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Investigation of the efficient operation of price signals in the NEM

Australian Energy Market Commission

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Executive summary

PwC has been asked by the Australian Energy Market Commission (Commission or AEMC) to provide advice on the efficient operation of price signals in the NEM. In particular, we have been asked to examine the potential for using prices to promote efficient consumer demand-side participation, by enhancing the consumers' abilities and incentives to make informed choices concerning their use of electricity. We have characterised this task as addressing the following questions:

- What is an efficient electricity price?
- Would existing prices be expected to encourage efficient outcomes?
- What other factors may influence the efficiency of prices and the possible response by consumers?

In answering each of these questions we have also sought to identify actions that could improve the efficiency of signals and consumer responses.

Given that the focus is on how prices effect final electricity consumers' consumption decisions, the relevant prices are the final retail prices. However, part of the cost that is borne by a retailer – and that is therefore recovered through its retail prices – is the price that is paid for the use of the networks. Given the potential for network charges to affect the level and structure of final retail price, the efficiency of these charges is also a focus of this study.

It is noted at the outset that this study is intended to be a first principles analysis of the broad characteristics of efficient prices and the challenges that may be faced with improving the efficiency of those prices. We have used historical information on electricity market spot prices and our knowledge of the broad characteristics of the costs of networks to draw such inferences. We note that the actual computation of efficient prices according to the principles set out in this report is a more complex task requiring, for example, a view on the extent to which the future pattern of electricity spot prices may vary from the past (for the wholesale electricity cost component of the price), as well as detailed knowledge on the location and timing of network constraints and the cost of relieving each particular constraint (for the network cost element of the price).

What is an efficient electricity price?

An efficient price should achieve two outcomes:

1. It should allow a business to recover at least the costs of providing a good or service, thus facilitating long term sustainable service provision, and
2. It should provide a signal to consumers to consume only where the value of consumption is more than the social cost of production.

In the context of encouraging efficient demand-side participation, the concept of cost that is most relevant is the cost of supplying an additional unit of electricity at a particular location and point in time (that is, the marginal costs of supply). When consumers are exposed to prices that are aligned to marginal cost, and if consumers make fully informed and rational decisions, then any consumption that does occur will be efficient from the perspective of society. In this circumstance there is no need to encourage further demand response from consumers, indeed it would be inefficient to do so.

Our assumption is that final consumers for the most part would receive a price that is announced in advance and fixed for a period, reflecting the current practice, although with the potential for an additional surcharge to be applied in exceptional circumstances (with the conditions for applying such a surcharge set out in advance). Based on our analysis of historical wholesale electricity prices and the broad characteristics of network costs, we have found that the cost characteristics of the sector suggest that an economically efficient price for electricity would have the following broad characteristics:

- A usage-based component that changes based on the time of use and the location of the consumer. The time of use element reflects the fact that wholesale electricity costs follow a predictable pattern during each day, being higher in the morning and early evening (following the predictable pattern in electricity usage) and also have a predictable seasonal pattern, being higher in summer and winter and lower in the other months. Network costs are highest during periods of peak demand (as it is peak demand that causes network constraints and augmentation requirements).[1] In addition, these costs would vary by location, reflecting the spare capacity available in different areas and the unit cost of the next augmentation. As a caveat, however, we note that the peak in demand that is expected on the different network elements reflects the local demand for that element, which may, but need not, occur at the same time as the time that peaks are recorded in electricity spot prices.

- A sound conceptual argument also exists for there being a substantial surcharge added to the normal price in times where wholesale electricity costs are unusually high (often referred to as a critical peak price). The justification for such a surcharge is because while there are predictable patterns in wholesale electricity costs, events may occur that result in wholesale energy costs being much higher in a particular period than would have been predicted (such unexpected peaks are often associated with parts of the networks or generators being unexpectedly out of service). Importantly, if a price offer contains a critical peak price, then the remaining elements of the price can be much lower than would otherwise have been the case.

- A component or components to recover any residual costs that would not be recovered with prices structured along the lines discussed above. At the retail level, this includes most of the retail operating costs (which do not generally vary with an individual consumer's energy consumption). At the network level, the existence of economies of scale and scope typically would be predicted to imply that pricing at marginal cost would leave costs unrecovered, although whether this is true (and its extent) is an empirical matter. The objective of this component or components is to recover the residual cost, while having the least effect on the amount of electricity that is consumed. Fixed charges (i.e., a charge that is the same for all consumers in a particular class) are often advocated as the best means of recovering such a shortfall; however, even so a decision is required as to how fixed costs are varied between consumer classes and care is required to ensure that fixed charges are not so high that consumers are induced to inefficiently disconnect from the network (either closing down if it is a commercial user, or seeking an alternative energy supply). In practice, the price responsiveness of electricity consumption is sufficiently low that there is unlikely to be a large reduction in use (and hence inefficiency) if part or all of the residual is recovered through a higher price applied to all consumption.[2]

Moreover, where consumers prefer not to have a time of use price (but prefer instead to have a charge with a constant volumetric component), then an approximate incentive for efficient use may still be delivered, provided that the magnitude of the volumetric component depends on the profile of the consumer's use and the charge is reviewed over time. That is, with a consumer who uses more than average during peak times paying a higher charge, and vice versa for a consumer who consumes relatively more in off peak periods. In such a price structure the incentive for efficient usage is created through an expectation that additional peak use will translate into a higher volumetric charge in the future.

We observe that it is the magnitude of the first two components above that are relevant to whether an incentive is provided for efficient demand side participation.

We note, however, that there are practical limitations in the ability to set fully efficient prices. In particular, price setting involves a trade-off between the extent to which the price accurately reflects cost, and the administrative complexity of deriving and applying more complex prices, and the capacity for consumers to understand and respond to more complex prices. It is also noted that equity considerations may constrain the capacity to introduce more efficient prices. This is because changes to the structure of prices inevitably means

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[1] An alternative approach for signalling network costs through prices is to apply a charge that reflects maximum demand, with a further choice being whether that is the individual consumer's maximum demand at the time of peak demand. This charge would be levied on the retailer in the first instance, and the retailer would have a choice as to whether the maximum demand charge was converted into a time of use charge, or whether it merely passed through the maximum demand charge directly to the consumer.

[2] Recovering residual costs through increased variable charges is often criticised. However, using variable charges for this purpose has the benefit of linking the residual cost recovery to a measure of the benefit that the consumer receives from the service, in turn making it less likely that the recovery of the residual would encourage inefficient disconnection from the network.

that some consumers pay more while others pay less, and the potential exists for vulnerable consumers to be amongst the adversely affected, at least in the absence of government measures to ameliorate the effect on such consumers. Further to this, we note that retailers set tariffs based on their expectations of future outcomes and that their forecasts can differ to actual outcomes.

Would existing prices be expected to encourage efficient outcomes?

In the NEM at present, the majority of residential consumers have a choice between the retailer through which they obtain their supply, and part of this choice is between a regulated retail tariff or a market-offer tariff. In addition, consumers may have a further choice between flat tariffs, inclining block tariffs, or time of use tariffs.[3] However, a time of use price can only be applied where the consumer has an interval meter in place or is prepared to pay an additional charge to obtain one. We did not identify any offers that incorporate a critical peak price (which sets a particularly high price for a number of pre-determined hours or days in a year) or rebates for avoided consumption that are marketed generally to consumers.

Most of the residential and small business consumers do not have an interval meter in place and so cannot face a time of use price. As such, the majority of consumers are unlikely to face a price that reflects the costs of supplying electricity. Consumers without an interval meter face prices that cannot vary over time, and therefore cannot follow the changing marginal costs of supply. A movement towards prices that vary over time on the basis of changes in costs can be welfare improving where the efficiency benefits exceed the costs associated with facilitating efficient pricing; such as the costs of technology.

Moreover, even where consumers are on time of use prices, we detected a number of shortcomings in those prices, which may well reflect the newness of these tariffs and the fact that they apply to few consumers. One shortcoming that we identified was a ratio of peak to off-peak prices that materially understated the ratio of the historically observed costs. A second deficiency was where retail prices were set that did not take account of the structure of network tariffs, so that the implied charge for wholesale electricity purchase costs was not aligned to the costs the relevant retailers incurred.

In contrast, while there is much less transparency about the structure of prices that large consumers pay (typically being determined in bilaterally negotiated arrangements), we find these electricity prices to be consistent with the principles for efficient pricing. This is facilitated by the ability to measure electricity use and price on a time of use basis for these consumers. In addition, our experience suggests that this sector is highly competitive and therefore the margins on cost could be expected to be low.

What market conditions influence the efficiency of prices and the proposed response by consumers?

As identified by the Commission in its Issues Paper,[4] other factors, referred to by the Commission as market conditions, can influence the ability for parties to make and implement informed decisions.

Consumer drivers

While electricity is an essential service for consumers and consumption is relatively insensitive to price, it also requires effort, time and information for consumers to make rational electricity consumption decisions. In addition, there appears to be a number of behavioural factors that inhibit efficient decision making by consumers. These behavioural factors mean that even when consumers are faced with an efficient price, they may not respond in an economically rational way. Options to improve the efficiency of a consumer's response to price signals may include using rebates (rather than price increases), having consumers opt out of technology options (rather than opt in), and comparing consumption performance between consumers to create social pressure for changed behaviour.

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3 For a flat tariff, the price does not vary depending on the time electricity is consumed, inclining block tariffs involve a step increase in price as the volume of consumption increases, and time of use tariffs involved prices varying depending on when electricity is consumed.

4 AEMC, *Power of Choice – giving consumers options in the way they use electricity, Issues Paper,* 15 July 2011.

Business drivers

Competition should provide an incentive for retailers to set a price that reflects their marginal costs of supply, comprising their electricity purchase costs, network costs, and their own costs. However, in a market characterised by a mix of competitive offers and regulated tariffs there may be some distortions to effectively competitive outcomes. This is because the existence of a regulated tariff may constrain the structure of competitive offers. A reason for this may be that the existence of a regulated tariff may provide a simple mechanism for retailers to market their offers to consumers, i.e., a discount off the regulated tariff. In addition, the regulated tariff provides a reference point for competitors that may allow them to coordinate behaviours. Given these factors, further consideration should be given to whether there are alternative approaches that protect the interests of consumers as markets transition to being effectively competitive.

The framework for the economic regulation of networks is broadly appropriate with respect to its encouragement for network businesses to set prices that reflect the long-run marginal costs of provision. In particular, the distribution Rules require businesses to have regard to long-run marginal costs and empower the AER to enforce this pricing principle. We note, however, that side constraints that limit the annual change in prices between consumer classes may limit the capacity of network businesses to set cost reflective tariffs. Liberalising these side constraints where pricing reform is being undertaken (for example, following a rollout of interval meters) would assist in improving the capacity for network businesses to set efficient network tariffs. We note that the Rules already remove the obligation to apply a side constraint where a remotely-read interval meter exists for a consumer.

Retailers and distributors both have limited incentive to roll-out time of use meters to consumers and thereby enable the setting of more cost reflective tariffs. Our reasons for this are as follows.

- Retailers would make a commercial decision, comparing the projected benefits and costs it would expect from the investment. Retailers would benefit if the installation of an interval meter and offering a time of use price is likely to attract additional consumers or provide a means of retaining existing consumers and/or making higher margins. However, this strategy for acquisition/retention is likely to be high cost – because (inter alia) less than half of the consumer base would be expected to benefit from time of use prices, implying a high cost of identifying and marketing to the target consumers.

- Distributors could try to convince the regulator (the AER in this case) that the economic benefits from interval meters exceeded the cost, in which case the investment decision would be contingent on the AER's views. Alternatively, the distributors could make a commercial assessment of whether the benefits it would receive from installing interval meters would exceed the costs the distributor bears. Under incentive regulation as applied to network businesses, there is a capacity for distributors to bear or receive a share of the costs and benefits created by their actions, which is intended to encourage efficient decisions. However, in this instance, the current incentive arrangements are unlikely to provide distributors with such an incentive, with some of the shortcomings being that:

  – distributors are only exposed to the network-related costs and benefits of their actions, and so they would not naturally consider the cost savings possible in generation, and

  – current incentive schemes do not deal well with projects that have an upfront cost in return for potential future benefit (this is because incentive schemes reward or penalise distributors for any divergence between forecast and actual expenditure over a regulatory period, and so benefits created for future regulatory periods are omitted).

However, both retailers and networks are likely to have an incentive to set efficient prices if interval meters are rolled out to every consumer within a region.

- For retailers, as discussed above, aligning price with marginal cost is a mechanism for ensuring that competitors cannot undercut and attract away consumers. In addition, by tying prices to cost, retailers are able to reduce their risk (critical peak pricing strategies in particular can reduce a retailer's exposure to peak events, and also provide an alternative to purchasing expensive derivatives instruments to hedge against high electricity pool prices). Two factors that may constrain the speed with which efficient prices are offered are:

- behavioural factors – that is, the ability for consumers to understand and respond to the new pricing offers although, as noted below, technology may offer solutions to this issue, and
- regulatory issues – as noted above, fallback regulated prices may act to constrain differentiation between retailers' offers.[5]

- Provided that distributors are not constrained in their price offers, they could benefit from more efficient prices, and indeed could be required by the AER to implement such prices. The one constraint to the incentive for distributors to set more efficient prices is the potential for such prices to cause additional volatility in revenue or a loss in revenue (that is, the revenue loss from the induced reduction in demand).

Technology drivers

Technology has a significant role in enabling businesses to set efficient tariffs and for consumers to be able to respond efficiently to those tariffs. Indeed, the inability to measure electricity consumption at different times during the day may seriously constrain the ability for a retailer or network business to set a price that varies based on expected changes in cost. This outcome is demonstrated above where the majority of consumers do not have access to interval meters and therefore cannot face a time of use price. Technology may also assist consumers when they have time of use metering in overcoming some of the transaction costs involved in making efficient consumption decisions. This can occur where consumption decisions can be automated through, for instance, smart appliances.

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5 Once retailers commence offering time of use prices generally, substantial care is required to ensure that any fallback regulated prices allow the entity that is required to offer those prices to recover costs (it is assumed here that these prices remain as non time of use prices). It would be expected that the consumers who remain on the fallback price are those that have a higher cost load profile than the average (as lower cost consumers would find competitive time of use prices a cheaper option). Thus, the load profile for the fallback regulated price would increase compared to the previous situation. Thus, the cost incurred by the retailer that was required to offer the fallback regulated prices would rise, requiring an increase in the regulated price. This dynamic would then repeat, as the higher regulated price would encourage more consumers to take up the competitive time of use prices, increasing further the cost to serve the residual consumers. Addressing this dynamic would require either substantial flexibility in fallback regulated prices, or for the fallback regulated prices to be converted to time of use prices.

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1 Introduction

This chapter sets out the background to this report. In doing so, the chapter identifies task that was put to PwC, some background on the role of pricing in markets, and it also outlines the structure and content for the remainder of the report.

1.1 What were we asked to do?

On 29 March 2011 the Ministerial Council on Energy (MCE) directed the Australian Energy Market Commission (the Commission or AEMC) to undertake a further review into demand-side participation in the National Electricity Market (NEM). The purpose of the review is to identify market and regulatory arrangements that would enable the participation of both supply and demand side options in achieving an economically efficient demand/supply balance in the electricity market.[6]

As part of the review the Commission wishes to understand whether electricity prices reflect the costs of supplying electricity and the associated efficiency implications of cost reflective pricing. On this basis, the Commission has engaged PwC to examine the efficient operation of price signals in the NEM, particularly their potential to promote efficient consumer demand-side participation by enhancing the consumers' ability and incentive to make informed choices concerning their use of electricity. In doing so, PwC is to also identify any technical and administrative impediments that may be in place. We have characterised the task as addressing the following questions:

- What is an efficient electricity price?
- Would existing prices be expected to encourage efficient outcomes?
- What market conditions influence the efficiency of prices and the proposed response by consumers?
- What actions could improve the efficiency of signals and consumer responses?

The purpose of this report, therefore, is to seek to answer these questions. It is relevant to note that the focus of our analysis is primarily on residential consumers, however, where relevant we will also comment on the circumstances for commercial and industrial consumers.

1.2 Role of pricing

An efficient price should achieve two outcomes:

1. It should allow for a business to recover at least the costs of providing a good or service, thus facilitating long term sustainable service provision, and
2. It should provide a signal to consumers for efficient consumption.

When prices properly reflect the costs of provision they provide incentives for consumers to make efficient decisions about when, and how much, of a good or service to consume. A rational consumer would be expected to only purchase a good or service when they believe the value of consumption is greater than the price charged. In turn, if prices reflect the costs of provision, it is also the case that this outcome would be efficient from the perspective from society as a whole.

Considering the impacts of inefficient consumption in response to inefficient prices is helpful in identifying the benefits of efficient pricing. Suppose, for example, the price of a particular good was set above the costs of production. In this case, the high price may provide a disincentive for some consumers to purchase the good on

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6 See: http://www.aemc.gov.au/Market-Reviews/Open/Stage-3-Demand-Side-Participation-Review-Facilitating-consumer-choices-and-energy-efficiency.html

the basis that they do not consider the value they will obtain to be greater than the price. This level of 'under-consumption' would be inefficient from society's perspective. This is because at least some consumers are likely to value consumption by more than the costs of provision, but less than the inefficient price set for the good. This lost consumption also means a loss in the productive capacity of the economy, either in producing the good or service or the economic benefits that would have been derived from its consumption.

1.2.2 Pricing for electricity demand response

One of the objectives of this report is to identify the role of pricing in providing signals for efficient electricity consumption decisions by consumers. In the context of electricity there are two ways in which a signal can be provided to consumers:

1. By providing a price that accurately reflects the costs of supply, or

2. By making a payment to the consumer to undertake a certain action, such as a reduction in demand.

When the first of these occur, and consumers are aware of the price and able to respond to it, any consumption that occurs can be said to be efficient. There is no need to encourage any further demand response from consumers in this circumstance. This is because we can assume that when consumption occurs, consumers value consumption more than the costs of production. Therefore, in this scenario, even where prices increase, potentially significantly, on the basis of a need for increased investment to meet supply, this investment, and the corresponding price increases, is efficient from the perspective of society. To encourage further demand reductions in this circumstance would mean that efficient consumption is lost and the costs of provision would increase above the efficient costs of supply (in order to make the incentive payment to consumers).

A payment to consumers to encourage a demand response can be efficient when prices are less than the costs of supply. This is because prices below the costs of production could provide an incentive for consumers to consume more even though they value supply less than the costs of provision. This additional consumption then causes additional costs to be incurred in the system. Therefore, a payment for reduced consumption at peak times can 'bridge the gap' so that consumers face a price signal that effectively reflects the costs of provision. An electricity supplier would have the incentive to make such a payment so long as its total cost, including the demand response payment, is less than the costs it would have incurred to meet demand absent the participation of the consumer. From the perspective of the consumer, when an offer of a rebate is made the total price for consuming at peak times becomes the standard electricity tariff plus the demand response payment that the consumer would forego if it chose to consume rather than 'participate'. It is relevant to note, however, for the demand response to be socially efficient the total cost of the demand response should not exceed the costs that the business would have incurred absent the demand response payment (e.g. the costs of augmentation). If this were to occur it would be more efficient for the consumer to consume and for the electricity supply business to incur the additional infrastructure costs.

1.2.3 Costs that should be signalled to consumers

In the context of demand-side participation the costs that have most relevance are marginal costs of supply. These are the costs that vary as consumption varies. That is, an additional unit of consumption will cause an additional unit of costs.

There are two types of marginal costs. These are short-run marginal costs and long run marginal costs. The short-run is defined in economics as the period of time where at least one input variable remains fixed and is the cost of supplying an additional unit with capacity fixed, and includes the cost of congestion. While the long-run is defined as the period of time in which all cost inputs can vary.

In the context of electricity, a short-run marginal cost price signals efficient use at a particular point in time, while long-run marginal costs signals influence longer term decisions such as location and the choice of appliance. However, it is not straightforward to simultaneously signal both short-run and long-run marginal costs to consumers. This is a result of practical reasons, for instance, short-run costs can be difficult to estimate and subject to considerable volatility, and in the presence of economies of scale and scope, long-run marginal costs sit below average costs. Therefore, prices based solely on long-run marginal costs would generate revenue below total cost and total cost would not be recovered.

It is important to note that forward looking costs are the costs that should be signalled to consumers. This is because these are the costs that can be influenced by consumer's behaviour. Reduced consumption today can only allow future expenditure to be avoided. Conversely, from an efficiency perspective, it is not considered efficient for prices to include a signal with respect to existing infrastructure.[7] This is because these investment decisions are sunk and consequently cannot be affected by consumption decisions. However, it is relevant to note that prices can play a role in not dissuading otherwise efficient use of existing assets.

1.3 Structure of report

This report is structured as follows:

- Chapter 2 identifies the costs that are incurred in the provision of electricity services and the implications this has for the setting of efficient prices
- Chapter 3 analyses the efficiency of various pricing structures, including the structure network tariffs and of retail market offers and regulated tariffs in the NEM
- Chapter 4 considers market conditions and factors that can influence the incentive and ability for efficient prices to be set as well as the capacity for consumers to respond efficiently to those prices.

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7 We note, however, that sunk costs should not be completely ignored. This is because if businesses were unable to recover their sunk costs for current investments they may be concerned that they would also be unable to recover the costs of future investments. This then could dissuade otherwise efficient future investment.

2 Costs of electricity and implications for price setting

The purpose of this chapter is to identify the costs that are incurred in the provision of electricity services. In particular, we seek to identify the costs that are caused or avoided by changes to consumption. This means identifying the costs associated with:

- Providing wholesale energy
- Transporting electricity along networks, and
- The retail function.

Given the costs caused by consumption, we identify the implications for efficient price setting.

Findings and recommendations

Based on the analysis, we have made the following findings:

- Wholesale electricity purchase costs tend to vary throughout the day and throughout the year. Wholesale energy costs tend to be higher in the early evening and also in summer and winter compared to all other times. In some circumstances, the wholesale electricity market experiences peak prices which may, but need not, occur at times of peak demand.
- Network costs are driven primarily by peak demand at a particular location. The costs of network provision once investments have been made are also largely fixed and sunk costs (that is, unable to reversed and the investment funds recouped)
- Retail operating costs vary based on the number of consumers a retailer serves rather than the amount of electricity consumed (that is, independent of use).

Given these findings, actions to improve the efficiency of price signals include:

- Setting prices so that, in an ideal world and where electricity use can be measured on a time of use basis, they contain the following:
  - A variable component that changes based on the time of use and the location of the consumer, and
  - A critical peak price for high priced events or network constraints that are difficult to predict.
- Noting that there are likely to be some practical, or even equity, limitations to setting fully efficient prices we note that:
  - Recovering some of the fixed costs and residual network costs through off-peak variable charges is unlikely to have a significant impact on efficiency given prices are relatively low at these times and consumers tend to have a relatively low responsiveness to modest price changes.
  - There are likely to be limitations to the extent that charges for residential and small businesses fully reflect their locational characteristics. This is due to the complexity and costs associated with developing a locational specific charge for these consumers.
  - Retailers set tariffs on an ex-ante basis, therefore, there will always be variations in forecast expectations of costs that are built into prices relative to actual outcomes. Therefore, striving for

perfect cost reflectivity is likely to be impractical.

2.1 Energy Costs

Energy costs are the costs associated with generating electricity. At its most basic level, this involves converting one source of energy into electric energy. For conventional generation, this involves heating water to produce steam.[8] However, renewable generators use natural resources such as wind and water flows to produce electricity.

2.1.1 Components of cost

Electricity generators incur both fixed and variable costs. The fixed costs relate mainly to the financing of capital associated with building the generation plant. They will also include the costs of any land as well as any permanent operating and maintenance staff that are required to be available even when the plant is not in operation. The fixed costs of generation will be incurred irrespective of whether the generator is actively producing electricity or not. The variable costs of generation are those additional costs that are incurred when electricity is produced. The main variable cost associated with electricity generation is the cost of fuel. However, variable costs can also include other operating and maintenance costs associated with the plant when it is active, start-up or shut down costs, plus any costs that may be associated with carbon emissions produced by the plant.

A variable cost that is also particularly important for electricity generation is the opportunity cost of production. This is particularly the case for energy constrained hydro-electric plants. The opportunity cost at one point in time is the cost of producing electricity now or at some other time. Conversely, for generators that take an extended period to start up and / or are costly to start up, *not* generating has an opportunity cost in terms of the cost and time delay associated with a restart.

As previously mentioned, in the context of demand-side participation, it is the marginal costs of supply that is of most relevance. The marginal costs of generation may be considered to involve three distinct phases.

- Phase 1 involves the start-up costs for a generator. For thermal plants the marginal costs associated with start-up may be quite high. This is because fuel must be used to heat the water for steam before any electricity can be produced. Given this start-up cost, it is often more economical for some generators to continue to generate even in circumstances where the revenue they receive from the market is lower than their short-run marginal costs of production.

- Phase 2 is when the generator is able to start producing electricity at a steady state. Marginal costs at this time tend to involve the costs of the fuel directly required to produce electricity. The thermal efficiency of a plant can affect the marginal costs of production at this time.

- Phase 3 is the marginal costs of production as the plant reaches its physical limit. At this point the marginal costs are very high as an additional unit of production would trigger either the curtailment of load (in the short-run) or the need to expand capacity of the plant (in the long-run).

The first two phases could be considered as short-run marginal costs, however, given the large fixed costs associated with phase 3, these would properly be aligned with the long-run marginal costs of supply.

2.1.2 Price setting

The price for electricity generation within the NEM is determined via a wholesale spot market. The analysis here focuses on the implications of the price outcomes from this market for setting efficient prices. A review of whether overall dispatch outcomes are efficient is outside the scope of this report.

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8 It should be recognised that there are other costs associated with producing energy for consumption, these include the costs of losses on the network as well as ancillary services costs. For the sake of simplicity these costs have not been considered in detail for this analysis.

In the wholesale spot market supply and demand are instantaneously matched in real time through a centrally-coordinated dispatch process. Generators participate in this market by making offers to supply a particular amount of electricity at a particular price for each five minutes of the day[9]. Once the system operator has all the offers from generators it will dispatch the lowest cost generation to meet demand first, and then use more expensive generation until sufficient generation is dispatched to meet all demand. The outcome of the ordered generation offers is referred to as the merit order. In the absence of congestion due to network constraints or outages, competitive market theory suggests that individual generators will offer into the market at their short-run marginal costs of supply. Therefore, the merit order determined through the market mechanism overall reflects the system wide marginal costs of meeting demand at a particular point of time. This may also be considered the socially efficient level.

The price received by generators for the electricity they produce is the price of the offer submitted by the highest cost generator that needs to be dispatched to meet demand. Only generators that make offers in the market are eligible to be dispatched by the system operator and only dispatched generation earns the wholesale price. The NEM is a regional nodal pricing model, so a price is determined for each region of the NEM based on supply at a defined regional reference point, this is referred to as the Regional Reference Price.[10] The price determined in each region is considered as then marginal cost of meeting demand within that region. The price at which electricity is traded ranges from a minimum of -$1,000 to a maximum of $12,500 per MWh.

The theory that supports that generators bid at short-run marginal cost at a socially efficient level is based on the assumption of a perfectly competitive market. In such a market generators would have an incentive to offer capacity into the market when their marginal cost of supply is less than the price in the market. Generators who did not offer into the market under such circumstances would risk not being dispatched by the system operator and will not earn any revenue. Allowing generators to receive the system wide marginal cost of meeting demand also seeks to reflect outcomes in competitive markets. That is, in a competitive market, lower cost firms will still be able to set their price at least up to the marginal cost of their competitors. The ability for lower cost generators to be able to receive a price above their short-run marginal costs means that they will also be able to make a contribution towards their long-run marginal costs. Making a contribution towards long-run marginal costs is necessary in order to sustain participation in the market. We note that these assumptions may not hold in a circumstance where some generators hold a degree of market power, due to, for example, transitory congestion on the network at a particular point in time. However, as stated above, our analysis does not extend to whether the overall dispatch outcomes are efficient.

Prices in the wholesale market experience considerable volatility. In addition, prices can rise very high at different times throughout the year. Therefore, retailers who purchase electricity through the spot market seek to manage this risk through hedging tools. These tools include entering into contracts with generators, or owning generators, to ensure they are not exposed to high spot prices when they occur. Retailers may also contract with loads such that they reduce their consumption when requested. This then reduces a retailer's exposure to high price periods.

2.1.3 Drivers of changes in prices

The price of wholesale electricity varies throughout the day and throughout the year. As indicated above, the price of wholesale electricity changes based on the offer price of the marginal generator required to meet demand. As a consequence, variations in demand throughout the day and the year, combined with generators bidding behaviour, would be expected to influence the wholesale price of electricity.

The figure below identifies the historical price of electricity throughout the day relative to the average price. What the figure shows is that on a NEM wide basis, the costs of energy have been relatively lower than the average cost between around 8pm and 10 am. Conversely, the cost of energy has been relatively higher on average at all other times and peaks around 6pm each day.

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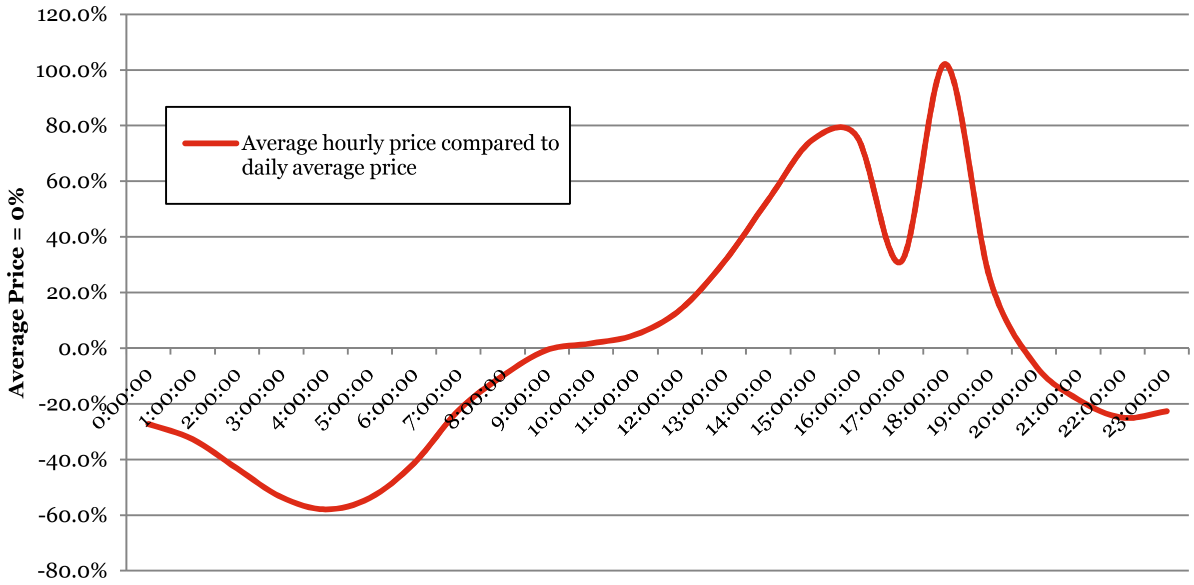
9 Note that generators submit offers for every 5 minutes of the day, however, the market is settled on a 30 minute basis. This means that the system operator takes the average of the six dispatch prices over every 30 minutes to determine the settlement price.

10 We note that in reality a price can exist for 'nodes' that are more granular than on a regional basis. However, given the price for settlement in the wholesale market is based on the regional reference node, this is the price that is relevant from the perspective of retailer costs and therefore signals to consumers.

