More efficient distribution prices

What do they look like?

Consultation paper

Submissions close: 5PM Tuesday 19 February 2019

11 December 2018

Market Design

Executive summary

The Authority is seeking your feedback on its proposals to:

- amend the Distribution Pricing Principles to clarify the Authority's expectations for efficient distribution prices
- monitor and rate the efficiency of distributors' prices and their progress on price reform.

The Authority also wishes to hear about how else the Authority and other stakeholders can assist distributors to progress distribution price reform.

Distributors need to adopt more efficient distribution network prices

There is broad industry agreement that distribution network prices need to change. The current standard approach to distribution prices distorts signals about the cost of using the network. Without clear price signals that help consumers decide when to adjust their use of the network, there will be unnecessary network investments.

The rising uptake of electric vehicles will amplify this issue. Distorted prices also encourage consumers to over-invest in technologies such as solar panels. This results in significant economic cost, and is pushing more of the network costs increasingly onto consumers who do not use these technologies. It also risks inefficient investments, exposing distributors to commercial risks (eg, stranded assets). The current situation is unsustainable.

The Authority has supported an industry-led approach to distribution price reform. Since the Authority published a consultation paper on distribution prices in 2015, distributors have been working on pricing options and implementation issues. But there are signs that without further facilitation and encouragement price reform efforts may not go far or fast enough. This would mean that consumers end up paying more than they need to.

Proposed changes to the Distribution Pricing Principles

To facilitate distributors making progress with distribution price reform, this consultation paper sets out the Authority's expectations for efficient distribution prices. The Authority proposes amendments to the Distribution Pricing Principles that reflect these expectations. The proposed principles are set out on page 10.

Rating the efficiency of price structures and engaging with distributors on progress

Distributors will want to manage the transition to more efficient distribution prices, working with retailers and other stakeholders. Distributors should not wait to start this transition. Consumers experience the adverse effects of inefficient prices now. Also, the size of the problem will only grow over time and become harder to address.

To encourage and support distributors to adopt more efficient prices with urgency − and to strive to the most efficient prices feasible − the Authority also proposes to undertake monitoring of the efficiency of distribution pricing and the extent of progress. It is proposed that this will consist of:

- an annual star-rating of the efficiency of each distributor's price structure
- an assessment of the ambition and progress of each distributor's price reform plans.

The Authority would discuss its assessments with distributors, and make them publicly available. This will help with communicating the case for price reform and the extent of progress to communities, and supporting distributors that are making good progress.

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What this consultation paper is about

1.1 The purpose of this paper is to consult with interested parties on the Authority's proposals to amend the Distribution Pricing Principles and to monitor the progress of distributors' price reform efforts.

1.2 The aim of these proposals is to promote distribution price reforms that are in the long-term interest of consumers.

How to make a submission

1.3 The Authority prefers to receive submissions in electronic format (Microsoft Word) in the format shown in Appendix E. Submissions in electronic form should be emailed to submissions@ea.govt.nz with "Consultation Paper—More Efficient Distribution Prices" in the subject line.

1.4 If you cannot send your submission electronically, post one hard copy to either of the addresses below, or fax it to 04 460 8879.

Postal address	Physical address
Submissions Electricity Authority PO Box 10041 Wellington 6143	Submissions Electricity Authority Level 7, Harbour Tower 2 Hunter Street Wellington

1.5 Please note the Authority wants to publish all submissions it receives. If you consider that we should not publish any part of your submission, please

(a) Indicate which part should not be published

(b) Explain why you consider we should not publish that part

(c) Provide a version of your submission that we can publish (if we agree not to publish your full submission).

1.6 If you indicate there is part of your submission that should not be published, we will discuss with you before deciding whether to not publish that part of your submission.

1.7 However, please note that all submissions we receive, including any parts that we do not publish, can be requested under the Official Information Act 1982. This means we would be required to release material that we did not publish unless good reason existed under the Official Information Act to withhold it. We would normally consult with you before releasing any material that you said should not be published.

When to make a submission

1.8 Please deliver your submissions by **5pm** on Tuesday **19 February 2019**.

1.9 The Authority will acknowledge receipt of all submissions electronically. Please contact the Submissions' Administrator if you do not receive electronic acknowledgement of your submission within two business days.

2 Issue the Authority would like to address

Network distribution prices need reform

2.1 Distribution prices recover around 37 per cent of the average electricity bill in New Zealand, including transmission costs. It is in the long-term interest of consumers that distribution prices are efficient, that is, as low as possible.

2.2 Distributors run primarily fixed-cost businesses, but recover most of their costs using a variable charge – a flat per kWh charge that is not cost-reflective, nor benefit-based. This is inefficient and means consumers are paying more than they need to. This is because flat per kWh charges:

- do not signal to consumers when the network is congested and costly to use, or when there is spare capacity. This results in unnecessary investment in the network, costing consumers more
- cause consumers to over-invest in technologies (such as solar panels) to avoid these charges, pushing more and more of the network costs onto consumers who do not use these technologies – often lower socio-economic households.

2.3 The outcome is inefficient and unsustainable.

2.4 In 2015, NZIER estimated that just in relation to solar panels alone distribution charges could increase by up to 30 per cent over 10 years. This would add 10 per cent to the retail bills of consumers without solar panels.[1] They effectively end up cross-subsidising others to over-invest in solar panels. The economic cost of this outcome occurring has been estimated to be in billions of dollars.[2]

2.5 The issue is not new. The Authority published a consultation paper on the need for distribution price reform in 2015. Also, distributors have been studying pricing options and working on implementation issues. This work, led by the Electricity Networks Association, is heartening. But given the cost pressures faced by consumers and the looming commercial implications for electricity distribution businesses of inefficient investments, the need for pricing reform is more urgent than ever.

2.6 The Authority needs to see the distribution networks act with ambition and urgency on reforming their pricing structures. They should put in place concrete transition plans now, rather than wait.

2.7 Distribution price reform is a key means for distributors to respond to the opportunities and threats posed by new technologies, and also policies aimed at reducing greenhouse gas emissions. Price reform will require strong leadership from distributors and active engagement with the community and other stakeholders, such as retailers.

2.8 Price reform does not change the rules on how much revenue distributors may earn in total from consumers.[3] That is set by the Commerce Commission for most distributors and by the firms themselves for those consumer controlled distributors that are subject to information disclosure regulation only. The Authority's interest is that distributors apply efficient price structures to generate revenue.

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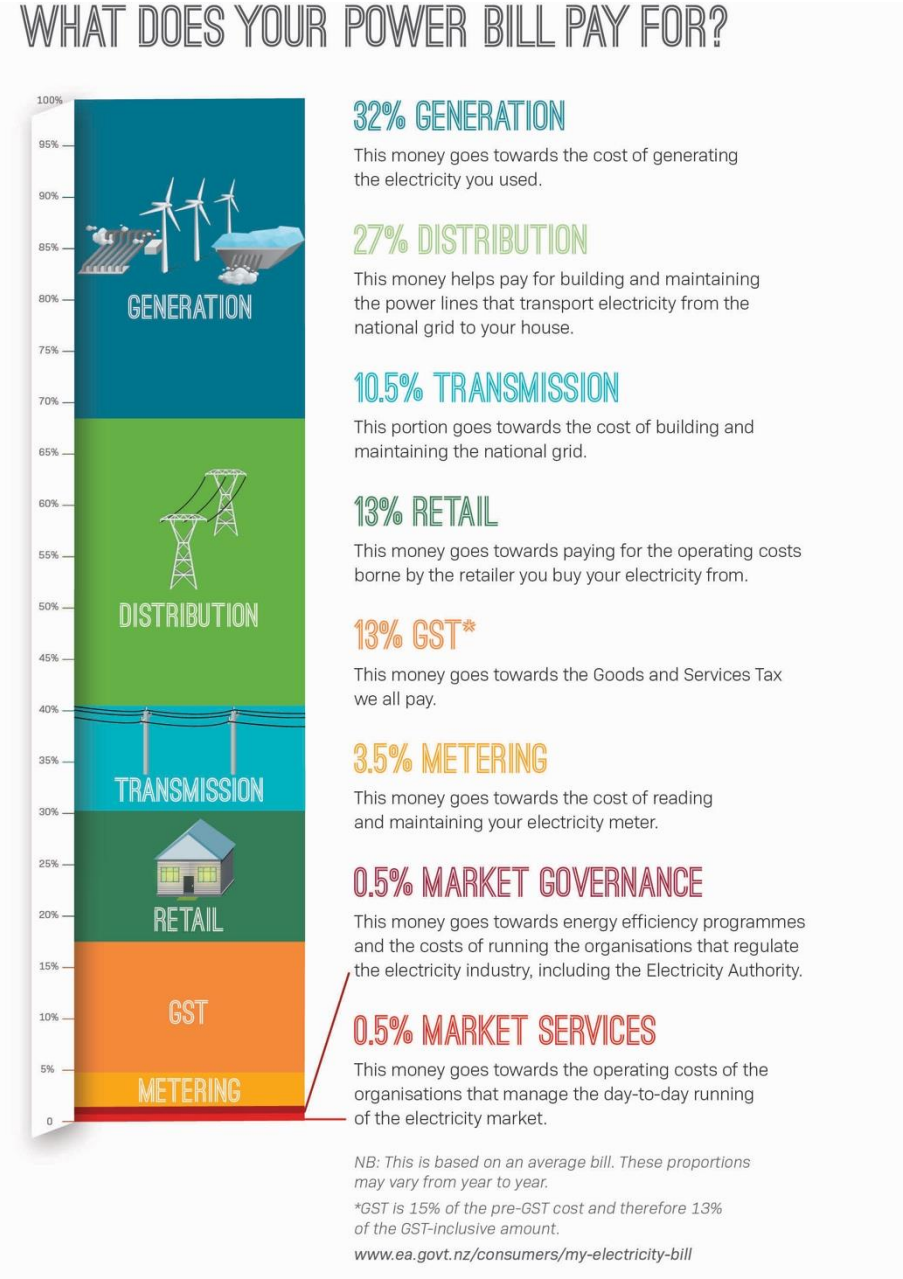
1 See NZIER 2015, *Effects of distribution charges on household investment in solar*, at www.ea.govt.nz

2 See NZIER 2015, and Concept Consulting 2017, *New technologies + old tariffs= problem!,* at www.concept.co.nz

3 The Commerce Commission regulates the revenues a distributor may earn.

Figure 1 Components of the average electricity bill



Source: Electricity Authority, *Electricity in New Zealand*, 2018.

