child' connection points. Load profiling could be an interim default solution if separate metering capability is not available at a site.

274 Energy Efficiency Council, issues paper submission, p.15.

275 MyHomePower, issues paper submission, p. 5.

276 Please refer to http://www.aemc.gov.au/Market-Reviews/Open/Energy-Market-Barriers-for-Electric-and-Natural-Gas-Vehicles.html

277 Under subtractive metering the existing meter and NMI (the parent meter) measures the total load at a site while a second meter and NMI (the child meter) measures the load or generation at a subsidiary connection point that is within the site associated with the 'parent' meter.

As part of its Small Generator Framework Design workstream, AEMO has already performed some analysis on the issue of metering to support the portability of energy for small generators. AEMO has recommended that the regulatory framework for subtractive metering of small market generators should be clarified and that the extent to which metering obligations in shared metering installations with small generators can support competitive market arrangements should be explored.[278]

Restrictions on consumers from selling their DSP products to any party may be due to the terms of their existing retail contracts. The issue of appropriate retail contracts for DSP has been raised by EUAA and Energy Efficiency Council. The Energy Efficiency Council argue that demand side contracts need to be established that allow DSP providers to sell their services to any party that is willing to purchase the DSP service. They consider that this will enable competition to set appropriate prices for DSP services, and ensure that retail churn does not affect the value of long term DSP contracts. We appreciate stakeholder views on whether amendments to the current market arrangements are required to facilitate such contracts and if so, what amendments are appropriate.

Questions Metering and settlement arrangements for DG

48. What are the appropriate metering and settlement arrangements to facilitate the ability of consumers and DG projects to sell their demand response to any party?

49. Are amendments to the current market arrangements required to facilitate DSP contracts which enable the DSP provider to sell its services to any party? If so, what amendments are appropriate?

Terms of the connection agreement with the DNSP

DG proponents argue that DNSPs are placing onerous restrictions on DG proponents in their connection agreements which can limit their export capability. For example, DNSPs may restrict the operation of DG installations by requiring it to run in 'island mode' (that is, not synchronised with the network) and this consequently prevents any energy from being exported. However, DNSPs consider that placing these terms in the connection agreement is their only opportunity to collectively identify and mitigate any technical and performance issues associated with DG that could arise in the network.

As discussed above, this issue could be addressed by establishing minimum technical standards for DG installations. This would alleviate some of the DNSPs' concerns and promote certainty in dealings between DNSPs and DG proponents. By developing technical standards, this would improve the level of information available and encourage best practice between DNSPs and DG proponents. Also as DNSPs engage

278 AEMO, *Small Generator Framework Design Paper*, July 2010.

with and investigate more potential DG projects, their expertise and experience with how such DG projects impacts upon their networks would improve. Ultimately this will depend upon the DNSP having a positive underlying incentive to facilitate the connection of DG.

Registration

AEMO's Small Generator Framework Design review identified issues with current registration process and classification procedures that could act as barriers to small generators (which includes DG projects). The issue is linked to the desired goal of improving the role of aggregators to better facilitate the registration of small generation. AEMO's Small Generator Framework Design made a series of recommendations which are proposed to be addressed by SCER. These recommendations include the AEMO rule change regarding 'small generator aggregator'.

Licence exemptions for retail and network activities

Under the National Energy Retail Law, a person seeking to sell energy must either hold a retailer authorisation or have an exemption from that requirement. Similarly, if a person seeks to distribute energy within an embedded network (for example, an industrial park or shopping centre), that person will need to be covered by a Network Service Provider exemption from the AER. The AER may place restrictions when granting the exemptions. The AER is currently consulting on retailer exemptions (exempt selling)[279] and NSP exemptions.[280]

ClimateWorks Australia raised concerns with the AER proposed guidelines because, in its view, these guidelines would be a barrier against multi-site, precinct-level co-generation systems. While we note its concerns, these matters should be appropriately addressed by the AER as part of its work reviewing the current retailer and NSP exemption processes.

11.2.4 Capturing the benefits of DG

To encourage the efficient level of DG participation in DSP, it is necessary that the DG proponents are able to capture a share of the benefits that they deliver. The relevant issues to consider relate to:

- feed-in tariffs;
- avoided TUOS payments;
- ability to obtain fair, reasonable compensation from networks when they provide DSP; and
- DG exports having to be sold at wholesale spot prices.

279 For further information please see: http://www.aer.gov.au/content/index.phtml/itemId/737837

280 For further information, please see: http://www.aer.gov.au/content/index.phtml/itemId/658904

Feed-in Tariffs

Feed-in tariffs enable DG proponents to receive a price for the energy that they produce. A feed-in tariff provides an incentive for investment in DG.[281]

However, there are substantial variations in the design of feed-in tariff schemes across NEM jurisdictions in terms of the eligibility criteria and payment levels. While all NEM jurisdictions currently include some payment for micro and mini DG installations with capacity up to 10 kW there can, nevertheless, be significant differences. For example, the ACT government is proposing to expand its scheme to include medium and large generators while the Queensland government is seeking to reduce the eligibility criteria to less than 5 kW given the large number of people investing in large scale solar PV systems. A summary of the various jurisdictional feed-in tariffs is provided in Appendix A of the AEMC's Interim Report into the Impact of the enhanced Renewable Energy Target on energy markets.[282]

In submissions to the issues paper, some DG proponents advocated for a national consistent feed-in tariff scheme.[283] Further, the Federal Government's Draft Energy White Paper recognised that the introduction of state based feed-in tariffs can affect decisions about investment in new generation capacity, and that the Federal Government will work with the jurisdictions to identify opportunities to harmonise micro-generation feed-in tariffs so that they do not impose an unjustifiable burden on electricity consumers.[284] We agree that there is merit in investigating a possible nationally consistent feed-in tariff scheme that correctly values DG. We consider that this matter is best progressed through the Federal Government working with the state governments.

One issue relating to feed-in tariffs is how to encourage such consumers who have micro generation units to maximise their export at peak times, that is, when the market values electricity. The existing schemes offer a flat rate per kWh exported, however the value of such exports to the system, will obviously differ between peak and non-peak periods. Potential amendments to the schemes include possible side-payments or developing appropriate time-sensitive retail tariffs for such consumers. We appreciate stakeholder views on whether such a concept is appropriate and practical and also on ways to achieve this.

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281 We also note that such DG units can also received payment under the Small Scale Renewable Energy Scheme (SRES), such as the purchase of eligible solar water heaters, small-scale solar PV panels and small wind and micro-hydro system. See, AEMC, Impact of the enhanced Renewable Energy Target on energy markets, 9 December 2011.

282 See AEMC, Interim Report into the Impact of the enhanced Renewable Energy Target on energy markets, 25 November 2011.

283 Ceramic Fuel Cells Limited, issues paper submission, p 9.

284 Commonwealth of Australia, *Draft Energy White Paper: Strengthening the foundations for Australia's energy future*, December 2011, p 228.

Question	Maximising the export value of DG to address peak demand

50. Should there be supplementary provisions to the arrangements governing feed in tariff payments to encourage such consumers who have micro generation units to maximise their export at times that enable deferment of network augmentation? If so, what are possible options to achieve this?

Avoided TUOS Payments

Under clause 5.5(h) of the rules, DNSPs must pass through the locational component of TUOS charges to the DG proponent that would have been paid by the DNSP in the event that the DG proponent did not connect to the grid. The DNSP is required to develop a methodology to calculate the amount to be passed through.

Stakeholders have raised concerns with the current application of avoided TUOS. Specifically, there is lack of harmonisation as to how TNSPs calculate TUOS charges and differences in how the tests are applied.[285] There is also a lack of transparency because the methodology for calculating avoided TUOS charges is not published on the DNSP websites. Submissions generally argued for the development of an explicit methodology for calculating avoided TUOS payments.[286]

The locational component of TUOS charges may not correctly value the transmission cost savings mostly due to the issues with the current TUOS charging methodologies due to:

- different definitions of peak demand; and
- Cost Reflective Network Pricing methodology is based upon allocating existing costs and does not value long term incremental cost.

We note that some of the issues relating to TUOS methodologies are being explored in the AEMC's IR-TUOS rule change request.[287]

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285 For example, there is currently no avoided TUOS in South Australia because ElectraNet considers that it cannot guarantee that the DG installation will be generating at system peak (and the DG installation is unwilling to incur the potential penalties DNSPs try to enforce if they do not deliver).

286 Origin Energy, issues paper submission, p. 6.

287 For further information please refer to: http://www.aemc.gov.au/Electricity/Rule-changes/Open/Inter-regional-Transmission-Charging.html

The existing payments may not correctly value the potential network cost savings from a DG installation. In fact, there is minimal evidence to suggest that installing DG actually leads to a reduction in transmission network investment. In such circumstances, the avoided TUOS payment becomes an inefficient cross-subsidy between DG and non-DG consumers.

We recognise that there is merit in considering these issues and note the desirability for transparency in relation to the calculation of avoided TUOS payments. However the value of existing avoided TUOS payments are unlikely to be a significant component of a typical DG project's financial viability. Therefore the existing arrangements may not materially impede the promotion of DG projects. Given this, we intend to focus this review on more material issues and not consider the existing arrangements for avoided TUOS Payments.

Ability to obtain fair, reasonable compensation

DG proponents consider that they have the potential to provide considerable benefits to DNSPs by helping to address peak demand. Accordingly, DG proponents argue that they should receive appropriate rewards for this service. DG proponents also argue that this situation is exacerbated by the fact that DNSPs are a natural monopoly that results in an unequal bargaining position. While clause 5.5(f) of the rules requires DNSPs and DG proponents to negotiate in good faith on the amount of compensation to pay to the DG in the event that the DG is constrained on or constrained off during an interval, DG proponents suggest that this does not always happen in practice. From the DNSP's perspective, their concern relates to the potential effects that DG connection would have on costs relating to system security and network protection rather than on potential peak demand benefits.

We consider that ensuring that there are commercial incentives on DNSPs to pursue the connection of DG and promoting transparent arrangements to allow affected parties to understand the impacts (in terms of both costs and benefits) of DG on distribution networks would be conducive to discussions regarding the appropriate DG compensation payments.

DG export being sold at wholesale prices

The Energy Efficiency Council considers that the requirement that the energy a DG proponent exports into the network is sold at the wholesale spot price means that DG projects fail to capture all the value of its benefits.[288]

However, this issue depends on the classification of the generating unit. A generator that is classified as a market generator must sell all electricity into the NEM and accept spot price payments from AEMO. More specifically:

- a market generator which is classified as scheduled is required to offer its capacity into the market and can seek to influence the spot price; and

288 Energy Efficiency Council, issues paper submission, p. 22.

- a market generator which is classified as non-scheduled does not make offers and it receives the prevailing spot price.

If the generator is classified as a non-market generator (or subject to a registration exemption), then it must sell its entire output to the local retailer or consumer at the same connection point. The price will be a matter for negotiation between the relevant parties.

The Energy Efficiency Council argues for flexibility for non-scheduled market generators to be able to influence the price at which it sells its electricity and should be able to determine to whom they sell their electricity.[289]

Our view is that the current arrangements are appropriate and we do not consider that there is sufficient justification for the additional complexity of treating non-scheduled generators differently in terms of settlement at wholesale prices. The wider question of whether DG, and in general DSP options, are able to capture all the value of the benefits it provides across the supply chain is discussed further in chapter seven.

11.3 Way forward

As a form of DSP, DG offers a way to reduce some of the rising demand on electricity networks and may ease pressures on generation capacity. Factors that improve the financial viability of DG include: technological advancements, rising electricity prices, the introduction of the carbon tax and increased demand for high rating energy efficiency commercial property. These factors would likely spur the penetration of DG in the NEM.

Stakeholders have raised a series of concerns relating to the connection and export of DG and our analysis indicates that there are a number of areas that require further consideration. As part of this review, we will further explore:

- the role of DNSPs during the connection process and the conditions that they place on DG proponents can influence the financial viability of DG projects. This review will assess how best to ensure that DNSPs are incentivised to facilitate both the efficient connection of DG projects and the export of their energy output; and

- the current arrangements for metering and settlement in the NEM can impede the ability of DG proponents, and all other forms of DSP, to sell their DSP services to other parties other than the host retailer. The review will investigate possible appropriate options to provide flexibility for DSP providers to sell their services to any party willing to purchase that service (i.e., the portability of energy supplied by a DG installation, terms of retail contracts).

