ELECTRICITY PRICE REVIEW

Hikohiko te uira

INITIAL ANALYSIS OF RETAIL BILLING DATA

15 October 2018

New Zealand Government

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Summary

To augment public information sources, the review requested billing data from the nine largest retailers. All retailers covered by the request provided data for the review. More than 50 million individual bills were supplied, subject to privacy and confidentiality provisions.

This paper describes the results of the analysis undertaken to date. We do not consider any policy implications at this stage.[1]

Average bills

- Power charges (which we define as fixed daily charges plus variable usage charges, assuming the bill is paid by the due date) are the dominant driver for average power bills. Other components of a bill such as marketing rewards and prompt payment discounts have relatively little impact at the *average* level. However, as we discuss, there is considerable variation in effects across different consumers which is not evident when considering average figures.

Differences across socio-economic groups

- Consumers living in the most deprived areas[2] pay around $79/year more on average for their power than consumers in the least deprived areas – after adjusting for other differences such as usage levels. This figure almost certainly understates the true level of difference (see main text for reasons).

- The biggest driver of differences across socio-economic groups is the effect of lost prompt payment discounts. These raise bills for consumers in the most deprived areas by around $50/year on average. Again the average hides a wide dispersion of outcomes. The data indicates five per cent of consumers in the most deprived areas pay additional costs of $250/year or more due to lost prompt payment discounts.

- Power charges are the next largest source of differences across socio-economic groups. Consumers in the most deprived areas pay around $27/year more on average than those in the least deprived areas.

- Debt-related charges add around $9/year on average to charges for consumers in the most deprived areas, as compared to the least deprived areas. Again, there is significant variation. Only 10 per cent of consumers in the most deprived areas incur any debt charges, but for these consumers the average debt charge is around $100/year.

Savings available to consumers from switching to cheaper offers

- We analysed the data to examine the extent to which consumers could make savings by switching to a cheaper offer. At the national level, we

[1] See Appendix A for description of caveats.
[2] The analysis is conducted at the 'meshblock level' – which are small geographic areas defined by Stats NZ. The most deprived areas refers to the 10 per cent of meshblocks that are most deprived. See main text for a more detailed description.

estimate residential consumers can on average save $240/year to $280/year by switching to a cheaper offer.

- We also analysed the data to examine how the saving from switching to a cheaper offer varies around the country. This showed average savings of approximately $150/year to $250/year for consumers in the main metropolitan areas. Average savings vary more for other consumers, ranging between approximately $100/year to over $500/year in some areas.

- One significant factor affecting bills is whether consumers are on a fixed term plan. The data shows consumers on such plans pay on average around $100/year less than consumers on non-fixed term plans.

- Another factor which can affect outcomes is whether consumers are with the incumbent retailer in the area. On average, consumers supplied by non-incumbent retailers pay around $45/year less than those supplied by incumbent retailers, but there are marked differences across networks.

Pre-pay compared to standard (post-pay) supply terms

- In the past, consumers buying electricity on pre-pay generally paid more than those on standard (post-pay) plans. Our analysis for retailers which offer both options indicates power charges are now aligned for these options. Furthermore, the pre-pay rates match the average pay-on-time rates for post-pay service options.

- However, consumers on pre-pay options may incur additional fees, such as for topping up their account. The analysis indicates pre-pay consumers on average pay approximately $40/year more than comparable consumers, primarily due to additional fees.

Effect of low fixed charge regulations

- The low fixed charge tariff regulations[3] act to lower bills for some consumers (generally those with below-average use) and raise bills for other consumers (generally those with above-average use). We analysed the data to examine the effect of the regulations on consumers living in the most deprived areas.

- The analysis indicates the regulations are not very effective at helping this group of consumers. Some consumers benefit from the regulations, but others end up paying more – and on analysis to date the two effects are similar in size.

- The regulations also have other unintended effects likely to be detrimental to consumers. Not all consumers choose the right type of plan. We estimate this raises total bills by up to $39 million per year. Finally, the requirement to offer low fixed charge and standard options increases complexity (raising the total number of price plans across New Zealand to over 14,000). This added complexity is likely to make it harder for consumers to identify the best price plan for their needs.

[3] See First Report of the Electricity Price Review, 30 August 2018, pp74-76.

Next steps

Although we are not seeking submissions on this paper, we welcome feedback stakeholders may have, including on how the analysis can be extended or refined by Wednesday 14 November 2018.[4]

Analysis of the data continues. Stakeholders will have a further opportunity to comment on the results later in the review.

[4] Please note we are unable to share the raw data due to confidentiality and privacy restrictions.

Purpose

The Electricity Price review terms of reference state the review "will collect information and report on:

- the key components of retail electricity prices [and...]
- variations in price across different consumer groups".

Information from public sources allows these issues to be examined at a broad level. For example, it provides data on average prices for business and residential consumers, and by region. However, public sources provide little visibility on variations in prices within a consumer group, or the underlying causes for variations.

To augment public information sources, the review requested billing data from the nine largest retailers.[5] All retailers provided data. Together, those retailers supply over 95 per cent of residential and business consumers.

In total, over 50 million individual bills were supplied, subject to privacy and confidentiality provisions. While the data provides a rich information source, collating and analysing the data posed challenges. Appendix A describes the processes used to clean and analyse the data, along with caveats which need to be borne in mind when interpreting the analysis.

This paper describes the analysis undertaken. We do not consider any policy implications at this stage.

Specific questions of interest

The review sought the data from retailers to shed light on the following key questions:

- How do total bills vary between socio-economic groups and what causes those variations. For example, how do prompt payment discounts affect different groups?
- To what extent is there dispersion in prices paid by residential consumers – and to what extent can consumers make savings by switching to cheaper price plans?
- How do prices for buying electricity on a pre-pay basis compare to those for standard (post-pay) plans?
- How do the low-fixed charge tariff regulations affect different consumer groups?

In addition, the review sought billing data for small business consumers. That information is being analysed. The results will be shared later in the review.

A few words about terminology

[5] Contact Energy, Electric Kiwi, Flick Electric, Genesis Energy, Mercury Energy, Meridian Energy, Nova Energy, Pulse Energy, Trustpower. The request also covered wholly-owned subsidiaries. See Appendix A for further detail on the scope of the request.