Issues with current distribution pricing

It increases the cost of electricity for all consumers

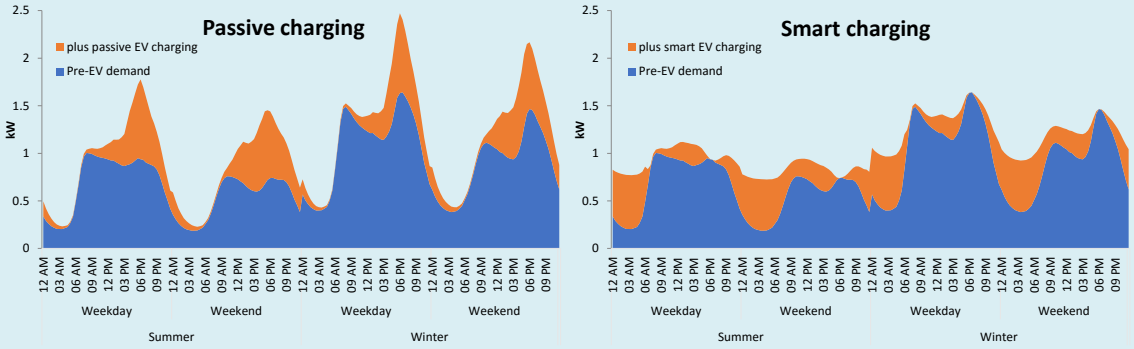
2.9 Current standard distribution prices do not signal when the network is congested nor when there is plenty of capacity. That means consumers have few incentives to avoid using power-hungry appliances or charging their electric vehicles when the network is congested, even if reducing demand is the cheapest option for addressing congestion. Distributors interpret the congestion as a need to invest in more network capacity. This ends up unnecessarily increasing consumers' power bills.

Reducing demand might be the cheapest option for addressing congestion. But without a clear price signal consumers will not know when to adjust their use of the network.

Demand response can be as simple as adding a time switch to a storage hot water cylinder – to avoid heating water over peak demand periods – or as sophisticated as adding a battery to a rooftop solar panel installation to draw on at peak time.

Figure 2 illustrates the difference for the network if households charge their EV when they get home or use smart (off-peak) charging. Prices that accurately signal the costs and benefits of using the distribution network give parties the right incentives to adjust their demand.

Figure 2 Effect of passive and 'smart' EV charging on household demand profile



Source: Concept Economics, 2018. *"Driving Change" – Issues and options to maximise the opportunities from large-scale electric vehicle uptake in New Zealand*

It can lead to poorer power quality and power cuts

2.13 Another problem is current standard distribution prices give consumers few incentives to pay attention to how their actions are affecting network power quality. For example, if a cluster of EVs are put on to charge at the same time this can create voltage problems and power cuts. Distributors would end up responding by installing extra capacity – that all consumers would pay for – or consumers would continue to experience poor service quality. The result is increased bills and dissatisfied customers.

Five households on the same street buy EVs and install 7 kW in-home chargers. As appliances in an average household have a combined load impact of around 2.5 kW, adding 7 kW to the peak load is like adding nearly three new houses to the local network.[4]

All five households charge their vehicles when they get home from work, adding to the already high evening peak load. This causes very low local voltage, which all neighbours notice. Clusters of solar panel installations can create similar problems when passing clouds simultaneously shade and then re-expose the solar panel cluster to full sunlight.

The local distributor has no operational visibility of these problems − until customers complain about poor power quality or the distribution transformer is overloaded leading to a fault. Efficient prices would give those with EVs and solar panels incentives to shift their demand to off-peak periods or store their excess solar energy and use it at peak times.

[4] So-called "fast chargers" have capacities of around 22 kW and require a major upgrade to a residence's electrical installation, including an upgrade to 3 phase power supply to the property.

It allows people to shift their share of costs to other users

2.14 Consumers are able to take steps to reduce their own electricity bill by installing solar panels, but this does not necessarily reduce distributors' costs. Distributors end up raising their flat per kWh charges to recover their costs.

2.15 As this goes on, prices become even less cost-reflective. Even more consumers are encouraged by these distorted price signals to make investments to avoid the increasing distribution network costs. It pushes more of the cost of the network onto those who have not made such investments. This cost spiral is unsustainable. It undermines the commercial returns for distributors and the durability of network prices.

Distributor network costs are driven by periods of peak demand, such as network congestion during a cold winter evening. But current standard distribution practice is to charge consumers based on total electricity distributed (that is, c/kWh charges), not peak demand.

Without distribution price reform, consumers have an incentive to over-invest in solar panels, because these reduce the total kWh they draw from the network – but not at peak times. This effect is real and large. The expected cost of this overinvestment is estimated to be $2.7−5 billion over 25 years.[5]

Because lower socio-economic households and renters are less likely to install solar panels, they actually end up subsidising the typically better-off households that do. This is because distributors will need to increase their kWh prices to recover the same total revenue from a decreasing number of kWh supplied from the network. Not reforming prices will thus cause a significant price impact for these consumers. This cost should be accounted for when assessing price reform.

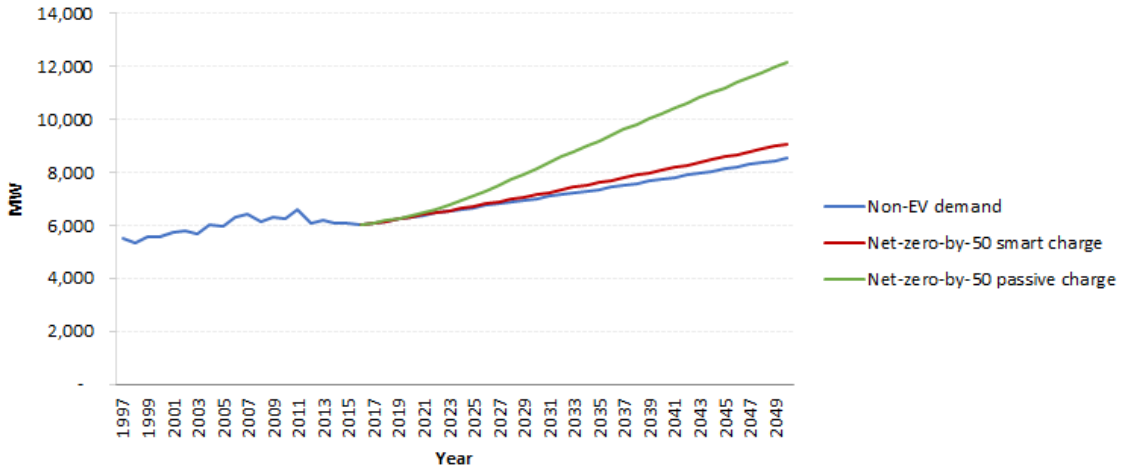
The potential for avoiding unnecessary investment is significant

2.16 The potential benefits of efficient distribution prices span beyond avoiding the cost of over-investing in solar panels, to avoiding distribution network investments required to meet the expected uptake of EVs.

2.17 Figure 3, taken from Concept Consulting, illustrates how much smart (off-peak) EV charging can reduce the future demand for distribution network capacity, compared to passive charging – people plugging in their EV when they get home, without regard for congestion. The scenario covers the uptake of EVs required to achieve the Government's ambition of net-zero emissions by 2050. The difference is around 3,000 MW.

[5] NZIER, 2015. *op.cit; see also* Concept Consulting, 2016. *Electric cars, solar panels, and batteries in New Zealand: Vol 2, the benefits and costs to consumers and society,* p48, at www.concept.co.nz.

Figure 3: Comparison of projected New Zealand peak MW demand for high EV-uptake between passive and smart EV-charging approaches



Source: Concept Consulting, 2018. *"Driving Change" – Issues and options to maximise the opportunities from large-scale electric vehicle uptake in New Zealand*, available at http://www.concept.co.nz

2.18 To put Figure 3 in context, in 2017 the distribution networks supplied a national peak demand of around 6,000 MW, with a combined regulatory asset based valued at $11 billion.[6] Peak demand is projected to double to 12,000 MW by 2050, under a scenario where EVs are passively charged. This compares to about 9,000 MW with smart charging. If people are to adjust their behaviours about when they put their EV on to charge, they need prices that signal when the network is congested and thus costly to use, and when it is uncongested.

Q1. Do you agree that distributors need to reform their prices? What is the reason for your answer?

Q2. How important and urgent are the issues identified by the Authority?

[6] See Schedule 4 of information disclosed by electricity distributors, at: https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-distributor-performance-and-data/information-disclosed-by-electricity-distributors

3 What needs to be done?

Distribution price reform

3.1 Distributors have two options for addressing these issues:

(a) More efficient distribution prices; or

(b) Restrict the use of new technologies.

