Electricity Distribution Network Tariffs

Principles and analysis of options

PREPARED FOR

The Victorian Distribution Businesses

(Ausnet Services, Jemena, CitiPower, Powercor, United Energy)

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This report was prepared for the Victorian electricity distribution businesses. All results and any errors are the responsibility of the authors. This report does not represent the opinion of The Brattle Group or its clients.

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Executive Summary

The Victorian Distribution Networks, working together with stakeholders, are developing ideas on network tariff design[1] ahead of the next formal Tariff Structure Statement (TSS) process. This will culminate in a design for Victorian network tariffs for the period 2021–2025. The network tariff is a set of charges which determines what proportion of the overall cost of the network is paid by each user. In the short run the total network cost is largely fixed, irrespective of how customers use the network, but, in the longer run, customer behaviour will influence future network costs. Both the overall cost (the network revenue) and the sharing (the network tariff) are regulated by the Australian Energy Regulator. As part of developing a new tariff design, the Victorian Distribution Networks have asked The Brattle Group to write a paper on tariff objectives and tariff options, and to include an overview of recent developments in adjacent and international jurisdictions.

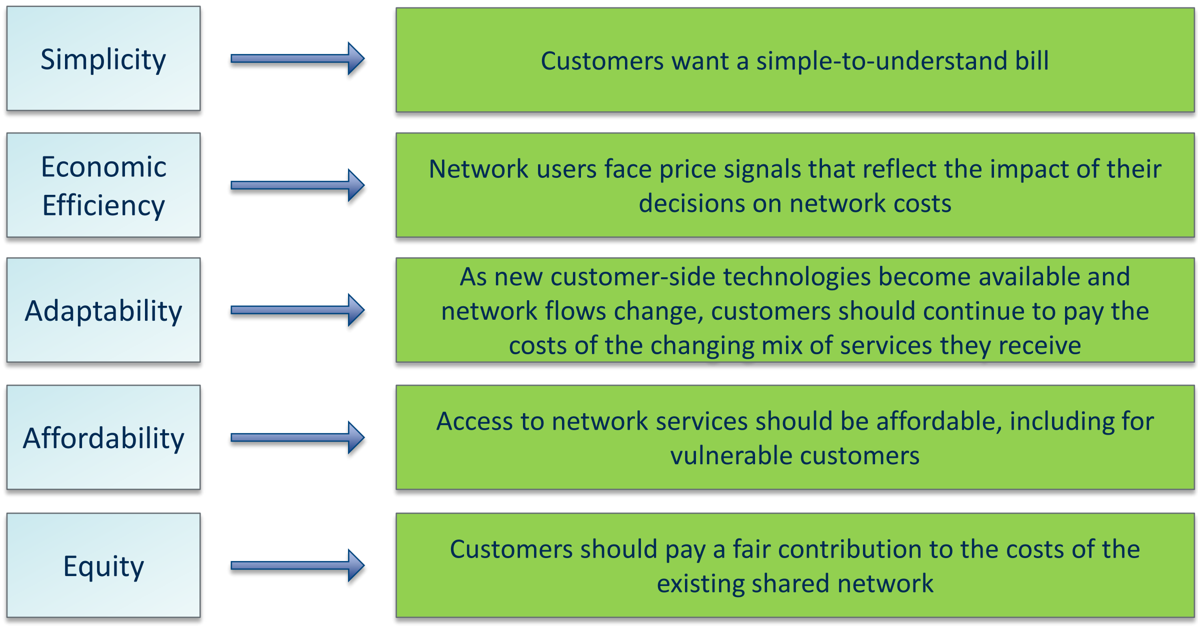
In most jurisdictions internationally and in Australia, small users have traditionally been charged for their share of network costs based largely on their energy consumption (ie, kWh). However, tariff reform efforts in many jurisdictions are tending to increase the weighting on peak demand and/or fixed daily charges in charging customers for their usage of the network. These reforms result in a network tariff that is more "cost reflective", in the sense that the contribution to overall network cost from each customer reflects drivers of future network cost. Reflecting cost is important because this promotes economic efficiency, ultimately leading to lower prices. However, economic efficiency is not the only objective of tariff reform, with other considerations often taken into account, such as equity or fairness, and the benefits of gradual change.

As in other jurisdictions, the Victorian Distribution Networks' stakeholder engagement process has identified several objectives for future tariffs. The five objectives are: simplicity, economic efficiency, adaptability, affordability and equity. In the chart below we show how these objectives can be interpreted for the purposes of network tariff design and prices paid by end customers. In developing tariff options that can help achieve these objectives, we need to recognise that there are trade-offs among the objectives (for example, a simple tariff may

[1] In this report we use "network tariff" to refer to charges for using the network. We use "retail prices" to refer to the prices paid by end customers. Implicitly or explicitly, retail prices cover the cost of the network tariff as well as other costs (generation, retail margin, and so on).

not be as good at promoting economic efficiency as a more complex one). Furthermore, in Victoria end customers pay the retail price, which may not necessarily resemble the structure of the network tariff.

Stakeholder objectives for network tariff design



In Victoria, households and other small customers do not pay for network services directly: customers buy "delivered" electricity from retailers, and retailers pay a charge to the network for their aggregate use of the network. The networks are responsible for delivering electricity to end customers, so customers' decisions about when and how much electricity to consume influence the networks' future investment plans. In turn, each retailer pays to the network a charge that depends on the aggregate consumption profile of the retailer's portfolio of customers.[2] Retailers design price plans to offer to potential customers, and these price plans must cover the retailer's costs as well as attract and retain customers. We think that both retail price plans and network tariffs have a role to play in meeting the objectives shown above.

Customers' bills depend on their choice of retailer and price plan, and customers' consumption decisions will be influenced by their bill and potentially other information provided to them by retailers. We depict these relationships below.

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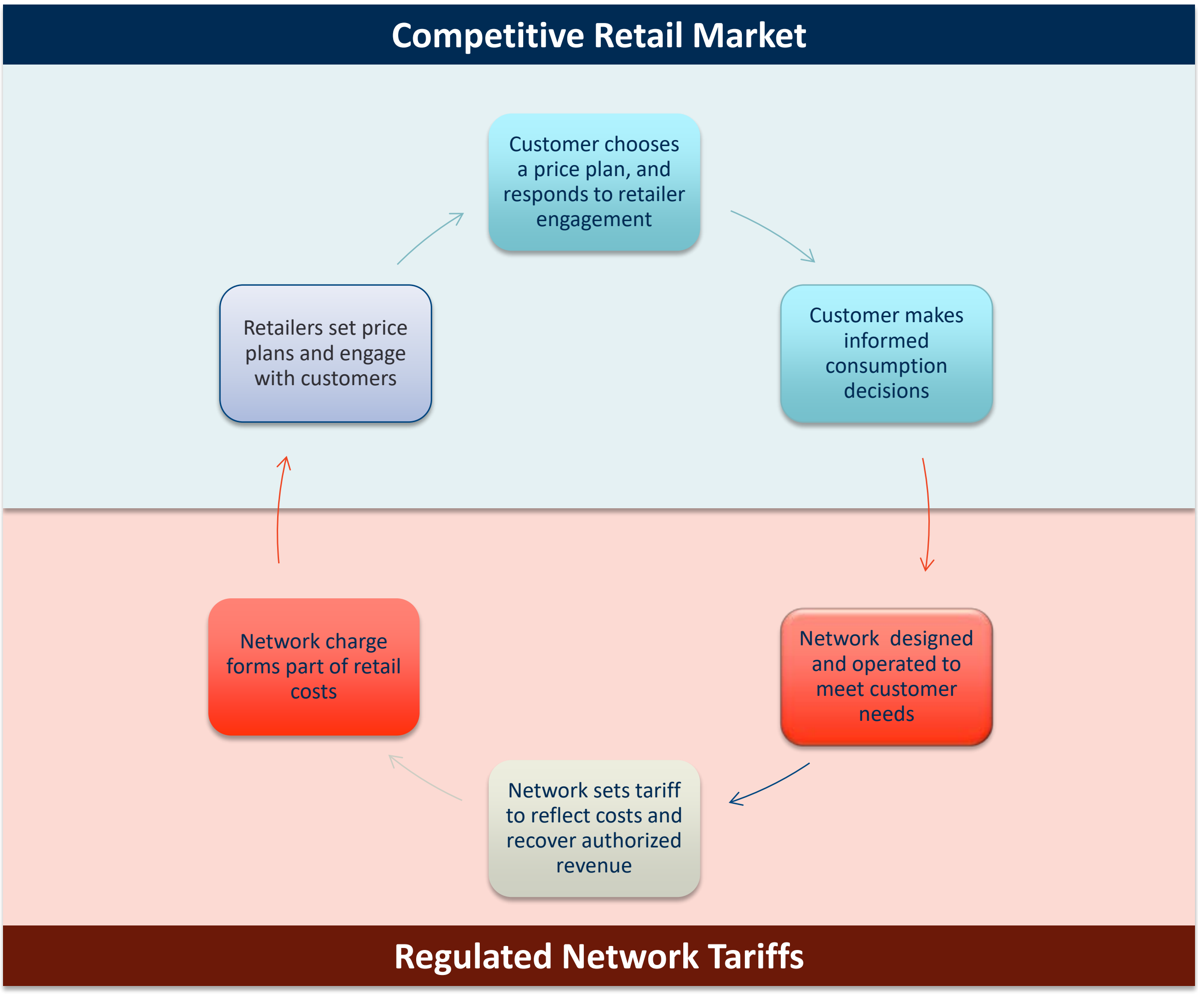
2 The network is responsible for calculating each retailer's network charge, made up of individual charges for each metering point assigned to that retailer

The cycle of information flows



The picture above illustrates that the information contained in the network tariff reaches customers via retailers. Therefore the primary "audience" for the network tariff is the retailer, and, in turn, the retailer is the primary source of information for customers to decide how their choice of different consumption patterns will influence the bill they pay. Information about network cost, and options that customers have to reduce their bills by changing consumption patterns, does not come to customers directly from the network. That information is communicated to customers by each customer's retailer. That information could be communicated via the choice of price plans offered by the retailer, on the customer's bill, or through some other channel. The cycle shown above is a "virtuous cycle" provided that network tariffs are well designed and that retail competition is effective (and well-designed network tariffs can facilitate retail competition). However, it could become a "vicious cycle" if either of these conditions do not hold because information about the impact of consumption decisions on costs cannot reach customers, and customers cannot make informed choices.

Meeting the objectives for tariff design requires trade-offs, and both the networks and the retailers can contribute. In the table below we explain how networks and retailers can each contribute to meeting the five objectives.

Contribution to meeting the stakeholder objectives

Objective	Network Role	Retailer Role
Simplicity	Network tariff reflecting cost permits retailers to develop a range of simple retail price plans. As a complementary measure, networks could help with analysis of load data and implcations for retailers' network charges.	Retailers have the resources to understand and respond to complex tariffs provided that tariff calculations are transparent; retail price plans need to be simple and understood by customers.
Economic efficiency	Tariff should include elements reflecting drivers of incremental costs, such as contribution to network peak demand; residual costs should be recovered from different elements, such as number of customers.	Success in a competitive retail market will deliver efficient outcomes.
Adaptable	Tariff contribution to economic efficiency needs to be robust to and updated for technical change (such as customers installing PV and storage).	Retailers can create and adapt price plans as new technologies emerge. Retailers can also create bundled technology offers (eg, storage).
Affordable	Economic efficiency and revenue regulation contributes to affordability; affordability for vulnerable customers could be part of residual cost recovery in the network tariff.	Retailers can help identify vulnerable customers; an affordable price plan for vulnerable customer groups could be part of retailer's market proposition (or hardship policy).
Equitable	Customers should pay a fair contribution to shared network costs, and pay all of the costs they impose on the network (which would otherwise fall on other customers).	Effective competition between retailers should result in customers paying the costs that they impose on the network.

A network tariff designed with the retailer as its primary audience might have a demand charge reflecting the cost of adding new capacity to the network, and a customer-count charge (ie, a charge proportional to the number of customers in the retailer's portfolio) to recover a share of the sunk cost of the existing network. The retailer in turn could design a series of price plans that reflect network and wholesale costs (and retailer operating and administrative costs) and elicit a positive response from customers. For instance, one retailer could have a time of use (TOU) energy plan that offers free nights and weekends (off-peak); a simple solar demand management plan, where a solar customer leases a battery that manages demand (the retailer could also potentially use the battery to provide benefits to its other customers); a capacity charge, where a customer signs up for a maximum simultaneous capacity to be delivered for a fixed monthly fee; and a straight pass through where the customer pays network and wholesale prices with a fixed mark-up. Other retailers may offer a different set of price plans. Successful retailers will study preferences of different customer groups in order to create customised price plans that will appeal to each group.

An alternative approach would be for the network tariff to address end customers directly with customers rather than via retailers. Some examples of simple network tariffs that could be addressed directly to end customers are a time of use tariff (TOU); a demand subscription tariff; and a fixed charge. These tariffs would be simpler than a tariff addressed to retailers, but would not contribute so much to the other objectives. This alternative approach might be taken if retail price plans offered in the market are not contributing to the objectives described above, for example due to ineffective competition. In order for the alternative approach to work, the networks would have to communicate the tariff directly to customers, for example through a requirement that retailers print details of the network tariff and network charge on the customer's bill.

If the network tariff is to be communicated directly to customers, networks (rather than retailers) would be responsible for ensuring that the information is presented in a way that customers understand. We think that this approach would be second-best because it would require a one-size fits all approach and because retailers are better suited than networks to communicate effectively to customers. Furthermore, a shift towards more cost-reflective network tariffs could help make retail competition more effective by creating opportunities for retailers to find customers with low-cost consumption patterns.

In the table overleaf we assess a set of tariff options according to how they might contribute to the stakeholder objectives set out above.

Illustrative comparison of tariffs

Tariff Objective	Network Tariffs for End-Customers			Network Tariffs for Retailers		
	TOU	Demand Subscription Service	Fixed Charge	CPP and Customer-count Charge	Demand and Customer-count Charge	Demand and Customer-count Charge + Assist Vulnerable Customers
Simple	Medium	Medium	Strong	Medium/Strong	Medium/Strong	Medium/Strong
Economic Efficiency	Medium/Strong	Strong	Weak	Medium/Strong	Strong	Strong
Adaptable	Medium	Strong	Weak	Strong	Strong	Strong
Affordable	Medium	Medium/Strong	Weak	Medium	Medium	Strong
Equitable	Weak	Medium	Strong	Strong	Strong	Medium/Strong

Strong Medium Weak

Reforming tariffs to better reflect system cost will provide a multitude of benefits. It will encourage better use of the existing network infrastructure and customer investments that minimize system costs. Tariff reform can also help avoid a situation where some customers are able to make investments that reduce their network charges but also increase network charges for other customers. Tariff reform can also help encourage retail competition, by creating greater opportunities for retailers to differentiate themselves. This can ultimately reduce prices for all customers.