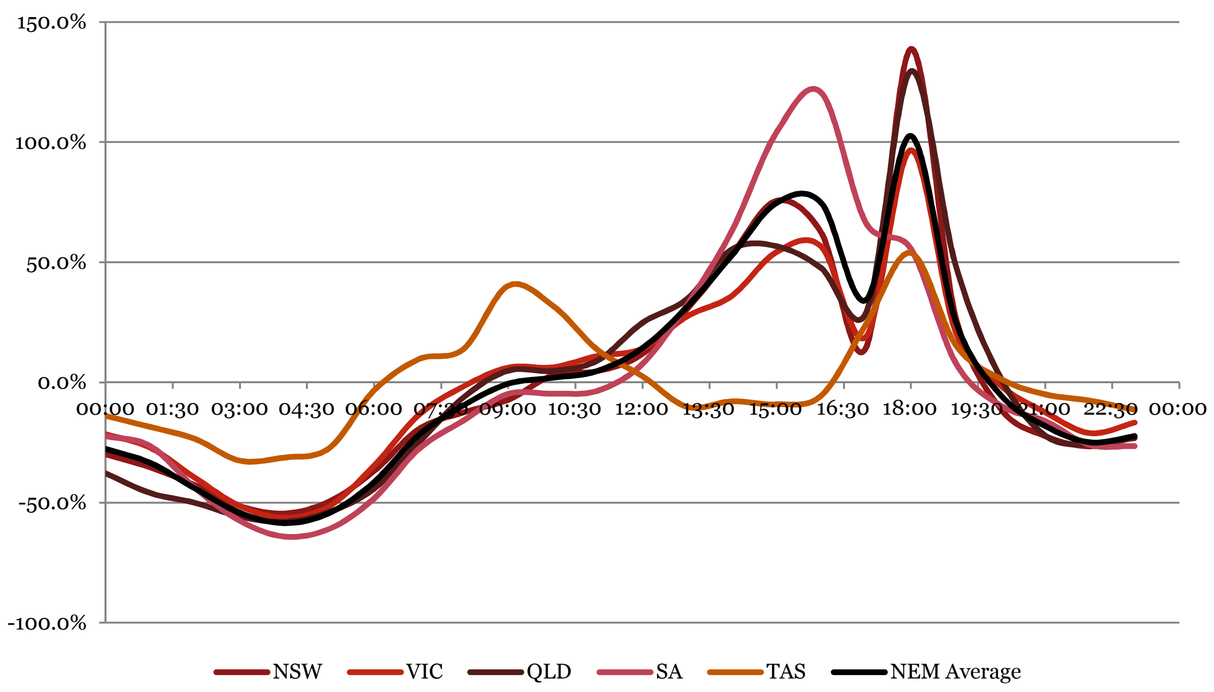
Figure 1 Relative hourly prices in the NEM 1999 to 2010



Source: PwC Analysis, AEMO Data

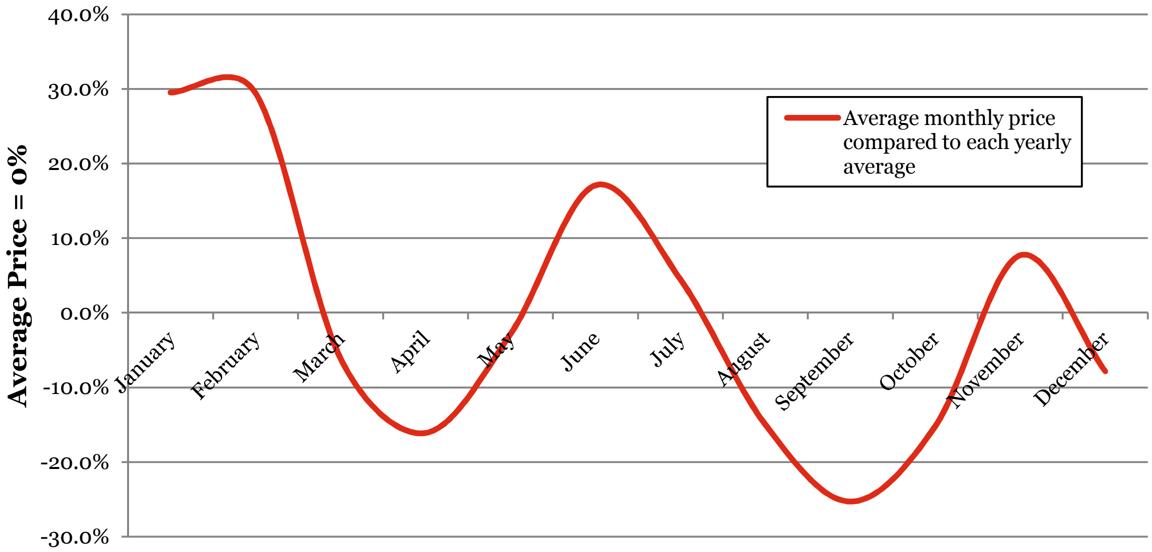
The figure below provides the relative historical hourly price by each NEM jurisdiction. It demonstrates that there has been a degree of consistency between the timing of peaks in each jurisdiction, with the exception of Tasmania. In addition, it can be noted that the average price has peaked earlier in the afternoon in South Australia when compared to the other jurisdictions.

Figure 2 Relatively hourly prices in the NEM by jurisdiction between 1999 and 2010



The cost of electricity also varies based on the time of the year. The figure below compares the historical average monthly price to the historical average yearly price. What this shows is that the cost of energy is relatively higher in summer and winter, and relatively lower in spring and autumn. The highest average prices on a monthly basis occur around January and February.

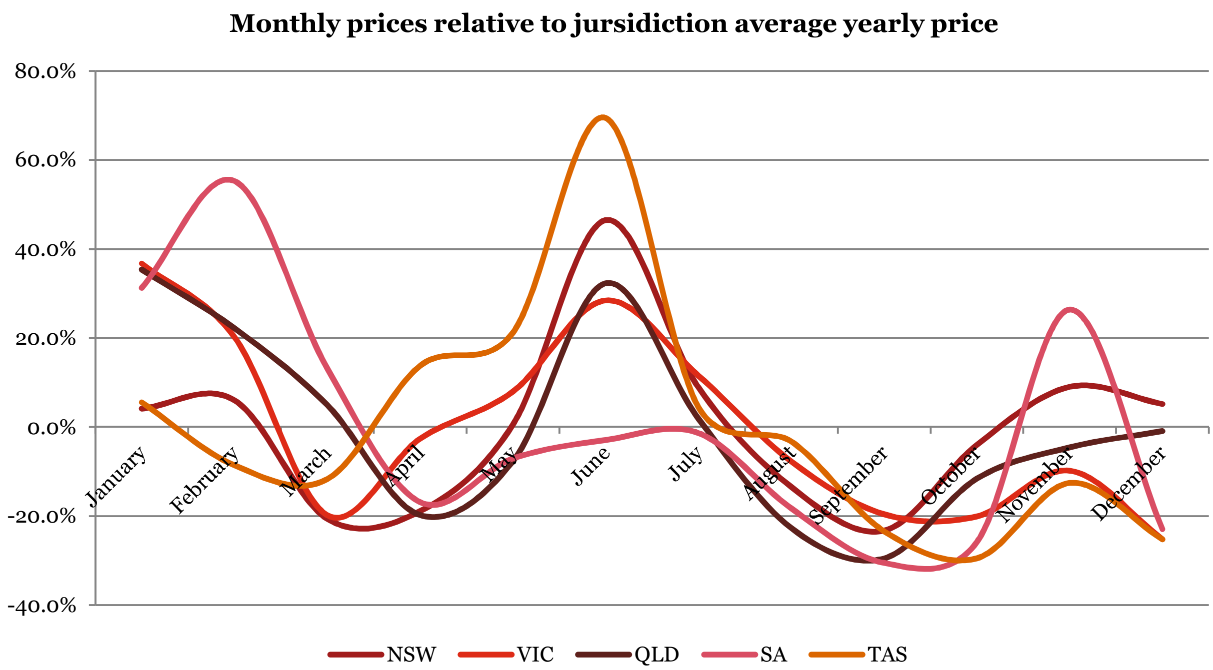
Figure 3 Relative monthly prices in the NEM 1999 to 2010



Source: PwC Analysis, AEMO Data

Again, similar outcomes are obtained when considered from the perspective of each jurisdiction. It can be identified that the average price in Tasmania has been relatively higher than for other jurisdictions in winter while the average price in South Australia has been relatively higher in summer than for other jurisdictions.

Figure 4 Relative monthly prices in the NEM by jurisdiction between 1999 and 2010



Source: PwC Analysis, AEMO Data

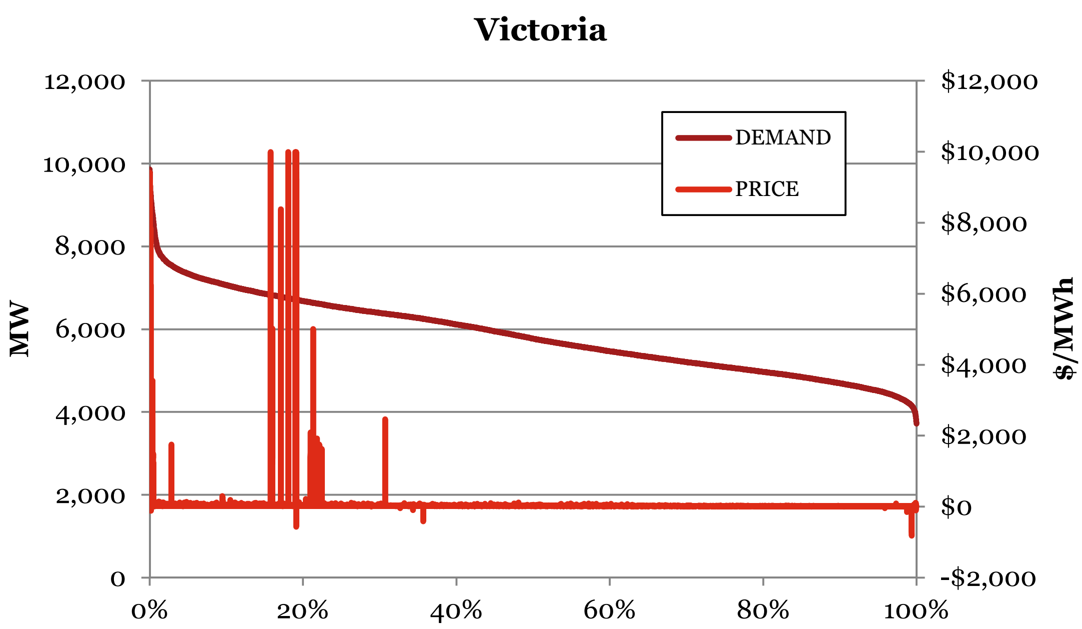
It is relevant to note that extreme price events have a significant impact on the average price of electricity within each jurisdiction. We removed the top and bottom one per cent of half-hourly trading prices from 2010 wholesale prices. When these prices were removed there were considerable reductions in the average price in each region. In particular, in South Australia this saw the average price in 2010 fall from $40 to $25. What this demonstrates is that there is the potential for demand response at high price periods to have a significant impact on the average cost of energy in the NEM. The table below provides the results from removing the top and bottom one percent of prices in each jurisdiction.

Table 1 Impact of the top and bottom 1 per cent of prices on the average price (2010)

	NSW	VIC	QLD	SA	TAS
Average Price	$30.89	$34.44	$25.53	$40.28	$30.89
Average Price with top and bottom 1 per cent removed	$25.13	$23.95	$21.60	$25.42	$24.65

Importantly, however, high demand may not always be the main driver of extreme prices in the NEM. High prices can result in from moderate demand where unexpected events occur that reduce supply (such as network outages). The figure below shows the correlation between price and demand in Victoria in 2010. What it shows is that there are a number of instances where high prices occurred absent a period of peak demand. The outcome in Victoria has arisen at least to some extent in each jurisdiction.[11] As a consequence, high price events may occur at unpredictable times.

Figure 5 Correlation between price and demand in Victoria 2010



Source: PwC Analysis, AEMO Data

2.1.4 Implications for efficient pricing

As noted above, the wholesale market dispatch process seeks to provide the short-run marginal costs of system supply. In the context of the implications for efficient pricing, we have not sought to review the effectiveness of this approach, and whether alternatives, such as capacity markets, would provide more efficient cost signals. Instead, we have taken the existing market framework and structure as it stands and sought to identify what the outcomes of that market mean for setting efficient prices. It is important to note that to the extent there are imperfections in the existing wholesale market, it is still appropriate that consumers face price signals based on these 'imperfect' costs as these are still the costs retailers' face to supply consumers with electricity.

The analysis above identifies that there has been a significant degree of variation in the average historical price of wholesale electricity throughout the day. The variation in price throughout the day has been relatively

[11] The outcomes for the other jurisdictions is contained in Appendix A.

consistent across jurisdictions. If we assume these outcomes persist into the future, consumers should be exposed to these variations in price. Based on the historical evidence, prices which are lower over night and in the early morning and increase throughout the afternoon would efficiently signal the marginal cost of electricity generation to consumers. The highest prices should be delivered around 6pm each night. In Tasmania, a mini-peak has occured in the early morning, most likely reflecting the use of space heating at this time. As a consequence, in Tasmania consumers should receive a higher price around 8am compared to prices over night or in the early afternoon.

There has also been a seasonal variation in wholesale prices. Again, the pattern of this variation in prices has been relatively consistent across jurisdictions, noting the level of peaks and troughs differ across jurisdictions. This outcome implies that prices for retail consumers should also vary throughout the year. For instance, peak prices should be higher in summer and winter than they are in spring and autumn.

As indicated, there has been a high degree of consistency in the pattern of average prices across the NEM. Therefore, there is a case that there should be limited variation in the pattern of prices across the NEM. We note, however, that this does not imply that the level of prices should be the same. For instance, in NSW the average summer price has been relatively higher than for other jurisdictions. Therefore, to the extent this continues this should be reflected in the relative price at peak times in a NSW based tariff compared to other jurisdictions.

As noted above, not all high prices in the wholesale market have been driven primarily by demand. However, given these prices influence the costs for retailers, they should also influence the prices for consumers. An implication of these outcomes, however, is that it may be more difficult to set prices that reflect expected future costs. That is, non-demand driven high price periods are likely to be less predictable than demand driven high price periods. Therefore, it may also be more difficult to set prices that reflect these costs. This may be overcome, to some extent, by setting prices closer to the occurrence of a particular high priced event. For instance, if it was anticipated that a network outage would lead to high wholesale prices, a sharp price signal could be provided to consumers relating to consumption on that day, or at particular times during the day.

An important assumption that has been made in this analysis is that prices are set by retailers in advance to reflect ‘expected’ wholesale costs. Where this is the case prices should reflect the expected load shape. For this analysis we have used history as a guide to expected future prices. However, we would expect that a retailer’s approach to identifying expected future costs would be more sophisticated. For example, a retailer would want to take into consideration the likely timing and impact of a price on carbon, expectations of changes in fuel costs, and any expected changes in demand when setting prices in advance.

2.2 Network Costs

The role of networks is to transport electricity from the point of production through to end-use consumers. The electricity network is generally conceptually separated into a distribution network and a transmission network. The distinction between the two is made on the basis of the voltage levels at which they transport electricity. Transmission is a higher voltage network than the distribution network. The higher voltage of the transmission network allows for electricity to be transported longer distances without significant electricity losses. This means that the role of the transmission network is typically to transport electricity from generators to load centres. The lower voltage distribution network then transports electricity from the transmission network to the majority of end-use consumers.

2.2.1 Components of cost

The majority of the costs associated with the network are the costs of building the physical network assets. This means network provision is dominated by the fixed costs associated with financing capital for infrastructure investment. Much of the operation and maintenance of networks could also be considered a fixed cost given that network maintenance is a constant and necessary function for network businesses. For transmission, network investment tends to be large and lumpy, while distribution network investment tends to be more incremental in nature. Both transmission and distribution networks exhibit significant economies of scale and scope in their provision. This means they are natural monopoly technologies and consequently it tends to be more efficient for one provider to build and operate a network rather than two or more providers.

2.2.2 Price setting

Due to the natural monopoly attributes of networks there is limited competitive pressure for network businesses to set efficient prices and as a consequence network prices are regulated by the Australian Energy Regulator. The arrangements differ between distribution and transmission; however, in both instances the focus for price setting is on ensuring businesses recover efficient costs, and within this constraint, to signal the long-run marginal costs of networks. Further discussion on the effectiveness of the regulatory framework in mandating or providing incentives for efficient pricing is discussed in chapter 4.

2.2.3 Drivers of changes in costs

The main factors that influence the total costs of network assets are:

- The distance electricity needs to be transported, and
- The amount of electricity that needs to be transported at a particular point in time.

The total costs of the network vary based on the distance of consumers from the source of generation. This is because the longer the distance between the two, the more network that needs to be built to deliver the electricity to consumers. In addition, networks are designed and built to meet peak demand with a level of contingency to address assets being out of service for limited periods of time. It is relevant to note that while the total costs of network provision may increase, the per unit costs of network services will decline as either demand or consumer density increases. This gives rise to the economies of scale inherent in network service provision.

The marginal costs of network services will vary based on a number of factors. These factors include differences between consumers and their locations, times of use, and types of use. As a consequence of these differing factors it is not correct to identify a single marginal cost for the entire network.

In addition to costs varying based on the factors above, the marginal cost of network service provision will also vary depending on the time horizon upon which costs are assessed. This is where the concepts of short-run marginal costs and long-run marginal costs identified in the previous chapter are relevant.

In the short-run, a network business is constrained in the amount of network capacity it can provide. Conversely, in the long run network businesses are able to invest in augmentations of the network to expand their capacity. In either case, however, the marginal costs of provision will depend upon the extent that network capacity is utilised. For instance, in the short-run, when there is excess capacity the marginal cost of an additional unit of consumption is close to zero. However, as the network becomes constrained the short-run marginal costs may include the costs associated with curtailing demand. Similarly, if there is sufficient excess capacity at peak demand periods, the long-run marginal costs of supply will also be low. However, where peak demand is increasing, so too will the need for new investment to meet that demand. The long run marginal cost for additional consumption at peak times, therefore, is the costs associated with bringing forward the next augmentation. By implication, as the time for the need for the next augmentation approaches, so too will the marginal cost.

2.2.4 Implications for efficient pricing

As indicated above, the majority of network infrastructure is built to ensure peak demand is met, and the level and timing of peak demand is determined by the consumption behaviour of consumers. Therefore, when setting prices it is the cost of meeting peak demand that should be signalled to consumers. Pricing in this way ensures there is a link between the amount consumers pay and the costs of providing the service. Where this link does not occur consumers may consume more or less that would otherwise be efficient.

While it is clear that it is necessary to signal the marginal costs of supply, it is necessary to decide which marginal cost to signal to consumers. That is, whether the short-run or long-run marginal costs of supply should be signalled to consumers. The decision in this respect will depend in some part on the objectives of either regulators or regulated businesses when setting prices.

Prices based on long-run marginal costs will encourage efficient long term consumption decisions. These decisions include where to locate as well as production or appliance choices. Given it is these decisions by consumers that drive much of network investment, prices that reflect long-run marginal costs are likely to be preferred in the majority of circumstances for network services.

Table 2: Estimation of Long-Run Marginal Costs

Estimating the long-run marginal costs of networks for the purpose of setting prices is not necessarily a simple exercise. Marginal cost analysis for networks is typically concerned with the per unit change in costs resulting from changes in future output that are small enough to be consistent with the concept of 'marginal', but significant enough to cause a change in the investment and operating costs needed to meet future demand.[12] This is typically determined by a comparison of costs over a period of years under alternative load growth scenarios.

There are two common methods applied to estimate long-run marginal costs for networks, these are the Average Incremental Cost approach and the Turvey Method. The Turvey Method tends to be the preferred method for estimating long run marginal costs and considers the impact of demand on expenditure by adding increments or decrements to forecast demand. The Turvey Method requires a consideration of forecast demand and the schedule of capital projects that can be implemented to meet capacity requirements over the period. To estimate long-run marginal costs it considers the change in the present value of costs over the planning period resulting from a permanent increment or decrement in forecast demand at a given date (compared to base demand) and divides this by the present value of the increment or decrement.

The Average Incremental Approach is often used as a rough proxy for long-run marginal cost and therefore may be less valuable as an estimation technique. This approach estimates long-run marginal cost by separately identifying capacity related expenditure and averaging this over a forecasted change in output. It is important to note that for this approach projects with an objective of improving quality are excluded from the future capital costs assessment. With this information an optimal capital program is identified to generate the least cost solution to addressing supply and demand imbalances. The long-run marginal cost will then be the present value of expected costs of this optimal strategy divided by the present value of the changes in demand.

A price based on the short-run marginal costs of supply would be preferred over a long-run marginal cost price if it is considered important to ensure existing capacity is properly utilised. As indicated above, the short-run marginal cost of existing capacity is very low. Therefore, prices for the use of existing capacity would also be low. A low price would likely encourage consumers to use this capacity more readily. However, prices set on this basis would be very unstable. This is because as network use reached the capacity of the network, consumers would face the full costs of augmentation. This would create a particularly steep price increase for consumers at this time.

Long-run marginal cost pricing avoids the instability of short-run marginal cost pricing because these future costs are always incorporated into the price. Therefore, long-run marginal cost pricing is expected to provide an incentive for the use of network services up to the point where the incremental benefits from use equal the incremental costs of provision. However, these short-run signals can still be provided to consumers through, for instance, a critical peak price. This price could be used in instances where there are unplanned outages or other short-term constraints on network capability.

Both a long-run and short-run marginal cost will vary by location. Variations in location will be driven by factors such as the amount of excess capacity available at a location and the size of peak demand in an area. For large consumers setting a site specific network charge is relatively simple. This is because network capacity requirements can be easily measured for these consumers and it is also simpler to identify assets that are directly attributable to those consumers. Providing a locational signal to residential and small business consumers can be more difficult. This is because of the difficulties and costs associated measuring these consumers contribution to peak demand absent the appropriate metering technology and the shared nature of many of the assets they use. This is particularly the case for transmission costs which occur upstream from the consumer.

It should be noted that given the nature of network investment, pricing on the basis of long-run marginal costs may lead to a network business not recovering all its allowed costs. When economies of scale and scope exist,

[12] ESC, *Information Paper, Estimating Long Run Marginal Cost, Implications for Future Water Prices,* September 2005, p.5.

marginal costs sit below average costs. Therefore, prices based on long-run marginal costs typically would generate total revenue that is below total 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 change for each consumer. It is noted that the concept of Ramsey pricing is often referred to in this context, under which the residual cost would be spread across consumers in a manner that was based on their relative price responsiveness.[13] This means that less price responsive consumers pay more and vice versa.

2.3 Retail costs

The key function of a retailer is to act as an interface between end-use consumers and the rest of the electricity supply chain. Therefore, this involves:

- Managing and paying for the costs of wholesale electricity
- Paying network businesses for the transport of electricity, and
- Billing consumers based on their proportional use.

2.3.1 Components of costs

There are a number of retail operating costs that are incurred in order to provide the services above and to carry on a retail electricity business, these include:

- Consumer acquisition costs
- Billing and IT systems
- Consumer management (e.g. call centres), and
- Meeting government policy objectives, e.g. renewable energy tariffs, feed-in tariff schemes and energy efficiency schemes.

The Commission recently undertook analysis of the proportion of each of the costs that make up the retail price of electricity to consumers and their contribution to possible residential price increases. The Commission's analysis, presented in the table below, shows that retail operating costs make up around 15 per cent of the total residential price of electricity.

Table 3 National summary of future possible residential electricity prices

	2009-10	2010-11	2011-12	2012-13	2009-10	2010-11	2011-12	2012-13
	c/kWh (nominal)				per cent of total			
Other state based schemes	0.11	0.12	0.12	0.13	0.6%	0.5%	0.5%	0.5%
Energy efficiency and demand management State schemes	0.41	0.57	0.59	0.61	2.1%	2.6%	2.5%	2.4%
SRES	-	0.30	0.57	0.47	-	1.4%	2.4%	1.9%
RET/LRET	0.17	0.10	0.15	0.32	0.9%	0.5%	0.6%	1.3%
Retail	2.93	3.42	3.59	3.74	15.1%	15.6%	15.1%	14.8%
Feed in tariff	0.25	0.38	0.42	0.44	1.3%	1.7%	1.8%	1.7%
Distribution	6.68	7.80	8.70	9.09	34.5%	35.6%	36.6%	36.1%
Transmission	1.42	1.56	1.69	1.89	7.3%	7.1%	7.1%	7.5%

[13] We note that Ramsey prices are difficult to derive as they require knowledge of different consumers' price responsiveness. Moreover, if fixed charges can be levied, then the benefits (in efficiency terms) of setting different fixed charges for different consumers in the same class is likely to be immaterial given that fixed charges are unlikely to generate a response by consumers (the only response being to disconnect from the network).

Wholesale	7.41	7.64	7.92	8.52	38.2%	34.9%	33.3%	33.8%
TOTAL	**19.38**	**21.89**	**23.75**	**25.21**	**100%**	**100%**	**100%**	**100%**

For the Victorian contribution to the national summary, the Victorian calendar year prices were averaged to produce financial year prices. As a result, all of the prices used to develop the national summary were financial year prices.

Source: AEMC Retail Pricing Final Report – June 2011

2.3.2 Price setting

In all jurisdictions, with the exception of Victoria, retail prices are set on the basis of either a regulated tariff or a competitive market offer. In Victoria retail price regulation has been replaced with a price monitoring framework.

Host, or first tier, retailers exist in each jurisdiction. These are typically the incumbent retailers at the time retail competition was introduced into the State. Host retailers are required to maintain a regulated tariff for those consumers who do not make an active choice about their electricity supplier. The regulated price in each State is designed to ensure that those consumers who do not make a choice about their electricity provider are supplied electricity at a fair and reasonable price. It also seeks to ensure that retailers are not able to take advantage of any market power they may possess by raising prices prior to competition providing an effective discipline on price setting.

All other retailers, including host retailers, are able to make market offers to consumers. These offers can take any form that a retailer considers will be attractive to consumers. However, given the existence of regulated tariffs it would be unusual for prices to be set above the regulated tariff.

2.3.3 Drivers of changes in costs

The marginal costs associated with retailing tend to be impacted primarily by the number of consumers a retailer has. However, given these costs are shared amongst consumers, one additional consumer is not likely to create a proportional increase in cost. Instead, the costs associated with retailing tend to be lumpy with some economies of scale available. For example, a retailer may have a billing system or call centre arrangement that is suitable for several thousand consumers. If the retailer is able to attract one additional consumer the existing systems are likely to be able to accommodate the additional consumer at no, or little, additional cost. However, at some point the existing systems of the retailer are likely to be insufficient for some increment of consumers. At this point the retailer would need to invest in new IT systems or expand its call centre arrangements. When it does so, it is likely to again have an excess of capacity within its systems that mean that again one additional consumer will have a limited impact on the overall costs of supply.

As noted in this discussion above, the marginal costs of retailing do not change depending on how much electricity a consumer consumes. Therefore, one additional unit of consumption will have no effect on the operating costs of a retailer.

2.3.4 Implications for pricing

Given the marginal costs associated with retail operating costs are driven by the number of consumers a retailer has, rather than the amount of electricity consumed, there is no efficiency justification for prices for this component of costs to vary with consumption, let alone time. Instead, a fixed per consumer charge is more appropriate from an economic efficiency perspective. Given the shared nature of these costs, the Ramsey Pricing principles identified above are also relevant. This means that it can be efficient for retailers to require those consumers that have the least sensitivity to price rises to contribute more to the recovery of retail operating costs.

2.4 Implications for setting retail tariffs for consumers

Retailers typically will set prices for final consumers that, for the most part, are announced in advance to apply for a fixed period of time. Therefore, we have applied this assumption to our analysis of the implications for setting efficient retail tariffs for consumers.

Based on the analysis presented above of wholesale electricity prices and the broad characteristics of network costs, we have found that the cost characteristics of the sector suggest that an economically efficient price for electricity would have the following broad characteristics:

- A usage-based component that changes based on the time of use and the location of the consumer

- There is also a sound conceptual argument for there being a substantial surcharge added to the normal price in times where wholesale electricity costs are unusually high (often referred to as a critical peak price), and

- A component or components to recover any residual costs that would not be recovered with prices structured along the lines discussed above.

The appropriateness of a time of use element for prices reflects the fact that wholesale electricity costs follow a predictable pattern during each day, being higher in the morning and early evening (following the predictable pattern in electricity usage) and also have a predictable seasonal pattern, being higher in summer and winter and lower in the other months. In addition, network costs are highest during periods of peak demand, noting that it is peak demand that causes network constraints and augmentation requirements. In addition, these costs would also vary by location. This reflects differences in spare capacity available in different areas and the unit cost of the next augmentation. As a caveat, however, we note that the peak in demand that is expected on the different network elements reflects the local demand for that element, which may, but need not, occur at the same time as the time that peaks are recorded in electricity spot prices.

We also note that an alternative approach to standard time varying prices exists for signalling network costs. This is through a charge that reflects maximum demand at a particular point in time. Such a charge, assuming any practical measurement difficulties can be overcome, could also reflect an individual consumer's maximum demand at the time of peak demand. This charge would be levied upon the retailer by a network business. The retailer would then have a choice of whether the maximum demand charge was converted to a time of use charge, or whether it is merely passed through to consumers directly a choice for the retailer.

The case for there being a substantial surcharge added to the normal price in times where electricity wholesale costs are unusually high is due to the difficulty in predicting extreme price events on an ex-ante basis. While there are predictable patterns in wholesale electricity costs, events may occur that result in wholesale energy costs being much higher in a particular period than would have been predicted. Unexpected peaks of this nature could be expected to be associated with parts of the networks, or generators, being unexpectedly out of service. Importantly, if a price offer contains a critical peak price, then the remaining elements of the price can be much lower than would have otherwise been the case. This is because a premium is no longer required in the standard tariff to accommodate the costs association with such critical peak price events.

It is important to note that if the charges for the prices above are set to reflect costs, that some residual costs would remain that are not recovered through these components. At a retail level, these costs would include most of the retail operating costs, given these do not vary with an individual consumer's energy consumption. At the network level, the existence of economies of scale and scope typically would be predicted to imply that pricing at marginal cost would leave costs unrecovered, although whether this is true, and its extent, is an empirical matter. Therefore, a component, or components to recover these costs is required. The objective of this component, or components, is to recover the residual cost, while having the least effect on the amount of electricity that is consumed.

Fixed charges, which are charges that are the same for all consumers in a particular class, are often advocated as the best means of recovering the shortfall in costs that would not be recovered through the other components of tariffs. However, for fixed charges a decisions is required as to how fixed costs are varied between consumer classes and care is required to ensure that fixed charges are not so high that consumers are induced to inefficiently disconnect from the network.

As discussed further in chapter 4, we note that in practice the price responsiveness of electricity consumption is relatively low. The implication of this is that there is unlikely to be a large reduction in use (and hence efficiency) if part or all of the residual is recovered through a higher price applied to all consumption. While recovering residual costs through increased variable charges is often criticised, using this component of charges for this purpose has the benefit of linking the residual cost recovery to a measure of the benefit that the consumer receives from the service (where higher consumption levels imply a higher benefit for consumers). In turn, it would also be less likely that recovering the residual in this way would encourage inefficient disconnection from the network.

Practical limitations to setting efficient prices

We note that there are some practical limitations that can constrain the capacity for prices to accurately reflect the variations in costs identified above. For instance, prices are set by retailers up to several years in advance. The analysis provided in this report looks only at historical costs to identify what an economically efficient electricity price may be. However, in practice, a retailer would need to consider what future issues may influence wholesale prices over time. This would include considerations of likely changes to demand and electricity use as well as factors that impact on the input costs of electricity generation, such the cost of fuel or a price on carbon. The most significant limitation, however, to setting cost reflective prices is the metering technology that consumers have. Where consumers do not have time of use metering it is not possible to set prices that accurately reflect their contribution to costs.

It should also be noted that there are likely to be limitations to setting location specific charges. Ideally, each household, or at least each street, should face a different locational price. This is primarily driven by the locational specific nature of network costs. Electrical losses across networks also mean that there is justification for the energy component of prices to vary based on location. However, it can be complex and costly to identify location specific costs and to set individual prices that reflect these cost. There are a number of other factors that may also limit the extent that prices reflect locational factors including: political preferences, consumer equity issues, the ability for retailers to be able to market offers simply, and the ability for consumers to be able to compare offers between retailers.

A further factor that requires consideration for the structure of prices is consumer preferences. If consumers prefer not to have a time of use price, but instead to have a charge with a constant volumetric component, retailers would not be able to attract consumers with a time varying price offer. Therefore, a retailer would be inclined to instead develop a tariff that varies based on the volume of electricity consumed. However, even with a volumetric price efficient use may still be delivered provided that the magnitude of the volumetric component depends on the profile of the consumer’s use and the charge is reviewed over time. That is, a consumer who uses more than average during peak times would pay a higher charge than a consumer who uses relatively more in off-peak times. In such a structure the incentive for efficient usage is created through an expectation that additional peak use will translate into a higher volumetric charge in the future.