3.2 Efficient prices signal the costs and benefits of using the distribution network and allow network users to decide whether the benefit of using the network justifies the cost.

3.3 Alternatively, distributors could address some of the problems outlined above by imposing restrictions, such as quotas on the number of new technologies (EVs, solar panels and batteries) that can connect to the network, or other restrictions on how or when they can be operated.

3.4 But quantity and similar types of restrictions are a recipe for inefficiency. They are unlikely to be acceptable to the public or to the Government – which has strongly signalled its desire for New Zealand to transition to a low-carbon economy.

3.5 A transition to efficient distribution prices is the better option. There is broad agreement that distribution prices need to change. When the Authority consulted on this in 2015, none of the submissions disagreed with that conclusion. And there was near unanimous industry agreement about the need for distribution price reform at our 2016 distribution pricing conference.

3.6 These views have been echoed in the recent Productivity Commission[7] and Electricity Price Review[8] reports, and internationally by industry regulators[9], competition authorities[10] and academics.[11]

Distribution prices should be cost-reflective and benefits-based

3.7 Efficient distribution prices:

- signal the true economic cost of providing electricity distribution services
- assign costs to each user on the basis of their use or benefit
- recover unavoidable or sunk costs in a way that least distorts use of, or investment in, the distribution network
- do not place unreasonable transaction costs on distributors, retailers or consumers, that is, such transaction costs need to be justified by the benefits.

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7 New Zealand Productivity Commission, 2018. *Low-emissions economy: Final Report.*

8 Electricity Price Review – Hikohiko te Uira, 2018. *First report for discussion*, pp.55-56.

9 Ofgem, 2017. *Reform of electricity network access and forward-looking charges: a working paper.*

10 Australian Competition and Consumer Commission, 2018. *Restoring electricity affordability and Australia's competitive advantage*, pp 173 – 190.

11 MIT Energy Initiative, 2016. *Utility of the Future – An MIT Energy Initiative response to an industry in transition*.

3.8 The appropriate form of distribution charges depends on the cost driver of each distribution service, and the extent to which costs can be attributed to specific users:

(a) **Connection** – the cost of the physical connection to the distribution network, including the cost of network augmentation if a user materially increases their load. These costs are one-off and fixed, and should be recovered from relevant users.

(b) **Access** – connected users have access to the distribution network assets to use (or generate) electricity. The network asset costs are fixed. The fixed asset costs can be shared among the group of users that benefit from the assets.[12] This should be done using an allocation method that does not distort network use.[13]

(c) **Network use** – the costs of using a distribution network relate to congestion and losses. When networks are congested, they cannot transport enough electricity to meet all consumer demand. The cost of congestion is the value consumers place on that unmet demand, and varies by time and location. Distribution charges should signal these variations in costs, so consumers can adjust their demand.

(d) **Common costs** – common costs primarily consist of 'overheads', such as billing systems, call centre costs and insurance. These cannot be directly attributed to a specific distribution service or specific consumers. As these 'fixed' costs do not vary with network use, they should be allocated across all parties connected to the distribution network in a way that does not distort use.

Signalling the marginal cost of network use

3.9 Locational marginal prices could in future be the way to signal the dynamic cost of congestion and losses.[14] Smart meters make it possible to record most, if not all, of ICPs' activities that contribute to marginal costs (time specific consumption, voltage, reactive power, etc).

3.10 However, it is not yet practical to calculate locational marginal prices on distribution networks. In practice, long run marginal costs[15] are an alternative in the distribution network when there is no better approximation of locational marginal cost. But prices that are based on long run marginal cost have disadvantages. These include that they:

- excessively discourage use of the network when there is spare capacity
- insufficiently discourage use when the network is congested.

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12 Beneficiaries of a new asset should be reasonably easy to identify and costs should be recovered from this group of users. Identifying beneficiaries may not be straightforward for existing distribution assets. It may be more efficient to recover these remaining costs through a fixed charge on all connected users in the network. This approach may appear inconsistent with the Authority's stated intentions to apply a beneficiary pays charge to at least some existing transmission assets as part of its review of transmission pricing. However, the reasons for that approach do not apply to distribution networks.

13 An allocation method should weigh accuracy against transaction costs of determining consumer benefit. A transparent method that gives a reasonable approximation may be better than a highly complex, opaque method that yields precise estimates.

14 These would signal the (short run) marginal cost of delivering an additional unit of electricity to a location at a specific time. Prices are low when there is excess capacity, and high when there is congestion.

15 This refers to the minimum increase in total cost of delivering an additional unit of electricity when all inputs are variable.

Revealing the true benefits of distribution network investments

3.11 Cost-reflective and benefit-based pricing will help reveal the real benefits of distribution network assets.

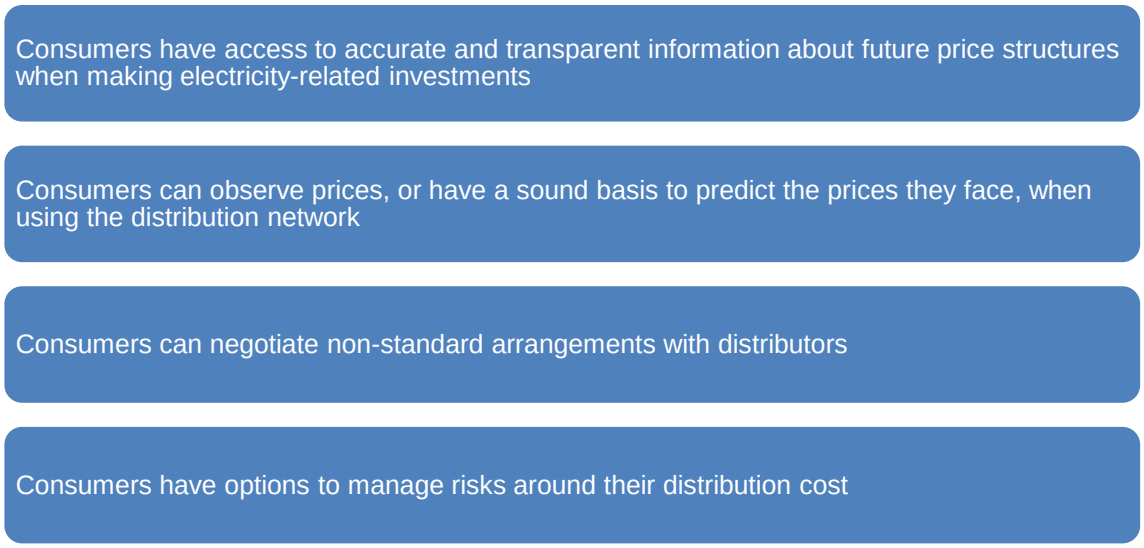
3.12 With more accurate information on the cost of connecting and having access to, and using a network, network users can make more efficient decisions on where, when and how much to use the network, or whether to make electricity-related investments (such as appliances, manufacturing equipment, EVs, solar panels, etc).

3.13 Another benefit is that more efficient pricing will give those who would end up paying for distribution network investments much-improved incentives to reveal the real benefits to them of different investment options. This in turn gives distributors better information, and sharper incentives, to propose and proceed with investments that best meet users' needs.

Sound information, and ways to manage price risks

3.14 Efficient price structures and levels need to go hand in hand with consumers having the right information at the right time on prices, and choices on how they manage price risks.

Figure 4 Non-price factors that influences the effectiveness of efficient prices



Changes in price structures should be well sign-posted and transparent

3.15 Distributors should go about price reform in a way that is transparent and enables network users to assess possible future outcomes when making decisions about electricity-related investments, such as appliances or machinery.

Network users need to be able to observe or predict prices

3.16 Network users can only make efficient decisions about using the distribution network if they know what that will cost them. In practice this means they need to be able to easily observe, or predict with a degree of accuracy, the prices they face when they are using the network. The more accurate and timely the price signal, the more efficient the outcome is likely to be.

3.17 This is not to say distribution prices must be stable or that users must have certainty about future prices. In fact, this can undermine efficiency. If underlying costs are volatile, then presenting a stable price weakens the cost signal.

3.18 It may well be the case that consumers prefer price stability.[16] But there is no reason distributors have a special advantage in managing price risk. It is likely more efficient to give consumers the choice, just as they do for wholesale price risk, on how they wish to manage price risk. Consumers can do this through their contract with retailers or third parties who may offer a variety of options.

Opportunities to agree non-standard arrangements with distributors

3.19 Distributors generally offer parties using their network a standardised access agreement. This helps to reduce transaction costs. But there may be circumstances where the standard agreement does not capture the needs of the party seeking to use the network.

3.20 In workably competitive markets, buyers and sellers will negotiate departures from the standard agreement for mutual benefit. Flexibility of this nature helps to promote innovation and reduce barriers to trade and competition.

Options to manage distribution-related price risk

3.21 Some distributors have argued that retailers should be obligated to pass distributors' prices directly through to their customers – 'mandated retail pass-through'.

3.22 The Authority does not see there is a particular efficiency reason why prices should be passed-through. Instead, pass-through could stifle the economic efficiency of the electricity sector because it reduces consumers' choice on how to manage price risk, and eliminates a dimension on which electricity retailers can innovate and compete for customers. As such, the Authority does not support mandated retail pass-through.

3.23 The vast majority of consumers, especially residential consumers, are on 'fixed price-variable volume' tariffs. That suggests that most residential consumers want some degree of protection from volatility in the prices they pay for electricity.[17] This may be because they are risk averse or do not want to actively manage their use.