I. Introduction

I.A. Background

The network tariff is the charge that retailers and some large commercial and industrial customers pay for network services.[3] Electricity is purchased on the wholesale market and transported over the high voltage transmission network, and is then distributed over the lower voltage distribution network to end-customers. The focus of this report is smaller customers who purchase "delivered" electricity from retailers as a bundled product, and do not pay for network services separately. The network tariff recovers the costs of the transmission and distribution networks. Retailers pay network charges, the cost of purchasing electricity on the wholesale market, metering costs, and other operating and administrative costs in respect of the delivered electricity that they sell to end customers as a bundled product.

The overall amount of network revenue that DNSPs can collect is determined by the Australian Energy Regulator (AER) once every five years in a revenue determination.[4]

The DNSPs set network tariffs every year—these tariffs set out the charges that all users of the network must pay. The tariffs does not determine the overall amount of revenue that the DNSP can collect, since this has already been decided. Rather, the tariff influences what proportion of the total revenue is collected from each network user, and how each user's charge depends on the way in which they use the network. For example, the tariff will determine whether the costs of the network are recovered mostly from usage at times of peak demand, or are more spread out across all usage.[5] The network tariff that is set each year

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3 In this report we use the term "network tariff" to refer to the rules which determine how much each user of the network will pay for using the network. We use "network charge" to mean the amount each user pays for network service, and "retail price" to mean the overall price paid by end-customers for delivered electricity.

4 In Victoria, the revenue that the DNSPs receive cannot exceed the revenue cap set by the AER (if excess revenue were to be collected, it would be refunded in the following year). Similarly, the revenue received by transmission network service providers, part of which comes from DNSPs, cannot exceed the revenue cap set by the AER. Network tariffs cannot recover more revenue than the sum of the distribution revenue allowance, transmission costs and premium feed-in-tariff costs.

5 Tariffs will also impact future network costs insofar as they influence customer behaviour, which in turn influences the need for investment in new network capacity (see Figure 3).

follows the tariff design set out in the TSS. The TSS is set every five years, and must be approved by the AER. The current TSS will apply until the end of 2020.

In Victoria, retailing of electricity is open to competition: there are many retailers, and consumers can choose which one to buy electricity from. The retail price of electricity is not regulated, but is set in the market. Customers who have never chosen a retailer, or who have allowed their retail contract to expire are placed on a "standing offer". Each retailer sets its own price for the standing offer, which is not subject to regulation. Around 9 per cent of residential electricity customers in Victoria are on standing offer contracts.[6]

From the perspective of the retailer, the network charge is a cost of doing business. The retailer will need to cover that cost from the revenues it obtains from selling electricity, but there is no direct relationship between the cost of using the network and the bundled price that a retailer charges its customers (which covers the cost of buying electricity on the wholesale market, network services, and other elements of the retailer's cost), just as there is no direct relationship between the cost of employing the retailer's staff and the retail price of electricity. In Victoria, household electricity bills sent by retailers typically do not show a breakdown of the retailer costs, such as network charges. In contrast, in some other jurisdictions internationally, retailers are required to include on the bill an estimate of how much that customer contributed to the retailer's overall network charge.

I.B. This Report

The Brattle Group has been retained by the Victorian DNSPs to prepare a report on principles for network tariff design, and possible options for developing future network tariffs in Victoria. Our work is an input to an upcoming stakeholder workshop in April 2018. Ultimately the Victorian DNSPs will be preparing new tariff designs to come into effect in 2021.[7] In our report we consider both network tariff designs that would be desirable in the long-run (say 2025), as well as how to implement and transition to such network tariffs, including any complementary measures that will facilitate the transition.

Our report builds on the results of the DNSP stakeholder engagement processes to date, and in particular on ideas developed by stakeholders for the objectives that network tariffs should

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6 Victoria DELWP (2017): "Review of electricity and gas retail markets in Victoria", p.14

7 The current tariff design is contained in the *Tariff Structure Statement 2017-20*, published by each DNSP and approved by the AER.

seek to achieve.[8] We also include a survey of distribution tariffs from international jurisdictions and elsewhere in Australia as a second source of ideas for the evolution of Victorian distribution tariffs.

The emerging conclusions in this report will be tested and further explored at a stakeholder workshop in April 2018.

I.C. Trends in Electricity Usage and Impact on Networks

Tariff design is not a new problem, but the introduction of smart meters means that designs previously only applicable to single large customers could be more widely applied.[9] New technologies that allow customers to self-generate, energy efficiency, and structural changes to the Australian economy are leading to a flat or declining outlook for total electricity consumption.[10] At the same time, the consumption patterns of individual customers are becoming more diverse. These changes make tariff design more challenging as the traditional correspondence no longer holds between energy consumption (traditionally the basis for charges) and peak demand (which drives network costs). Peak demand may increase without a corresponding increase in energy consumption as existing technologies such as air-conditioners become more widespread and new technologies such as electric vehicles are introduced. Moreover, even though load growth may be declining for the system as a whole, this is not uniform across the network. Certain areas are still experiencing high population growth and thus localised peak demand is growing.

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8 These ideas are described in Victorian distributors' 2017 consultation paper. See AusNet Services, Jemena, CitiPower, Powercor and United Energy, "Victorian electricity future forum: Household network pricing – Consultation report", December 2017, available at: https://www.ausnetservices.com.au/-/media/Files/AusNet/About-Us/Determining-Revenues/Distribution-Network/VICTORIAN-ELECTRICITY-FUTURE-FORUM-HOUSEHOLD-NETWORK-PRICING.ashx?la=en.

9 The principles that guide electric rate design have evolved over a long period of time. See, for example: Hopkinson, John R., "On the Cost of Electricity Supply", *Transactions of the Junior Engineering Society*, Vol. 3, No. 1 (1892), p.1-14; Doherty, Henry L., "Equitable, Uniform and Competitive Rates, Proceedings of the National Electric Light Association", (1900), p.291-321; Bonbright, James C., Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates*, 2d ed. (Arlington, VA: Public Utility Reports, 1988); and Kahn, Alfred, *The Economics of Regulation: Principles and Institutions*, rev. ed. (MIT Press, June 1988).

10 Energy Networks Australia (ENA), "Electricity network transformation roadmap: Final report", April 2017, available at: http://www.energynetworks.com.au/sites/default/files/entr_final_report_web.pdf.

Network tariffs need to recover the overall cost of the existing network—they need to result in revenue equal to that approved by the AER in the revenue determination process. At the same time, tariffs need to send signals to network users about the impact of usage on costs, so that the network develops in an efficient manner. This is particularly important as usage patterns change, for example with the adoption of new technology like PV and storage. In the long run, parts of the network need to be replaced and/or expanded, so one customer using the network imposes an opportunity cost on customers as a whole. Well-designed tariffs will target these costs on the users that cause them. Often the incremental cost of replacing and/or expanding the network will be different from the total cost of the existing network (the difference between the two is termed "residual costs"),[11] and one of the challenges for tariff design is to provide correct price signals while also recovering total costs. In this report, we refer to "balancing items": tariff elements that might be adjusted up or down from cost-reflective levels in order to recover total costs.[12]

The costs of the current network are largely independent of changes in network usage. In particular, if usage falls, the costs of the existing network do not fall unless reduced usage means that replacement expenditure can be avoided or deferred. The costs of additions to the network are primarily driven by the need to build capacity to meet peak demand. Customers pay for the option to take power from the network at any time and to impose demand on the system of any magnitude (up to the physical capability of their connection). In the future, if customers want to use the network differently such that they do not need the option to increase consumption at any time, the future network would be less expensive than what it would otherwise have been. This presents a number of challenges for the networks as they work to deliver value to customers: 1) how to make the existing network as useful as possible, and 2) how to meet future customer needs while minimizing future network expenditure. The key to attaining both goals is to provide rewards for the adoption and use of new technologies (and behaviours) that shift load away from network peaks. Investments by end-customers will play a large role in this future as they make decisions over adopting air-

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[11] For a discussion of residual costs and the role of network tariffs in recovering residual costs, see *Structure of Electricity Distribution Network Tariffs: Recovery of Residual Costs*, Brattle paper for the Australian Energy Market Commission, August 2014.

[12] Often the incremental cost of providing additional network capacity will be less than the average cost, due to economies of scale. In this situation, the "residual cost" is positive, so balancing items will be adjusted upwards. In some circumstances, such as where a large proportion of the existing network is depreciated (ie, its cost has already been recovered), incremental cost can be above average cost, and residual cost and balancing items could be negative.

conditioners, solar panels, electric vehicles and battery storage. Decisions that customers, retailers and third parties take now to install such equipment will have impacts on usage for some time to come, and may trigger expensive network upgrades if customers are unable to take into account the consequences for network costs of using such equipment. If the network tariff does not reflect costs, there is no way for customer decisions to take network costs into account, and the costs will ultimately be borne by customers as a whole (many of whom will not be benefitting from the services provided by the expanded network).

In areas of high growth, where growth in network usage may be triggering significant network upgrades, customer behaviour may not take into account the need to pay for the upgrades. End-customers may be unaware of this cost, even though they will have to pay it in the future. For example, changing the angle of solar panels to catch more of the late afternoon sun could have a beneficial impact on the system by reducing net peak demand, but can only benefit all end-customers if it is reflected in network tariff design.[13] Under a volumetric tariff structure, households are able to invest in self-generation technologies that allow them to reduce their contribution to network charges without reducing their peak demand on the system. However, since the costs of the existing network are sunk, investing in self-generation may result in increased charges for those other customers unable to invest or not interested in such technologies, such as renters, customers in multi-family dwellings, or customers on low incomes.

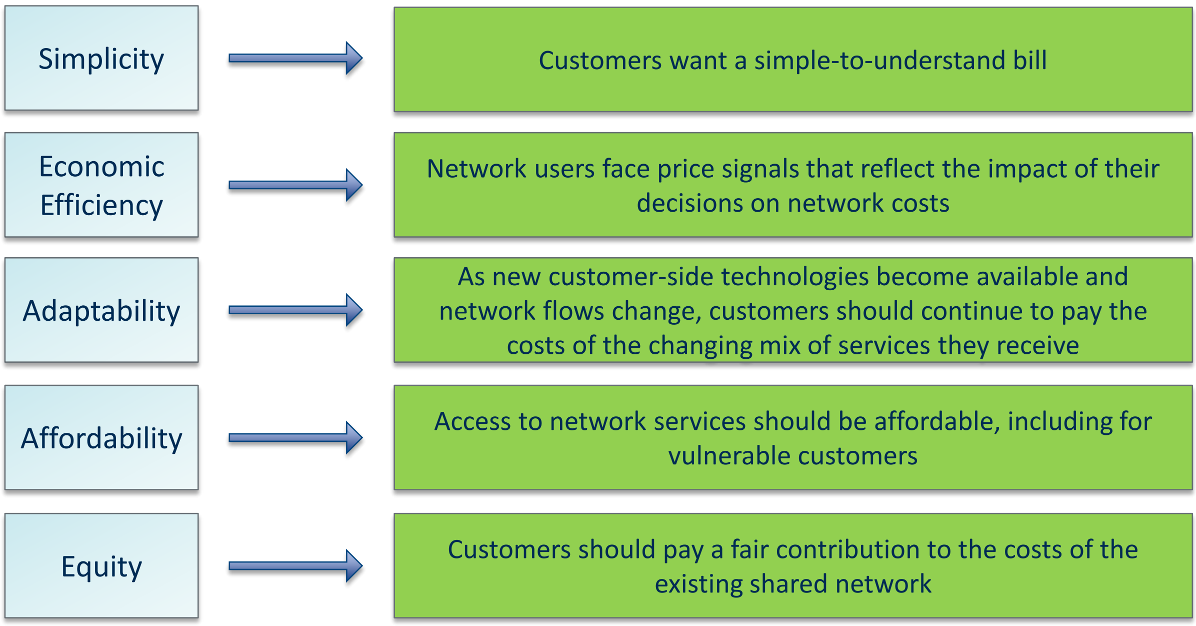
I.D. The Objectives of Tariff Reform

The Victorian electricity network businesses are currently developing their submissions for the AER to set tariff structures for the five-year period 2021 to 2025. To better understand consumer and stakeholder perspectives on tariffs and energy use, the Victorian networks held a stakeholder workshop on 1 November 2017. Attendees included 56 representatives from government, retailers, consumer groups, social services, technology, and green energy companies, among others. All but five participants believed that some change to network pricing was necessary or desirable, with the remaining participants unsure; and those five agreed further work is to be done. Attendees discussed the rationale for network pricing changes as well as potential benefits and challenges, and nominated and voted on the key objectives for network tariff design. The top five objectives were: simplicity;

13 As we will discuss later, cost-reflective network pricing is necessary, but not necessarily sufficient to ensure that end-customers are adequately informed of the trade-offs that they face in making investment decisions.

efficient/reflective; fairness/consistency/equity; affordability; and recognise two way energy flows. In Figure 1 below we show how these objectives can be interpreted for the purposes of network tariff design and prices paid by end customers. In developing tariff options that can help achieve these objectives, we need to recognise that there are trade-offs among the objectives (for example, a simple tariff may not be as good at promoting economic efficiency as a more complex one). Furthermore, in Victoria end customers pay the retail price, which may not necessarily resemble the structure of the network tariff.

Figure 1: Stakeholder objectives for network tariff design



The objectives shown above are familiar from the tariff design literature (for example, they are similar to the 10 principles of tariff design laid out by Professor James C. Bonbright in *Principles of Public Utility Rates*).[14] While the first three of these objectives are relatively straightforward and well-understood, the objectives of affordability and equity may be open to several different interpretations. "Affordability" could be interpreted to mean that the revenues collected by network service providers should reflect only efficient costs, so that network services are provided at lower cost in the long-run. This interpretation is arguably captured by the economic efficiency objective (and the framework of revenue determinations). However, "affordability" could also be interpreted to mean that poorer customers should pay less, or that a "basic" level of network service should be available to all customers at a reduced cost. Much of the total cost of the network is sunk and relates to assets

[14] Bonbright, James C., Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates,* 2d ed. (Arlington, VA: Public Utility Reports, 1988).

that are shared (rather than specific to any one customer). Creating an unequal sharing of residual costs, in order to contribute to this interpretation of "affordability", would therefore not necessarily conflict with the objective of economic efficiency. Relatedly, the objective of "equity" could be interpreted to mean that all customers should pay an equal contribution to the costs of the existing shared network. However, since the costs of the existing network are sunk, there is no economic basis for preferring an equal contribution from all customers over other possible sharing arrangements (including arrangements that would give favourable treatment to vulnerable customers), as we discuss further below.

I.E. Customers, Distribution Networks, and Retailers

The electricity bills paid by households cover the costs of generating electricity (including customer feed-in tariffs), the use of the high voltage transmission network, the use of the lower-voltage distribution network, the costs of metering, and the costs of the retailer. In Victoria, customers pay a single bill covering all of these costs, and each customer receives a bill from that customer's retailer. In turn, each retailer is liable for purchasing, from the wholesale market, the aggregate amount of electricity consumed by its customers, as well as paying for green schemes, the use of the transmission and distribution networks, metering services and paying its own operating and administration costs. The household customer does not pay any of these costs directly: it receives a single bill from the retailer.