It will not be appropriate for any amendments to the market arrangements to transfer the costs associated with distributed generation onto consumers who do not have DG

289 Ibid.

installation. In our assessment we will test whether any recommended amendments would deliver a net benefit to the market.

In this chapter, we have raised several issues relating to the connection of DG to a DNSP's network and to capturing the value of DG as DSP. For example, issues relating to multiple technical standards that must be met by a DG proponent may act as an impediment to the efficient connection of DG or the merits of harmonising feed-in tariffs and avoided TUOS arrangements to enable DG proponents to capture the value of the DSP services it provides. While we recognise the importance of these issues, these issues are being addressed through other avenues. Therefore, we shall not consider these issues further in the context of this review.

12 Energy efficiency regulatory measures that integrate with or impact on the NEM

Summary

As part of this review, we are to assess the potential for energy efficiency measures and policies to promote efficient DSP in the NEM.

In this chapter, we outline the energy efficiency programs that we intend to consider and our approach to assessing the extent which such policies and measures promote the efficient use of, and investment in DSP in the stationary energy sector.

We recognise that there is also work underway by the Australian Government to further develop a national savings initiative as part of its Clean Energy Future package, and part of that work involves consideration of mechanisms or incentive that helps to reduce peak electricity demand. We note this work programs and are considering interactions and outcomes in our review.

As outlined, energy efficiency involves using less energy to produce the same level of output, or using the same amount of energy to deliver a higher level of output. Energy efficiency actions by consumers can include installing more efficient appliances and equipment or engaging a third party to provide energy audits/assessments of household or business operations to consider potential improvements that could be made.

Energy efficiency can play an important role in the context of policy responses to greenhouse gas emissions and potentially help address energy supply issues. For example, energy efficiency can help to lower energy bills for consumers, manage electricity loads, and increase productivity and competitiveness in the market.[290]

Over recent years, there has been a range of policies and regulatory measures introduced by state and federal governments to encourage improvements in energy efficiency. These policies and measures have tended to focus on those measures that seek to address information and behavioural barriers, environmental externalities (e.g. greenhouse gas emissions) or misaligned incentives between different parties.[291] Such measures have included education and information programs;[292] obligations for

290 International Energy Agency, *Energy Efficiency Policy and Carbon Pricing Information Paper*, August 2011, p.7.

291 Misaligned or 'split' incentives between parties can occur where the person responsible for the energy efficient action is not the person who benefits from that action. For example, where the landlord is responsible for the payment and installation of energy efficient features of a building but the tenant is the one that pays the electricity bills.

292 For example, energy efficiency labelling schemes for certain appliances (energy efficiency star ratings).

minimum standards on appliances, products or buildings;[293] direct financial assistance, such as grants or rebates; and market based schemes (e.g. white certificate schemes).[294]

In 2009, the Council of Australian Governments (COAG) agreed to develop a National Framework on Energy Efficiency (NFEE) to accelerate and deliver a consistent and cooperative approach to energy efficiency.[295] This strategy places requirements on the MCE and our work on this element of the review arises due to those requirements. MCE considered that while energy efficiency policies are external to the electricity market rules, these measures and policies have the potential to impact on the efficient DSP and broader electricity market outcomes. Hence, consideration of specific energy efficiency measures and policies for this review relate to those policies and programs that impact or seek to integrate with the NEM, and the role they play to facilitate efficient DSP in the market.

There has been a suite of reviews and reports relating to existing or planned energy efficiency policies and the extent to which they are meeting different objectives. The most recent report includes the Prime Minister’s Task Group on Energy Efficiency that considered measures to deliver a step change improvement in energy efficiency by 2020.[296] The Australian Government has provided its response to the findings of the Task Group final report through its Clean Energy Future package.[297] The Government is now expanding its Energy Efficiency Opportunities program and is undertaking further work on a possible National Energy Savings Initiative (ESI).[298]

Part of the Government's consideration of a national ESI is to include potential incentives or a requirement that would help reduce peak electricity demand. Such a mechanism could involve integrating peak demand requirements or incentives into a wider energy efficiency scheme or considering peak reduction measures as a separate obligation within an ESI. The Australian Government released its issues paper on its

293 Such as standards for electrical appliances or equipment or energy efficiency building codes/regulations.

294 A detailed overview of existing measures and policies can be found at http://www.pc.gov.au/projects/study/carbon-prices/report.

295 NFEE is part of COAG’s National Partnership Agreement on Energy Efficiency. More information can be found at http://www.ret.gov.au/Documents/mce/energy-eff/nfee/default.html.

296 A copy of the final report prepared by the Prime Minister's Task Group on Energy Efficiency in 2010 is available at http://www.climatechange.gov.au/~/media/submissions/pm-taskforce/report-prime-minister-task-group-energy-efficiency.pdf.

297 Details on the Clean Energy Future package are available at http://www.cleanenergyfuture.gov.au/clean-energy-future/securing-a-clean-energy-future/#content09.

298 The Government's work on a possible ESI includes considering the costs and benefits of a national scheme before making a final decision on whether to pursue the policy. Any decision to adopt a national ESI would be conditional on the endorsement of COAG and the agreement that existing state schemes will be folded into any national scheme. The AEMC is a represented on the ESI Advisory Committee - http://www.climatechange.gov.au/government/initiatives/energy-savings-initiative.aspx.

work on ESI and peak demand issues in December 2011.[299] The AEMC is engaged on the Government's ESI and is considering this work in light of our requirements for MCE, specifically, the interaction between EE and DSP with respect to facilitating efficient DSP in the NEM.

Energy efficiency regulatory programs and measures for consideration

In our issues paper, we noted there are a number of energy efficiency programs in place that could be considered as part of this review. We noted that we would limit our assessment to only those existing regulatory policies and measures that impose a direct obligation or incentive on NEM participants.

Some stakeholder submissions commented on the programs to be included,[300] however the majority of submissions made observations more generally on the role of energy efficiency policies and programs in the context of energy markets. Many stakeholder submissions considered that there needs to be better coordination of existing state and federal measures and that the multiple schemes may be increasing cost, complexity, and potentially creating barriers to new entrants in the market.[301] Others considered that once a carbon price is introduced regulatory energy efficiency schemes should be phased out so as to limit the regulatory burden on businesses and allow for a competitive market to develop.

We note these observations and will take these and other issues into account in our assessment of measures and the extent that they facilitating consumer choice and efficient DSP in the NEM.

To assist us with our assessment of specific regulatory energy efficiency measures and policies we have engaged Oakley Greenwood (OGW) to:

- provide a stocktake of the regulatory energy efficiency measures and policies that should be considered as part of the review, including commentary on the potential impacts/benefits of measures on the NEM and a review of international approaches (stage one - stocktake);
- assess the effectiveness and cost-efficiency of those regulatory measures and policies identified in the stocktake (stage two); and

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299 See Department of Climate Change website: http://www.climatechange.gov.au/government/submissions/consultation-on-a-national-energy-savings-initiative.aspx

300 Sustainable Energy Association of Australia, issues paper submission, p.6, SA Department of Transport, Energy and Infrastructure, issues paper submission, p.10, Vic Department of Primary Industries, issues paper submission, p.2-3, Energy Supply Association of Australia, issues paper submission, p.14, Energy Users Association of Australia, issues paper submission, p.22, EEC issues paper submission, p.31-33.

301 Origin Energy, issues paper submission, p.9; TRU Energy issues paper submission, p.11; Smart Grid Australia, issues paper submission, p. 12; AGL, issues paper submission, p.2.

- provide advice on the elements for a best practice model or approach for energy efficiency measures and policies that seek to promote the efficient use of, and investment in, DSP in the stationary energy sector (stage three).

OGW have completed stage one and the stocktake can be accessed, in full, on the review website.[302] In order to perform the assessment under stage two, OGW prioritised the programs identified in the stocktake in terms of the level in which they placed direct obligations or incentives on NEM participants. The following four programs were selected for detailed assessment as they involve a target or required level of achievement from NEM participants:

- the Victorian Energy Efficiency Target (VEET) Scheme;
- the NSW Energy Saving Scheme (NSW ESS);
- the South Australian Residential Energy Efficiency Scheme (SA REES); and
- the Commonwealth's Energy Efficiency Opportunities (EEO) program.

Stage one also seeks to provide some commentary on other energy efficiency measures (such as performance standards) that while directly related may have the potential to influence or impact DSP outcomes. Broader discussion of EE and DSP is given in next section.

Stage two of the OGW work will input to determining the direct and indirect costs and benefits (including avoided costs) of the energy efficiency measures and policies on each part of the electricity supply chain, including market participants and consumers. It differs from similar assessments conducted by other organisations due its focus on the impact of such programs on the NEM – rather than to only assess their performance or cost-effectiveness against their own program objectives. The programs will be assessed against the NEO and include carbon price considerations. Where programs fail the NEO test, we intend to make observations on the cost effectiveness of programs meeting their intended objectives (e.g. energy saved or CO2-e emissions abated). The programs' impacts on wholesale market price and the reliability of electricity supply will also be considered.

The assessment will specifically consider the extent to which the policies/measures:

- facilitate efficient consumer DSP and electricity use decisions;
- recognise or reward efficient consumer DSP actions;
- invest directly in energy efficiency opportunities;
- enhance the level and transparency of information identifying DSP opportunities; and

302 The DSP review website can be accessed at http://www.aemc.gov.au/market-reviews/open/power-of-choice-update-page.html.

- enhance the potential for NEM infrastructure and systems (i.e. market settlement systems, smart metering, smart grid technologies) to support efficient use of, and investment in, DSP.

In undertaking its work, OGW will also be undertaking some market simulation modelling to understand the impacts of energy efficiency policies and measures on the NEM, particularly on the maximum demand and energy consumption (i.e. loadshape).

We note that there is likely to be some limitations to the assessment given lack of data and ability to quantify some benefits. We are seeking stakeholder feedback on any data that may be available, and the parameters for best practice approach for energy efficiency in the context of facilitating efficient DSP in the electricity market.

Interaction between energy efficiency regulatory measures and uptake of efficient DSP

It is important to recognise that energy efficiency opportunities can be those regulatory programs put in place by various governments or energy efficiency actions taken up by consumers' independent from such programs.

In chapter four, we noted a range of issues with regard to consumers' ability, willingness and incentive to take up DSP measures. These factors also relate to uptake of energy efficiency, particularly, consumers awareness and personal preferences to invest and the issues associated with the level of DSP that appears to be cost effective (dependant on technology, information and pricing), and the lower levels that appear to be actually occurring in practice.

A number of stakeholders have indicated that consumers generally do not separate undertaking energy efficiency and DSP. Consumers, from their perspective, seek to manage consumption and costs[303] and are indifferent in most cases to the weather its DSP or energy efficiency. It is also important to recognise that in some cases, particularly in the international context, energy efficiency policies are used as measures to drive demand abatement outcomes.[304]

Given consumer views and how DSP options are packaged and delivered in the market there may be benefits for greater coordination of energy efficiency policies and DSP generally. Better coordination and consideration of approaches and collection and sharing of information may help drive new and competitive electricity services to consumers and improved policy responses for uptake of cost -effective DSP.[305]

Some stakeholders who responded to our issues paper also considered that there could be better interaction of energy efficiency and DSP policies, particularly given that

303 EUAA and Australian Government Energy Efficiency Opportunities Program workshop [June 2011]

304 http://raponline.org/resource/BrattleGroup_Faruqui_USRegulatoryMechanismsEE_PEPDEE_Sydney_2011_DEC_12.pdf

305 Smart Grid Australia, issues paper submission, p.12.

existing energy efficiency programs fail to take into account the wider DSP potential,[306] and tend not reflect the value of peak demand reductions.[307] A few stakeholders also commented that any programs which may be put in place should be cost-effective, evidence based and complementary to existing market frameworks.[308]

For the review, we consider energy efficiency opportunities are a form of DSP, hence the consideration of the linkages and role of energy efficiency policies and measures in the context of the market and regulatory arrangements required to facilitate efficient DSP in the electricity market is an important part of our work.

Questions **Energy efficiency policies and measures that impact on, or integrate with, the NEM**

51. What do you consider is the role for regulatory energy efficiency policies and measures in the context of facilitating uptake of cost effective DSP in the electricity market?

