Report prepared for Mercury NZ Limited

Loss and constraint rentals - economic analysis of Mercury code change proposal

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26 March 2019

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Contents

Executive summary v

1. Introduction 7

2. Loss and constraint excess (LCE) 8

2.1 Derivation of the LCE 8
2.2 Current LCE allocation 8
2.2.1 Residual loss and constraint excess 9
2.2.2 Loss and constraint excess 9
2.2.3 Allocation of LCE to market participants 9
2.3 EDB treatment of LCE 10
2.3.1 Commerce Commission regulation 10
2.3.2 Electricity Authority supervision of EDB pricing 11
2.3.3 EDB approach to LCE treatment 12

3. Economic analysis 16

3.1 Approach 16
3.2 Pass through to commercial customers 16
3.3 Pass through of cost savings to mass market consumers 17
3.3.1 Decisions on pass through to consumers 17
3.3.2 Pass through depends on competitive pressure 17
3.3.3 EDBs as natural monopolies for lines services 19
3.3.4 Retail market structure 19
3.3.5 Proportion of pass through 21

4. Long-term benefit to consumers 23

4.1 Efficient prices promote economic welfare 23
4.2 All options preserve nodal prices 23
4.3 Changes to price of energy vs lines services 24
4.3.1 LCE are produced from the energy market 24
4.3.2 Change in relative prices impacts dynamic efficiency 25
4.4 Promoting competition 26
4.5 Alignment with Authority priorities 27

5. The quantum of LCE returned directly to consumers 28

5.1 LCE returned to consumers - a measure of efficiency gain 28
5.2 Quantifying the LCE returned to consumers 28

6. Conclusion 31

Appendices

No table of contents entries found.

Tables

Table 1 Efficiency effects of LCE pass through options v

Table 2 EDB treatment of LCE 12

Table 3 Efficiency effects of LCE pass through options 31

Figures

Figure 1 Cost pass-through by a monopoly 18

Figure 2 Direct benefits to consumers of LCE options 30

Executive summary

Mercury NZ Limited (Mercury) has asked the Electricity Authority (Authority) to consider a Code change altering the existing arrangements for allocating loss and constraint excesses (LCE). The Code amendment would require Electricity Distribution Businesses (EDBs) to pass through the LCE to their customers, including retailers. We compare the economic efficiency effects of this proposal (the factual) relative to three alternative scenarios:

- a continuation of the current arrangements in which it is left to the EDBs to determine how to use the LCE in setting their prices
- an alternative Code change that would require the EDBs to return the LCE directly to end consumers.
- a further alternative Code change that would require Transpower to apply the LCE it receives to reduce transmission charges.

In quantifying current practice, we evaluate the efficiency effects if the current pass through levels are maintained. We also assess the effects of a scenario where EDBs return about 50 percent of the LCE to consumers over time, consistent with their market power.

All alternatives would maintain nodal prices. The status quo options have the lowest pass through of LCE to consumers, especially if over time EDBs reduce the amount passed on to consumers consistent with their market power. The other three options are within a range of $13m (~3%) in terms of the amount of LCE passed on to consumers. The Mercury proposal is the only scenario that preserves efficient infra-marginal prices, and hence promotes dynamic efficiency. The dynamic efficiency benefits of the Mercury proposal could be expected to eclipse the static pass through effects.

We summarise this analysis in Table 1 below:

Table 1 Efficiency effects of LCE pass through options

Option	Efficient nodal prices	Direct pass through to consumers $m NPV	Efficient infra-marginal prices
Status quo (current practice)	√	353	X
Status quo (converge to 50% pass through)	√	181	X
LCE credited to transmission charges	√	402	X
EDB return to customers	√	389	X

Option	Efficient nodal prices	Direct pass through to consumers $m NPV	Efficient infra-marginal prices
Mercury proposal	√	398	√

The proposed Code change may also provide further benefits for retail competition, as the allocation of LCE to retailers can provide improved risk management for retailers during high price events driven by constraints. In particular, where the constraint is unable to be managed in the Financial Transmission Right (FTR) market, the LCE could partially mitigate the difference in spot prices between nodes.

We conclude that the Mercury proposal presents the greatest benefits to consumers when the full range of benefits is considered. All other options contain inherent distortions to relative prices that have the potential to impact end consumer decision making with regards to fuel choices in an increasingly ‘electrified economy’. The dynamic efficiency consequences of distorted final prices might, therefore, be expected to be large over time. In any event, it would be difficult to reconcile the Authority’s statutory objective with retaining or implementing any of the counterfactuals, as a distortion to dynamic efficiency cannot be consistent with promoting economic efficiency.

1. Introduction

Mercury NZ Limited (Mercury) has asked the Electricity Authority (Authority) to consider a Code change altering the existing arrangements for allocating loss and constraint excesses. Mercury has engaged us to explain the changes in economic efficiency were the alternative method adopted.

Loss and constraint excesses (LCE) are the difference between the amount paid by electricity purchasers and the amount received by electricity generators in New Zealand's wholesale electricity market. These differences result from transmission losses, transmission constraints and reserve prices. The LCE is allocated to Transpower, which passes it on to Electricity Distribution Businesses (EDBs).

There appears to be no requirement in either the Electricity Industry Participation Code 2010 (the Code), or in the Commerce Commission's Input Methodologies, governing how EDBs use the LCE in setting their prices. Hence, there is a range of approaches taken by EDBs in their treatment of the LCE they receive from Transpower.

Mercury proposes that the Code should be amended to:

- require Transpower to allocate LCE to customers in accordance with its existing methodology – that is, allocate the LCE for each asset class (HVDC, AC interconnection and AC connection) to its customers in proportion to their contribution to transmission charges for each asset class
- require distributors to pass through the LCE to their customers, including retailers, in proportion to the allocation of network charges to those customers.

The critical change that would result from the Code amendment would be the requirement for EDBs to pass through the LCE to their customers, including retailers. We compare the economic efficiency effects of this proposal (the factual) relative to three alternative scenarios (or counterfactuals):

- a continuation of the current arrangements in which it is left to the EDBs to determine how to use the LCE in setting their prices
- an alternative Code change that would require the EDBs to return the LCE directly to end consumers
- a further alternative Code change that would require Transpower to apply the LCE it receives to reduce transmission charges.

Taken together, the proposal and the counterfactuals cover a broad spectrum of possible approaches. We assess the proposal against these counterfactuals in terms of the likely:

- amount of LCE directly returned to consumers
- indirect consequences for the long-term benefits to consumers due to changes in economic incentives.

2. Loss and constraint excess (LCE)

2.1 Derivation of the LCE

The New Zealand Electricity Market is a nodal based system, where prices vary between nodes based on the marginal cost of supplying electricity at different points across the country. Prices are designed to reflect the marginal losses and constraints in supplying electricity at each node, and therefore provide an efficient price signal at the margin. Nodal prices vary to reflect the grid's condition at a point in time, taking into account losses, limits on the network and the impact of providing for reserve generation.