The wholesale purchase cost for which the retailer is liable depends on the aggregate consumption decisions of the retailers' customers as a portfolio. Similarly, the retailers' liability for transmission and distribution network charges also depends on its portfolio of customers, and the portfolio's aggregate use of the networks. Both for wholesale power purchase costs and network charges, the retailer's liability depends on the portfolio of customers, how much electricity they consume, and when they consume it. The relationship between the consumption decision of an individual customer and the ultimate liability of the retailer is not necessarily straightforward. For example, the impact on a retailer's wholesale power purchase cost of an additional kWh of household consumption depends on *when* the kWh is consumed (because the wholesale price is time-varying)[15] and *where* the kWh is consumed. All power purchased to supply end customers in Victoria pays the Victorian

15 In January 2018, the half-hourly wholesale price in Victoria ranged from a low of $32/MWh to a high of $12,931/MWh (AEMO data).

wholesale price,[16] but the amount of electricity that has to be purchased by a retailer from the wholesale market has to cover network losses (which in turn depend on the location of the customers).

The inter-relationships between the household, the retailer and the distribution network give rise to an important question: in designing network tariffs, are individual end-customers the intended "audience" for the network tariff, or is the intended audience the retailers supplying those customers? The intended audience for wholesale prices which vary by half-hour[17] is clearly the retailer: retailers package these prices into simpler price plans for retail customers where prices change infrequently. If the intended audience for the distribution tariff is the end-customers, the tariff should be designed to be communicated directly to customers, such as by printing the tariff and the resulting charge on each customer's bill without modification. In contrast, if the intended audience for the distribution tariff is the retailers, the tariff should be communicated to them. This question is important because, if the tariff is to be effective in meeting stakeholder objectives, the tariff design should be tailored to the intended audience.

If the view is taken that the most effective arrangement is one where the DNSP addresses its tariff directly at end-customers, one would expect the contribution of the network tariff to each end-customer's bill to be independent of the identity of the end-customer's retailer (ie, retailers would "pass through" the network tariff component of the bill). If the network tariff and its contribution to the overall bill were communicated to the end-customer by the retailer, the tariff and the amount of the network charge would be the same no matter which retailer is supplying that customer. In contrast, if the view is taken that it is more effective to design the distribution tariff with retailers as the intended audience, the retailer is a crucial part of the relationship between the network and the customer. Importantly, in this case one would not expect the contribution of the network charge to each end-customer's bill to be independent of the identity of the customer's retailer.[18] It would be a matter for each retailer

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16 Retailers are likely to have a portfolio of hedges, and may own their own generation. Nonetheless, the opportunity cost of supplying a customer in Victoria is the Victorian reference price.

17 From 2021, reference prices on the wholesale market used in settlement will be set every five minutes.

18 Since the retailer collects a single "bundled" bill from each customer, the division of that bill into components for wholesale electricity, distribution charges and so on would be arbitrary. However, one retailer might design its retail price offering such that the customer's bundled bill is not sensitive to when the customer takes electricity, whereas a second retailer might have an offer

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to decide how (and how much) to recover from an individual customer, just as the retailer must decide how to recover its operations and administration costs.

If network tariffs are addressed directly to end customers, then retailers are competing with one another over how cheaply they can procure wholesale electricity, but are not competing over the costs of using the network to deliver electricity to customers (since this cost would be transparent to customers).

If network tariffs are addressed to retailers, then the retailers can compete over a larger "value stack" which also includes the cost of using the distribution network (which the customer would not see, as is the current case). Retailers could, for example, compete by identifying and targeting customers with consumption patterns that give rise to reduced network charges, or by providing a reward to their customers for adopting such consumption behaviour. In the future retailers, or a third party, could use technologies such as embedded generation and batteries to manage the customers' use of the network in a way that reduces the cost of using the network to deliver electricity to the customer.

Different jurisdictions take different approaches to this question. For example, in Texas the costs of the distribution and transmission network are broken out as individual line items on the bill that is sent to the household.[19] In Illinois some end-customers get an entirely separate bill for network services.[20] In most jurisdictions, including Victoria, the retailer charges a bundled price that includes network prices, but the network charge component of the bill is not separately identified for residential and small business end-customers.[21] This is similar to

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that results in a higher bill for consumption around the time of peak demand and a lower bill otherwise.

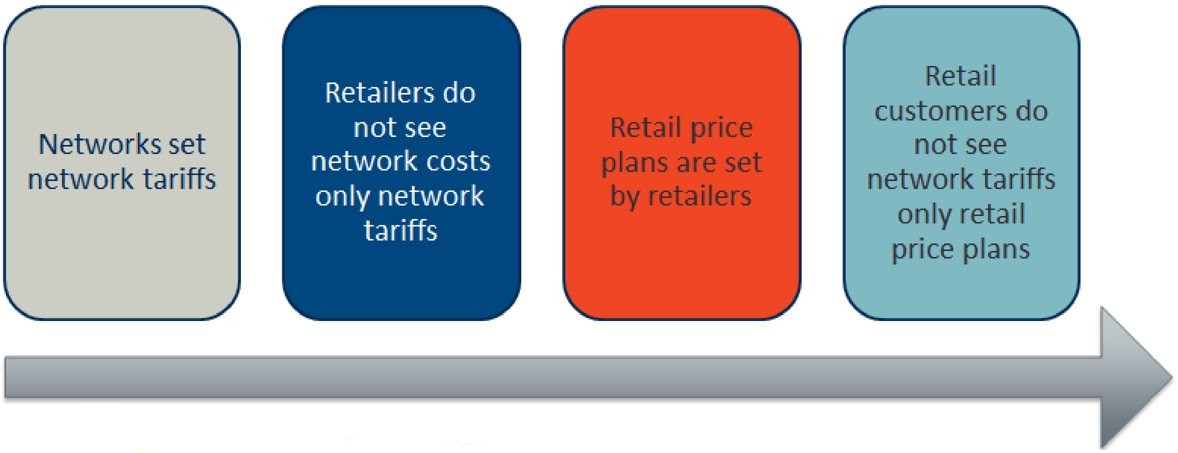
19 See the PUCT's bill explainer, Public Utility Commission of Texas (PUCT), "Charges on your electric bill", n.d., available at: https://www.puc.texas.gov/consumer/electricity/bill_e.aspx. See also an example of a bill, Current Utilities, "TXU example bill", n.d., available at: https://www.currentutilities.com/txu-bill/.

20 See, for example, Plug In Illinois, "Frequently Asked Questions", n.d., available at: https://www.pluginillinois.org/faq.aspx.

21 Network prices are separately itemized for large commercial and industrial end-customers. See AEMC, "Distribution network pricing arrangements, Final determination", 27 November 2014, available at: https://www.aemc.gov.au/sites/default/files/content/de5cc69f-e850-48e0-9277-b3db79dd25c8/Final-determination.PDF.

the billing arrangements in many other industries, where customers do not observe individual elements of their bill or anything about the supplier's costs.[22] Figure 2 illustrates the series of information flows that occur between networks, retailers and customers under the current arrangement. Retailers see the network tariff, but this is the only information they receive about network costs; customers see the retail price but this is the only information they receive about the retailer's costs.

Figure 2: Information Flows between Networks and Retail Customers



In the long run, customers have the ability to increase or lower network costs through their electricity usage behaviour. Figure 3 illustrates the feedback loop between customer behaviour and network costs intermediated by network tariffs and the retailer. Given that customers and retailers do not see network costs, it follows that network tariffs that do not reflect costs could cause a "vicious cycle" where poor price signals result in uneconomic decisions by customers, further increasing network costs and the price of delivered electricity. However, appropriately designed network tariffs have the ability to create a "virtuous cycle", ultimately resulting in lower network costs as retailers compete to help end-customers reduce the cost of delivered electricity. In such a virtuous cycle, the ways in which retailers could help customers to reduce the cost of delivered electricity would include all elements of the "value stack". For example, shifting consumption to off-peak hours might reduce the cost of purchasing electricity on the wholesale market as well as reducing network costs.

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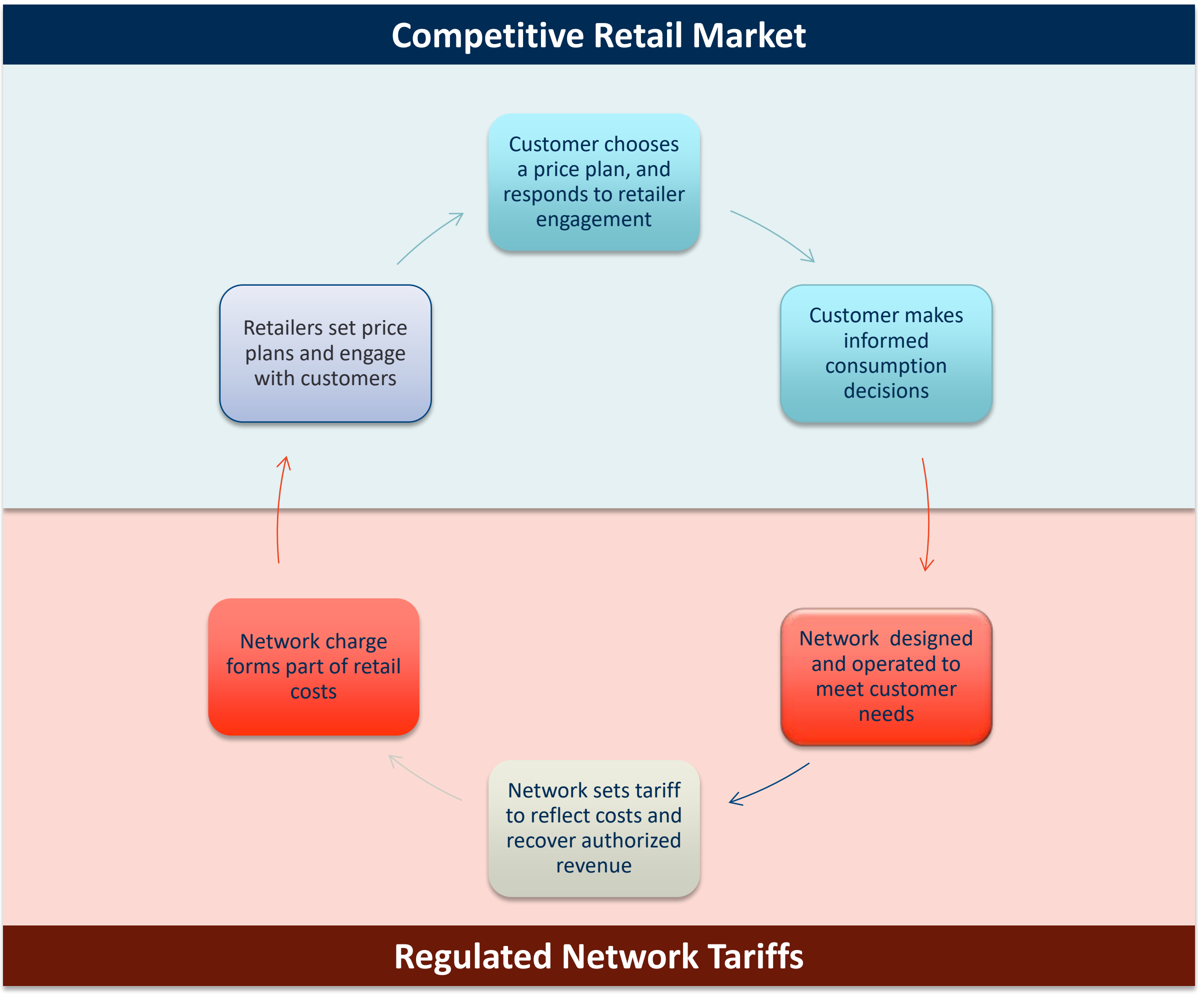
22 For example, a typical mobile phone bill does not identify any components of the operator's costs except for GST (which has to be shown separately in order that business customers can reclaim the tax).

Figure 3: The cycle of information flows



An important consideration in the cycle shown above is the way in which retailers compete to attract and retain customers. If competition is effective,[23] we should expect to see retailers actively seeking out "lower cost" end-customers and offering those customers lower prices because it is cheaper to supply those customers than other customers with consumption patterns that cause higher network charges. In addition, effective competition should result in retailers designing their prices and taking other actions to help inform end-customers

[23] We note that the Victorian Government is considering its final response to the recent independent review of competition in Victoria's gas and electricity markets, and that the ACCC is also currently reviewing the competitiveness of retail electricity prices. The AEMC's most recent review of retail competition is *2017 AEMC Retail Energy Competition Review* (AEMC, July 2017).

about their choices and to identify and implement consumption behaviour that reduces network costs. [24]

If retail competition is not effective, an alternative approach would be for the networks to communicate directly with customers rather than via retailers. In Figure 3 above, that would be a new communication route directly from the network to the end customers. Direct communication of the network tariff to customers could be achieved by requiring retailers to print details of the network tariff and network charge on the customer's bill. If the network tariff is to be communicated directly to customers, networks (rather than retailers) would be responsible for ensuring that the information is presented in a way that customers understand. Since communication with customers is a core part of the retail function, we expect that networks communicating their tariff directly to customers would not be as effective as if the retailers were to play this role (provided that retail competition is effective).

[24] While price and the design of price plans is an important mechanism for retailers to influence customer behaviour, other mechanisms could include various types of communication on bills or otherwise, as well as providing technology solutions such as apps or smart controllers.

II. The international movement towards tariff reform

II.A. Current Distribution Tariffs and Future Design Options

Network costs are largely driven by the need to provide capacity to meet network peak demand. However, until recently, volumetric tariffs have been the norm for residential customers in much of the world. Victoria is no exception—the default tariff for all five Victorian networks is a volumetric energy charge coupled with a daily service charge. However, in many jurisdictions, nationally and internationally, there are current reform efforts to change the structure of the distribution tariff. In most cases, these reforms are reducing the weight on the volumetric energy charge component, and increasing the weight on the fixed and/or demand charge component. Other innovations such as peak-time rebates are also being introduced.

Table 1 illustrates the current landscape for default residential distribution tariff designs of 18 utilities across the US, Canada, other Australian states, New Zealand, the UK, and France, alongside the Victorian distribution networks' tariffs. This sample includes both distribution-only utilities and integrated utilities with unbundled distribution charges, and spans investor-owned utilities and public utilities.[25] We have selected these utilities because they are known to have fairly innovative rate design practices and they cover regulatory contexts and practices from around the world.[26]

The tariff structures in Table 1 all show a fairly common structure, with all of the reviewed distribution utility tariffs having volumetric energy charges (kWh) and most having fixed charges.

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[25] Some vertically-integrated utilities (responsible for both distribution and retail functions) have unbundled distribution rates and a separate retail rate.

[26] Vertically integrated utilities do not always publish network only tariffs. Thus most of the most utilities we examined have some form of retail competition, although the competitiveness of the retail market varies between jurisdictions. California, where PG&E is located, does not have typical retail competition, but allows for community choice aggregation (CCA). This system allows for cities, counties, municipalities, and special districts to secure alternative energy supply on behalf of their residents, which then functions as retail competition in participating areas. These programs can be opt-in or opt-out relative to the default utility.