Alignment between wholesale and network peaks

For a retailer seeking to set an efficient price a further consideration will be the relationship between its different time-varying variable costs, in particular, the extent to which the peak periods it experiences for wholesale electricity align with the peak periods in network prices. While wholesale electricity costs are related to the aggregate demand across the market, network costs for the various levels of network assets are caused by the peak demand expected for the asset in question, with the demand for a particular asset becoming more location-specific for the lower levels of network assets. Thus, if network prices are aligned to network costs, the potential exists for the peak periods to be misaligned between wholesale electricity and network prices for groups of consumers. In turn, this would present a challenge to retailers when aggregating these different costs into a single price offering, including on such matters as when, and for how long, off-peak, shoulder and peak rates apply.

Taking NSW as an example, the average wholesale peak has typically occurred at around 6pm each evening. This means that on average an efficient price for the wholesale component of prices would have been relatively higher at this time compared to other times. If the network peak for a particular location also occurs at around 6pm each evening then it means that a consumer can be provided with a relatively simple and concise peak price signal.

If, however, the location specific network peak occurs at a different time to the wholesale peak, this may lead to a different construction of prices. For instance, we have identified based on data of demand at zone substations that in Cronulla the network peak occurs slightly later than the average wholesale market peak, with the peak on average occurring between 30 minutes to an hour later than the average wholesale market peak in NSW. This means that when setting a price for this location the duration of the peak price may need to occur for a longer period of time than for areas where the wholesale and network peak are better aligned.

We note that there may also be a prospect of locations where the local peak occurs at completely different times to system peak. In these circumstances prices may need to contain two peak periods, one to reflect the local network peak and the other to reflect the wholesale price peak. An alternative to setting two peak prices may be to apply a capacity charge to the network component and a time of use charge for the wholesale component. In this way the network charge can be recovered through a fixed daily price while the wholesale component can be recovered through variable charges. A further description of time of use and capacity prices is provided in the following chapter.

3 Analysis of prices

The purpose of this chapter is to assess the ability for different pricing structures to provide efficient signals for consumption. First we identify some of the options that are available with respect to pricing structures. Then we analysis prices that are presently available within the market to determine whether consumers are likely to receive efficient price signals.

Findings and recommendations

Based on the analysis, we have made the following findings:

- Flat tariffs, and inclining block tariffs, are the least effective tariffs for signalling the marginal costs of consumption. This is because they do not vary throughout the day.

- Tariffs that vary based on the time of use are likely to be more effective in signalling the marginal costs of consumption. A critical peak price is likely to be particularly effective in providing a sharp signal related to the costs of meeting peak demand or wholesale price spikes.

- Based on actual offers in the market, the majority of consumers are unlikely to face a price that reflects the costs of supplying electricity. Consumers without an interval meter face prices that do not vary over time, and therefore do not reflect the marginal costs of supply.

- Where time of use meters are in place network businesses and retailers have been active in setting time of use prices. To date, however, the locational component of prices has been limited to distribution regions.

Given these findings, actions to improve the efficiency of price signals include:

- A movement towards prices that vary over time on the basis of changes in costs can be welfare improving where the efficiency benefits exceed the costs associated with facilitating efficient pricing; such as the costs of technology.

- For those consumers who do not have a time of use meter an inclining block tariff may be preferable to a flat tariff. This is because there appears to be evidence that higher electricity use is strongly linked to air-conditioning use and air-conditioning use tends to align with peak periods.

3.1 Assessment of different pricing options

There are a number of alternative pricing options that exist for attempting to signal the costs of electricity services to consumers. The purpose of this section is to describe some of the options available to retailers and network businesses and to identify the implications and advantages and disadvantages associated with these options for signalling efficient consumption.

3.1.1 Accumulation meter tariffs

Flat tariffs

A flat tariff sets one price for consumption and does not vary by the time of year or the time of day. There are a number of efficiency concerns associated with flat tariffs, including:

- They would not signal the marginal costs of consumption. This is because while costs vary throughout the day and throughout the year, the price faced by consumers does not. As a consequence, consumers are not provided with any signals about the impact their consumption has on the costs of providing electricity.

- There is a high likelihood of flat tariffs containing cross-subsidies between consumer groups. Flat tariffs apply the same price irrespective of when different consumers consume. As a consequence, these tariffs do not reflect the different impact on the costs of providing electricity that different consumers cause.

The impact of the inefficiencies in flat tariffs is that the resource costs incurred are likely to be higher than would otherwise be needed. For instance, when wholesale costs rise above the flat retail tariff, the lack of price-responsive demand will mean that generation stock may be used in excess of the amount consumers value using electricity at that time. Conversely, when wholesale costs fall below the flat price, consumers may forego consumption that was socially beneficial.

It is relevant to also note that given the lack of alignment between marginal costs and prices, flat tariffs will tend to include a risk premium for retailers. This risk premium would seek to cover the difference between the costs they face in either the network or wholesale component of tariffs and the revenue received from consumers.

Inclining block

Inclining block tariffs see the marginal price for a unit of electricity increasing as a certain consumption threshold during a particular period (normally a meter reading cycle) are crossed. Thus, the marginal price depends upon the volume of electricity used by a consumer in a period.

Inclining block tariffs, like flat tariffs, do not vary based on the time of the day or the time of the year. Instead, the assumption with these tariffs is that consumers who consume more electricity tend to have a greater proportion of their electricity usage at high cost times, and hence cause a higher cost per unit of energy consumed (i.e., per kWh) than an average consumer.

In particular, these tariffs appear to be targeted to consumers with air-conditioners on the assumption that these consumers use significantly more energy and contribute more to summer peak network congestion.[14] If it is the case that higher consumption consumers tend to make greater use of air conditioning, then it would follow that the consumers would cause a higher per unit cost to serve. For example, a report prepared for the National Appliance and Equipment Energy Efficiency committee and the Australian Greenhouse Office indicated that for the residential sector, while air-conditioners contribute only five to six per cent of energy they contributed nearly 40 per cent to peak day demand.[15] This provides some support to the view that higher residential energy users contribute more to the marginal costs of supply.

However, it certainly will not be the case that all consumers with a higher level of consumption cause a greater cost per unit than the average consumer, noting in particular that no allowance is typically made when setting the consumption thresholds for the size of the household (given that this is difficult to observe). If the higher demand was to occur proportionately across all time periods, the per unit cost of serving the high consumption consumer would be the same as that of the average consumer. More generally, as inclining block tariffs are not based on the timing of actual consumption, they do not provide a targeted incentive to reduce demand at peak times, but rather provide a signal that is related to all use (and that only varies with the extent of use). For this reason, as with flat tariffs, inclining block tariffs are poor at signalling the costs of electricity supply to consumers.

3.1.2 Interval meter tariffs

Time of use

Time of use tariffs see prices set in advance that vary based on either the time of the day, the week (e.g. week-day or weekend), or the time of year. If a time of use tariffs varied across a day it may set a different price for consumption during off-peak, shoulder and peak times.

When set properly, time of use tariffs can be effective in signalling the predictable changes in costs of electricity. This is because a different price signal for consumption is provided at different times of the day or year. Indeed, even where these prices do not fully follow the pattern in the changes in costs, the relative difference between prices in peak versus off-peak times may be sufficient to encourage consumers to avoid consumption in peak periods. We note that as the costs of supplying electricity change based on the season, when time of use tariffs are set it would be efficient for the level of the tariff to also change by season so to better align with costs.

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[14] Ausgrid, *Ausgrid Network Pricing Proposal for the Financial Year Ending June 2012,* 30 April 2011, P.42

[15] George Wilkenfeld and Associates, *A National Demand Management Strategy for Small Air-conditioners,* Report No. 2004/22, November 2004, p. 18

It is relevant to note, however, that even with time of use tariffs, the price at peak periods is still likely to be lower than the marginal costs of supply electricity. This is because the peak price would still reflect some degree of averaging over time where they are applied for a period longer than the actual peak. Therefore, there remains a risk of inefficient over-consumption at these times. Such averaging may also mean that the price understates the short-run marginal costs of supply when an unexpected event occurs in the wholesale market.

Peak time rebate

Peak time rebates tariffs provide a payment to consumers for a limited number of hours or days where the energy price is high if consumers reduce their levels of consumption. The rebates may be funded by the avoided costs that occur when consumers take up the rebate and reduce consumption. There are a number of necessary conditions for setting a peak time rebate tariff, including:

- A baseline of electricity consumption is needed in order to determine where a consumer has responded. Caution may be necessary in setting this baseline as sophisticated consumers may seek to inflate the size of this baseline in order to attract a higher rebate at peak times.

- There is a need to be able to accurately measure the response from the consumers to the peak time rebate. In particular, there would be a need to differentiate between action from the consumer to reduce consumption and an incidental reduction in demand. For instance, a consumer may be out of the house on the day the rebate is operating. Therefore, a consumer in this circumstance would not need to undertake any action to attract the rebate. This would effectively be a windfall gain for the consumer. It would also mean that the costs of price responsive demand would be higher than they otherwise would need to be.

When these conditions are properly addressed, peak time rebates may be more attractive from the perspective of consumers, and as a consequence, may increase the participation of consumers that respond to price signals. The preferences of consumers in this respect is discussed further in chapter 4.

Critical peak pricing

In contrast to a peak time rebate, critical peak pricing sets a higher price for a pre-determined number of hours or days on which the energy price, or the marginal cost of network provision, is likely to be high. In order for critical peak pricing to be effective, consumers would need to be made aware, with sufficient time to respond, of when a critical peak pricing event occurs. Typically, as with peak time rebates, these high prices will apply only for a limited number of peak days or hours per year.

Given the costs of electricity are closely aligned to a limited number of peak demand periods throughout a year, critical peak pricing can be considered as providing efficient signals for consumption. In particular, network investment is highly dependent on being able to meet the absolute peak of demand with some level of contingency. Therefore, if the costs of meeting this peak can be signalled to consumers, demand response from consumers may play a role in providing the 'contingency' for network services.

Critical peak pricing also has the benefit of allowing prices at other times to be set with a reduced risk margin for retailers. As the extreme peak only occurs for a limited number of days or hours per year, a critical peak price can recover these costs as they are incurred without the need for a premium to be added to charges at all other times. Therefore, there is also an increased chance that otherwise efficient consumption is not dissuaded at non-peak periods.

Dynamic peak pricing

Dynamic peak pricing is similar to critical peak pricing; however, the price of the event is set considerably closer to the time of the event, for instance, the day before. Therefore, dynamic peak pricing can provide an improved link between the marginal costs of supply and the marginal price of electricity. This is particularly the case where high costs may be driven by events with reduced levels of predictability, or where several hot days in a row increase the likelihood of a peak demand event. At least initially dynamic peak pricing may be more suitable for commercial and industrial consumers who are better able to dedicate resources to monitoring high price event days and responding appropriately. However, we note that technology may play a role in the future in ensuring that the broader consumer base are aware of the dynamic peak price given it is set close to the time of the event.

Capacity or demand pricing

Capacity or demand charges seek to provide a signal to consumers related specifically to their use at a peak time. Capacity or demand charges are relevant only for network charges given that peak demand drives practically all of the usage-related network costs (noting that losses are not recovered through network charges). This contrasts to the wholesale electricity purchase cost element where costs are incurred in serving all demand (in turn reflecting the fact that fuel costs are incurred by generators during off peak times).

A capacity or demand charge means setting a price that reflects a consumer's electricity use during a peak period. There are, however, different types of capacity charges in use that have different implications for metering.

- The charges could be based upon the consumer's own peak demand during a period, for instance, one approach is to set the capacity charge based on the maximum kW or KVA recorded during the peak period of a working weekday over the previous 12 months. This charge merely requires a measurement of the consumer's peak usage during the relevant period (e.g., a year).

- Alternatively, the charge could be based on a consumer's use during the system peak, in which case a continuous measurement of the consumer's usage is required, given that the consumer's peak demand may occur at a different time to the system.

- A variation of the second option is for the charge to reflect the consumer's use during the expected peak period (that is, known in advance). Again, this charge requires a continuous measure of the consumer's usage.

These three variants also present a trade-off between the relevance (and efficiency) of the price and the predictability of the charge that is offered to consumers (and potentially also the predictability of revenue to the network business).[16] A charge that is based on the consumer's own use is a predictable charge for consumers; however, as the charge is not sensitive to the state of the network when the consumer consumes, it may well encourage demand response when it offers no benefit to the network. In contrast, charges that are based on a consumer's contribution to actual peak usage is linked clearly to cost; however, the timing of peaks cannot be predicted in advance, which lessens the capacity for response. It is noted, however, that new technologies may provide scope to improve the ability for consumers to respond to charges that reflect consumers' actual contributions to system peak.

Wholesale cost pass-through

A wholesale cost pass-through tariff would see the retailer provide a consumer with a portfolio of derivatives and a residual exposure to the spot price. This may include, for instance, a swap for a particular daily volume of electricity and exposure to the spot price for consumption in excess of that amount, or a cap on a consumer's wholesale spot price exposure. A wholesale pass through price would, therefore, potentially have a strong alignment with the marginal costs of wholesale electricity. However, there are a number of practical issues with this type of tariff that mean it is unlikely to be attractive for the majority of consumers.

- A pass through of wholesale costs would expose consumers to material price risk. Given the cap for the wholesale price is set very high, the only way for consumers to limit their exposure to this price is to reduce consumption.

- Given the wholesale price is highly volatile consumers are likely to have limited ability to know what the price is a particular point in time. Without this information it would be difficult for consumers to respond effectively to price signals. In addition, obtaining this information would likely cause a considerable increase in the transaction costs for consumers from using electricity.

[16] The predictability of revenue to the network business will also be affected by the significance of the capacity-based charge (relative to, say, fixed charges) and the form of price control to which it is subject. If the business is under a revenue cap, then any variation in revenue caused by variation in actual use would be carried forward to the next year. In contrast, under a tariff basket, the business bears the consequence of volatility in demand during a regulatory period.

- Given peak wholesale prices do not always correlate with high demand periods, a wholesale cost pass-through price may not provide good signals for network costs.

Given these practical issues it is unlikely that a wholesale cost pass through tariff is likely to attractive for the majority of mass market consumers. Large consumers, however, which are able to provide resources to monitor energy costs may benefit from a wholesale cost pass-through. These consumers may also be able to negotiate with retailers that their exposure to the spot price be limited.

3.2 Network tariffs

As indicated above, network prices are regulated by the AER. Chapters 6 and 6A of the NER set out the framework for setting distribution and transmission network revenues and prices. Transmission use of system (TUOS) charges, resulting from the chapter 6A regulation process are a direct pass through to distribution businesses and are included in the distributors calculations of network use of system charge (TUOS + DUOS). For each regulatory year distributors are required to submit annual pricing proposals which set out the tariff classes and charges[17]. We have used the information available in the distribution businesses annual pricing proposals to inform the analysis in this chapter. For the purposes of this discussion any references to 'network tariffs' is a reference to the network use of system charges, which are the summation of distribution network tariffs and transmission network tariffs for each tariff class.

Tariff classes are defined by distributors, having regard to AER guidance, and must be constituted with regard to the need to group consumers together on an economically efficient basis, and the need to avoid unnecessary transaction costs.

In the NEM, network tariffs for small consumers (distinguishable based on their annual consumption being below a prescribed level) are usually grouped together for each of the distribution areas for the purposes of tariffs and then on the basis of their meter types (standard or interval). The NER also allows that consumers can be classed based on the nature of their connection.

The common structure of tariffs for network services involves:

- Daily service charge (c/day)
- Energy consumption charge (c/kWh), and
- Fee based services that are individually charged. These include items such as connection or disconnection charges, special meter reads, and meter investigations.

While the pricing criteria in the Rules (discussed further in chapter 4) give consideration as to whether the consumers of the relevant tariff class are able or likely to respond to price signals, there is some flexibility as to how the variable charge is to be structured. Hence, within in the NEM jurisdictions there are a number of different structures and combinations of structures are utilised.

Table 4 outlines the various tariff structures for energy consumption available to small consumers in the NEM across the various jurisdictions.

Table 4 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)

[17] NER 6.18

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

3.2.1 Assessment of network tariffs

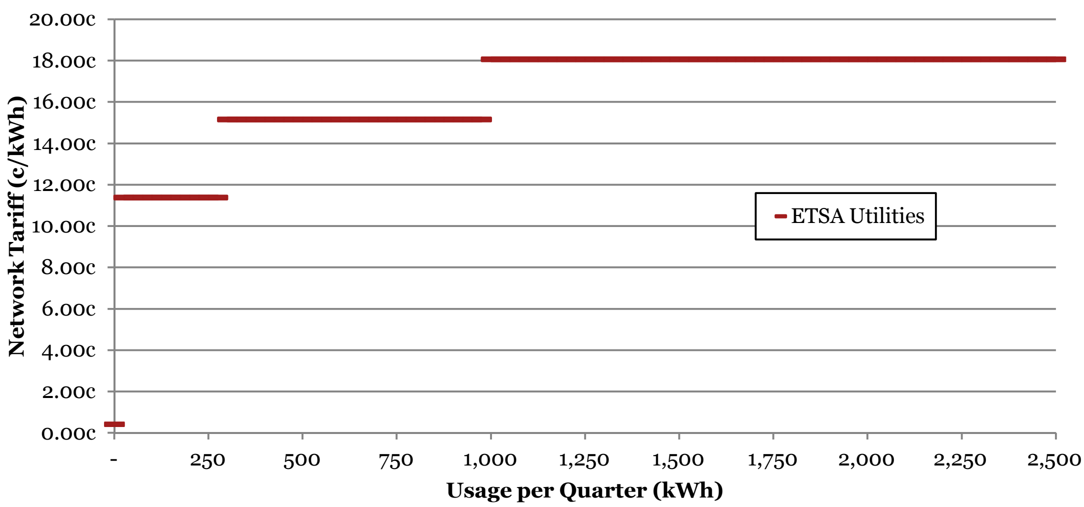
As explained in the previous chapter, network tariffs will be efficient where they signal the long-run marginal costs of supply. For this to occur, prices should be set so that consumers receive a signal about the costs associated with meeting peak demand. As indentified previously, this cost can vary based on a number of factors, including for instance, consumer location and the time of use.

Non- Time of Use Tariffs

Non time of use tariffs are used in all distribution areas of the NEM. In some areas we note that the tariffs are only available to existing consumers with no new consumers able to access the tariff. This is the case for some of the areas in Victoria and NSW. As outlined in the previous section, there are two main types of non-time of use tariffs: flat tariffs and block tariffs. Both structures are used in the NEM.

Figure 6 shows the inclining block tariff structure offered to low voltage residential consumers in South Australia. As mentioned in the previous section, the effectiveness of inclining block tariffs in signalling the costs of supply are limited as they cannot vary based on the time of use.

Figure 6: Inclining block tariff (non-time of use) for South Australia



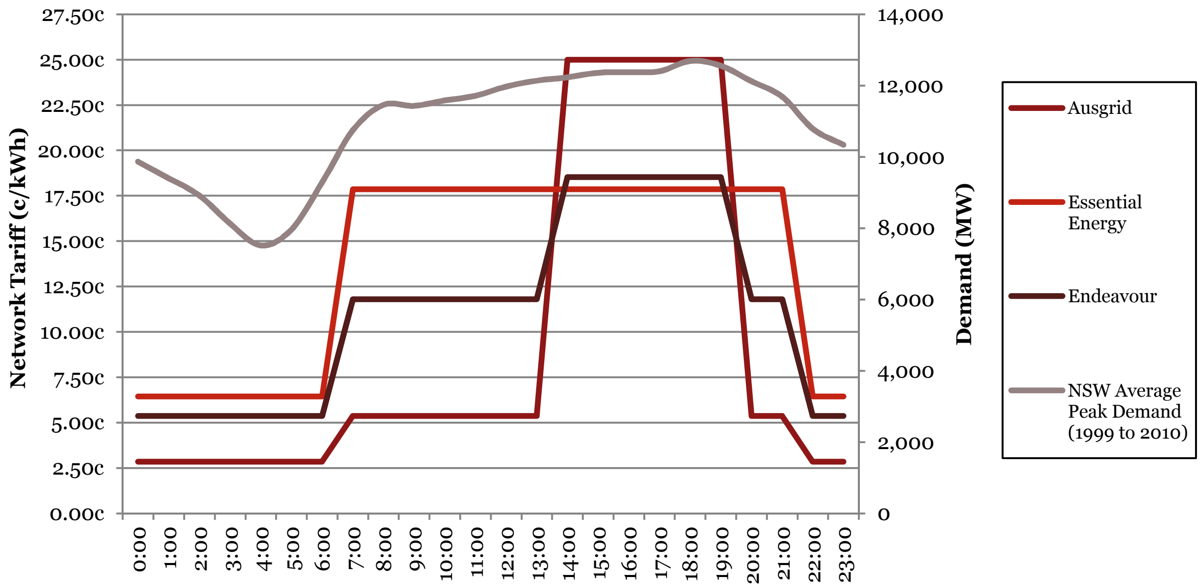
Time of Use Tariffs

With the emergence of new technologies (which are discussed in chapter 4), it has become possible to set prices that vary with use. Indeed, it appears that network businesses have been active in setting tariffs that vary based on time of use when interval meters are available.

As the previous discussions have noted, network tariffs should set a price that signals the costs of meeting peak demand. In the NEM, for the distribution areas where time of use tariffs are applied, they are structured on the basis of a peak, shoulder, and off peak price. Figure 7 shows how time of use tariffs offered by NSW distribution businesses varies throughout the day in comparison to the average peak demand for NSW.

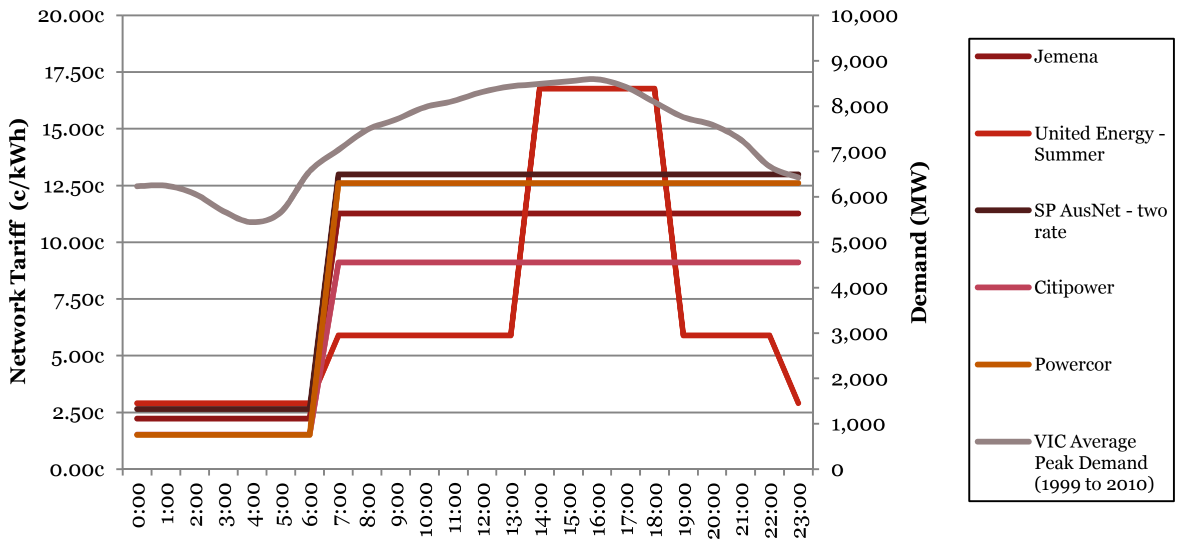
In contrast, in Victoria (see Figure 8), where interval meters are mandated by the Victorian government, the time of use tariffs offered by the majority of distribution business is a peak and off peak rate. Conversely, a tariff offered by United Energy in summer sets a different price over off-peak, shoulder and peak periods. While it is not possible to make a definitive conclusion without knowing the actual costs associated in various distribution areas (for instance, if the distribution network has excess capacity the long-run marginal costs may be low), it appears the United Energy tariff may improve the chance that consumers are provided with prices that signal the costs of peak demand.

Figure 7 NSW Network Tariffs (Time of Use)



Source: PwC Analysis of published tariffs

Figure 8 Victorian Network Tariffs (Time of Use)



Source: PwC Analysis of published tariffs

We note that network businesses have also offered some innovative tariffs for commercial and industrial consumers. For instance, distributors have been active in offering commercial and industrial consumers KVa or capacity base charges. In addition, according to distributors' tariff reports, the prices for commercial and industrial consumers are far more location specific. This even extends to the transmission charges for these consumers. While for residential consumers the transmission component of tariffs tends to be an average, for commercial and industrial consumers their transmission charges tend better reflect locational elements, particularly for those large consumers located closer to the transmission network.

Seasonal Tariffs

Two jurisdictions in the NEM make a distinction between summer and non-summer consumption for small consumers. Victorian distributors United Energy and SP AusNet each offer seasonal tariff structures combined with a daily peak, shoulder, and off peak tariff (for non-business days). United Energy offers differing summer and non-summer rates, and SP AusNet offers three seasonal variations (summer, winter, and other months). ESTA Utilities in South Australia also offers a summer and non-summer rate combined with an inclining block tariff. This degree of variation in tariffs over the day and between seasons has the features associated with efficient tariff setting as discussed above. Therefore, such tariffs may provide an improved capacity to signal the marginal costs of supply to consumers.

Figure 9 Time of Use Network Tariff offered by United Energy

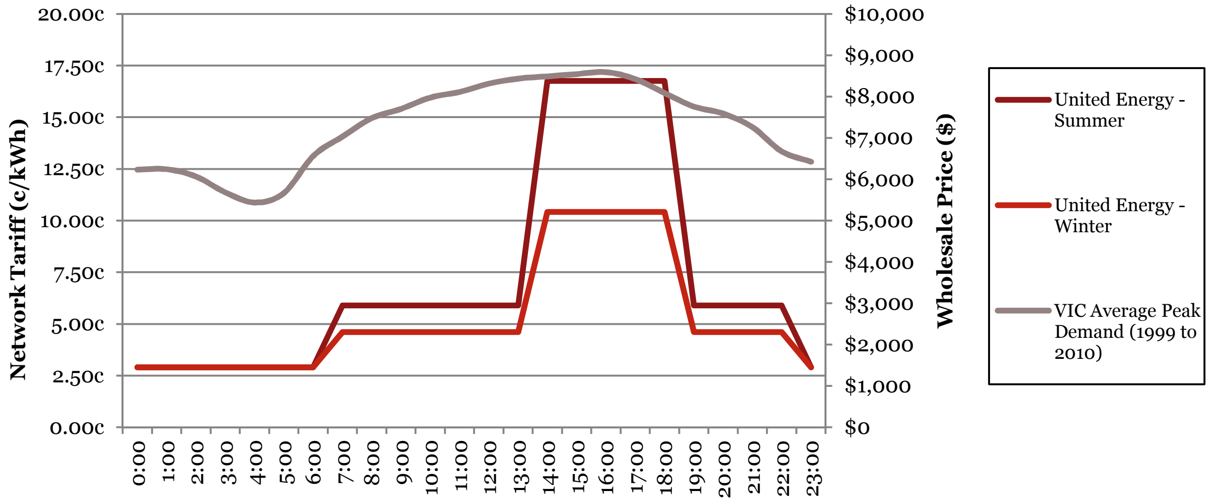
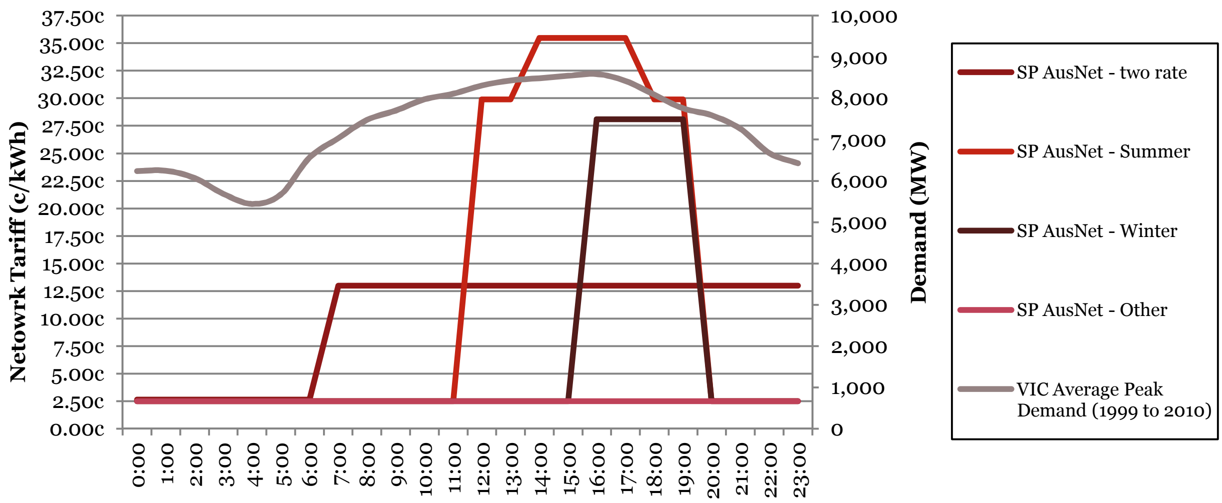


Figure 10 Time of Use Network Tariff offered by SP AusNet



Source: PwC Analysis of published tariffs

3.3 *Retail Offers*

As mentioned previously there are both regulated and market offers available in the NEM (with the exception of Victoria where only market offers are available). For regulated tariffs, network charges, jurisdiction scheme costs, and NEM fees are directly passed through. Wholesale prices are estimated by jurisdictional regulators using varying methodologies and then an allowance is granted to retailers. For market offers, however, the retailer has complete discretion on how it sets its tariffs, subject to competition.

The nature of retailers costs have been outlined in Chapter 2. It was stated that retail operating costs should, to a large extent, make up the fixed component of charges and therefore not vary with time of consumption. Alternatively, we indicated that the wholesale electricity generation costs would vary with time, both on a daily basis as well as a seasonal basis.

In order to identify the efficiency of retail tariffs, the analysis in this section takes the retail offers for small consumers located in each of the twelve distribution areas and deducts the underlying network tariff component. The case that tariffs are set efficiently would be supported by prices where the variable component of retail tariffs varies throughout the day in line with changes to the wholesale electricity price.

3.3.1 Assessment of regulated prices

In each jurisdiction a different approach is taken to setting retail tariffs. This includes different methodologies for determining an appropriate allowance for wholesale costs, as well as which costs are included for retail operating costs. The table below is drawn from a report of the Queensland Competition Authority; it identifies the different approaches undertaken in each jurisdiction to regulated tariffs. Note that the regulatory determinations relate to retailer controllable costs, therefore, regulatory obligations that impose additional costs are passed through to end-use consumers.

Table 5 Jurisdictional arrangements for retail regulated price setting

	Queensland	New South Wales	ACT	South Australia	Tasmania
Regulatory framework	All retailers required to offer supply on regulated tariff	Incumbent retailers required to offer regulated tariff	Incumbent retailer required to offer regulated tariff	Incumbent retailer required to offer regulated tariff	Fully regulated market with no choice of supplier for small consumers
Pricing period	1 year	3 years	1 year	3 years	2.5 years
Energy costs	50/50 LRMC and EPC	LRMC based on Frontier Economics Model	EPC model using market data	EPC model and AGL hybrid LRMC /EPC model	Determined by Government under Price Control Regulations
Network costs	Pass onto retailers	Direct pass through to consumers	Direct pass through to consumers	Direct pass through to consumers	Transmission cost pass through Distributor and retailer the same entity so less transparent
Retail operating costs	Benchmark cost inflated annually by an average of wage growth and inflation. Includes acquisition costs	Set after considering bottom up calculation and retailers' actual costs. Includes acquisition costs	Adjusted for CPI	Based on ROC allowances granted in other jurisdictions and actual costs of AGL SA. Includes acquisition costs.	Based on an upper end of benchmarks in other jurisdictions with FRC costs stripped out.
Retail margin	5%	5%	5%	5%	3%

Source: QCA, *Information Paper, review of Electricity Pricing and Tariff Structures*, July 2009.

Non-time of use tariffs

In Tasmania and for the Country Energy area of NSW the main regulated residential tariff follows a very simple structure of a daily supply charge and a variable charge related to all usage. This means the marginal price of electricity does not change based on any factor, including time or volume of consumption.

