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Fair pricing for power

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Overview

Australians are paying too much for power. In the five years to 2013, the average household power bill rose 70 per cent: from $970 to $1660 a year. The prices we pay are also unfair: some people are paying more than their fair share. These consumers are paying on average about $150 a year more than they should to subsidise other consumers. To get fairer and cheaper prices, network tariffs need urgent reform.

Electricity networks transport power from generators to our homes and businesses. Like roads and freeways, they are built at a size to keep electricity moving at times of maximum demand – peak hour. Yet the price we pay to use electricity networks is the same whatever the time of day or season. The price therefore provides no incentive to use the network efficiently by avoiding peak times.

It also provides little incentive for network owners to invest efficiently because it is unrelated to their main cost: building enough infrastructure to meet peak demand and avoid blackouts. Network owners spent $17.6 billion on expanding power networks between 2009 and 2013. If prices had encouraged consumers to use less power in periods of peak demand, $7.8 billion of this investment could have been avoided and the savings passed on as lower power bills.

It is widely agreed that reform is needed. Yet there is a lack of specific proposals to improve the structure and operation of network tariffs. This report, the third in a series of Grattan reports on the excessive cost of electricity, fills that gap.

It proposes two major reforms to the way network companies charge customers for the cost of carrying power to homes and small businesses. First, the 43 per cent of the consumer bill that goes to fund the network should no longer be based on total energy use. Instead, consumers should pay for the maximum load they put on the network. This tariff is called a capacity-based charge because it is based on the capacity of the infrastructure that must be built to carry this maximum load. A capacity charge far better reflects the cost of building and running the network.

Yet this reform alone may not reduce peak demand in areas where the network is under pressure. Therefore the report also proposes the introduction of a new tariff in areas that - in the absence of prices that better reflect the cost of running the network - will require expensive infrastructure upgrades. Under this tariff, consumers will be charged more for use during times (usually in summer) when the network is under most strain. Because these periods drive total investment in infrastructure, reducing peak demand levels ultimately leads to lower prices.

These reforms will give all consumers incentives to use electricity more efficiently. When they do, the pressure on network companies to invest in infrastructure will fall, and power prices with it. But governments must commit to these reforms and carefully explain their benefits. Advanced electricity meters will need to be installed on most Australian homes, at material short-term cost. Politicians may decide it is too hard. But if they do, they will miss an opportunity to deliver cheaper and fairer power prices.

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1 The power system: how it runs and why it needs to change

Grattan Institute's December 2012 report, *Putting the customer back in front: how to make electricity prices cheaper*, showed how fixing the flaws in the regulation of network businesses could save consumers $2.2 billion a year. Grattan's December 2013 report, *Shock to the system: dealing with falling electricity demand*, identified actions governments must take to address the consequences of unprecedented falls in electricity consumption.

One of these actions was to "begin the hard task of reforming network tariffs so that the prices companies charge reflect the costs they incur." This third report shows how the reform could be done.

The current structure of charges is not only unfair, it does not encourage the most cost-effective use of the electricity network. To make the system both fairer and cheaper, this report argues that existing network charges must be replaced with tariffs that reflect the real cost that customer choices impose on the network businesses that carry power to the home.

Under the changes, tariffs would consist of:

- A capacity charge, based on a customer's maximum electricity consumption, to replace tariffs based on overall electricity use.
- A critical peak price tariff in areas where a change in user behaviour could remove or delay the need for new network investment.
- A standing charge to cover the cost of account management and fixed costs to maintain the network connection.

To understand the need for these changes it is first necessary to understand the operation of the electricity system, and especially the networks that carry power from the generator to the home.

1.1 The role of networks in the power system

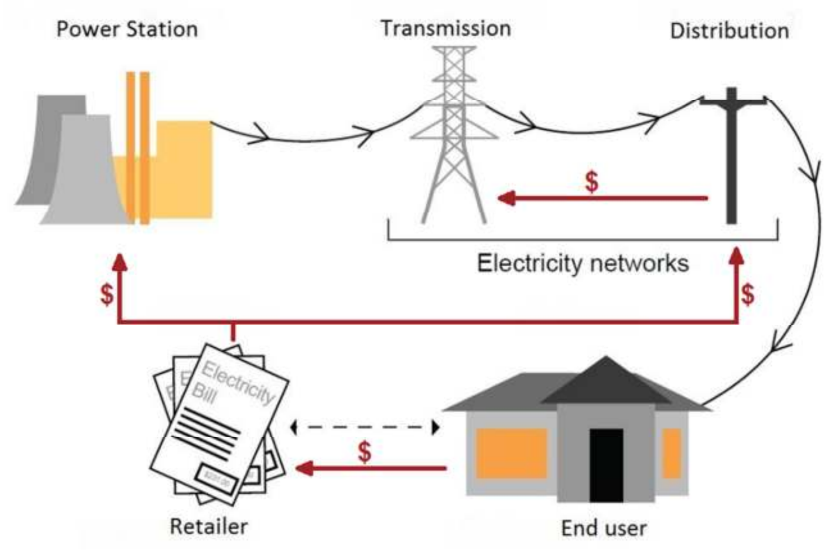
Electricity is produced at a power station and transported to customers through high voltage transmission networks and low voltage distribution networks. The system is operated by four kinds of business: generators, retailers, and transmission and distribution businesses. The last two are often collectively called network businesses.

Retailers collect payments from customers, and then pay power stations for the electricity they generate, and distribution businesses for use of the electricity network. Distribution businesses then pay transmission businesses for use of the high voltage network. Figure 1 shows a simplified version of this system.

This report uses the term *network tariff* to describe the prices that retailers pay to distribution businesses for use of both the distribution and transmission networks.[1]

[1] On distribution businesses' tariff schedules, this is referred to as the 'Network Use of System' tariff.

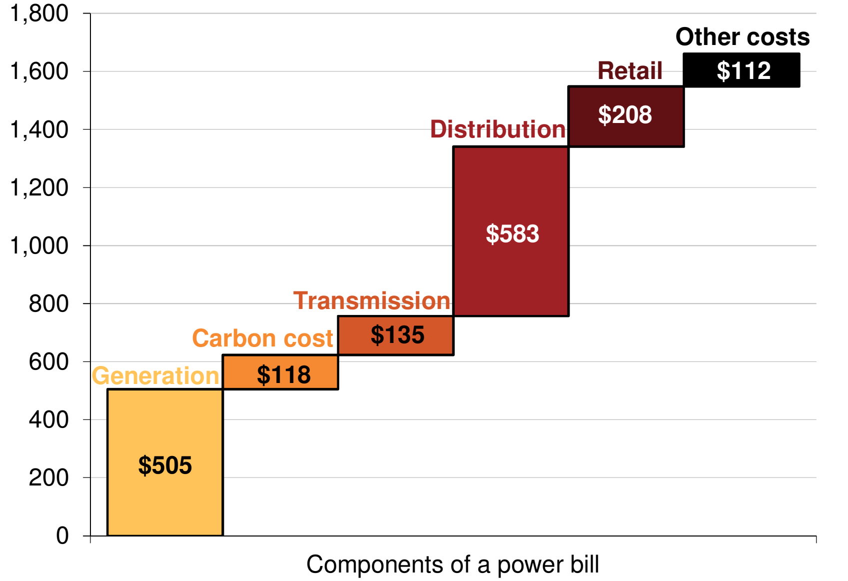
Figure 1: How electricity and payments flow through the power system



Source: Grattan Institute

Network tariffs make up a substantial portion of household power bills. On average, they comprise about 43 per cent of the average annual bill, or $720 a year. In the past five years, power bills have increased from $970 to $1660 a year.[2] Figure 2 shows a breakdown of the average Australian power bill in 2013.

Figure 2: Breakdown of an average household power bill, 2012-13
$ / year

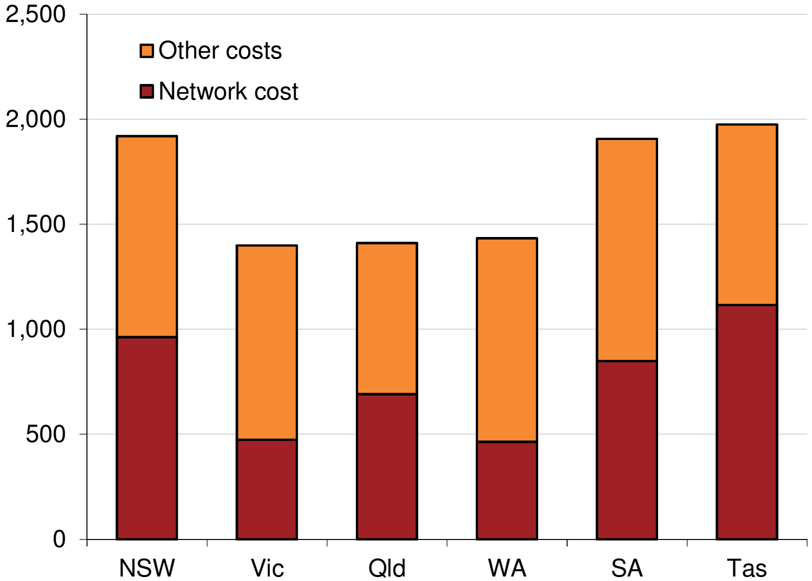


Note: 'Other costs' include the Large and Small-scale Renewable Energy Target and state-based schemes such as feed-in tariff schemes, energy savings schemes in New South Wales, Victoria and South Australia, the Queensland Gas Scheme and Western Australian Tariff Equalisation Contribution.
Sources: ABS (2013a), ABS (2013b), ABS (2013c), ABS (2011), AEMC (2013a), AEMO (2014), AER (2013b), BREE (2013a), BREE (2013b), ESCV (2014), IMO (2014), IPART (2013), QCA (2014), SA Power Networks (2013), Synergy (2013).

Figure 3 shows that the cost of using the power network varies widely between states. Customers in Western Australia pay an average of only about $460 a year, while Tasmanians pay more than $1100 a year.

[2] These figures are expressed in nominal terms. In real terms, bills increased from $1110 to $1660 – a 50 per cent increase.

Figure 3: Household network charges vary widely between states
Average $ / year



Note: Chart shows average power bills split by network costs and non-network costs by state in 2012-13.
Sources: ABS (2013a), ABS (2013b), ABS (2013c), AEMC (2013a), AEMO (2014), AER (2013b), BREE (2013a), BREE (2013b), ESCV (2014), IMO (2014), IPART (2013), QCA (2014), SA Power Networks (2013), Synergy (2013).

In the way they raise revenue, network businesses are different from power generators. Generators operate in a competitive market. If the price of power falls or they sell less of it, generators earn less money. Network businesses, by contrast, work in a highly regulated market. The Australian Electricity Regulator determines the amount of revenue that they are allowed to earn each year and approves the prices that they charge.[3]

Each geographical area only has one distribution and one transmission business. In other words, network businesses are regulated monopolies. This is because it would be impractical and prohibitively expensive to have multiple physical networks competing to deliver electricity from the same generators and to the same customers.