Table 1: Default Residential Customer Tariff Structure for Distribution Only Rates

Default Residential Rate Structure	Country	State/ Region	Retail Competition	Locational Variation Rate	Fixed Charge	Variable Component: Has a Variable Charge	Variable Component: Tiered	Variable Component: Increasing Tiers	Variable Component: TOU	Variable Component: Seasonal	Demand Component: Has a Demand Charge	Demand Component: Has a Capacity Charge
			[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
AusNet Services	Australia	Victoria	X		X	X	X	X				
Jemena	Australia	Victoria	X		X	X						
Citipower	Australia	Victoria	X		X	X						
Powercor	Australia	Victoria	X		X	X						
United Energy	Australia	Victoria	X		X	X				X		
ATCO	Canada	Alberta	X		X	X						
Fortis Alberta	Canada	Alberta	X		X	X						
Hydro One	Canada	Ontario	X	X	X	X						
Enedis	France	Mainland	X		X	X			X	X		X
Northern Powergrid	UK	North East	X	X	X	X						
Western Power	UK	South West	X	X	X	X						
ConEd	US	NY	X			X	X	X		X		
PG&E	US	CA	CCA	X		X	X	X		X		
National Grid, NY	US	NY	X		X	X						
Arizona Public Service	US	AZ				X						
Salt River Project	US	AZ			X	X	X	X		X		
NSTAR	US	MA	X	X	X	X						
ComEd	US	IL	X		X	X						
Consumers Energy	US	MI	X		X	X						
Oncor	US	TX	X		X	X						
Energex	Australia	Queensland	X		X	X						
Evoenergy	Australia	ACT	X		X	X					X	
Vector	New Zealand	Auckland	X		X	X						
Total	23 distribution utilities		21	5	20	23	4	4	1	5	1	1

Notes: The information in this table refers to the default rate for each rate group; if the utility's rate schedule does not explicitly identify a rate as the default rate, we chose the "standard" rate or a rate that seems to be commonly used by customers.
[1]: Community choice aggregation ("CCA") consists of cities, counties and special districts securing alternative energy supply on behalf of its residents, and can account for a significant share of residential retail choice.
[2]: This indicates whether or not rates vary based on location within service territory.
[6]: Increasing tiers are defined here such that the higher consumption tier has a higher variable charge. A rate with a tiered variable charge and with non-increasing tiers (i.e., a check in column [5] but not in column [6]), has decreasing tiers.
[7]: Enedis has three tariffs, one is TOU. It is not clear which is the default, but many French customers are on a TOU retail rate.
[8]: This indicates whether charges vary according to the season.
[10]: This refers to a per day charge which depends on the customer's registered supply capacity.

II.B. ALTERNATIVE TARIFF COMPONENTS

Currently the standard approach to structuring distribution tariffs places heavy weight on a volumetric energy charge component. However, recent changes in customer behaviour and technology are causing many utilities around the world to reconsider this approach. On the utility side, smart meters mean that it is no longer costly to measure how and when residential customers are consuming electricity. On the customer side, new technologies like rooftop solar and storage mean that customers are using electricity networks in more diverse ways than ever before. This makes it increasingly difficult to use a volumetric tariff to recover a fair contribution to shared network costs and to signal to customers the impact of their behaviour on future network costs. Alternative tariff structures that are increasingly being investigated in a range of jurisdictions can comprise a number of tariff components, discussed below. Some of these alternatives are being investigated by distribution-only utilities, while others are being investigated by vertically-integrated utilities responsible for both distribution and retail supply.

In this section we provide a short description of nine different tariff components that can form part of a reformed distribution tariff. In section II.B we provide some specific examples from utilities in a range of international jurisdictions.

Demand charges are based on a consumer's peak demand over a specified time period, typically the monthly billing cycle. It is typically based on the consumer's maximum demand across all hours of the month, or on their maximum demand during those hours of the month in which network demand as a whole is at a maximum.[27] Since most capital investments on the distribution network are driven by peak demand, the idea is that demand charges will better align the price that consumers pay with the costs that they are imposing on the system.[28] The primary function of the demand charge is to accurately convey the cost structure of delivering electricity to consumers so that they can make informed decisions about how much power to consume, and at what time. There is some evidence that residential consumers respond to demand charges by smoothing out their electricity

27 Maximum demand may be measured as the largest kWh consumption in any hour over the prior month, or the largest consumption in any hour during peak time during the prior month, or the largest consumption in the hour during which the overall network demand was at its maximum during the prior month.

28 The question of whether to base the demand measurement on the individual consumer's maximum demand over the month ("non-coincident peak") or their maximum demand during system peak hours of the day ("coincident peak") is an important consideration. It depends, in part, on the extent to which customers' individual maximum demands are correlated and drive the local peak on the distribution system.

consumption profile.[29] When faced with demand charges, residential consumers may have the incentive to buy smart digital technologies such as thermostats, load controllers, home energy management systems and smart appliances, along with batteries and other storage options. Provided that these demand charges are well-designed (targeting demand at times when network capacity is scarce and with effective customer communication), they can help reduce network costs in the long run. Demand charges have been used widely in various forms in commercial and industrial rates for a large part of the last century in many jurisdictions, and are now being offered by many US utilities to household customers.

Demand subscription service (DSS) requires customers to subscribe to a demand level, but also provides the option of deviating from this level if need be. If customers deviate from their subscribed demand level, they will pay a pre-determined price for every extra unit of consumption. Usually this would be set to reflect the marginal/incremental service price. There are many ways in which the DSS idea can be specified. It can be based on subscribing to a kW demand, a load shape, or possibly even a quantity of energy.

Capacity charges again require customers to subscribe to a demand level, but customers no longer have the option of exceeding this (as they could with the DSS). Capacity charges are typically offered to all customer sizes and are relatively simple to understand. Capacity charges are common in Europe where they have been offered for a very long time (*e.g.*, since the 1960s in France); in a recent survey, nine out of the 28 European Member States had capacity charges in their distribution rates for households.[30] In France, the meters installed in homes contain a fuse that switches off the power if the customer's demand reaches a level above the subscribed capacity.[31]

Fixed charges are a feature of most residential tariffs around the world (sometimes called a customer charge, standing charge, service charge, or a monthly service charge). These charges are typically modest in size and typically only cover a small portion of the costs of distribution capacity. However, proposals to increase the fixed charge have become

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29 For a summary of these studies, see Hledik, Ryan, "Rediscovering Residential Demand Charges." *The Electricity Journal*, August/September 2014.

30 Directorate-General for Energy, "Study on tariff design for distribution systems – Final report", 28 January 2015, p. 111, available at: https://ec.europa.eu/energy/sites/ener/files/documents/20150313%20Tariff%20report%20fina_revREF-E.PDF.

31 After turning off one or several appliances allowing the demand to be below the subscribed capacity, the customer can easily turn the power back on. The customer also has the option to increase the subscribed capacity at relatively low cost to have more flexibility in its consumption; however, it requires contacting the utility and making some changes to the meter settings.

increasingly common—a recent survey found that there are active proposals to increase the residential customer fixed charge in at least 18 of the 50 states in the US.[32] The Canadian province of Ontario has decided to move to 100% fixed distribution charges for residential customers.

Minimum bills ensure that all consumers will pay a minimum threshold amount each month, and are often offered as an alternative to a fixed charge. The theory is that the minimum bill amount can be associated with the average consumer's fixed cost of using the grid and therefore guarantee that this amount is recovered on a monthly basis. A common criticism of the minimum bill is that it will limit low-use customers' opportunities to reduce their monthly bills.

Time-varying charges are a modified form of volumetric pricing that includes time-differentiated prices. Generally, a higher price would be charged during on-peak hours and a lower price charged during off-peak hours. It would provide consumers with an incentive to shift consumption away from higher cost hours, reducing system costs and electricity bills. Time varying pricing can come in many forms.[33] **Time-of-use (TOU)** is the most common form of time-varying charge, with the high peak price and lower off-peak price applied on a predictable, daily basis. TOU rates may also feature seasonal variation. **Critical peak pricing (CPP)** is a dynamic form of time-varying charge, where the peak price would be significantly higher on a limited number of days per year (typically 10 or 15) when the system is most likely to reach its peak, and lower during all other hours of the year. The dynamic nature of a CPP rate allows the utility to respond with short notice to unexpected reliability – or price – driven events on the system. **Peak time rebates (PTR)** are in some ways the mirror image of a CPP rate. A PTR provides consumers with a payment for reductions in consumption below a predetermined customer level baseline during peak events.[34] PTR is popular since it is a "no-lose" tariff for customers (in the short-term at least). However, accurately forecasting customer baseline usage is not trivial. **Real-time pricing (RTP)** provides consumers with an

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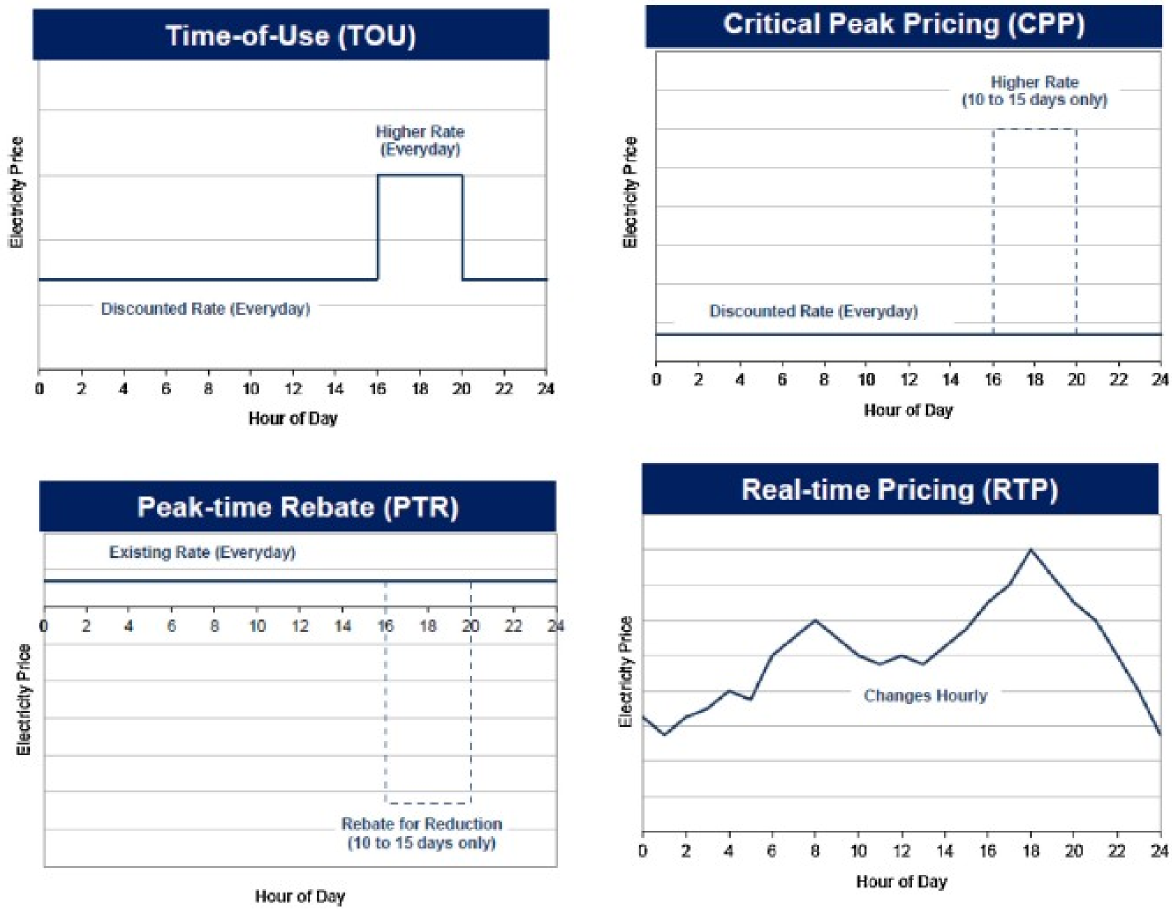
32 Inskeep, Benjamin, *et al.,* "The 50 States of Solar", prepared by the NC Clean Energy Technology Center and Meister Consultants Group, Q3 2015, available at: https://nccleantech.ncsu.edu/wp-content/uploads/50-States-of- Solar-Q3-FINAL_25.pdf.

33 Faruqui, Ahmad, Ryan Hledik, and Jennifer Palmer, "Time-Varying and Dynamic Rate Design", prepared for the Regulatory Assistance Project, July 2012, available at: http://www.raponline.org/wp-content/uploads/2016/05/rap-faruquihledikpalmer-timevaryingdynamicratedesign-2012-jul-23.pdf.

34 Day-ahead notification of a critical peak pricing event is typically provided.

hourly or sub-hourly price. While RTP is typically used to capture hourly variation in energy prices, it could also be applied at the distribution system level to reflect distribution system capacity constraints.[35] Especially as the amount of intermittent generation capacity from wind and solar generating sources increases, distribution system capacity constraints may become less predictable and hence rate designs that can respond to actual system conditions (such as RTP or CPP) rather than reflect stable patterns (such as TOU) may become more valuable. The various time-varying pricing options are illustrated in Figure 4.

Figure 4: Illustrations of Alternative Time-Varying Rates



Distribution locational marginal prices (DLMP) are distribution charges that vary depending on a consumer's location *within* the distribution system, as well as varying according to the overall load on that part of the system.[36] DLMP has begun to garner attention in jurisdictions

[35] The concept is beginning to receive attention in the US, particularly in New York, where efforts are underway to facilitate the integration of distributed energy resources.

[36] See, for instance, Glick, Devi, Matt Lehrman, and Owen Smith, "Rate Design for the Distribution Edge", Rocky Mountain Institute, August 2014. The paper discusses the potential benefits of

Continued on next page

that are confronting the issue of how to accommodate high levels of distributed energy resources. Taken to its extreme, the DLMP approach could require that billions of location-specific prices be computed in a given market on a monthly basis.[37] However, there are options for simplifying this pricing model. For instance, PG&E, the utility that serves consumers in much of northern California, offers a tiered volumetric charge where the threshold between tiers depends on where consumers are located. There are nine geographic regions whose boundaries are designed to capture key climatic differences, such that customers in the hotter climate zones where air-conditioning is more prevalent are charged at the lower amount on a larger amount of consumption before kicking up into the higher-priced tiers.

Distributed generation (DG) only tariffs have been created in some jurisdictions to account for the unique net load profiles (and service needs) of customers who act as both consumers and generators.[38] Offering special rates to DG consumers is analogous to the development of "standby rates" for "partial requirements customers", a common practice in some jurisdictions for commercial and industrial consumers. In addition to the rate designs described previously, DG-specific charges could be implemented based on the size of the installed DG capacity, the output of the facility, or a one-time connection fee. Currently, most of the proposed DG-only rates have a structure similar to the standard rate offered to all customers in that group (*e.g.*, DG residential rate vs. rate offered to all residential customers) with a change in some price provisions such as an increased fixed charge or an additional demand charge. This difference in fixed or demand charges reflects the fact that while a large portion of the fixed costs are recovered through variable charges for an average residential customer, a DG customer can avoid paying their share of the fixed costs as their total consumption is lower due to self-generation, and therefore their variable charges are also lower than what is needed to cover the fixed costs.[39]

Continued from previous page

unbundling rates across various attributes and introducing temporal and spatial granularity into the tariff's design.