52. In your view, do consumers consider energy efficiency measures separately to DSP, or do they consider all actions as part of managing consumption and hence controlling electricity costs?

53. What are the elements for a best practice model or approach for energy efficiency policy to facilitate efficient investment in, and use of, DSP in the electricity market?

306 Essential Energy, issues paper submission, p.17; SP AusNet, issues paper submission, p.26.

307 Energex, issues paper submission, p.16.

308 Jemena, issues paper submission, p.21; Major Energy Users Inc, issues paper submission, p.21.

Abbreviations

AEMA	Australian Energy Market Agreement
AEMC	Australian Energy Market Commission
COAG	Council of Australian Governments
DLC	Direct load control
DNSP	Distribution network service provider
DSP	Demand side participation
EE	Energy efficiency
ESI	National Energy Savings Initiative
FCAS	Frequency Control Ancillary Services
LRMC	Long run marginal cost
MCE	Ministerial Council on Energy
MPC	Market price cap
NCAS	Network Control Ancillary Services
NECF	National Energy Customer Framework
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NSSC	National Stakeholder Steering Committee
RERT	Reliability and Emergency Reserve Trader
SCER	Standing Council on Energy and Resources
STPIS	Service Target Performance Incentive Scheme
TNSP	Transmission network service provider
TUOS	Transmission use of system

A Characteristics of DSP measurement options

Chapter 3 outlines a range of DSP options available or that could be available in the market. Each of these have different characteristics and can be deployed for a number applications. We discuss here information taken from a paper by the Brattle Group.[309]

A.1 Customer segment

Due to the different characteristics of each customer classes/sectors, demand response options are typically created to target opportunities in each, or even to target specific sub-groups within the segments. Because the focus of demand response programs can be about reducing system peak demand or network demand, customers can be grouped by the size of their individual peak demand. Enrolment in demand response programs would then be limited to customers who meet the peak demand size criteria.

A.2 Signal to the end use customer

Incentive-based DSP options pay customers to reduce load during events called by the program sponsor. These events can be triggered by an emergency on the grid or by high electricity prices. Incentive-based options include programs such as direct load control (DLC), interruptible tariffs, and other curtailable load management programs. Price-based options incorporate time varying rates that reflect the cost of providing electricity during different time periods. These rates encourage customers to change consumption patterns and provide opportunities for electricity bill savings. Price-based options include critical peak pricing, peak time rebates, and real-time pricing.

A.3 Trigger for the demand response event

Demand response can be either reliability or price-triggered. Reliability-triggered options are called in response to emergency conditions on the grid (e.g., outages). These options typically provide short notification time due to unpredictable nature of emergencies. On the other hand, price-triggered options are called in anticipation of high market prices. A single demand response option can be both reliability and price-triggered, having a dual character. Usually, incentive-based programs are called at times when the system operator or utility determines that the need for peak load reduction is critical. This can occur either when electricity prices are high or when demand is near the reserve margin and there is an increased risk of grid failure (such as blackouts). This distinction does not define any particular program, but is something that can vary within a program category. Demand response programs can be triggered by both price and system emergencies.

309 The Brattle Group, Bringing demand-side management to the Kingdom of Saudi Arabia, 2011

A.4 Response requirement

DSP options with mandatory participation requirements carry a high penalty fee for non-compliance. Typically, participation in a capacity-market option is mandatory as the load commitment from the end-use customer represents a firm resource level for the utility or program provider.

Voluntary options provide participants an incentive to reduce demand but do not penalise for non-compliance. Participation in dynamic pricing options is usually voluntary. Among incentive-based options, participation in a curtailable load management measure, as well DLC, is typically voluntary.

Alternatively, some DSP options can be offered on a mandatory, voluntary, or default basis (with the option to opt-out). While the response requirement for a particular demand response option can be mandatory, participation in the demand response option may be voluntary. For example, enrolment in some curtailable load management measures is voluntary, but once enrolled, all participants are required to reduce their load.

A.5 Dispatchability

Dispatchability of DSP measures refers to the ability to provide a demand response-inducing signal within a limited timeframe of the event commencement. DLC measures, for example, are dispatchable because they are event-based. A TOU rate, on the other hand, is not dispatchable because the peak period is pre-determined. Dispatchability is the primary characteristic that distinguishes demand response programs from permanent load shifting programs.

A.6 Notification

The amount of response time that is provided to the participant is another characteristic of DSP measures. Day-ahead DSP options are those which require that the customer be notified a day in advance of the critical event. Day-of could mean 6 hours of notification, 1 hour, 15-30 minutes of notice, or even an instantaneous demand reduction. Day-of options become more feasible if end-use customers are equipped with enabling technology, which allows them to automatically respond to demand response signals. Day-of dispatch requires more customer education and management of expectations. Also, participant incentives increase as notification time becomes shorter. Dynamic pricing can be offered as day-of when customers are equipped with enabling technologies. Among reliability-based options, direct load control (DLC) is a day-of option. Under the Rules, the Reliability and Emergency Reserve Trader (RERT) mechanism allows the Australian Energy Market Operator (AEMO) to intervene in the market to ensure reliability of supply and to maintain power system security. That is, the RERT enables AEMO to contract for additional reserves up to nine months ahead of a period where reserves are projected to be insufficient to meet the relevant power system security and reliability standards, and, where practicable, to maintain power system security and dispatch these additional reserves should an actual shortfall occur.

The Commission recently published its final rule determination, which was to make a more preferable rule to postpone the RERT's expiry for four years to 30 June 2016.[310] The new rule also removes the need for the Reliability Panel to review the RERT a year prior to its expiry

A.7 Control

DSP options can also be distinguished on the basis of whether the load reduction is being controlled by the utility or by the customer. DSP options such as DLC provide the utility with physical control of the customer's air conditioning, hot water units, or other appliances. In most DSP options, the customer physically controls the demand reduction. This often allows for greater flexibility in which end uses or processes are ramped down. However, a hybrid approach of utility- and customer-controlled demand response is possible where the utility initiates the demand response event, which automatically triggers pre-set load shed parameters set by the customer.

A.8 Type of incentive payment

There are variations in the type of incentive payment that is offered to participants in a DSP option. Some options have a fixed level of incentive payment that is not directly tied to electricity market fluctuations in price. For example, DLC participants are usually offered a fixed monthly incentive per kW of load reduction. However, many of the curtailable load management measures provide incentives that are based on fluctuations in the marginal price of energy, capacity, or both.

Depending on how a given DSP option is structured along these characteristics, it will span a spectrum of value to the utility and convenience to the customer. This spectrum, and where each of the characteristics falls on the spectrum, is illustrated below.

Figure A.1 Utility Value/Consumer Convenience Spectrum

310 See Australian Market Energy Commission, *Expiry of the Reliability and Emergency Reserve Trader*, final rule determination, 15 March 2012, Sydney

B Consumer drivers and preferences for energy use - existing research overview

This appendix outlines a range of research reports or surveys relating to consumer drivers and preferences for energy use. The reports include both international perspectives and Australian sources. The following reports outline specifically consideration of; what drives consumers' decision-making process in relation to their energy use, the relationship that consumers have with their retailer, how problems are addressed by both the consumer and retailer, the treatment of vulnerable consumers, the extent of knowledge held, available and required by consumers, and any other factors which may affect consumers' attitude to making decisions when it comes to energy usage. We note that this is only a subset of reports/surveys potentially available and welcome any others that stakeholders may be aware of during the course of the review.

B.1 *Accenture, Revealing the Values of the New Energy Consumer, end-consumer observatory on electricity management, 2011*

Accenture carried out this global survey in 18 countries over a range of regulated and deregulated markets and sought to investigate consumer attitudes in relation to electricity management programs by asking attitudinal and behavioural questions.[311] The information obtained was evaluated by using a conjoint analysis to understand how much consumers weight each component of a program in their adoption making process, to probe consumer preferences among different options and to segment them according to their preferences. The key findings in the report are:

- While consumers regard their utilities as the primary provider for energy-related products and services, dynamic business models are emerging.
- Price is the pivotal factor in the acceptance of electricity management programs, but price alone will not drive adoption.
- A wide array of consumer preferences is driving the need for differentiated propositions and experiences and consumers will respond to programs that consider their full spectrum of values and preferences.
- There are four critical implications for utilities/electricity providers as they seek to address the evolving energy marketplace which are; make information the new currency, embed innovation into consumer operations, redefine the meaning of the 'consumer', and rethink traditional business models to maximise value.

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311 http://www.accenture.com/us-en/Pages/insight-revealing-values-new-energy-consumer-summary.aspx.

B.2 *Accenture, The New Energy Consumer - Strategic Perspectives on the Evolving Energy Marketplace, 2011*

Accenture's aim with this report was to assist utility and energy providers in both regulated and deregulated markets to help them prepare their retail operations for the next decade.[312] The report is the result of two years of research into exploring the attitudes and preferences that energy customers have towards electricity management programs. In this report, Accenture considers that utility and energy providers are facing fundamental changes that are transforming the industry and that consumers, technology and market forces will test every utility's ability to innovate.

A new, more active energy consumer is emerging, technologies are changing and regulatory and market forces are evolving the marketplace. Accenture is of the view that for energy providers, these changes represent a series of opportunities and challenges that must be addressed within the consumer-facing organisation and they must consider their approach to realise value from beyond-the-meter products and services, determine their strategy and business models and build solutions that are scalable and sustainable.

The report considers that utilities need to act by following four key steps - evaluate the options and choose a business model; re-evaluate traditional operating models and determine the capabilities that will be required to align with the new business model; define the path forward - including a transition strategy and roadmap for execution; and start now - take immediate steps to accelerate the journey.

B.3 *Accenture, Understanding consumer preferences in Energy Efficiency, end-consumer observatory on electricity management, 2010*

Accenture conducted this study[313] in 17 countries with over 9,000 individuals to understand consumer opinions and preferences toward electricity management programs by asking six key questions:

1. Do consumers have a clear understanding of the impact of electricity consumption on the environment?

2. Do they understand how they can optimize their electricity consumption?

3. Do they feel social pressure to do so?

4. Which organisations do they trust to inform them about actions they can take to optimise their electricity consumption?

5. Are they aware of electricity management programs?

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312 http://www.accenture.com/us-en/Pages/insight-strategic-perspectives-evolving-energy-marketplace-summary.aspx.

6. What are the drivers and barriers to adoption of electricity management programs?

The study found that there is a significant contradiction between consumer perceptions and their actual knowledge of energy efficiency. Accenture notes that a consumer's first instinct is to contact utilities/electricity providers for energy-efficiency activities but providers still need to build trust and credibility.

Accenture found that while price remains a key factor to adoption, the extent of the utilities'/electricity providers' control over energy use has emerged as a potential barrier - consumers are not willing to allow electricity providers to remotely limit the use of their home appliances as part of an electricity management plan without significant discounts. The study also found that almost half of consumers would be deterred from joining electricity management programs if their electricity bills were to increase as a result and programs that enable efficient use of energy will need to be simple, convenient, intuitive and accurate.

B.4 *Accenture, Engaging the new energy consumer, operational imperatives for energy efficiency, 2010*

Accenture carried out this research[314] to investigate the drivers of and barriers to energy efficiency in the residential market. Accenture is of the view that, as interest and momentum increase for consumer-orientated energy-efficiency programs, renewable options and demand-response capabilities, many energy providers must rethink their traditional service models and operational capabilities.

Accenture considers that consumers will need and expect far more sophisticated service and support in the future and ultimately, energy providers must demonstrate true consumer-centricity by transforming their customer operations. The report notes that successful energy providers will redefine their consumer strategy, technological and consumer insight capabilities, workforce competencies and core customer operations processes - the result of which will be an energy management experience that is tailored, insight driven and responsive to dynamic consumer challenges.

B.5 *Auspoll, Energy Efficiency - A study of community attitudes, 2011*

Auspoll[315] carried out this study using six focus groups and a fifteen minute survey which was taken part by 1,000 Australians to investigate the attitudes of consumers in relation to various energy matters. Participants consisted of varying age groups, family status, and attitudes towards climate change. Of those surveyed, it was found that:

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313 http://www.accenture.com/us-en/Pages/insight-engaging-new-energy-consumer-summary.aspx.