The calculation of nodal prices gives rise to what are termed 'loss and constraint excesses'. These loss and constraint excesses (LCE) arise from three sources:

- The loss component arises because the nodal wholesale price paid by purchasers includes the cost of marginal losses (the electricity lost on the last unit) at each grid exit point. As electricity losses increase exponentially as power lines become heavily loaded, payments by consumers for losses always exceeds payments to suppliers.
- The constraint component arises because the marginal constraint price is paid by all consumption at a constrained grid exit point, even though some of the generation receives a lower non-constrained price.
- The third component (the reserves component) arises from price differences between the North and South Islands resulting from different prices applying for reserves in the two islands.

In all three cases, the amount collected from purchasers is greater than the amount required to pay generators. The LCE is the difference between these amounts. The Electricity Industry Participation Code 2010 (the Code), defines the calculation of the loss and constraint excess in clause 14.16 as:

> **14.16 Calculation of loss and constraint excess**
>
> (1) A **loss and constraint excess** accrues for a **billing period** when the total of the amounts owing by the **clearing manager** to **generators** for that **billing period** for the **electricity** sold and purchased in accordance with clause 14.3 is less than the total amount owing to the **clearing manager** for that **billing period** for the **electricity** sold and purchased in accordance with clause 14.6.

2.2 Current LCE allocation

The Code, and associated documents, set out the mechanism for allocating the LCE to market participants. The LCE generated in the market is split into two components:

- residual loss and constraint excess
- loss and constraint excess.

2.2.1 Residual loss and constraint excess

A component of the LCE is used to fund Financial Transmission Rights (FTRs), a financial instrument for managing locational price risk. An FTR pays the price difference between two chosen nodes. The LCE associated with the path between nodes, for which FTRs are offered, is used to fund the settlement of the FTR. If there is excess LCE once FTRs have been settled,[1] the remaining amount is returned to the Clearing Manager and is defined as the 'residual loss and constraint excess'.[2] The residual LCE is then required to be treated by Transpower in the same way as any loss and constraint excess (that is, in the same manner as the LCE not relating to the FTR market).[3]

2.2.2 Loss and constraint excess

Loss and constraint excess is the amount of calculated loss and constraint rentals remaining after the loss and constraint rental relating to the FTR network nodes is removed.

2.2.3 Allocation of LCE to market participants

The Code requires the residual loss and constraint excess, and the loss and constraint excess (less the amounts to be applied to FTR settlements), be paid to Transpower.[4]

Transpower's Benchmark Agreement (Part D, rule 45) governs how the LCE is paid out to its customers.[5] It states that:

> *45. CUSTOMER SHARE*
>
> *45.1 Calculation of Customer Share:*
>
> *In respect of each month in which it receives a losses and constraint excess payment, Transpower will:*
>
> *(a) Calculation:*
>
> *calculate, in accordance with its prevailing methodology for distribution of losses and constraint excess payments, the share of that payment (net of any GST received) to be allocated to the Customer (the "Customer Share"); and*
>
> *(b) Deduction of Customer Share:*

1 Note that if FTR settlement is greater than the LCE relating to the FTR network, then the FTR settlement figures are scaled down. This ensures revenue adequacy and limits any further call on other, non-FTR relating LCE. In January 2019 LCE excess available to Transpower was in deficit, due to a combination of all LCE for January being used to settle FTRs for January and the need to off-set wash-ups from earlier periods.

2 As per the defined term "**residual loss and constraint excess**", Electricity Industry Participation Code.

3 Rule 14.35, Electricity Industry Participation code.

4 Rule 14.16(7).

5 Customer is defined in Transpower's Benchmark Agreement as a distributor, a generator that is directly connected to the grid, or a direct consumer that has a point of connection to the grid.

issue the Customer a credit note for the Customer Share. The credit note will be issued at the same time as the invoice for Grid Charges for the month following the month in which the losses and constraint excess payment is received.

The current method is further detailed in a Transpower document, *Transmission Rentals, Loss and Constraint Excess Payments*.[6] The allocation of LCE is determined by the type of assets that creates the excess:

- Connection Assets: Generators receive the portion of excess allocated to their connection assets.
- HVDC Assets: South Island generators receive a share of HVDC rentals according to their share of the Historic Maximum Anytime Injection.[7]
- Interconnections Assets: Offtake consumers (distributors) receive the portion of excess produced by their connection assets and the same proportion of excess allocated to interconnection assets as their contribution to the payment of interconnection charges.

The Code provides no further guidance on the treatment of LCE once amounts are passed by Transpower to the EDBs.

2.3 EDB treatment of LCE

2.3.1 Commerce Commission regulation

EDBs are subject to the regulatory provisions under subpart 9 of Part 4 of the Commerce Act 1986. If an EDB meets the customer ownership criteria in the Commerce Act, then the EDB is subject to information disclosure regulation, otherwise the EDB is also subject to price quality regulation.

Information disclosure regulation requires EDBs to make publically available information about the operation and behaviour of their business, including information about their costs and prices, price terms and conditions of supply, amongst other items.

Price quality regulation is aimed at ensuring EDBs—that operate in markets with little or no competition—have incentives to innovate, invest and operate efficiently, as if they were operating in a competitive market. A key component of the price path is the maximum revenues that an EDB can earn. The method for setting the maximum revenue is detailed in the Commerce Commission's input methodologies (last updated 3 April 2018).[8]

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6 https://www.transpower.co.nz/sites/default/files/publications/resources/transmission-rentals-2008.pdf

7 The average of the 12 highest injections at a South Island generation connection location during any of the four immediately preceding pricing years.

8 Commerce Commission, *Electricity distribution services input methodologies determination 2012 – consolidated 3 April 2018.*

The input methodologies dictate that the amount of revenue EDBs can recover from consumers cannot exceed its forecast allowable revenue, which is made up of four categories and is defined in Part 3, Subpart 1 of the input methodologies:

- net allowable revenue
- pass through costs
- recoverable costs
- wash-up account.

Net allowable revenue and wash-up account are not relevant to the treatment of LCE as net allowable revenue is a function of price charged for distribution services multiplied by quantities and the wash-up account is a mechanism for recovering or rebating revenue where forecasts vary from actual.

Pass through costs are defined as either rates payable to a local authority, or a levy[9] payable under the Commerce or Electricity Authority Acts, or from the electricity and gas complaints commissioner scheme. LCE payments do not fall into any of these categories

Recoverable costs are a broad category of costs. The majority of these are unrelated to transmission related charges so are not assessed here.[10] The exception is Clause 3.1.3(1)b, which relates to charges payable to Transpower for electricity lines services. Electricity lines services are defined in the Commerce Act to mean the conveyance of electricity by line and services provided by Transpower as system operator.[11] However, there is no specific mention of loss and constraint rentals or equivalent terms.