Before discussing the results, we need to briefly explain our terminology. We break down the total electricity bill into these elements:

- **Power charges** are the standard fees for providing electricity. These are typically a combination of fixed charges plus charges which vary with usage or capacity – all expressed on a basis assuming the consumer pays on time (this allows us to analyse any lost prompt-payment discounts as a distinct component).
- **Prompt payment discount (PPD) lost** refers to charges for paying a bill after the due date – but excludes any debt-related charges.
- **Debt-related charges** are fees directly related to the collection of overdue amounts, including debt-management charges, disconnection and reconnection charges due to bad debt.
- **Payment-channel** charges/incentives are specific fees/discounts directly related to the form of billing or payment – such as fees for paying at NZ Post shops, or discounts for paying by direct debit or receiving bills online.
- **Marketing rewards** are monetary rewards provided to a consumer at the discretion of the retailer and are net of contract break fees. Marketing rewards covers payments such as lump sum incentives for win-backs or one-off acquisition credits, and 'friend get friend' credits.

The analysis does not include any specific 'dual-fuel' discounts or other discounts where retailers provide electricity as part of a 'bundle' of services. These discounts are excluded because there was insufficient information available from the data to consistently apportion their value among different services in a bundle.

Unless stated, monetary amounts are reported inclusive of goods and services tax.

Analysis of socio-economic impacts

In addition to providing consumer usage and billing data, retailers were asked to provide the 'meshblock' code for each consumer record.

What are meshblocks?

Meshblocks are the smallest geographic unit for which census-based statistical data is collected and published by Stats NZ. Meshblocks typically contain 30 to 60 households and vary in size from part of a city block to a large area of rural land.

This enabled billing records to be matched to a published database that reports the relative level of socio-economic deprivation applying to each meshblock, expressed as a decile rank. Meshblocks in decile 1 are the least deprived areas in New Zealand, and meshblocks in decile 10 are areas which are the most deprived. (Rather confusingly) this is the opposite to the decile numbering system used for classifying the relative affluence of a school's catchment.

The deprivation measurement methodology was developed by the University of Otago and is widely used for research and policy purposes. It assesses socio-economic deprivation based on a range of income, employment, housing and other

statistics.[6]

Next steps

Although we are not seeking submissions on this paper, we welcome any feedback stakeholders may have, including on how the analysis can be extended or refined by Wednesday 14 November 2018.[7] Analysis of the data is continuing and stakeholders will have a further opportunity to comment on the results later in the review.

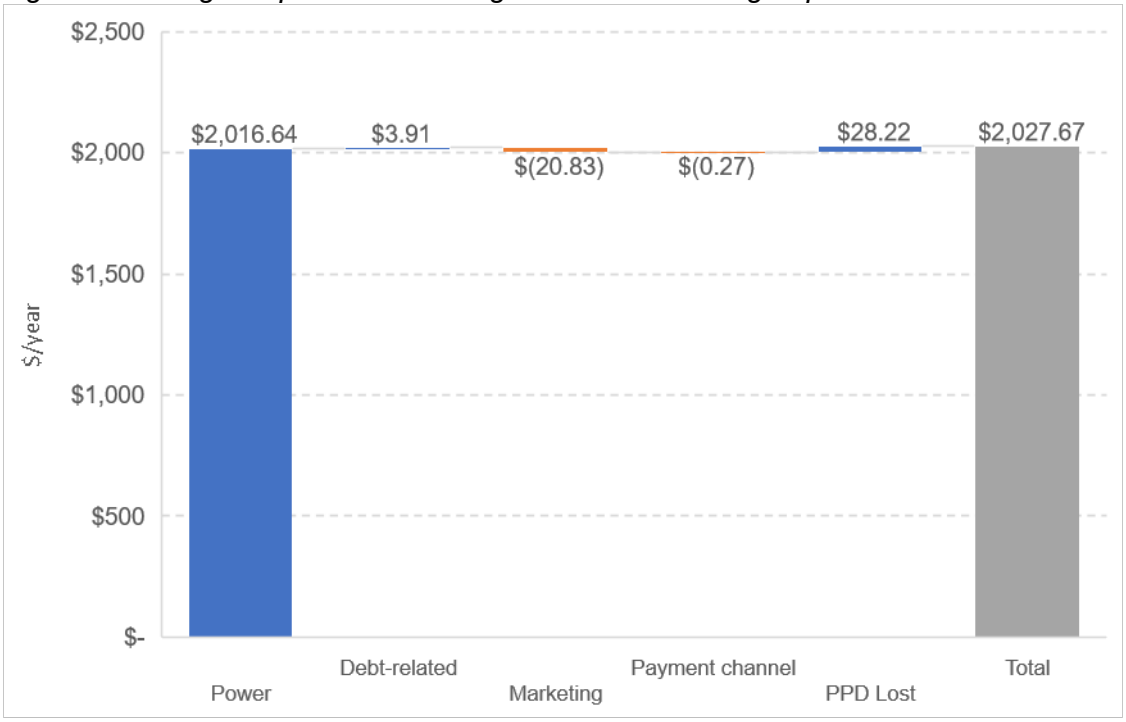
[6] See www.otago.ac.nz/wellington/otago069936.pdf for more information.
[7] Please note we are unable to share the raw data due to confidentiality and privacy restrictions.

Results of analysis

Make-up of 'average' electricity bill

Figure 1 shows the breakdown of an average residential bill by component.[8] This average has been calculated by aggregating each charge/discount component for all residential consumer records and adjusting the figures into annual equivalent terms. The total sum is then divided by the number of consumers.[9]

Figure 1: Pricing components – average across all decile groups



The key observation from the analysis is the power charge component (fixed daily and variable usage charges) dominates the make-up of the average consumer bill. Other components (such as lost prompt payment discounts or marketing rewards) have relatively little impact in average terms. However, as we discuss below, there is significant variation around these average outcomes for different types of consumer.

Price differences by deprivation decile group

A key aspect of the review is to better understand what drives price outcomes for consumers across different socio-economic groups. To explore this issue, it is important to recognise the effective price paid by a consumer depends on many

[8] See Appendix A for a discussion of caveats. In addition, the analysis behind this graph excluded records where a consumer was supplied by a retailer for less than 180 days. This is because the effect of lump sum amounts (such as marketing rewards) are magnified for shorter duration consumers.