314 http://www.accenture.com/us-en/Pages/insight-engaging-new-energy-consumer-summary.aspx

315 Auspoll's research was provided by the Clean Energy Council. For more information, see http://www.cleanenergycouncil.org.au/mediaevents/media-releases/June2011/MR200611-Auspoll-EE.html.

- the cost of living was the most concerning issue;
- home energy costs are the most concerning cost of living issue;
- consumers are prepared to make additional changes or take actions to use less energy or be more energy efficient;
- half don't know very much, or know “nothing at all”, about key aspects of their home energy use;
- consumers would welcome more information on how they could use less energy, or use it more efficiently, in their home;
- independent consumer groups are seen as the most trusted source of information to give accurate information on energy efficiency;
- there is a belief that the Federal Government should run programs that assist people to save energy and be more energy efficient in their homes;
- government leadership on the issue of energy efficiency would be welcomed, as well as support for households if they implement a carbon tax;
- there was support for schemes which would make energy retailers directly responsible for assisting home owners to use energy more efficiently;
- there is an awareness of at least one government program designed to assist households save energy although more than half couldn't think of any;
- the overwhelming majority were glad they participated in each of the government's energy efficiency programs;
- most would prefer carbon tax revenue is used to assist people to save on their power bills or to invest in renewable energy; and
- virtually all surveyed believe the government should link the carbon tax with matching programs to support the community to save energy and money.

B.6 *Australian Alliance to Save Energy (A2SE), Barriers to demand-management: A survey of stakeholder perceptions, 2011*

The Australian Alliance to Save Energy undertook this study to investigate the role of energy efficiency and demand management in energy network planning.[316] It considers network investment, the planned national trajectory for reducing emissions, and the opportunity to reduce both the required investment and emissions through implementing energy efficiency improvements, load management and distributed generation. The report investigates the best practice for demand management globally and the rationale for making demand management the preferred investment option for

316 http://www.a2se.org.au/activities/research.

the energy supply industry. The report found that policy makers should pay particular heed to barriers deemed most significant by stakeholders, considering and implementing solutions not only to each barrier, but also to interrelating barriers.

The report listed 25 barriers to demand management, some of which include:

- lack of coordination at state/national level;
- no DM/environmental objective in National Electricity Law;
- time based prices poorly reflect time and location cost of energy;
- competing priorities in utilities limit consideration of DM;
- disaggregated electricity market: DM benefits hard to capture;
- electricity suppliers lack expertise/experience with DM;
- lack of data on costs, reliability, potential from DM precedents; and
- consumers want to use power how and when they choose.

B.7 *Australian Alliance to Save Energy (A2SE), Report of the 2010 survey of electricity network demand management in Australia, 2010*

This report contains the findings of the first systematic national survey of Demand Management (DM) undertaken by electricity network service providers in Australia, the Survey of Energy Network Demand Management in Australia.[317] The main findings of the survey are as follows:

- most demand management projects in Australia are in the area of peak load management with a primary end goal of peak load reduction;
- nineteen network service providers implemented 115 demand management projects for the 08/09, 09/10, and 10/11 financial years;
- the total expected energy savings from demand management projects in 10/11 is 51 GWh;
- demand management projects in 08/09 resulted in savings of 328 GWh (which was 0.16 per cent of Australia's total energy use in that year); and
- total reported expenditure for the projects was $22.2 million and the total reported savings were $57.2 million.

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317 http://www.a2se.org.au/activities/research.

B.8 *Australian Bureau of Statistics (ABS), Australia's Environment: Issues and Trends (Energy Efficiency in homes), 2010*

The ABS carried out this report in relation to the issue of climate change in Australia and issues and trends that are apparent in relation to energy efficiency in households.[318] Some key findings of the report are:

- residential buildings are responsible for a significant proportion of Australia's emissions, in both construction and use;
- electrical appliances account for around 30 per cent of energy use in the home;
- when buying new appliances, consumers reported that energy efficiency was the biggest factor which influenced the decision to buy refrigerators and air conditioners; and
- low income consumers are particularly vulnerable to price increases as they spend a greater proportion of their incomes on items that are more likely to be impacted by higher energy prices, such as food, petrol, electricity and gas.

B.9 *Australian Bureau of Statistics (ABS), Household Expenditure Survey, Australia: Summary of findings (2009-10), 2010*

This report by the ABS assesses the expenditure of households during the 12 months to June 2010.[319] Key findings in the report are:

- households spent an average of $1,236 each week on goods and services, which is an increase of 38 per cent on the result found in the previous survey conducted in 2003-04;
- expenditure was generally made up of housing costs, food and non-alcoholic beverages and transport;
- the level and pattern of expenditure differs between households, reflecting characteristics such as income, wealth, household composition, household size and location; and
- the reporting of financial stress does not necessarily indicate that a household has low income; however, financial stress indicators decrease as equivalised disposable household income increases.

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318 http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4613.0Feature+Article1Jan+2010

319 http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/6530.0Main per cent20Features22009-10?opendocument&tabname=Summary&prodno=6530.0&issue=2009-10&num=&view

B.10 *Australian Bureau of Statistics (ABS), Year Book 2008 - Energy Use by Households, 2008*

This report assesses the level of energy use by households in Australia.[320] Key findings within the report are:

- households account for about 11 per cent of the country's total energy use;
- natural gas and electricity continue to be the main energy sources for room heating, water heating and cooking; and
- in 2005, 78 per cent of all households used room heating and gas and electricity were almost equally preferred for room heating, electricity was the major source of energy for hot water systems installed in dwellings (51 per cent), heaters and coolers are major contributors to household energy use and costs and they account for 39 per cent of total household energy use.

B.11 *Australian Council of Social Service (ACOSS), Energy at home. Issues for consumers. Affordability, Efficiency, Advocacy, 2011*

ACOSS carried out this research to investigate consumers' energy usage and the issues that are facing them now and in the future in terms of affordability and efficiency.[321] The report states that electricity is an essential domestic service which supports fundamental human needs such as safe food and shelter and in most instances there is no alternative to electricity.

ACOSS is of the view that a reliable, safe, affordable supply of electricity is a right rather than a privilege and access must be guaranteed as far as reasonably possible. ACOSS considers the meaning of affordable - how much is consumed and produced, how is it metered, how efficiently, at what price and financing and feed-in arrangements. It was noted that consumers with an inability to pay their electricity, gas or telephone bills on time are displaying signs of experiencing financial stress.

B.12 *Australian Council of Social Service (ACOSS), The Clean Energy Future package, households on low incomes and the community services sector - A briefing on the Australian Government's climate change plan*

This report assesses the Clean Energy Future Package and how it affects low income households.[322] ACOSS considers three key questions in relation to the package - Is it adequate? Is it fair? Is it accessible, timely and sustained? ACOSS considers that people facing inequality and poverty will be affected the most by the impacts of climate

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320 http://www.abs.gov.au/ausstats/abs@.nsf/0/850C57021C2D381ECA2573D20010621A?opendocument

321 http://www.acoss.org.au/policy/climate_energy/acoss_energy_forums_/

322 http://acoss.org.au/images/uploads/ACOSS_Analysis_Clean_Energy_Future_Package_August_2011.pdf

change, and that the package introduces a price on carbon and begins the adjustment to a low cost carbon economy without adversely affecting those on low incomes. ACOSS is of the view that the increases in social security payments and tax cuts are fair in that they are mainly directed at those with lower incomes, who are likely to be disproportionately affected by the carbon price and have the least ability to improve their energy efficiency.

The report notes that the Government has made several commitments to households such as; low income households will be eligible for assistance that at least offsets their average expected cost impact; assistance will be permanent; households with individuals with a concession card who have a medical condition resulting in high electricity costs will be eligible for additional cash assistance; and at least half of the revenue from the sale of permits will be distributed to households. ACOSS considers that to protect the future living standards of people on low incomes, the Government should commit to further increases in social security payments above inflation if these are needed to fully offset the effects of increases to the carbon price.

B.13 *Elsevier, How to change attitudes and behaviours in the context of energy, 2008*

This report considers how to adjust consumers' attitudes towards energy usage.[323] Elsevier notes that in the area of energy consumption, there is a need to take account of the physical, social, cultural and institutional contexts that shape and constrain people's choices. In addition, attitudes and behaviours need to be modified in order to manage demand and achieve step changes in energy efficiency, and to secure a sustainable energy supply for the future, involving the siting of new facilities.

The report focuses on public attitudes and behaviours, and on two areas in which these are significant - energy consumption (drawing examples from both the domestic and personal transport sectors), and citing issues (considering both established and novel technologies). The report characterises eight themes around which social science is likely to develop, such as; knowing about attitudes and behaviours; new disciplinary insights and more sophisticated concepts of interdisciplinarity; dealing with complexity; reconceiving the role of the public and consumers; avoiding mixed messages; the need for a systemic approach and confusion of objectives.

B.14 *Energy and Water Ombudsman NSW (EWON), Annual Report 2010/11, 2011*

This report highlights the extent to which complaints in respect to energy bills have risen in the last financial year.[324] The Ombudsman has found that consumers are more likely now to closely check and query their bills. EWON states that consumers are expressing concern more frequently about their financial ability to pay their bills

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323 http://www.bis.gov.uk/assets/bispartners/foresight/docs/energy/energy per cent20final/owens per cent20paper per cent20-section per cent204.pdf

324 http://www.ewon.com.au/index.cfm/publications/annual-reports/annual-report-1011/

because of the current political and media debate about price rises. The report notes that during the year there was an 8 per cent increase in customers who were facing disconnection and an 18 per cent increase in cases where customers had been disconnected due to financial hardship.

The report also notes that marketing complaints increased after the sale of the state owned electricity retailers. EWON's complaints statistics indicated that culturally and linguistically diverse customers (many of who are vulnerable because of limited English) had above average transfer and marketing related complaints. The report contains many case studies highlighting the various issues that consumers approach EWON about, particularly billing errors, credit issues, transfers, and marketing complaints.

B.15 *Energy and Water Ombudsman NSW, Current issues for consumers: what's happening and why? 2011*

EWON notes the current issues facing consumers with regard to energy usage.[325] They (consumers) expect to have a safe, affordable and reliable electricity supply and to be consulted and provided with information in relation to things which affect them. The report highlights that there is now a media focus on electricity prices, and because of this media focus, consumers are now more likely to closely check and challenge their bills and other utility issues, be anxious about future bills, price increases and their ability to pay their bills by the due date.

The report considers that price increases affect those in low and fixed income households, tenants with no control over their infrastructure (such as insulation and heating) and households with no financial ability. EWON notes that there have been marketing complaints about deceptive and misleading conduct, pressure and coercion and marketing in relation to vulnerable consumers. Another issue highlighted in this report is in relation to switching sites - they are not necessarily independent as many act as brokers on commission for one or more energy providers. EWON states that consumers need to be better informed of the options available to them, and help for consumers experiencing difficulty could be in the form of No Interest Loans (NILS), financial assistance to pay energy bills and/or financial counselling.

B.16 *IBM, 2011 Global Utility Consumer Survey*

IBM conducted this survey to try to understand the needs and wants of energy consumers worldwide.[326] The survey found that saving money was noted as one of the highest level of influence, behind consumers making changes to their energy usage behaviour (62 per cent), though it was no longer the dominating factor. IBM found that information sent directly to the consumer by the provider (bill and insert) remained to be the top reported single influence across all of the countries with more than one third

325 http://www.acoss.org.au/images/uploads/energy per cent20110913 per cent20- per cent20petre.pdf

326 http://www-03.ibm.com/press/us/en/pressrelease/35271.wss

of consumers using energy bills and inserts to source information about energy costs, environmental impact and alternative suppliers. The report notes that the reliance of media-based sources and the opinions of friends and family in aggregate outweighed the influence of direct-contact sources like bill inserts.

The report found that slightly more than 30 per cent of consumers reported that they were unaware of the basic unit charge for energy consumption, while 5 per cent did not know who their provider was and approximately 50 per cent did not understand the term 'time of use pricing'. IBM found that the most knowledgeable consumers were 42 per cent more likely to have a positive opinion of local deployment programs, underway or proposed and 64 per cent were more likely to change energy usage patterns to meet specific goals. 42 per cent of consumers were found to be committed to engaging with their providers to meet their personal goals, while 33 per cent were unlikely to take added responsibility to make these decisions in the short to medium term. More than 50 per cent of consumers worldwide expect the deployment of smart grids and smart meters to foster development of clean energy technologies and over 60 per cent believe that these technologies will benefit their families.