3.24 Consumers themselves are in the best position to decide on the level of risk or active management they prefer. As Biggar and Reeves observe:[18]

> "While some may be prepared to pay a retail price that varies dynamically with wholesale market conditions, others would be prepared to pay a premium in exchange for insurance against volatile wholesale prices. If we are to achieve overall efficient outcomes, it is not enough for consumers to face efficient price signals; end-customers must also receive the degree of insurance or risk-sharing they desire."

3.25 A workably competitive retail electricity sector provides consumers with choice of retailers and innovative retail services and plans that better match consumers' circumstances and preferences. It is better to rely on competition to stimulate solutions and innovation, rather than imposing an administrative solution on price risk.

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16 For example, the ENA promotes stable distribution prices so consumers can better plan their finances Electricity Networks Association, 2017. *A Guidance Paper for Electricity Distributors on new pricing options*, p.7, available at www.ena.org.nz

17 As at 30 June 2018, less than 2 per cent of residential and small to medium enterprises were on a spot priced retail tariff.

18 Biggar and Reeves, 2016. *Network Pricing for the Prosumer Future: Demand-Based Tariffs or Locational Marginal Pricing?*, In 'Future of Utilities – Utilities of the Future: How Technological Innovations in Distributed Energy Resources will Reshape the Electric Power Sector', p.250.

Distribution Pricing Principles clarified to reflect these concepts

3.26 The current Distribution Pricing Principles are no longer fully consistent with the Authority's current thinking on efficient distribution pricing. Accordingly, the Authority proposes to amend the Distribution Pricing Principles.

3.27 The proposed principles are set out in the following table. A detailed exposition of the proposed changes in the principles, and their rationale, is set out in Appendix A.

3.28 The information disclosure guidelines published with the current pricing principles would not be carried over, as the relevant information is captured under the Commerce Commission's Electricity Distribution Information Disclosure Determination clause 2.4.

Proposed Distribution Pricing Principles

(a) Prices are to signal the economic costs of service provision by:
  (i) being subsidy free (equal to or greater than incremental costs, and less than or equal to standalone costs), except where subsidies arise from compliance with legislation;
  (ii) signalling the effect that network use has on costs including losses, opportunity costs of capacity constraints and other avoidable costs;
  (iii) being time and location-specific;
  (iv) charging costs to a specific user or group of users where those costs can be attributed to that specific user or group of users.

(b) If prices satisfy (a) above, they should be responsive to the requirements and circumstances of users and potential users, including by reflecting services provided by users and to users:
  (i) where prices based on efficient incremental costs would under-recover allowed revenues, the shortfall should be made up by prices that least distort network use and reflect the value that users derive from the network;
  (ii) allowing for negotiation to better reflect the economic value of services and enable stakeholders to make price/quality trade-offs or non-standard arrangements for services; and
  (iii) where network economics warrant, encourage investment in transmission and distribution alternatives (eg, distributed generation or demand response) and technology innovation.

(c) The application of these principles should be transparent and predictable.

(d) Prices should not place unreasonable costs and requirements, including transaction costs, on retailers or other consumer agents and should be economically equivalent across retailers and other consumer agents.

(e) Consumers should be able to know or predict prices they will face when making decisions to connect to or use the network.

Q3. Do you agree with the proposed Distribution Pricing Principles?

Q4. What, if any, changes would you recommend are made to the proposed Distribution Pricing Principles, and why?

4 How can distributors do this?

Selecting more efficient and practical price structures

4.1 The Authority currently believes that distributors are best placed to lead their own price reforms. But some price structures are more efficient than others.

4.2 The ENA has published guidance on the efficiency of different distribution price structures. We have drawn on this and other work to rate price structures by their efficiency – the extent to which they are cost-reflective and benefit-based – with reference to the proposed pricing principles.

4.3 Below we present the Authority's rating of the status quo and compare that with three more efficient structures that could be implemented. These structures, ranked from somewhat more efficient to much more efficient, are:

(a) Fixed charges + seasonal time of use charge
(b) Fixed charges + static demand charge
(c) Fixed charges + dynamic demand charge

4.4 This list is not exhaustive. Nor are these structures complex – each has a fixed charge and a variable charge. Fixed charges would recover the largely fixed costs of providing the network (and any connection costs). The variable charge would seek to signal marginal cost of using the network at a particular time and location.

4.5 All options require resolution of technical implementation issues. These can be overcome – and indeed have already been overcome by some distributors. The industry-led Technical Implementation Working Group is helping by working to resolve various operational and systems issues.

Rating distribution price structures

4.6 We have rated price structures on alignment with the proposed pricing principles − the more closely-aligned, the higher the star-rating. Appendix B has a detailed assessment.

Status quo pricing model, based on a flat per-kWh charge, is inefficient

Cost driver	Charge	Comment	Rating
Use	Flat per-kWh, Also used to recover fixed costs	+ Simple, easily understood - Poor signal of cost of using the network - Users can avoid their share of fixed cost	★☆☆☆☆
Access (and residual costs)	Fixed daily charge	+ Non-distorting way to recover fixed cost + Could vary by location or customer size - Limited use of benefit-based charging	★★★★☆
Connection	No consistent approach	Unable to assess as there is no industry consistency for connection charges	n/a

Source: Electricity Authority

4.7 The status quo model is inefficient. It would for example cause over-investment in solar panel installations and result in unnecessary investments in distribution network capacity to accommodate the uptake of EVs. The Authority expects distributors to take steps to reform these prices with urgency.

Seasonal time-of-use is a step in the right direction, but not the end-point

Cost driver	Charge	Comment	Rating
Use	Seasonal time-of-use kWh (peak/off peak, summer winter)	+ Certainty about what rate at what time + A proxy signal for network congestion - Use is a poor proxy for congestion - preset blocks can't respond to actual load	★★☆☆☆
Access (and residual costs)	Fixed daily charge	+ Non-distorting way to recover fixed cost + Could vary by location or customer size - Limited use of benefit-based charging	★★★★☆
Connection	Direct charge to connecting users	+ Assigns acual, situation-specific costs	★★★★★

Source: Electricity Authority

4.8 The efficiency of time-of-use [TOU] charging depends heavily on the design of this time block structure. Importantly, it also depends heavily on whether the network actually experiences periods of congestion. The more nuance in the structure (eg, peak/off-peak, summer/winter), the better the signal, and thus the more efficient outcomes could be.

4.9 It remains a blunt signal of the economic costs of service provision. The greater the diversity of load profiles within the network, the less accurate the price signal will be.

4.10 Seasonal time-of-use price structures are clearly a step in the right direction. But distributors should not see it as an end-point. The Authority expects distributors that have adopted it to continue to take steps to more efficient distribution prices.

Static critical peak (congestion) demand charge signals congestion better

Cost driver	Charge	Comment	Rating
Use	Static critical peak demand charge, kVA	+ charges based on forecast congestion + covers congestion and power quality - pre-set, may not signal true congestion	★★★½☆
Access (and residual costs)	Contracted capacity − a charge based on a customer's agreed maximum demand	+ Non-distorting way to recover fixed cost + Charges can reflect differences in users + Can cover explicit price/service trade-off + Can apply to all, not just major users - Transaction costs	★★★★★
Connection	Direct charge to connecting users	+ Assigns actual, situation-specific costs	★★★★★

Source: Electricity Authority

4.11 Under this model, distributors would predict the likely periods of congestion and set demand charges for specific periods on that basis. This price signal gives consumers the opportunity to adjust their demand.

4.12 Ultimately factors, such as changeable weather conditions, can mean that conditions at the pre-set critical congestion periods may not fully reflect actual congestion. The static critical peak price signal may thus not be accurate, risking inefficient use of the network.

4.13 However, a static critical peak demand charge is more consistent with the proposed pricing principles than a time-of-use charge as it offers a closer approximation of the economic costs of service provision.

4.14 Our preference is for kVA-based demand charges, rather than kW charging, because kVA is more analogous to congestion. In addition, kVA can signal the cost of poor power quality as customers pay for both their active (kW) and reactive power use (kvar).

Aim for dynamic critical peak (congestion) demand charges

Cost driver	Charge	Comment	Rating
Use	Dynamic critical peak demand charge, kVA	+ Signals the marginal cost of congestion + Signal adapts to actual conditions + Covers congestion and power quality - Distributors need to manage quantity risk when consumer reaction is uncertain - Greater implementation challenges	
Access (and residual costs)	Contracted capacity	+ Non-distorting way to recover fixed cost + Charges can reflect differences in users + Can cover explicit price/service trade-off + Can apply to all, not just major users - Transaction costs	
Connection	Direct charge to connecting users	+ Assigns actual, situation specific costs	

Source: Electricity Authority

4.15 Under the proposed pricing principles dynamic critical peak (congestion) demand charges are the best method for pricing congestion and losses associated with the use of the network. That is because such charges mirror the changing economic costs of service provision, thus supporting the most efficient use of the network.

4.16 Peak charges would apply on a dynamic basis – typically set in advance on a daily or half-hourly basis, as is currently the case in the wholesale market. They apply when congestion is present or imminent, reflecting prevailing network conditions. This is particularly important given the influence of weather conditions on network demand and congestion in New Zealand, making it more difficult to predict when congestion will occur and how long for.

Low fixed charge regulations do not prevent making progress

4.17 Distributors often point to the *Electricity (Low Fixed Charge Tariff Option for Domestic Consumers) Regulations 2004* (LFC Regulations) as a barrier to more efficient prices.

4.18 Our 2016 guidance note on the regulations explains the regulations do not prevent distributors from progressing price reforms, for example by adopting charges based on capacity, peak demand or time-of-use.[19] All of these vary according to when and how much electricity is consumed. Also, the regulations apply to residential customers only, who account for only part of electricity consumed on distribution networks.