In short, the input methodologies appear silent on the treatment of loss and constraint rentals. Similarly, there is no mention of loss and constraint rentals, or transmission rentals, in the Commerce Commission's report explaining the Input Methodologies.[12]

2.3.2 Electricity Authority supervision of EDB pricing

The Electricity Authority considers that its legislative mandate extends to ensuring EDBs adopt efficient pricing methodologies. Its work to date, in setting distribution pricing guidelines, and reviewing EDB pricing methodologies against those guidelines, has not considered the allocation of LCE.[13]

For the purposes of this report, we therefore assume that there is no legislative requirement (by either the Commerce Commission or the Electricity Authority) on EDBs in terms of how they treat LCE in setting their prices.

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9 Defined as a tax, charge or fee directly imposed by or under legislation.

10 Clauses 3.1.3(1) a, c-v.

11 Clause 54C, Commerce Act (1986).

12 Commerce Commission, *Input Methodologies (electricity distribution and gas pipeline services) Reasons Paper,* December 2010.

13 See for example, Castalia, *Review of Electricity Distribution Businesses' 2013 Pricing Methodologies*, 2013.

2.3.3 EDB approach to LCE treatment

Further, albeit circumstantial, evidence that existing regulations do not prescribe how EDBs are to allocate LCE is provided by the wide range of existing practice amongst EDBs, both those exempt and non-exempt from price quality control. In Table 2, we list the EDBs and provide an assessment of how each EDB currently uses the LCE in setting their prices. This table has been prepared from:

- reviewing the published pricing methodology of each EDB
- advice from Mercury on whether it receives a LCE payment or credit from the EDB in the network areas in which Mercury retails electricity.

Where an EDB is silent in its published pricing methodology on how it treats the LCE, and Mercury advises that it does not receive an LCE credit from that EDB, we assume that the LEC is retained by the EDB.

Table 2 EDB treatment of LCE

Network Company	Treatment	Source
Alpine Energy Ltd	Silent (assumed retained by the EDB)	https://www.alpineenergy.co.nz/__data/assets/pdf_file/0017/3536/Alpine-Energy-Limited-Pricing-Methodology-effective-1-April-2018.pdf
Aurora Energy Limited	Return to retailer	Mercury Energy
Buller Electricity Ltd	Silent (assumed retained by the EDB)	https://www.bullerelectricity.co.nz/wp-content/uploads/BEL-Pricing-Methodology-2018-19.pdf
Centralines Limited	Silent (assumed retained by the EDB)	https://www.centralines.co.nz/docs/default-source/centralines-/pricing-disclosures/2018/ds1002centralines_pricing_methodology_disclosure_2018.pdf?sfvrsn=cc9ef30b_4
Counties Power Ltd	Silent (assumed retained by the EDB)	http://www.countiespower.com/vdb/document/90
EA Networks	Silent (assumed retained by the EDB)	https://www.eanetworks.co.nz/files/EA_Networks_Pricing%20Methodology_2018.pdf
Eastland Network Limited	Silent (assumed retained by the EDB)	http://www.eastland.nz/wp-content/uploads/2018/03/Pricing-Methodology-2018-19.x18343.pdf

Network Company	Treatment	Source
Electra Limited	Credits estimates of LCE against transmission revenue	https://electra.co.nz/assets/Uploads/Pricing-methodology-2018-19.pdf
Electricity Southland Limited	Returned to retailer	http://www.powernet.co.nz/~powernet/uploads/2018/03/Line-Pricing-Methodology-TPC-2018.pdf
Horizon Energy Distribution Ltd	Return to retailer	Mercury Energy
Mainpower New Zealand Limited	Silent (assumed retained by the EDB)	http://www.mainpower.co.nz/assets/Disclosures/Pricing-Methodology-2018-final-V2.pdf
Marlborough Lines Limited	Credits estimates of LCE against transmission revenue	https://www.marlboroughlines.co.nz/Documents/Pricing-Disclosure-2018Final_copy-for-website.aspx
Nelson Electricity Ltd	Silent (assumed retained by the EDB)	http://www.nel.co.nz/dmsdocument/297
Network Tasman Limited	Returned to large users, silent on retail	http://www.networktasman.co.nz/documents/reports/pricing/PricingMethodology%201%20April%202018.pdf
Network Waitaki Limited	LCE are included in transmission prices	https://www.networkwaitaki.co.nz/assets/Uploads/RE-Price-methodology-final-2018-19.pdf
Northpower Limited	Returned to large users, silent on retail	https://northpower.com/media/documents/Distribution-pricing/Distribution-Pricing-Methodology-Disclosure-2018-Northpower.pdf
Orion New Zealand Limited	Return to retailer	Mercury Energy

Network Company	Treatment	Source
OtagoNet	LCE are classed as revenue, and used to reduce energy rates	http://www.powernet.co.nz/~powernet/uploads/2018/03/Line-Pricing-Methodology-OJV-2018.pdf
Powerco Limited	Return to retailer	Mercury Energy
Powernet Ltd	Return to retailer	Mercury Energy
Scanpower Limited	LCE are included in transmission prices	http://www.scanpower.co.nz/disclosures
The Lines Company Ltd	Return to retailer	Mercury Energy
Top Energy Ltd	Silent (assumed retained by the EDB)	http://topenergy.co.nz/wp-content/uploads/2018/04/20180329_Pricing-Methodology-2018-2019_combined.pdf
Unison Networks Limited	Return to retailer	Mercury Energy
Vector Limited	In 2018 Vector paid approximately 82% to end customers	https://blob-static.vector.co.nz/blob/vector/media/vector-regulatory-disclosures/vector-electricty-pricing-methodolgy-2019.pdf
Waipa Networks Limited	Silent (assumed retained by the EDB)	http://waipanetworks.co.nz/wp-content/uploads/2018/03/Pricing-Methodology-2018.pdf
WEL Networks Limited	Return to retailer	Mercury Energy
Wellington Electricity Lines Limited	Return to retailer	Mercury Energy

Network Company	Treatment	Source
Westpower	Credits estimates of LCE against transmission revenue	https://www.westpower.co.nz/system/files/resources/Pricing%20Methodology%20YEMar2019.pdf

On the basis of the above assessment of the current treatment of the LCE by EDBs, we estimate that about 49% of the LCE rebated by Transpower to the EDBs is passed on to retailers. The remaining amount is either retained by the EDB or used to offset transmission charges, or in the case of Vector around 82% of the LCE it receives from Transpower was this year paid directly to end consumers.[14] We estimate in total 81% of the LCE rebated by Transpower is either paid to retailers, used to offset transmission charges or paid directly to end consumers, and 19% is retained by EDBs under current practice.