37 De Martini, Paul and Lorenzo Kristov, "Distribution Systems in a High Distributed Energy Resources Future", prepared for Lawrence Berkeley National Laboratory, October 2015, available at: https://emp.lbl.gov/sites/all/files/lbnl-1003797.pdf.

38 A net load profile is the customer's load shape after production from on-site generation and/or storage has been subtracted from it. Storage can come from standalone batteries or electric vehicles that allow for vehicle to grid charging.

39 Many jurisdictions allow residential and small general service customers to be metered for all electricity generated above their usage, even if consumption and generation don't coincide in time. In the US, the most common mechanism is net metering, which allows customers to be

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Tiered/seasonal variable charges means that usage below a certain threshold is charged at one price, and usage above the threshold is charged at another price. Increasing tiers means that the higher consumption tier has a higher variable charge, and seasonal refers to different prices being charged according to the time of year. Increasing block tariffs have generally been instituted to either promote conservation or to assist low income customers. However, with increasing energy efficiency and distributed generation, the links between low usage and low income are tenuous. Conservation impacts have also been questioned in the empirical literature. [40]

II.C. Recent Developments in Tariff Design

While most utilities still rely on traditional fixed and volumetric distribution charges, time-varying rates and demand charges are becoming more common,. The increasing prevalence of smart meters has removed much of the barrier for implementing time-varying rates and demand charges. While most programs are still opt-in, a few large utilities are moving toward default TOU rates, and some utilities have achieved significant enrolment with opt-in programs (20 to 50 percent).[41] Time-varying rates such as peak time rebate (PTR) and critical peak pricing (CPP) have also gained traction.

Many of the utilities we examined in Table 1 do offer more innovative tariffs on an opt-in basis. Table 2 shows that nearly all of these utilities have opt-in TOU or other time-varying rates, and a few have residential demand charges. Many utilities also offer dedicated distributed generation, electric vehicle, or battery storage rates.

Continued from previous page

remunerated for the electricity generated at the same rate (*i.e.*, the variable or energy charge) as the electricity they consume. In Australia there is a buy-sell arrangement, which defines different remunerations for the electricity "bought" (*i.e.*, consumed) and "sold" (*i.e.*, generated) by the customer.

40 Ito, Koichiro. "Do Consumers Respond to Marginal or Average Price? Evidence from Nonlinear Electricity Pricing." *American Economic Review* (2014): 537-563, available at: https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.104.2.537.

41 These programs are for vertically integrated utilities with one "all-in" price for end-customers and which are actively engaging with their customers on a frequent basis, including active marketing of these opt-in rates. Customers in the states under discussion do not have a choice of retail providers, and the only choice they can make is between the different tariff options, all regulated, offered by the utility.

Table 2: Opt-in Residential Customer Tariff Structure for Distribution Only Rates

Residential Rate Options	Country	State/ Region	Retail Competition	Optional Rates Available to Customer	Alternative Rate Options: Time Varying	Demand Charge	Distributed Generation	EV/Battery
			[1]	[2]	[3]	[4]	[5]	[6]
AusNet Services	Australia	Victoria	X	X	X	X		
Jemena	Australia	Victoria	X	X	X	X		
Citipower	Australia	Victoria	X	X	X	X		
Powercor	Australia	Victoria	X	X	X	X		
United Energy	Australia	Victoria	X	X	X	X		
ATCO	Canada	Alberta	X					
Fortis Alberta	Canada	Alberta	X					
Hydro One	Canada	Ontario	X	X			X	
Enedis	France	Mainland	X	X	X	X	X	
Northern Powergrid	UK	North East	X	X	X			
Western Power	UK	South West	X	X	X			
ConEd	US	NY	X	X	X		X	
PG&E	US	CA	CCA	X	X			X
National Grid, NY	US	NY	X	X	X			X
Arizona Public Service	US	AZ		X	X	X	X	X
Salt River Project	US	AZ		X	X	X	X	X
NSTAR	US	MA	X	X	X			
ComEd	US	IL	X	X	X			
Consumers Energy	US	MI	X	X	X			X
Oncor	US	TX	X					
Energex	Australia	Queensland	X	X	X	X		*
Evoenergy	Australia	ACT	X	X	X	X		X
Vector	New Zealand	Auckland	X	X	X			*
Total	23 distribution utilities		21	20	19	10	5	8

Notes: The information in this table refers to non-default rates.
[1]: Community choice aggregation ("CCA") consists of cities, counties and special districts securing alternative energy supply on behalf of its residents, and can account for a significant share of residential retail choice.
[2]: This indicates whether or not residential customers have different rate options.
[3]: This indicates whether or not rate options include a time-varying tariff. Economy 7 tariff in the UK offers cheaper electricity at night (based on an average load profile). In the US, ComEd has an hourly pricing tariff. All other businesse marked as having time-varying tariffs have TOU ones.
[4]: This indicates whether or not rate options include a demand charge. For Enedis, optional rates include capacity charges rather than demand charges.
[5]: This indicates whether or not rate options include a stand-alone tariff for distributed generation (in addition to net energy metering).
[6]: This indicates whether or not rate options include a dedicated tariff for EV or battery storage owners. Energex and Vector offer a controllable load tariff, for which EV owners are eligible.

In the rest of this section we look at examples of innovative tariffs from both distribution-only utilities and vertically integrated utilities responsible for both distribution and retail supply on an integrated basis. In jurisdictions with regulated retail prices and integrated utilities, some of the same design questions faced by the Victorian distribution networks have to be solved in relation to retail prices as well as distribution tariffs. We consider utilities located in the United States, Canada, Australia, Asia, and Europe.

II.C.1. North America

In the United States, most tariffs include a small fixed charge and a flat volumetric charge. Among US utilities, TOU rates are becoming more common. As of 2015, 14% of all US utilities offered residential TOU rates, although most of these are on an opt-in basis. The proportion of customers who have the option of TOU is higher since TOU is more commonly offered by the larger utilities.[42] 6% of the TOU rates on offer include a demand charge in addition to the time-varying volumetric charge.[43]

Uptake of these optional TOU rates is low. Only 3.4% of customers for which a TOU rate is available are enrolled in it.[44] Although customer opt-in participation levels are generally low, there are some exceptions where utilities have obtained high customer penetration even with an opt-in rate. Arizona Public Service Company (APS) and the Salt River Project (SRP) in Arizona have enrolled 51 and 30 percent of their customers in an opt-in TOU tariff, respectively (as of 2015).[45] Similarly, almost 20% of Oklahoma Gas & Electric's (OG&E) customers have enrolled in a TOU pricing scheme called "Smart Hours".[46] These relatively high participation rates are in jurisdictions where utilities are actively engaging with their customers on a frequent basis, including active marketing of these opt-in rates. Customers in the states under discussion do not have a choice of retail providers, and the only choice they can make is between the different tariff options, all regulated, offered by the utility.

Looking ahead, some US jurisdictions are planning to implement default time-varying rates such as TOU, PTR, and CPP, with transitions to be completed within the next 2-3 years. In California, the state has mandated that the large investor-owned utilities default all ten million of their residential customers onto TOU between 2018 and 2020.[47] San Diego Gas & Electric (SDG&E) already offers an opt-in PTR program and plans to achieve full implementation of their default residential TOU tariff by 2019.[48] The Sacramento Municipal Utility District (SMUD) has committed to transitioning to default residential TOU by the end

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42 Brattle analysis of 2015 EIA-861 data.

43 Brattle analysis of 2015 EIA-861 data.

44 Brattle analysis of 2015 EIA-861 data.

45 Brattle analysis of 2015 EIA-861 data.

46 Brattle analysis of 2015 EIA-861 data. See also, Oklahoma Gas & Electric, "SmartHours", n.d., accessed February 23, 2018, available at: https://bit.ly/2uOjdxp.

47 See CPUC Decision D. 15.07-001 and Inside Edison, "Q&A: Time-of-Use Rate Plan Transitions Begin in 2018", November 2017, accessed February 23, 2018, available at https://www.insideedison.com/stories/q-a-time-of-use-rate-plan-transitions-begin-in-2018.

48 SDG&E, "Time-of-Use Period Grandfathering for Net Energy Metering Customers", December 2017, accessed February 23, 2018, available at: https://www.sdge.com/clean-energy/time-use-period-grandfathering-net-energy-metering-customers.

of 2019.[49] Starting May 1, 2018, all new Arizona Public Service (APS) customers will be on a default TOU rate as well. In Maryland and Delaware, Baltimore Gas and Electric (BG&E) and Pepco Holdings (PHI) have enrolled all residential customers in default PTR, and are launching a new TOU pilot program due to commence in mid-2018.[50]

Demand charges for residential customers have been gaining momentum in the United States. Altogether, utilities in at least 21 states offer tariffs with fixed, volumetric, and demand charges to residential customers.[51] Among these utilities, APS has the highest uptake, with nearly 120,000 customers enrolled.[52] APS has been running an opt-in demand tariff since the early 1980s.[53] In a sample of APS customers on a three-part tariff, 60% showed a reduction in demand after switching to the three-part rate, with those who actively manage their demand achieving savings of 10 percent to 20 percent or more.[54] A small number of utilities include

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49 American Public Power Association, "SMUD board approves new Time-of-Day standard residential rates", June 23, 2017, available at https://www.publicpower.org/periodical/article/smud-board-approves-new-time-day-standard-residential-rates.

50 Faruqui, Ahmad, Ryan Hledik, and Neil Lessem. "Smart by Default: Time-varying Rates from the Get-go—Not Just by Opt-in", *Public Utilities Fortnightly* (August 2014): 25-32, accessed April 11, 2017, available at: https://www.fortnightly.com/fortnightly/2014/08/smart-default, and Rate Design Work Group Report, filed with the Maryland Public Service Commission, August 23, 2017, at http://webapp.psc.state.md.us/newIntranet/AdminDocket/NewIndex3_VOpenFile.cfm?ServerFilePath=C%3A%5CAdminDocket%5CPublicConferences%5CPC44%5C66%2Epdf.

51 Brattle review of US utility tariffs.

52 Randazzo, Ryan. "How much power do you use at home? Not knowing could cost you." *AZCentral*, May 8, 2016, accessed March 7, 2018, available at: https://www.azcentral.com/story/money/business/energy/2016/05/08/how-much-power-do-you-use-home-not-knowing-could-cost-you/83988622/.

53 Randazzo, Ryan. "How much power do you use at home? Not knowing could cost you." *AZCentral*, May 8, 2016, accessed March 7, 2018, available at: https://www.azcentral.com/story/money/business/energy/2016/05/08/how-much-power-do-you-use-home-not-knowing-could-cost-you/83988622/.

54 Faruqui, Ahmad, Wade Davis, Josephine Duh, and Cody Warner. "Curating the Future of Rate Design for Residential Customers." *Electricity Policy* (July 2016): 1-25, p. 11, accessed April 11, 2017, available at: https://electricitypolicy.com/Articles/curating-the-future-of-rate-design-for-residential-customers.

mandatory demand charges in their residential tariff offerings.[55] However, optional demand charge offerings have elicited weak customer enrolment overall in the United States, though the situation may change with better design and marketing of the rates to end-use customers by vertically integrated utilities as well as continued deployment of smart meters.[56] As mentioned previously, these vertically integrated utilities face similar pressures as the Victorian distribution businesses to make tariffs more cost reflective, but must do so via tariffs that are paid directly by end-customers rather than via retailers.

Vertically integrated utilities have faced resistance to implementing demand charges as default residential tariffs from regulators and customer advocacy groups. APS has proposed to make three-part tariffs the default for all residential customers, but this proposal was rejected after years of debate between APS, industry representatives, and solar advocacy groups.[57] ComEd in Illinois proposed mandatory residential demand charges, but eventually dropped this proposal after criticism that the demand charge would particularly harm solar customers and customers on fixed and lower incomes.[58] Similarly, Oklahoma Gas & Electric (OG&E) proposed residential demand charges, but they were rejected by the regulator, saying residential demand charges were too confusing and OG&E needed to further evaluate the impact on low-income customers and seniors.[59]

The rise of new technologies such as distributed generation (DG), electric vehicles, and batteries has been a major driver in shifting utilities' pricing designs. A number of regulatory

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55 Faruqui, Ahmad, Wade Davis, Josephine Duh, and Cody Warner. "Curating the Future of Rate Design for Residential Customers." *Electricity Daily* (July 2016): 1-25, p. 11, accessed April 11, 2017, available at: https://electricitypolicy.com/Articles/curating-the-future-of-rate-design-for-residential-customers.

56 Faruqui, Ahmad. "The Future of Electric Rate Design", presented to Consolidated Edison Corporate Leadership Team, May 26, 2016, accessed April 14, 2017.

57 Pyper, Julia. "Arizona Public Service, Solar Industry Reach Critical Settlement in Contentious Rate Case." *Greentech Media*, March 1, 2017, accessed February 25, 2018, available at: https://www.greentechmedia.com/articles/read/arizona-public-service-solar-industry-reach-critical-settlement-in-content.

58 Pyper, Julia. "ComEd Strips Mandatory Demand Charges From Illinois Energy Bill." *Greentech Media*, November 23, 2016, accessed February 26, 2018, available at: https://www.greentechmedia.com/articles/read/comed-strips-mandatory-demand-charges-from-illinois-energy-bill.

59 Monies, Paul. "OG&E customers will be due refund in rate case vote." *NewsOK*, March 21, 2017, accessed February 26, 2018, available at http://newsok.com/article/5542416.

proceedings have looked at specific interventions for DG customers to remedy issues with the current mostly volumetric tariff system. Intervenors in these proceedings in several US states have proposed TOU pricing as a solution to the challenge of recovering grid costs from customers with rooftop solar. Some utilities have required demand charges for DG customers. SRP has instituted a mandatory three-part tariff (fixed, demand and kWh) for all residential customers who choose to install a new grid-connected DG photovoltaic system after January 1, 2015.[60] Other utilities including Eversource, NV Energy, and Westar Energy have filed applications to make demand charges mandatory for DG customers.[61] APS is offering a pilot technology rate, open to owners of rooftop solar PV systems, chemical storage systems, or electric vehicles, to test the ability and desire of participants to reduce on-peak energy and demand usage.[62] Other utilities like National Grid[63], Salt River Project[64], and Consumers Energy[65] offer an optional TOU, designed primarily for residential customers with plug-in electric vehicles, with lower off-peak prices to incentivize usage during those times. Additionally, the TOU peak period has been shifted to later in the evening to account for the rise in demand that occurs when solar PV output falls in several jurisdictions. APS has revised its TOU design to include a super-off-peak winter price between 10 am and 3 pm and shifted

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60 Faruqui, Ahmad, Wade Davis, Josephine Duh, and Cody Warner. "Curating the Future of Rate Design for Residential Customers." *Electricity Daily* (July 2016): 1-25, p. 11, accessed April 11, 2017, available at: https://electricitypolicy.com/Articles/curating-the-future-of-rate-design-for-residential-customers.

61 Faruqui, Ahmad, Sanem Sergici. "Rate Design for DER Customers in New York: A Way Forward." Presented to VDER Rate Design Working Group, March 6 2018.