[19] Electricity Authority, 2016. *Variable charges under the low fixed charge regulations – Guidelines*

4.19 In its first report the Electricity Price Review raised concerns about unintended consequences of the LFC regulation and whether it was effective at targeting those who need help. It also stated: "It may be questionable how much the regulations limit development of more efficient plans..."[20]

4.20 As LFC regulation does seem to affect distributors' willingness to reform, it would be very useful if distributors could illustrate the issues with the LFC regulation for price reform.

Q5. What if any changes would you propose to the star-ratings to better reflect the relative efficiency of distribution prices?

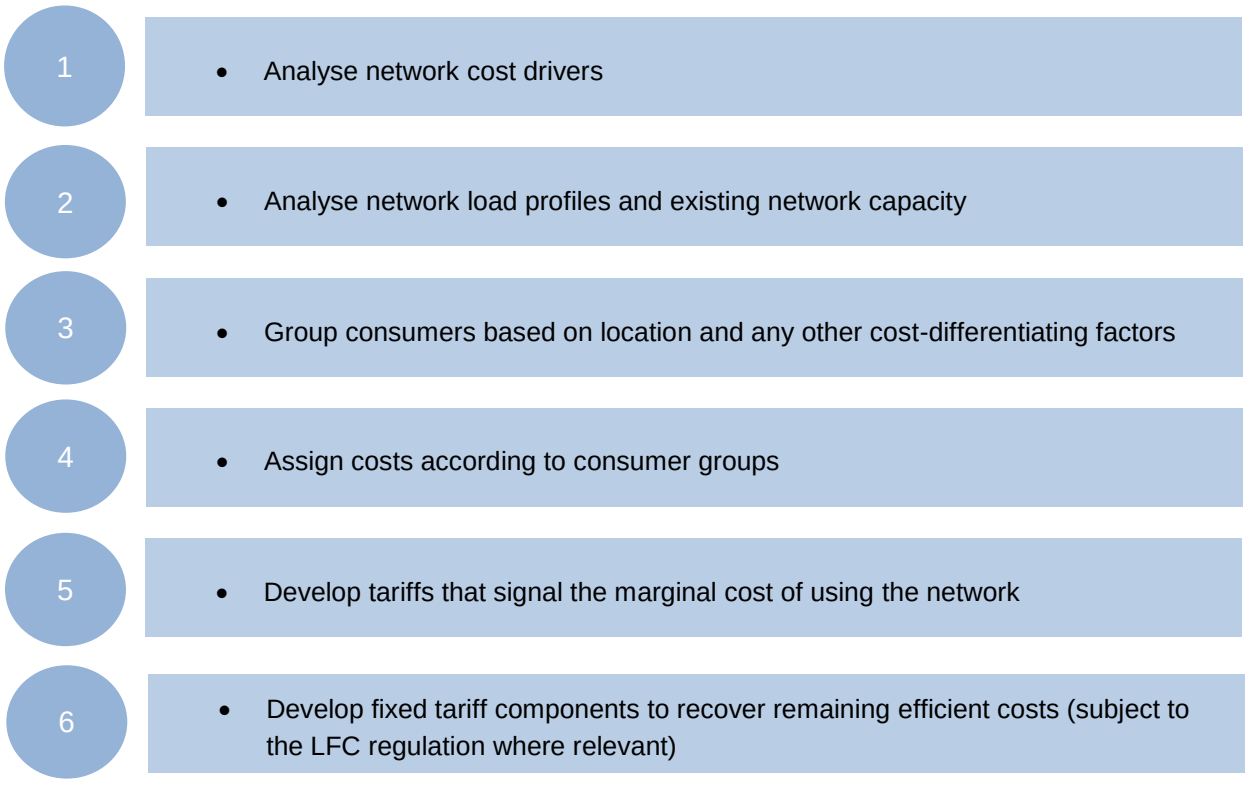
Q6. How long do you think distributors would reasonably need to introduce the different price structures discussed above?

Q7. Can you illustrate how and to what extent the LFC regulation hinders price reform?

Steps distributors can take to set more efficient prices

4.21 Distributors would take the following six steps in developing efficient tariffs:[21]

Figure 5 Process for distributors to develop more efficient prices



[20] Electricity Price Review, 2018. *First report for discussion*, p.76

[21] These steps draw on work by NERA and the ENA. NERA Economic Consulting, 2014. *Economic Concepts for Pricing Electricity Network Services – A Report for the Australian Energy Market;* and Electricity Networks Association New Zealand, 2017. *A guidance Paper for Electricity Distributors on new pricing options*.

Step 1: Analyse network's efficient cost and their drivers

4.22 Assign and quantify distribution network costs to the key cost drivers:

- network connection and augmentation
- network assets
- network use
- common (and residual) costs.

Step 2: Analyse network load profiles and existing network capacity

4.23 Analyse network load profiles, existing capacity and network congestion to identify the locations where the network is likely to get congested.

4.24 This requires analysis of:

- the system-wide load profile
- load profiles at lower levels of the network, including zone sub stations, local feeders and transformers
- headroom between network demand and installed capacity at each network level.

Step 3: Group consumers by location and other cost-relevant factors

4.25 It costs more to provide distribution services in some locations within the area covered by a network than in others. Each distributor will thus need to determine and be able to explain location-based groups

4.26 Grouping will involve a trade-off between being able to design highly cost-reflective, benefit-based tariffs for consumers in each location, and the practicality of doing so.

4.27 Distributors may also be able to split consumers by other cost-relevant factors and their meter type. For example, distributors have more options in the structure of tariffs they can offer to consumers with smart meters than those without.

Step 4: Assign costs to consumers

4.28 Allocate each of the four cost-types (connection, access, use, and common and residual costs) to each consumer group.

4.29 This step will identify the efficient costs to be recovered through variable or fixed tariffs:

- the variable tariff would reflect the marginal cost of using the network
- the fixed tariff would cover costs that do not vary in the short run.

4.30 It is not currently practical to use locational marginal prices for distribution networks.[22] Because of this limitation, long-run marginal cost or incremental cost pricing are currently a practical alternative, because it approximates the kinds of prices that are expected to be delivered by a workably competitive market on average, over time. This approach is assumed to be used in the following step.

[22] In future, it may be possible to use locational marginal pricing to set prices at individual locations based on the cost of serving an additional amount of demand at each location. This depends on technology and transaction costs. The marginal cost would include the cost of transporting energy longer distances (due to higher losses) and the effects that additional demand has on losses, congestion and system stability. This is how prices are set in the wholesale market with costs measured half-hourly for each of the "nodes" where electricity is measured as entering and leaving the national grid.

4.31 Fixed costs will likely form the bulk of a distributor's cost. These costs may not be able to be directly attributed to individual consumers. In that case, these costs have to be assigned to consumer groups through an allocation method such as share of coincident peak demand, or number of connections.

Step 5: Develop tariff that signals marginal cost for each consumer group

4.32 Convert the long run marginal cost (LRMC) into a cost-signalling tariff for each consumer group. Step 4 explains why LRMC is currently likely to be an appropriate basis.

4.33 The preferred congestion period demand charge would be calculated as follows:

$$\text{Congestion period demand charge (\$/kVa)} = LRMC\ of\ 1\ kVa \quad (1)$$

4.34 If the less efficient seasonal TOU kWh tariff is adopted the relevant formula would be:

$$\text{Peak TOU charge (\$/kWh)} = \frac{\text{LRMC of 1 kVa}}{\text{Total Congestion Hours} \times \text{Average Power Factor}} \quad (2)$$

4.35 Where the information infrastructure is more limited, a simple flat kWh charge could be calculated using the following formula:

$$\text{Flat (\$/kWh)} = \frac{LRMC\ of\ 1\ kVa}{(365\ \times\ 24) \times Average\ Power\ Factor} \quad (3)$$

Step 6: Develop fixed cost component to recover remaining efficient cost

4.36 Efficient costs that do not vary with use of the existing network assets should be recovered using a fixed tariff, by:

(i) determining the contribution of each consumer group to the total efficient costs (defined by allowable revenues)[23] of the existing network infrastructure

(ii) estimating the revenue expected to be generated by the consumer groups' marginal cost signalling tariff component

(iii) calculating the residual revenue for each tariff class as the total efficient cost (i) less revenue from cost signalling tariffs (ii), while complying with LFC regulation

(iv) designing tariffs to recover the residual revenue such that they do not distort consumer behaviour and maximise network utilisation.

4.37 The Authority's preferred formulae for the residual tariffs for each consumer groups are:

$$\text{Per connection per annum} = \frac{Residual\ Revenue}{Connections}$$

or

$$\text{Per kW per annum} = \frac{Residual\ Revenue}{\text{Capacity kW}\ [Contracted\ or\ installed]} \quad (4)$$

[23] As specified by the Commerce Commission, for those distributors subject to the Commission's revenue regulations. Some distributors do not have their revenues regulated by the Commerce Commission.

5 When should distributors do this?

With urgency

5.1 Distributors should not wait until 2020 to start their transition to more efficient prices. Consumers experience the adverse effects of inefficient pricing now, even if the reasons are hidden from view. The size of the problem will only continue to grow with the uptake of EVs, solar panels and batteries.

5.2 The Government's focus on transitioning to a low-carbon economy will likely accelerate adoption of such technologies. This makes it even more important that distribution prices send the right signals. It also means the commercial implications for boards − from being lumbered with inefficient investments and costs increasingly concentrating on a smaller group of consumers − are closing in much faster than recent trends might suggest.