[14] Estimated as follows: Between December 2016 and May 2018 inclusive, Transpower paid out $73m in LCE to interconnection customers (Source: Transpower data.). We estimate Vector's share of total interconnection payments would likely have been around 28% or $20.3m (or equivalently 31% of distributor payment of $64.8m). Vector's last LCE payment to distributors was for November 2016. Vector has announced that it will pay $30 per customer: $30 x 555,100 electricity customers = $16.65m . $16.65/$20.3 = 82%.Customer numbers source: http://www.scoop.co.nz/stories/BU1707/S00557/vector-customers-new-connections-rise-in-year-to-june.htm We did not consider Vector's pay-out was for the 12 months up to May 2018 as Vector's share of interconnection payments for June 2017 to May 2018 was only $13.8m, almost $3m less than their estimated pay-out.

3. Economic analysis

3.1 Approach

The critical difference that would result from the proposed Code amendment relative to the counterfactuals would be the requirement for distributors to pass through LCE arising from AC interconnection and AC connection assets to retailers. Currently, the LCE is paid to the EDBs to do with at their discretion. Under the alternative counterfactuals, the EDBS would be required to either pass the LCE directly to end consumers or to use it to offset transmission charges.

Our approach to assessing the economic effects of the proposed Code change consists of two primary steps:

- First, we identify the changes in the amount of LCE returned directly to end consumers likely to result under the proposed Code relative to the amounts under the counterfactuals.
- Secondly, we identify and describe how those changes in payment flows would affect relative prices and hence economic incentives and therefore the long-term benefit to consumers.

We consider large commercial customers charged directly by EDBs separately from mass market and other consumers purchasing a bundled delivered energy service from a retailer.

3.2 Pass through to commercial customers

Under the current arrangements, EDBs determine the amount of LCE that is passed through to commercial customers. There appears to be a wide range of existing practice amongst EDBs as illustrated in Table 2 above. Under the Mercury Code change proposal, the EDBs would be required to return the LCE to commercial customers, where those commercial customers are charged directly by the EDB for lines services (situations where commercial customers purchase a bundled delivered energy service from retailers are considered below). A similar outcome for commercial customers would arise under the alternative Code change scenarios, as in each case the LCE would be returned to the commercial customer either directly or as a credit against transmission charges.

Hence, the Mercury Code change (and the alternative Code change scenarios) would result in a direct benefit to commercial customers relative to current arrangements. We quantify this benefit in section 5 below. The alternative Code change scenarios would not improve the direct benefits for commercial customers relative to the Mercury Code change proposal.

3.3 Pass through of cost savings to mass market consumers

3.3.1 Decisions on pass through to consumers

With the exception of the counterfactual in which EDBs are required to return the LCE directly to end consumers, the proposal and the other counterfactuals involve either the EDBs or the retailers (or both) making decisions which would impact the amount of the LCE which is passed through to end consumers:

- currently, the amount passed through to end consumers depends on decisions of EDBs (how much is passed to retailers, offset against transmission, or returned directly to consumers) and, in relation to the amounts passed to retailers, the decisions of the retailers
- with the proposal, the amount passed through to consumers would depend on the decisions of the retailers
- with the alternative scenario where the LCE is offset against transmission charges, the amount passed through to consumers would depend on decisions by retailers for customers on an interpose retail agreement; we assume that customers on a conveyance only contract have all changes in transmission and distribution charges passed through at the direction of the EDB.[15]

3.3.2 Pass through depends on competitive pressure

Economic theory finds that the extent to which a cost saving (in this case, the return of the LCE) is passed on to a consumer depends on the competitive pressure in a market. In the extreme case of perfect competition, there are many sellers of a homogenous product and all firms are price takers with no power to influence or set prices; the market price of an additional unit exactly equals the cost of producing that unit. In this situation, a change in costs will result in all of the cost change being translated into market prices, and consumers would receive the full benefit or incur the full impost of the change in costs.

The other extreme case is a monopoly (a single seller). If we assume that demand can be represented by a linear demand curve,[16] then the monopoly would pass through half the change in costs. This result is shown in a stylised form in Figure 1 below.

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15 With an interposed contract, the retailer is interposed between the EDB and the final consumer. The retailer is charged by the EDB for distribution and transmission services and provides a bundled delivered energy price to consumers. With a conveyance only contract, the EDB retains a direct contractual relationship with the final consumer; the retailer charges the final consumer for energy, but may also act as an agent for the EDB in billing distribution and transmission services.

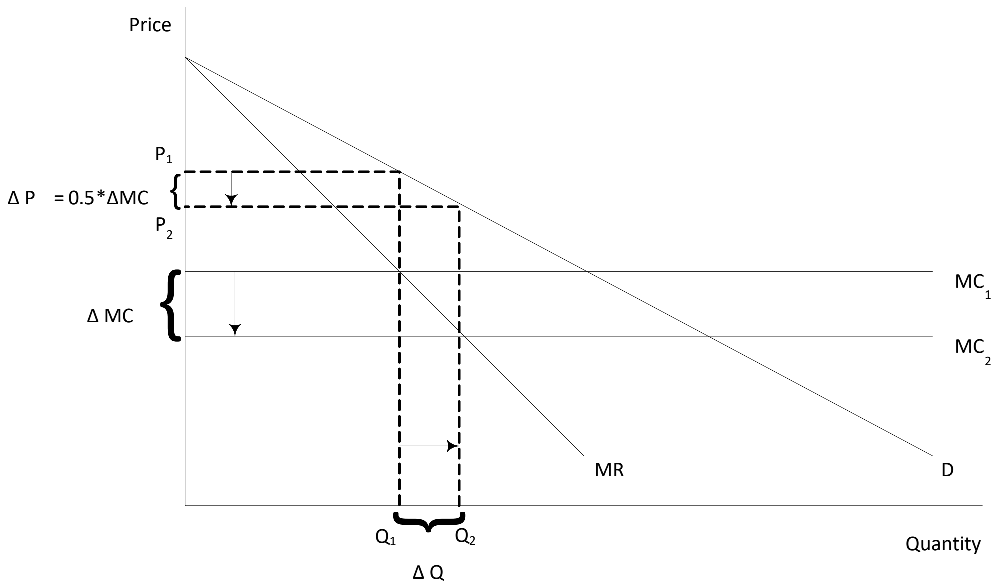
16 A demand curve is the graphical representation of the relationship between the price of a good and the quantity of that good consumers are willing to pay at a certain price at a point in time. In reality, demand curves are rarely linear. However, we show later in the paper that the change in costs from the change in LCE allocation is small at a consumer level. Therefore, an assumption that the demand curve can be approximated as linear over this scale of variance from the market price seems reasonable.

A profit maximising monopoly will produce a quantity such that marginal revenue (MR) is equal to marginal cost (MC). A monopoly will target this quantity as a lower level of production would reduce profits as the revenue lost would exceed the cost reduction; similarly, a higher level of production would reduce profits as the additional cost would exceed the additional revenue.

In Figure 1, the quantity where MR is equal to MC is represented by Q_1 (before a change in costs). When a monopolist produces the quantity determined by the intersection of MR and MC, it can charge the price determined by the market demand curve at that quantity, represented by price P_1 in Figure 1.