B.17 *Independent Pricing and Regulatory Tribunal (IPART), Residential energy and water use in Sydney, the Blue Mountains and Illawarra, Results from the 2010 household survey, Electricity, Gas and Water - Research Report, 2010*

The purpose of the survey[327] was to collect information on the characteristics of households and their energy and water use to help to determine the impact of energy and water pricing decisions on different households and community groups and assess the extent of participation on the competitive energy retail market, and households experience in the market. The survey found that the average amount of energy that households use fell between 2006 and 2010. The report identified a number of factors as contributing to the declining trend, such as; higher utility costs, especially for electricity, the introduction of additional energy savings schemes by the NSW and Commonwealth Government and a greater awareness of environmental issues.

IPART noted that on average, households with higher incomes tend to use more electricity, water and gas than lower income households. High water consumption is associated with watering gardens, particularly with sprinklers. In relation to income, the report noted that a households' income can influence its consumption of electricity, gas and water, as well as its ability to pay for these services, and that low income households tend to consume less electricity and water as typically they were less likely to own items such as clothes dryers, swimming pools, and second refrigerators. In Sydney, it was found that low-income households experiencing payment difficulty were more likely to contact their electricity retailer than middle or high income households. Analysis of payment difficulties experienced by households in the survey

327 http://www.ipart.nsw.gov.au/files/1a6e3aaa-d5ac-4162-adbc-9f5d00ab2baa/Report_-_2010_HH_survey_report_FINAL_website_-_APD.pdf

confirmed that income is one of the only factors that can affect the likelihood of a household experiencing difficulty in paying their bills.

B.18 *International Energy Agency, Empowering customer choice in electricity markets, 2011*

This report by the International Energy Agency[328] considers how consumer choice in the energy market can be improved. The report found that effective deployment of demand response could greatly increase power system flexibility, delivering greater electricity security and market efficiency. The IEA notes that progress has been made in recent years to more effectively manage demand response, principally from larger industrial loads and in the context of supporting more reliable system operation, however potential is yet to be developed. The report suggests that there are a range of barriers to efficient and timely deployment of demand response, such as; insufficient exposure to real time prices, under-developed electricity retail markets and products, insufficient access to accurate and detailed information to support the development of innovative products and to inform effective consumer choice, and an inability to monitor, verify and guarantee responses in real time, especially for small-volume customers without access to advanced metering, information and control devices. The report considers that consequently, these barriers may result in legal and regulatory uncertainty, limited product innovation and offerings, and higher transaction costs.

The IEA is of the view that an effective approach is needed; which may include; increasing customer exposure to real-time pricing with the protection of vulnerable consumers addressed through targeted transfers that do not unduly distort efficient price information; ready access to detailed, real-time customer information while ensuring privacy; a knowledgeable and well-informed customer base that has the capability to and opportunity to take full advantage of available choices; and market processes for contracting, switching and billing that are as simple and seamless as possible to keep transaction costs to a minimum. The report notes that governments play a key role - effective government leadership would create an environment where the considerable potential of demand response could be realised to help increase power system flexibility and electricity security, eventually achieving decarbonisation goals at a lower cost.

B.19 *Ofgem, What can behavioural economics say about GB energy customers? 2011*

Ofgem carried out this report[329] to help determine what influences consumer decision making, and in the context of the energy market, why consumers are often reluctant to switch energy provider. The report notes that well-functioning markets require the effective operation of both the demand side and the supply side. Ofgem considers that

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328 http://www.iea.org/papers/2011/Empower.pdf

329 http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/Behavioural_Economics_GBenergy.pdf

there are four behavioural themes which can help to influence a consumer's decision making process. These themes are:

- Limited consumer capacity - consumers may have a difficulty in assessing many options and large quantities of information about these options.
- Status quo bias - consumers prefer to stick with their current option.
- Loss aversion - consumers tend to attach more weight to monetary losses than gains and prefer to avoid risk taking behaviour.
- Time inconsistency - consumers prefer immediate gains and so place too much weight on initial costs compared to future savings. This results in consumers not actively engaging in the energy market, even though to do so would benefit them.

Ofgem is of the view that behavioural economics can provide a good insight as to why consumers make the choices that they do, and that all groups are susceptible to these behavioural biases but more groups may be more susceptible than others, for instance those on low incomes or the elderly. Ofgem notes that complex tariff information and poor comparability between suppliers' tariffs increases the impact of these biases.

B.20 *Public Interest Advocacy Centre (PIAC), Choice? What choice? A study of consumer awareness and market behaviour in the electricity market in five regions of New South Wales; Cooma, Lismore, Bourke, Wagga Wagga and Orange, 2011*

This study[330] set out to consider whether residential customers in the five selected regions were able to participate effectively in the NSW electricity market. The results suggested that, consumer awareness of the ability to choose one's electricity retailer, and the range of electricity retailer options available to consumers was relatively low in the five selected regions, when compared to similar surveys carried out in Victoria, South Australia, and other regions in NSW. The report noted that there also appeared to be a low level of retailer marketing activity in those regions. The research also indicated that there was insufficient evidence to suggest that effective competition exists in the electricity markets in the regions surveyed.

B.21 *University of Cambridge Electricity Policy Research Group, Do homes that are more energy efficient consume less energy? A structural equation model for England's residential sector, 2011*

This report[331] considers the first known application of structural equation modelling (SEM) for the explanation of residential energy consumption in England. This technique allows for the calculation of both direct and indirect effects that explain energy consumption in the residential sector. The report considers that using SEM, it is

330 http://www.piac.asn.au/publication/2011/06/choice-what-choice

331 http://www.econ.cam.ac.uk/dae/repec/cam/pdf/cwpe1139.pdf

possible to gain a deeper understanding of what variables can have the most effect at reducing residential energy consumption. The report notes that using this method, it is possible to show how direct, indirect and total effects interact and drive residential energy consumption and that the largest determinants for explaining residential energy consumption are the number of occupants living at the dwelling, household income, floor area, household energy patterns, temperature effects and SAP rating.

The most important discovery of the research is the finding of a statistically significant reciprocal relationship between SAP and residential energy consumption. The report considers that homes with a propensity to consume more energy should be targeted using behavioural methodologies combined with economic penalties and incentives, and accordingly homes with a propensity to consume less energy (and therefore lower overall SAP rates), should be targeted for whole home efficiency upgrades in order to break through the energy efficiency barrier.

C Retail electricity time sensitive tariff options

Chapter five discusses the effectiveness of current retail electricity tariffs to signal efficient costs of supply and delivery of electricity to consumers. The chapter also discusses some of the limitations to achieving cost reflective electricity prices on a broad scale in the market. To aid stakeholders understanding, this appendix provides an overview of the various types of time sensitive tariffs. The appendix also details the evidence of their effectiveness in promoting DSP (existing trials and pilots) and provides an initial discussion on the some of the issues that may need to be addressed in the design of such tariffs.

Cost reflective prices require both a time aspect and a geographical aspect. Where the network costs of supplying consumers differs by location, the network tariff should likewise vary by location. However this appendix is only focussed on tariff types where the level varies by time. A description of approach of having capacity charges for networks is included in chapter five.

We are not intending to provide advice on an option for one particular type of tariff, however we consider that some analysis should be given to how such tariffs should be applied and whether additional pricing principles need to be included into the rules to promote more efficient DSP.[332]

There are various types of tariffs which can vary by time (i.e. "time sensitive"). As noted, the concept of choosing one type of tariff that is most appropriate for all consumers is not considered useful or appropriate. This is particularly due to the differences in consumer habits, circumstances and preferences and that the effectiveness of tariffs aimed at facilitating consumer response will therefore differ. It is likely that it may be more appropriate to let the market and each consumer to decide upon the type of tariff it considers applicable for its own circumstance and consumption or businesses decisions.

C.1 Types of retail tariffs

C.1.1 Description of the various time sensitive tariffs

There are a number of time sensitive tariff options that could be used to manage peak electricity demand and to provide different products and offers to consumers to manage consumption. Such tariffs include Time of Use (TOU) and variations of TOU such as seasonal TOU, (STOU), Dynamic Peak Pricing (DPP) that can include real time pricing (RTP), Critical Peak pricing (CPP), Variable Peak Pricing (VPP) and peak time rebates/incentives. Some can be applied to more residential and small business consumers, while others may be more appropriately applied to large industrial facilities given their business operations.

332 We note work under the SCER - National Smart Meter Consumer Protections work program and recent Draft policy paper published in December 2011.

Table C.1 provides an overview of each tariff and examples of where these are being applied in Australia, either commercially, or through existing trials by retailers or networks. it is possible that different types of these tariffs could be combined in the tariff structure and Box C.1 provides a description of some examples.

It is important to note, time sensitive tariffs requires interval metering capability plus in some types a mechanism which signals to the consumer when a critical period begins and ends (i.e. telecommunications). Strictly speaking, meter and telecommunication combinations can be used in place of true real time recording meters. It is also noted that pricing, for example time-of-use pricing, is part of the decisions made in the competitive market and should reflect the access to - and need for - energy at any given time. For the suppliers to be able to give customers offers that best reflect actual consumption patterns, DSOs/metering operators have to enable smart metering systems capable of recording consumption on a configurable time basis. Issues associated with metering and technology capability are further discussed in chapter six.

Table C.1 Examples of types of retail tariffs

Retail tariff type	What is it?	Application example?
Time-of-use (TOU)	A rate with different unit prices for usage during different blocks during 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. These tariffs tend to reflect only the average cost of generating and delivering electricity to consumers during those times of the day.	In the NEM, two (peak and off - peak) or three (peak, off-peak and shoulder) time periods have been used depending on location. Victoria basic TOU tariff – peak and off peak. Ausgrid PowerSmart Home three part TOU tariff – off peak, shoulder and peak periods. Refer to Futura Consulting Final report at http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF for examples of existing rates.
Seasonal Time of Use (STOU)	STOU aim to reflect the different seasonal costs of electricity supply. They apply a different TOU pricing at different times of the year. Typically higher prices for summer and winter peak periods (higher demand for electricity) and lower prices during spring and autumn	Current trial in the NEM by endeavour Energy – Western Sydney Pricing Trial. Other trials by Essential Energy and Ausgrid Refer to Futura Consulting Final report at http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF for examples of existing rates.

Retail tariff type	What is it?	Application example?
Dynamic peak pricing (DPP) – seeks to more accurately reflect supply and demand conditions, and hence costs of supplying and delivering electricity to consumers. There are various forms of DPP, which are outlined below. Formulations of DPP have been used to encourage consumers to lower usage during peak times.		
Real time pricing (RTP)	A rate in which the price for electricity typically fluctuates hourly reflecting changes in the wholesale price of electricity. Customers are typically notified of RTP prices on a day-ahead or hour-ahead basis.	Currently, in the NEM, these can be used by larger consumers who have the communication and metering technology as well as in house skills.
Critical Peak Pricing (CPP)	CPP rates are a hybrid of the TOU and RTP design. CPP is a real-time rate that is effective during periods of significant system stress, when short-run market prices significantly exceed average retail rates. 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 would be charged. Generally, consumers are notified about a CPP event through various communication media tools – telephone, e-mail, SMS and messages in home displays. Notification can be 2 hours or 24 hours before. The consumer can choose to avoid higher prices by reducing its consumption during those times.	Trials by Energex and Ergon Energy's - Rewards Based Tariff The trial (which at present is paper-based) consists of two components: • a CPP rate that is 5 to 8 times higher than the general use flat T11 tariff that is dispatched on 15 peak days per year, in combination with an off-peak TOU rate that gives a 20% discount on the T11 rate; and • a peak time rebate (PTR) (see below) incentive to reduce consumption based on a $75 bonus at the start of the year that rises/falls according to usage below/above set thresholds and 'theoretical DPP' prices. Other trials by Essential Energy and Ausgrid. Refer to Futura Consulting Final report at http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF for examples of existing rates.
Variable Peak Pricing (VPP)	This is a form of a TOU pricing that allows customers to purchase their wholesale electricity supply from the retailer at prices set on a	Currently, in the NEM, these can be used by larger consumers who have the communication and metering technology as well as in

Retail tariff type	What is it?	Application example?
	daily basis. Under the VPP program, the on-peak price for each weekday will vary on a daily basis and will be announced on the previous day. Effectively VPP is a hybrid between TOU and DPP.	house skills.
Peak time rebates (PTR)	Consumers generally receive an incentive payment in the form of a $ per Kwh rebate for reducing energy use during peak periods. Typically, customers 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 need to verify each customer's load reduction by comparing their half hourly usage during a peak demand dispatch event to a 'baseline' usage profile.	Endeavour Energy implemented PTR program known as *PeakSaver* during the 2010/11 Rooty hills summer as part of DSP program. The *PeakSaver* program was a voluntary opt-in, and participants choose what end use(s) they curtail in response to a dispatch event call. Refer to Futura Consulting Final report at http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF for examples of existing rates.