5.3 We expect distributors to make substantial progress by 2020, in order to align with the change from price to revenue cap regulation.

The longer distributors wait, the harder it will be to address these issues

5.4 As more consumers invest in emerging technologies, the greater the total cost of the inefficiency and also the harder it becomes to make changes and unwind cross-subsidies.

5.5 Although price reform is expected to lower the average price consumers will face, in the short term price reform can result in increases in bills for some consumers. It may also involve systems upgrades for distributors and retailers.

5.6 Distributors are likely to want to plan their transition to more efficient prices over time, and work with retailers as intermediaries, so the changes are manageable.

5.7 We note that the Commerce Commission will also reset the weighted average cost of capital (WACC) that applies to distributors in 2020. Given the current economic climate, it looks likely that the WACC will fall from its current level. If that happened, a lower WACC would result in distributors having lower allowable revenues and therefore prices.

5.8 This provides an opportunity to offset any ‘bill shocks’ that may occur for some consumers if distributors reform their tariffs in 2020.

Start the transition now, with concrete, time-bound plans

5.9 We expect distributors to put in place concrete transition plans now and make a start on them, rather than wait until 2020 to begin working on a transition.

5.10 The existing distributor-led roadmaps have not met the Authority’s expectations on consistency, rigour and commitment to timeframes.

5.11 We propose to formalise our expectations for future roadmaps, so they provide detailed, concrete and time-bound plans for price reform. As part of an updated roadmap process we would expect distributors to publish their plans for distribution price reform, and to explain:

(a) the date(s) at which the distributor will decide on, publicise and describe their new tariff structures

(b) the date that any tariff trials will begin and end, and details of the trials

(c) the date at which the distributor will introduce new tariff structures

(d) how and when they plan to consult on proposed changes with retailers and interested stakeholders

(e) how they will gather the necessary data for setting price levels and ensuring revenue requirements are met

(f) how they plan to identify and address implementation issues

(g) what their strategy for transitioning from legacy tariffs to new tariffs is:

(i) what are the risks of adopting new price structures?

(ii) who bears these risks?

(iii) how will the risks be efficiently mitigated?

(iv) how will tariff changes be communicated?

(v) how and when will retailers be involved in the process?

(vi) whether the new tariffs will be mandatory or not, and opt-in or opt-out?

5.12 We will develop and publish a template roadmap for distributors to complete or update every six months. We will publish the template in time for distributors to use for their 30 March 2019 roadmap update.

5.13 If the Authority is unsatisfied with a distributor's roadmaps, we will follow up with a distributor directly to discuss any aspects of a distributor's roadmap that is unsatisfactory or unclear.

5.14 We expect distributors to publish updated roadmaps every six months in a 30 March/30 September cycle. In addition to publishing their roadmaps we expect distributors to email their roadmaps directly to the Authority at Distribution.Pricing@ea.govt.nz.

6 We will monitor distributors' progress

6.1 The Authority also proposes to monitor distributors' progress towards more efficient prices. The aim is to encourage distributors to put a sharper focus on price reform.

6.2 Through this monitoring we will assess:

- the efficiency of the distributors' top three-five tariff structures, based on the proposed pricing principles
- how well the structure of each distributor's revenues align with their cost structure
- the quality and ambition of distributors' price reform roadmaps, and progress made.

6.3 Distributors generally revise their prices once a year on 1 April. We would update our monitoring reports annually following this revision, or when a distributor changes their price structures. We would also publish a general update, based on roadmap updates.

6.4 We propose to undertake the first round of monitoring once the final report for this consultation process has been completed. We would provide each distributor with its rating prior to publishing the results and offer each distributor an opportunity to test and discuss its rating and pricing reform plans with us.

Rating tariff structures

6.5 We will rate the efficiency of each distributor's top three-to-five price structures (based on revenue recovered), applying the pricing principles. This will use information that forms part of distributors' Information Disclosure obligations. The following table provides a (non-exhaustive) list of price components to illustrate star-ratings.

Table 1 Charging methods ratings

Cost driver	Charging Method	Rating
Network use	Dynamic Critical Peak (congestion) Demand	★★★★☆
	Static Critical Peak (congestion) Demand	★★★½☆
	Seasonal Time of Use	★★☆☆☆
	Anytime Maximum Demand	★☆☆☆☆
	Flat kWh	★☆☆☆☆
Network access	Contracted Capacity	★★★★★
	Fixed Daily Charge	★★★★☆
	Installed Capacity	★★☆☆☆
Network Connection	Capital Contribution	★★★★★
	Gifted Assets	★★★★★
	Ongoing Fixed Charge	★★☆☆☆

Source: Electricity Authority

6.6 The better a price structure aligns with the pricing principles, the higher it will be rated, that is, the greater the number of stars it will get.

6.7 Distribution tariffs can consist of multiple components. For example, residential consumers are generally charged a fixed daily charge and a charge per kWh consumed. To derive a single star-rating for each tariff, we will apply an equal weight to each of its components. This is because each tariff component should be as efficient as possible.

Assessing how well distributors' revenues align with their cost structures

6.8 We will also identify each distributor's cost structure and how well this cost structure aligns with their revenue structure. This too will draw on Information Disclosure data.

6.9 In terms of revenues, distributors are required to group each tariff component in one of four components, which we categorise as either fixed or variable:

- Delivery – Variable
- Fixed – Fixed
- Other – This category captures a range of distributor specific tariff components. Each component will be assessed on a case-by-case basis
- Peak – Variable.

6.10 Distributors also publish Information Disclosure data on their operational expenditure (Opex). Table 2 assigns each category (from Schedule 6b) as either fixed or variable. Our assessment of each of Opex category above can be found in Appendix C.

Table 2 Authority assessment of Opex cost categories

Opex category	Fixed/variable
Service interruptions and emergencies	100 per cent fixed
Vegetation management	100 per cent fixed
Routine and corrective maintenance and inspection	100 per cent fixed
Asset replacement and renewal	100 per cent fixed
System operations and network support	100 per cent fixed
Business support	100 per cent fixed

Source: Electricity Authority

6.11 While none of these costs vary according to marginal changes in network use, this does not mean all of distributor costs should be recovered via fixed charges. In particular, the congestion and losses – the primary costs of network use – are variable. But these cannot be observed directly given the absence of distribution locational marginal prices.

6.12 To estimate what proportion of costs could be expected to be recovered via variable charges, we use spending on system growth as a proxy for spending to ease congestion. This suggests 25 per cent of costs relate to congestion, being the ratio of:

(a) Total industry spending on system growth 2013 − 2018: $1,033 m[24]

(b) Total industry capital expenditure 2013 − 2018: $4,085 m.[25]

[24] Data sourced from Commerce Commission spreadsheet of information disclosed by distributors. Taken from Schedule 6a(i): Expenditure on Assets – System Growth.

6.13 This indicator is broadly consistent with an estimate derived from statements the ENA has made about distributors' cost structures. For example, the ENA has stated: "In total, the actual fixed costs [for a distributor] can be over $2.00 per day for typical residential users…" It then also stated: "[t]he actual cost of a connection to the grid varies from place to place, but a typical amount is $2.50 a day for the lines component alone."[26]

6.14 Although this is only an approximation, we propose to use as a reference point a cost structure of 80 per cent fixed costs and 20 per cent variable (congestion) cost, for the purpose of monitoring the alignment of revenues with cost structures. We believe this is a reasonable approach, as the focus is on the direction of change over time, not levels.

6.15 The Authority is also considering how the star-ratings for each of the top three-five tariffs could be turned into a single headline star-rating for each distributor, using the assessment of revenue and cost structures in absence of more detailed published data. A single star-rating would assist distributors to communicate progress in their communities. The method is described in Appendix D. We welcome feedback on this.

We will complement the star-ratings with qualitative assessments

6.16 We will support the star-rating approach with a qualitative assessment that:

(a) interprets the star-ratings for each distributor

(b) comments on the quality and ambition of distributors' reform roadmaps

(c) compares the progress each distributor has made against their own published roadmaps and against distributors overall.

Q8. How accurately has the Authority categorised distributor revenues and costs? How could this be done more accurately?

Q9. What, if any, would be better indicators of the efficiency of distribution prices, or the ambition of and progress being made by distributors on their price reforms?

[25] Data sourced from Commerce Commission spreadsheet of information disclosed by distributors. Taken from Schedule 6a(i): Expenditure on Assets – Capital Expenditure.

[26] Accessible at: https://www.ena.org.nz/news-and-events/news/why-the-low-fixed-charge-regulations-should-be-removed/

7 Transition

7.1 The Authority recognises that distributors may wish to transition to new price structures over a period of time to help manage the impact on consumers. They should do so in consultation with retailers. There are different options. For example, the Authority proposed to cap the initial impact of transmission pricing reform to no more than 3.5 per cent of total electricity bills.[27] The Lines Company applied a similar cap when it recently introduced time of use charges.

7.2 Because price reform will create winners and losers, it is likely that there will be opposition to change. This could weaken distributors' resolve to drive price reform for their network.

7.3 But it is important that everyone recognises the cost of doing nothing. The immediate change in electricity bills caused by price reform may be most visible. But that ignores the benefits. This highlights the need for distributors to communicate to their communities that price reforms will avoid bill increases that would otherwise occur, due to inefficient network investments and increasing cross-subsidisation.

7.4 The Authority acknowledges that electricity retailers are raising the question about a standardised approach to distribution prices. While this is not a question that the Authority seeks to address specifically at this point, we do want to understand it.

7.5 The Authority is open to suggestions on how else it can facilitate price reforms that are in the long-term interest of consumers, in a way that is consistent with its role, for example by removing or reducing barriers to price reform.