With a linear demand curve, the marginal revenue curve is twice as steep as the demand curve. To sell more, a monopolist must reduce its prices, therefore the net additional revenue from the last unit sold is less than its average revenue on all units sold.[17] Hence, for any shift in the marginal cost curve, the change in price will be half that of the change in costs. This effect is demonstrated in Figure 1; that is, the reduction in price from P_1 to P_2 is equal to half the reduction in marginal cost from MC_1 to MC_2.[18]

Figure 1 Cost pass-through by a monopoly



[17] For example, if a monopolist could sell 1 unit for $10 and 2 units for $9, the change in average revenue is $1 and the change in marginal revenue is $18-$10 = $2. This example, and the analysis that follows, assumes EDBs cannot price discriminate given Commerce Commission and Electricity Authority scrutiny of pricing policies. To the extent that EDBs can price discriminate (charge more to customers that are less price sensitive), the analysis presented below is conservative—that is, EDS would likely retain a larger proportion of the LCE that we estimate.

[18] For ease of illustration, a flat marginal cost curve (MC) is shown, but the result is the same for a shift of any shape marginal cost curve.

3.3.3 EDBs as natural monopolies for lines services

The Authority refers to EDBs as natural monopolies.[19] A natural monopoly is a type of monopoly that exists due to high fixed costs of entering the industry. An electricity distribution business faces high fixed costs in setting-up the network infrastructure required to supply consumers. Therefore, the logical market arrangement is to have a single supplier as it would be expensive, and inefficient, to have more than one set of power lines supplying the same electricity consumers.

The Commerce Commission notes that Parliament decided that transmission and distribution businesses should be subject to regulation under Part 4 of the Commerce Act because there is little or no competition in the markets for these services.[20]

As outlined above, there appears to be no specific guidance from either the Authority or the Commission as to how EDBs should account for loss and constraint excesses received from Transpower. This lack of guidance has led to a situation where EDBs operate different pass through arrangements, perhaps due to different perceptions and interpretations of their requirements under the regulatory regimes. Some companies have changed their approach over time. For example, Vector previously passed through the LCE to retailers (based on its 2011 pricing methodology), but in 2018 has elected to return approximately 85% of the LCE directly to final consumers.[21]

For the purposes of assessing the efficiency effects of Mercury's proposal, relative to the counterfactual of the current arrangements, we assume that over time the EDBs will converge to a consistent treatment of loss and constraint rentals. Following the Authority's view that distribution networks are natural monopolies, we assume that, if left unregulated, electricity distribution businesses would pass on to consumers 50% of any LCE received by the distribution network (as illustrated in Figure 1 above).

3.3.4 Retail market structure

A market, whose structure lies between that of a monopoly and perfect competition, will provide for a pass through to the consumer of cost changes somewhere between a half and the full cost change.

Analysis of Authority data regarding the number of installation control points (ICP, a physical point of connection on a local network where a retailer supplies electricity to a customer) supplied by retailers show that the five largest suppliers supply 89% of all ICPs nationally.[22] These five retailers supply electricity in all 39 regions identified in the Authority data:

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[19] https://www.ea.govt.nz/about-us/media-and-publications/media-releases/2017/7-november-2017/

[20] http://www.comcom.govt.nz/regulated-industries/electricity/electricity-role/

[21] Other than a statement from Vector that it has deduced reasonable administration costs, we are not aware of a public statement from Vector as to how the remaining 15% of LCE was applied, assuming our calculations at footnote 13 are approximately correct.

[22] Extracted from Electricity Authority EMI database for month ending 31/03/2018

- Genesis Energy, 24% market share
- Contact Energy, 20% market share
- Mercury NZ, 19% market share
- Meridian, 14% market share
- Trustpower, 12% market share.

There are around 17 additional competing retailers of various sizes and longevities.[23] The spread of market shares has generally been shifting towards these newer, smaller brands, although there are still material levels of switching between the larger retailers. The market share of emerging retailers has increased from 3 percent in January 2010, to 11 percent in June 2018.

The Electricity Authority has described retail competition as "intense".[24] The greater the competitive pressure, the greater the portion of any cost savings that can be expected to be passed through to consumers. However, to be conservative in our estimates of pass through of LCE, we assume the national retail market can be characterised as oligopolistic—a market characterised as being dominated by a few firms.

The two cornerstone economic models for understanding how firms interact and compete for market share in markets that are not perfectly competitive (that is, almost all real world markets) are "Cournot" or quantity competition, and "Bertrand" or price competition. Under price competition, each firm sets price given its belief about how the other firms will price. Under quantity competition, firms may behave as though they set quantities based on their knowledge of demand and the quantities they expect other firms to set.

Most academic analysis of the wholesale electricity market we are aware of concludes that the market has a Cournot-like structure, as suppliers simultaneously submit a schedule of quantities (willingness to supply at a range of prices).[25] In concept, retail electricity markets exhibit some of the conditions necessary for Bertrand competition—the product sold is largely homogeneous and on a casual analysis the costs to supply might be thought to be more or less similar. However, because the five main retailers are vertically integrated with generation—an organisational form which has emerged in all competitive electricity retail markets to efficiently manage price and quantity risk—all retailers are subject to capacity constraints. This feature of the electricity retail market distinguishes it from textbook Bertrand competition; in Bertrand (or price competition), each firm can potentially take all the market.

Suppliers with physical generation assets face capacity constraints. Economic theory shows that when limits exist on the production capacities of competitors, markets that might otherwise exhibit Bertrand competition yield Cournot outcomes.[26] Literature on competition

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23 The Electricity Authority lists 29 as parent companies, but a number of those are self-suppliers (e.g. Norske Skog, body corporates, or supply only to commercials).

24 https://www.ea.govt.nz/about-us/media-and-publications/market-performance/year-in-review/2015/

25 See for example, Seamus Hogan, *Does wholesale market power extend to fixed-price forward prices in electricity markets?*, Department of Economics, University of Canterbury,

26 Kreps and Scheinkman (1983), *Quantity Precommitment and Bertrand Competition Yield Cournot Outcomes*, The Bell Journal of Economics, Vol. 14, No. 2 (Autumn), pp. 326-337.

in the British and Norwegian markets,[27] and observations from the New Zealand market, tend to support a conclusion that electricity retail markets exhibit Cournot competition.

In New Zealand, retailers appear to compete over the number of consumers/ICPs. Annual reports released by retailers suggest that the number of ICPs is a critical success factor, as are measures of churn (gains and losses of consumers). For example, Meridian Energy's annual report lists customer ICPs as a key statistic, and Contact Energy's annual report provides information on churn relative to market average. Importantly, companies note that there is an optimum balance of consumers to generation capacity:[28]

> *We aim for a volume of contracted retail sales that optimises our overall earnings relative to market risk.*

Additionally, methodologies adopted by investment banks in valuing the retail electricity supply businesses internationally use customer numbers as a key variable in determining the long-term value of the business.