62 Arizona Public Service, "Rate Schedule R-Tech", accessed March 2, 2018, available at: https://www.aps.com/library/rates/SaverChoiceTech.pdf.

63 National Grid, "Residential Voluntary Time of Use", accessed March 2, 2018, available at: https://www9.nationalgridus.com/niagaramohawk/home/rates/4_vtou.asp.

64 Salt River Project, "Electric Vehicle Price Plan", accessed March 2, 2018, available at: https://www.srpnet.com/prices/home/electricvehicle.aspx.

65 Consumers Energy, "Plug-in Electric Vehicle Rates", accessed March 2, 2018, available at: https://www.consumersenergy.com/residential/programs-and-services/alternative-fuel-vehicles/pev-rates.

the peak period from 12-7 pm to 3-8 pm.[66] SDG&E has similarly delayed its peak period from 11am-6pm to 4-9pm.[67]

In Canada, the province of Ontario is notable because it is one of the few regions in the world to have deployed smart meters to all of its residential customers and to have set default TOU tariffs for almost all residential customers (the TOU prices in Ontario cover only the energy component of the total bill; the distribution network charge is moving to 100% fixed).[68] Ontario's TOU tariffs were deployed with the intention of curtailing load during the peak period and encouraging customers to shift usage to mid-peak and off-peak periods. Customers could opt out of the TOU by choosing a flat rate offered by a competitive retail provider. However, less than ten percent have opted into flat rates offered by retailers.[69] This is in line with the low level of opt-outs seen on time-varying tariffs elsewhere where customers need to make the opt-out decision.[70] Reductions in peak demand that are statistically significant at the 95% confidence level have been observed following deployment of default TOU tariffs, with peak usage reductions ranging from 1.18% to 3.26%.[71] Hydro Quebec's standard residential tariff included a demand charge until 2017, when a new tariff was created for residential and farm customers with demand greater than 50 kW. These larger customers

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66 Arizona Public Service, "Service Plan Transition", accessed February 26, 2018, available at: https://www.aps.com/en/residential/accountservices/serviceplans/Pages/service-plan-transition.aspx?src=hero.

67 St. John, Jeff. "An Hour's Difference Triggers Pushback Over California's Time-of-Use Rates." *Greentech Media*, August 8, 2017, accessed February 26, 2018, available at: https://www.greentechmedia.com/articles/read/hour-debate-california-time-of-use-rates.

68 The TOU rates in Ontario cover only the energy component of the total bill. The distribution network charge is moving to 100% fixed.

69 Lessem, Neil, Ahmad Faruqui, Sanem Sergici, and Dean Mountain. "The Impact of Time-of-Use Rates in Ontario". *Public Utilities Fortnightly* (February 2017): 56-87, accessed April 15, 2017, available at: https://www.fortnightly.com/fortnightly/2017/02/impact-time-use-rates-ontario. See also Ontario Energy Board (OEB), "Understanding your electricity bill", accessed February 23, 2018, available at: https://www.oeb.ca/rates-and-your-bill/electricity-rates/understanding-your-electricity-bill.

70 This is very different from a situation where retailers, who are not subject to the same behavioural biases as households, make the opt-out decision. For more on customer-led opt-outs and the power of the default see Faruqui, A., R. Hledik & N. Lessem (2014): "Smart by Default", *Public Utilities Fortnightly*, August.

71 Lessem, Neil, Ahmad Faruqui, Sanem Sergici, and Dean Mountain. "The Impact of Time-of-Use Rates in Ontario" *Public Utilities Fortnightly* (February 2017): 56-87, accessed April 15, 2017, available at: https://www.fortnightly.com/fortnightly/2017/02/impact-time-use-rates-ontario

retained the demand charge, where the smaller residential tariff reverted to a two-part tariff containing fixed and volumetric charges.[72]

II.C.2. Europe

In the UK, distribution network operators (DNOs) largely recover costs through a simple tariff which includes a "standing charge" (p/day) and a "unit charge" (p/kWh). Retailers do not have an obligation to pass the structure of the distribution tariff on to their consumers. Proportionally, the standing charge is relatively small, with the majority of domestic distribution revenue being recovered through the unit charge, and distribution charges currently account for only 15 to 20 percent of a domestic consumer's total bill.[73] Roughly 20 percent of customers are on a TOU tariff,[74] but most of this is accounted for by a legacy tariff known as Economy 7.[75] A smart meter rollout is currently underway in the UK with a planned nationwide completion date of 2020 for the UK's 26 million residential customers.[76]

The UK energy regulator, Ofgem, recently launched a reform effort focused on the residual charge element of distribution and transmission tariffs. This effort aims to address concerns that large commercial and industrial customers can avoid contributing to the residual charge and thereby push the burden onto residential customers.[77] Residual cost recovery charges are bundled with volumetric or demand charges, which incentivizes inefficient consumption

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72 Hydro Quebec, "2017 Electricity Rates: Effective April 1, 2017", accessed February 23, 2018, and Hydro Quebec, "Rate DP: New in 2017", accessed February 23, 2018, available at: http://www.hydroquebec.com/residential/customer-space/account-and-billing/understanding-bill/residential-rates/rate-dp.html.

73 Hledik, Ryan, Ahmad Faruqui, Jurgen Weiss, Toby Brown, Nicole Irwin, "The Tariff Transition: Considerations for Domestic Distribution Tariff Redesign in Great Britain", April 2016.

74 Hledik, Ryan, Ahmad Faruqui, Jurgen Weiss, Toby Brown, Nicole Irwin, "The Tariff Transition: Considerations for Domestic Distribution Tariff Redesign in Great Britain", April 2016.

75 Competition & Markets Authority, "Energy market investigation", June 24, 2016, available at: https://assets.publishing.service.gov.uk/media/56ebdec8ed915d117a000000/Appendix_3.1_-_Restricted_meters.pdf.

76 Smart Energy GB, "About the rollout", accessed February 27, 2018, available at: https://www.smartenergygb.org/en/smart-future/about-the-rollout.

77 For discussion of residual charges, see Brown, Toby, Ahmad Faruqui, "Structure of Electricity Distribution Network Tariffs: Recovery of Residual Costs", August 2014.

decisions and leaves smaller residential customers to make up the revenue shortfall.[78] The review is ongoing and a solution is scheduled to be implemented in 2021.

In Italy, default TOU pricing was extended to all 20 million plus households starting in 2010.[79] In response to the TOU prices, more than half of customers have shifted consumption patterns.[80] Residential customers across France have been offered a CPP tariff since 1996, and about 400,000 customers were enrolled in 2012.[81] Known as the Tempo Tariff, the tariff differs from a conventional CPP as both the peak and off-peak prices are unknown to participants until the preceding evening. Each evening, customers are informed that one of three different price schedules will be in place the next day. French distribution network Enedis has both a time of use (TOU) volumetric charge and a capacity charge in its tariff (see Table 1).[82] In Spain, half of consumers are on default hourly pricing through a regulated tariff (the next day's prices are published every night).[83] Capacity charges have been deployed as a part of residential tariffs in France, Italy and Spain for many years.[84]

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78 Ofgem, "Targeted Charging Review: update on approach to reviewing residual charging arrangements", November 6, 2017, available at: https://www.ofgem.gov.uk/publications-and-updates/targeted-charging-review-update-approach-reviewing-residual-charging-arrangements.

79 Maggiore, Simone *et al.*, "Impact of a Mandatory Time-Of-Use Tariff on the Italian Residential Customers", 2013, abstract available at: http://www.iaee.org/en/publications/proceedingsabstractpdf.aspx?id=6395.

80 Faruqui, Ahmad. "Time-Variant Pricing (TVP) in New York." Presented at the NYU School of Law, New York, March 31, 2015, accessed April 14, 2017.

81 Faruqui, Ahmad, Ryan Hledik, and Jennifer Palmer. "Global Issues in Time-Varying Rate Design and Deployment: Final Report." Prepared for the Regulatory Assistance Project, April 4, 2012, 3-67, accessed April 11, 2017.

82 Enedis has three tariff options, one is TOU. It is not clear which is the default, but many French customers are on a TOU retail rate.

83 International Energy Agency. "Energy Policies of IEA Countries: Spain 2015 Review." 2015. Accessed 15 March 2018, at pp. 114-117, and Red Electrica de Espana. "Voluntary Price for the Small Consumer (PVPC)." Accessed 15 March 2018, at http://www.ree.es/en/activities/operation-of-the-electricity-systemvoluntary-price-small-consumer-pvpc.

84 Faruqui, Ahmad, Ryan Hledik, and Jennifer Palmer. "Global Issues in Time-Varying Rate Design and Deployment: Final Report." Prepared for the Regulatory Assistance Project, April 4, 2012, 3-67, accessed April 11, 2017.

Ireland plans to introduce TOU tariffs to consumers from the end of 2020 (after the smart meter rollout), and flat tariffs are planned to be eliminated by 2026.[85] In Portugal, residential consumers have the choice between two and three time period tariffs, as well as a flat tariff. To promote demand side flexibility, the local regulator has created a regulatory framework to introduce dynamic pricing tariffs such as CPP and PTR.[86]

In the Netherlands, capacity based tariffs were introduced in 2009, requiring customers to nominate a fixed connection capacity. The distribution tariff is composed of this capacity charge and other fixed charges and does not contain a volumetric charge. Consumers were therefore encouraged to reduce their connection capacity to avoid higher costs.[87]

II.C.3. Australia and Asia

In Asia, a variety of tariff reform measures have been proposed and/or implemented. In response to increasing electricity demand, declining load factors, and power shortages, the People's Republic of China has developed various demand-side management programs aimed at mitigating the issues. In Beijing, which has experienced a steadily decreasing load factor, about 62 percent of the population was on a TOU tariff in 2003, causing 700 MW to shift to off-peak hours.[88] In 2016 it was reported that public charging stations for electric vehicles in Beijing will be on a TOU tariff with peak, off-peak, and shoulder periods.[89] In 2003, the province of Hebei had 40,000 customers on TOU tariff and has instituted a CPP tariff where the critical peak price is 10 percent higher than the standard peak price. But 6 months into a TOU pilot in Shijiazhuang Hebei in 2013, the pilot demonstrated a retention rate of 10%,

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85 Commission for Regulation of Utilities, "Smart Metering Cost Benefit Analysis", November 20, 2017, accessed February 28, 2018, available at: https://www.cru.ie/wp-content/uploads/2017/11/CRU17324-Smart-Meter-Upgrade-Cost-Benefit-Analysis-Information-Paper.pdf.

86 Council of European Energy Regulators, "Electricity Distribution Network Tariffs, CEER Guidelines of Good Practice", January 23, 2017, accessed February 28, 2018, available at: https://www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413.

87 Council of European Energy Regulators, "Electricity Distribution Network Tariffs, CEER Guidelines of Good Practice", January 23, 2017, accessed February 28, 2018, available at: https://www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413.

88 Wang, Jianhui, Cary N. Bloyd, Zhaohuang Hu, and Zongfu Tan. "Demand Response in China." *Energy* (2010): 1592-1597, p. 1593, available at: http://www.chinaero.com.cn/images/english/enegry_experts/2010/07/12/0E84C16C766F1ECF591C5A15F50D71D0.pdf.

89 Gasgoo, "4,440 public charging piles in Beijing will apply TOU tariff scheme". June 20. 2016, accessed February 27, 2018, available at: http://autonews.gasgoo.com/m/Detail/40007856.html.

despite showing effectiveness in shifting electricity use.[90] In Jiangsu, TOU pricing has been offered to residential customers on an opt-in basis since 2003. From 2003 until 2007, 95% of urban residents voluntarily enrolled in the TOU program, shifting peak load at over 1,000MW at its maximum.[91] In Shanghai in 2003, customers faced a steep TOU tariff with a 4.5 to 1 peak to off-peak price ratio. But as recent as 2010, Shanghai has given a fifty percent discount at night to residential customers who purchase a smart meter.[92]

Japan has been testing smart technologies and pricing in four cities. The results suggest that customers respond to hourly marginal price, and the various CPP treatments reduced peak demand by 11 percent on average.[93] The Japanese government also plans to install smart meters in all households (50 million) by 2024.[94] CLP Power in Hong Kong has completed its two year pilot with PTR and TOU in late 2017, with preliminary results showing support for the effectiveness of demand response[95], and CLP has further plans to roll out PTR to all customers.

In Australia, some distribution utilities have experimented with innovative demand charges for residential customers. It is our understanding that Energex and Ergon Energy in Queensland are considering a new cost-reflective tariff option for the 2020-2025 regulatory control period based on customer-nominated peak usage bands, with a top-up charge paid for the maximum demand observed above the band in a given month. This tariff is still being developed and is subject to regulatory approval. Evoenergy in the ACT has a default demand

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90 Ge, Jing, *et al.* "An Overview of the Success Story of Jiangsu Electric's Residential Time of Use Program in China and Related Behavior Changes", 2016, available at: https://aceee.org/files/proceedings/2016/data/papers/6_408.pdf

91 Ge, Jing, *et al.* "An Overview of the Success Story of Jiangsu Electric's Residential Time of Use Program in China and Related Behavior Changes", 2016, available at: https://aceee.org/files/proceedings/2016/data/papers/6_408.pdf.

92 Pepper, Emmett. "Time-of-Use" Pricing Could Help China Manage Demand, 2010, available at: http://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1447&context=sdlp.

93 Faruqui, Ahmad. "Time-Variant Pricing (TVP) in New York." Presentation at the NYU School of Law, New York, March 31, 2015, accessed April 14, 2017.

94 Ida, Takanori, *et al.* "Electricity demand response in Japan", August, 2015, accessed February 28, 2018, available at: http://www.econ.kyoto-u.ac.jp/projectcenter/Paper/e-15-006.pdf.

95 Faruqui, Ahmad. "Time-Variant Pricing (TVP) in New York." Presentation at the NYU School of Law, New York, March 31, 2015, accessed April 14, 2017.

charge for new residential customers.[96] The default demand charge came into effect on 1 December 2017 for all new residential customers, concurrent with a smart meter rollout for all new and replacement meters. The demand charge is only applied during peak hours of 5-8pm, for all days of the week and year round. While the demand charge does not currently have a seasonal component, Evoenergy has indicated it may introduce a seasonal component in the future. Prior to 1 December 2017, Evoenergy had a default TOU tariff. This tariff is now opt-in, and Evoenergy's volumetric tariff is closed to new customers.

96 Evoenergy, "Revised Tariff Structure Statement for the ActewAGL Distribution Electricity Network", 4 October 2016, pp. 19-23, available at: https://www.evoenergy.com.au/-/media/evoenergy/tariff-structure-statements/revised-tss.pdf?la=en&hash=36220ECF2833C2CD193FAA93C7439F3C265ED058.

III. Evaluating tariff options for 2025

In this report we are considering how to design a tariff that would be desirable in the long run (say the end of the next regulatory determination period in 2025), as well as implementation and transitional measures. In this section we consider the design of tariffs for 2025, and in section IV.A we discuss the transition process.