Q10. What assistance could the Authority (or other stakeholders) offer distributors in order to speed up the reform process, or help to remove or reduce barriers to distribution price reform?

[27] Electricity Authority, 2016. *Transmission Pricing Methodology: Second issues paper – Supplementary consultation.*

Appendix A Proposed amendments to Distribution Pricing Principles

7.6 The Authority proposes to amend the Distribution Pricing Principles to clarify the aims of, and expectations for, efficient distribution prices.

Current Distribution Pricing Principles	Proposed Distribution Pricing Principles
(a) Prices are to signal the economic costs of service provision by: (i) being subsidy free (equal to or greater than incremental costs, and less than or equal to standalone costs), except where subsidies arise from compliance with legislation and/or other regulations; (ii) having regard, to the extent practicable, to the level of available service capacity; and (iii) signalling, to the extent practicable, the impact of additional usage on future investment costs.	(a) Prices are to signal the economic costs of service provision by: (i) being subsidy free (equal to or greater than incremental costs, and less than or equal to standalone costs), except where subsidies arise from compliance with legislation; [Deleted redundant phrase: "and/or other regulations"] (ii) signalling the effect that network use has on costs including losses, opportunity costs of capacity constraints and other avoidable costs; [Clarified version of principle a(iii)] (iii) being time and location-specific; [New – additional guidance] (iv) charging costs to a specific user or group of users where those costs can be attributed to that specific user or group of users. [New – additional guidance]
(b) Where prices based on 'efficient' incremental costs would under-recover allowed revenues, the shortfall should be made up by setting prices in a manner that has regard to consumers' demand responsiveness, to the extent practicable.	(b) If prices satisfy (a) above, they should be responsive to the requirements and circumstances of users and potential users, including by reflecting services provided by users and to users: [Renumbered and expanded version of principle (c)]
(c) Provided that prices satisfy (a) above, prices should be responsive to the requirements and circumstances of stakeholders in order to: (i) discourage uneconomic bypass; (ii) allow for negotiation to better reflect the economic value of	(i) where prices based on efficient incremental costs[28] would under-recover allowed revenues, the shortfall should be made up by prices that least distort network use and reflect the value that users derive from the network; [Revised version of (b) – clarified and position changed] (ii) allowing for negotiation to better reflect the economic value of

[28] Quotation marks around the word 'efficient' have been removed in these proposed Pricing Principles because they are of uncertain provenance and purpose.

Current Distribution Pricing Principles	Proposed Distribution Pricing Principles
services and enable stakeholders to make price/quality trade-offs or non-standard arrangements for services; and (iii) where network economics warrant, encourage investment in transmission and distribution alternatives (eg distributed generation or demand response) and technology innovation. (d) Development of prices should be transparent, promote price stability and certainty for stakeholders, and changes to prices should have regard to the impact on stakeholders. (e) Development of prices should have regard to the impact of transaction costs on retailers and should be economically equivalent across retailers.	services and enable stakeholders to make price/quality trade-offs or non-standard arrangements for services; and [No material change – renumbered version of c(ii)] (iii) where network economics warrant, encourage investment in transmission and distribution alternatives (eg, distributed generation or demand response) and technology innovation. [Unchanged – renumbered version of c(iii)] (c) The application of these principles should be transparent and predictable. [Clarified and contracted version of principle (d)] (d) Prices should not place unreasonable costs and requirements, including transaction costs, on retailers or other consumer agents and should be economically equivalent across retailers and other consumer agents. [Clarified version of principle (e)] (e) Consumers should be able to know or predict prices they will face when making decisions to connect to or use the network. [New – additional guidance]

Reasons for proposed amendments to the pricing principles

Changes to principle (a)

A.1 Principle (a)(ii) has been removed because the intent of the principle is captured in the current principle a(iii).

A.2 Principle (a)(iii) has been rewritten as proposed principle (a)(ii) to:

- clarify that distribution prices should signal the avoided costs should network use not occur, such as costs of capacity constraints and avoidable pass-through costs.
- remove the term “additional usage” because it doesn’t account for the effect that a reduction in use has on costs.

A.3 Amended principle (a)(iii) reflects the fact that prices which signal economic costs need to reflect that costs of providing distribution services vary across time and location.

A.4 Amended principle (a)(iv) states that where costs can be attributed to a specific user or set of users, those costs should be recovered from those users only.

(a) The term ‘to the extent practicable’ has been removed from current principles (a)(iii) and (b). The reasons for this are:

(i) The principles are not binding, leaving room for distributors to do the best they can to the extent practicable.

(ii) The term is used only in connection to ‘having regard’ and ‘signalling’, both of which are not precise and leave flexibility for distributors in applying the principles.

(iii) Removing the term will shift the burden of proof of what is not practicable onto distributors. This will encourage careful consideration of what is in fact practicable and thus better encourage innovation and measurement and monitoring of network condition and services.

Changes to principles (b) and (c)

A.5 Principles (b) and (c) have been modified and consolidated into a single principle.

A.6 The objective of current principle (b) has been revised to clarify that the purpose of the principle is to minimise the extent to which fixed cost recovery affects how parties use the network, rather than ‘having regard to consumers’ responsiveness’. That is to minimise distortions in network use.

A.7 The change in wording also reflects that prices should be benefit-based. It is more efficient for those who benefit most from an investment (and have the strongest incentive to lobby for it) to pay more towards its cost than those who receive less or no benefit.

A.8 The objective set out in current principle (c) has been revised to clarify that responsiveness to user requirements involves prices that reflect the value of services. This revision ensures that alignment with the amended principle is measurable.

A.9 The term ‘stakeholders’ in current principle (c) has been replaced with the phrase ‘users (including potential users)’. The term ‘stakeholders’ is too broad in light of the Authority’s statutory objective. The term ‘users’ encompasses consumers as well as generators, because consumers benefit from these principles being applied to generators also.

A.10 Current principle (c)(i) has been removed because it is unnecessary. Prices that are subsidy-free and have regard to users' benefits or demand responsiveness do not encourage 'uneconomic bypass', so that phrase does not add anything. Distributors have a natural incentive to discourage uneconomic bypass because revenue and profit are linked to volumes of distribution services provided – via the price-quality regulation.

Changes to pricing principle (d)

A.11 Principle (d) has been simplified and clarified in proposed principle (c).

A.12 Requirements for price stability, certainty and regard for stakeholder impact have been removed, because stability and certainty are imprecise, and may not promote efficiency. For example, for prices to be efficient, they will likely vary by location and time.

A.13 The term 'predictable' is added, because it better captures the intent behind the word 'certainty'. Unpredictable or arbitrary changes to prices do not support consumers making well-informed decisions on network use or investments in electricity-related investments.

A.14 The phrase 'having regard to the impact on stakeholders' has been removed because it unnecessarily weakens the principle. The term 'stakeholders' is too broad in light of the Authority's statutory objective.

Changes to principle (e)

A.15 Principle (e) has been modified to apply to a broader set of agents acting for consumers, or managing consumers' use of the network. This would become principle (d).

A.16 It also broadens the application to an expectation that any costs and requirements, of all kinds, should not be unreasonable, rather than the less precise and more limited expectation that distributors have regard to the impact of transactions costs.

We have added one new principle

A.17 The new principle recognises that efficient distribution prices only lead to efficient outcomes if network users can act on them. That is, network users need to be able to observe the price, or form a reasonable expectation of what the price will be, when they decide whether, when, and how much to use the network.

A.18 This is how workably competitive markets work.

A.19 Consumers are unable to respond to price signals if they cannot observe them or predict what they are likely to be. If users cannot identify with a reasonable degree of accuracy when prices are likely to peak, or when they are low, they cannot make efficient decisions on when to switch on or off their heat pump, hot water cylinder, EV charger, or battery. This could also promote wide-spread inefficient investment by consumers and their retailers in technology like hot water tanks, solar PV, electric vehicles and household batteries.

A.20 To give a sense of the value of reducing price uncertainty, eliminating the two day delay in the wholesale market between 'real-time' indicative spot prices and the final prices has been estimated to provide $53 million of present value net benefits in the base case over 15 years. This is because removing uncertainty about the final price, allows parties to make efficient real-time decisions about consumption and generation.[29]

[29] Electricity Authority, 2017 *Real-time pricing proposal – Consultation paper*.

Appendix B Background to star-rating

Table 3 Charging method analysis: use of system

Pricing Principles	Fixed Charge ($/day)	Anytime kWh ($/kWh)	Anytime maximum demand ($/kW or kVA charge based on users measured maximum demand)	Contracted Capacity ($/kW/kVA charge based on agreed maximum demand)	Time Of Use (TOU) kWh ($/kWh charge that varies with time of day and season)	Critical peak demand charges ($/kW or kVA charge)	Reactive power charges ($/kvar or $/excess kvar)
(a) Prices are to signal the economic costs of service provision	Does not signal the marginal cost of consumption or network congestion. Encourages inefficient use of the network. Does not send locational or dynamic signal.	Does not signal the marginal cost of consumption or network congestion. Encourages inefficient use of the network. Does not send locational or dynamic signal.	Extremely limited signal of network congestion, marginal cost or the coincidence of a consumer's demand to peak congestion. Encourages inefficient use of the network. Does not send locational or dynamic signal.	Limited as the consumer's contracted maximum demand is unlikely to align with periods of network congestion. Does not send locational or dynamic signal.	Is able to broadly signal periods of congestion in the network. Addition of a seasonal factor will achieve a better signal, and improve the economic efficiency of outcomes. Does not send locational or dynamic signal. Energy consumption is a poor proxy for congestion.	Fixed period peak/off peak periods can broadly signal periods of network congestion. Seasonal factor will achieve a better signal, and improve economic efficiency of outcomes. Use of dynamic periods results in dynamic price signal. Does not send locational signal. kW or kVA are reasonable proxies for network congestion.	Signals of the marginal cost of reactive power but not of apparent power or network congestion.