An oligopolistic market, that exhibits Cournot competition, produces a level of cost pass through that is between the monopoly and perfectly competitive outcomes. In a study often cited, Ten Kate and Niels (2005)[29] found that the price change in an oligopolistic market, with linear demand and a homogenous product, will be equal to N/(N + 1) of the cost change, where N is equal to the number of firms in the market. In the case of the retail energy market, if N is assumed to equal to five (the number of retailers that supply nearly 89% of all consumers), the expected pass through would be 5 / 6 or 83%. If N is larger, to reflect the smaller retailers in the market, the pass through percentage would increase. For example, if the additional 17 small retailers mentioned in section 3.3.4 are added, N would be 22, and the pass-through would be 22 / 23 or 96%.

3.3.5 Proportion of pass through

Applying the analysis outlined above, we make the following assumptions as to the portion of LCE passed through to consumers:

- under the Mercury Code change proposal, competitive pressure could be expected to result in about 83% of the LCE being passed back to consumers (a higher proportion would be passed back, to the extent competitive pressure is higher than our conservative assumptions)
- under the current arrangements, we would expect the EDBs to converge over time to a consistent treatment of LCE and pass about 50% of LCE through as reductions in cost to retailers or directly to consumers. Currently, the pass through is higher, with Vector for example passing about 82% of the LCE directly to consumers. Where EDBs pass the LCE to retailers, the proportion returned by the retailer to end consumers would be

27 Dominiqe Finon and Raphael Boroumand (2011), *Electricity retail competition: from survival strategies to oligopolistic behaviors,* Working Paper, May.

28 Meridian Energy Integrated Report, June 2017, p.29.

29 Ten Kate and Niels (2005), *To what extent are Cost Savings Passed on to Customers? An Oligopoly Approach* European Journal of Law and Economics, Vol. 20: pp 323 - 337.

determined by competitive market pressure, hence end consumers could expect to receive 50% x 83% of the LCE initially passed by Transpower to the EDBs

- under the scenario in which the LCE is offset against transmission charges, then the proportion returned to end consumers supplied by retailers on interpose agreements could be expected to be about 83% of the offset (that is, subject to the same competitive pressure as under the Mercury Code change proposal); EDBs would, we assume, have greater ability to direct retailers in terms of the amounts returned to end consumers under conveyance only agreements
- under the scenario in which an alternative Code change requires all EDBs to return the LCE to end consumers directly, the proportion returned would be reduced by the administrative costs of EDBs in establishing (or contracting for) the necessary billing systems.

In the following chapter we consider the long-term benefits to consumers due to the changes in economic incentives under each scenario. In chapter 5 further below we estimate the quantum of pass through to end consumers under each scenario.

4. Long-term benefit to consumers

4.1 Efficient prices promote economic welfare

In a modern economy, prices collate and convey information. By conveying information, efficient prices help solve the central problem of economics—how to secure the best use of resources known to, and controlled by, individual members of society for ends whose relative importance only those individuals know.[30]

Efficient prices promote efficiency because they allow individuals and firms to make decisions based on their own preferences and the relative prices of inputs available to them—this information is hidden from central decision-makers. Efficient prices operate with an economy of knowledge—participants need to know comparatively little (that is, the better priced option for them) to take the 'right' actions. By the same means, price distortions can lead to poor resource allocation and lower economic welfare.

We consider the effects of the alternative scenarios on prices at the margin and on infra-marginal prices.

4.2 All options preserve nodal prices

All scenarios would preserve nodal prices; none of the proposals would alter prices in the wholesale electricity market. In economic terms, the price of the marginal unit of electricity in the wholesale market should (at least in concept) continue to equate the willingness to pay of the marginal consumer with marginal cost. This condition must be met if economically rational decisions are to be made on whether to purchase more or less electricity at any point in time.[31]

However, the economic concept of efficient marginal prices applies only to the marginal unit (the last unit sold), not every unit; pricing all units at marginal cost can easily fail to be efficient.[32] The scenarios would differ in their impact on infra-marginal prices; that is, the scenarios would alter the relative costs of energy and lines services.

30 von Hayek, F. A. (1937), 'Economics and Knowledge', Economica, Vol. 4, No. 13, (Feb., 1937), pp. 33-54.

31 This condition for economically efficient prices has been uncontroversial in economic theory since the theoretical work of Alfred Marshall in 1890.

32 Hal R Varian, (1996), *Differential Pricing and Efficiency*, First Monday, Volume 1, Number 2 - 5 August 1996

4.3 Changes to price of energy vs lines services

For many activities, it is the infra-marginal (not marginal) prices that inform the total cost and benefit assessments of consumers and producers, and hence resource allocation decisions over time. That is, it is information on total costs that often determine which activities are engaged in and whether or not to engage in an activity; marginal decisions tend to allocate resources within a pre-determined set of activities.[33]

For example, a household choosing whether to upgrade their hot-water system with a new hot-water cylinder or a gas-califont will consider the expected relative costs of electricity versus gas prices over the life of the asset, along with any differences in the capital and installation costs; that is, the decision will be guided by an assessment of the total costs and benefits of each option. Having decided on one option over the other, the household may make decisions at the margin on the time and duration of hot water use (and hence make decisions impacting on their incremental use of electricity or gas). But the important decision on resource allocation—whether to select a gas-califont or an electric cylinder and hence to use gas or electricity for hot water heating—would be based on the infra-marginal or total expected cost of the options, not marginal prices.

The Mercury Code change proposal is distinguishable from the other scenarios in terms of the effect on infra-marginal prices, or relative cost, of lines services and energy services. The Mercury Code change proposal would return the LCE to consumers via the average cost consumers pay for energy (without altering nodal prices), leaving the cost of lines services—transmission and distribution—unchanged. The other scenarios would all lower charges for lines services (transmission and or distribution) while raising total energy costs relative to those that would be incurred under the Mercury Code change. This change in relative prices would occur under the counterfactuals because the LCE would be collected from wholesale market trades, but would be returned (under the counterfactuals), at least in part, through a reduction in the cost of lines services. This change in relative prices would arise regardless of whether the reduction in the cost of lines services occurs through a direct payment to consumers (as Vector has initiated) or through offsetting the LCE against transmission charges (as currently applied by some EDBs).

4.3.1 LCE are produced from the energy market

In academic debates prior to the establishment of nodal wholesale markets, queries were raised as to whether congestion rents were an element of the transmission market or the energy market. These early debates centred on engineering optimisation models that assumed

[33] Xiakai Yang, Wai-Man Liu, (2008), *Inframarginal economics*, University of New South Wales, chpt 3.3.2

congestion rents would be collected by line owners.[34] There were echoes of these early debates in some papers written in the first few years of market operation.[35]

However, the market and regulatory arrangements, as implemented in New Zealand, separate transmission and distribution pricing from pricing in the wholesale market, including LCE. Notably, the Input Methodologies set out in detail the method that transmission and distribution entities should use to establish the maximum revenue necessary to meet efficient costs of transmission and distribution services. As discussed above, these Input Methodologies do not anticipate that lines companies would receive revenue from wholesale market trades in the form of LCE.