1.2 Current charges do not tackle peak demand

Distribution companies (and before them the state-owned corporations that once ran the whole power system) historically measured household consumption of electricity by sending a meter reader to the home. The standard accumulation meter, located at the front of each home, is a relatively simple piece of technology that measures the amount of power used, regardless of when during the day, week or year it is consumed.

The company then multiplies total use by the unit cost of power to arrive at the dollar amount that goes on the electricity bill. When accumulation meters were the only type of metering technology available, this was the best way to charge for power. Accumulation meters remain the norm across most of Australia. Box 1 explains the four kinds of meters and why upgrading to smarter meters is important in the reform process.

[3] In Western Australia, this role is performed by the Economic Regulation Authority of Western Australia.

Box 1: Charging by the meter: simple and smart ways to measure power use

Electricity meters are attached to each house to collect information about household power consumption. This information is used to calculate the customer's bill. There are four main types of electricity meter:

Accumulation meters are the oldest and simplest type. As electricity flows into a house, a counter inside the meter turns. Several times a year, a meter reader comes to the home and compares the counter reading to the reading from the previous period. Power companies then charge customers based on the volume of energy used over the billing period.

Two rate meters work like accumulation meters, but contain two counters, which operate at different times. When the meter is read, both counter values are recorded and different prices apply for consumption at peak and off-peak times. These meters became necessary to support cheaper tariffs to encourage customers to run their hot water systems during the night.

Interval meters record energy use during every half hour throughout the day. These meters give power companies greater flexibility to use tariffs that charge different rates at different times of day, and can measure a household's maximum electricity use as well as total use over a given period. Households that install rooftop solar are typically required to have an interval meter to collect information on how much power was exported to the power network from the rooftop solar.

Interval meters are a big step forward, yet they still have limitations. They must be programmed in advance and meter readers must still go to the home to record data. The manual reading process limits the range of sophisticated data management and tariffs than can be used.

Smart meters combine the functions of an interval meter with a remote communications system. This means data can be extracted from the meter without visiting the house. Remote readings enable additional features. These include the possibility for tariffs that reflect real time changes in supply and demand for electricity, real time feedback about electricity usage, and remote control of high-use appliances during peak periods.

Because most Victorian households had smart meters installed between 2009 and 2013, the broadest range of tariffs is already possible for customers in Victoria.

In other states, households have a mix of accumulation, two-rate and interval meters. This means that tariff options are currently more limited outside Victoria. Chapter 4 considers how tariffs could be improved in areas where smart meters are not currently available.

Sources: Victorian Government (2014a)

The system worked well in the days when most customers used electricity in largely similar ways, using similar home appliances. Demand varied across days, weeks and seasons, but the variation did not generally produce any severe imbalance in the amount each customer contributed to the cost of the network.

But new technologies mean that different households are using the power system in different ways. In particular, the widespread installation of air conditioners and rooftop solar is transforming the way we use electricity. These technologies change the pattern of power demand: it becomes more subject to greater peaks and troughs.

Peak demand is defined as the maximum amount of electricity used in a section of the power system at any point in time. If the network has insufficient capacity to meet peak demand, the system is likely to fail and cause blackouts. Blackouts are expensive and extremely unpopular with both businesses and households. For power companies, they cause reputational damage and may trigger financial penalties.

Some blackouts are caused by factors that are beyond the control of network owners: damage as a result of storms or traffic accidents, for example. But outside these factors, the main risk of a blackout is a shortage of capacity at times of peak demand. Because it is not economically viable to store large quantities of electricity in power networks, the electricity network must be built with enough capacity to deliver power at any moment through the year as if it were a peak demand time. Box 2 describes peak demand in more detail.

Peaks in the power network are like peak hour on roads and freeways. These times place greatest strain on the system and they determine how much is spent on it. The total amount of energy used is less important than the maximum being used at any one time. If peak demand can be reduced, network operators can spend less money to build and run the network, and thereby charge their customers less.

In most Australian states, peak demand comes on a hot weekday evening in summer, when factories and businesses have not yet shut for the day, householders are switching on air conditioners and other appliances, and output from rooftop solar is low. (In Tasmania, milder summers and colder winters mean that peak demand usually occurs in winter, when many consumers are simultaneously running heaters.)

When peak demand for electricity increases, new infrastructure must be built to carry enough power at peak times. So the cost of an additional unit of peak electricity consumption in the network is very high. The Productivity Commission has estimated the cost of each additional kilowatt of peak load on the power network to be between $240 and $310 a kilowatt.[4]

Yet households do not pay more to use power at peak times than at other times. The result is that households have no financial incentive to use less power at peak times. As network businesses invest in ever more infrastructure to ensure they can cater for peak demand, all consumers pay through higher prices.

[4] Productivity Commission (2013)

Box 2: The Grand Final of electricity demand

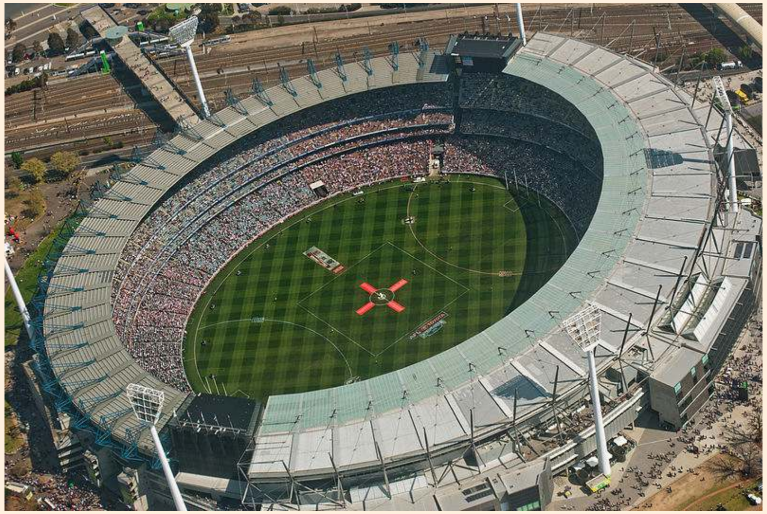
Think of the electricity network as like the Melbourne Cricket Ground. The MCG operators had to determine the capacity of the stadium – the maximum crowd it can hold. Then they had to build enough grandstands, seats, corporate boxes, entrances and toilets to cater for the maximum crowd.

In the same way, owners of a power network have to make decisions about how much infrastructure - poles, wires, transformers and substations – they need to build to meet demand for electricity. The MCG only comes close to being filled a couple of times a year, usually at the AFL Grand Final and the Boxing Day cricket test. From a financial perspective, it is good for the operators to fill the stadium as often as possible. Empty seats represent money that has been invested in infrastructure that is not generating any revenue.

For the networks, peak demand day is like Grand Final day – the day when all the capacity available in the system is most likely to get used. As with the MCG, much of the capacity in electricity networks is only used for a small part of the year.

Yet network owners face a major problem that stadium owners do not. On AFL Grand Final day, the stadium operators can raise the price of tickets and restrict the total number of tickets on sale. But owners of the power network must build enough capacity to cater for all consumers who want to use it at all times. If they do not, the shortfall will cause blackouts and the network owner will face financial penalties.

With existing electricity tariffs, most consumers pay the same price to use the electricity network, regardless of when they use it. This would be as if the MCG charged the same price per seat for every game and every event across the year, regardless of the demand for seats. Network tariff reform is about enabling network owners to adopt pricing strategies to help balance supply and demand. Otherwise, too much network capacity is likely to be built and all consumers have to pay the cost of installing ‘empty seats’ – capacity that is only needed for a few hours a year.



Source: Sheko (2010)

1.3 The problem with air conditioners and rooftop solar

Increasing use of air conditioners in homes is a major driver of peak demand growth. Consider the case of a Victorian customer who purchases an air conditioner with a capacity rating of five kilowatts. The standard reverse cycle air conditioner has a capacity rating of between two and nine kilowatts.[5] Table 1 shows the costs this air conditioner may add to the network, and what the owner might pay in extra network charges during peak times.

This air conditioner could add between $1200 and $1550 to the cost of the network. Yet its owner would only pay an extra $53.40 a year in network charges. Because the network businesses do not recover their costs through usage charges associated with using the air conditioner, they must recover these costs in other ways. The result is higher prices for all users.

A similar situation may occur when households install rooftop solar. If peak demand occurs at a time when the sun is shining, then rooftop solar can help reduce peak demand. Yet in many areas, peak demand occurs in the evening when output from solar panels is low.

Some households will pay substantially less to use the network after they install rooftop solar, since more of the network charge is based on the amount of energy the household requires from the network. Yet, if consumption at peak times remains the same, then the cost a household imposes on the network will not change. Again, other users must pay more to cover the gap.

[5] Appliances Online (2014), figures based on 20 most purchased air conditioners.

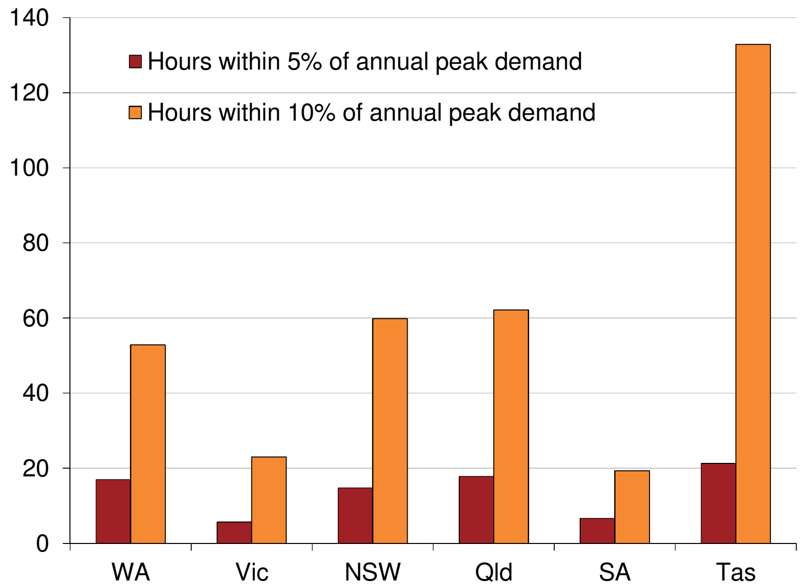
Table 1: The use of air conditioners during summer costs the network much more than many users pay

Cost to power networks of using an air conditioner at peak times	
Maximum capacity of the air conditioner	*5kW*
Cost per additional kW to distribution networks	*$150 to 220/ kW*
Cost per additional kW to transmission networks	*$90/ kW*
Total investment cost to power networks	$1200 to $1550
Network charges for using an air conditioner in summer	
Maximum capacity of the air conditioner	*5kW*
Price per kWh of electricity paid to the network	*$0.10/ kWh*
Average hours of summer air conditioner use	*107 hours*
Implied network cost to consumer	$53.40/ year

Note: The 'price per kWh of electricity paid to the network' is the usage component of the network tariff. It excludes fixed charges and charges that relate to other parts of the power system, such as the price paid to retailers or power stations.
Sources: AEMC (2013a), Appliances Online (2014), Productivity Commission (2013), CitiPower Pty (2012) Jemena (2012) Powercor Australia Limited (2012), SP AusNet (2012), United Energy (2012), Roy Morgan (2008)

In a network built and maintained to meet demand at peak times, the incremental investment cost to use the infrastructure at other times is very low. This is particularly striking because peak events occur so rarely. As Figure 4 shows, over the past three years, demand came within five per cent of the annual peak for an average of between six and 21 hours a year – less than 0.24 per cent of the time.