In South Australia and NSW the marginal price of the residential regulated tariff is based upon the volume of electricity consumed. In NSW, for the Energy Australia and Integral Energy areas, a daily service charge applies and a variable charge for the first 1,750kwh per quarter, and another charge for consumption in excess of that threshold. In South Australia tariffs are structured such that a daily service charge applies and then the marginal price of electricity increases over four step changes. In addition, in South Australia there are seasonal differences in between the tariff. Specifically a summer and winter tariff applies in South Australia.

In Queensland, both a flat tariff and a declining block tariff are offered for energy with varying daily charges. The flat tariff has a slightly lower monthly service fee than the block tariff which is made up of three consumption blocks each with a lower price. Tariff reforms were passed through the Queensland parliament on 7 September 2011 which will allow for the introduction of an inclining block tariff structure for domestic consumers from 1 July 2012[18].

Given these residential retail tariffs do not vary based on the time of day they would not signal the marginal costs of consumption. That is, while costs vary throughout the day, the residential retail tariffs described here

[18] Media Release: Energy and Water Minister for Queensland, Stephen Robertson on 7 September 2011. Available at: http://statements.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=76447

do not. Therefore, consumers would not be provided with efficient signals about the impact their consumption has on the costs of providing electricity.

Time of use tariffs

Regulated time of use tariffs are offered in both NSW and Queensland. In Queensland peak prices apply from 7am to 9pm on weekdays and an off peak applies at other times.

In NSW, there are regulated time-of-use tariffs in all three distribution areas. The offers are supplied by Energy Australia, Country Energy (Origin) and Integral Energy (also Origin). The peak, shoulder and off peak times vary slightly between the areas:

Table 6 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

3.3.2 Market offers

There is considerably more variability in the structure and form of market offers available in the NEM. It is relevant to note, however, that we have not identified any retailers that have marketed any offers that include a critical peak price or rebates for avoided consumption at peak periods for residential and small business consumers.

In the jurisdictions where there are regulated tariff structures, these tariffs tend to set the base line for the pricing of market offers.

Non-time of use tariffs

As per the network tariffs, there are retailers in all jurisdiction who offer prices that does not vary based on time of use. Such a tariff is necessary while consumers remain on accumulation meters.

The non-time of use retail offers in the NEM tend to follow the basic structure of the regulated network tariff, though not exclusively. That is, where there is a flat network tariff then the retailers tend to offer a flat usage rate to consumers. When a block tariff applies to the network portion of the offer, the retailers use the same consumption blocks to vary prices.

In the jurisdictions where there are regulated retail tariff structures, the market offers tend to mirror this structure. For example, many retailers offer a standard discount of around 3-5 per cent plus an additional percentage discount for on-time payment. While some offers provide the discount off each component of the tariff, it appears, particularly in NSW, that the discounts are in some circumstances available only on the variable component of charges.

Retailer’s market offers do not always mirror the structure of regulated offers or the underlying network tariff. In some areas where an inclining block tariff is offered by the network business, when this component is deducted, it reveals that the variable retail charge is a declining block, or varying block tariff (using the same consumption level trigger points).

Figure 11 below shows the marginal price for the underlying network charge while Figure 12 shows the marginal price for the retail component of the market offers for the distribution area.

Figure 11 SA Network Tariff (ETSA)

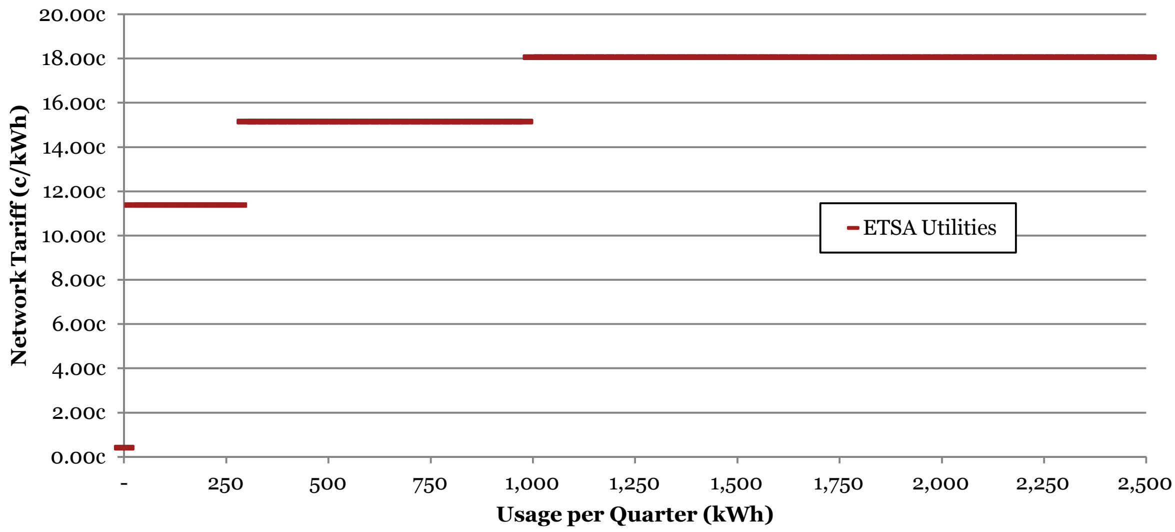
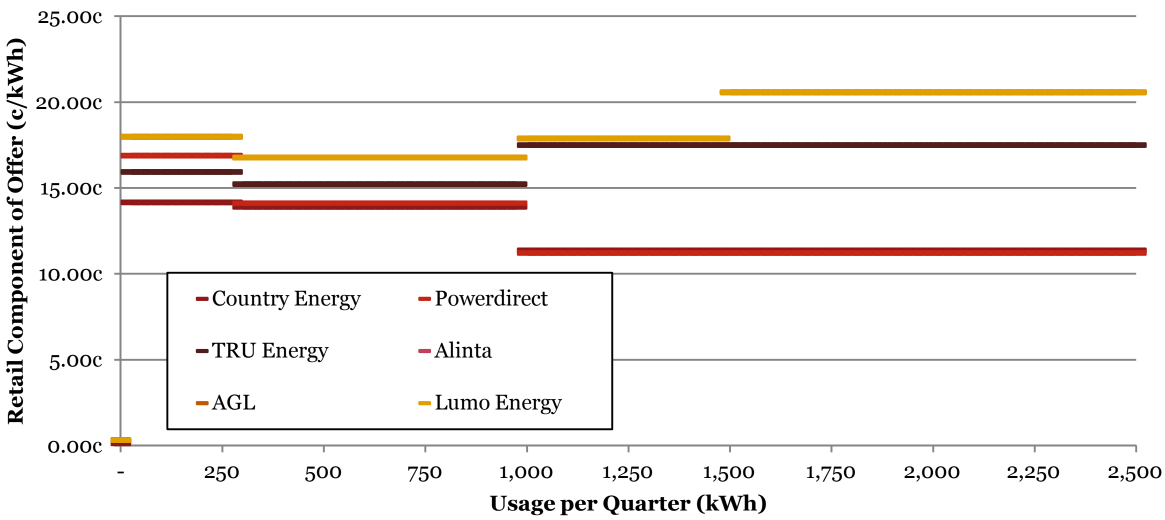


Figure 12 Retail component of market offers ETSA distribution area



* Network tariff components relating to ESTA Utilites have been stripped out of total retail offer

What it shows is that the retail component of tariffs does not align with the network component of tariffs. Indeed, for the retail component of tariffs, the marginal price faced by the consumer for the retail component falls with consumption.

Moreover, some retailers offer block tariffs where the underlying network tariff is flat, and alternatively, only offer a flat rate to consumers where the network tariff is a block structure.

Comparison of prices within distribution regions

As explained in chapter 2 above, a single wholesale electricity price exists within each region. Therefore, retailers that operate within the region would face the same wholesale spot price for energy (ignoring network losses). Given this, where competition is effective and prices reflect costs, the variable component of tariffs should be similar for retailers across jurisdictions.

The table below (Table 7) provides the average retail component of market offers in two NSW distribution regions. It shows that there is considerable difference in both the variable charge and the average daily service charge between distribution regions, with the two charges being inversely related. For the variable component of tariffs, which is the part that is impacted by the cost of wholesale electricity, there is some similarity.

Table 7 Comparison of fixed and variable rates for retail component of tariffs in NSW (non-ToU)

	Daily Service Charge (c/day)	Variable Charge (c/kWh)
AusGrid distribution region	16.82	10.09
Essential distribution region	27.33	11.15
Endeavour distribution region	31.43	15.41

Source: PwC Analysis

We note that in both distribution regions the market offers appear strongly influenced by the regulated tariff. As a consequence, the similarity in the variable component of prices may simply be due to the practice of market offers being stated as discounts off the regulated price rather than the tariff properly reflecting costs.

In Victoria, where there is no regulated retail tariff to set base prices, there is greater variation in both network and retail offers. However, like in NSW, the average retail component of market offers varies between distribution areas despite many of the retailers operating and offering contracts in all five areas and being exposed to the same Victorian wholesale electricity price (see Table 8).

Table 8 Comparison of fixed and variable rates for retail component of tariffs in VIC (non-ToU)

	Daily Service Charge (c/day)	Variable Charge First Amount (c/kWh)	Variable Charge Balance (c/kWh)
Jemena distribution area	65.951	14.382	14.382
United Energy distribution area	57.434	11.987	11.987
SPAusNet distribution area	71.904	13.203	12.578
Citipower distribution area	65.477	10.771	11.239
Powercor distribution area	60.025	13.885	12.654

Source: PwC Analysis

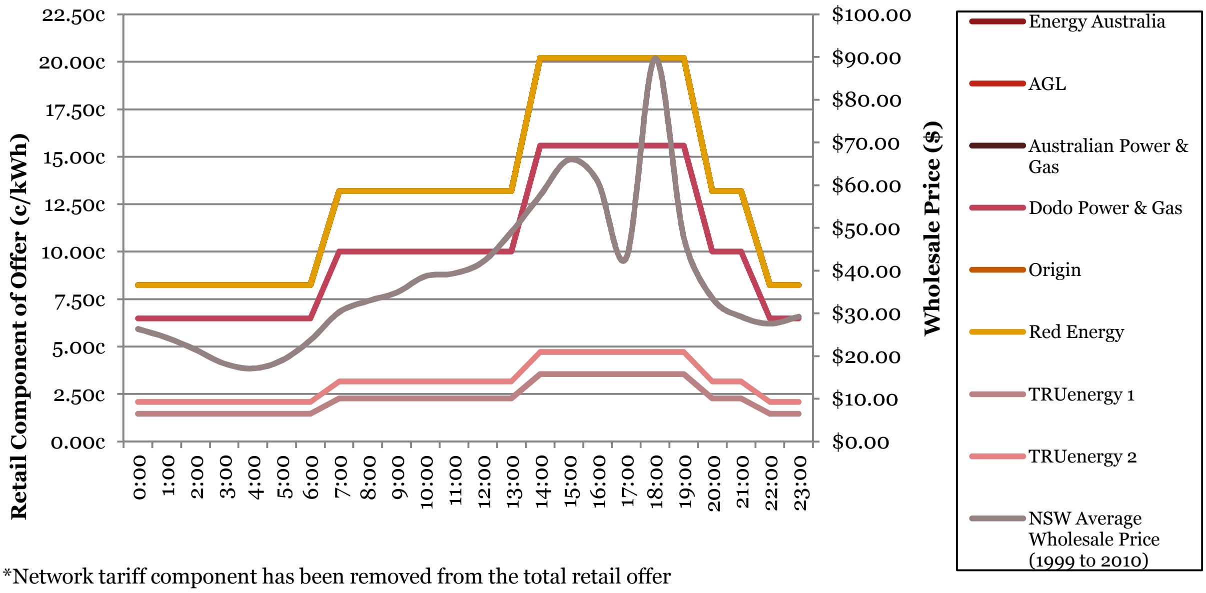
Time of Use Tariffs

As explained above, time of use tariffs set different prices based on the time of the day. In order for a consumer to be able to access a time of use tariff they will require a meter that can measure electricity at different times through the day, such as an interval meter. Without this information it would not be possible to determine how much electricity is consumed at particular times of the day.

Setting different tariffs throughout a day means that for consumers, the marginal cost of electricity consumption will also vary throughout the day. The extent that time of use tariffs are efficient will depend on the extent they align with changes in wholesale prices throughout the day.

The time of use tariffs available in the Ausgrid distribution region provide a good example of tariffs varying in line with changes in the wholesale electricity price. The marginal price and its relationship to the wholesale price is presented in the figure below.

Figure 13 Retail component of market offers in Ausgrid distribution area

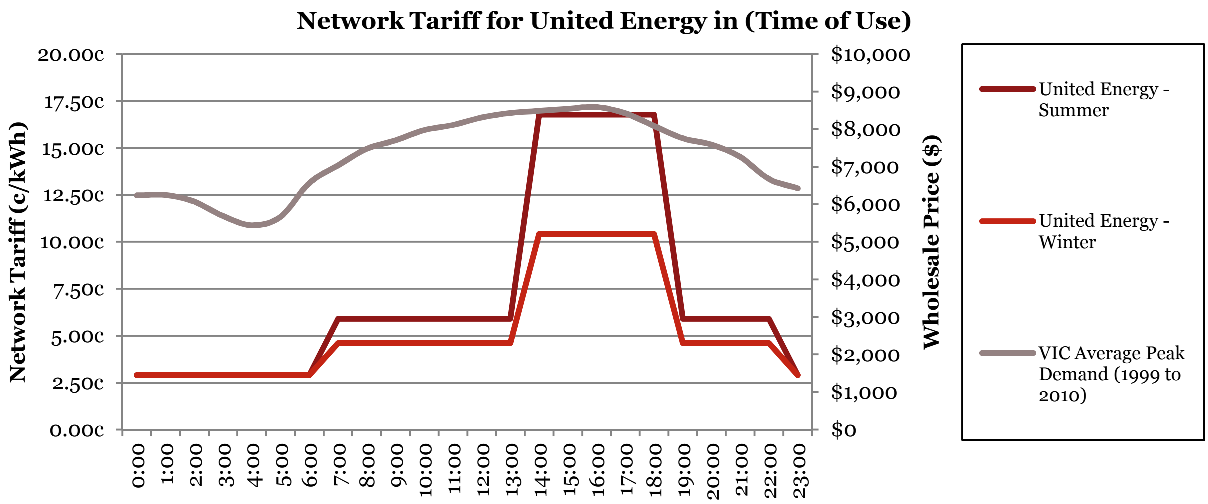


Source: PwC Analysis of published tariffs

As with the non-time of use offers, the structure of the time of use retail offers generally follow the structure of the underlying network tariffs. For instance, a network tariff may consist of an off-peak, a shoulder and a peak component, whereas the retail tariff may only consist of a peak and off-peak component. Figure 14 and Figure 15 show the network tariff and retail component of the market offer in the Victorian United Energy distribution area. What this shows is that due to the retail tariff being flat between shoulder and peak periods, during peak times, when the marginal price for network increases, the marginal price for the retail component effectively falls. It is possible that retailers in this situation expect that the revenue they receive for consumption at off-peak and shoulder periods covers the additional costs associated with peak periods.

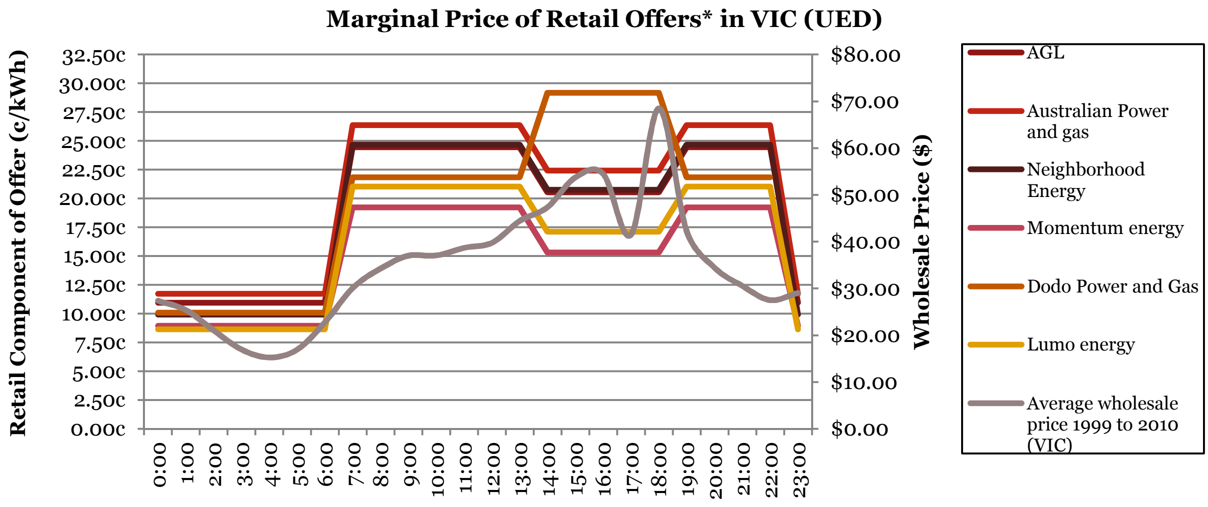
It is not clear why this occurs, however, we note that, in Victoria in particular, the issue of time varying prices is relatively controversial. Therefore, retailers may have determined that consumers would not be attracted to prices that involve an off-peak, shoulder and peak period or have not set three part time of use tariffs as a reaction to the political climate.

Figure 14 Network Tariff for United Energy (Time of Use)



Source: PwC Analysis of published tariffs

Figure 15 Retail component of market offers in United Energy distribution area

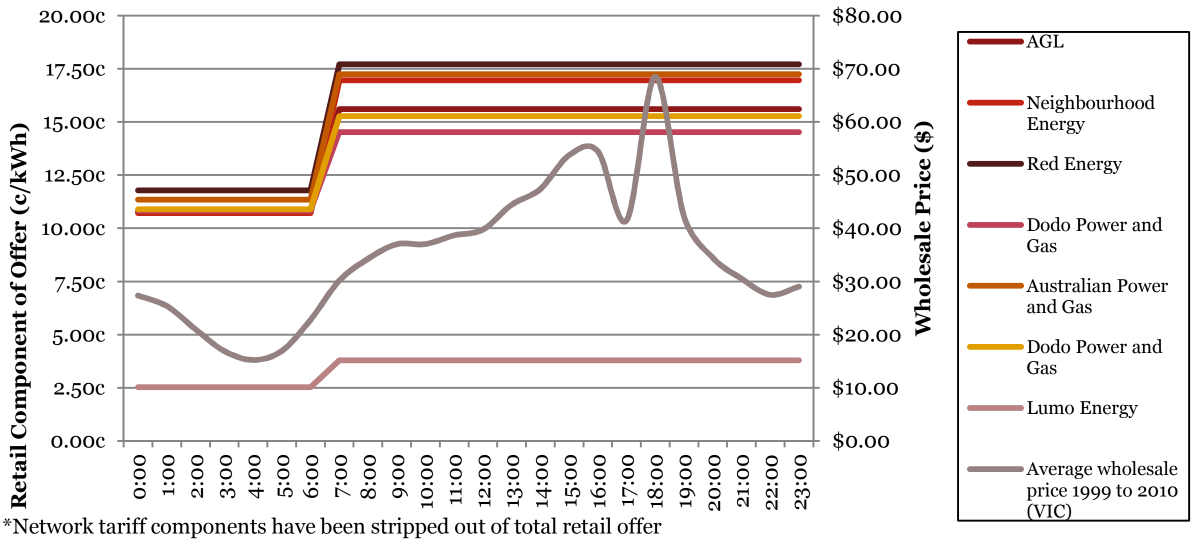


*Network tariff components have been stripped out of total retail offer

Source: PwC Analysis of published tariffs

We note that the situation in the United Energy distribution region is not reflected in every distribution region in Victoria. In those distribution regions where the network component of tariffs only contains a peak and off-peak component, the retail component of tariffs follows this structure. This is demonstrated in the figure below. This is also the case in the CitiPower distribution region, which also has a two part time of use retail tariff.

Figure 16 Retail component of market offers in Powercor distribution area



*Network tariff components have been stripped out of total retail offer

Source: PwC Analysis of published tariffs

While there are examples across the NEM of the retail component of time of use prices reflecting the variation in wholesale prices in the NEM, it appears that there are some circumstances where prices are likely to understate the costs of provision. This is particularly the case in Victoria where the marginal price of retail offers actually declines in peak periods.

While data on commercial and industrial consumers is not publicly available, it is our understanding that this sector of the market is highly competitive and retail margins are low. This reflects the importance of electricity as a cost input in the commercial and industrial sector. If it is indeed the case that margins are low for this sector it implies that the prices faced by these consumers should closely align with the costs of supply. If this were not the case, in a highly competitive environment, retailers would be able to undercut those retailers that did not set prices that closely aligned with costs.

Comparison of prices within distribution regions

Again, we have compared whether the level of the variable charge in the retail component of prices is consistent across distribution areas to provide an indication of the possible efficiency of the tariffs. As previously stated, we would expect to see the variable charge in the retail component of tariffs to be similar across distribution regions within a state given the wholesale price faced in each region, with the exception of losses, is the same.

In Victoria we find that there is some consistency between in the variable component of retail tariffs between the distribution areas, with the exception of the SP AusNet region where the peak price is relatively lower and the off-peak price relatively higher. However, there appears to be some variation in the daily service retail tariffs across regions.

Table 9 Comparison of time of use retail component of tariffs in VIC

<table>
<tr><th></th><th>Daily Service Charge (c/day)</th><th>Peak (c/kWh)</th><th>Shoulder (c/kWh)</th><th>Off peak (c/kWh)</th></tr>
<tr><td>Jemena distribution area</td><td>71.931</td><td colspan="2">16.276</td><td>10.103</td></tr>
<tr><td>United Energy distribution area</td><td>61.214</td><td>10.742</td><td>21.607</td><td>8.513</td></tr>
<tr><td>SPAusNet distribution area</td><td>68.116</td><td colspan="2">12.118</td><td>11.836</td></tr>
<tr><td>Citipower distribution area</td><td>55.379</td><td colspan="2">15.803</td><td>9.866</td></tr>
<tr><td>Powercor distribution area</td><td>59.328</td><td colspan="2">15.3525*</td><td>10.206</td></tr>
</table>

Source: PwC Analysis

* Powercor has four block inclining tariff during peak times, therefore implied figure given an assumption level of 7441kWh per month is given.

In NSW, however, there appears to be considerable variation in the variable component of retail tariffs across distribution regions. The average peak retail price in the Ausgrid region, for instance, is considerably higher than the peak retail price in the Essential Energy region. We note, in addition, the daily service charge is significantly higher in the Essential Energy region. Again, it would be expected that there may be a higher cost to service in regional areas, especially given the costs associated with consumer acquisition, however, it is not clear that such a significant difference is justified.

Table 10 Comparison of time of use retail component of tariffs in NSW

	Daily Service Charge (c/day)	Peak (c/kWh)	Shoulder (c/kWh)	Off peak (c/kWh)
Ausgrid distribution area	18.773	19.170	12.519	7.924
Essential Energy distribution area	67.946	13.559	12.836	9.981
Endeavour Energy distribution area	4.730	17.475	16.428	8.757

Source: PwC Analysis

It is particularly relevant to note that the retail component of tariffs for individual retailers also varies between distribution regions. For instance, the retail component of an AGL tariff is different depending on whether it is the Ausgrid region or the Essential Energy region. In the case of an individual retailer there is even less justification for differences in the variable component of the tariff across distribution regions.

4 Market conditions to encourage efficient prices

As identified in the Commission's Issues Paper for the Power of Choice Review, market conditions can influence the ability for parties to make and implement informed decisions. Such features may include: information, technology, pricing structures, and incentives provided by legislation or regulation. In this chapter we discuss market features and conditions for three areas:

1. Consumer drivers
2. Electricity supply business drivers, and
3. Technology drivers.

Findings and recommendations

Based on the analysis, we have made the following findings:

- Electricity is a unique service from the perspective of consumers. While it is an essential service, and consumption is relatively insensitive to price, it requires effort, time and information for consumers to make (economically) rational electricity consumption decisions. In addition, there are likely to be a number of behavioural factors that may inhibit efficient decision making by consumers even when faced with an efficient price.

- Competition should provide an incentive for retailers to set a price that reflects the marginal costs of supply. However, in a market characterised by a mix of competitive offers and regulated tariffs there may be some distortions to effectively competitive outcomes.

- When prices and costs are properly aligned and only an efficient margin is earned, there should be no incentive on retailers to discourage efficient consumption or preclude efficient reductions in consumption.

- The framework for the economic regulation of networks is appropriate and encourages efficient price signals to consumers. The exceptions to this are the application of side constraints and the arbitrary starting point of 50 per cent for the locational component of transmission charges.

- There are factors that may limit the incentives for retailers and distributors to roll-out time of use meters to consumers so that more cost reflective tariffs can be set. In both cases this is driven by the costs of either attracting consumers to time of use meters from a retailer's perspective, or the costs of a roll-out from a distributor's perspective, relative to the expected benefits. However, both retailers and networks should have strong incentives to set efficient prices if time of use meters are rolled out to every consumer within a region.

- Technology has a significant role to play in providing an effective market framework for efficient pricing. In particular:

  - the measurement of electricity at different times during the day
  - informing consumers of price, and
  - assisting consumers to respond to price signals.

Given these findings, actions to improve the efficiency of price signals include:

- Taking into consideration the behavioural biases of consumers when making electricity consumption decisions may improve the efficiency of their response. Options in this respect include using technology to overcome the costs of making energy purchase decisions, using rebates rather than price increases, or comparing consumption performance between consumers to create social pressure for changed behaviour.

- Further consideration should be given to the influence that a regulated retail tariff has on the incentives for retailers to offer cost reflective tariffs and whether there are alternative approaches that protect the interests of consumers where there are reasons to maintain pricing protection for consumers.

- Removal of side-constraints for network prices would improve the capacity for network businesses to set efficient network tariffs. However, consideration should also be given to the impacts this may have on the ability to provide consumers with relatively stable network tariffs.

- The transmission Rules identify that a 50 per cent split of revenue between locational and non-locational components of tariffs as appropriate. While this split is not binding on the businesses its existence in the Rules, and the limited incentives for network business to change the sharing between locational and non-location components of tariffs, may limit the extent that transmission prices are fully cost reflective.

- Given the ability to measure electricity at different times through the day is a necessary pre-condition for efficient pricing, where the benefits exceed the costs, consumers should be provided with time of use meters.

4.2 Consumer drivers

There are a number of unique factors about electricity that make it different from the majority of other goods and services consumers purchase. One of the key aspects of electricity is that it is considered as an essential service. This means that electricity as a service is considered to contribute to the social and economic wellbeing of the population. However, there are numerous other ways in which electricity differs from typical goods and services that consumers regularly purchase, including:

1. Electricity itself is intangible, although its benefits are not (e.g. electricity powering a television for the enjoyment of the latest episode of Masterchef). This characteristic means that for most people it is difficult to comprehend how much electricity they are using or how to conserve electricity.

2. Supply of electricity is continuous, while staple goods, although purchased frequently, can also be stored for use at a later date. This means that consumers cannot 'stock up' on electricity while it is cheap, as they may do with other products they use on such a regular basis.

3. There are limited alternatives to electricity as it is required for lighting and to power certain appliances, such as refrigerators.[19] Hence, consumers are forced to choose an electricity retailer, whereas other consumables may be optional or deferred.

4. Electricity is homogenous by nature. Consumers demand that their electricity supply be continuous and reliable. However, retailers have no influence over the basic attributes of the good. Therefore, the only basis upon which electricity retailers can compete is on price and consumer service.

4.2.1 Decision making by consumers

Given that electricity has limited, or no, substitutes and is an essential good, consumers have a limited number of choices with respect to their electricity consumption:

1. **Choice of retailer -** From the early 2000's, State Governments commenced the introduction of full retail contestability in electricity markets. This contestability enables all consumers to contract with a

[19] In some circumstances gas can act as a substitute for electricity, such as for space heating, cooking and for hot water systems.

retailer of their choice.[20] Given the homogeneous properties of electricity as a consumable good, retailers differentiate themselves through pricing discounts, bundling of services (with natural gas, for example) and consumer service.

2. **Choice of when and how much electricity to consume** – As with other consumable goods, consumers decide when to consume electricity, and the quantity needed at a particular point in time. Typically this decision should be influenced by the cost to the consumer from consuming a particular amount at a particular point in time. However, because electricity is typically an input into the use of an appliance or machine, the quantity and corresponding cost of electricity consumed may often be disaggregated from the decision to use an appliance.

3. **The choice of what electricity dependent appliance to purchase** – In response to the costs of using electricity, consumers have the ability influence the overall energy efficiency of their home or business by investing in energy efficient appliances. Improving energy efficiency allows consumers to obtain the same benefits from an appliance or machine at a lower overall level of electricity consumption. The choice of whether to buy a more energy efficient appliance will depend on the cost of the energy efficient appliance and the expected savings on electricity that would result.

4.2.2 Characteristics of electricity demand

The demand for electricity is generally characterised by predicable peak periods. While certain exogenous factors can impact demand (such as a heat wave increasing electricity demand from air conditioners), consumption is generally influenced by individual tendencies. A majority of people are governed by habits, which dictate the time and quantity of electricity consumption.[21] These habits are generally difficult to change.

Price, however, is likely to play some role in influencing the consumption decisions of consumers. In addition, given household consumers only replace appliances infrequently, and hence overall energy use is relatively stable, there will be a difference between short and long term responses to adjustments in price. In the short term, consumers may respond with immediate behavioural changes, such as turning lights off or reducing air conditioner use at a particular time. Consumers respond over the longer term by altering appliance use and investing in more energy efficient products to reduce the total use of electricity.

While a change in price may alter behaviour, the extent of impact can be understood by examining the sensitivity of consumption to changes in price. Traditional economic theory suggests that an increase in price will lead to a decline in demand. Products are sensitive ('relatively price elastic') if small changes in price lead to a large effect in demand or insensitive ('relatively price inelastic') if a large change in price has a small impact on demand. Therefore, the more sensitive the demand for a product is to changes in price, the more 'price elastic' it is considered to be.

The National Institute of Economic and Industry Research (NIEIR) undertook a review of the long-run price elasticity of electricity demand for the NEM in 2007, and estimated the values of -0.25 , -0.35 and -0.38 for residential, commercial and industrial consumers, respectively.[22] As the absolute values are less than 1.0 (indicating relative inelasticity), a 1 per cent change in electricity price will lead to less than a 1 per cent change in the quantity of electricity demanded. The residential demand for electricity responds less to price fluctuations in the short term than in the long term. [23] Therefore, electricity consumption is

[20] Australian Energy Regulator, *State of the Energy Market 2009*

[21] Fear, J., Denniss, R., *Zero Sum game? The human dimensions of emission trading,* Institute Paper No.2, August 2009, ISSN 1836-8948

[22] National Institute of Economic and Industry Research (2007), *The Own Price Elasticity of Demand for Electricity in NEM Regions*. Tech. rep., National Electricity Market Management Company; referenced in Hyndman, R., Fan, S., *The price elasticity demand in South Australia,* Business and Economic Forecasting Unit, Monash University

[23] Garnaut, R., (2011) *Transforming the electricity sector,* Garnaut Climate Change Review – Update 2011, Update Paper 8, Commonwealth of Australia, Canberra

characterised by a relatively low price elasticity of demand, such that an increase in price normally results in a less than proportionate reduction in demand.

There are several characteristics that are likely to impact consumers lack of sensitivity to changes in the price of electricity:[24]

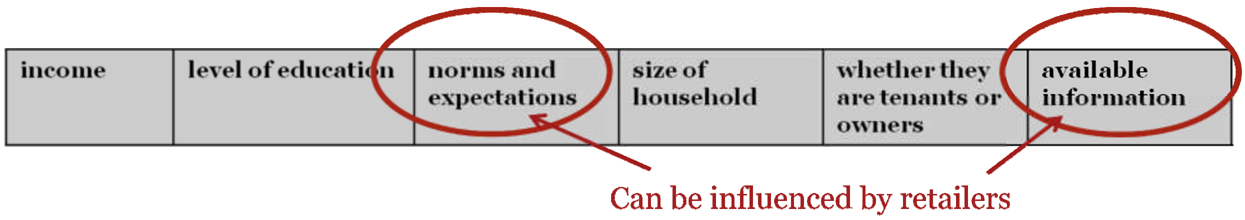
- Electricity has limited, if any, substitutes in circumstances (the exception being gas heating etc).
- Electricity is essential, rather than a luxury good.
- Numerous complementary goods and habits require electricity (e.g. a fridge requires a reliable source of energy).
- The link between the decision to consume electricity and the cost of using the electricity is delayed (i.e. months elapse between using an appliance to when the bill arrives).