There are several reasons why the market is designed this way:

- The early engineering based models did not deal with how generator (and to a lesser extent, demand) bidding behaviour may be affected by line constraints—economists quickly realised that LCE would be impacted by offer strategies and not just electrical engineering.[36]
- The Australian experiment of merchant transmission in which an inter-connector was to be funded by price differences proved problematic in practice.[37]
- If the grid owner benefits from LCE, adverse incentives to increase LCE arise in relation to dispatch, grid configuration and network investment.[38]

In any event, the relevant comparator for the Mercury Code change proposal is not whether an alternative paradigm might be preferable involving a fundamental rethink of market design and transmission funding. Rather, as the market is subject to a set of rules, the Code, it is reasonable that Mercury's proposal is evaluated in terms of the incremental welfare stemming from the proposed change.

4.3.2 Change in relative prices impacts dynamic efficiency

As discussed above, the Mercury Code change proposal is the only scenario which preserves efficient infra-marginal prices. The other scenarios would all artificially lower charges for lines services (transmission and or distribution) while raising total energy costs.

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34 See for example, Bohn, R. E., M. C. Caramanis and F. Schweppe (1984) "Optimal Pricing in Electricity Networks Over Space and Time," *Rand Journal of Economics* 15, 360 – 376.

35 For example, in what seems an aside, Lew Evans and Richard Meade comment "In fact, the rentals obtained after the generators have been paid for the energy in the losses, given the pricing mechanism, arguably properly rest with the grid because it generated them" in "Economic Analysis of Financial Transmission Rights (FTRs) with Specific Reference to the Transpower Proposal for New Zealand" 28 September 2001.

36 See for example, Backerman, S. R., S. J. Rassenti and V. L. Smith (2000), "Efficiency and income shares in high-demand energy networks: who receives the congestion rents with a line is constrained? *Pacific Economic Review,* 5: 3, pages 331 – 347.

37 Joskow, P., and Tirole, J (2003), "Merchant Transmission Investment", CML Working Paper 24, The Cambridge-MIT Institute, 6 May.

38 Hogan, W. W., (2001), "Designing Market Institutions for Electric Network Systems: Reforming the Reforms in New Zealand and the U.S.". *Paper for the utility convention*, Auckland, New Zealand, 13 March.

The price effects are relatively modest and for many existing uses of electricity there is no effective substitute. However, the distortion could potentially impact many decisions by end consumers concerning fuel choices in the widely expected "electrification of the economy".[39]

For example, the Electricity Authority wants to see distributors move to more efficient pricing. Originally this was referred to as cost reflective and service based pricing, though more recently the language adopted has referred to it as efficient. Intended benefits include prices that better reflect the cost to consumers of charging electric vehicles at particular times or not drawing on batteries accompanying photovoltaic energy sources particular times or conditions. All of these price signals would be distorted if the LCE comes back through the distributor and, as a result, those charge/discharge decisions or asset purchase/not purchase decisions are different.

The dynamic efficiency consequences of distorted final prices might therefore be expected to be large over time. This is because dynamic efficiency can be measured as "the outcomes from the sequence of future decision-making relating to the allocation of resources, production technologies of firms, and investment in new knowledge".[40] There is strong empirical support for the claim that dynamic efficiency is much more important for economic performance that static efficiency,[41] and hence if a policy improves dynamic efficiency it should generally be preferred over one that delivers only static efficiency benefits.

In any event, it would be difficult to reconcile the Authority's statutory objective with retaining or implementing any of the counterfactuals as a distortion to efficient infra-marginal prices cannot be consistent with promoting economic efficiency.[42]

4.4 Promoting competition

The proposed Code change may also provide further benefits for retail competition, as the allocation of LCE to retailers can provide improved risk management for retailers during high price events driven by constraints (low probability, high impact events). In particular, where the constraint is unable to be managed in the FTR market, the LCE could partially mitigate differences in nodal prices.

This partial mitigation of risk may encourage, at the margin, further entry into electricity retailing. The majority of products sold by new entrant retailers are fixed price (at least in the

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39 See for example the discussion in Electricity Price Review, Hikohiko te uira, First Report for Discussion, 30 August 2018, which suggested that the electrification of the economy could double electricity demand.

40 Evans, L., N. Quigley, J. Zhang (2000), "An Essay on the Concept of Dynamic Efficiency and Implications for Assessment of the Benefits from Regulation and Price Control", Working Paper, New Zealand Institute for the Study of Competition and Regulation.

41 For example, Solow (1957) concluded that approximately 87 per cent of the source of economic growth in the United States in the first half of the 20th century could be explained by technological change, rather than increases in capital and labour, Solow, R., (1957), "Technical Change and the Aggregate Production Function", *Review of Economics and Statistics,* 39(3), 312 – 320.

42 The Authority's Statutory Objective, under section 15 of the Electricity Industry Act 2010, is "To promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers."

short term), and high spot price events are a significant risk to those retailers. Having access to the LCE would lower the risk faced by these retailers during a high spot price event.

4.5 Alignment with Authority priorities

The Authority published the 2019/2020 indicative work programme in November 2018. The proposed Code change is aligned to the Authority's projects in 2019/2020. In particular the projects "Distribution pricing – monitoring distributors' adoption of more efficient prices" and "Spot market settlement on real-time pricing" will be enhanced by ensuring efficient electricity prices are maintained, and efficient distribution prices are discovered.

5. The quantum of LCE returned directly to consumers

5.1 LCE returned to consumers - a measure of efficiency gain

The Authority interprets its statutory objective as requiring it to promote economic efficiency. In applying this interpretation, the Authority explains that it will typically exclude wealth transfers from its assessment of costs and benefits of a proposed Code change.[43] Wealth transfers are ignored because a change which benefits participant A by the same amount as it costs participant B (a transfer from B to A) produces no net economic benefit, unless the change also alters behaviour.

Arguably, the differences in direct pass through of LCE to end consumers under the alternative scenarios should not be classified as 'wealth transfers'. Absent any other effects, the differences are changes in the benefits to consumers. Those options which result in less direct benefits to consumers must result in larger amounts being retained by the entities in the supply chain – that is, some of the LCE would be absorbed through by higher returns to labour or capital or other costs. Economists sometimes refer to these efficiency losses, as X inefficiency.[44]

5.2 Quantifying the LCE returned to consumers

Mercury identified in its LCE Code change request, a total sum of LCE payable to distributors in 2016 of $35.7m. $35.7m is 88% of the total interconnection value and excludes direct connect consumers. Taking this value as an indicative annual amount, we assess how much of the LCE would be returned to consumers under the proposed factual and each of the counterfactuals. In each case, we separately assess the impact on mass market consumers[45] and larger commercial and industrial consumers.[46]

We make this distinction because larger commercial and industrial consumers are likely to face a pass through of distribution charges by retailers (or be billed directly by the EDB),

43 Electricity Authority, *Interpretation of the Authority's statutory objective*, 14 February 2011, paragraph A.6.

44 Leibenstein, Harvey (1966), "Allocative Efficiency vs. X-Efficiency", American Economic Review, 56 (3): 392-415.

45 All residential consumers, and we assume half of commercial consumers are sufficient size to be billed separately for network services or for those services to be billed at cost by retailers.