As discussed in section I.E above, there is a fundamental question about the relationships between retailers, the network and end-customers that needs to be addressed before selecting a preferred tariff design. Retailer actions can influence how the networks are used and hence future network costs. This is because the ways in which retailers compete for customers, design their retail prices and manage other interactions between retailers and customers can influence customer behaviour. If retailer actions are significant drivers of network usage and future network costs, a network tariff designed for retailers may be more effective at achieving stakeholders' desired objectives than a network tariff designed for end-customers.

We think that there is the potential for retailer actions to be important. Retailers have direct contact with customers and already need to communicate with and influence customer decisions in order to gain market share and retain their existing customer base. A retailer that is able to identify lower-cost customers, or to assist customers in adopting lower-cost behaviours, should be able to offer lower prices than a retailer that is less successful in identifying and influencing customers. However, for this potential to be realized, retail competition has to be effective and retailers will have to do more to work with customers to lower costs by going beyond pricing plans with just daily service and energy charges.

We also think that there is the potential for a reformed network tariff addressed to retailers to promote retail competition. As network tariffs become more cost reflective, the cost to a retailer of supplying a particular customer with electricity will increasingly depend on more than the quantity of electricity supplied: it may depend more on the quantity consumed at the network peak, for example. As a result, a more cost reflective network tariff will reveal opportunities for innovative retailers to supply some customers more cheaply, and to encourage all customers to adapt their consumption behaviour so that they are cheaper to supply. These opportunities in turn could provide a commercial incentive for retailers to compete more vigorously.

In Figure 5 we summarize how the networks and retailers can help achieve stakeholder objectives discussed above.

Figure 5: Role of networks and retailers in achieving objectives

Objective	Network Role	Retailer Role
Simplicity	Network tariff reflecting cost permits retailers to develop a range of simple retail price plans. As a complementary measure, networks could help with analysis of load data and implcations for retailers' network charges.	Retailers have the resources to understand and respond to complex tariffs provided that tariff calculations are transparent; retail price plans need to be simple and understood by customers.
Economic efficiency	Tariff should include elements reflecting drivers of incremental costs, such as contribution to network peak demand; residual costs should be recovered from different elements, such as number of customers.	Success in a competitive retail market will deliver efficient outcomes.
Adaptable	Tariff contribution to economic efficiency needs to be robust to and updated for technical change (such as customers installing PV and storage).	Retailers can create and adapt price plans as new technologies emerge. Retailers can also create bundled technology offers (eg, storage).
Affordable	Economic efficiency and revenue regulation contributes to affordability; affordability for vulnerable customers could be part of residual cost recovery in the network tariff.	Retailers can help identify vulnerable customers; an affordable price plan for vulnerable customer groups could be part of retailer's market proposition (or hardship policy).
Equitable	Customers should pay a fair contribution to shared network costs, and pay all of the costs they impose on the network (which would otherwise fall on other customers).	Effective competition between retailers should result in customers paying the costs that they impose on the network.

In the remainder of this section we consider each of the stakeholders' tariff objectives, and analyse how these objectives should influence tariff design, and the role of retailers in lowering overall cost.

III.A. Objectives

In this section we elaborate on and discuss the five tariff objectives raised by the stakeholders in the initial stakeholder workshop hosted by the Victorian distribution companies in December 2017.

III.A.1. Simplicity

Tariffs should be designed so that customers receive sufficient information to make informed consumption decisions. End-customers have limited visibility of electricity costs and, in most cases, limited contact with retailers. They may have no contact with networks at all. They may see price plans being offered by retailers if they move or consider switching retailers;

they may see pricing information in their electricity bill and they may be shown the impacts on their total electricity expenditure when considering adopting new technologies or equipment. In some jurisdictions, customers receive direct information on network tariffs through their bill. For example, in Texas the costs of the distribution and transmission network are shown as individual line items on the bill, while in Illinois some end-customers get an entirely separate bill for network services.[97] In Victoria, as in many other jurisdictions, end-customers are not shown the network tariff at any point in the customer experience. Thus the only pricing information on wholesale, network and retailer costs that customers receive is through the retail price plan, which is often a simple energy charge or energy charge plus fixed charge. Retailers already manage all of these cost components, some of which like the wholesale market are quite volatile, to produce a simple price plan. The structure of retail prices is completely different from the structure of wholesale prices: wholesale prices can change dramatically from hour to hour, whereas retail prices may remain constant for months; retail customers can consume as much or as little electricity as they like and will pay the same price, whereas on the wholesale market prices can only be fixed in advance for a fixed quantity of consumption.

We believe that there are several advantages to relying on retailers to deliver simple pricing messages to customers.

1) **Complex network tariffs do not mean complex retail tariffs.** Retailers already manage complex cost structures that are not passed through to customers. If cost-reflective network tariffs imply a certain degree of complexity, retailers should be able to manage this complexity just as they manage complex wholesale costs.

2) **Retailers have the ability to offer multiple simple, cost-reflective plans** to customers that best meet their needs. There are many dimensions in which current retail price plans, which are largely volumetric, can become more cost-reflective. Different aspects of cost-reflectivity will appeal to different customers. Some customers may choose to manage their daily peak energy usage through a TOU tariff, while other will find it easier to manage peak demand through a demand charge.[98] This is illustrated in

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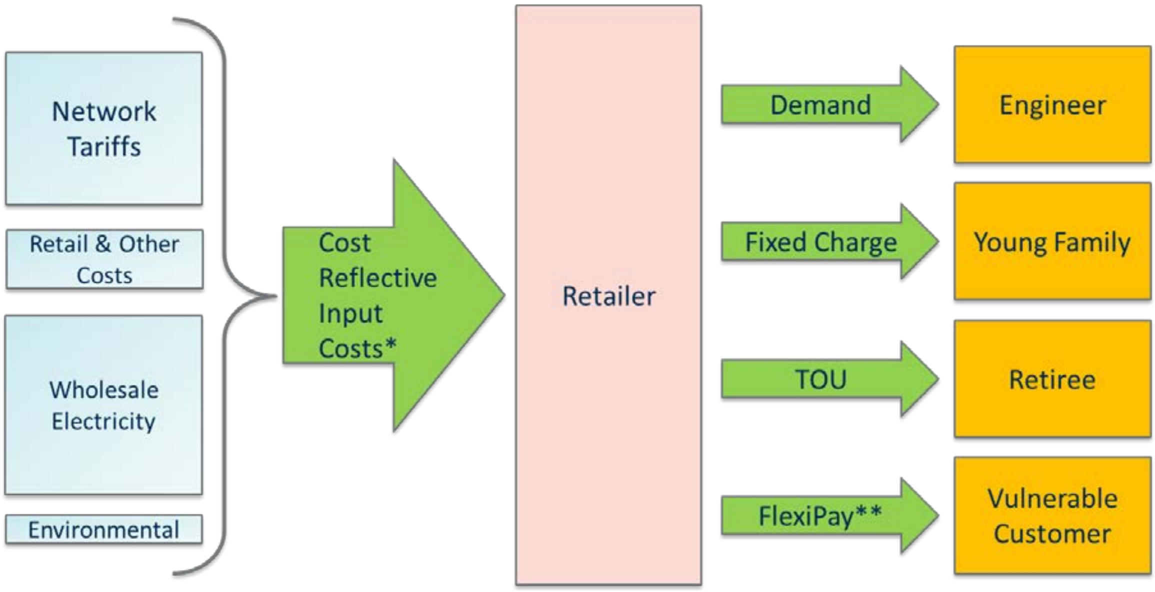
97 See, for example, Plug In Illinois, "Frequently Asked Questions", n.d., available at: https://www.pluginillinois.org/faq.aspx.

98 Some customers may also want more complex pricing structures and this too can be a retail offering.

Figure 6. Retailers could also offer customer price plans that are bundled with technological solutions. Retailers are in a better position than networks to assess what price plans suit customer needs, including how each customer might be able to adjust their consumption to reduce network charges. Diversity is important in that no individual customer need handle all of the aspects of cost reduction – different customers could each take on one easily manageable behavioural shift. Retail competition is necessary for innovation to occur, and cost-reflective network tariffs could help strengthen retail competition.

Figure 6: Retailers can set multiple price plans



* Retailer input costs are sized to match the cost shares for Victoria for 2017/18 derived from the AEMC 2017 Residential Electricity Price Trends (December 2017). These are: 38% networks, 44% wholesale electricity, 13% retail and other costs (including retail margin) and 5% environmental.

** FlexiPay is a fictitious tariff that relies on retailer customer expertise to identify and serve vulnerable customers at a reduced price. It could be voluntary, subsidized by government or regulated.

3) **Simple network tariffs are risky and inflexible.** To make a simple network tariff, networks would need to choose one message that best reflects the multiple constraints that they face. If the relative importance of constraints shifts over time, the network tariff is at risk of sending out the wrong signal to customers. This is particularly problematic in Australia's National Electricity Market where tariff structures are fixed for five year periods. In contrast, retailers can offer multiple pricing plans and can adjust them frequently.

4) **Cost-reflective network tariffs can help encourage retail competition**, by creating greater opportunities for retailers to differentiate themselves through offering reduced prices to customers with a lower cost-to-serve, and by helping customers to identify

lower cost consumption behaviour. Increased retail competition will ultimately result in lower prices and more varied service offerings for customers.

III.A.2.Economic Efficiency

Economic efficiency is synonymous with both minimizing cost and reducing waste. This involves ensuring that decisions are made in such a way that all of the opportunities to make at least one person better off without adversely impacting someone else, are taken advantage of. In a market economy with many millions of actors, we rely on prices to perform this coordination role. Where price does not signal value, then wasteful decisions can result. For example, if electricity were offered for free, many customers would likely make consumption and investment decisions where the value that they received from the extra electricity they consumed was less than the cost of providing it. Cost-reflective network tariffs ensure that customers face the economic costs of their consumption decisions and therefore can make efficient decisions. For example, if the costs of providing peak network capacity are not correctly reflected in prices, consumers will use more electricity at peak times than they would otherwise,[99] triggering potentially expensive network upgrades. In competitive retail markets retailers will have the incentive to create different cost-reflective price plans that take into account network, wholesale and other retailer costs and allow customers to make informed choices over their consumption options. Figure 6 (above) shows how cost-reflective tariffs could result in retailers designing multiple price plans to appeal to different customer segments. Each of these price plans would be more cost-reflective than current volumetric prices.

III.A.3.Adaptability

Cost-reflective tariffs are by definition adaptable to change. As customer behaviours and technology evolve, the networks are left indifferent to these changes because their tariffs allow them to recoup costs from those customers who cause them. However, as the types of behaviour that cause costs change over time, a tariff that once reflected costs may not continue to do so indefinitely. For example, some loads essentially represent the charging of storage devices (which could be batteries, hot water heaters, or electric vehicles). When penetration is low, the impact on the system is low, but at higher penetrations there could be

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99 See for example Faruqui, A. S. Sergici & C. Warner. (2017): *"Arcturus 2.0: A Meta-analysis of Time-varying Rates for Electricity"*, The Electricity Journal (Vol.30)

severe impacts if the timing (and location) of the individual loads is not diversified. The network tariff will need to be able to signal the value of diversity (and, conversely, the cost of synchronised operation). Adaptability will be important to allow the network tariff to accommodate changing uses of the network and corresponding changes in what types of use drive costs.

Cost-reflective network tariffs alone will not be sufficient to cover the network's costs since incremental future costs will likely differ from those incurred in the past. Balancing items are therefore needed in the tariff structure to recover the remaining residual costs. As discussed below, these balancing items could be used to promote social objectives such as affordability or equity. However, careful thought needs to be given as to what elements of the tariff can best be used to recover residual costs. For example, fixed charges may not always be the best way of recovering residual costs if customers are deciding whether to leave the grid.

III.A.4. Affordability

The framework of economic regulation applied to networks in the NEM is designed to encourage efficiency, in the sense of producing the network services required by customers at least cost.[100] The objective of economic efficiency discussed above, implies that network services should be priced in a way that reflects cost, such that customers will only demand network services that they value at least as much as the cost of providing them. Taken together, the system of incentive regulation applied to networks and cost-reflective pricing of network services should result in a network tariff that is no higher than needed to pay for the services that customers value. In the long-run, this contributes to a network tariff that is lower—and hence generally more affordable—than otherwise.

However, this picture is not complete: first, a cost reflective tariff component is designed to reflect the incremental cost of new network services, not to cover the costs of the existing network. Second, much of the cost of the network is shared, in the sense that assets used to provide one service to one customer are also used to provide services to other customers. There is no single correct solution to splitting these shared costs. Under many types of network tariff, customers contribute to the cost of the existing shared network via a simple

100 For example, during the five year term of a revenue determination, if the network spends less on producing required network services, its revenue does not go down as a result, thereby creating a financial incentive to improve efficiency.

sharing rule, such as all customers paying an equal amount (through a fixed charge) or all customers paying an equal kWh charge, or by scaling up a tariff based on incremental cost.

A tariff which applied a simple sharing rule so that, for example, all customers paid an equal contribution to the shared costs of the existing network, would meet one interpretation of the affordability objective, in that tariffs are no higher than they need to be, as we explained above. However, an alternative interpretation of the affordability objective could involve the networks using balancing items to create progressive tariffs that would be cheaper for vulnerable customers. However, such interventions would likely need to be targeted specifically to vulnerable customers to be effective, rather than operating via a proxy such as metering data. For example, one might suggest giving all customers a discount on the network charge for the first 100 kWh used every month to benefit vulnerable customers as a "living allowance". However, such a discount is likely to benefit many affluent customers and harm many vulnerable customers. Many vulnerable customers may be high usage customers due to poorly insulated housing stock and inefficient appliances, whereas many more affluent households may have solar panels and efficient appliances, making them low usage households. Given that networks do not have direct customer relationships, we would not expect them to be in a good position to identify vulnerable customers. However, if retailers could reliably identify vulnerable customers (perhaps assisted by a government agency), the network tariff could provide a discounted charge for electricity delivered to those customers. Provided that the discount applied only to the balancing items relating to recovering residual costs of the shared network, this would not conflict with the objective of economic efficiency (although any such mechanism would presumably require verification/auditing, which would add cost).

III.A.5.Equitable

An equitable tariff implies that customers should pay a "fair share" of network costs. Usually this means that similar customers pay a similar amount in similar circumstances. However, given that there are shared costs, it is not always clear how balancing items, which are needed to recover the full revenue requirement, should be used to determine the proportion of shared costs paid by each customer. For example, the balance of revenue after creating cost-reflective tariffs could be recovered by charging all customers a uniform fixed charge, or by creating a volumetric charge, so that allocation is proportional to utilisation (assuming neither will significantly change customers' key investment decisions). Each method treats all customers in the same way, but the resulting distribution of charges could be very different. Furthermore, there may be a trade-off between the objective of an equitable outcome and one which is affordable for vulnerable customers. As a result, the definition of "fair share" can be controversial and will depend on the circumstances of a specific jurisdiction and its policy settings.

III.B. Illustrative Tariff Designs

In this section we assess two different approaches to tariff design, and for each approach we discuss some possible tariff designs using the stakeholder objectives as evaluation criteria. The first approach assumes that the tariff is designed for the retailer, since end-customers do not see network tariffs directly, as is the current case in the market. Retailers will take this tariff and other cost inputs and elect how to create different pricing messages for end-customers. As we explained above, we think that the actions of retailers are potentially very important in providing customers with information about how they can reduce the cost of using the network.