4.2.3 Behavioural factors affecting demand

Assuming consumers behave rationally, private households should use any selection of possibilities to reduce their costs associated with using electricity.[25] This involves using electricity at the most efficient time and in the most efficient way. As previously indicated, an efficient use of electricity would be when the value derived from consuming electricity is equal to, or greater than, the cost of providing it. If the price of electricity is cost reflective, then consumers should make efficient decisions about when and how much electricity to consume.

Consumer behaviour and non-price aspects, however, can have a significant impact on electricity consumption decisions by consumers. Consumer knowledge and the provision of information is important for decision making, yet the *2011 IBM Global Utility Consumer Survey* revealed that many consumers do not understand the basic unit of electricity pricing and other energy concepts used by energy providers.[26] Indeed, retailers and regulators may be able to influence demand simply by providing transparent information and by better shaping consumer norms and expectations (Figure 17)

Figure 17 - Factors that may influence consumer decisions



There are a number of indications that some electricity consumers may not make fully rational decisions related to their consumption of electricity. The economic literature suggests that norms and expectations and existing ‘rules of thumb’ may lead people to make economically irrational decisions relating to their electricity consumption. For instance, it has sometimes been observed that consumers will switch retailers simply to obtain a non-price inducement, such as free football club membership, even though the price they will pay for electricity associated with that offer may be higher than other offers available. Alternatively, consumers may purchase low cost but energy inefficient appliances, which over the life of the appliance cost more than a more expensive appliance due to the amount of energy it requires.

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[24] Fear, J., Denniss, R., *Zero Sum game? The human dimensions of emission trading,* Institute Paper No.2, August 2009, ISSN 1836-8948

[25] Hamenstaedt, U., (2010) *An experiment on consumer decisions about electricity-saving household appliances*, University of Muenster, Paper for the 3rd ECPR Graduate Conference (ID 118)

[26] *IBM Survey Reveals New Type of Energy Concern: Lack of Consumer Understanding,* AcronCEO, Press Release, August 26 2011, available at http://akronceo.com/news/2011/08/ibm-survey-reveals-new-type-energy-concern-lack-consumer-understanding/

In the field of behavioural economics, there are several theories of consumer behaviour that explain some of the seemingly irrational consumption decisions for electricity. The theoretical underpinnings of behavioural economics was initially presented in the influential work of Tversky and Kahneman in the 1970's. Their work brought to light the effects of heuristics (e.g. rules of thumb) and biases to mainstream economics.[27] At the core of behavioural economics is the notion of 'framing', where seemingly inconsequential changes in the formulation of choice to consumers can cause significant shifts in preference.[28] The remainder of this section describes some of the behavioural economics theories that may be relevant in the electricity context.[29] We then follow this discussion of the theory with a description of how they may influence electricity consumption decisions in practice.

Limited consumer capacity

This theory suggests that consumers have a limited capacity to assess the goods and services offered to them. These limitations are due to scarcity of time and attention consumers can use to assess offers, as well as the knowledge and skills of individuals. For instance, one study on the psychology of decision making suggested that the 'limited capacity of working memory is used to explain many departures from optimal, rational performance'.[30]

Consumers may also be highly influenced by a 'reference point', such that they may stop searching when they are presented with a price offer slightly cheaper than their current one, even though it may not be the best option for them overall. A reference point provides consumers with quick and simple information given other information may either be insufficient or too complex.[31] Indeed, it has been identified that when presented with three options, consumers are more likely to choose the mid-price one on the basis that it must be better than the low-priced option, but more affordable than the high priced option.

Status quo bias

Decision making theories suggest that people make decisions based on ranking options and selecting the most preferred alternative. In this context, the decision for a consumer becomes whether to maintain the current situation or choose a different alternative. Doing nothing is always a possibility. Faced with new options, consumers have a tendency to remain with what they are currently doing unless they face a compelling reason to change.[32] This relates to the reluctance of people to change patterns of behaviour once they have been established.[33]

Loss aversion

A person's appetite for risk can affect their decisions to act, or to assess information. Specifically, consumers place different values on future gains and losses according to their appetite for risk. In reality, people tend to require more compensation for a loss than for a gain.[34] People seem reluctant to trade, especially when they already own or possess an item.[35] Hence, consumers may make decisions in order to avoid a small downside rather than position themselves for a greater upside.[36]

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[27] See discussion in Angner, E., Loewenstein, G., (2006) *Behavioural Economics,* to appear in Elsevier's Handbook of the Philosophy of Science, Vol. 5, page 30

[28] Tversky, A., & Kahneman, D. (1981). *The framing of decisions and the psychology of choice*. Science, 211, 453-458.

[29] Ofgem (2011) *What can behavioural economics say about GB energy consumers?,* Energy Market Research and Economics Group, UK

[30] Hastie, Reid & Dawes, Robyn (2001). *Rational choice in an uncertain world: The psychology of judgment and decision making*. Thousand Oaks: Sage Publications.

[31] Angner, E., Loewenstein, G., (2006) *Behavioural Economics,* to appear in Elsevier's Handbook of the Philosophy of Science, Vol. 5

[32] Samuelson, W., & Zeckhauser, R., (1988) *Status Quo Bias in Decision Making,* Journal of Risk and Uncertainty, 1: 7-59

[33] Angner, E., Loewenstein, G., (2006) *Behavioural Economics,* to appear in Elsevier's Handbook of the Philosophy of Science, Vol. 5

[34] Tom, S., Fox, C.R., Trepel, C., & Poldrack, R.A. (2006). *Losses loom larger than gains in the brain: Neural loss aversion predicts behavioural loss aversion*. Working Paper. Uncertainty laboratory research group, University of California, Los Angeles.

[35] See discussion in McAuley, I., (2010) *When does behavioural economics really matter?* Paper to accompany presentation to Behavioural Economics stream at Australian Economic Forum, August 2010 and Kahneman, D., Knetsch, J.,& Thaler, R. (1991) *The Endowment Effect, Loss Aversion, and the Status Quo Bias,* Journal of Economic Perspectives, Vol 5 #1 Winter.

[36] Tversky, A & Kahneman, D. (1991) *Loss Aversion in riskless choice: A reference dependent model,* Quarterly Journal of Economics 106, 1039-1061

A consumer's current situation provides a reference point to which other options are compared. While references allow for comparison, a consumer's preferences depend on their 'reference point', which is usually their existing situation (or endowment). The notion of loss aversion implies that people dislike negative departures from their reference point.[37] A reference point and loss aversion combine to make consumers averse to giving up objects currently in their possession. This can help to explain differences in price response between a price increase and price fall.[38]

Time inconsistency

Conventional economic models of intertemporal choice assume that people choose between intertemporal options by discounting according to the time they occur.[39] However, it may be that consumer preferences for immediate gains means that they place too much weight on costs incurred now compared to future savings.[40] In other words, they too heavily discount the value of future spending or purchases, leading to excessive consumption in the present at the cost of far less consumption in the future.

Time inconsistency also relates to procrastination, where people put off important decisions to the future. In this case, consumers prefer to delay payment far into the future even if they end up paying more to do so.[41]

Comparative norms and conditional cooperation

People are heavily influenced by other people's actions and opinions, especially when information suggests that they are different from the majority in any way. In this way, people use social learning to take short cuts and follow simplifying rules of thumb and routine displayed by others. In fact, when a person identifies strongly with a group, then the perceptions of social pressure can lead them to ignore their own preferences and copy the actions of others.[42]

Social norms can provide incentives for individuals to conform. Hence the behaviour of individuals, and hence groups, can be influenced by developing the desired norm within the broader community.[43] In the case of consumer decisions, individuals may respond to feedback about others' behaviour, especially when people have imperfect information and are searching for clues about the right way to act.

The impact of these behavioural themes on the consumer decision making process is summarised in the following table. The analysis in the table, which aligns with the UK Office of Fair Trading's consumer decision making framework, identifies that there are three stages of consumer decisions where behavioural factors may have an effect on electricity consumption decisions. [44]

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37 Angner, E., Loewenstein, G., (2006) *Behavioural Economics,* to appear in Elsevier's Handbook of the Philosophy of Science, Vol. 5

38 Hardie, B. G. S., Johnson, E. J. & Fader, P. S. (1993*). Reference dependence, loss-aversion, and brand choice.* Marketing Science, 12, 1993, 378-394.

39 Angner, E., Loewenstein, G., (2006) *Behavioural Economics,* to appear in Elsevier's Handbook of the Philosophy of Science, Vol. 5, page 30

40 O'Donoghue, T. & Rabin, M. (2001). *Choice and procrastination.* Quarterly Journal of Economics, 116(1), 121-160.

41 Chater, N., Huck, S., Inderst, R., (2010) *Consumer Decision-Making in Retail Investment Services: A Behavioural Economics Perspective,* Decision Technology Ltd

42 Baddeley, M. (2010) *Herding, social influence and economic decision-making: socio-psychological and neuroscientific analyses,* Phil. Trans. R. Soc. B (2010) 365, 281–290

43 McAuley, I., (2010) *When does behavioural economics really matter?* Paper to accompany presentation to Behavioural Economics stream at Australian Economic Forum, August 2010

44 Office of Fair Trading (2010) *What does behavioural economics mean for competition policy?,* UK

Figure 18 - Consumer biases and the effects on decision making

	Searching	Obtaining	Acting
Limited consumer capacity	Awareness of challenges means that consumers do not search at all	Consumers adopt pre-existing 'rules of thumb' or shortcuts to navigate and sort information	Consumers may switch to an option that is 'better' but may not be best for them
Status quo bias	Consumers do not search for alternatives	Consumers over-emphasise knowledge and benefit of existing provider or package	Consumers do not switch away from current provider or package
Loss aversion	Consumers are less inclined to search when prices fall than when they rise	Consumers place more weight on potential losses relative to potential gains	Consumers postpone making a decision
Time inconsistency	Consumers do not search for alternative energy deals or pursue energy efficient appliances	More emphasis on short term discounts or less emphasis on long term savings	Consumers do not make a decision or choose a sub-optimal option
Comparative norms	Consumers rely on information presented by other consumers	Consumers place a high weight on actions of others	Consumers choose the option that, although popular, may not be best for them

Source 1 adapted from Ofgem (2011) [45]; PwC analysis

While these behavioural biases can affect a wide range of consumer products, an increased understanding of their impact may help in designing electricity pricing structures. Regulators and electricity retailers may be able to design pricing frameworks that encourage improved responsiveness from consumers. Field experiments can provide an indication of how an understanding of the behavioural biases discussed above can be applied to electricity consumption and pricing structures:[46]

- The *2011 IBM Global Utility Survey* found that globally, more than half of respondents do not know if their energy provider has a green energy program available, and almost a quarter of those who participate in green energy programs have no idea if they pay a premium for that power, or what price they pay.[47] **Improving the transparency of pricing information to consumers may allow for more individually efficient decision making. Alternatively, the decision could be taken out of consumers hands through the use of technology, e.g. smart appliances.**

- Consumers may be more likely to buy cheaper less energy efficient appliances, discounting the future potential savings that could be obtained from more efficient appliances. **Promoting the purchase of energy efficient appliances to consumers and providing information of the potential cost**

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45 Ofgem (2011) *What can behavioural economics say about GB energy consumers?,* Energy Market Research and Economics UK

46 We note that the AEMC has also engaged Futura Consulting to undertake an assessment of demand management trials in Australia. The findings from this study would provide further evidence on how consumers behave in practice in an electricity market context.

47 *IBM 2011 Global Utility Consumer Survey,* Fact Sheet

savings may help to reduce electricity demand without the need for specific changes to pricing instruments to change behaviour.[48]

- Some consumers believe that their current provider or service is sufficient and 'good enough' for their needs. This preference for the status quo, or indifference to obtain the 'best' or most suited electricity service, may impact the responsiveness of consumers to changes in pricing. Some consumers may not switch despite substantial available savings while others may switch, but to a more expensive provider or one that does not offer the cheapest available product.[49] **The benefits of seeking supply arrangements that suit individual needs should be clearly communicated to encourage active participation.[50]**

- The tendency of consumers to require greater compensation for a loss than an equal gain affects the effectiveness of different pricing structures for encouraging efficient behaviour. Approaches that seek to deliver penalties for inefficient use (such as a tax) may provide a disincentive to consumers. **Rebates benefitting consumers may be more effective in rewarding efficient behaviour than similar instruments that lower price at off-peak times to achieve the same demand management outcome.**

- In a field experiment, households were provided with energy tips and one of four appeals to reduce energy use. Providing people with normative information about other peoples energy use ("the majority of your neighbours conserve energy") was significantly more effective in achieving reductions than appeals based on protecting the environment, benefitting society or saving money.[51] **The desire to align with peers can provide for an opportunity to reduce electricity consumption with no direct pricing mechanism or encourage an optimal response to such a pricing mechanism.**

4.2.4 Consumer impacts of cost reflective pricing

It is important to recognise that as prices become more cost reflective they will have a different effect on different classes of consumers. We have identified that there are three factors that will influence the extent a consumer will be better or worse off from a shift towards cost reflective pricing:

1. Their own load profile compared to the average load profile
2. What a cost reflective price looks like, and
3. Whether consumers have the capacity to respond.

For those consumers whose electricity consumption is not measured on an interval basis, the price they pay reflects the costs of serving the average load profile for non-interval metered consumers. The load profile is determined based on the average profile of consumption across a day for a particular area. The major issue with the use of a load profile is that the consumption of any individual consumer in an area will depart from the average load profile. For instance, if a consumer is located in an area where there is a high penetration of air conditioners, but does not own an air-conditioner, a load profile would assume a consumption profile for that consumer as if it did have an air-conditioner. Given it is assumed that the consumer consumes on the basis of the load profile, this will be factored into the energy purchase costs for the retailer. Therefore, there will be a difference between the actual cost of electricity for this consumer compared to the cost of electricity that is assumed to apply in the tariff set for the consumer. This is in effect a cross-subsidy between those consumers that consume less, or at different times to the load profile, and those consumers that match the load profile.

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48 Hamenstaedt, U., (2010) *An experiment on consumer decisions about electricity-saving household appliances*, University of Muenster, Paper for the 3rd ECPR Graduate Conference (ID 118);

49 Wilson, C., Waddams Price, C. (2005) *Irrationality in Consumers' Switching Decisions: When more firms many mean less benefit,* ESRC Centre for Competition Policy, University of East Anglia

50 Tang, Y., Medhekar, M., *Drivers of Green Power Electricity Purchase,*

51 Lawrence, C. (2011) *Reducing Electricity Use in Households,* School of Psychology, University of Western Australia, accessed at http://www.shapingtomorrowsworld.org/lawrenceReduceUse.html

Measuring and settling the consumption of consumers on an interval basis means that cross-subsidies between consuming due to load shape would be removed. As cross-subsidies are removed and consumers are priced on the basis of their actual contribution to costs, the price for some consumers may go up will the price for others will fall. In the example above, the consumer without the air-conditioner would pay less for electricity than they would under the load profile reflecting a lower wholesale cost to meet their demand.

The structure of a cost reflecting tariff may also create different impacts for different types of consumers. For instance, if an efficient price structure means the fixed component of tariffs increases substantially, those consumers that consume relatively little electricity would be worse off than before the cost reflective tariff was introduced. This case may also impact low income households relatively more given it reduces their capacity to lower total energy costs. This is because the fixed component of charges needs to paid irrespective of how much electricity is consumed. However, as discussed previously, the efficiency losses from recovering some fixed of residual costs through an off-peak variable charge is unlikely to be significant.

The capacity for consumers to respond to changes in price will also determine the size of the impact of cost reflective pricing. For instance, it could be assumed that lower income households have a reduced capacity to respond to more cost reflective prices than would high income households. This is because one of the key ways to respond to price signals is to purchase more energy efficient appliances. However, the upfront cost of these appliances tends to be higher than less energy efficient appliances. Conversely, lower income households tend to have lower energy use (due to the lack of access to air-conditioning , or other high energy use appliances, and smaller homes), therefore, the overall impact on these consumers may be less in any event.

To the extent there are concerns about the impact of more cost reflective pricing for low income households there may be a case for financial support to be offered to these consumers. However, it is important to recognise that any such financial support should be decoupled from actual electricity prices. If consumers were to receive a subsidy on the price they paid for electricity, or a tariff with in-built subsidies, it could provide an incentive for overconsumption. This is because electricity for these consumers would be relatively cheaper than the costs to supply electricity. To the extent such overconsumption was wide-spread, it may in fact exacerbate the problem of rising electricity costs.

4.3 Business drivers

There are many factors that influence the incentive for network and retail businesses to set efficient prices. In addition, the structure of tariffs, as well as form of price control in the context of network businesses, can impact on the incentives for electricity supply businesses to encourage more or less consumption. In this section we consider the impact of competition for setting efficient prices. We also consider the incentives for retailers and network businesses to set efficient prices.

4.3.1 Impact of competition on price setting

Where competition is effective, rivalry between businesses imposes constraints on their pricing and output decisions. In order to attract consumers competing firms have to offer superior price and service offers to rivals. In the context of electricity market, effective competition should provide incentives for retailers to price close to their cost of supply. That is, at a retailer’s own marginal costs of supply.

The pressure on retailers to align prices with costs will depend upon the effectiveness of competition in the market. Markets may range from being perfectively competitive to pure monopolies. It is accepted that monopoly conditions are unlikely to provide pressure on firms to price efficiently, except perhaps where there is strong countervailing pressure from the demand side. Conversely, while perfectly competitive markets provide the best competitive pressure for efficient pricing, they are generally accepted to be only a theoretical construct. This is because they are characterised by markets that have a large number of buyers and sellers, each producing a homogenous product, with perfect knowledge of the conditions of supply and demand. The cost of entry and exit in a perfectly competitive market is considered to be low, and therefore, the degree of competition between suppliers is considered to be high.

Real world markets generally sit somewhere between pure monopoly and perfectively competitive. As a market moves along the spectrum away from pure monopoly and towards perfect competitive the pressure to align price with costs increases. This spectrum from pure monopoly to perfect competition is identified in the figure below.

The pressure to align price with costs grows as with the strength of competition. The uncertain element is what is seen as enough competition to provide sufficient pressure to price at cost. The Australian Competition Tribunal's consideration of effective competition is relevant for this assessment, it stated:[52]

> *"As was said by the U.S. Attorney General's National Committee to study the Antitrust Laws in its report of 1995 (at p. 320): 'The basic characteristic of effective competition in the economic sense is that no one seller, and no group of sellers acting in concert, has the power to choose its level of profits by giving less and charging more. Where there is workable competition, rival sellers, whether existing competitors or new potential entrants in the field, would keep this power in check by offering or threatening to offer effective inducements…".*

It should be noted that increased competitive pressure also should provide increased incentives on retailers to provide services, and levels of service that consumer's desire. That is, if a retailer provides poor consumer service it would be expected that consumers would switch to alternative providers that appear to offer high levels of service quality and reliability. Competitive pressure can also provide incentives for retailers to offer innovative service offerings to consumers. The rise of 'green energy' offers is an example of retailers in a competitive environment developing new service offerings for consumers.

Given the outcomes that can be derived from competitive rivalry between firms, policies that act to increase the level of competition within the market can improve the incentives for retailers to set prices that reflect their own marginal costs of supply.

A limiting factor to increased competitive behaviour, however, may be the consumer behavioural factors discussed above. Given the tendency for consumers to stick with their present circumstances, they may not seek out alternative offers except for in unique circumstances, such as when moving home. Therefore, until consumers become more active in their choice of retailer the overall effectiveness of competition may be constrained.

It is relevant to note, in addition, that competition does not have the same role in network provision as it does for retailers. As noted previously, due to their natural monopoly characteristics, network businesses are regulated with limited, or no direct competition for the services they provide. This does not mean that there are no constraints on network pricing. For instance, the incentive to avoid consumers bypassing their network places some pressure on ensuring prices are at least below stand-alone cost.

Impact of regulated tariffs on competitiveness

As identified in the analysis above, the existing retail market is characterised by a mix of competitive market offers and regulated tariffs. The existence of a regulated tariff is justified on the basis that the current market is not sufficiently competitive to protect consumers against market power. In this circumstance a regulated price acts as a price ceiling that provides an incentive for retailers to price no higher than the regulated price.[53] It is also common for the regulated price to include sufficient margin to ensure new entry is not foreclosed. As new entry occurs and market power reduces, the need for regulated prices should also fall away.

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[52] Re: Queensland Co-operative Milling Association; Re: Defiance Holdings Ltd (1976) 25 FLR 169 at 188.

[53] In reality, a retailer could have a market offer in excess of the regulated tariff, however, in this instance a rational consumer would always choose the regulated tariff over the market offer assuming they offer the same services.

While there is a clear rationale for retaining a regulated price in the context of a market characterised by market power, it is relevant to consider the implications of the co-existence of regulated tariffs and market offers in a market where the degree of competition is increasing.

As identified above, a regulated price will tend to include an inflated margin so to provide an incentive for new retailers to join the market. Therefore, any retailer that prices at the regulated price is likely to earn margins in excess of the "competitive" margin. Naturally, for a profit motivated business, the incentive exists to only reduce prices below the regulated price to the extent necessary to avoid losing market share to competitors. As rivalry intensifies, however, it would become increasingly difficult for businesses to maintain prices above efficient costs.

In competitive markets one way for firms to maintain prices above efficient costs is to act in a collusive manner. That is, they agree amongst themselves to set prices above costs on the basis that each will benefit through higher profits than if competition was intense. This form of collusion is illegal given its anti-competitive nature and the detrimental impact it has on consumers. However, firms can also sustain super-competitive prices through implicit coordination where they interact repeatedly. This coordination can be 'policed' by 'punishing' competitors that do not maintain super-competitive prices.[54] Economists refer to this behaviour as tacit collusion or tacit cooperation. Given businesses in this situation do not explicitly agree to fix prices at a certain level it would generally not be caught by anti-trust laws.

The main barrier to tacit coordination is the ability maintain coordination absent an explicit agreement to do so. However, it has been suggested in the economies literature that the coordination problem can be deduced through the use of a 'focal point'. The role of focal points in coordination was first identified by Thomas Schelling in 1960.[55]

It is possible that a regulated price in electricity markets can act as a focal price for coordination amongst market participants. We note in the context of the electricity market that many retail market offers are characterised as a discount off the regulated tariff. The price ceiling in this instance can assist participants to identify which outcomes are more likely to occur. It can also assist participants to identify where 'cheating' may occur and allow such behaviour to be quickly punished so to avoid its occurrence in the future. A study by Knittel and Stango supports the proposition that price ceilings can act as a focal point to assist tacit coordination. Their paper concluded:[56]

> *"The finding that a nonbinding price ceiling may facilitate tacit collusion has important policy implications. For example, price caps recently have been imposed in the electricity industry to curb prices during peak demand periods. However, the high day-to-day variance of electricity demand implies that these price caps frequently will be non-binding. Our results imply that any welfare analysis of the caps should consider the possibility that firms might use them to facilitate tacit collusion. This is particularly important given the degree of distortion in market outcomes that we observe as a consequence of ceilings; they affect not only pricing, but also patterns of entry"*

The possibility of a focal price enabling tacit collusion provides support for policy makers to speed up the transition to reliance on competitive outcomes to protect consumers. While ever a regulated price exists, there remains a prospect that more competitive outcomes are dissuaded.

The existence of a regulated retail price may also impact on the incentive for consumers to take up market offers as well as the ability for retailers to set cost reflective prices over time. This could occur if the regulated retail price does not align price with cost. In this circumstance, some consumers may be better off remaining on the regulated retail price rather than taking up a market offer. Indeed, for these less profitable consumers, a retailer would have a limited incentive to make a market offer to them. This is a particular issue when interval meters are introduced and a flat regulated retail price remains. Those consumers with a poor load profile would be

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54 This outcome is referred to as Folk Theorem. Folk Theorem suggests that in repeated games participants will eventually reach a Nash equilibrium.

55 Schelling's best known description of the use of focal points involves two people who are not in contact with each other having to choose a location to meet. As there are an infinite number of possible locations each could meet at, the chances of coordination might appear to be quite low. However, in practice participants will tend to choose from a relatively short list of well known places, for instance, Circular Quay in Sydney or Flinders Street Station in Melbourne. When participants choose well known locations the chances of meeting increase significantly.

56 C.R. Knittel and V. Stango, *Price Ceilings as Focal Points for Tacit Collusion: Evidence from Credit Cards", American Economic Review,* December 2003, p.1726

better off remaining on the flat tariff, while others would be better off shifting to a market offer. Over time, as consumers with a better load profile move off the flat tariff, the load profile of consumers associated with the flat tariff would deteriorate. Given the flat tariff is a regulated price, there would be limited scope for retailers to adjust tariffs to accommodate for the deteriorating load profile.

4.3.2 Relationship between prices and revenue and profit

Retail

The structure of a tariff can influence the economics of serving particular consumers. When a tariff is structured efficiently the fixed component of the charge will contribute only to the fixed costs of provision while the variable component of the charge will contribute only to variable costs. When tariffs are structured in this manner it reduces the risk exposure for retailers, as well as limiting the opportunity for another retailer to undercut their offer. That is, if the structure of tariffs is aligned with the costs, an additional unit of consumption will lead to an additional unit of revenue that at least covers the costs of provision.

It is important to note that where prices reflect efficient costs, and are hence appropriately structured, a retailer should be relatively indifferent to an additional unit of consumption. This is because the level of profit received by the retailer will not be changed based on additional consumption. That is, an additional unit of consumption will:

1 Create an additional unit of costs, and

2 Provide an additional unit of revenue for the retailer.

As retailer's costs will increase in line with the revenue it received under efficiently set tariffs, the profit margin earned by the retailer will not change when consumption changes. Given this outcome, efficiently structured tariffs work to protect retailers from variable profit outcomes. Should demand, and therefore revenue, fall, so would the retailer's costs, and overall profit margins would be maintained. An important caveat, however, is that this approach implies that a retailer, setting prices ex-ante, has perfect foresight about future costs. In reality, circumstances change and a retailer's assessment of future outcomes may be wrong. A critical peak price, however, can reduce the need for retailers to have perfect foresight as it enables prices to be set to accommodate extreme events.

If prices are not structured efficiently, however, the profitability of consumers will depend upon their level of consumption. For instance, if revenue from the variable component of tariffs is required to make a contribution to fixed costs, a retailer will have a preference for serving large consumers and an incentive to encourage increased consumption. This is because every unit of additional expenditure would make a consumer more profitable from the perspective of the retailer.

It is relevant to note, as discussed above, that the extent that a retailer can continue to offer tariffs that do not reflect the costs of supply will be influenced by the effectiveness of competition in the market. Where a retailer structures tariffs such that prices were above costs for some, or all, aspects of the tariff, competing retailers would be able to structure an offer that better reflected costs and was therefore a lower price, raising the potential that the consumer would be lost to the retailer with inefficient tariffs.

Impact of interval meters on the incentive to set efficient prices

There are two aspects to the question of the incentives retailers would have to set efficient prices if interval meters were in place. Given the majority of consumers do not have interval meters, the first question is whether retailers have an incentive to provide consumers with interval meters to enable the setting of more cost reflective tariffs. The second question is whether retailers would have an incentive to set efficient prices if interval meters had been rolled out across a jurisdiction (for example, if distributors installed interval meters under a regulatory obligation to do so).

Turning to the first of these questions, the assumption here is that the retailer would pay for the interval meter and seek to recover that cost from the consumer in question (although the consumer would be expected to receive some credit off of its network bill to account for the fact that it no longer had an accumulation meter in place). 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:

- The cost of identifying and marketing interval meters to consumers is likely to be high. For retailers to voluntarily install interval meters they would require consumers to agree to have the interval meters installed. In the first instance retailers would need to identify those consumers that are likely to benefit most from an interval meter once the costs of installing the meter are taken into account – and, unless many consumers expect to be able to respond to time of use prices, less than half of the consumer base would be expected to be attracted to time of use prices.[57] Once this subset of consumers is identified, retailers would need to undertake a marketing campaign. Marketing electricity services to consumers tends to be a high cost exercise given the low interest and inertia of electricity consumers, and the marketing channels required, such as door-to-door marking.

- As retailers obtain more consumers on a time of use meter their costs of managing consumers may also increase. This is because there are likely to be higher data management costs associated with consumers on interval meters. The high 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.

- Where many retailers were installing interval meters – implying that there was a mix of consumers on 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 would be encouraged to take up interval meters; however, this process is likely to be slow.

If interval meters were rolled out across a jurisdiction the incentives for retailers to set cost reflective prices will change. If all consumers have interval meters retailers will be settled on the basis of actual usage rather than the net system load profile. In this circumstance, if a retailer continues to offer flat tariffs to consumers it makes serving consumers more risky. This is because the price that the retailer receives will not match the price it pays for energy to serve that consumer in the wholesale market. Therefore, a retailer should have an incentive to set cost reflective prices when all consumers are on interval meters so that the revenue it receives from a consumer better reflects the cost to provide energy. The costs of managing risk for a retailer could be further reduced in this circumstance when critical peak prices are applied. This is because the critical peak prices would reduce the reliance a retailer would have to have on caps as a hedging tool. We note, however, that the capacity for a retailer to successfully offer a time of use tariff in this circumstance may be constrained by the extent consumers are attracted to such a tariff.

Network

The key influence over the incentive, and profitability, associated with different price structures for network businesses is the form of price control applied and the Rules based guidance, or restrictions, on setting tariffs.

There are two forms of price control that are predominately applied by network businesses in the NEM, these are the weighted average price cap and revenue caps. The key differences between the two are the extent revenues are linked to consumption, and potentially the flexibility afforded to set individual tariffs.

- Weighted Average Price Cap – Price caps operate by constraining the rate of change in the weighted average of a basket of prices from one year to the next. The framework that applies in the NEM affords distribution businesses some flexibility regarding how they balance the individual prices that comprise the weighted average.

- Revenue Cap –under a revenue cap total revenue is fixed. Given the incentives provided by fixing total revenue irrespective of consumption, there tends to be greater regulatory oversight as to how prices are set under a revenue cap.

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57 If time of use prices were implemented for all consumers in a manner that was revenue neutral, the consumers with a lower cost load profile than average would pay less, and those with a higher cost than average load profile would pay more. If this cost to serve was symmetrically distributed, then half of the consumers would be expected to benefit from time of use prices. However, if consumers were required to pay for the interval meter, then less than half would obtain a net benefit from time of use prices.

In addition, hybrid forms of price controls can also be applied in the NEM. Under a hybrid approach there can be scope for revenue to vary on the basis of pre-determined cost drivers, such as consumer numbers.

Each form of price control can present different risks and opportunities from the perspective of a network business.

Incentives to set efficient prices

Each form of price control provides different incentives for setting efficient tariffs. Under any form of price control the incentive for a network business should be to maximise profits, and for a given level of profit, minimise risk.

Under a revenue cap, total revenue is fixed. Therefore, a network business will maximise profits by minimising costs irrespective of consumption. Given additional consumption at peak times can create additional cost, a network business should seek to set very high peak-prices as a means of discouraging consumption. Discouraging consumption in this manner, given the application of a revenue cap, will have no effect on revenue earned within the period. However, the foregone consumption may be inefficient from the perspective of society.

Under a price cap form of control a network business will have some flexibility in how it sets prices. Therefore, it can maximise profit, or minimise risk, by setting prices that encourage consumption when this would deliver a profit and discouraging consumption where this would incur a loss (i.e. the costs of meeting the additional costs would be in excess of the revenue earned). As a consequence of the circumstances under which profit can be maximised under a price cap, there is an incentive for network businesses to set peak use prices that reflect marginal costs.

Regulatory framework for price setting

Given the different incentives for efficient price setting under a revenue cap and a price cap, different levels of prescription are applied to provide incentives for efficient prices to be set.