46 This excludes large industrials that connect directly to the national transmission system such as New Zealand Aluminium Smelters, Pan Pac Forest Products and New Zealand Steel.

where mass-market consumers typically receive a bundled delivered energy charge from retailers.

We estimate that mass market accounts for 49.4 percent of total demand for mass market and larger consumers account for 50.6 percent. These estimates were calculated using each category's share of total electricity demand in 2017 from Energy in New Zealand, published by MBIE.[47] We then apply the calculated proportions to the total LCE payable to distributors, which gives a LCE share for mass-market consumers of $17.63m and $18.05m for large consumers (of the indicative annual total of $35.7m).

Our estimate of the LCE portion passed through to consumers under each option is summarised below:

- Status quo (current practice), from the information summarised in Table 2, we estimate consumers receive 81% of LCE paid to EDBs, broken down as follows:
  - mass market consumers receive 79% of LCE paid to EDBs
  - large consumers receive 84% of LCE paid to EDBs
- Status quo (if EDBs practice converges over time to pass about 50 percent of LCE through), we estimate:
  - Mass market consumers would receive 42 percent of LCE paid to EDBs, which is the monopoly pass through (50 percent) multiplied by the retailer pass through (83 percent)
  - Large consumers would receive 50 percent of LCE paid to EDBs, which is the monopoly pass through (50 percent)
- Mercury proposal:
  - Mass market consumers would receive 83 percent of their LCE share, which is the retailer pass through
  - Large consumers are assumed to receive their full share of LCE, as we assume the LCE is passed through by the EDBs directly to these consumers
- LCE credited to transmission charges:
  - Mass market consumers are assumed to receive 83% of their LCE share, which is the retailer pass through (as the reduced transmission costs reduce retailer costs)
  - Large consumers are assumed to receive their full share of LCE, as we assume the LCE is passed through by the EDBs to these consumers
- EDB return directly to consumers:
  - Mass market consumers receive all the LCE, less the costs of EDBs costs of setting up and operating a refund process
  - Large consumers receive all the LCE (we assume EDBs already have systems in place to charge large consumers directly).

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47 Mass-market is defined as residential consumers plus half of commercial. Larger consumers are defined as half of commercial, all of agriculture forestry and fishing and industrial consumers (excluding those that connect directly to the transmission system).

We present our estimates of the direct pass through of LCE to consumers in Figure 2:

Figure 2 Direct benefits to consumers of LCE options

Share of LCE ($m)	Mass market ($17.63m)		Large Customers ($18.05m)		Total Net Benefits ($m)	
Option	%	$m	%	$m	Annual	Long term
Status Quo (current practice)	79%	13.92	84%	15.09	29	353
Status Quo (long term)	42%	7.35	42%	7.52	15	181
Mercury Proposal	83%	14.69	100%	18.05	33	398
LCE credited to transmission charges	83%	15.04	100%	18.05	33	402
EDB return to customers	100% less costs	14.03	100%	18.05	32	389

1. Annual net benefits is the total of mass market and large customer net benefits
2. Long term benefits are assumed over a twenty year period, discounted at 6%[48]
3. Annual operating cost of EDBs returning LCE to consumers is assumed at $3.6 million. This is based on payments to approximately 1,800,000 consumers, 1,720,000 residential consumers and half the 175,000 commercial consumers.[49] A cost of $2 per consumer is assumed, covering postage, printing and cheque costs.
4. The long term benefit of EDB returning LCE to consumers is reduced by an assumed capital cost of $1 million incurred by EDBs in obtaining a consumer management system. We assume that the twelve consumer owned EDBs[50] already have a system for contacting consumers for either trust elections, or trust payments. The remaining 17 EDBs would require a simple system. The $1 million cost is a little over $50,000 per EDB.

Most of the options are roughly equivalent in terms of the amount of LCE passed through to consumers. The exception is that we would expect that, under the current arrangements, the EDBs would to converge over time to a consistent treatment of LCE and pass about 50% of LCE to their customers, resulting in a significantly reduced pass through of LCE to consumers.

As we observed in chapter 4 above, the Mercury proposal is the only scenario that preserves efficient infra-marginal prices, and hence avoids dynamic inefficiencies.

48 New Zealand Treasury, Current Discount Rates, October 2016.

49 Electricity Commission, Electricity in New Zealand, 2018, p.7

50 https://comcom.govt.nz/regulated-industries/electricity-lines/commissions-role-in-electricity-lines/consumer-owned-electricity-distribution-businesses

6. Conclusion

Mercury has asked the Authority to consider amending the Code to require EDBs to pass through the LCE to their customers, including retailers. We compare the economic efficiency effects of this proposal (the factual) relative to three alternative scenarios (or counterfactuals):

- a continuation of the current arrangements in which it is left to the EDBs to determine how to use the LCE in setting their prices
- an alternative Code change that would require the EDBs to return the LCE directly to end consumers.
- a further alternative Code change that would require Transpower to apply the LCE it receives to reduce transmission charges.

All alternatives would maintain nodal prices. The status quo options have the lowest pass through of LCE to consumers, especially if EDBs reduce overtime the amount passed on to consumers consistent with their market power. The other three options are all within a range of $13m (~3%) in terms of the amount of LCE passed on to consumers. The Mercury proposal is the only scenario that preserves efficient infra-marginal prices, and hence promotes dynamic efficiency. We summarise this analysis in Table 3 below:

Table 3 Efficiency effects of LCE pass through options

Option	Efficient nodal prices	Direct pass through to consumers $m NPV	Efficient infra-marginal prices
Status quo (current practice)	√	353	X
Status quo (converge to 50% pass through)	√	181	X
LCE credited to transmission charges	√	402	X
EDB return to customers	√	389	X
Mercury proposal	√	398	√

The proposed Code change may also provide further benefits for retail competition, as the allocation of LCE to retailers can provide improved risk management for retailers during high price events driven by constraints. In particular, where the constraint is unable to be managed in the Financial Transmission Right (FTR) market, the LCE could partially mitigate against high spot prices.

We conclude that the Mercury proposal presents the greatest benefits to consumers when the full range of benefits are considered. All other options contain inherent distortions to relative prices that have the potential to impact end consumer decision making with regards to fuel choices in an increasingly 'electrified economy'. The dynamic efficiency consequences of distorted final prices might therefore be expected to be large over time. In any event, it would be difficult to reconcile the Authority's statutory objective with retaining or implementing any of the counterfactuals as a distortion to efficient infra-marginal prices cannot be consistent with promoting economic efficiency.