Figure 4: Energy use approaches peak levels for only a few hours a year
Hours per year



Note: Chart shows the average number of hours when demand came within five per cent of the annual peak, 2011-2013. Tasmania has more hours close to the peak than in other states as it has a winter peak - demand tends to be less volatile in winter than in summer.
Source: AEMO (2014a), AEMO (2014b), IMO (2014)

This disparity between the costs of using the network at peak times, when the network is constrained, and off-peak times when there is spare capacity means that energy-based tariffs can be unfair. Customers who use a large portion of their electricity outside peak times may pay substantially more than their fair share, while other customers who use a lot of power during a peak demand period effectively receive a subsidy.

Network tariffs that do not reflect the costs of peak demand can also add to the overall cost of the power system, which means that all consumers have to pay more. Over the past five years, when peak demand was forecast to rise substantially, network businesses invested heavily in new infrastructure. As a result, the regulator allowed them to collect more revenue in the form of electricity price increases. It is estimated that $7.8 billion of network investment over the past five years could have been avoided if customers faced better price signals at peak times.[6]

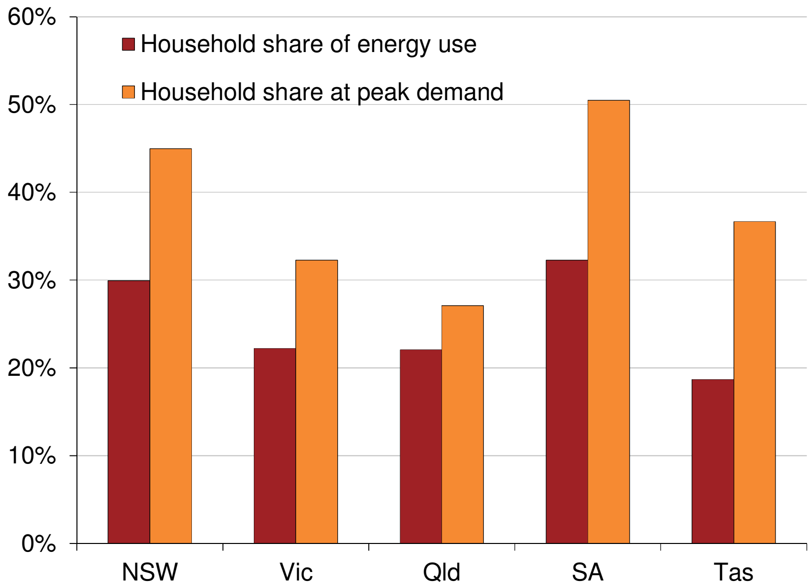
1.4 Why should households pay a new power tariff?

Households are not the only power consumers connected to major electricity networks. In fact, household electricity use accounts for just 20 to 30 per cent of power consumed. Yet at peak times, households consume significantly more power than they do at average times. Figure 5 shows that households consume between 30 and 50 per cent of total demand at peak times. This suggests there is substantial opportunity to reduce peak demand by improving the way households use power.

The analysis in this report has specifically targeted household users, but the proposed reforms would also be suitable to apply to small businesses. Large commercial users often already pay power charges that reflect their maximum power use but, like households, small businesses' network tariffs do not provide an incentive to reduce consumption at peak times.

[6] This figure reflects potential savings in capital expenditure related to network growth. See Section 3.3 for further detail.

Figure 5: Households account for a higher share of energy use at times of peak demand
Household share of use



Note: The figure shows the average household contribution to peak demand between 2011 and 2013. Peaks are measured as the half hour intervals with maximum demand on days that fall within 5 per cent of the annual peak.
Sources: AEMO (2014a), AEMO (2014b), BREE (2013a), IMO (2014)

Recent technological developments have created both a need and an opportunity to improve the way households pay for power. The need comes in part from the widespread adoption of air conditioning and rooftop solar (see Table 1). The opportunity comes from improvements in metering technology (see Box 1) and data management systems.

The cost of metering and data processing used to be a major constraint on the types and amount of data collected from customers. This, in turn, narrowed the range of tariffs that could be charged. In recent years, the cost of these technologies has fallen substantially. While data processing and a roll out of smart meters would still be expensive, they make it possible for bills to be calculated far more precisely, based on a household's maximum consumption level, geographic location in the network, or consumption at certain times of day or during peak demand periods.

1.5 Why focus on network charges?

Network tariffs are a significant part of total consumer charges. Higher peak demand means more spending on the network and higher network tariffs.

Policy design often requires trade-offs between making a whole system more efficient and sacrificing a degree of efficiency to distribute costs more fairly. The beauty of network tariff redesign is that it can achieve both. It can share the cost of running networks more fairly among consumers, and at the same time help network owners to find cheaper solutions to network constraints, which will bring prices down in future.

The approach proposed here does not impose a narrow formula for how reform must be carried out. Instead, it gives regulators and network businesses latitude to design tariffs that better reflect the cost pressures faced by network businesses and more fairly allocate costs among consumers.

Reform of network tariffs will also give retailers a price signal – an incentive to encourage customers to use the power network more efficiently. Retailers retain the ability to tailor products to suit customer preferences and to help customers to adjust to new tariff structures.

In the short term, the reforms this report proposes will redistribute costs among households without changing the total cost of the network across all customers. Over the longer term, providing consumers with incentives to use the network more efficiently, especially at peak times, will save on the cost of building the network and reduce costs for all consumers.

2 A capacity tariff: a fairer way to pay

Domestic customers are currently billed for using the power network based on how much electricity they use over the billing period. This type of network tariff, calculated by multiplying the volume of use by the price of each unit of power, is both unfair on some customers and does not reflect the cost to distribution businesses of running the network. In fact, the average customer subsidising others pays around $150 too much for electricity each year.

Instead of this tariff, households should pay a charge based on the amount of network capacity they use. That is, a charge that is based on their maximum energy use during the year.[7] This tariff will lead to a more efficient network, and to lower, fairer prices. Across Australia, large commercial and industrial consumers already pay network tariffs that reflect the user's maximum demand on the network. Households and small businesses should also pay tariffs that reflect their requirements for network capacity.

A household's maximum use is different from peak demand. Peak demand measures the highest level of consumption across all consumers in a network, while maximum use measures it for just one household. It is the individual household's maximum use that forms the basis of a capacity charge.

2.1 How a capacity tariff would change the household bill

Network charges make up about 43 per cent of the $1660 the average Australian household pays for power each year. The balance is made up of charges paid to power retailers, power generators and for compliance costs. Network charges consist of a standing charge – the fixed costs of running the network that range from about 6 to 24 per cent of the bill – and a usage component based on a customer's consumption.[8]

Under the new tariff, the usage component of a household's network charge would be calculated based on its maximum capacity requirement; not its overall energy use. In other words, households would pay based on the period during the year when they use the most power. Compared to existing energy-based charges, this is a far better estimate of the household's contribution to peak demand. Peak demand drives the costs of building and running the network, and therefore the prices that consumers pay.

Figure 6 shows how a capacity charge captures households' contribution to peak demand much more effectively than a charge based on total energy use. Using a flat rate energy charge, the share of network costs paid by each household has only a weak relationship with the household's actual contribution to peak demand. Time-of-use tariffs are not much better. Yet, a capacity

[7] The capacity tariff modelled in this report is based on a households top five half hour intervals of energy use throughout the year. Energy use is only considered between 9am and 8pm on weekdays.

[8] The eastern and Mt Isa regions of Ergon energy's business are exceptions. These regions apply a higher fixed charge, making up an average of 33 and 47 per cent of the bill, respectively.

charge based on a household's maximum energy use over a half hour interval between 9am and 8pm on weekdays has a strong relationship with the amount of energy the household is using at peak times.[9]

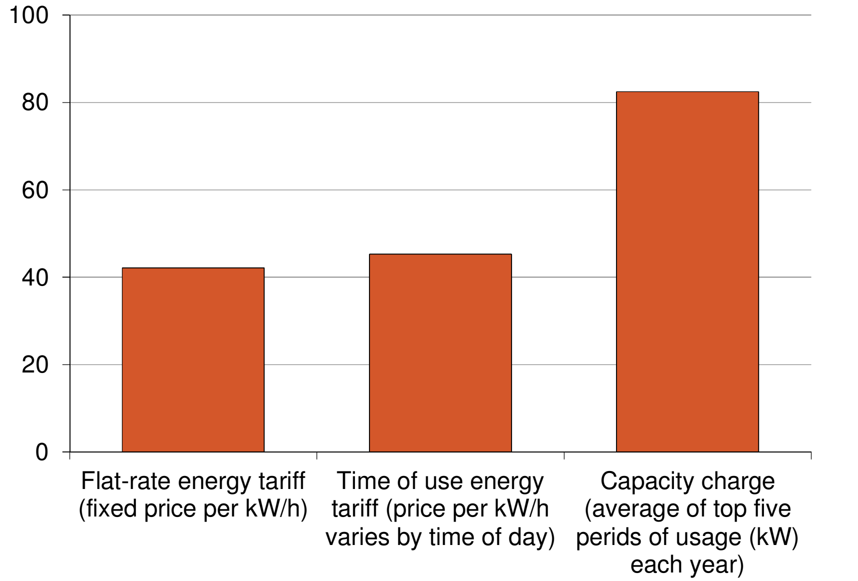
A time-of-use tariff is based on total energy use, but the price of energy varies at different times of day, throughout the week, or in different seasons. This differs from a flat rate tariff, where the price per kilowatt hour is fixed throughout the year.[10] Time-of-use tariffs are only marginally better than flat rate tariffs at reflecting the cost of household energy use at peak times.

Capacity tariffs, however, are a significant improvement. Under a capacity tariff, a distribution business may continue to collect a portion of revenue through a fixed standing charge paid by each household. Yet, the portion of the network bill based on usage charges would be based on the customer's maximum capacity requirement, measured in kilowatts.

Box 3 provides an illustrative case study of how capacity charges could change the way that households share the cost of paying for the power network.