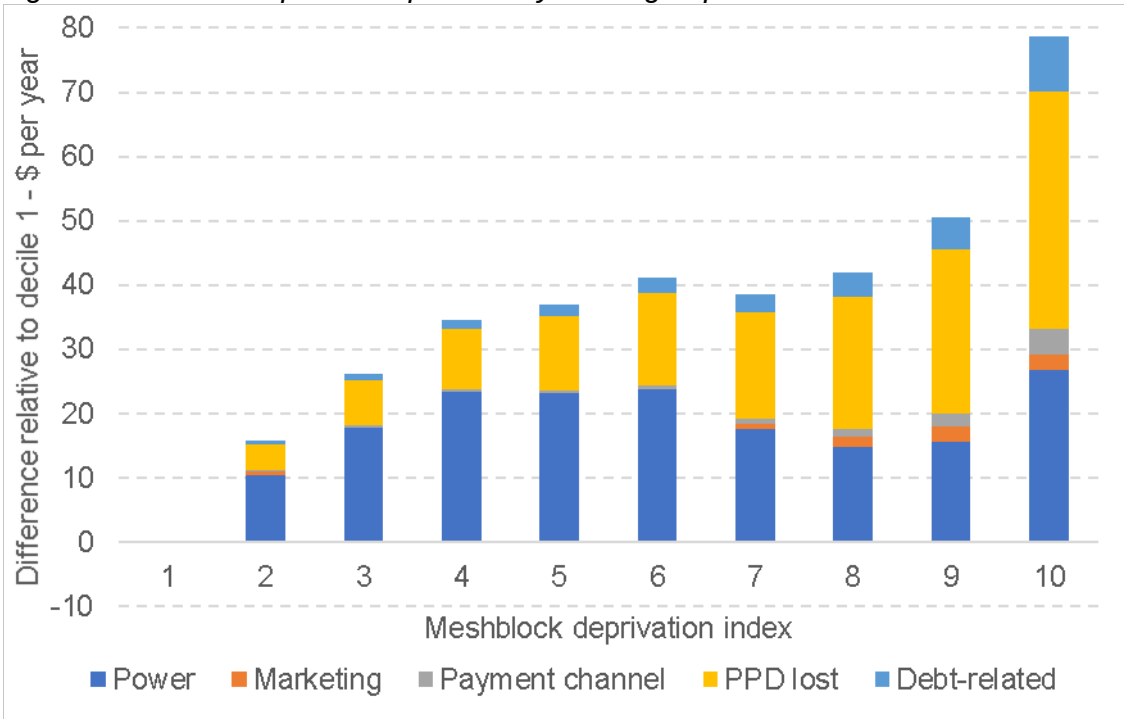
[9] The resulting figure is very close to the average residential bill reported by the Ministry of Business, Innovation and Employment ($2,031/year for year ended March 2018). Source: www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/prices/electricity-prices/sales-based-residential-prices.pdf (downloaded 8 October 2018).

factors – such as their location, level of consumption and metering set-up.[10] To assess how the effective price of power varies by socio-economic group, it is important to account for these differences as far as possible.

For example, electricity prices vary by location in part because distribution charges differ between networks. It is important to account for this in the analysis of socio-economic factors, to ensure observed price differences do not simply reflect distribution charges being higher or lower in areas with greater concentrations of consumers in more deprived meshblocks.

With this in mind, we used regression analysis to assess the extent to which individual price components differed across deprivation decile groups. In effect, the regression analysis allocates the observed dispersion in price components to the different explanatory factors such as consumers' location, usage, meter set-up and meshblock decile group.

Figure 2: Variation in price components by decile group[11]



[10] Metering set-up refers to issues such as whether a consumer has a controlled hot water cylinder and how it is metered. Typically, consumers without a controlled hot-water cylinder have a single 'uncontrolled' meter. If they have a hot-water cylinder they may have a second 'controlled' meter and associated rate, or they may have a single meter with a so-called 'inclusive' rate that is different to the 'uncontrolled' rate. Other common variants include having two separate meters that each record 'day' and 'night' consumption with different associated rates. Each network area tends to have common meter configurations that apply to the vast majority of residential consumers in that area. The price dispersion analysis discussed later focusses on consumers with the most common meter configurations.

[11] The multi-variate analysis regressed each charge component against usage, and used dummy variables to represent each network area, meter setup and decile group. The chart shows the differences in coefficients for the dummy variables for each decile group, relative to the coefficient for decile 1. Total charges were also regressed against the explanatory variables. This analysis produced similar results to the sum of the individual charge components, with an R-squared value of 93 per cent. A variance inflation factor test for collinearity was performed and this did not identify any explanatory variables that could be determined from other explanatory variables. A regression model assuming a multiplicative relationship between explanatory variables, as well as a regression equation modelling price per kWh were investigated and produced similar results. However, they performed worse on standard regression diagnostic tests and so the presented model is preferred.

Figure 2 summarises the results of the analysis. The vertical scale shows the difference in annual charges for consumers in each meshblock decile, relative to the annual charge for those in the least deprived meshblocks.

Key observations from the analysis are:

- There is a discernible correlation between total charges and increasing deprivation. After correcting for factors such as usage and network location, consumers in the most deprived meshblocks pay approximately $79/year more on average than those in the least deprived meshblocks.

- The biggest driver for the observed difference in total charges is the effect of lost prompt payment discounts. Consumers in the most deprived meshblocks pay around $37/year more on average in such charges than consumers in the least deprived meshblocks. In absolute terms, the average amount of lost prompt payment discount for the decile 10 group is $50/year although, as noted later, there is a significant dispersion in outcomes within the decile. There is also a relatively steady increase in such charges across other decile groups with rising deprivation.

- Power charges are the next largest source of differences. Consumers in the most deprived meshblocks pay around $27/year more on average than those in the least deprived meshblocks. Power charges across other decile groups do not exhibit any clear pattern. As discussed in Appendix A, some retailers may provide marketing benefits (such as retention or acquisition rewards) in the form of a reduced power charge and such benefits would not be shown in our results as a marketing reward. Examination of individual retailer data shows some retailers provide lower marketing rewards to consumers in more deprived meshblocks while other retailers have the opposite pattern. These factors may partly explain the observed variations in marketing rewards across decile groups.[12]

- Debt-related charges are the next largest driver of price differences[13] – adding around $9/year on average to charges for consumers in the most deprived meshblocks, as compared to the least deprived meshblocks. Again, there is significant variation within the decile. Only 10 per cent of consumers in decile 10 incur any debt charges, but for these consumers the average debt charge is around $100/year.