Due to the limited incentive for efficient pricing under a revenue cap the Rules tend to be more prescriptive for transmission. For instance, in chapter 6A the Rules specify how the cost recovery for prescribed transmission services should be allocated across consumer groups.[58] The Rules also provide guidance on how prices should be structured. Importantly in this respect, clause 6A.23.4(e) states that '*Prices for recovering the locational component of providing prescribed TUOS services must be based on demand at times of greatest utilisation of the transmission network and for which network investment is most likely to be contemplated*'. This clause directs transmission businesses to price on the basis of long-run marginal costs, which as we identified earlier, would set an efficient price signal for consumption.

The transmission Rules, however, include a number of clauses that may limit the extent to which a transmission business can provide truly cost reflective prices. The first relates to the application of a side-constraint on price increases. For transmission, clause 6A.23.4(f) of the Rules requires that the location component of prices must not change by more than 2 per cent per annum. This means that even when the contribution to costs from a consumer class in a particular location is more than 2 per cent per annum prices cannot change by this amount to reflect this impact. It also means that where prices are presently not set efficiently, it will take multiple years for prices to be adjusted so they reflect costs.

The second possible limitation on the efficient structure of prices for transmission occurs due to the application of postage stamped pricing. Postage stamped pricing limits the extent that consumers in a distribution region receive different prices based on their location. In chapter 6A of the Rules, there is a requirement for 50 per cent of annual service revenue requirement is to be allocated to the location component of tariffs, while 50 per cent is to be allocated to the non-location component of tariffs. The extent that this causes inefficient outcomes is dependent on whether the long-run marginal costs of supply can be recovered within the arbitrary 50 per cent limit. We note, however, that postage stamped pricing is not binding for transmission as the Rules allow an alternative allocation to each component. This allocation is to be based on a reasonable estimate of future network utilisation, the likely need for future transmission investment, and has the objective of providing more

[58] Clause 6A.23.2 of the NER.

efficient locational signals to market participants and end-users.[59] Nevertheless, the existence of an arbitrary value in the Rules, and the lack of incentive on transmission businesses to make a change may mean that the locational component of tariffs may not always signal the long-run marginal costs of supply.

The Rules for distribution pricing, however, provide more flexibility than the transmission Rules. This reflects the variety of approaches that can be applied to distribution, as well as the natural incentive for efficient price setting when a price cap form of control is applied. The key pricing principles in the distribution Rules framework are that:

- The revenue expected from a tariff should lie on or between the upper and lower bound of costs so to avoid the prospect of cross-subsidy
- The charging parameters for a tariff must take into account the long-run marginal cost for the service
- The charging parameters for a tariff must be determined having regard to the transaction costs associated with the tariff and whether consumers of the tariff are able or likely to respond to price signals, and
- Any remaining revenue should be recovered in a manner that causes the minimum distortion to efficient patterns of consumption.

Again, as identified previously, the fact that this directs distributors to pricing the long-run marginal costs of supply, in combination with the other requirements, indicates that consumers should, where prices are set in this manner, receive a price that reflects the marginal costs of consumption at a particular point in time.

Similar to the arrangements for transmission, the distribution Rules also include a side constraint. The side constraint requires that the expected weighted average of revenue raised from a tariff class for a particular regulatory year must not increase by more than the CPI-X limitation plus 2 per cent. The Rules do not, however, put a side constraint on changes within a tariff class. Therefore, there is scope for distributors to adjust tariff structures to individual consumers within a tariff class. Importantly, the Rules also put the following limitation on the application of the side constraint:

> *This clause does not, however, limit the extent a tariff for consumers with remotely-read interval metering or other similar metering technology may vary according to the time or other circumstance of the consumer's usage.*

This exception is important because it is in these circumstances that cost reflective pricing is possible.

Impact of interval meters on the incentives to set efficient prices

As with retailers, interval meters provide an opportunity for network businesses to set tariffs so that revenues better align with the drivers of cost. In addition, when smart technologies are added to interval meters they can allow network businesses to better manage the operation of the network or to reduce meter reading costs. The economic case for a network business to roll-out interval meters is dependent on whether the network savings are larger than the costs of the meter installation, and whether a regulatory allowance is made for the costs incurred in rolling out the interval meters . Submissions by network businesses to the MCE's cost benefit analysis for smart meters indicated that there were concerns about the uncertainty of costs and benefits for a roll-out.[60] In addition, the decision to roll-out interval meters or smart meters would depend on whether it is the lowest cost mechanism of reducing network costs. For instance, making a payment for a specific demand response, or direct load control, may achieve the same outcome for a network business as a rollout of interval meters with more certainty and at a lower cost.

It is also relevant to note that the incentive framework for network businesses can have some influence on the incentive to rollout interval meters. Under the present framework businesses are able to retain the differences between forecast and actual expenditure over a regulatory period. However, if the benefits, or savings, from interval meters, accrue to a network business in a subsequent regulatory period they may not be able to capture

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59 Clause 6A.23.3(d)(2) of the NER.

60 See: http://www.ret.gov.au/Documents/mce/_documents/Consultants_Response_to_Submissions_Recived_on_the_Phase2Report20080915085648.pdf

all of the possible benefits. Therefore, the incentive to install interval meters may be weakened. We note, in addition, that the benefits that can be obtained by the network business in this instance are also limited to those that occur at the network level, despite the prospect of additional benefits being achieved at the wholesale market level.

When a consumer has an interval meter, however, the evidence appears to be that there has been little reluctance for network businesses to set time of use prices. For instance, before the moratorium on time of use pricing in Victoria, companies such as SP AusNet had received approval from the AER to introduce a time of use tariff for small commercial and residential consumers that provided a sharp difference between peak and off-peak prices. We understand that, aside from the moratorium in Victoria, all consumers that have an interval meter also have a time of use price.[61]

While network businesses appear to have been encouraged to set time of use pricing for consumers with an interval meter, network businesses do not yet appear to be setting different tariffs on a geographic basis. One reason for this may be that there is insufficient penetration of interval meters for network businesses to set geographic tariffs effectively. Another factor that may influence the introduction of location specific tariffs may be a political environment that values consistent prices across locations for consumers.

4.4 Technology drivers

Technology can have a significant influence on both the ability for businesses to set efficient prices as well as the capacity for consumers to respond. However, new technology comes at a cost. We note, however, that an assessment of the full costs and benefits of different technology options is outside the scope of this study. In particular, we have not considered functions that do not contribute to either efficient price setting or consumer response to prices. Nevertheless, it is worthwhile considering the role that different types of technology may have in facilitating more efficient price setting and response by consumers. On this basis we have separated our analysis between technologies that assist the supply side in setting and applying efficient prices, and those technologies that assist consumers in perceiving and responding to the price signals.

4.4.1 Supply side functions required for efficient pricing

We concluded earlier that an efficient price for electricity should vary with the time of the day, season, and potentially also with extreme events. A pre-condition for setting this form of price is the ability to measure electricity consumption at different times of the day. Therefore, from the supply side perspective, a key role for technology is to provide data on when consumers consume electricity. When armed with this information retailers and network businesses are able to do two things:

1. Identify the extent a consumer contributes to the costs of supplying electricity, and
2. Apply a price based on the timing of electricity consumption.

There are three main electricity metering technologies that are available in the market today. These are:

- Accumulation meters – these meters measure the total volume of electricity used over an extended period and do not provide any information about when electricity is consumed during that period. Typically, these meters need to be read at the meter.
- Interval meters – these meters are able to measure consumption at different times of the day although they may be read infrequently. We have classified interval meters as those meters which require local reading.
- Smart meters – smart meters are the same as interval meters except that they embody additional functions, relevantly here, being able to be read remotely.

Given the key requirement for setting efficient prices is the ability to measure electricity at different times of the day, the minimum level of technology that is necessary is an interval meter. This means the scope for providing

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[61] We note, in addition, that different incentive issues may arise where consumption falls as a result of time-of-use prices and there is a resulting reduction in revenue. We note that this issue was addressed in some detail in the Final Report for Stage 2 of the Review of Demand-Side Participation in the NEM.

consumers with an efficient price signal when they possess an accumulation meter is considerably reduced. As long as accumulation meters exist it is not possible to settle consumers based on their actual consumption, and also not possible to set prices, and receive revenue, that reflects the timing of a consumer's actual consumption. The table below provides a summary of each metering technology and its potential for enhancing price signals.

Table 11 Metering technologies and their capacity to enhance price signals

Function	Enabling technology	Availability of technology	Cost of technology	Potential for enhancing efficient price signals
Provision of electricity usage information	Accumulation meters / pre-pay meters	Already common	Low	Limited
	Interval meters (local read)	Common for large users	Medium	Moderate (depending upon load predictability)
	Smart meters (remote read)	Many options available	Medium - high	High

The manner in which a meter is read does not impact on the ability to set efficient prices. As long as data can be gathered to reflect the timing of consumption, retailers and network businesses will be able to set prices that relate to the time of use. A possible advantage of remotely read meters is the ability to receive data quicker. Receiving data quicker may enable prices to be updated more frequently. However, constant variability in tariffs is likely to be administratively costly and also potentially unattractive to the majority of consumers.

4.4.2 Demand-side functions required for efficient pricing

From the perspective of consumers, technology can have a role in facilitating an efficient response once efficient prices exist. This can be achieved by:

- Providing information about the use of electricity at a particular point in time
- Providing information about the cost of electricity at a particular point in time, and
- Making decisions on behalf of consumers.

The table below provides an assessment of each of these types of facilitating technology and their ability to enhance a consumer's response to price signals.

Table 12 Technologies and their capacity to enhance consumer's ability to respond to price signals

Function	Enabling technology	Availability of technology	Cost of technology	Potential for enhancing efficient price signals
Provision of electricity usage information	Accumulation meters / pre-pay meters	Already common	Very low	Very limited

	Interval meters (local read)	Common for large users	Low[62]	Very limited
	Smart meters (remote read)	Available – but not widely marketed	Medium - high	Very limited
	In home displays – energy usage only (either aggregate usage or dis-aggregated by equipment)	Available – but not widely marketed	Medium	Limited - Medium
Provision of electricity cost information	Electronic information via computers / mobile devices	Available – but not widely marketed	Medium	Medium
	In home displays - energy usage and cost (either aggregate cost or dis-aggregated by equipment)	Available – but not widely marketed	Medium - high	Medium
Ability to reduce and/or shift demand (load control)	'Dumb' controls on individual equipment (start time programming or delay functions)	Already common	Low	Medium (better when combined with an in-home display)
	Remote control (via contracts that enable the utility to control equipment remotely)	Not commonly available	Medium	Medium
	Smart controls that can communicate with various equipment (e.g. Home Area Networks)	Not commonly available	High	High

Technologies that provide consumers with information, while useful, still require them to assess the information and make a decision. Making this decision is a cost to consumers, mainly in the time it takes to make an assessment of the costs and benefits of consumption. In addition, as noted above, consumers have only a limited capacity to assess the benefits and costs of consumption at a particular point in time. On that basis, we consider that technologies that help to improve the information consumers have about price and use are likely to have only limited effectiveness.

Given the costs and ability for consumers to make informed consumption decisions, it may be the case that increased automation of consumption may be needed. Such automation can still be undertaken based on the preferences of consumers, however, it avoids the need for constant decision making by consumers. We note, given the status quo bias of consumers and their risk aversion that they may only be initially willing to cede limited control of equipment to electricity supply companies. As a consequence, opt out schemes may be the preferred method for shifting consumers to this type of technology. In addition, consumer education and acceptance is likely to be the biggest challenge encountered with technologies that can assist with efficient

[62] We note that where a consumer has a locally read interval meter that the retailer may provide information on the consumer's bill about their load profile. Where this information is provided this would go some way to providing relevant information to consumers about their consumption patterns and how improvements could be made to reduce energy costs.

responses to price signals. Therefore, the rate of acceptance may also be linked to perceptions over the magnitude of cost savings available, which in turn will be linked to perceptions over the costs of electricity.

4.4.3 Conditions required to enhance the availability of technology

One of the biggest factors limiting the widespread use of technology in the electricity market is its cost. Many of the technologies are new and therefore remain high cost relative to the cost savings that can be achieved by consumers through their use. However, the cost of enabling technologies is likely to fall as they are increasingly deployed to consumers and scale improves.

We also consider that the increased use of technologies may be further facilitated by evolving business models including:

- Third party aggregators who are prepared to deploy and recover the up-front investment of technology through sharing in the resulting reductions in electricity costs (for example, through a typical retailer model)

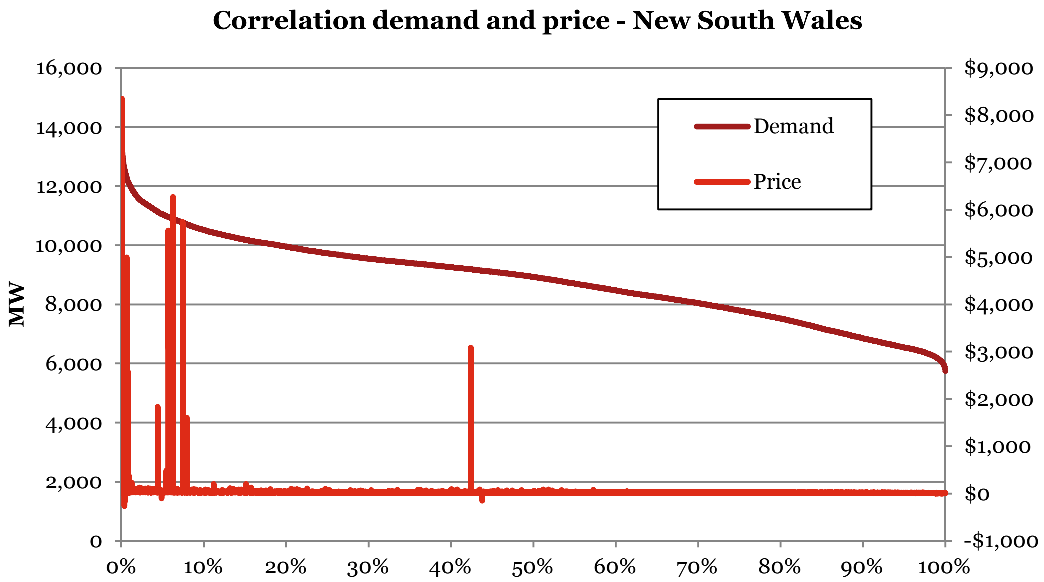
- Technology providers or utility companies who are willing to subsidise the cost of providing electricity load control or in-home displays because of other desirable outcomes. For instance, the potential value of obtaining consumer information and / or the ability to communicate with consumers as a sales or marketing channel, and

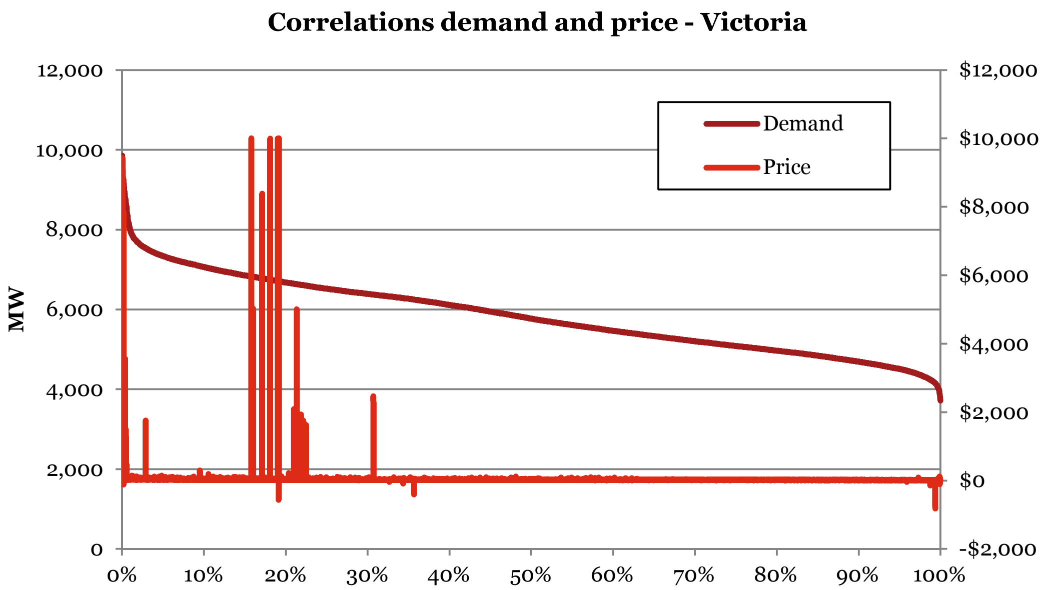
- Equipment manufacturers who are willing to subsidise the costs in order to gain a foot-hold into the market. Once achieved, this may allow other products or services to be provided to consumers.

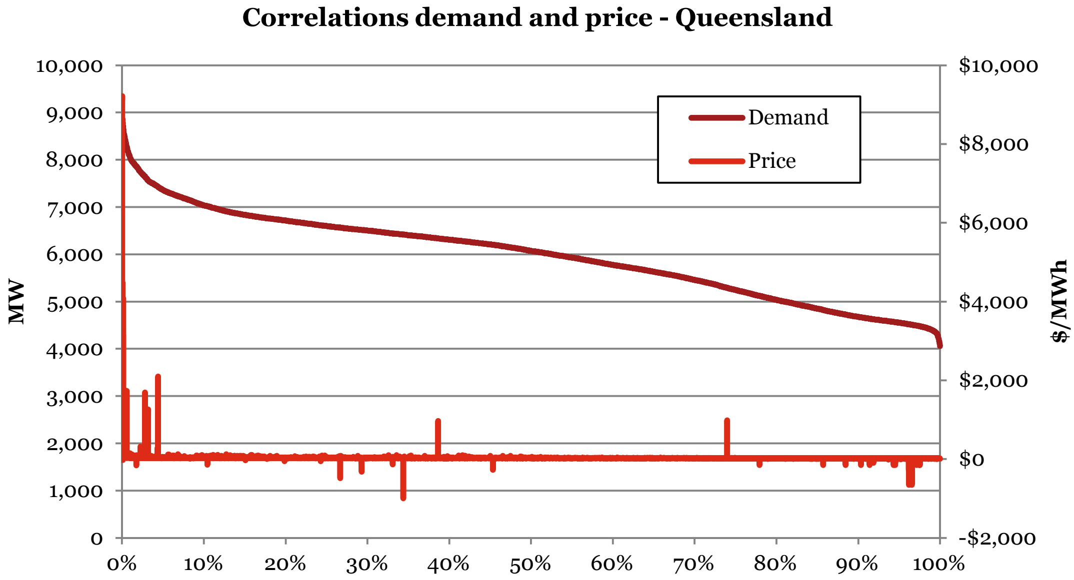
Appendices

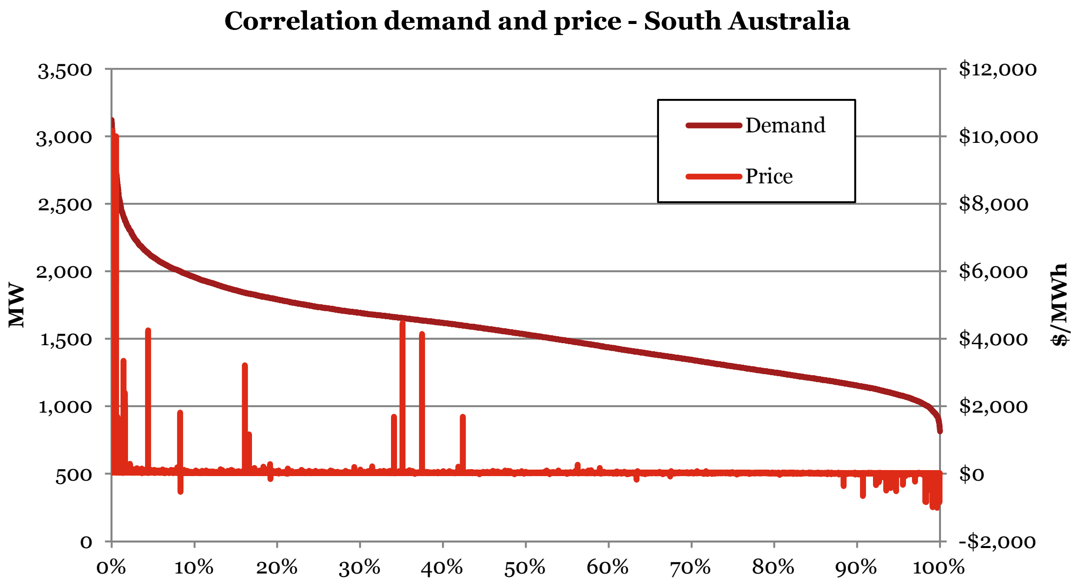
Appendix A Correlation between price and demand 2010

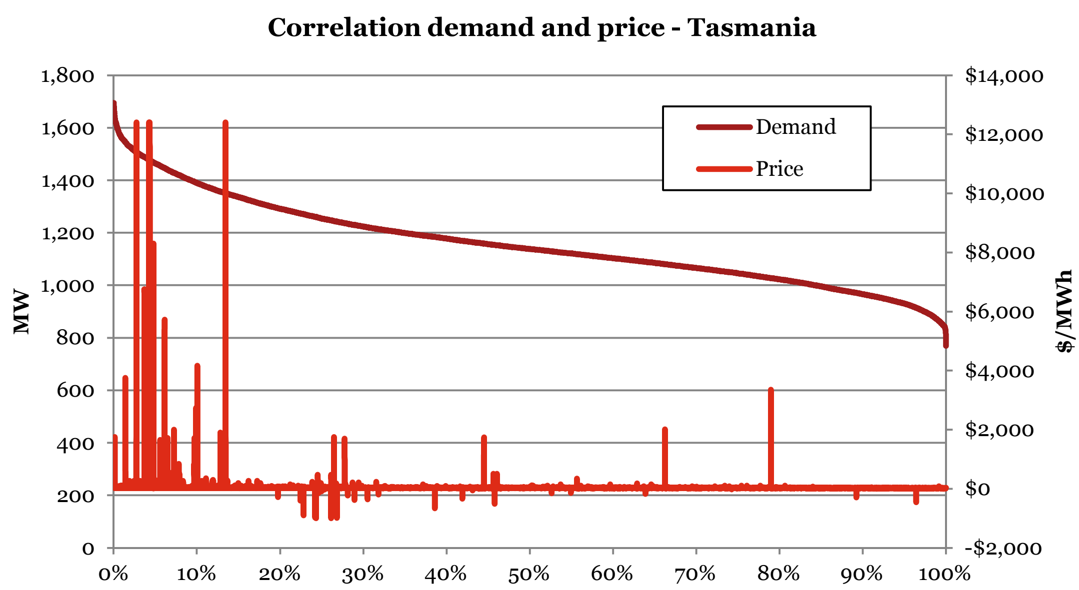
The figures below provide PwC analysis of AEMO data.






Correlations demand and price - Queensland
Demand
Price
MW
$/MWh
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
$10,000
$8,000
$6,000
$4,000
$2,000
$0
-$2,000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%


Correlation demand and price - South Australia
Demand
Price
MW
$/MWh
3,500
3,000
2,500
2,000
1,500
1,000
500
0
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
-$2,000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%



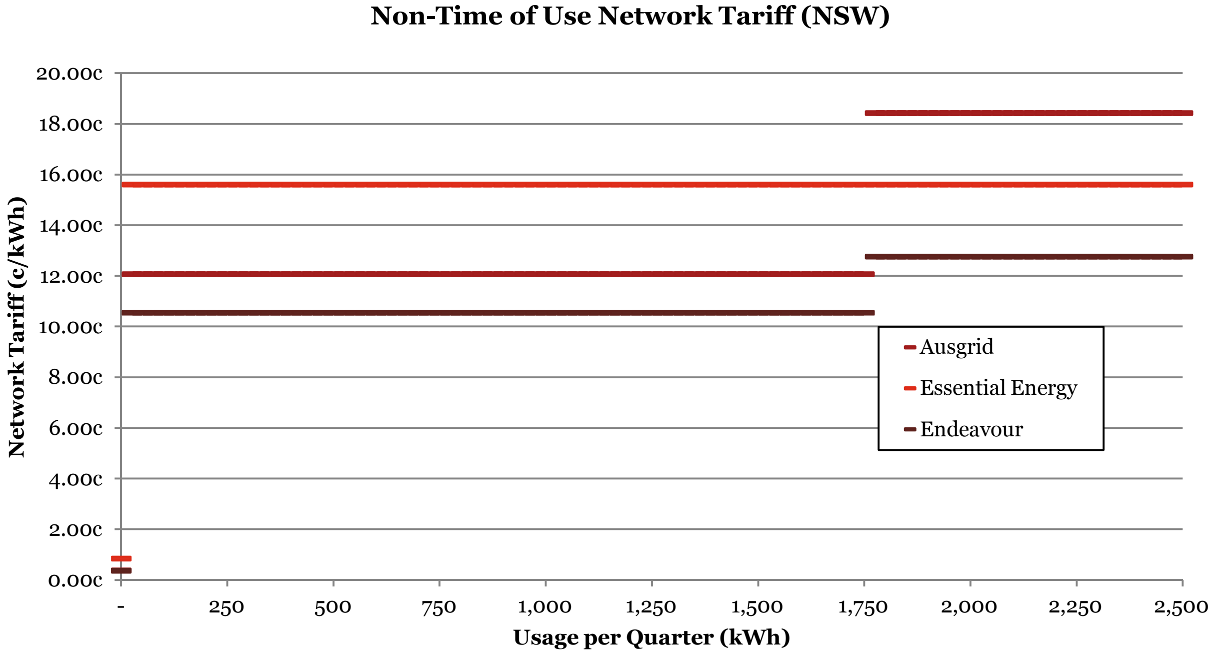
Correlation demand and price - Tasmania
MW
$/MWh
Demand
Price
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
-$2,000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Appendix B Network tariff and retail offer supplementary data

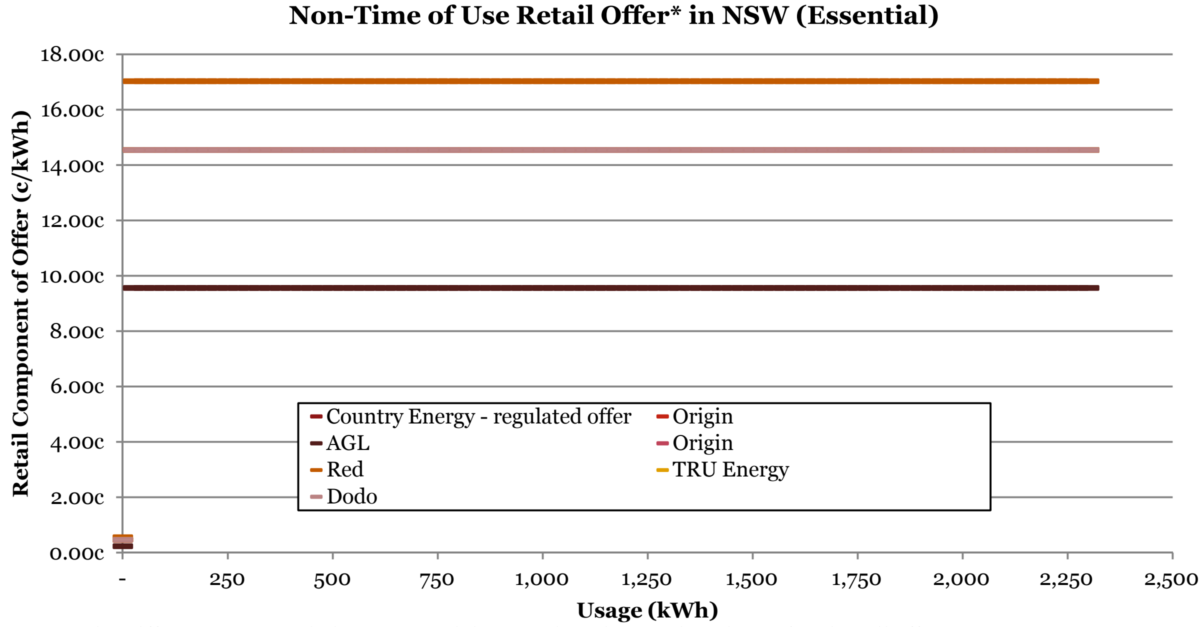
The figures below are PwC analysis of published tariff data

4.5 New South Wales

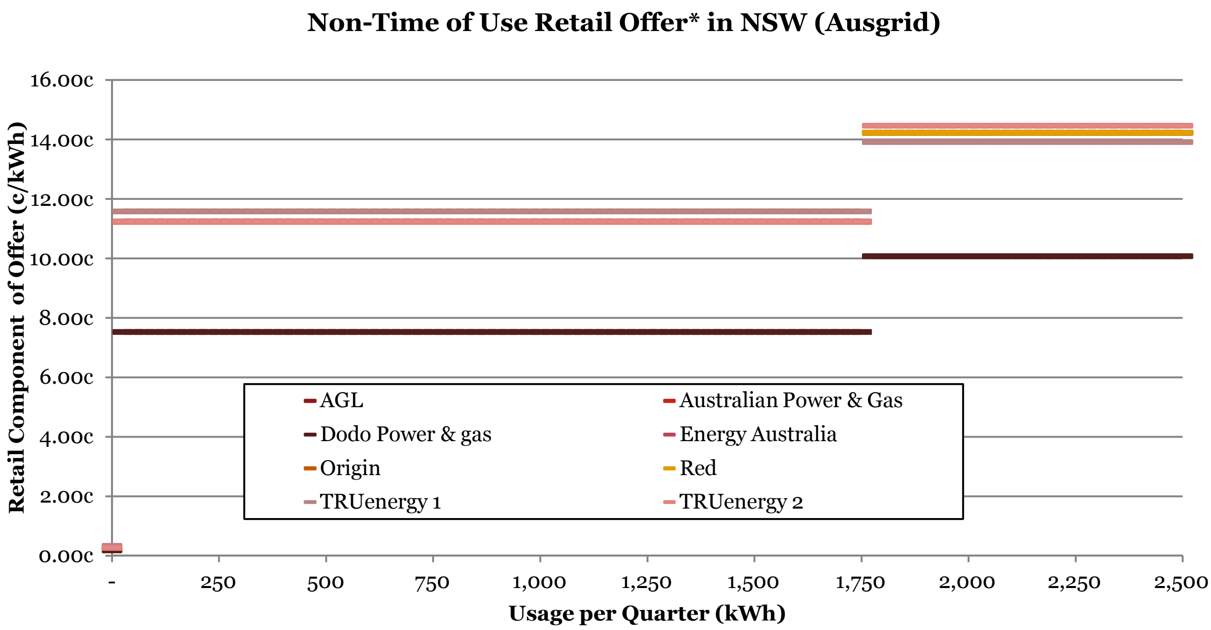
4.5.1 Non – Time of Use – Network Tariffs



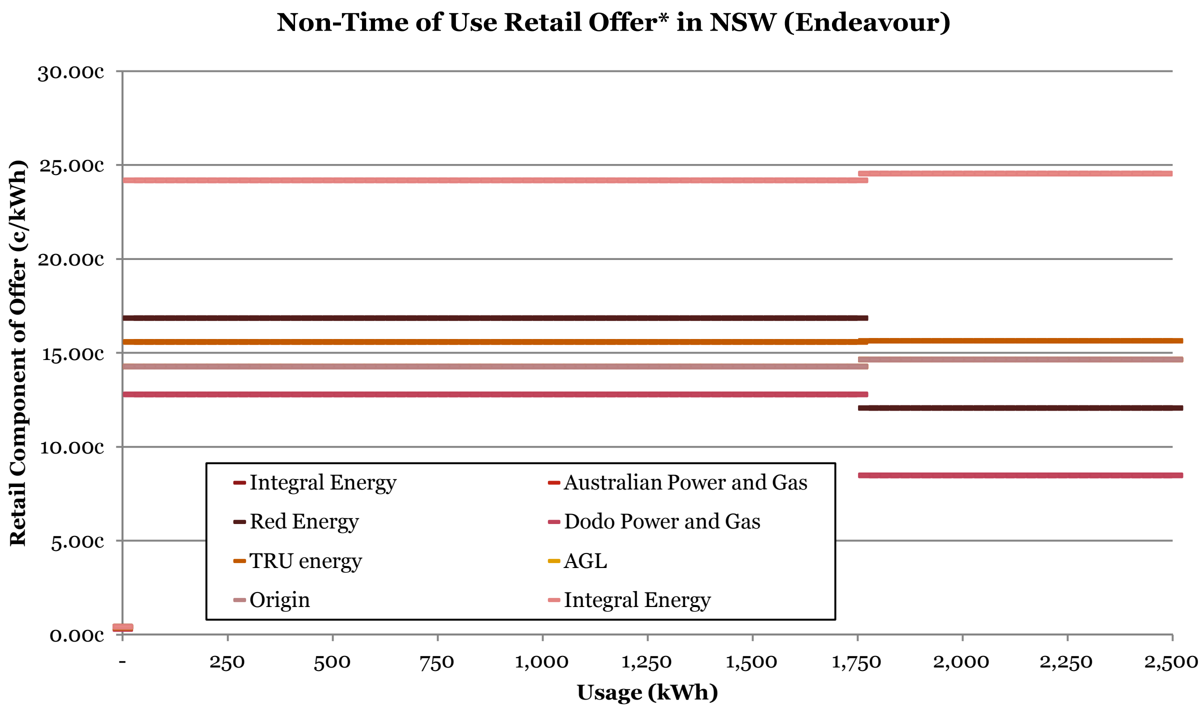
4.5.2 Non – Time of Use – Retail Component