Box C.1: Ability and potential to mix TOU with CPP (real or fixed)

As indicated, there is the potential to mix TOU basic structure with CPP that is real time or fixed. There are a number of options that could achieve this, such as:

- Time-of-use pricing with a real-time critical peak price
- Time-of-use pricing with a fixed critical peak
- Time-of-use pricing without a critical peak price
- Non -TOU pricing with a fixed critical peak price

The first option, TOU pricing with a real-time critical peak price, would provide customers with a TOU rate (two or three period) that would be fixed except during critical peak periods. The benefit of this is that it provides the greatest certainty of cost recovery during the critical peak hours for the power supplier, leading to expected lower bid prices for all other hours. The disadvantage is that customers have more difficulty planning their responses in advance, insofar as they do not know what the critical peak price will be. This option requires advanced metering.

The second option, TOU pricing with fixed critical peak price, would provide customers with a fixed TOU rate (two or three period), and a fixed critical peak period price, set at a level that is three to five times the “normal” on-peak price. The advantage of this is that customers know what the price of electricity will be well in advance and can plan a response so that when a critical peak is called, they can implement a planned response. The disadvantage is that the fixed price may be above or below the market price at the time it is invoked. This option requires advanced metering.

The third option, TOU pricing without a critical peak price, would simply give customers a two or three-period TOU price. This would be a simple, but improved (insofar as it increases demand response) rate form for these customers. It would give the customers substantial predictability in energy costs, but would be expected to produce a much more modest demand-response than a rate structure with a critical peak feature.

The fourth option, non-TOU pricing with a fixed critical peak price, would give customers a flat rate during all hours, except for the critical peak period, and a fixed rate during the Critical Peak hours that is multiple times higher than the “normal” rate. The advantage of this is that it allows customers to focus their efforts exclusively on the critical peak periods, when demand-response is most valuable. The disadvantage is that it “loses” some of the off-peak load-shifting incentive that TOU rates create.

C.1.2 Evidence on effectiveness of time-sensitive tariffs

Table 1 outlines a range of time sensitive tariffs that are, or could be available to consumers to reflect the costs of supply and delivery of electricity, and also aim to facilitate and promote DSP in the market. Some of the tariffs outlined exist in the market today for consumers to choose to sign up to (noting the existing network and pricing issues); others are being trialled by networks and retailers to determine their effectiveness and the potential consumer response. Below we outline some of the findings of the effectiveness of time of use pricing in Australian markets (including current or past trials)[333] and international examples. It is worthwhile noting that consumer responses require not only prices but also the capacity and willingness to respond. As such other market conditions are required such as information on impacts and costs of consumption decisions.

333 More information about pilots and trials can be found at http://www.aemc.gov.au/Media/docs/Futura%20Consulting-508587ea-32b3-42b1-9e8b-014c62231aff-0.PDF

Time of use/seasonal time of use

- simple pricing strategies provide some capacity to induce household responses that reduce or shift consumption. Small to medium businesses however tend to show less capacity, mainly because of their business operations and priorities.

Box C.2: Ausgrid

Analysis by Ausgrid of its AMI trial interval meter data for a number of residential customers that were transferred from a standard domestic tariff (does not vary with time) to a TOU tariff showed an average shift of about 4 per cent in the normalised coincident maximum demand (CMD) for those customers. In contrast to those residential customers participating in Ausgrid strategic pricing study (SPS) STOU trial that achieved an overall reduction in peak demand of about 13 per cent and 5 per cent in summer and winter, relative to days with very high network demand.

Dynamic peak pricing

- DPP trials specifically utilising CPP indicate that residential consumers are generally more responsive to such pricing strategies (although complex) and typically tend to reduce their consumption to a greater extent than those on a simple TOU tariff. SME's display some DSP response to DPP but varies based on business operations.

Box C.3: Essential Energy

Recent trials by Essential Energy achieved a peak demand reduction by 30 per cent in response to a CPP price of about 38 cents per kWh. Endeavour Energy WSPT found that residential consumers responded to CPP of about $1.67 per kWh with a 30 to 40 per cent reduction in peak demand. The Blacktown Solar Cities businesses trial DPP pilot demonstrated similar results with peak demand reductions of about 24 per cent. Ausgrid SP study found reductions in residential consumption during specific CPP dispatch events corresponding to extreme temperatures of 36 per cent on hot summer days and 30 per cent on cold winter days (CPP of $1.00 per kWh). The results for the average peak demand reduction across all CPP events was lower – in the range of 23 to 25 per cent. Small business customers on the SPS trial did not show any statistically significant peak demand reduction on DPP tariff.

Peak time rebates and rewards

- PTR rebates are demonstrating that such incentives potentially may have the capacity to achieve greater levels of consumer participation and response, and hence deliver peak demand reductions.

Box C.4: Endeavour Energy

PTR trials by Endeavour Energy prior to the 2010/2011 summer demonstrated some significant peak demand reductions ranging from 29 to 51 per cent on dispatch days. Customers actively participated in the program and changed their behaviour through avoiding using their air conditioners (or turning them down), electric cooking appliances, and shifting discretionary loads like pool pumps, dishwashers and clothes dryers to out of peak periods. Providing advice and information to consumers on ways to reduce energy use during peak demand dispatch events was a key element of the program.

Ergon Energy recently implemented an innovative Solar Cities trial on Magnetic Island to get consumers to reduce their energy consumption over the peak demand hours of 6 pm and 9 pm each day. Rebates of up to $25 per month are offered as an incentive, with additional rebates available to households that sustain the reduction for three months. Preliminary results are promising with a total peak consumption reduction of 1,649 kWh, or 23%, over the 6 pm to 9 pm peak period achieved for June 2011 as compared to June 2010 for the 80 plus trial participants.

Hybrid pricing strategies and responses

- Hybrid approaches using DPP and rebates/rewards are also demonstrating to be effective for consumer response and hence facilitating DSP.

Box C.5: Energex and Ergon Energy

Energex and Ergon Energy's collaborative Rewards Based Tariff Consumption trials are consists of a DPP rate (that is 5 to 8 times higher than the general use T11 tariff), a TOU tariff, and a PTR incentive to reduce consumption. The DPP program has successfully reduced household peak demand for electricity. For example, in Brisbane, which is one of three trial areas, average peak load reductions of 21per cent were observed over summer and winter CPP dispatch events. For those customers that were unwilling to stop using their air conditioners during peak demand periods, they did appear to be willing to reduce their peak demand by electing to shift chores such as dishwashing, clothes washing and drying, and vacuuming out of the peak period. This in contrast to the TOU tariff where demand shifts were only 1per cent to 3 per cent of electricity use from the peak to the off-peak period.

C.1.3 Potential design issues for consideration

Time sensitive tariffs can either be offered to the market as a result of a decision by the network business or by the retailer or by both. In considering the design and application of such tariffs there are a number of considerations facing these market participants. There is also an question for this review on whether the current arrangements provides the right framework to facilitate such decisions. As noted in chapter five, network businesses are required to comply with a number of pricing principles and rules when developing their tariffs.

This section introduces two key considerations. We will conduct further analysis in these and other considerations. These may include which component of costs to signals, which groups of, how to engage consumers and charges that should apply. Also we note that increased complexity of the tariff structure may lead to increase confusion for consumers customers. This would probably hamper the development of demand response as regards the possibility to choose from a variety of offers as well as the general transparency of the market conditions.

Interaction between wholesale component and network component of the retail tariff

Network businesses are concerned about managing peak demand across their networks. Such peaks can differ across the locations depending upon the conditions and demand characteristics of the local area. The value of addressing such peaks to the network business will depend upon the level of spare capacity and its approved investment plans.

However, retailers are interested in managing their exposure to the peak in the wholesale market - which is a state based peak. As recognised by some stakeholders, spikes in the wholesale prices may not necessarily be caused by high demand. Instead they could be due to unforeseen network and generator outages.

There is not a prefect correlation across network peaks and wholesale peaks. There are potential misalignments between the hours of the day when the NEM and/or state system peaks occur and when the network element peaks occur. There may also be misalignments between the actual days these peaks occur. This could be mean that network and retailers may want to have different time periods when developing time-sensitive tariffs. The issue is how would a separate energy only tariff relate to a cost reflective network tariff. For example, a retailer may want to have a peak price between 3pm and 6 pm and the network business may want to have a peak price between 5 pm and 8 pm. This issue will obviously vary by location and retailer.

Basing TOU prices on marginal costs

The second issue relate to the commercial aspects of developing time sensitive tariffs. When moving from a standard tariff structure to a time of use tariff structure, businesses tend to develop the peak and off-peak rates to have a neutral impact on their revenue. However this may mean that the rates are not consistent with the marginal costs facing the businesses.

For example, the price differential in the TOU rate may vary more significantly than a retailer costs. This disparity may means on-peak sales are often more profitable to the supplier than off-peak sales, creating a disincentive for retailers to offer DSP programs that would reduce consumption during the peak period. This is because it could be revenue enhancing.

This is an important consideration for designing TOU rates. However, it is equally important not to understate the time-varying nature of the price of electricity, and to reflect all costs in the rate design, to avoid muting the price signal and reducing customer incentive to shift load. Also likely to see increased enrolment and reductions in peak load as the price differential of the TOU is increased.

D Issues related to vulnerable consumers

The Power of choice review considers that more cost reflective pricing structures have the potential to promote efficient DSP. However changes to make retail tariffs more cost reflective (e.g. through peak time charging and Time of Use pricing) could disadvantage those consumers who are unable to change their consumption patterns to respond to more cost reflective tariffs. If these consumers are unable to change their consumption patterns, they may be placed in a vulnerable or more vulnerable position.

D.1 Definition of a vulnerable consumer

There is no single accepted definition of a vulnerable consumer. The National Electricity Customer Framework, which comes into force on 1 July 2012 does not include the term 'vulnerable consumer'. It only refers to hardship customers. Hardship customers are defined as "someone who, though willing to pay their energy bills on time in accordance with our usual payment terms, is experiencing financial difficulties that mean they cannot pay on time".

In 2003, the ACCC ran a campaign to improve its ability to access trade practices complaints affecting disadvantaged and vulnerable consumers. The campaign did not define the term 'vulnerable consumer' but outlined a list of characteristics of those consumers. The characteristics are as follows; low income; disability (intellectual, physical, sensory, head injury, stroke, brain injury or other such as autism); serious or chronic ill-health; non-English speaking background; illiteracy; indigenousness; homelessness; remoteness; elderly and youth. Not all vulnerable consumers are disadvantaged consumers. "Some consumers will be vulnerable only because of temporary personal circumstances that adversely affect them in consumption; or adverse market, product or transaction characteristics specific to a particular purchase, rather than their purchases generally". The more vulnerable a consumer is due to circumstance, the greater the likelihood that he or she will be a disadvantaged consumer.

For the purposes of the Power of choice review, we consider that a vulnerable consumer is one that is affected by changes to make pricing structures more cost-reflective because:

- there is a significant deterioration in the consumer's financial ability to pay their bills; and
- the consumer has a limited ability to respond.

D.2 Impacts on vulnerable consumers

Dynamic pricing may improve economic efficiency by decreasing the need for peak capacity. However, vulnerable consumers may be adversely affected by changes to make retail tariffs more cost reflective. This may be because they are in a situation which requires them to consume electricity during the periods which are the most expensive and consequently, they cannot change their consumption patterns. The following reasons are some examples as to why this may occur for certain types of consumer:

- the consumer requires constant controlled temperatures or longer showers due to a medical condition;
- consumers with a physical disability may rely on Attendant and Home Care services to assist them. These services operate on fixed timetables over which the consumer has little or no control; and
- elderly people often live on very low incomes and their larger than average dwellings are often poorly insulated. Thus, they have high energy consumption and bills.