- Marketing rewards – consumers in the most deprived meshblocks on average receive around $2.50/year less in marketing rewards, compared to the least deprived meshblocks. As discussed in Appendix A, retailers differed in the way they provided data on marketing rewards. The impact of in marketing rewards across socio-economic groups is an issue we intend to examine further.

- Payment-channel ‘charges’ can be positive or negative, because some retailers provide a discount for paying electronically, while some levy a charge for paying manually. These charges also contribute to higher overall

[12] The variation in power charges and marketing rewards is an issue that we expect to examine further.
[13] Not all retailers distinguished between debt related and non-debt related reconnections and disconnections in their data. For retailers that did not, we assumed all reconnections and disconnections were not due to debt reason. This may understate the effect of debt related costs.

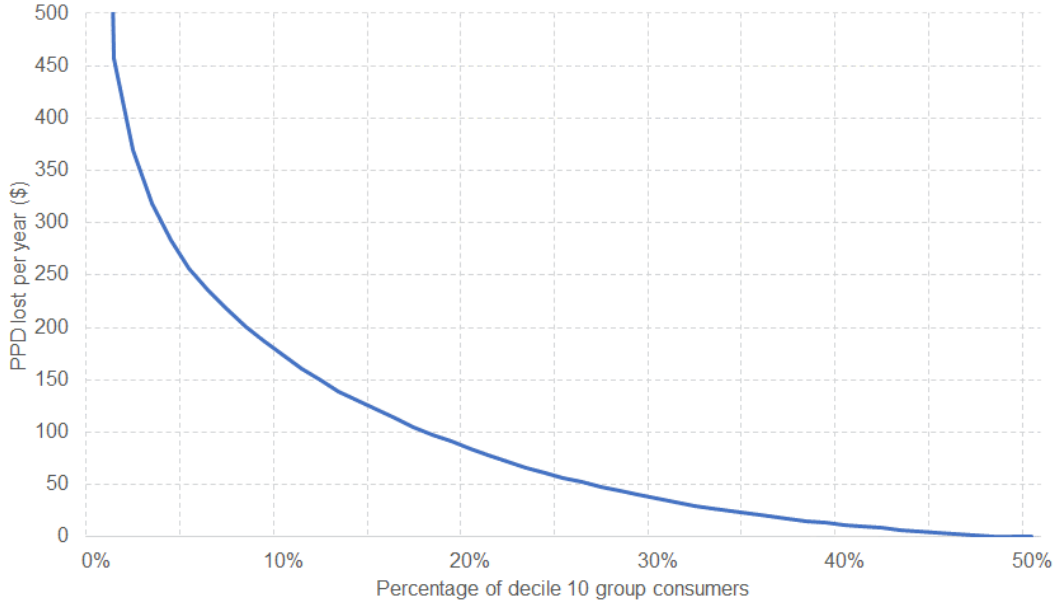
charges for decile 10 group, whose consumers on average pay about $4 more per year than consumers in decile 1 in net terms.[14,15]

Lost prompt payment discounts

As noted above, consumers in the most deprived meshblocks pay around $37/year more on average due to lost prompt payment discounts, compared to consumers in the least deprived meshblocks. This figure almost certainly understates the real socio-economic impact of lost prompt payment discounts for two reasons.[16]

Firstly, the results in Figure 2 show the average effect across households in decile 10 meshblocks. This average hides a significant dispersion of results at the individual household level. Some households receive full prompt payment discounts, while others forego sizeable sums. As shown in Figure 3, the dataset indicates five per cent of consumers in decile 10 are losing $250 or more in prompt payment discounts each year.

Figure 3: Lost prompt payment discounts for consumers in decile 10 meshblocks



The second reason impacts are likely to be understated is the deprivation index measures socio-economic characteristics for meshblocks rather than individual households. Although households within a meshblock are likely to have relatively similar socio-economic characteristics, they will not always have the same relative deprivation. Some relatively better-off households will be located in the more deprived areas and vice versa.

As a result, we are not necessarily seeing the effect of lost prompt payment discounts on the poorest 10 per cent of *households* – rather we are measuring the effect on households in the poorest 10 per cent of *areas*.

Meshblock-based analysis will therefore introduce a degree of averaging over

[14] See Appendix A for caveats.
[15] All results presented for decile 10 group customers are statistically significant at the 99% confidence level.
[16] The same comments apply to other components of the bill.

different types of households. For this reason, had socio-economic data been available at the individual household level, we would expect even larger differences to be apparent between the least and most deprived deciles of households.[17]

Price dispersion for residential users

Figure 16 of the review's first report indicated that there was significant variation in the prices offered by retailers, and this had been growing. However, that analysis was based on public offers and gave no indication of whether consumers were actually paying the higher or lower rates available in the market. Our analysis of the retail data sought to establish the extent to which there is variation in the price actually paid by consumers.

We have focused to date on the extent to which there is variance in the power charge component of prices paid by consumers - i.e. excluding effects such as one-off marketing credits, payment-related charges or discounts, or people being on the 'wrong' low-fixed charge option for their usage. This is because power charges dominate the amounts paid for electricity, as shown earlier in Figure 1. However, we intend to further analyse dispersion in the other components.

Ensuring 'like for like' comparisons

A key challenge in an analysis of price dispersion is making valid 'like-for-like' comparisons to isolate the effect of consumers' choice of price plan from other factors which cause dispersion. In essence, the analysis addresses this issue by grouping consumers into 'types' with substantially common characteristics – i.e. the same distribution network and meter configuration, and low user or standard user characteristics. The analysis also normalises usage levels to the observed average for each consumer type.