Pricing Principles	Fixed Charge ($/day)	Anytime kWh ($/kWh)	Anytime maximum demand ($/kW or kVA charge based on users measured maximum demand)	Contracted Capacity ($/kW/kVA charge based on agreed maximum demand)	Time Of Use (TOU) kWh ($/kWh charge that varies with time of day and season)	Critical peak demand charges ($/kW or kVA charge)	Reactive power charges ($/kvar or $/excess kvar)
(c) The application of these principles should be transparent and predictable. (e) Consumers should be able to know or predict prices they will face when making decisions to connect to or use the network.	Consumers know price when making decisions to use the network. It will not vary with use. Easily understood by all users.	Consumers know price when making decisions to use the network. Current practice, well understood by retailers and consumers.	Consumers know price when making decisions to or use the network. Concept of demand charging is well understood by retailers and widely adopted for large users.	Consumers know price when making decisions to use the network. Small consumers may lack sufficient understanding of their demand profile and demand prices to enter contracts with distributors.	Consumers know price when making decisions to use the network. Both kWh and time of use charging well understood by and broadly applied by retailers.	Under the static approach customers know price well in advance of making decisions to use the network. When prices are set on a dynamic basis, they should be set in advance. Prices set ex-post do not comply with this principle and would not be transparent. Concept of demand charging is well understood by retailers and widely adopted for large users, as is the application of peak/off peak prices.	Consumers know price when making decisions to use the network. Many users would lack understanding of how their actions result in kvar being produced Many retailers have already adopted kvar charging for large users.

Pricing Principles	Fixed Charge ($/day)	Anytime kWh ($/kWh)	Anytime maximum demand ($/kW or kVA charge based on users measured maximum demand)	Contracted Capacity ($/kW/kVA charge based on agreed maximum demand)	Time Of Use (TOU) kWh ($/kWh charge that varies with time of day and season)	Critical peak demand charges ($/kW or kVA charge)	Reactive power charges ($/kvar or $/excess kvar)
(d) Prices should not place unreasonable costs and requirements, including transaction costs, on retailers or other consumer agents and should be economically equivalent across retailers and other consumer agents.	Predominant current price structure, no additional transactional cost incurred by retailers or networkers.	Predominant current price structure, no additional transactional cost incurred by retailers or networkers.	Some billing systems would require re-configuration incurring transaction costs. Distributors costs would likely be incorporated into higher prices and passed on to retailer.	Would require the individual consumer contracts to be managed on an ongoing basis. Significant reconfiguration of both network and retail billing system incurring material costs.	Billing systems predominantly use kWh, limited reconfiguration required. Transaction costs would be less material than other approaches requiring more significant changes to systems and processes.	Billing systems would require significant re-configuration. The costs of which may be material and be incorporated into higher prices which are passed on to retailers and ultimately users.	Billing systems would require significant re-configuration to expand to all users. The benefits from broader application of kvar charges may not exceed cost of application.

Table 4 Charging method analysis: network investments

Pricing Principles	Fixed Charge ($/day)	Anytime kWh ($/kWh)	Anytime maximum demand ($/kW or kVA charge based on users measured maximum demand)	Contracted Capacity ($/kW/kVA charge based on agreed maximum demand)	Time Of Use (TOU) kWh ($/kWh charge that varies with time of day and season)	critical peak demand pricing ($/kW or kVA charge)	Reactive power pricing ($/kvar or $/excess kvar)
(b)(i) where prices based on efficient incremental costs, based on (a) above, would under-recover allowed revenues, the shortfall should be made up by setting prices in a manner that seeks to reflect the value that users derive from the network	Would have little distortionary effect on consumers' behaviour. Differentiation between consumers of significantly different loads required.	Distorts behaviour by incentivising reduction in demand during non-congested periods while also encouraging consumption during periods of network congestion.	Distorts user behaviour by incentivising consumers to reduce demand during non-congested periods while also encouraging excess consumption during periods of network congestion.	Would have little distortionary effect on consumers' behaviour.	Distorts behaviour as price would be higher than the network cost of consumption promoting inefficient choices including under consumption and over investment in non-network alternatives.	Distorts behaviour as price would be higher than the network cost of consumption promoting inefficient choices including under consumption and over investment in non-network alternatives.	Distorts behaviour as price would be higher than the network cost of consumption promoting inefficient investment in power factor correction equipment.

Appendix C Assessment of Opex categories

Opex category	Fixed/variable	Comment
Service interruptions and emergencies	100% fixed	Cost in this category is not driven by network use. Costs are driven by network equipment condition (eg, end-of-life failure of electrical components) and the incidence of events external to the network that impact the proper functioning of the network (eg, high winds blowing tress across overhead lines or a car hitting a pole).
Vegetation management	100% fixed	Cost in this category is not driven by network use. Overhead lines that run through plantations or adjacent to trees require either adequate separation or encroaching trees to be periodically trimmed or removed. Costs are driven by the degree of vegetation encroachment on overhead line routes.
Routine and corrective maintenance and inspection	100% fixed	Cost in this category is not driven by network use. High, medium and low voltage equipment, whether located in substations or that make up overhead or underground electrical circuits all require periodic inspection, testing and maintenance. Cost is either periodic, based on manufacturer recommendations, or is driven by test results, number of operations (eg, of a circuit breaker) or by other condition assessments.
Asset replacement and renewal	100% fixed	Cost in this category is not driven by network use. High, medium and low voltage equipment eventually reaches end-of-life, at which point it is efficient to replace or refurbish the asset. Costs tend to be driven by either asset age or condition and are planned via fleet strategies and asset management plans.
System operations and network support	100% fixed	Cost in this category is not driven by network use. Activities in this cost category relate to office-based operational and engineering support functions. Costs are driven by the need to continuously research, adopt and implement good industry practice (eg, design, system operations, new connections management) and the overall size of the network.
Business support	100% fixed	Cost in this category is not driven by network use. Activities in this cost category relate to office-based business support functions. Costs are driven by the need to provide sound business practices (eg, commercial, regulatory, legal and people and general management) and the overall size of the network.

Appendix D Calculating a single headline rating

D.1 We will rate three to five of each distributor's top tariffs by value. To come to an overall rating for a distributor, we can aggregate the individual tariff ratings into a single rating. This would involve two key steps.

D.2 The first step would be to weight each of the top three-five tariff ratings based on the share of revenue for each tariff to the total revenue for these tariffs.

D.3 For example, imagine a distributor's top three tariffs have ratings of 4.5, 4.2 and 3.1 and that these account for, say, 32 per cent, 12 per cent and 56 per cent respectively of the total revenue collected between the three tariffs. The aggregate rating for the tariff structure will be:

$$(4.5 \times 0.32) + (4.2 \times 0.12) + (3.1 \times 0.56) = 3.68$$

D.4 This gives an overall efficiency rating for the distributor's tariff structure.

D.5 However, this overall rating may not account for the fact that a distributor may have an efficient tariff structure, but recover its cost inefficiently. For example, it may recover most of its costs using a variable charge, despite being a primarily fixed cost business. This would mean that the distributor is over-signalling the cost of using the network and unnecessarily and inefficiently reducing demand on its network.

D.6 The second step adjusts for this. The tariff rating would be weighted to account for the degree to which a distributor's revenue structure aligns with their cost structure.

D.7 To do this we propose to take the proportion of a distributor's revenues that are recovered using fixed charges and subtract the proportion of the distributor's costs that are in fact fixed. As this could be a negative number, we take the absolute value of that calculation.

D.8 For example, assume the distributor in this example recovers 30 per cent of its revenues from fixed charges, but that 80 per cent of its costs are fixed (as proposed earlier in this paper). As such, its overall tariff structure weighting would be:

$$|0.3 - 0.8| = 0.5$$

D.9 Where a distributor's revenue structure exactly matches its cost structure, the calculation above will equal 0 and a distributor with a revenue structure that very poorly matches its cost structure would receive a figure close to 1.

D.10 We thus need to invert the numbers for the weighting to be meaningful. Accordingly the above calculation becomes:

$$1 - |0.3 - 0.8| = 0.5$$

D.11 This value is then multiplied by the distributor's aggregate tariff structure star rating to provide an overall efficiency rating of the distributor's prices. The overall rating for the distributor in this example would be:

$$3.68 \times 0.5 = 1.84$$

Appendix E Format for submissions

Question	Question	Response
Q1	Do you agree that distributors need to reform their prices? What is the reason for your answer?	
Q2	How important and urgent are the issues identified by the Authority?	
Q3	Do you agree with the proposed Distribution Pricing Principles?	
Q4	What if any changes would you recommend are made to the proposed Distribution Pricing Principles, and why?	
Q5	What if any changes would you propose to the star-ratings to better reflect the relative efficiency of distribution prices?	
Q6	How long do you think distributors would reasonably need to introduce the different price structures discussed above?	
Q7	Can you illustrate how and to what extent the LFC regulation hinders price reform?	
Q8	How accurately has the Authority categorised distributor revenues and costs? How could this be done more accurately?	
Q9	What if any would be better indicators of the efficiency of distribution prices, or the ambition of and progress being made by distributors on their price reforms?	
Q10	What assistance could the Authority (or other stakeholders) offer distributors in order to speed up the reform process, or help to remove or reduce barriers to distribution price reform?	