* Network tariff components relating to Essential Energy have been stripped out oftotal retail offer

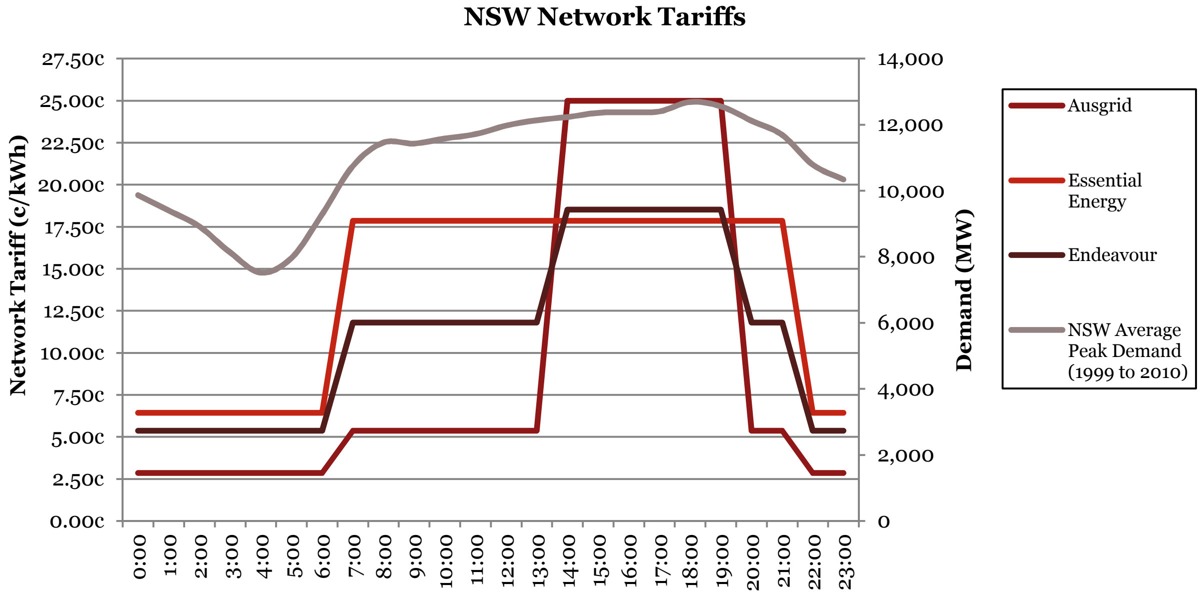


* Network tariff components relating to AusGrid have been stripped out oftotal retail offer

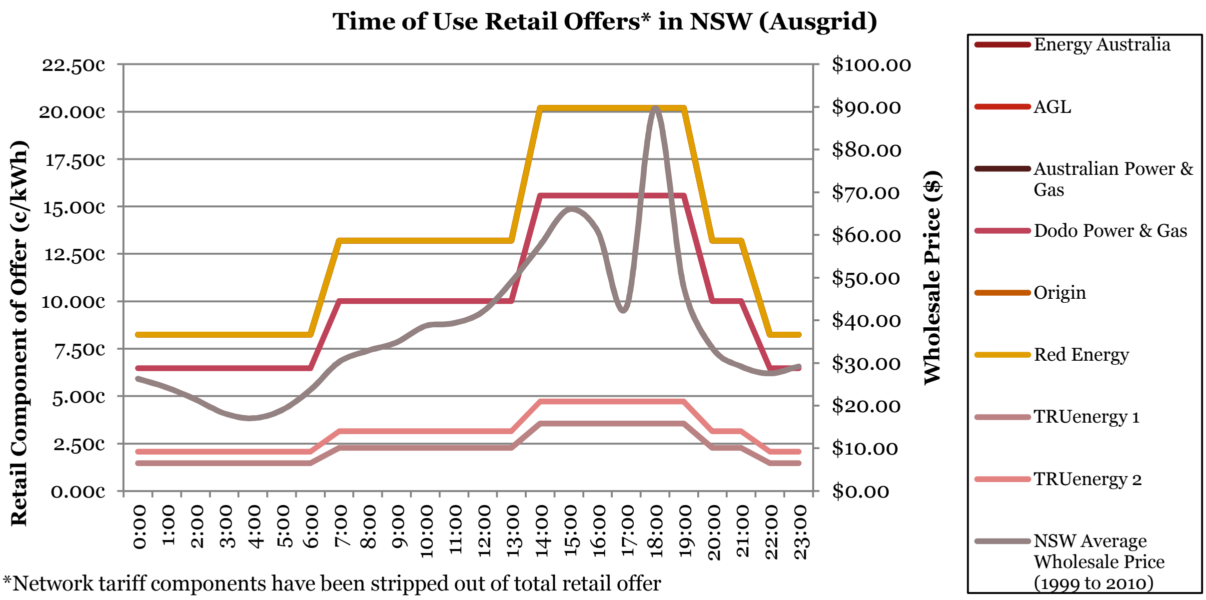


* Network tariff components relating to EndeavourEnergy have been stripped out oftotal retail offer

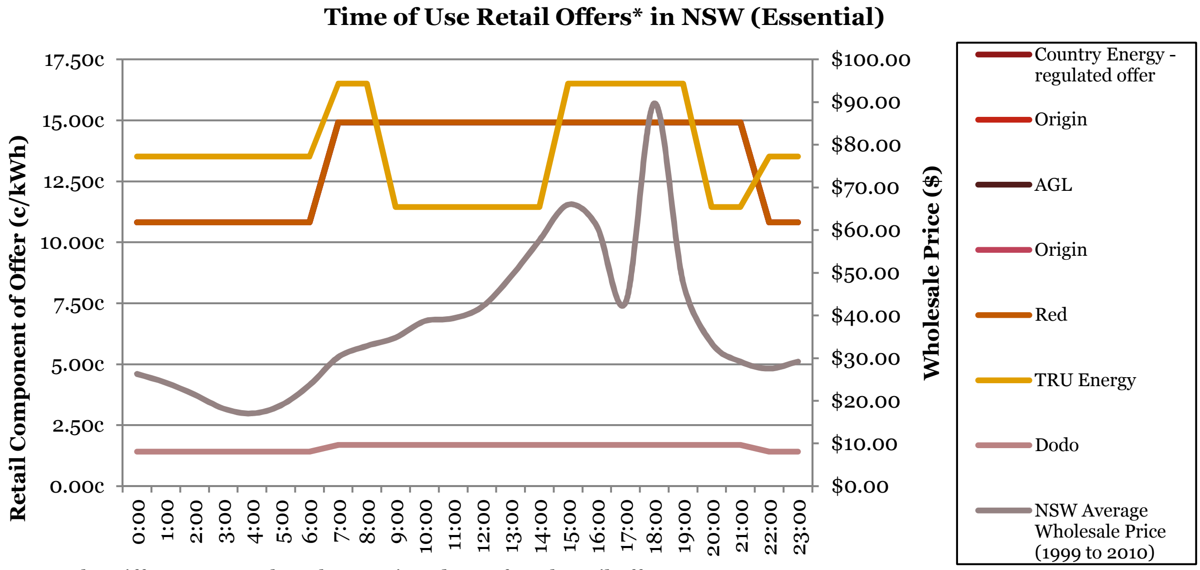
4.5.3 *Time of Use – Network Tariffs*



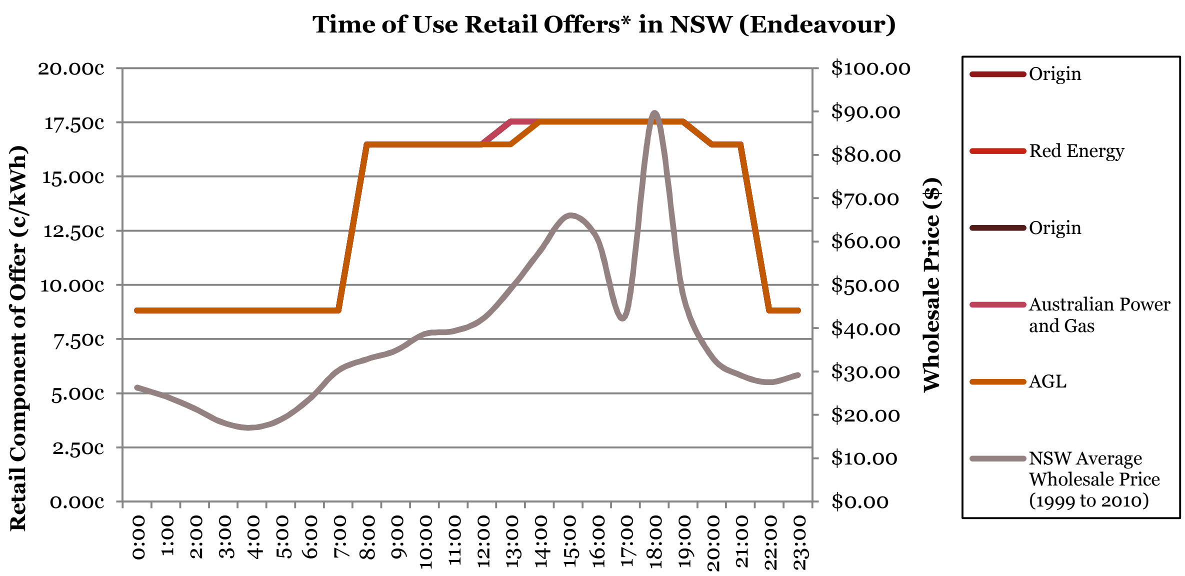
4.5.4 *Time of Use – Retail Components*



*Network tariff components have been stripped out of total retail offer



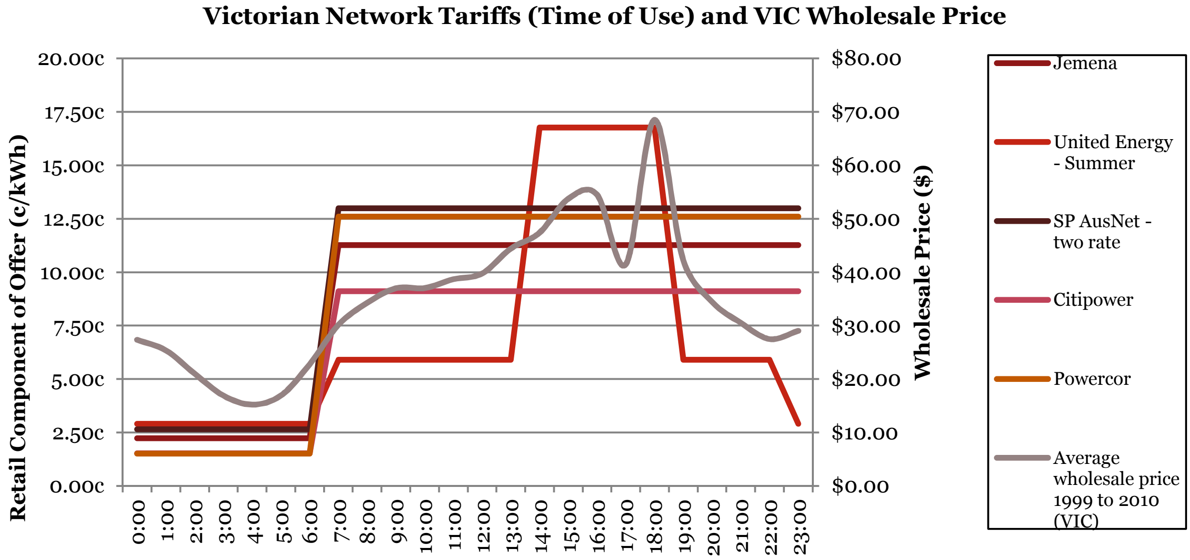
*Network tariff components have been stripped out of total retail offer

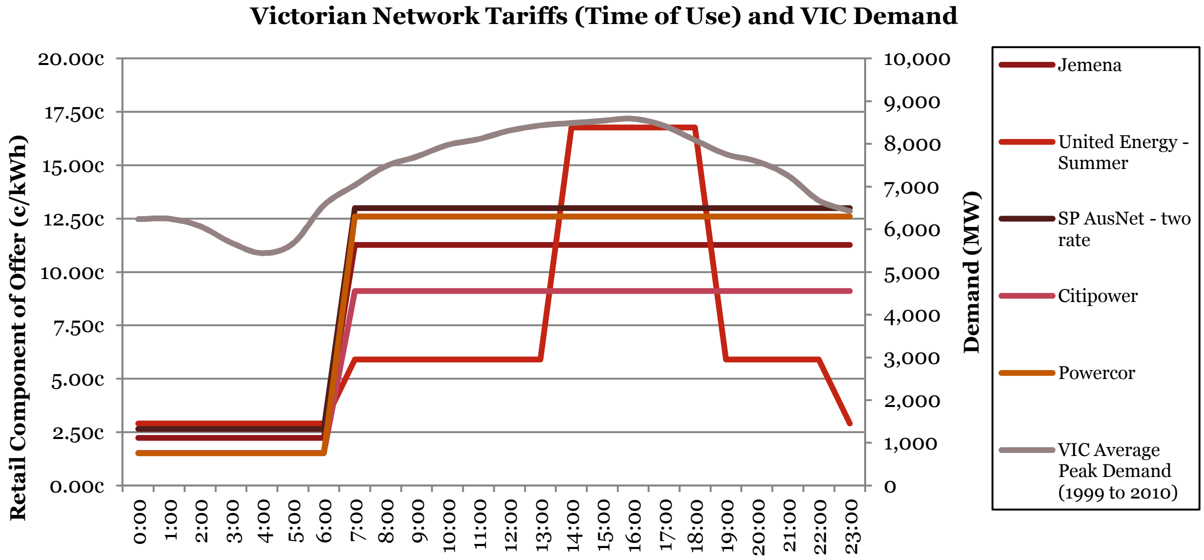


*Network tariff components have been stripped out of total retail offer

4.6 Victoria

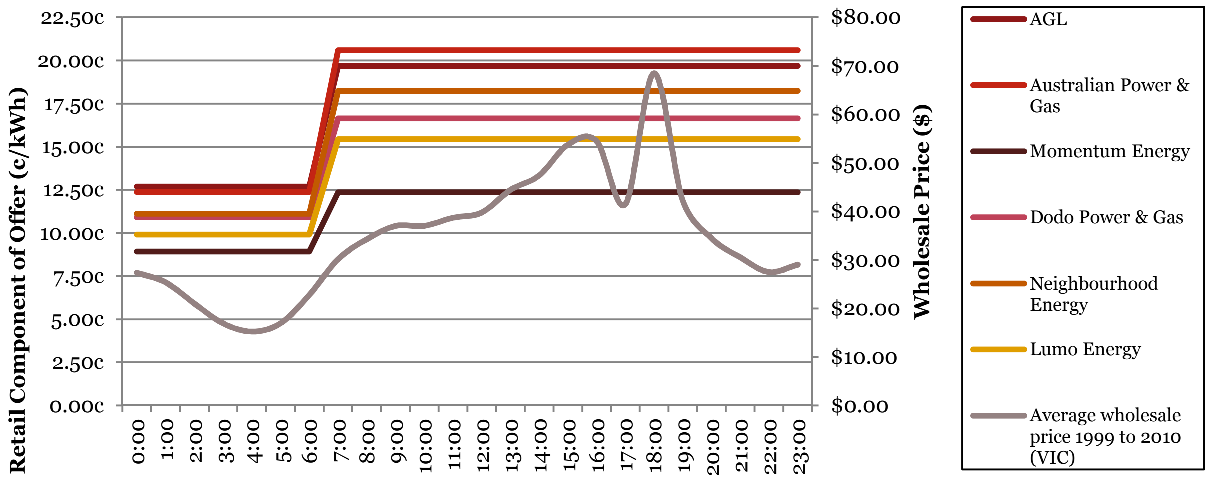
4.6.1 Time of Use – Network Tariffs





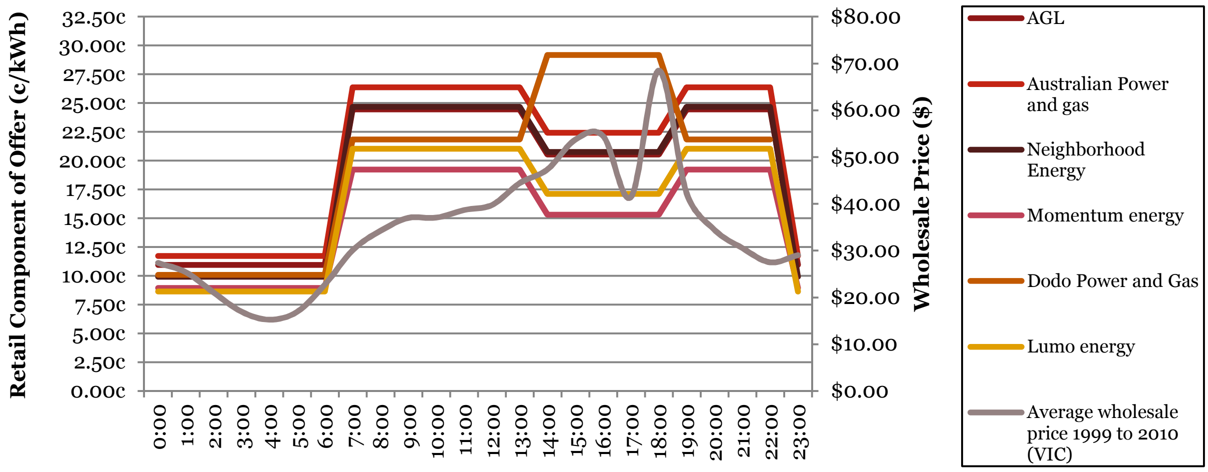
4.6.2 Time of Use – Retail Components

Time of Use Retail Offers* in VIC (Jemena)

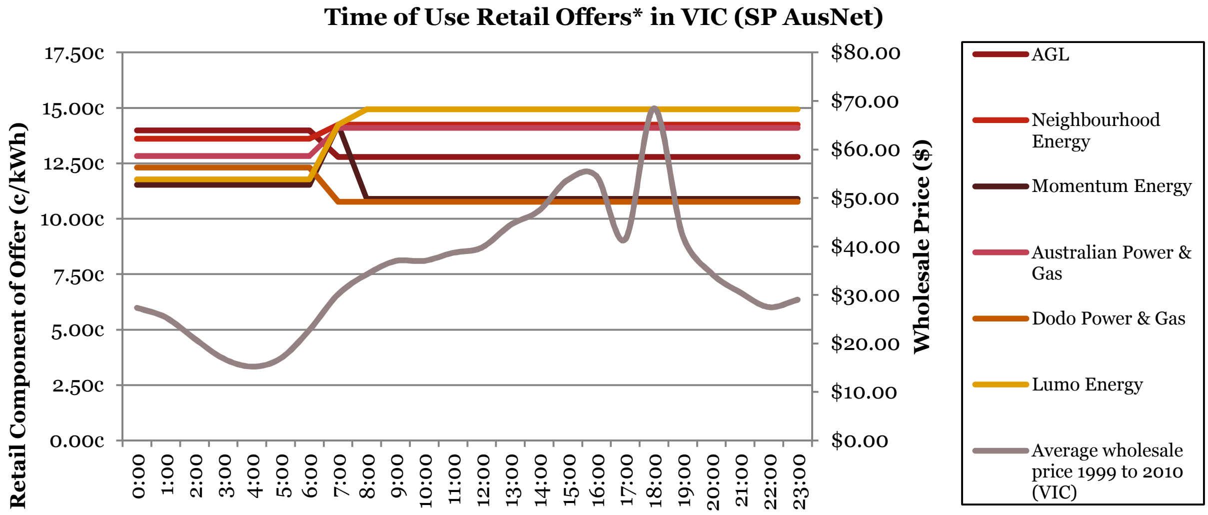


*Network tariff components have been stripped out of total retail offer

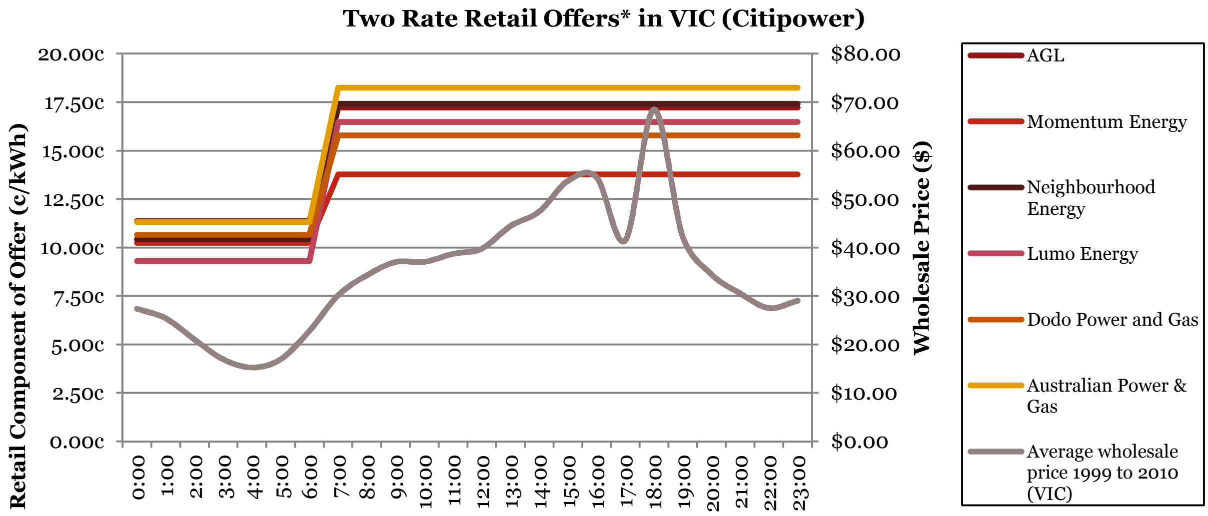
Time of Use Retail Offers* in VIC (United Energy)



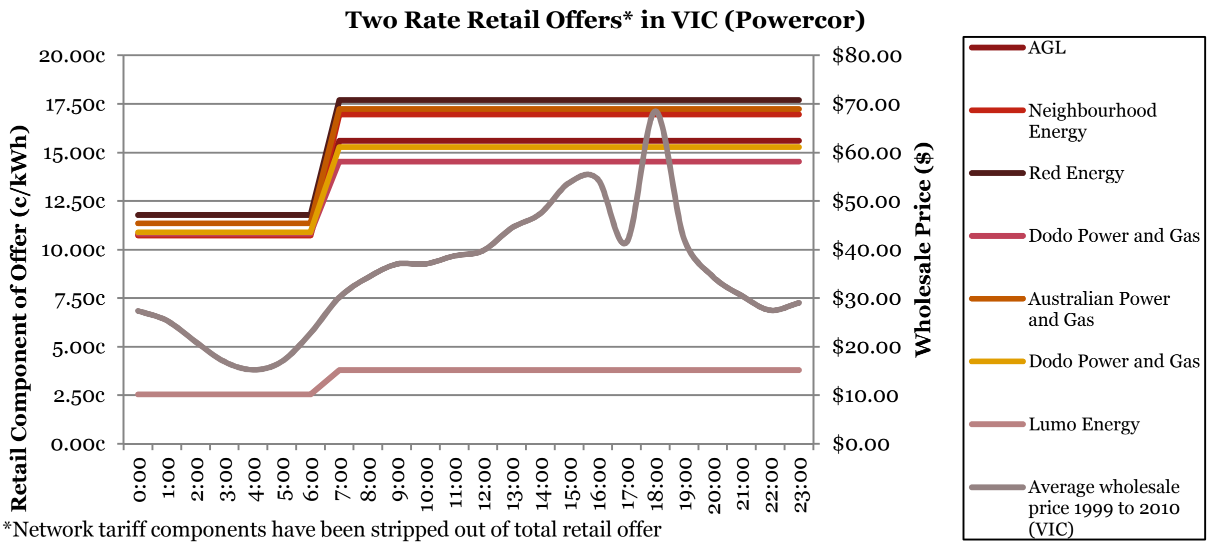
*Network tariff components have been stripped out of total retail offer



*Network tariff components have been stripped out of total retail offer

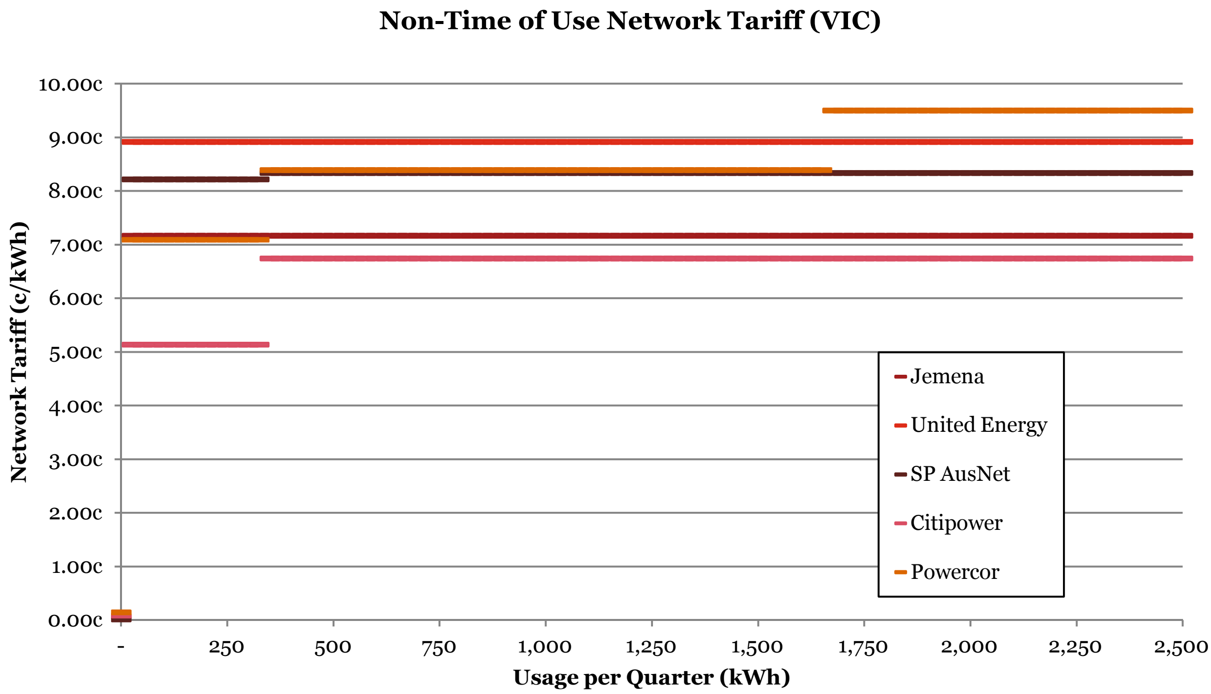


*Network tariff components have been stripped out of total retail offer

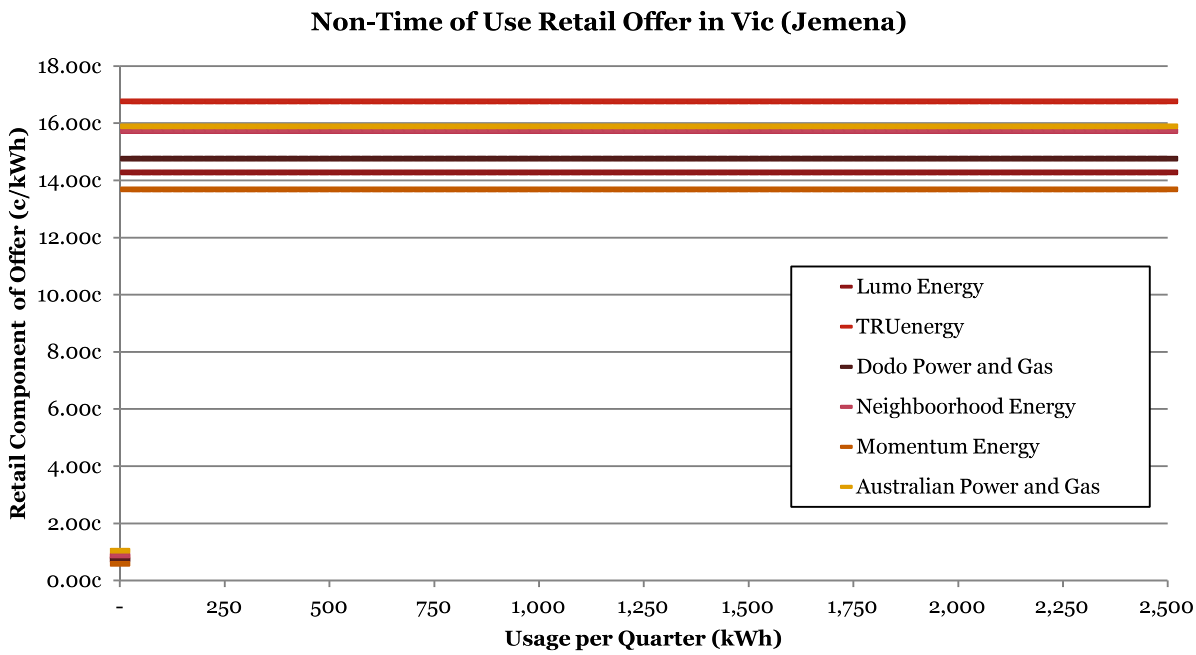


*Network tariff components have been stripped out of total retail offer

4.6.3 Non-Time of Use – Network Tariffs

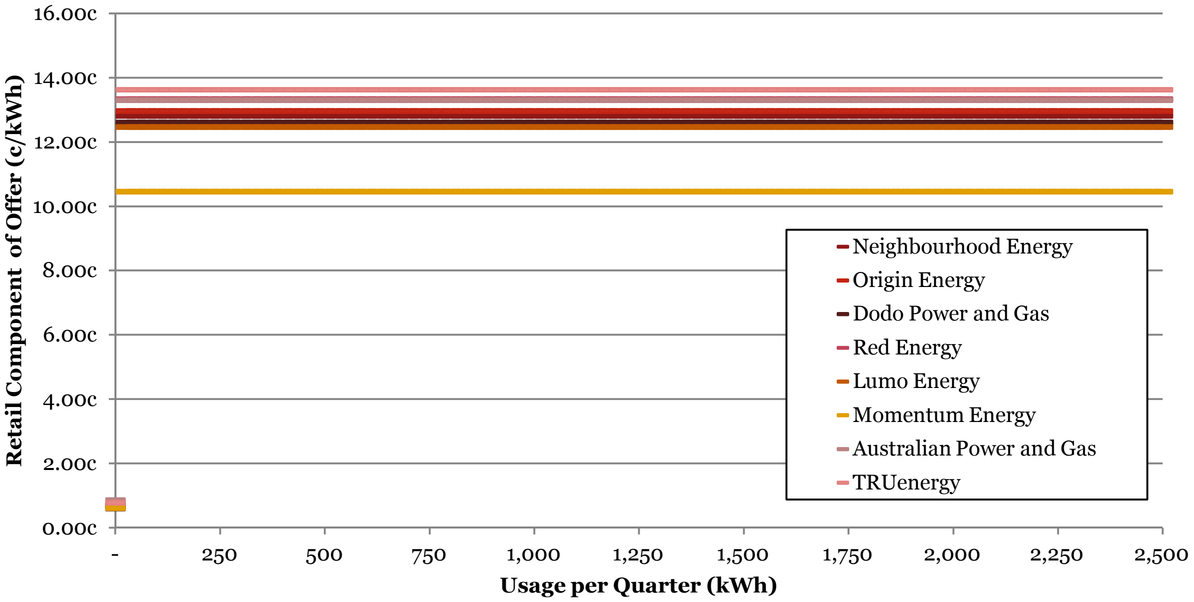


4.6.4 Non-Time of Use – Retail Offers



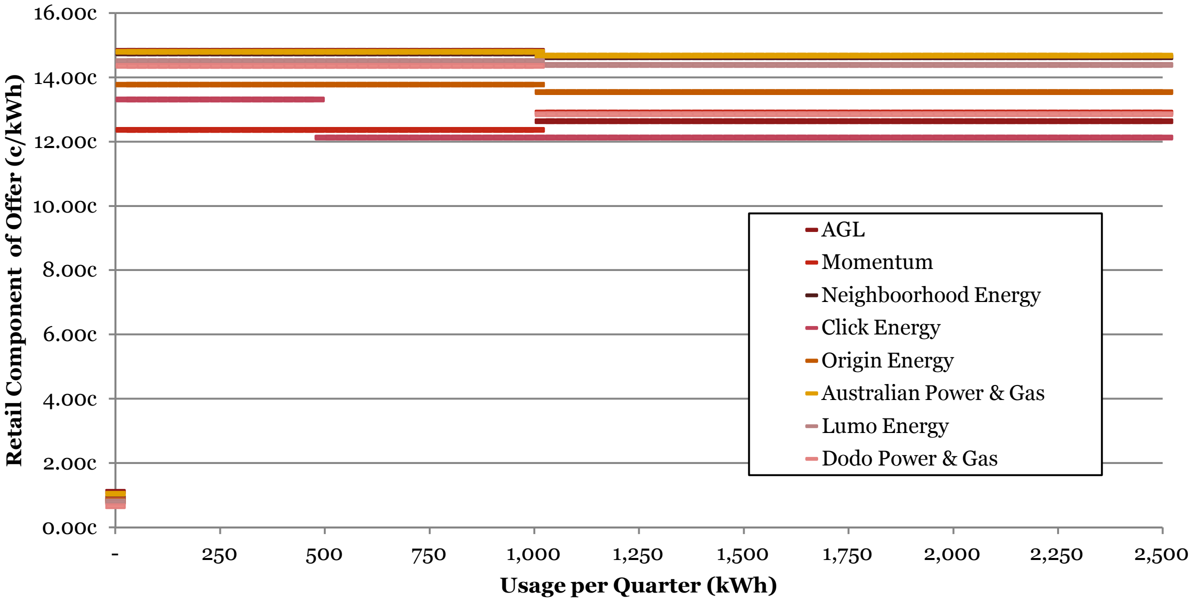
* Network tariff components relating to Jemena have been stripped out of total retail offer