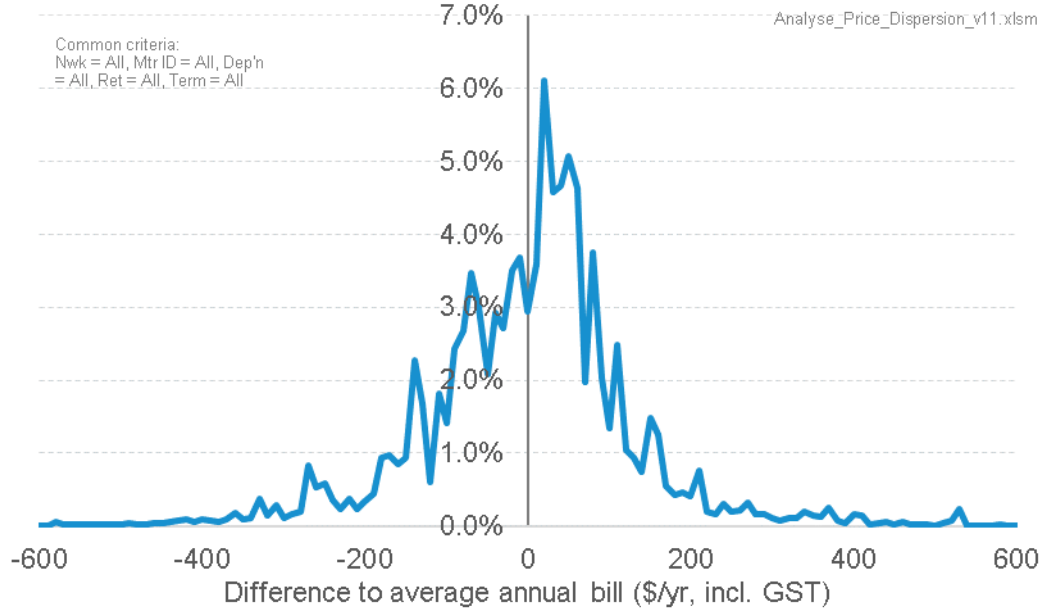
Appendix B describes the steps taken in the analysis in more detail. It also describes the cross-checks made against public sources to test the robustness of the approach.

Observed levels of price dispersion

Figure 4 summarises the results of the price dispersion analysis at the national level.[18] It shows the proportion of consumers paying more or less than the average bill for their type.

[17] For a general discussion of the issue, see C Salmond, P Crampton, Heterogeneity of deprivation within very small areas, Journal of Epidemiol Community Health, 2002; p669–670.
[18] As discussed elsewhere, the dataset was filtered to remove records that were incomplete etc. See caveats for more detail.

Figure 4: Variation in bills based on observed power charges



While the analysis indicates a clustering around the average bill for each consumer type (indicated by the central peak near the zero mark on the x-axis), there is also a dispersion of outcomes with some consumers paying appreciably more or less than the average (indicated by the tails to the left and right of the central peak).

Estimated savings available from switching to cheaper price plans

We also calculated the saving available to consumers from switching to a cheaper price plan. Rather than assuming all consumers switch to the absolute cheapest plan for their type,[19] we estimated savings based on the following scenarios:

- Consumers switch to a plan at the lowest 10th percentile[20] of charges provided by non-incumbent retailers in their distribution network area.[21]
- Consumers switch to a plan at the lowest 5th percentile of charges provided by non-incumbent retailers in their distribution network area.

The results are summarised in Table 1.

[19] As discussed in Appendix B, using the lowest observed price would increase the likelihood of results being affected by outliers.

[20] A percentile is a measure used in statistics to indicate the value below which a given percentage of observations in a dataset will fall. For example, the 10th percentile of charges represents the value below which 10 per cent of observed charges will be found. The average savings per consumer is calculated by summing the total individual savings across consumers, and dividing by the number of consumers. This calculation excludes consumers whose observed charge is below the relevant percentile figure.

[21] As discussed in the First Report of the Electricity Price Review, the incumbent retailer refers to the retailer that was operating in a distribution network area when retail competition was introduced in the late 1990s. Incumbent retailer prices are excluded when calculating the percentile threshold to address any situation where there are cheaper prices offered by non-incumbents, but these do not 'show up' in the 10th and 5th percentile measures because the incumbent retailer has a high market share.

Table 1: Estimated average savings ($/year) available to consumers from switching

Region	Savings based on 'X'th percentile			Electricity Authority estimate
	10th	5th	1st	
New Zealand	240	280	400	
North Island	230	270	380	195
South Island	250	310	440	242

The table also shows saving estimates published by the Electricity Authority using its own methodology.[22] The savings estimates for the 10th percentile are similar to those published by the Authority. We note the Authority's savings estimates do not include fixed term contract offers.[23] As set out below, these were typically among the cheaper offers available to consumers for the period covered by the data. This may partly explain why our estimates are higher than the Authority's estimates.

There are factors which mean the price dispersion shown in Table 1 may understate the true picture. As with the Authority's analysis, we have not included price plans linked to spot prices because they are less directly comparable with other plans. Including them would be likely to increase observed dispersion. Similarly, it might be argued the 5th and 10th percentiles are unduly conservative and that a lower threshold is appropriate. The table also shows the results at the 1st percentile level. These have appreciably larger savings from switching than the 10th and 5th percentile measures and indicate the degree of sensitivity to the choice of percentile threshold.

Conversely, the analysis assumes all consumers can switch freely to other price plans. This may not be possible in some cases. For example, a consumer may require a smart meter to switch to some price plans. Likewise, a consumer may be on a fixed term contract and incur a break fee if they switch before the term expires. Including such factors would tend to reduce the estimated price dispersion.

Lastly, the analysis above focuses on the power charge, as that component dominates pricing outcomes. It is possible other components could widen or narrow the observed dispersion if they are included. In particular, marketing components might affect outcomes, or the effect of discounts related to bundled services such as 'dual-fuel' offerings.