Figure 6: Capacity tariffs reflect household contributions to peak demand better than energy-based tariffs in Victoria

Household network peak costs reflected in each tariff type (%)



Note: Chart shows the level of correlation between users' contributions to network peaks and their expected network bills based on a variety of network tariffs and historical energy use. The sample includes household customers in Victoria.

Source: Grattan Analysis based on Jemena (2012) and metering data provided by the Victorian Department of State Development and Innovation.

[9] This analysis is based on Victorian data. The extent to which each tariff type 'explains' the household's cost to the network is measured by comparing the household's actual contribution to peak demand with the size of the household's expected annual bill under each tariff structure. The peak is measured as half hour intervals where demand was within 5 per cent of the absolute annual peak. The time-of-use tariff is based on the flexible pricing tariff offered in the Jemena network in Victoria.

[10] The time-of-use tariff modelled in Figure 6 is based on the Victorian off-peak, shoulder and peak time periods, with prices based on the flexible pricing tariff option provided by the Jemena distribution business.

Box 3: How bills could change with a capacity tariff

Table 2 shows how the introduction of a capacity charge would change the network component of bills accrued by two different households, which both use the same amount of energy but have different capacity requirements from the network.

Table 2: How charging for network capacity could change household bills

	Household A	Household B
Energy based network tariff		
Energy use	*5000kWh*	*5000kWh*
Network energy use charge	*9c/kWh*	*9c/kWh*
Network usage charge	$450	$450
Network standing charge	$150	$150
Non-network costs (generation, retail, etc)	$900	$900
Total bill	**$1,500**	**$1,500**
Capacity based network tariff		
Maximum capacity	*4kW*	*6kW*
Network capacity use charge	*$90/kW*	*$90/kW*
Network usage charge	$360	$540
Network standing charge	$150	$150
Non-network costs (generation, retail, etc)	$900	$900
Total bill	**$1,410**	**$1,590**

Assume Households A and B both consume 5000 kilowatt hours of electricity a year and now pay $1500 a year each for electricity. Of this total retail bill, $600 is for network tariffs – a $450 energy charge and a $150 standing charge.

Household B requires six kilowatts of capacity on the network to meet its maximum level of demand, whereas Household A only requires four kilowatts. So, while both households use the same amount of energy, it is likely that Household B would put more pressure on the network at peak times.

Assume these two households are the only customers in the network. The $600 a year that each of the businesses are paying in network tariffs means the regulator has allowed the distribution business to recover a total of $1200 in revenue. Of this, $300 is paid through the standing charge.

If the remaining $900 is recovered through a capacity charge, the households no longer share the cost evenly. Household A pays $90 less – a total capacity payment of $360 – and Household B pays $90 more, or $540.

This reflects that Household B uses more network capacity. The extra $90 Household B will now pay will not increase company profits – rather, it is a saving to Household A. Before moving to a capacity charge, Household A was paying too much and subsidising Household B.

Under the capacity charge, revenue collected by distribution business would not change in the short term. Savings would come over the medium term by reducing the need for new network infrastructure. Yet capacity charges would change the way network costs are shared among households.

Note: This example illustrates how network costs may be are allocated using different tariff structures. It does not show actual customer charges, or expected outcomes.

2.2 Should capacity charges vary by location?

Network tariffs currently vary across network businesses, meaning that customers located in different distribution areas pay different prices. The prices they pay reflect the historical spending patterns of the network businesses, their operating costs, allowed rates of return and depreciation.

However, within each distribution network area, all customers of the same type pay the same price.[11] This can result in some customers paying higher prices to subsidise customers in other parts of the same network.

This problem could be resolved by allowing distribution businesses to charge different rates within different regions of their distribution areas. One distribution business, Ergon Energy in Queensland, already does this. Ergon Energy has three regions; East, West and Mt Isa and applies different charges to customers in each region.

Capacity charges would reflect network costs more accurately if network businesses charged households different prices based on their location.[12] The benefits and costs of combining capacity tariffs and some form of locational pricing should be fully explored as part of the introduction of new pricing principles.

[11] Wood, T., Carter, L., and Harrison, C. (2013), p24
[12] Productivity Commission (2013) p438

2.3 How more advanced meters will enable reform

Introducing capacity-based tariffs would be much simpler if all Australian households had access to interval or smart meters that could record their maximum capacity. Yet while almost all Victorian homes have smart meters installed, most Australian homes do not.

Interval meters are more widespread. Households with rooftop solar, which make up around one in ten Australian homes, typically have an interval meter or smart meter installed to measure the flow of electricity from the home onto the network.

Until advanced meters are more widely installed, most customers would need to be charged based on their estimated maximum capacity.[13] Yet they should have the option to acquire an advanced meter that would enable them to move to a tariff based on their actual energy use during the time period of maximum capacity, rather than an estimate. Consumers who use less electricity during times of high demand would have an incentive to take this option since it would lead to them paying lower bills.

Over time, in order to save money, many consumers will choose to be billed based on their actual (rather than estimated) capacity. Those who continue to be billed on the estimated tariff will see their prices rise. This is because many of those who choose to be billed based on their actual use will be those who place less demand on the network and want to see that reflected in cheaper

[13] The charge could be based on the Net System Load Profile of each network region. The Net System Load Profile of each network is the estimated energy consumption for each 30-minute interval of customers that do not have smart meters.

bills. They would leave behind a group that on average is placing greater strain on the network and would therefore pay more. This will give more customers paying the estimated tariff an incentive to move to an actual capacity tariff calculated by an interval or smart meter. In this way, new metering infrastructure could be rolled out to a growing number of customers who stand to gain.

The switch from energy-based to capacity-based tariffs changes the incentives customers face. They will have a strong incentive to avoid using large amounts of power at any one time – by switching on many appliances at once, for example – because that risks increasing their maximum capacity and paying more. But outside the maximum capacity period, they will incur no additional charges for using the network, and can increase their power use without incurring further network costs.

Consumers will not just be encouraged to reduce their capacity use through changing their behaviour. They will also have an incentive to use technologies that will save them money by reducing their maximum capacity. Many of these technologies, such as timers that allow dishwashers to run late at night, already exist.

While the network component of a household's bill would be based on capacity, a substantial part of the average household's total bill will still be based on overall energy use. For example, the cost of buying power from power stations - about 40 per cent of a household's bill – is likely to remain an energy-based charge.

In the short run, capacity tariffs would mean that consumers who are now subsidising others have their electricity bills significantly reduced. Households that are using the network inefficiently would start to pay their fair share.

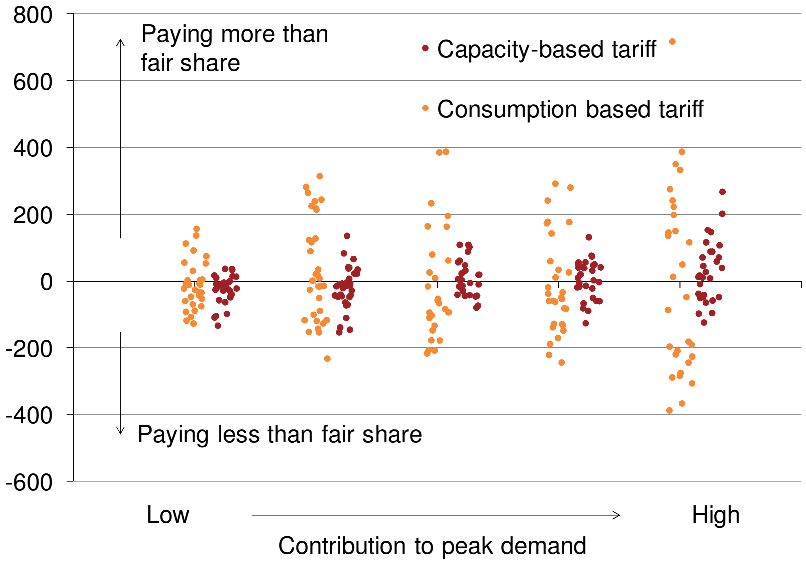
Figure 6 shows how capacity tariffs are far more effective than energy-based tariffs at signalling to consumers the true cost of their network use. Figure 7 shows that, under existing energy-based tariffs, many households are paying more than they should for using the network while many others are paying too little.

Figure 7 also compares the spread of those households paying too much and too little through energy-based charges to what the same households would pay under a capacity-tariff in Victoria.[14] In each case, the size of each household's bill is compared to the household's actual contribution to peak demand. With capacity tariffs, households will incur a network charge that is far more closely related to the costs they place on the network.

To date, Australian households have not been exposed to capacity-based charges. Their introduction would require a significant effort to clearly explain to households how they are being charged for using the network and how they can respond to the new charges to lower their power bills.

[14] Care should be taken when extrapolating these results. The Victorian dataset used for this analysis was collected as part of an opt-in survey, suggesting the sample may have been skewed by customers who are more actively engaged with their power use than those who chose not to participate. Additionally, differences in climate, demographics and other factors mean that caution should be taken when applying results to other states. These results do not reflect behavioural changes that could occur as a result of introducing capacity charges.

Figure 7: How energy and capacity tariffs compare to the true cost of using the network
$ per annum



Note: The five groups represented in this figure are divided up based on the households' contribution to peak demand.
Source: Grattan Analysis based on Jemena (2012) and metering data provided by the Victorian Department of State Development and Innovation.

Over time, households paying capacity tariffs are likely to become increasingly aware of their maximum energy use and the patterns of energy use that increase their capacity requirements. At least some households will change their behaviour as a result, leading to lower levels of peak electricity demand and lower prices.

2.4 Political and institutional challenges

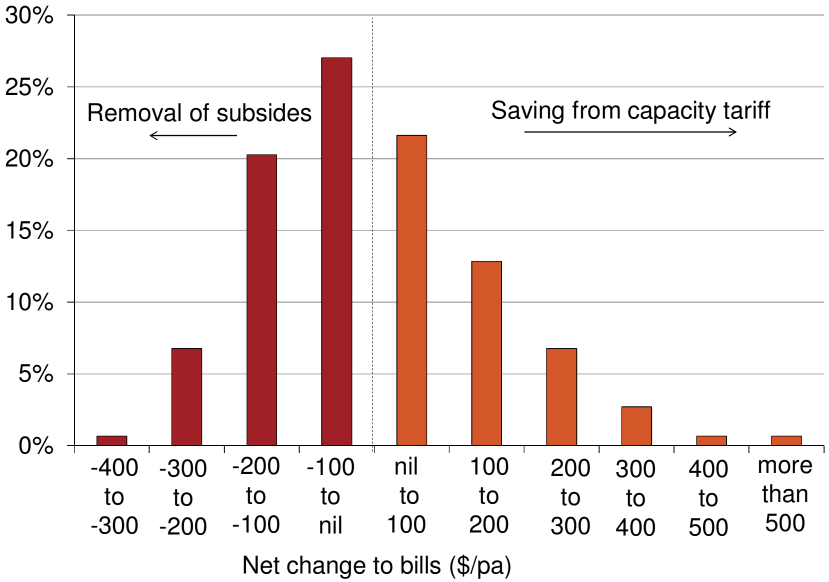
Pricing use of the network based on capacity, not energy, is not a new idea. The Australian Energy Market Commission (AEMC) is currently charged by the Council of Australian Governments (COAG) Energy Council to implement a rule change request that establishes the framework for more cost reflective pricing.[15] The Productivity Commission has recommended that tariffs should better reflect the cost of running the network and therefore should be based on network peak periods.[16] In a report for the Energy Supply Association of Australia, the peak body for the stationary energy sector, Deloitte Access Economics found that "capacity tariffs are consistently the strongest performing tariffs in terms of cost reflectivity".[17]

The move to capacity-based network tariffs will allocate costs more fairly among customers and lead to lower costs overall. But it confronts politicians with a challenge because in the short term it will remove the implicit subsidy that some customers are receiving. Figure 8 uses a sample of Victorian power users to show how removing the unfair subsidy might affect consumers.