Analysis on this topic by Meier and Jamasb found that low income households, pensioners, benefit recipients, and female single households spend considerably more of their incomes on energy in comparison to other households. "This can be explained by three arguments: vulnerable households live on lower than average incomes and in order to reach a certain level of comfort they need to spend a larger share of their income on energy. A second reason could be that these households spend more time at home than households that consist mainly of full time workers and thus use more energy than others. The third reason may be that these households are not able to improve the energy efficiency of their homes. Thus the energy efficiency is lower and their energy using appliances may be less efficient."[334]

D.3 Points raised in submissions

Submissions expressed mixed views on the issue. The following points were raised in relation to the negative impacts of cost-reflective pricing:

- With full cost-reflective pricing, there will always be consumers who are better off and others worse off with no demand response.
- Time-of-use tariffs may disproportionately impact customers who may be at home during more expensive peak times.
- Low income and vulnerable consumers will be limited in their ability to benefit from ToU pricing because of difficulties in shifting demand and already limited usage. There is also a risk that many of these consumers will experience increased financial difficulty as a result of new tariff arrangements.
- There is considerable uncertainty about how much demand would actually be affected by ToU and/or critical peak pricing. Low take-up rates would result in increased bills or no positive change or reduction for many consumers due to their flat or low elasticity profiles which limit their ability to adjust their load.

334 T Jamasb & H Meier, 'Energy Spending and Vulnerable Households', EPRG Working Paper 1101, Cambridge, 2010, p. 11.

This is particularly the case for consumers who are necessarily home during peak times and must use heating and cooling appliances at those times - older consumers, disabled consumers and other vulnerable groups may receive increased bills under TOU pricing.

- It is important that, should ToU pricing be introduced, there is a policy framework to provide consumer protections, particularly to ensure electricity remains accessible and affordable to low income and vulnerable consumers. Consumers should have the voluntary option for ToU pricing and should not be required to use it should it not benefit them.

- A connection to the electricity supply is not discretionary or optional. A reliable, safe, affordable supply of electricity is a right, not a privilege, and access must be guaranteed as far as reasonably possible. Increasing the number of products, options and incentives available relating to energy are serving to make the market increasingly complex.

- By virtue of their respective situations, some consumers have fewer choices about when and how much electricity they use. While energy rebates are available to help with some of these costs, the shortfall must be met by the consumer.

- No consumer should be disconnected from an essential service solely because of an inability to pay.

- A social tariff could offer a safe haven to low income and vulnerable consumers, while consumers who are in a position to take the risks can gain commensurate rewards from cost reflective pricing.

In terms of the benefits of more cost-reflective pricing structures, submissions raised the following points:

- A more granular ToU design (i.e. higher peak price for a small period) may benefit vulnerable consumers as these consumers tend to have flat load profiles.

- A well-designed ToU tariff structure will not only be more cost reflective, but also lead to the majority of vulnerable customers being better off. It is the design of the ToU tariff that will determine the extent to which vulnerable customers may or may not be adversely affected – not the imposition of the ToU tariff itself. A well-designed ToU tariff that reflects the usage of a distributors system will lead to a ToU tariff that only imposes a peak and/or shoulder tariff on a very small proportion of usage, which in turn means it will be more cost reflective, and much less likely to impact vulnerable customers because of their typically flat load profile.

- Consumers can gain cost benefits from using their energy efficiently and buying energy under clearly explained tariffs that are affordable and suitable for their individual circumstances.

Research carried out by a Canadian university on the smart–metering initiative in Ontario found that the implementation of ToU pricing only resulted in small changes to consumption; households in affordable accommodation decreased on-peak consumption, while on-peak consumption increased in households with senior members. Low-income households benefitted from the smart-metering and ToU pricing structure.[335]

An American study on the Impact of Dynamic Pricing on Low Income Customers in June 2010 found that there was strong evidence that low-income consumers respond to dynamic rates and in many cases, there was a load reduction of over 10%. The study also found that "even without responding to dynamic rates, a large percentage of low income customers will be immediate beneficiaries of dynamic rates due to their flatter than average load profiles. These results suggest that when evaluating dynamic pricing, it is important to recognise that such rates are not harmful, and in fact, may be beneficial to a large percentage of low income customers".[336]

D.4 Approaches to protecting vulnerable consumers

There are a number of options available to protect consumers who are made vulnerable, or more vulnerable by changes in price structures. Greater rebates could be made available to assist them financially if they are in a position where they cannot decrease their consumption during peak periods. Grants could be made available to help them make their homes more energy efficient. Currently in NSW, the low-income household energy rebate of $200 is available and has been since 1 July 2011. This figure will increase in 2012 to $215, to $225 in 2013 and to $235 in 2014. There is also a life-support rebate available for those who are eligible, (paid on a cents per day basis). This rebate is provided for those who have a chronic illness that requires the assistance of certain equipment. It does not apply to those with motorised wheelchairs for instance (which have batteries that must be charged for significant periods of time). International examples of how vulnerable and low-income consumers have been assisted in relation to energy costs are interesting to note.

In the UK, several schemes are in place to help assist vulnerable consumer groups. The Winter Fuel payment is a scheme to assist the elderly pay their home heating costs. Cold weather payments are available for those on low income when a low temperature is maintained for 7 days in a row. The Warm Home Discount scheme provides those who qualify with a £120 rebate for the winter of 2011/12 and the next three consecutive winters. Electricity suppliers with more than 250,000 customers must provide the rebate. Social tariffs are currently available in England but will soon be replaced by the Warm Home Discount scheme.

Also in the UK, a disabled facilities grant is available to help a disabled person live an independent life. For instance, this grant can be used to provide or improve a heating

335 S Simmons & I H Rowlands, 'ToU rates and vulnerable households: Electricity Consumption behaviour in a Canadian case study', University of Waterloo, Ontario, 2008.

336 A Faruqui, S Sergici & J Palmer, 'The Impact of Dynamic Pricing on Low Income Customers', IEE Whitepaper June 2010.

system. Owner-occupiers, landlords and tenants may apply for the grant provided the work is for the benefit of a disabled person who lives or will live on the property. An energy efficiency scheme is operation, known as the Warm Front in England and the Nest program in Wales. The Warm Front Scheme provides grants for improvements such as; installing energy efficient space or water heating systems which use energy from a renewable source; improvements to the energy efficiency, repair or replacement of any part or any space or water heating system; or insulation measures. The maximum Warm Front grant is £3,500 or £6,000 if central heating is to be installed. In Wales the Nest program can be used for the installation of solar panels or other renewable technologies such as air source heat pumps. The criteria upon which one can apply for a Nest grant are quite broad. The applicant must be in receipt of a benefit such as income support, income-based job seekers allowance, pension credit, be disabled or chronically ill, be pregnant at the time of application or be in a household with children under 25. A similar scheme is in operation in Scotland and Northern Ireland.

In Ireland, an electricity allowance is provided to those who are eligible. The allowance covers normal standing charges and up to 1,800 units a year (300 units in each two-monthly billing period).

Up to 1200 unused units can be carried forward between each billing period. In California, a program is in operation called CARE (California Alternative Rates for Energy). This program provides a discount of at least 20% for low-income users.

D.5 Possible solutions

In designing protections for vulnerable consumers, a number of recommendations from previous work in this area should be taken into account. The manner in which consumers are presented with information is very important. A report by CUAC on Consumers and Smart-Meters in 2010 found that "A government media campaign should be the first step to increase basic understanding. Television, radio and local newspapers should be used as methods of communication. It was found that non-text sources of information had the greatest effect, particularly for vulnerable consumers. A clear message to come out of the report was that simple and clear messages are needed when providing information to consumers".

The Committee for Melbourne conducted a Utility Debt Spiral Project and found that a best practice model for responding to energy customers who are experiencing financial hardship would have some of the following features:

- Links to energy efficiency programs – run by the provider, local Councils, government and/or community agencies.

- Links to financial counselling agencies – funding of financial counselling services, liaison with these services via workshops, presentations and information sharing. An acknowledgment that that a wide range of social issues may result in a person experiencing financial hardship and that financial counselling services are well-placed to provide assistance. Respect for a financial counsellor's advice about their clients capacity to pay.

- Links to concessions, government assistance programs and non-government support services – with information accessible by postcode or area.
- Affordability – the implementation of appropriate, affordable and agreed payment arrangements.
- Customer focus groups – focus groups involving customers who have experienced financial hardship provide an opportunity for direct feedback on hardship.

Adequate consumer considerations and protections must be in place if cost-reflective pricing becomes the norm. The structure of the ToU tariff is important. In an ideal world, a Pareto improvement would occur in which at least one person is made better off while no one else is made to be worse off. However, adherence to this theory would make it "impossible to move to a better allocation of resources through more efficient pricing, even if people agree that it is ultimately the correct outcome". Finding solutions to the issues surrounding vulnerable consumers and more cost-reflective pricing structures are not easy to solve. Measures such as the following could be undertaken the smooth the transition to more cost-reflective pricing:

- creating consumer awareness about how to decrease their consumption and why it is important;
- encouraging consumers to actively participate in the market and switch to the most efficient tariff for their needs;
- encouraging consumers to invest in more energy-efficient appliances is so far as possible;
- providing vulnerable consumers with the option of opting out of using ToU tariffs; and
- providing grants and rebates to vulnerable consumers.

Glossary

Accumulation meter	Measures only how much electricity has flowed through them since they were installed. The quantity used in any given period is determined by subtracting the previous reading from the current reading. Accumulation meters are the predominantly-used metering technology in Australia.
Accumulation metering data	The accumulated energy data, once collected from a metering installation, is accumulated metering data. Accumulated metering data is held in a metering data services database and the metering database.
Advanced metering services	These services typically include the remote retrieval of interval consumption data, managed and controlled load services, remote connection and disconnection of electricity supply, quality of supply monitoring, HAN services etc.
Advanced metering solutions	A set of systems that provide advanced metering services.
AMI	Advanced Metering Infrastructure - All of the systems required to support advanced metering. Includes smart metering and other services such as controlled load circuit and managed load services.
Ancillary services	Services used by the market operator to: 1 manage power system security; 2 facilitate orderly trading; and 3 ensuring electricity supplies are of an acceptable standard.
Average Daily Load	The average daily consumption by a customer measured in kWhs.
Capacity based tariff	Pricing which contains a component of the total electricity bill that is based upon how much of the capacity of the network that the customer has used during the billing period. Typically the capacity value is based upon either the customer's maximum demand or the customer's coincident maximum demand during the billing period or season.
Capacity market	A type of Capacity Mechanism in which the total volume of capacity required is estimated, and providers willing to offer capacity (whether in the form of generation or non-generation technologies and approaches such as storage or demand side response) can sell that capacity. There are several forms of Capacity Market, depending on the nature of the ‘capacity’ and how it is bought and sold.
Churn	A measure of the extent to which energy is traded and retraded in the market as market participants manage their risks. A higher churn rate is an indication of a more liquid market.
Coincident Maximum Demand (CMD)	A consumer's consumption during the interval of time that the local electricity supply system has its maximum demand interval. Typically the local electricity supply system has a maximum demand interval and maximum demand value for both summer and winter seasons.