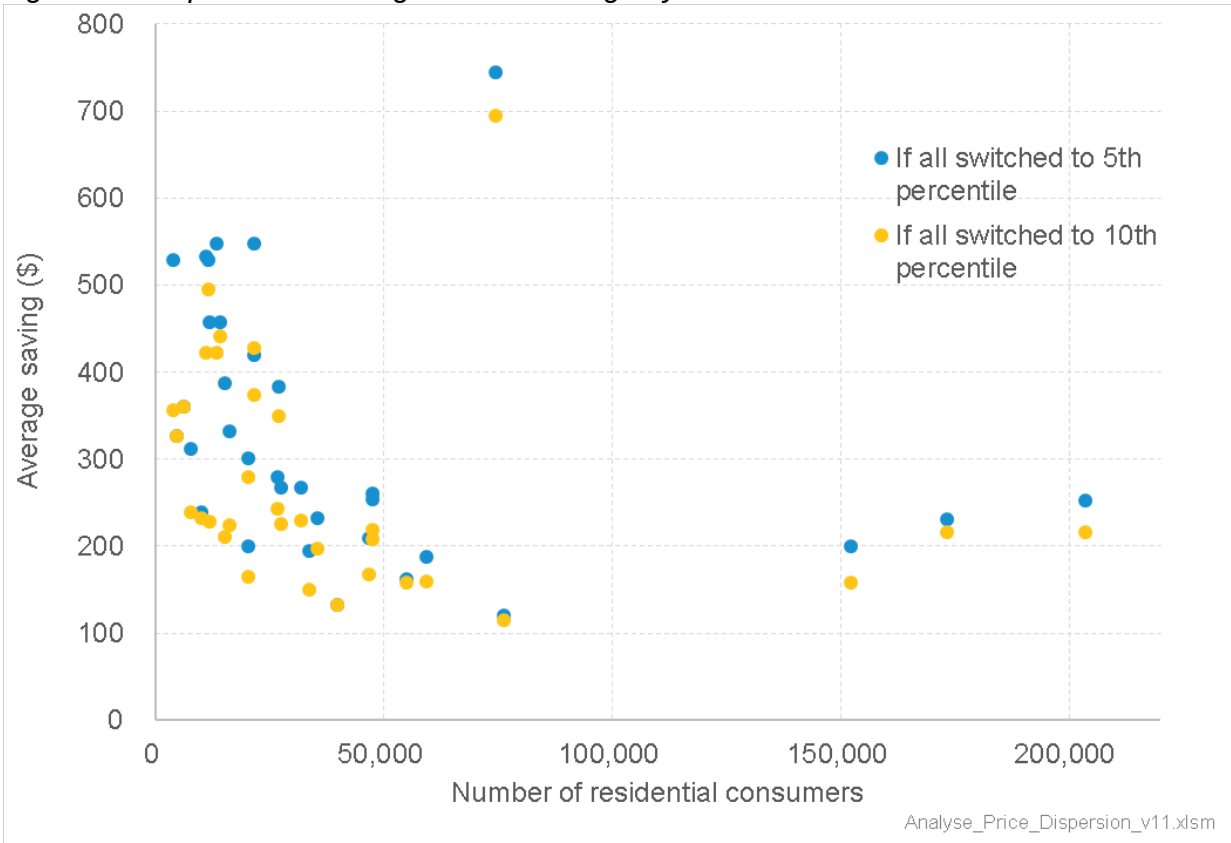
We plan to examine these types of issue further to the extent the data allows us to do this.

Estimated savings from switching – network level analysis

We have also examined how savings from switching vary across the country, by estimating the level of saving for consumers on each distribution network. These results are summarised in Figure 5.

[22] Electricity Authority, estimates for 2017 are available at: www.emi.ea.govt.nz/Retail/Reports/IR0U5M?RegionType=ISLAND_1&_si=tg|residential-savings,v|3
[23] Ibid at 22, see 'more information' tab. Based on our analysis, approximately 17% of customers were on a fixed term contract at some point during the 2-year period analysed.

Figure 5: Comparison of savings from switching - by distribution network area



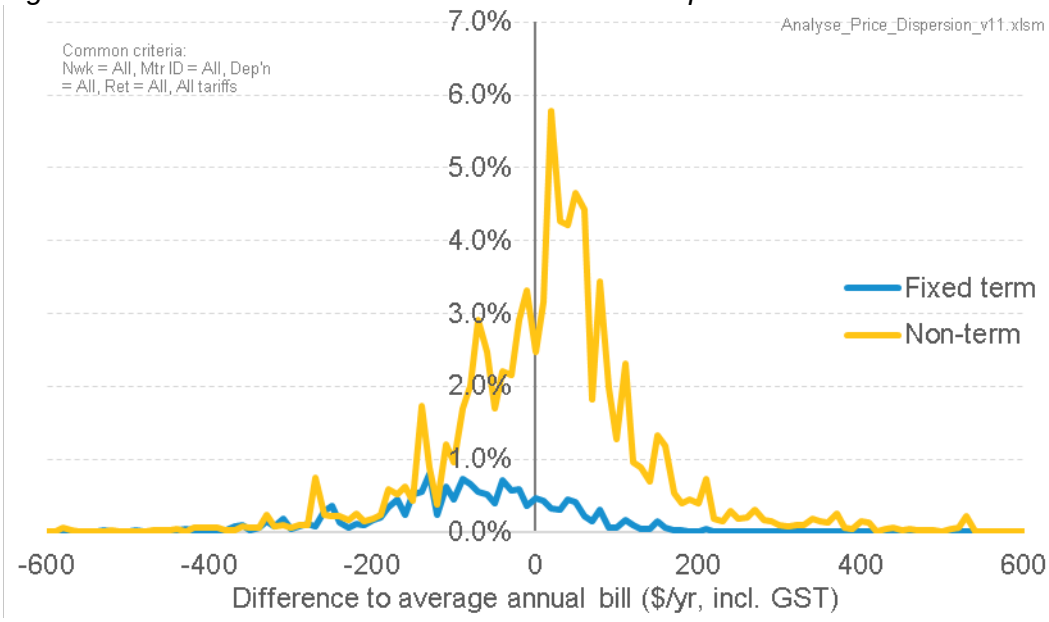
It shows a considerable variation in outcomes and indicates the savings available from switching are generally lower in the networks with larger numbers of consumers (mainly the larger urban areas). The available savings vary more widely for networks with fewer consumers, with some areas having much higher levels of savings available if consumers switched to a cheaper option.

Fixed term price plans

A factor which appears significant is whether consumers are on fixed term price plans, i.e. contracts where the consumer is committed to buy from the retailer for a pre-defined period at a certain price. Figure 6 shows the average bill for consumers on fixed term plans is around $100/year less than those on non-fixed term plans.

Anecdotal evidence suggests consumers on fixed term plans are more likely to have recently switched supplier, or obtained a better offer from their existing retailer by shopping around (by negotiating a better deal or via a win-back offer). We plan to undertake further analysis of the data to examine this issue. We also intend to examine the effect of consumer tenure on pricing outcomes.