The proposed reforms will make many customers better off. Yet customers tend to value losses more highly than they value gains.[18] That means the customers losing the subsidy are far more likely to be vocal opponents of change than winners will be in supporting the measures.

[15] AEMC (2013c)
[16] Productivity Commission (2013)
[17] Deloitte (2014)
[18] Kahneman and Tversky (1979)

Figure 8: Households currently subsidising others will pay less and other households will pay more under a capacity charge
Proportion of households



Note: This analysis does not take into account behavioural changes. Households are likely to respond to both higher and lower prices that result from the proposed reforms. In general terms, this will tend to reduce the size of both savings and costs to households.
Source: Grattan Analysis based on Jemena (2012) and metering data provided by the Victorian Department of State Development and Innovation.

Governments should anticipate resistance to the proposed changes from customers who benefit from the unfair status quo. Policymakers will need to explain how the proposed changes would make the power system more efficient and cheaper in the long run. They should be prepared to stand up for the customers forced to pay cross-subsidies through the existing system.

Policymakers should also recognise that some consumers would find it harder to cope with a sharp price increase, even if it were justified. Ideally, all customers would move to capacity-based charges as soon as possible. Yet, some compromises may be needed to accommodate low income and vulnerable households.

The Productivity Commission and the South Australian Council of Social Service have noted that many low-income households have lower levels of use at times of peak demand. Introducing pricing structures that better reflected the costs users place on the system would see average bills for most of these households fall by 10 to 20 per cent.[19] Nevertheless these reforms would negatively affect some low-income households. This is not a reason to give up on reform but highlights the need for well-targeted concessions to help these households adjust to change.

Finally, policymakers and businesses should emphasise the fact that the proposed reforms will not increase the revenues of distribution businesses. All of the short-term losses some customers face will go towards reducing the bills of other customers who use the network more efficiently.

[19] Productivity Commission (2013), SACOSS (2012)

3 Critical peak pricing can deliver cheaper power

This chapter explains the concept of critical peak pricing, and how it should be used to help prevent unnecessary expansion of infrastructure in power networks in specific locations. If infrastructure costs can be kept down, prices will also fall.

The previous chapter described how power prices would be fairer if customers were charged based on the maximum capacity they require from the power network, rather than on the energy they use. Tariffs based on a household's maximum power use far better reflect the costs the customer is likely to put on the network at peak times than do tariffs based on energy use.

Yet, there are some circumstances where capacity tariffs do not do enough to reduce peak demand. A more targeted approach is warranted in locations where a network has, or is expected to have, a shortage of capacity to meet future peak demand, and where reducing this peak demand could remove or delay the need to build more assets. This method of charging higher prices for short periods when demand for power is high is known as critical peak pricing.

3.1 A role for critical peak pricing in some places

During a peak demand period, households use a larger share of electricity than at other times. This is because many households are simultaneously using more electricity than usual. Yet not all of these users will have their maximum capacity requirement during the peak. In fact, while peak demand in most states occurs in summer, many households have their highest demand for capacity in winter, as Figure 9 shows.[20]

With a capacity charge, a large portion of each household's network bill is based on its maximum capacity requirement. This means that, so long as the user does not exceed the maximum capacity level set in the previous year, the cost of using more power will be lower. Where peak demand occurs in summer but the household uses maximum capacity in winter, this could mean households have an incentive to use more power, not less, at peak times.

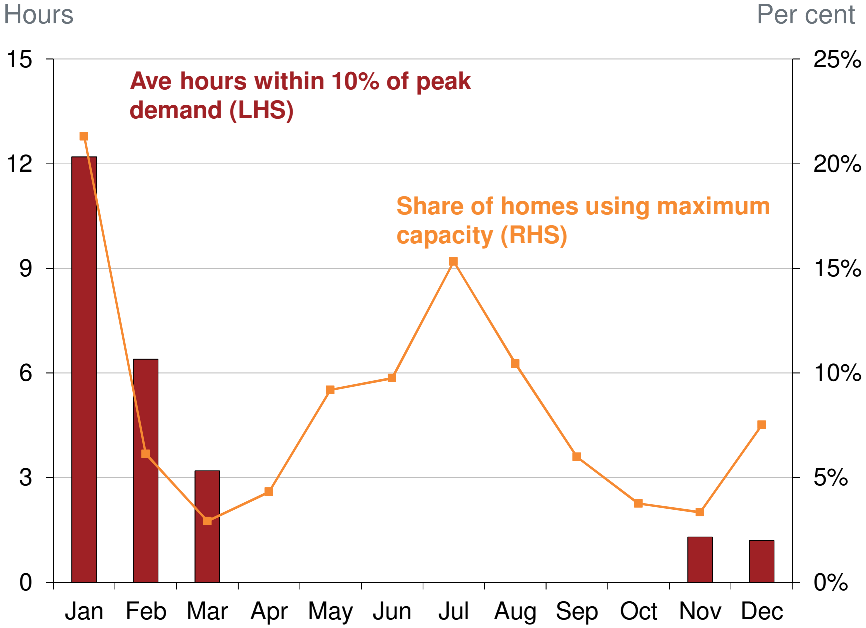
In areas of the network that are not under strain this is not a problem. Capacity tariffs would more fairly allocate the cost of paying for the network without adverse effects.

Yet in areas of the network that are under pressure, capacity tariffs alone are unlikely to be sufficient. A supplementary pricing structure that raises prices during periods of peak demand may bring real benefits.

Under a critical peak price (CPP) tariff, customers are told in advance of an imminent peak demand event that will trigger a period of high prices. During this period, customers will pay a substantially higher price to use the network – the retail power price will increase to between three and eight times the standard flat rate tariff. In exchange, they pay lower prices at other times through a rebate linked to the household's capacity charge.

[20] In Tasmania, peak demand typically occurs in winter. Historically, peak demand in New South Wales has also occurred in winter in some years.

Figure 9: Why capacity charges are not always enough: the mismatch between maximum household use and peak demand



Note: Average hours within 10 per cent of peak demand are based on the average between 2009 and 2013. All data are for Victoria.
Sources: AEMO (2014a), Victorian Government (2014b)

Critical peak pricing will reduce prices over time by reducing the amount that needs to be spent to build the power network. Properly designed, it has three main attractions:

- It provides a strong incentive to customers to reduce their consumption during peak periods, but does not increase the amount of revenue collected from customers overall.
- It only imposes a high price for around 30 to 40 hours on up to 15 days a year - at times when lowering energy use is most critical to the network. By contrast, time-of-use tariffs typically have a peak period of at least three hours every weekday – a total of 780 hours a year.
- Finally, not all customers need to pay the CPP price, only those in areas where introducing CPP could avoid the need to spend more on the network.

3.2 How critical peak pricing would work

CPP tariffs charge customers high prices during periods of peak demand in order to encourage them to use less power at those times. The goal is to reduce demand at peak times, which will reduce the need for infrastructure investment. Over time, this will lower network prices.

Good design can help CPP tariffs do this in a way that balances the needs of the network against customers' need for relatively stable and transparent prices. This is vital to win customers' support for introducing CPP and to enable customers to change their power use in order to save money.

First, the only customers to pay a CPP tariff would be located in areas that would otherwise require upgrades to the network and where implementing CPP would be cheaper than the required upgrade. If a subsequent investment in the network removed the capacity constraint in an area, the CPP tariff would no longer be required and would be removed.

Second, the tariff would be set so that the price customers paid during peak times was offset by lower prices at other times. Customers on a CPP tariff would receive a small daily rebate on most days of the year, which would be determined based on the user's maximum capacity. Customers on the CPP tariff would then pay significantly higher prices for energy during a small number of CPP events each year.

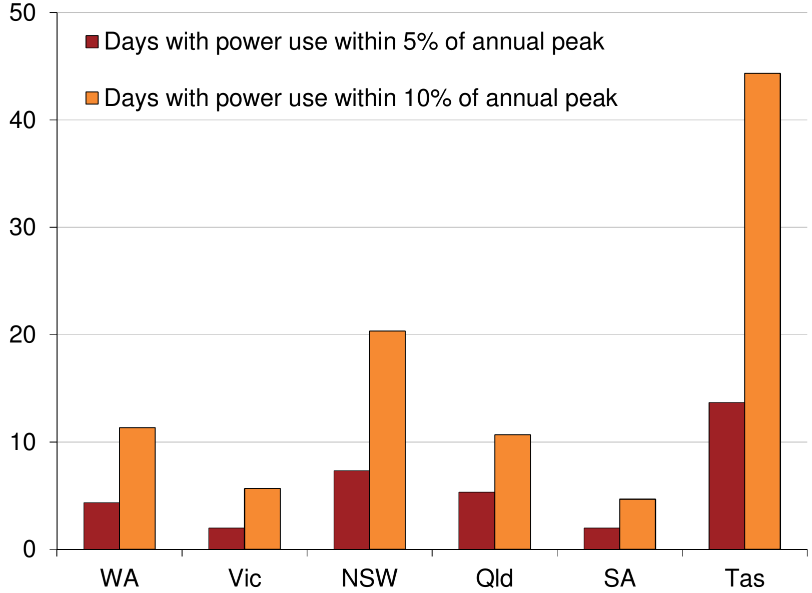
So while customers who used large amounts of electricity at peak times would pay more, customers who used less at peak times could pay a lower bill. Since distribution businesses would charge the tariff, the regulator would ensure that they did not earn extra revenue as a result of the CPP.

To protect consumers and retailers, there would be a maximum number of CPP hours that could be called each year. As Figure 4 shows (see section 1.3), electricity came within five per cent of the annual peak demand for an average of just four to 21 hours a year between 2011 and 2013.

It is proposed that network businesses should be allowed to call for CPP periods for between 30 and 40 hours per year. The number of hours of CPP allowed per year should be as narrow as is practical to limit the amount of time that customers are exposed to high prices. Yet it should allow some margin to account for the fact that networks must predict peaks in advance, that the timing of peaks may be different at different locations, and that the number of peak hours varies widely between years.