Coincident maximum demand capacity tariff	A capacity tariff based upon the customer's coincident maximum demand.
Combined Cycle Gas Turbine (CCGT)	A power station that generates electricity by means of a number of gas turbines whose exhaust is used to make steam to generate additional electricity via a steam turbine, thereby increasing the efficiency of the plant above open cycle gas turbines.
Combined Heat and Power (CHP)	Generation where both heat and power is produced. This results in a more efficient use of both fossil and renewable fuels if there is a customer for the heat.
Controlled Load Circuit services	A controlled load circuit is an electrical circuit separate from the general supply circuit that has historically been energised and de-energised by the electricity utility as well as being separately metered and tariffed from the general supply service. Electrical loads on the controlled load circuit may also be managed through a managed load service.
Contracted DSP	Contracted DSP promotes consumer participation through a direct compensation payment or incentive. The consumer agrees to curtail their electricity use under certain defined circumstances in return for an explicit payment.
Critical Days Tariff	An electricity tariff where a customer has relatively cheap electricity rates for all the days except for days when the utility calls a Critical Day (CD) event. Typically the contract with the customers allows the utility to a certain number of CD events per year or per season. The electricity price during the Critical Day is usually much higher than the standard rate to encourage the customer to reduce their consumption during the CD event. The utility gives the customer an agreed upon warning period for each CD event.
Critical Peak Pricing	An electricity tariff where a customer has relatively cheap electricity rates for all the time except for periods when the Utility calls a Critical Peak Pricing (CPP) event. Typically the contract with the customers allows the utility to a certain number of CPP events per year or per season. The electricity price during the CPP period is usually much higher than the standard rate to encourage the customer to reduce their consumption during the CPP event. The utility gives the customer an agreed upon warning period for each CPP event.
Day Ahead Market	Market for buying and selling electricity for delivery on the day after trading takes place.
Demand buyback	Demand buyback has been used in the USA and elsewhere to enable customers who were unwilling to make the commitment called for by interruptible contracts or direct control programs to play a part in demand response. Customers participating in demand buyback programs respond on a day-ahead basis to offers from the utility or system operator of payment for load reduction. Typically the utility announces what it is willing to pay for load reduction the next day and the customer responds with an amount of reduction it is willing to make for that level of compensation. The utility notifies customers whose reductions will be compensated usually the afternoon of the day before reductions are needed.
Demand reduction	Changing behavioural patterns to reduce the amount of energy consumed, for example through switching off lights when they are not needed.

Demand side participation	Ability of consumers to make decisions about the quantity and timing of their electricity use that reflects the value they obtain from using electricity services. This can include such measures as peak shifting, electricity conservation, fuel switching, utilisation of distributed generation and/or energy efficiency.
Demand side response (DSR)	An active, short-term reduction in electricity consumption either through shifting it to another period, using another type of generation, or simple not using electricity at that time.
Distributed generation on DSP context	Generation located on consumer premises that may or may not be connected to a distribution network. This excludes standalone and scheduled generators and generation connected to the transmission network.
Dynamic Peak Time Rebates	A rebate paid to a customer who responds to an event called by the electricity utility. This event calling process is similar to CPP, however the customer receives a rebate from the utility based upon how much they respond to the called event relative to a baseline consumption value for the called period for the customer.
Frequency Control Ancillary Services (FCAS)	Those ancillary services concerned with balancing the power supplied by generating units and the power consumed by loads over short intervals.
Energy efficiency	Energy efficiency is defined as either using the same amount of energy to produce increased outcomes or using less energy to produce the same outcomes (Prime Minister's Task Group on Energy Efficiency).
Energy intensity	A measure of total primary energy use per unit of gross domestic product.
Energy unserved	The amount of electricity demand each year that cannot be met due to insufficient supply.
Feed-in Tariff (FiT)	A type of support scheme that provides revenue support to certain generators, such as low-carbon generators.
Forward market	Market for buying and selling electricity for delivery at a future date, e.g. month, season or year ahead.
Gigawatt (GW)	A power measure (usually electricity) equivalent to 1,000,000 kilowatts. One gigawatt of electricity from wind could meet the annual energy needs of over 600,000 UK households, around 1.5 per cent of the UK energy demand. For example: • 1,000,000,000 Watt (W) = 1,000,000 kilowatt (kW) = 1,000 megawatt (MW) = 1 gigawatt (GW) = 0.001 terawatt (TW)
Gigawatt-hour(GWh)	An energy measure (usually electricity) equivalent to 1,000,000 kWh. One GWh of electricity would meet the hourly energy needs of over 600,000 UK households.
HAN	Home Area Network (HAN) is a premises based communications and control service. In the context of advanced metering services it relates to energy services.
In Home Display (IHD)	A display that is located inside a premises that at a minimum supplies information to the customer about their electricity consumption.

Inclining Block Tariffs	An electricity tariff that has a price for consumption up to a specified level over a specified period and then another price for consumption above the specified level.
Interoperability	The capability of two or more networks, systems, devices, applications, or components to share and readily use information securely and effectively with little or no inconvenience to the user.
Interruptible tariffs	This tariff offers a lower electricity general supply service level in exchange for a lower price for electricity supplied under a general supply tariff. The electricity retailer or the network would be able to interrupt the customer's general supply under the terms of the supply contract.
Interval consumption data	Electrical energy consumed over specified time intervals. In this report the time consumption intervals are 30 minute intervals starting from midnight.
Interval meter	A meter which provides half hourly readings of electricity consumed and surplus electricity produced which is fed back into the grid.
Interval metering data	The internal energy data, once collected from a metering installation, is interval metering data. Interval metering data is held in a metering data services database and the metering database.
kilowatt- hour (kWh)	A kilowatt- hour (kWh) is the amount of power consumed or generated over one hour of time.
Load	The electrical power delivered to a person or to another network, or the amount of electrical power delivered at a defined instant at a connection point, or aggregated over a defined set of connection points.
Liquidity	Liquidity refers to the proportion of energy trading, or the number of buyer and sellers willing to trade, in the market. Liquidity enables companies to quickly buy or sell a product without causing a significant change in its price and without incurring significant transaction costs. A liquid market is one in which market participants have confidence in traded prices. This in turn informs investment decisions and can help facilitate new entry.
Load Duration Curve	Plots interval consumption from highest level to lowest level over a specified time, typically a season or a year. The peak demand interval is the first plotted point at the left of the chart. A load duration curve can be plotted for a single customer or a group of customers. A standard customer load duration curve is non coincident.
Managed load services	An electrical load that is managed by a third party. Typically these loads are not separately metered and may not involve tariff arrangements separate from the general supply tariff. An example of a managed load is a signal to adjust an air-conditioning thermostat setting up or down from the temperature set by the customer.
Marginal cost	An economic term to mean the cost of an additional unit or the extra cost in relation to the baseline.
Market conditions	Market conditions are characteristics that need to be present in the national electricity market to enable all participants (i.e., consumers, retailers/aggregators, network operators, generators, and others) in that market to make and implement informed decisions while recognising that it is the consumer who makes the final consumption decision.
Market and	Market and regulatory arrangements are the measures that facilitate the

regulatory arrangements	market conditions. Such arrangements include all energy market and regulatory arrangements that impact on the electricity supply chain (i.e. National Electricity Law, National Electricity Rules, other National and jurisdictional rules, regulations, government policy initiatives, information, commercial arrangements and transactions, organisational culture and capability, technology and systems and market behaviours.
Market participant	A person who is registered by the market operator as a market generator, market customer or market network service provider under Chapter 2 of the NER.
Maximum Demand	The highest consumption during a specified interval of time over a specified period. In this report the interval of time is the half hour interval starting on either the hour or half hour time during the day. The specified period is either the summer or winter season.
Megawatt hour (MWh)	A measure of energy equal to 1000 kWh.
Metering values through web portal/gateway	Transformation of metering data into web format can be presented through different channels. Capability of the metering system to inform on total usage, injection and other metrological and non-metrological data for external visual display.
Network Control Ancillary Service (NCAS)	A service which provides the market operator with a capability to control the real or reactive power flow into or out of a transmission network.
NEM	The National Electricity Market (NEM) is an electrical energy market that covers all states of Australia excluding Western Australia and the Northern Territory.
Network pricing	The network component of the price of electricity. The other major components are energy costs (for generation) and retailer costs.
Network pricing signal	A price signal built into the structure of a network tariff which is designed to encourage a specific customer response. The customer's retail tariff may amplify, diminish or simply pass through the network price signal.
Non-contracted DSP	Non-contracted DSP links prices in retail and wholesale markets, with retail consumers receiving a price signal reflecting the costs of production and delivery. When high energy prices are correlated with reliability problems or local network constraints, actions taken by consumers to reduce load can have a positive impact on reliability in addition to reducing overall costs.
Payback period	A payback period is a specified period of time during which the initial capital outlay of an investment is recouped. Many firms select a specific payback period as a method of investment appraisal. The length of a payback period implies a particular rate of return for an investment (given a certain investment life). For instance, assuming a ten year investment life, a two year simple payback period implies a 40 per cent rate of return. Similarly, a six year payback period implies a rate of return of less than 7 per cent for the same investment. Thus the shorter a payback period the higher is the rate of return required, and the more stringent the investment rule.
Peak load, peak demand	These two terms are used interchangeably to denote the maximum power requirement of a system at a given time, or the amount of power required to supply customers at times when need is greatest. They can refer either to the load at a given moment (e.g. a specific time of day) or to averaged

	load over a given period of time (e.g. a specific day or hour of the day).
Real Time pricing	A rate in which the price for electricity typically fluctuates hourly reflecting changes in the wholesale price of electricity.
Seasonal ToU	A ToU pricing structure that varies depending upon the season. The rates and times of the peak period are typically different for each season. There are at least two seasons in the year with the typical arrangement being a summer season and a winter season.
Smart metering	A term used to describe metering that at a minimum uses electronic meters that measure electricity consumption on an interval basis and are also remotely read via a two way communications system via a smart meter management system.
Smart metering technology	Smart meter technology which covers both the smart meter itself and also the IT management and communication systems essentially does two things. Firstly, and most significantly in terms of the expanded range of functions that smart meter technology provides, it brings the consumer's site within the scope of the electricity network's automated control systems (the 'upstream' functionality). This allows 'real time' data and instructions to flow to and from the network and the customer's site. This could include data on consumption and the quality of voltage supply. Interruptions and faults can also be automatically and remotely accessed; and instructions can be issued to the meter to disconnect or reconnect supply, cap the level of consumption or otherwise control the supply provided to the customer's site. Not only are many presently manual functions automated, the expanded functions provide opportunities for more efficient use and management of the electricity system. Secondly, smart meter technology provides the customer with an increased capacity to manage their electricity consumption through in-house control systems that connect to the meter. Such systems may, for example, allow the use of individual appliances to be managed according to information received by the meter on the price of electricity applying at that time. This 'downstream' functionality is dependent upon the development of in-home control systems that communicate with the smart meter.
Spinning reserve	The extra generating capacity that is available by increasing the power output of generators that are already generating electricity into the network.
Subscription Capacity tariff	A pricing product where the customer selects a capacity value and pays a fixed amount on a daily or weekly basis that is related to the selected capacity. As an example a customer could select a maximum demand consumption value during the peak period of 20 kWh. This has a daily charge related to the selected 20kWh. If the customer exceeds the selected 20 kWh value during a peak period then there are relatively high rates for the excess consumption. This tariff is similar to some offerings by telecommunications industry retailers.
System peak	For the purposes of this review, system peak is defined as the highest level of instantaneous demand for electricity during the year on the system (state, NEM-wide or network).
Thermal storage	Thermal storage programmes typically involve the use of chillers to create ice during off-peak hours that is then melted during peak hours to offset air conditioning load. Chillers are installed only at larger load sources due to costs and economies of scale. Although it is possible that this technology could be expanded to the mass consumer market, it would involve the

	installation of significant equipment at the household level. A simpler method of thermal storage that can be adopted at the household level utilizes the internal air temperature of the home to store energy. By intelligently cycling air conditioners, while maintaining temperatures within a comfort zone instead of at a single setting, significant load can be shifted from peak hours. Such a scheme can also be applied to electric water heaters and electric heat.
Time of Use (ToU)	This relates to a type of tariff that typically applies electricity consumption rates that vary depending on what time of day the electricity is consumed. The cost of electricity being highest in the peak period.
Two-way communication	The meter has the capability of two-way communication between the metering system and the relevant system providers. The metering system has the capability to retrieve data at a distance on e.g. usage, network and supply quality, events, network or meter status and non-metrological data and to make this data available to the relevant service providers. It gives the ability to the relevant service providers to configure the metering system at a distance, and to carry out firmware/software updates. It is also possible for the metering system to retrieve information - for example information sent from the supplier (and/or via relevant third parties e.g. DSO or metering operator) to the customers' smart meter.
Vulnerable customer	A customer with limited capacity to pay their electricity bills. This is typically defined as a customer who is either a pensioner or has had difficulty paying their electricity bills (definition to be confirmed).
Zone Substation	In the Ausgrid network a metropolitan zone substation typically distributes power to about 10,000 customers.