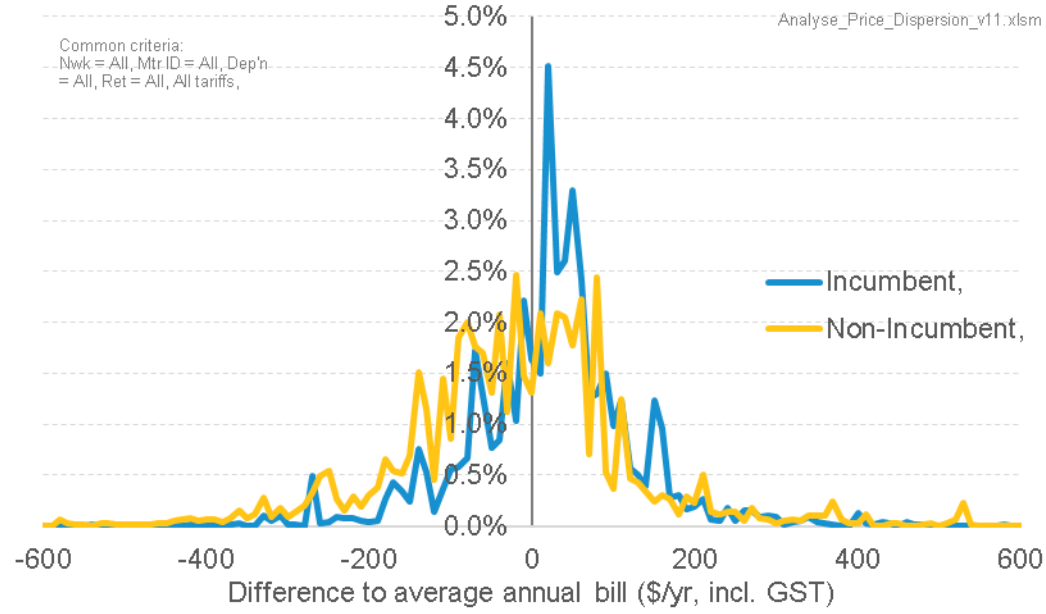
Figure 6: Variation between fixed term and non-term plans



Incumbent retailer versus non-incumbent pricing

Another factor affecting outcomes in some cases is whether consumers are with their incumbent retailer.[24] Figure 7 shows consumers supplied by non-incumbent retailers pay around $45/year less on average than those supplied by incumbent retailers.

Figure 7: Variation between pricing by incumbent and non-incumbent retailers



However, this effect varies materially by network area, depending on which retailer is the incumbent. In some areas, incumbent pricing is similar to other retailers' pricing, whereas there are marked differences on other networks. This observation is also supported by analysis of public tariffs published in Powerswitch.

[24] Ibid at 21.

Prices for pre-pay plans compared to standard plans

Some retailers offer the option to "pre-pay" for power. In the past, consumers buying electricity on a pre-pay basis (and often they are more vulnerable consumers) usually paid more than those on standard (post-pay) plans, in part because of the need for special meters to support pre-pay options. However, the increasing use of smart meters has apparently lessened the gap between standard and pre-pay prices.

Our analysis of published rates for pre-pay and standard services from retailers which offer both options indicates the rates are now aligned for these options. Furthermore, the billing data indicates average power charges for pre-pay match the average pay-on-time rates for standard service options.[25]

However, consumers on pre-pay options may incur additional fees, such as for topping up their account, or for receiving information about their balance. On the other hand, pre-pay customers never incur additional costs for lost prompt payment discounts.

Overall, analysis of the retail data indicates pre-pay consumers pay approximately $40 a year more than other comparable consumers, primarily due to additional payment channel fees.

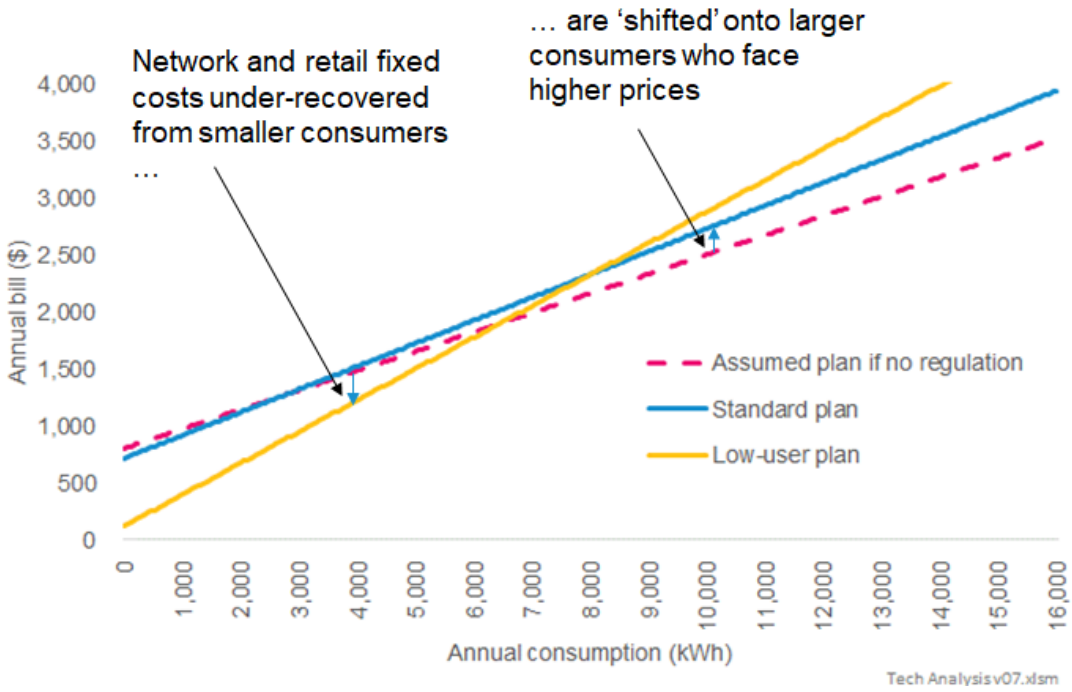
Low fixed charge tariff plans

As discussed in the review's first report,[26] retailers are required by regulation to offer every household the option of a low fixed charge tariff plan.[27] It is widely accepted the regulations lower the bills for many consumers on low fixed charge plans and increase them for many on high-user plans.[28] These effects are illustrated by Figure 8.