Similarly, to reduce the effect on customers the number of days on which peak demand events could be called in a given year should be limited.

Figure 10: Why CPP events will be rare
Number of days



Source: AEMO (2014a), AEMO (2014b), IMO (2014)

As Figure 10 shows, confining CPP periods to a maximum of 15 days per year would limit the number of days in which customers would be exposed by high prices, but would still typically allow network businesses to target enough days to significantly lower the annual peak.

In years where peak demand is relatively low, there is a higher chance that more days will come close to this annual peak demand level. In these years, lower peak demand means less strain on network infrastructure, and therefore capturing all periods of peak demand is less critical.

Power companies at all levels of the supply chain devote substantial resources to tracking electricity demand. This is critical over the shorter term for making sure the system operates reliably, and over the longer term for infrastructure planning.

As a consequence, businesses generally know in advance when peak demand events are likely to occur. Reliable weather forecasts are available a day or more beforehand. Under a CPP tariff, distribution businesses would notify retailers at least a day in advance that a CPP event would occur. It would also specify a block of time – from 2pm to 6pm, for example – when the CPP price would apply.

The CPP would be imposed on retailers based on their customers' use of the network during peak times. Retailers would be responsible for notifying their customers about CPP events and for structuring their prices to collect the CPP tariffs from customers.

Retailers in deregulated markets would not be obliged to pass on the CPP tariff directly to consumers – though it is expected that many would do so to avoid the risk of their revenue not matching the payments they owed to network businesses. Yet some retailers could choose to manage this risk in other ways. Box 4 discusses some of the approaches retailers could take to give customers choice about how to manage CPP events.

3.3 Why CPP brings savings to the network

The key to the effectiveness of CPP lies in deciding how much to charge customers at peak times. Network businesses must assess the extent to which customers are likely to respond to this price signal by changing their behaviour. This response is critical to deciding whether to delay or cancel a decision to build new infrastructure.

A 2009 study compiled results from 28 pricing studies conducted around the world.[21] The study considered a range of pricing structures, including time-of-use tariffs, critical peak pricing trials and peak time rebate programs.[22] For each pricing structure, Figure 11 shows the average peak demand reduction from replacing energy-based tariffs with an alternative pricing structure. The study also separately assessed trials where customers were given some type of technology to help manage their power use.

These results show the potential for CPP to significantly reduce peak demand. The average reduction in peak demand in trials featuring CPP was 17 per cent. Access to technology to assist in managing the peak load increased the average reduction to 36 per cent.

[21] Faruqui and Sergici (2009)
[22] Peak time rebates are similar to CPP tariffs, but rather than receiving a higher bill during peak times, customers receive a discount for reducing their use from some baseline level at peak times.

Box 4: What new tariffs would mean for retailers and customers

This report proposes a number of reforms to the way distribution businesses charge for power. These reforms would change the way retailers pay network businesses for using the power system. Retailers would not have to pass these new charge structures on to customers, but many probably will. It is risky not to pass on network prices; retailers might not collect enough revenue to pay for network tariffs, and would have to make up the difference from their profits.

Even so, some retailers may choose to operate differently. Unlike network businesses, retailers exist in a competitive market and could create new products or pricing structures to appeal to certain customers. There are two ways main ways they could do this.

First, retailers could charge customers using a different price structure from the way they pay networks. For example, a retailer could decide not to pass on critical peak pricing tariffs and instead charge customers a slightly higher rate throughout the year

Some customers could choose this tariff to be saved from worry about power use on CPP days. Yet, these customers are unlikely to save money. Retailers would charge extra to cover the risk of not collecting enough revenue to cover their costs to networks. Plus it is likely that customers with low use at CPP times would prefer to pay the critical peak price, so retailers would need to charge a high premium to cover the cost.

Second, the retailer or another company could introduce new technology products to help customers manage their electricity use. Some of these products are already becoming available. From 2015, all new Australian air conditioners must have the ability to be fitted with a remote control system. Households will not be obliged to use this feature, but some may choose to – possibly to help reduce their use during a critical peak pricing period.

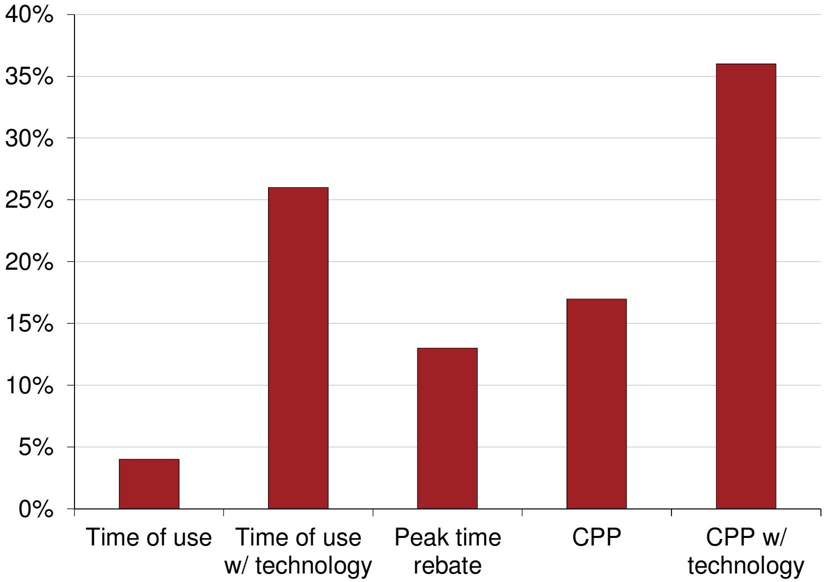
Another example is customers using battery storage to reduce their maximum capacity requirement. For example, Bosch, a German industrial equipment maker, sells a household power storage system that stores energy from rooftop solar and automatically switches between drawing power from the network and using batteries when stored energy is available.

Currently, this storage system is expensive, with prices for a small unit starting from around $20,000 – but storage costs are falling. Tariffs that charge customers higher prices during peak times would provide more incentive to invest in technology to help reduce consumption for those few critical peak hours per year.

Sources: Bosch (2014), Wilkenfeld, G. (2014)

Figure 11: Critical peak pricing encourages customers to change their behaviour

Reduction in energy use at peak times from different tariff types



Note: Figure shows the average reduction in peak demand for each tariff type. These figures collate the results of 28 pricing studies conducted worldwide.
Source: Faruqui, A and Sergici, S. (2009)

Critical peak pricing trials in Australia have produced results consistent with these international studies. For example, separate pricing trials conducted by three New South Wales distribution businesses, Ausgrid, Essential Energy and Endeavour Energy, tested customers' responses to critical peak pricing.

In each of these trials, customers had a critical peak price and access to information about their power use through either an in-home display unit, or via the internet. The average reduction in peak demand in these trials ranged from 23 per cent to 35 per cent.[23]

The CPP price for many of the trials was set at between three and eight times the standard retail energy tariff. For the average Australian customer paying 30 cents a kilowatt hour, this suggests that the retail electricity price during peak times would need to increase to between 90 cents and $2.40 a kilowatt hour to reduce peak demand by 17 per cent or more. This would mean the network charge would need to increase from 12 cents a kilowatt hour to between 70 cents and $2.20 a kilowatt hour.

Yet if this CPP design were adopted, it does not mean that customers, overall, would pay more for using the power network. The design of the tariff means that all of the revenue collected through the critical peak prices would need to be paid back to customers through a daily rebate. As with capacity charges, users that put less strain on the system would actually pay lower bills.

Between 2009 and 2013, around $42.8 billion was invested in Australia's major power networks. Of this, $17.6 billion was spent on growing the size of the network.[24] Figure 12 shows a five-year forecast of peak demand growth from 2009 to 2013 set against the actual investment in network growth over the same period.

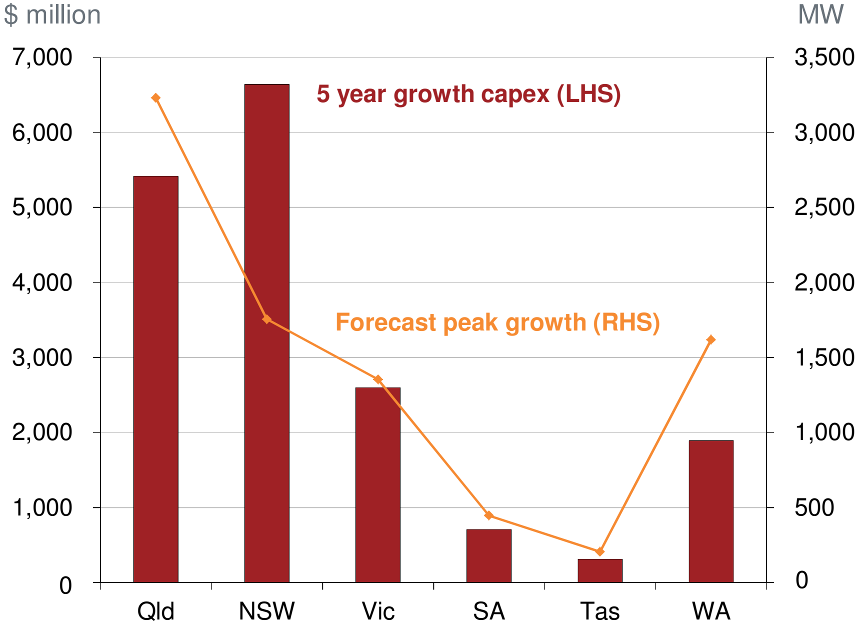
[23] Futura (2011)
[24] CitiPower Pty (2012) Jemena (2012) Powercor Australia Limited (2012), SP AusNet (2012), United Energy (2012), Aurora Energy (2013), SA Power Networks (2013), Horizon Power (2014), Western Power (2013), Ergon Energy (2013), Energex (2013), Essential Energy (2012), Endeavour Energy (2013), Ausgrid (2013b), AEMO (2012).

With critical peak pricing, households' demand for electricity during peak times would have been lower. Given that households make up a large share of network demand at peak times, this could have led to significantly lower forecasts of peak demand in each state.

If CPP resulted in a 17 per cent reduction in household demand at peak times, CPP could have led to $7.8 billion less investment to meet peak demand over the past 5 years.[25]

As it turned out, peak demand did not rise as rapidly as forecast, while overall consumption has fallen. So infrastructure is not fully utilised, and too much has been spent. For a while the new spare capacity may enable the network to cope with any increases in peak demand. Yet as assets depreciate, or if peak demand levels start growing again in some locations, more investment will inevitably be required. Critical peak pricing is an important tool to prevent this investment from becoming excessive in future.