The second approach considers a tariff that is intended to send a price signal directly to the end-customer, without involving the retailer. The second approach would be adopted if retailers proved ineffective at communicating information about network costs to customers (including via retail pricing plans offered).[101] In order for the second approach to function, it would be necessary to create a new mechanism for networks to communicate directly with customers. For example, a route for communicating with customers via the billing process could be created with a new requirement that the network tariff and the network charge component of the bill be included in the retailer's billing communications.

A network tariff that addresses the retailer rather than end customers can use several tariff components to reflect costs, since part of the role of the retailer will be to develop one or more simple retail tariffs. A multi-part tariff consisting of a coincident peak demand charge, a maximum demand charge, and a fixed charge can capture the current drivers of network costs and be adjusted as required to recover total authorised revenue. The coincident peak demand charge could be based on the retailer's total demand at the time of network peak demand. The maximum demand charge could be based on the sum of the individual (non-coincident) maximum demands at each end-customer connection point. The customer-count charge would be a fixed charge proportional to the number of customers in the retailer's portfolio. The maximum demand charge is intended to capture the capacity costs of the

101 Retailers could provide information to customers via multiple channels, and this might not require retail prices that mirror the structure of network tariffs. Retailers are able to offer a range of price plans that engage with the diverse preferences of their different customers.

connections to each end-customer. The coincident peak demand charge reflects the retailer's portfolio's use of the network during the peak demand conditions. The customer-count charge can be used to recover residual costs. If there is little/no variation in the capacity costs of the connection to the household, then the maximum demand component can be subsumed into the fixed charge. An alternative to the coincident peak demand charge would be a critical peak price (CPP), a dynamic form of time-varying charge where consumption during the peak hours is usually charged at a relatively low rate, but where the peak price would be significantly higher on a limited number of days per year (typically 10 or 15) when the system is most likely to reach its peak.

The retailer can decide how to reflect such a network tariff in retail price plans offered to customers. For example, the retailer may find that some customers don't want to know about demand, but are happy to have the retailer install a battery on their premise for a fixed monthly fee. The retailer could then use this battery to manage peak demand, so that it would not be necessary to charge that customer separately for peak demand.

There will be many possible variations and refinements as a retailer-focussed multi-part tariff is developed and implemented. For example, locational variation could ultimately be included, and there are different ways in which a demand charge can be calculated. However, we would expect the basic design to be as described above.

A variation on this multi-part tariff would be to adjust the recovery of residual costs to provide a discount to vulnerable customers, for example by reducing the customer-count charge (the customer-count charge could be one rate multiplied by the count of vulnerable customers for each retailer, and at a higher rate for the count of other customers). Vulnerable customers would need to be identified directly by retailers, who manage the customer relationship. Such an approach would not change the design of the tariff but would alter the value of the tariff components (for example, a lower fixed charge per vulnerable customer, offset by a higher fixed charge per non-vulnerable customers). We acknowledge that this approach may have to be informed by policy considerations outside the current scope of the regulatory framework for tariff design.

A network tariff design that addresses end customers directly will be simpler than one addressing retailers. However, because the tariff is overly simple, it cannot reflect drivers of network costs in the same way. Candidates might include the following network tariffs:

- A TOU tariff, with a peak and off-peak period for the summer period only. In the winter it is a flat kWh charge. It could also include a daily service charge.

- A demand subscription service, where customers select from a menu the level of maximum demand during peak hours that they want to pay for on a monthly basis. If customers exceed their nominated demand level, they will be charged for this exceedance at a higher rate.[102]

- A simple fixed service charge to cover all network costs.

We provide our assessment of how these tariff options rate against the objectives in Figure 7.

Figure 7: Illustrative comparison of tariffs

Tariff Objective	Network Tariffs for End-Customers			Network Tariffs for Retailers		
	TOU	Demand Subscription Service	Fixed Charge	CPP and Customer-count Charge	Demand and Customer-count Charge	Demand and Customer-count Charge + Assist Vulnerable Customers
Simple	Medium	Medium	Strong	Medium/Strong	Medium/Strong	Medium/Strong
Economic Efficiency	Medium/Strong	Strong	Weak	Medium/Strong	Strong	Strong
Adaptable	Medium	Strong	Weak	Strong	Strong	Strong
Affordable	Medium	Medium/Strong	Weak	Medium	Medium	Strong
Equitable	Weak	Medium	Strong	Strong	Strong	Medium/Strong

Strong Medium Weak

We note that, for the approach of addressing end-customers directly, there is a trade-off between simplicity and the other objectives. The simplest tariff is the fixed charge, but this does not score well on the other objectives. The best of the three tariffs shown above is probably the demand subscription service. As mentioned in Section II, this approach is

102 This could be similar to the recently-contemplated tariffs in Queensland, discussed above.

currently being considered by Energex and Ergon Energy in Queensland. The demand subscription service is similar to a capacity charge, which is used in several European jurisdictions. Both tariffs charge a customer for anticipated rather than actual demand, but differ on what happens when you exceed this. Where capacity charges have been implemented it has tended to focus on customer maximum demand rather than coincident peak demand.[103] Coincident peak demand would better reflect drivers of network cost, but might be more difficult for customers to engage with.

The retailer-focused approach scores better because this approach relies on the retailer to develop a multitude of cost reflective price plans that best suit the needs of their diverse customer base (including possibly options similar to the three end-customer tariffs discussed above). Customer tastes, such as risk aversion, form a continuum from being very risk averse, to being very risk tolerant. Some customers prefer low volatility at the expense of higher prices, while other customers prefer the opposite. The retailer-focused approach allows for more complex tariffs than the customer-focused approach. This translates to more volatility in underlying costs for the retailers, which they can pass on to interested customers through "riskier" (more cost reflective) price plans. Customers can choose the plans and behaviours that best suit their risk tolerance and lifestyles. Retailers are better placed to engage with these customers and tailor plans to customer characteristics (for example, demographics, tastes, or behaviours)

103 Maximum demand can be over the entire day, or limited to during the peak period.

IV. Supporting Measures

IV.A. Support During the Transition

Despite the presence of cost-reflective network tariffs, there are several reasons retail prices may not resemble network tariff structures. For instance, some customers have different tastes, and prefer to face higher prices with greater stability across billing periods. Another reason is that retailers face volatile wholesale costs and their own retailer costs as well as network tariffs, and these costs may pull retail prices in different directions. Finally, the cost to retailers of implementing prices that reflect network tariff structures may outweigh the benefits to the retailer. The benefits to retailers come from increasing market share. More cost-reflective tariffs offer greater value to be passed through, which can help attract customers. However, new network tariffs may introduce costs such as costs to analyse the market and develop new pricing plans, and to implement the new tariffs in billing systems. Thus, retail price plans offered to end-customers will not exactly mirror the underlying network tariff – and for good reason. However, as we discuss below the networks have some ability to influence the retailers' assessment of the benefits and costs of more cost-reflective pricing. For example, networks can ensure that retailers have access to the necessary information to understand how the retailer's network charge has been calculated (and how it might change if the retailer's portfolio and network usage changed).

A further reason that retail prices may not reflect underlying costs is that some retailers may have market power, which means they have some ability to set prices in the market independent of their costs. However, networks can act to help intensify competition in the retail market, benefiting customers (improved network tariffs should create opportunities for retailers to identify and serve lower-cost customers at reduced prices, thus intensifying competition). Increased retail competition also aligns with the networks long-run self-interest since it will ensure that their assets are used as thoroughly as possible (reducing the risk of stranded assets). More complex cost-reflective tariffs offer retailers the ability to differentiate themselves by offering a number of plans aimed at particular market segments. These plans can be coupled with complementary technologies that retailers can lease to customers or offer at subsidized prices. More importantly, cost-reflective tariffs offer retailers more value to compete over. Allowing retailers greater control over their costs will encourage new entry and greater competition. Innovative retailers can help customers reduce network costs and their overall bill, while less innovative retailers may lose market share. However, it should also be recognised that there are many other factors influencing the state of competition in the retail market.

During the transition to cost-reflective tariffs, the networks can develop complementary measures to ease the transition and enhance competition. These measures could assist retailers avoid price shocks to customers, ensure that retailers stay viable, encourage price competition, and help retailers see value in creating retail prices that reflect network costs.

1. The networks can create a **transitional mechanism that leaves average per customer networks costs initially unchanged** for each retailer, but introduces the new price signals so retailers face new tariffs at the margin. The tariff elements would not be altered, but after calculating each retailer's total network charge, an adjustment would be made so that the cost per customer was the same for each retailer. Since each retailer's total network cost is initially unchanged, retailers would not be under an immediate financial imperative to increase prices if they happen to have a portfolio of customers that are more costly to supply than the average. In this transition plan, the average cost per customer would change slowly as the transitional mechanism phases out. In this way, retailers have every incentive to offer customers more cost reflective price plans, but are not adversely affected if they start off with an expensive customer base to serve.

2. Networks could provide **implementation support for smaller retailers** to help the overcome some of the "lumpy" costs that may be associated with a tariff transition. For example networks could assist small retailers with a customized analysis of their customers' meter data, or host workshops that illustrate innovative price plans offered in other jurisdictions. This will help smaller retailers with implementing new price plans, so that they are able to continue to push the larger retailers to innovate to maintain their customer base.

3. Networks can help create a **clear value stack for retailers** who are implementing cost-reflective price plans. Networks can reward cost reducing behaviour by carrying out open, transparent processes for non-network solutions so that retailers can compete for these services, such as providing network level demand response.

We explained above that it would be possible to provide support to vulnerable customers by separating the fixed charge tariff element (used to recover residual costs) into a lower fixed charge per vulnerable customer and a higher fixed charge per non-vulnerable customer, provided that these customers can be reliably identified. Such support could be part of a transition plan or could be a permanent feature of reformed tariffs.

IV.B. Peak Time Rebates

Peak Time Rebates (PTR) are programs that pay customers to reduce their usage at critical peak times when it is valuable to the network and/or retailer. Customers need to be notified of events in advance so that they can respond to them, and this is usually done over email, text or through an app. Actual customer usage during an event is compared to a customer-specific baseline, which is a simple forecast of what they would have used if a PTR event had not been called. If customers use more than their baseline, there is no penalty and they just pay their regular tariff. If they use less, they pay their regular tariff, but also are paid a rebate for every kWh reduction during the critical peak period. In this way, PTR can be implemented independently of other tariff/pricing designs. PTR can be rolled out system-wide, or concentrated in particular locations that are facing constraints.

PTR could be implemented directly by the networks in order to send a clear price signal to end-customers without the risk of the signal being masked by retailers. However, the networks would need to sign up customers to participate in PTR, and set up systems to pay customers directly, and this is costly, since they do not have customer details.[104] To minimize the costs and maximize the value of PTR in Victoria, it would be best to implement in locations with specific network constraints.

Networks could alternatively implement PTR through service providers, including retailers, and rely on them for customer outreach and marketing (although PTR payments would still be made directly). The retailer may want to increase the rebate payment, if it helps them to manage their wholesale energy costs. However, it would be necessary to coordinate closely to ensure that customers are recruited in the target locations.

IV.C. Tariff Choice

In some markets the network tariff reform process has been accompanied by a debate over whether tariffs should be opt-out, opt-in or mandatory. For example, if there is a new network tariff with a demand charge, should the new tariff be compulsory for the retailers of all customers, and if retailers/customers have a choice, should the default be the new tariff (with the option to opt-out and go back to the old one) or should the default be the old tariff.

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104 PTR programs in other jurisdictions have been implemented on either an opt-out or opt-in basis. However networks in Victoria would need to recruit customers on an opt-in basis since they may not have the customer contact information necessary to notify customers of events and pay them for responding.

We note that in many cases these markets have bundled retail and distribution rates, with no or limited retail competition (ie, the utility is designing an "all in" retail price, rather than a network tariff per se).

Providing end customers with a choice of network tariffs (or retail price plans) may have advantages. Since different customers may have different preferences, for example in terms of tolerance for price volatility, choice can be beneficial. Choice can also help to reveal information about customers' preferences. Defaults also matter for end-customers, who generally have predictable behavioural biases. Research has shown that the majority of customers tend to stick with the default choice, irrespective of whether it is the old or new tariff.[105] This may be due to a variety of reasons: customers may take the default as an implicit recommendation by authority; customers may want to change tariffs, but keep putting it off; or customers may feel that the costs of switching outweigh the benefits. The same is not true for retailers. Retailers do not have behavioural biases or significantly heterogeneous preferences. If retailers were to be given a choice of network tariffs, we would expect all of them to all make the same choice and to choose the tariff which minimizes their expected network charges. We would not expect valuable information to be revealed through offering a choice of tariffs to retailers. We would therefore suggest that providing a choice of network tariffs could make sense if the approach is to design tariffs addressed directly to end-customers, with the choice being exercised by the customer. However, if the tariff is addressed to the retailer, a choice of tariffs would be unhelpful.

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[105] Faruqui, Ahmad, Ryan Hledik, and Neil Lessem. "Smart by Default: Time-varying Rates from the Get-go—Not Just by Opt-in", *Public Utilities Fortnightly* (August 2014): 25-32, accessed April 11, 2017, available at: https://www.fortnightly.com/fortnightly/2014/08/smart-default

V. Conclusion

Reforming tariffs to better reflect system cost will provide a multitude of benefits. It will encourage better use of the existing network infrastructure and customer investments that minimize system costs. Tariff reform can also help avoid a situation where some customers are able to make investments that reduce their network charges but also increase network charges for other customers. Tariff reform can also help encourage retail competition, by creating greater opportunities for retailers to differentiate themselves. This can ultimately reduce prices for all customers.

In this report we identify an important preliminary question: should network tariffs be designed to address retailers, or should they be designed to be communicated directly to end customers? We think that communicating with customers and understanding customer preferences is a key part of the retailer's role in a competitive retail market. As such, provided that retail competition is effective, a cost reflective network tariff designed to address retailers is the better approach to meeting stakeholder objectives. Both networks and retailers have a role to play.

A network tariff designed with the retailer as its primary audience is likely to have a demand charge to reflect the cost of adding new capacity to the network, and a customer-count charge to recover a share of the sunk cost of the existing network. Retailers in turn could design a series of price plans that reflect network and wholesale costs (and retailer operating and administrative costs) and elicit a positive response from customers.

If retail competition is not effective, an alternative approach would be for the networks to communicate directly with customers rather than via retailers. Some examples of simple network tariffs that could be addressed directly to end-customers are a time of use tariff (TOU); a demand subscription tariff; and a fixed charge.

Direct communication of the network tariff to customers could be achieved by requiring retailers to print details of the network tariff and network charge on the customer's bill. If the network tariff is to be communicated directly to customers, networks (rather than retailers) would be responsible for ensuring that the information is presented in a way that customers understand. Since communication with customers is a core part of the retail function, we expect that networks communicating their tariff directly to customers would not be as effective as if the retailers were to play this role. We also think that a shift towards more cost-reflective network tariffs could help make retail competition more effective by creating opportunities for retailers to find customers with low-cost consumption patterns.

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