Non-Time of Use Retail Offer in Vic (United Energy)

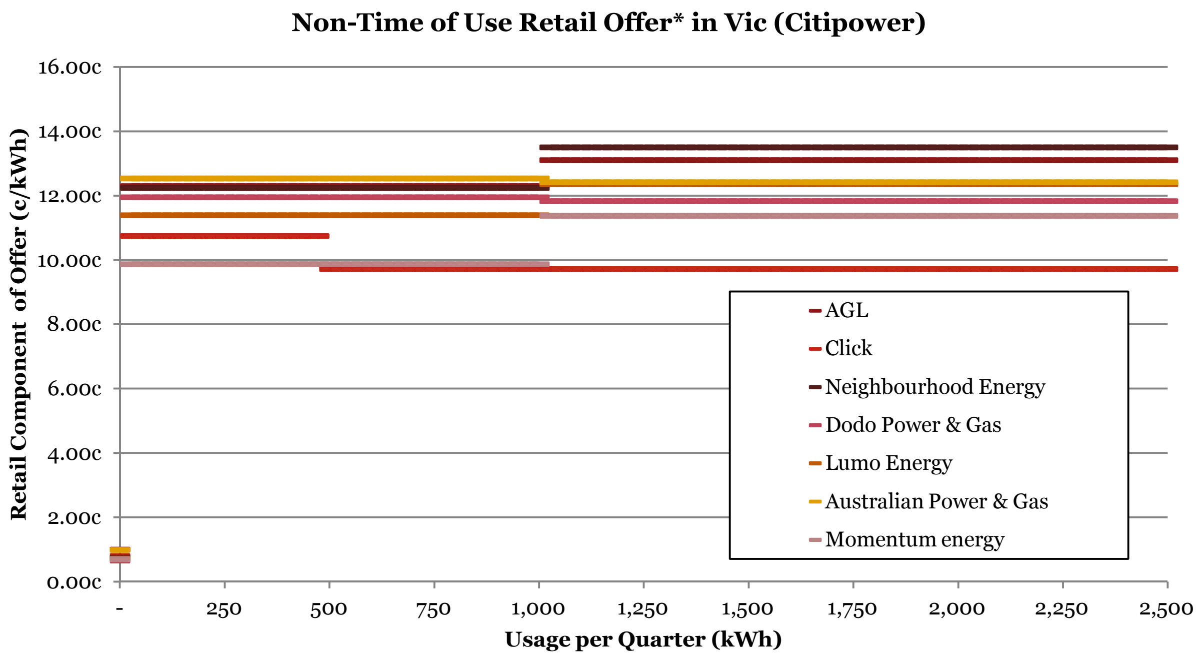


* Network tariff components relating to United Energy have been stripped out of total retail offer

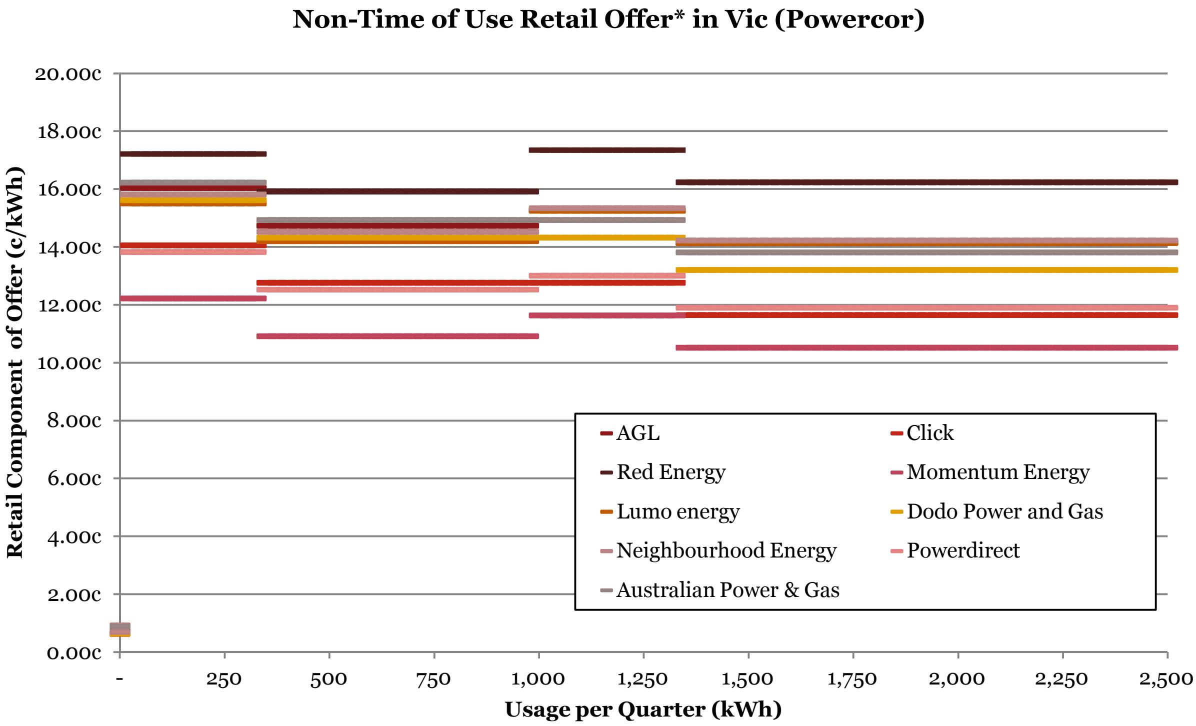
Non-Time of Use Retail Offer* in Vic (SP AusNet)



* Network tariff components relating to SP AusNet have been stripped out of total retail offer



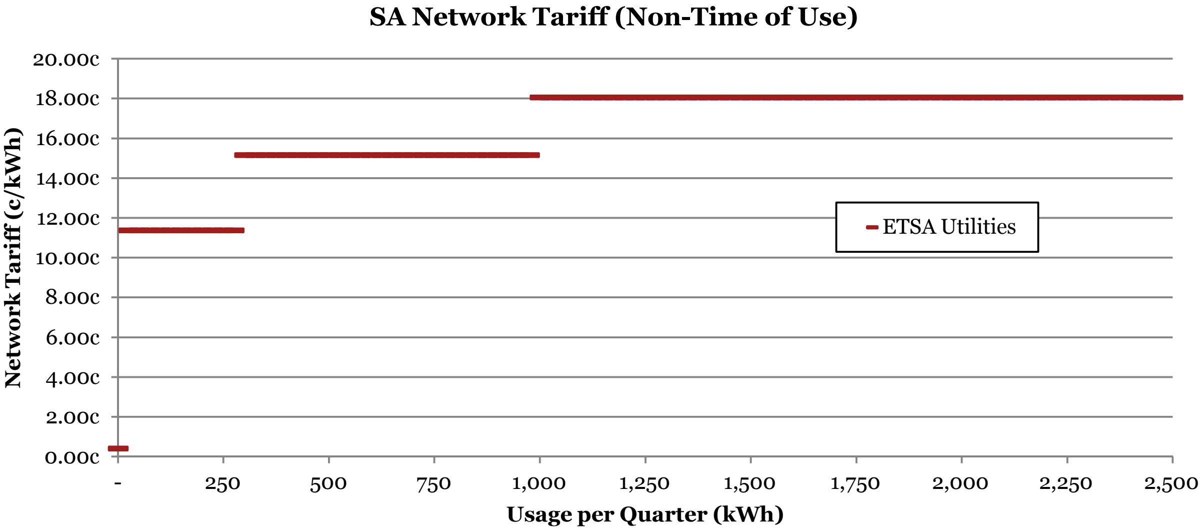
* Network tariff components relating to Citipower have been stripped out of total retail offer



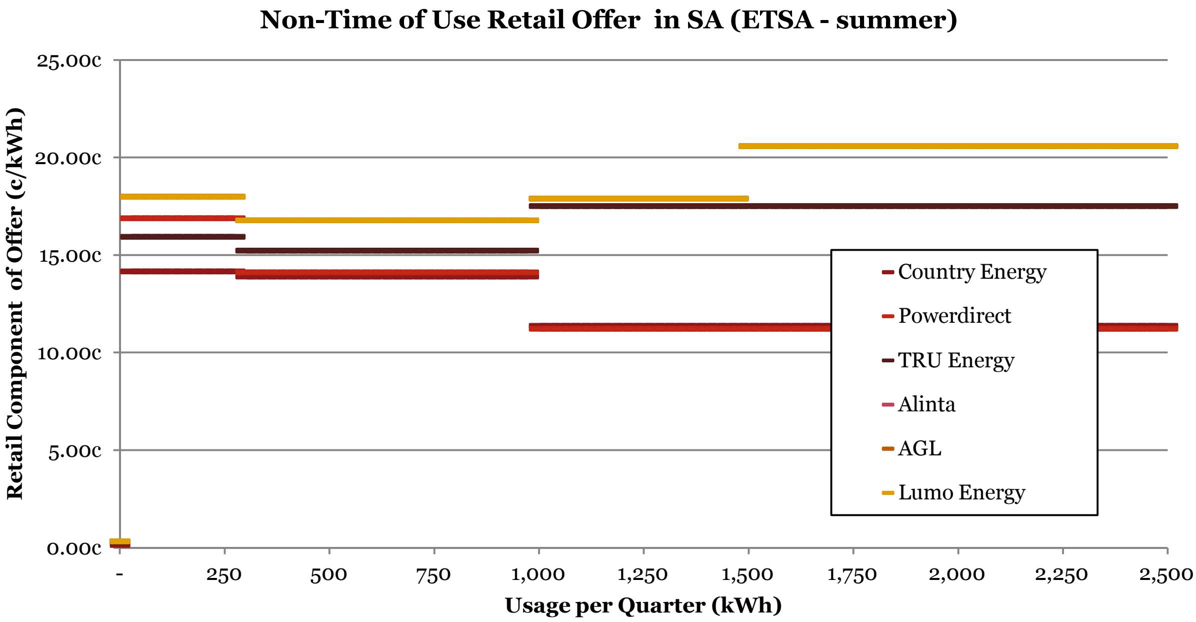
* Network tariff components relating to Powercor have been stripped out of total retail offer

4.7 South Australia

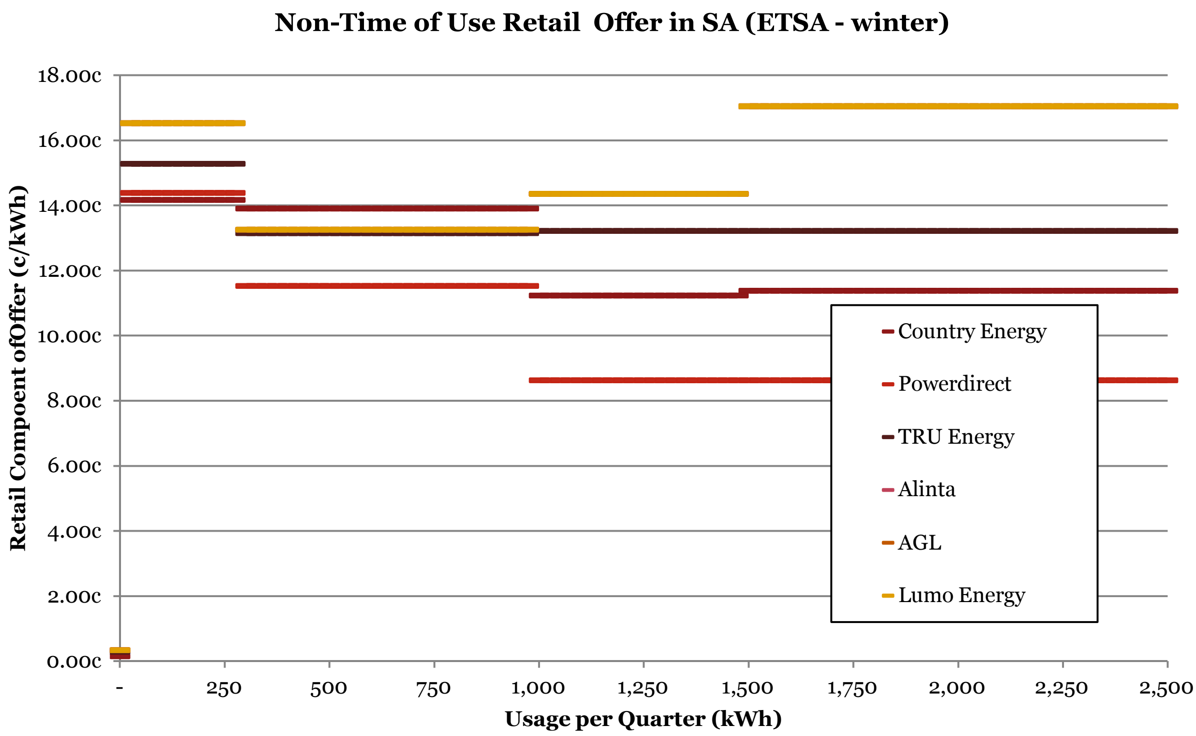
4.7.1 Non- Time of Use – Network Tariffs



4.7.2 Non- Time of Use – Retail components



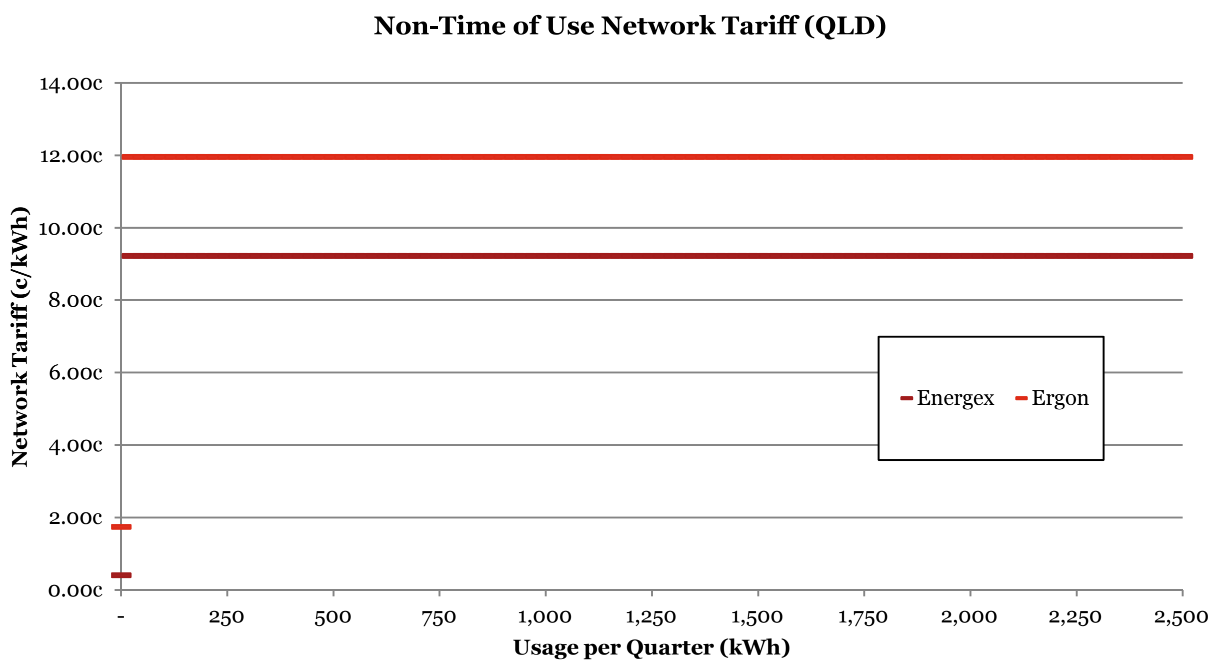
* Network tariff components relating to ESTA Utilites have been stripped out of total retail offer



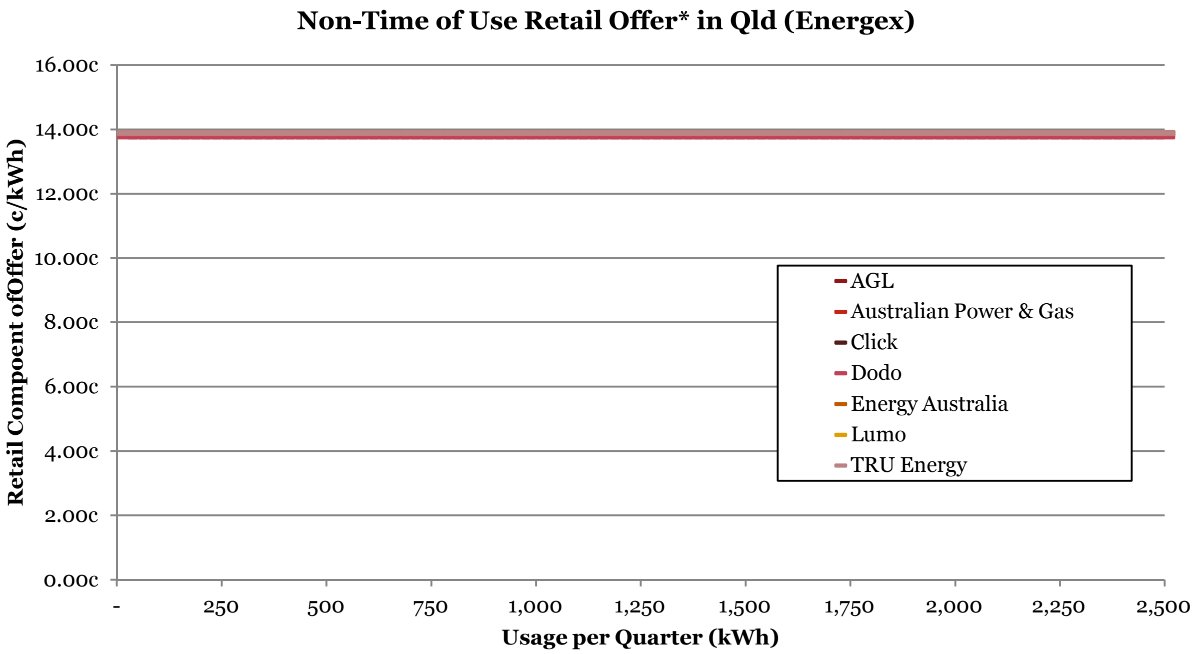
* Network tariff components relating to ESTA Utilites have been stripped out of total retail offer

4.8 Queensland

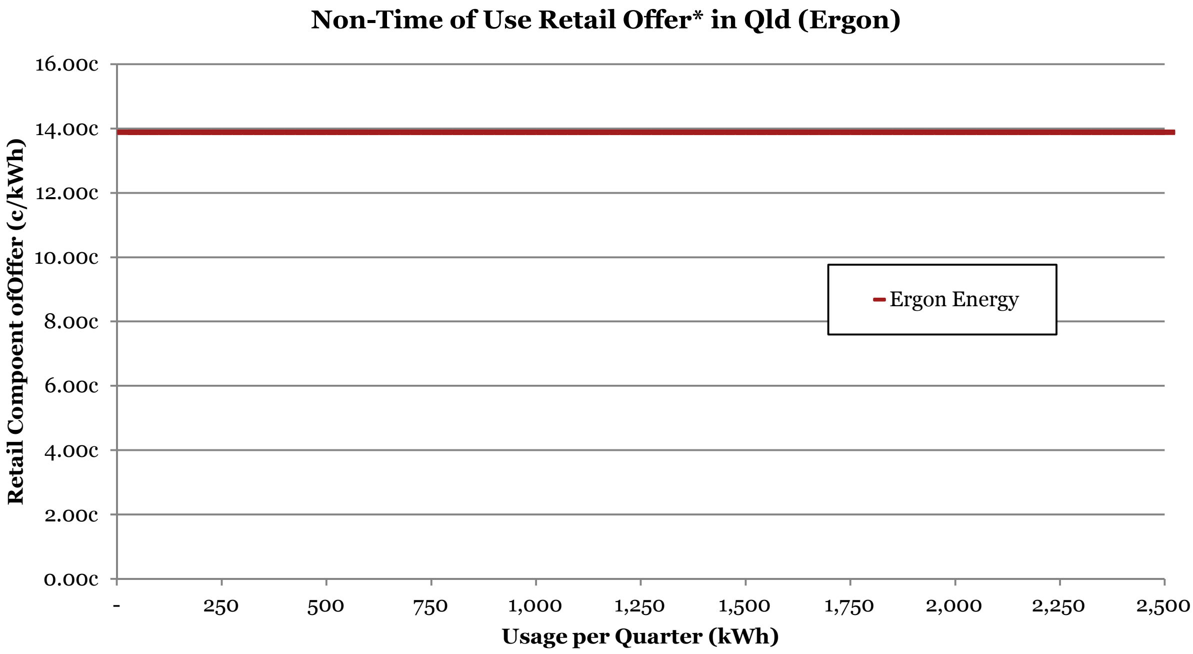
4.8.1 Non- Time of Use – Network Tariffs



4.8.2 Non- Time of Use – Retail Component

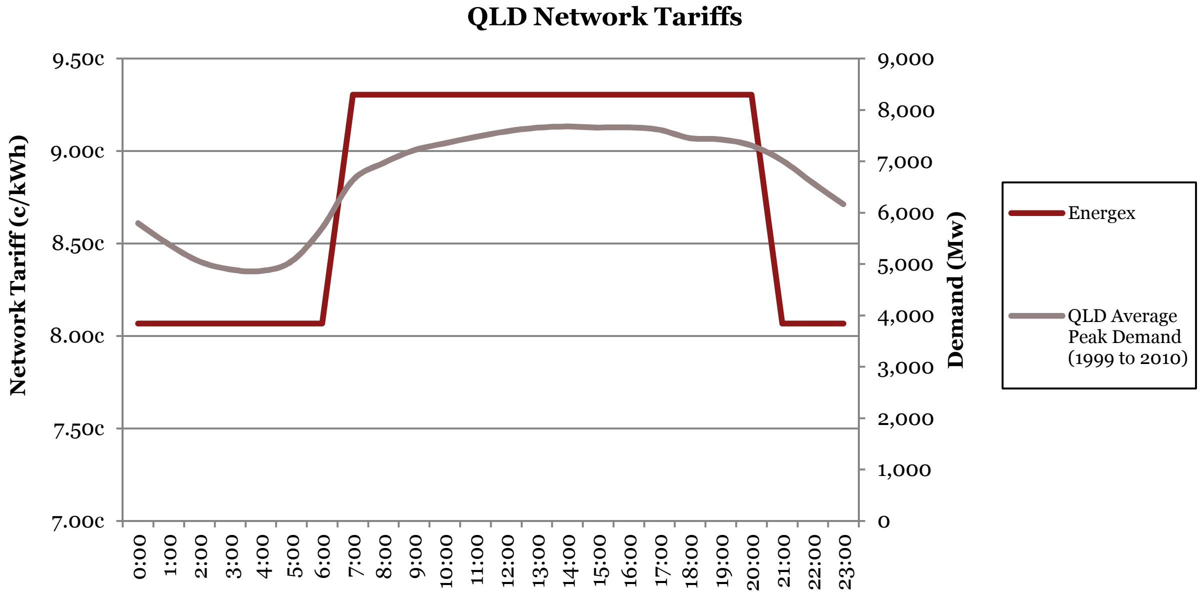


* Network tariff components relating to Energex have been stripped out of total retail offer



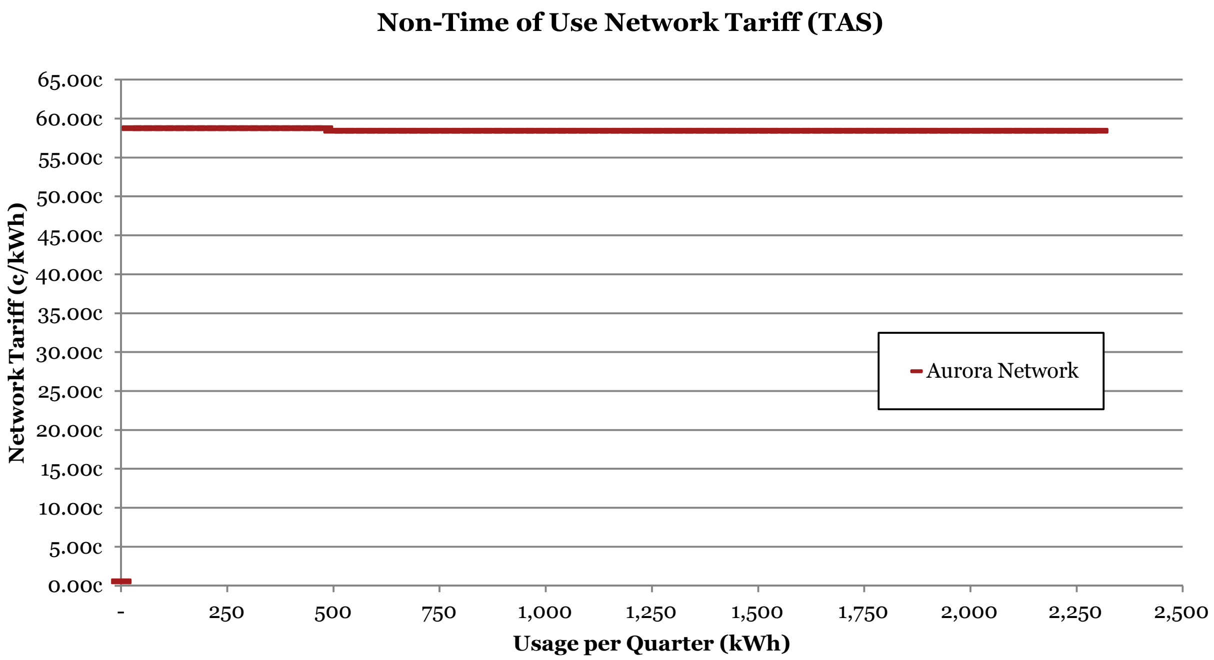
* Network tariff components relating to Ergon (network) have been stripped out of total retail offer

4.8.3 Time of Use – Network Tariff

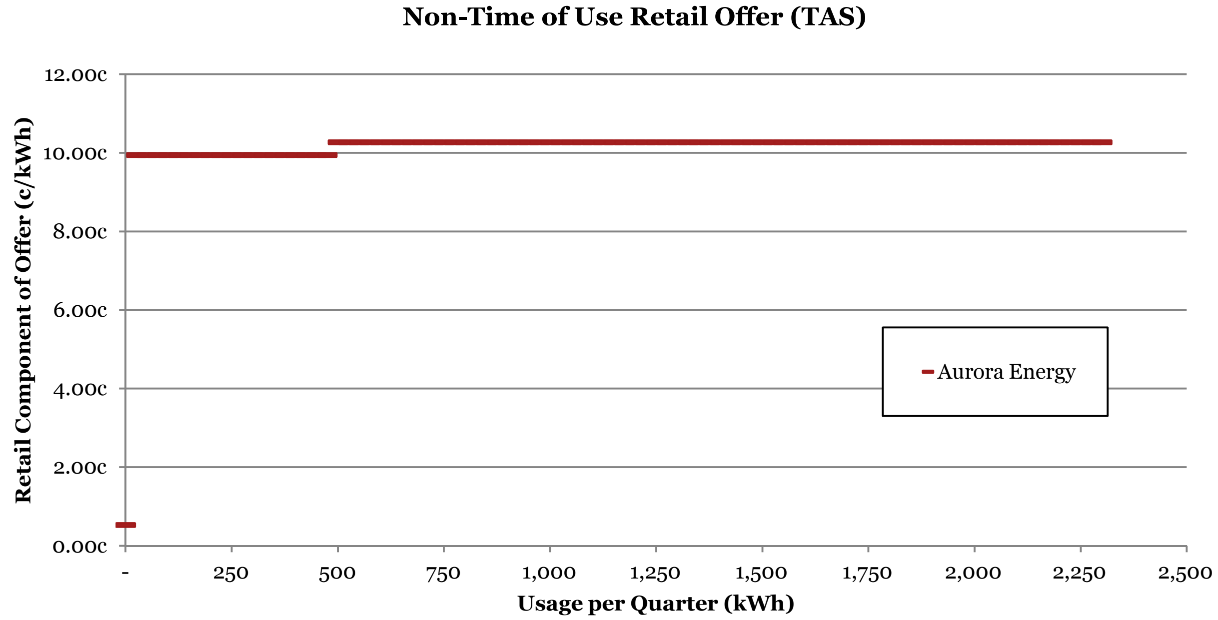


4.9 Tasmania

4.9.1 Non- Time of Use – Network Tariffs



4.9.2 Non- Time of Use – Retail Component



* Network tariff components relating to Aurora Network have been stripped out oftotal retail offer

4.10 Active electricity retailers in the NEM

Table 13 Active electricity retailers – small consumer market, June 2010

Retailer	QLD	NSW	VIC	SA	TAS	ACT
ActewAGL Retail						•
AGL Energy			•	•		
Aurora Energy					•	
Australian Power & Gas						
Click Energy						
Country Energy		•				
Dodo Power & Gas						
Energy Australia		•				
Ergon Energy						
Integral Energy		•				
Lumo Energy						
Momentum Energy						
Neighbourhood Energy						
Origin Energy	•		•			

Powerdirect	•					
Qenergy						
Red Energy						
Sanctuary Energy						
Simply Energy						
Tas Gas Retail (formerly Option One)						
TRUenergy			•			

Local area retailer	•

Note: A 'local retailer' is required to offer a contract to supply energy services to consumers that establish a new connection to the electricity or gas network within a designated geographic region

Source: Page 95, http://www.accc.gov.au/content/item.phtml?itemId=961581&nodeId=4410b75e01cc91ee16d4fbf1d86c0d5a&fn=Chapter%204%20Retail%20energy%20markets.pdf

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