Figure 12: How peak demand forecasts (right or wrong) drive infrastructure spending



Note: Chart shows forecast peak demand growth between 2009 and 2013, as predicted by AEMO in 2009. These figures are compared with actual capital expenditure on growth over the same period. Peak demand forecasts are an important consideration in planning network growth

Source: CitiPower Pty (2012) Jemena (2012) Powercor Australia Limited (2012), SP AusNet (2012), United Energy (2012), Aurora Energy (2013), SA Power Networks (2013), Horizon Power (2014), Western Power (2013), Ergon Energy (2013), Energex (2013), Essential Energy (2012), Endeavour Energy (2013), Ausgrid (2013b).

[25] Most of trials in Faruqui and Sergici (2009) involved volunteers. These customers may be more engaged or more informed about pricing structures than the general population, which could potentially inflate the customers response to peak prices. However, other trials, particularly those combining CPP with technology, produced much larger reductions in peak demand. Australian trials using critical peak pricing resulted in average peak demand reductions of 23 to 35 per cent.

3.4 How to implement CPP

Changes to the National Electricity Rules made by the Australian Energy Market Commission in October 2012 require distribution businesses to carry out an annual planning review that covers at least the next five years.[26] They also oblige the businesses to assess "non-network" options as an alternative to building more assets, when these assets would cost $5 million or more. Critical peak pricing should be considered among these non-network options. Network planning and tariff design would then complement each other in delivering the best outcomes.

The regulator should be flexible in allowing CPP projects outside the planning framework described above. In some cases, the five-year planning process may provide insufficient time to roll out new infrastructure, to introduce new pricing structures, or to ensure that the response from customers has been adequate to defer investment in new assets. In addition, critical peak pricing could be introduced to avoid new investment projects with a value below $5 million.

Critical peak pricing should also be considered in areas where there is no need to grow the network, but where existing assets require replacement. In this case, CPP could be used to avoid or defer investment, or to replace large pieces of infrastructure with smaller systems in areas where peak demand is falling.

In each case, the use of CPP would be limited to situations where the distribution business can show that the area where the tariff is being introduced faces an imminent network constraint.

In some areas of Australia, introducing CPP would require the installation of smart meters that can measure household power consumption during peak periods. Where metering infrastructure is not already available, the cost of such infrastructure could be built into the cost-benefit analysis of whether CPP is a suitable alternative to more capital investment.

[26] AEMC (2012d)

4 How to implement tariff reform

This report analyses the structure of network tariffs and recommends reforms to make them cheaper and fairer. While it is businesses that will ultimately need to reform tariff structures, politicians and regulators have a vital role in introducing frameworks and incentives and removing barriers to change.

The present state of the power sector in Australia gives them both a need and an opportunity to do so. Rising electricity prices, five years of falling electricity use, and the spread of technologies such as smart meters, batteries and smart appliances are changing the way we consume power. Yet designing better tariffs is only part of the story; reform will only succeed if its advantages can be communicated and consumers are engaged in the process.

In the past two years a number of high-level reviews have made a strong case for reform to network tariffs. The COAG Energy Council of Commonwealth, state and territory energy ministers noted in December 2013 that the prices customers pay for the network do not necessarily align with the cost of producing power.[27]

The Australian Energy Market Commission, the independent rule maker for energy markets, observed in November 2012 that:

> *"The way in which network tariffs and retail pricing offers are currently structured means that individual consumers are not always faced with final prices which accurately reflect the actual costs of supply and delivery of their electricity."*[28]

And the Productivity Commission wrote in 2013 that:

> *"under current pricing approaches, households and many businesses are not exposed to the much higher costs of supplying electricity during critical peak periods."*[29]

These reviews have pointed directly at the problem. This report has sought to provide a solution.

This chapter identifies the actions that need to be driven by the COAG Energy Council and implemented through the AEMC and the Australian Energy Regulator (AER). The AEMC is already well-advanced with establishing the framework for more cost-reflective network pricing. The AEMC is also working to establish a competitive market for providing metering services – a critical reform to encourage the deployment of smarter meters.[30]

4.1 What has to be done?

Earlier chapters have made two key recommendations. Capacity charges for all households should replace flat rate and time-of-use energy network tariffs. Where interval or smart metering is not

[27] SCER (2013), p5

[28] AEMC (2012), pviii

[29] Productivity Commission (2013), p247

[30] Currently, metering services are the responsibility of distribution businesses. AEMC (2013c), AEMC (2014b)

available, distribution businesses would estimate a household's capacity from its energy use and the average household pattern of power use across all homes. Where advanced meters are available, distributors should charge customers based on the household's maximum power consumption over the preceding 12 months.

When customers request it, distribution businesses should be required to supply an interval or smart meter to enable billing based on actual maximum usage. The meter should be supplied at a reasonable cost that reflects the benefits of interval metering to both the customer and the power system.[31]

The AER should explicitly require businesses to consider critical peak pricing as a non-network alternative to building or replacing more costly assets. Prices should be structured to ensure that all revenue collected through CPP is returned to customers through rebates, with the size of the rebate based on the customer's maximum capacity.

The COAG Energy Council should make reform of network tariffs a priority. This would explicitly reflect earlier agreement to amend pricing principles to encourage more efficient network pricing. Having endorsed the AEMC's recommendation in this regard, the COAG Energy Council should make sure it is implemented and evaluate its success [32]

The current regulations allow network businesses considerable flexibility in setting tariff structures. This is because the businesses have access to greater amounts of detail on the size and specific consumption patterns of customers and on the available capacity and limitations of the network. The AER is primarily concerned with the overall revenue outcome.

This report recommends that distribution businesses adopt capacity charges for all customers and critical peak prices in areas where the cost is lower than the potential benefit. The AER should consider these pricing principles when reviewing network businesses' annual pricing proposals and when assessing the Pricing Structures Statements that businesses would be required to submit under changes proposed by the COAG Energy Council.[33]

4.2 Gaining support for fairer pricing

In the short term, these reforms will produce tariffs that share the cost of the power network more fairly between consumers. In the longer term, the reforms will reduce the need for new infrastructure and bring down prices through reducing the cost to build the network.

For consumers who do not use a lot of power at peak times, and who therefore impose lower costs on the network, the proposed reforms could immediately reduce their power bills. But some consumers who have relatively high peak usage are currently receiving an implicit subsidy, paid for by other users. These

[31] Network business can save money by not having to manually read the meter, and retailers can use the richer information about the customer's electricity use to tailor better products and services.
[32] AEMC (2012)
[33] SCER (2013)

customers will start to pay their fair share when these subsidies are removed.

For the reforms to succeed, their purpose and consequences must be clearly communicated. Consumers will need to understand why reforms are required and how the change in tariffs will benefit all users over time.

Governments, businesses and regulators will need to be clear that the total amount of revenue collected by network businesses is not increasing as a result of the changes; that higher bills for some customers will be offset by lower bills for others.

Policymakers should consult with welfare agencies to examine how tariff changes may affect vulnerable consumers.[34] It is important to recognise that, in many cases, vulnerable customers are among those paying too much for power to subsidise other users. Yet, in cases where evidence shows some vulnerable customers will face substantial bill increases, transition or support measures should be provided. Such measures are important to protect these users. They will also reduce the risk that negative consumer reactions could pressure decision makers to abandon or delay reform.

While some transitionary or support measures may be necessary, it should be recognised that the proposed reforms will make tariffs cheaper for all consumers and allocate costs among them in a fairer way. It is therefore important that additional welfare measures, where necessary, should complement these goals.

Specifically, support measures that remove the price signal for consumers to use less power at peak times should be avoided. Measures such as support to replace inefficient appliances or providing direct financial payments could be structured to limit cost increases to vulnerable customers, while retaining the incentive to reduce consumption at peak times.

Consumers' response to the reforms is critical to their success. Box 5 shows how an attempt by a Victorian distribution business to make use of the state's smart meters triggered a consumer backlash that stalled the reform process. Following public criticism, the Victorian Government imposed a moratorium on the introduction of new tariffs in March 2010, and did not lift it until September 2013.[35]

This report proposes pricing structures that give consumers choices that will allow them to save money. For example, customers being billed for capacity based on the average user's energy profile will be able to install an interval meter if they believe their consumption is more efficient than the average. Households with critical peak pricing will receive a discount on their power bills if they reduce their consumption at peak times, or may pay more if they opt for the convenience of using more power at these times. Either way, customers will end up paying tariffs that best reflect the choices they make in the way they use electricity.

[34] Work undertaken by Deloitte Access Economics for the Victorian Department of Primary Industries identifies nine types of vulnerable household groups and examines the impact of time-of-use pricing. See Deloitte (2012)

[35] Minister for Energy and Resources (Victoria) (2010), Origin Energy (2014)

Box 5: Policymakers must keep customers satisfied

In early 2010, a public debate erupted when SP Ausnet, a Victorian electricity distribution business, proposed a new household tariff structure. The flat rate tariff charged $6.20 a year for connection, and 7.6 cents a kilowatt hour for energy, or 8.1 cents for use in excess of 1020 kilowatt hours per quarter.

The new tariff increased the price for power during certain peak times on weekday afternoons in summer and winter. These rates were between 30.6 cents and 38.2 cents per kilowatt hour – a significant increase on the previous charges. Yet at other times electricity was much cheaper: only 2.6 cents a kilowatt hour.

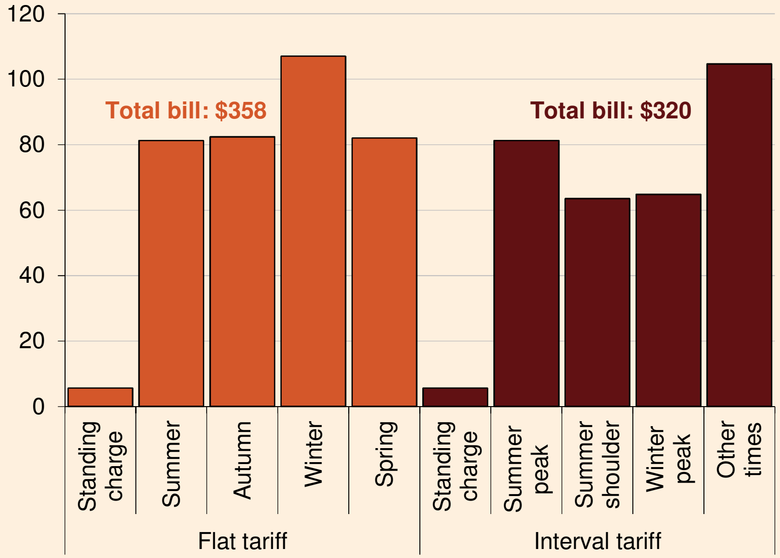
The new tariff would have saved the average Victorian households an average of $38 a year – more than 10 per cent off the network bill. Yet public discussion focused only on the peak prices. The ABC reported that:

> *The Victorian Energy Minister, Peter Batchelor, says the price rise sought by SP AusNet is excessive.*

In March 2010, the State Government introduced a moratorium on time-of-use pricing, which remained in place until September 2013. Victorians spent $1.8 billion to install smart meters on every home, but it would be two and a half years before businesses would be allowed to use them for most customers.

This example serves to highlight how important customer support is to the introduction of new tariff structures. Despite the fact that most customers would have been better off with the new tariffs, a lack of information, poor communications and a lack of analysis on how the changes would affect vulnerable customers produced a major delay to the tariff reform process.

Comparison of flat and interval network tariff costs for an average SP Ausnet residential customer in 2010
$/ per year



Sources: AEMO (2014b), SP AusNet (2012), Grattan Analysis of household power consumption by state.

Sources: ABC (2010), Metering.com (2010), Origin Energy (2013), Victoria Government (2014a).

The introduction of a capacity-based tariff is not designed to change the earnings of network businesses but rather redistribute revenue across consumers with different usage patterns.

Critical peak pricing seeks to ensure more efficient future network investment, and hence lower prices for customers. When distribution businesses build more assets they are permitted to collect more revenue from customers. So, less investment means less future profit for networks. Yet, because the networks also avoid building assets, CPP will not lower the rate of return that networks earn on existing assets.

In contrast, excessive investment in network assets raises the risk that future governments or regulators could move to write down the value of existing network assets. This could materially reduce network owners' rates of return. Businesses therefore have at least some incentive to encourage efficient investment.

4.3 Specific stakeholders can help create change

The COAG Energy Council should set targets and monitor the achievement of these targets. It should ensure that success is measured as the achievement of outcomes such as changes in peak demand, changes in household bills and adoption of cost reflective tariffs - and not as a set of agreed actions with no consideration of outcomes.

State and Territory governments and their agencies must take a lead in communicating the benefits of the proposed pricing reforms to their electorates. The removal of remaining retail price regulation must also be a priority.

The AEMC has taken a strong leadership role in its 2012 *Power of Choice* report and in recommending rule changes that facilitate more cost-reflective network pricing.[36] The role of the AER will be critical to deliver the benefits of network tariff reform and ensure they are not outweighed by associated costs. The COAG Energy Council should monitor the performance of the AEMC in making rule changes and the AER in enforcing them.

Across the National Electricity Market, distribution network businesses have trialled a number of approaches to tariff reform, generally on their own initiative. They have also developed, trialled and promoted other innovations such as direct load control, in which devices are used to remotely switch off an appliance for short periods during peak demand times or to help consumers manage their maximum use by switching appliances on at off-peak times.

The recommended network tariff reforms are not intended to hurt the profitability of distribution businesses, but rather to provide incentives for them to invest in infrastructure in the long-term interests of consumers. The risk to distribution businesses of future loss of revenue, including having to write down the value of their infrastructure if network prices become uncompetitive with off-grid alternatives,[37] should provide an underlying incentive to secure their support for efficient reforms.

Over time, network businesses are likely to profit from innovations such as advanced metering, distributed generation, electricity storage and direct load control with smarter appliances.

[36] AEMC (2012b)
[37] Wood, T., Carter, L., and Harrison, C. (2013)

Regulatory reforms should encourage, not hinder, such opportunities.

Retailers have a direct relationship with electricity consumers. The introduction of the network tariff reforms described in this report and the opportunity to adopt smart meters and benefit from the greater information base that they provide, will give retailers the opportunity to offer a wider range of services to customers. While retailers can be expected to take up this opportunity, adoption rates and their results should be monitored and any barriers addressed.

Welfare organisations will be concerned to ensure that fairer and lower prices do not lead to unintended adverse impacts on their constituents, particularly low-income households and other vulnerable consumers. It will be vital that such consumers understand the benefit of reducing their consumption at peak times and adopting tariffs that deliver such benefits. It may also be necessary to review existing mechanisms that support vulnerable consumers to ensure these mechanisms continue to play that role under a new tariff structure.

The price of electricity has risen substantially every year in recent years, even as consumption falls. Network tariff reform has the potential to help prevent such large rises in future and remove unfairness among customers. The poor history of the mandatory smart meter rollout in Victoria, and the general tendency of consumers to put a low value on uncertain benefits against the prospect of certain costs,[38] mean that governments and their agencies, NGOs and retailers, will have to clearly communicate the reasons for the changes and their benefits.

The interests of power generators, which produce the electricity that is transported through the networks, should also be considered when proposing major reform to the way customers use electricity. Like network businesses, generators must build enough infrastructure - power stations, in this case - to supply the power system at times of peak demand.

Over recent years, as peak demand has increased relative to average demand, gas-fired generation plants have been built to provide a faster response to changes in overall demand. Gas generators have the advantage that they can be switched on and off more quickly than coal-fired power stations. The introduction of more wind power, driven by Renewable Energy Target, has changed the nature and mix of the electricity supply system. Falling demand for electricity has resulted in lower wholesale electricity prices, putting financial pressure on power stations.

Changes to tariffs are likely to further change the way power is consumed and supplied. While tariff reform should not give undue consideration to the commercial interests of power generators, regulatory changes and reversals of government positions can deter investment. Retailers may also combine CPP for networks with some element of similar pricing to reflect higher generation costs at critical peak times. Therefore major changes to the framework for network tariff design should be clearly flagged so that power generators can adapt their strategies accordingly.

[38] Kahneman and Tversky (1979)

4.4 Addressing barriers to implementation

Tariff reform will need to overcome a number of structural barriers. These include existing limits on retail price competition, the unsophisticated nature of Australia's electricity meters, and consumer inertia.

4.4.1 Retail price regulation

In 2004, the Council of Australian Governments committed to deregulation of retail energy prices. Under the Australian Energy Market Agreement, retail price regulations would be removed in each jurisdiction once it was shown that effective retail price competition existed.[39] Because not all states have made this transition, the method of setting retail tariffs varies among states.

In Victoria and South Australia, the retail market is fully deregulated, and regulators are not required to approve the price that retailers charge customers or the form tariffs must take. Competition between retailers is assumed to be a sufficient control on prices.

Retail price deregulation has been introduced in New South Wales from 1 July 2014. Residential customers in the Australian Capital Territory, Western Australia, Queensland and Tasmania are still able to choose between a retail tariff set by the regulator and competitive offers from retailers. That is, retailers may compete for customers by offering discounts on the regulated tariff. The regulated prices aim to ensure that, regardless of the level of competition, all customers can obtain prices for electricity and gas that the regulator considers reasonable.[40]

The reforms this report recommends will provide the best results for consumers and the supply sector if retailers use the changes to network prices as an opportunity to offer a new wave of innovative products and services to existing and potential customers. This is harder to achieve in states where regulators must approve new products or price structures before they are made available to customers. It is one more reason why such regulation should be eliminated.

4.4.2 Smarter meters

The adoption of capacity and critical peak tariffs requires interval or smart meters. There has been a push to roll out these meters more widely over the last few years. The mandatory roll-out of smart meters in Victoria between 2009 and 2013 is the leading example. The widespread adoption of rooftop solar has also required the installation of interval meters to measure inflows and outflows of power, so that households can be paid for electricity sent from the home.

Some distribution businesses have also installed interval meters as part of ongoing meter replacement programs. For example, Ausgrid in New South Wales supplies power to around 1.6 million customers. Over half a million of these customers have interval meters, 3000 customers have 'advanced' interval meters and

[39] AEMC (2014)

[40] AEMC (2014)

nearly 18,000 have smart meters.[41] Energex, a distribution business in south-east Queensland, have around 1.3 million customers. Of these, 300,000 already have interval meters.[42]

A national mandated rollout of smart meters seems unlikely in the foreseeable future due to the perceived deficiencies of Victoria's mandatory smart meter rollout, uncertainties regarding the net benefit of the rollout, and the difficulties in resolving who should pay for the meters, given that retailers, network businesses and customers will all share in the benefits.[43]

The debate has been distorted by the experience of the mandatory rollout in Victoria. A 2011 review of the program concluded that over 2008-28 it would result in a net cost to customers of $319 million.[44] As with many such programs, the benefits were lower and the costs higher than the original analysis had estimated. Because other Australian jurisdictions have little appetite for repeating this experience, the tariff reform process and rate of uptake for smart meters across Australia under a market-based approach is likely to be slow.[45]

There is a case for expanding the types of businesses that are able to install meters on customers' homes. While distribution network businesses should oversee most smart meter rollouts, regulatory barriers to third party providers and major roles for retailers should be removed, subject to third parties supplying meters that are compatible with the needs of existing systems.[46]

Meter rollouts should also be included when network businesses are considering capital investment to augment or expand the network. This report argues that businesses should be required to consider alternatives - including the introduction of critical peak pricing in certain locations - that could remove or at least postpone the need for such investment. Such alternative assessments would need to include the cost of smart meters if such meters are not in place in areas where the network is constrained.

Other countries have taken a different approach. The British Government has adopted a mandatory rollout of smart meters by 2020. Installing smart meters is expected to provide £6.2 billion of net benefits to the UK over the years to 2030.[47] The program will cost £10.9 billion and is expected to deliver £17.1 billion in benefits.

Progress in Australia should be monitored so that if uptake turns out to be slow, policy makers could update analysis in the light of the latest information and data on both the benefits and costs across the full electricity supply chain.

[41] 'Advanced' interval meters have additional 'smart' features but do not have the communications capability of smart meters. Ausgrid (2013a)
[42] AER (2013b), figures for Energex interval meters provided through private communications.
[43] Productivity Commission (2013)
[44] That is, in present value terms, the costs of the program will exceed the benefits by $319 million. Deloitte (2011)
[45] Productivity Commission (2013)
[46] AEMC (2014b)
[47] DECC (2011)

4.4.3 Consumer inertia

Electricity consumers do respond to price signals. More than 70 per cent of households in south-east Queensland have chosen to accept a market offer from a private retailer rather than remain on the regulated tariff set by the state government regulator, the Queensland Competition Authority.[48] Across Australia, feed-in tariffs and falling technology costs have led more than a million homes to install rooftop solar.[49]

The historically unprecedented fall in electricity consumption over the last five years also shows that consumers respond to price, particularly when change is made easier by the availability of a wide range of choices, including smarter and more efficient appliances. Australian trials of critical peak pricing also suggest that customers would reduce their peak consumption by between 23 and 35 per cent in response to higher prices at peak times.[50]

The Productivity Commission explored consumer responsiveness to time-based prices in some detail.[51] It concluded that providing customers with access to information about the savings available through changing patterns of consumption, and information about technologies and devices that would help to deliver these savings, was essential to change.

4.5 Longer term

Network tariff reform can make electricity prices fairer and cheaper. Customers will be given more choice in the way they use electricity, and network companies can better match expenditure to real customer needs. But reform is never easy, particularly when multiple parties are involved. Delivering these benefits will require a sustained commitment from governments, regulators and electricity businesses. It is a commitment worth making.

48 QCA (2014)
49 Clean Energy Regulator (2014)
50 Futura (2011)
51 Productivity Commission (2013)

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