In essence, the low fixed charge regulations tend to lower bills for consumers with usage below around 6,500 kWh/year (assuming they are actually on a low fixed charge plan), and increase bills for other consumers.[29] The gain or loss rises in size with an increasing difference between a consumer's actual usage and this 6,500 kWh 'pivot' point.

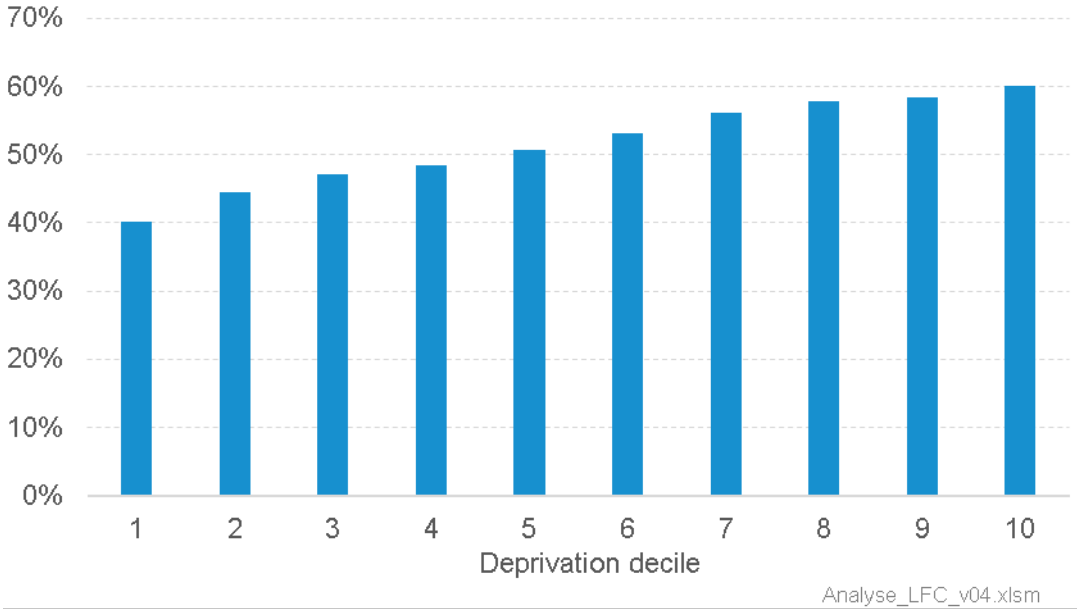
[25] That said, there is dispersion in power charges for standard offers as discussed earlier in this paper, so consumers can pay less than the average rate by shopping around.
[26] Electricity Price Review, Hikohiko Te Uira, First Report, 30 August 2018, at p74-76.
[27] For brevity, we also refer to these as low fixed charge plans, or low user plans.
[28] Assuming consumers choose the tariff plan that matches their usage.
[29] The pivot point for benefiting from the regulations is less than the 8,000 kWh threshold in the regulations due to the distribution of consumption across consumers. In particular, as illustrated by Figure 10 later, due to the fact that the *median* consumption is approximately 6,500 kWh.

Figure 8: Effect of low fixed charge regulations



Turning to the retail data, we examined consumers' actual uptake of low fixed charge plans to identify which groups are benefiting from the regulations. Figure 9 shows the proportion of consumers within each meshblock decile on low fixed charge plans.[30]

Figure 9: Low user plan uptake across meshblock decile groups[31]



The chart shows consumers in more deprived meshblocks have higher uptake of

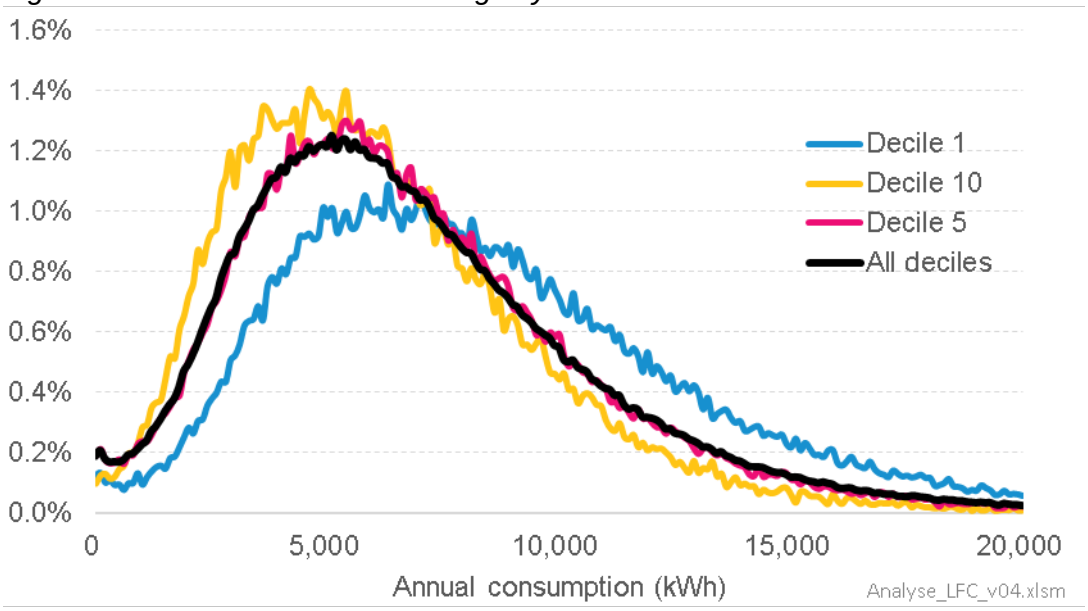
[30] Consumers paying an effective average daily charge between 20 cents and 45 cents for the period were categorised as being on low user plans. Accordingly, consumers on a low user plan for a short part of the period would not be categorised as being on a low user plan in this analysis.
[31] Meshblock data was not available for some records and these have been excluded from the analysis.

low fixed charge plans than consumers in less deprived meshblocks (although the extent of this varies by network area). Accordingly, in average terms, a greater proportion of consumers in more deprived meshblocks are benefiting from low fixed charge plans than those in less deprived meshblocks.

However, it is important to recall that while the low fixed charge regulations typically reduce bills for consumers on low fixed charge plans, they *increase* them for consumers on standard plans. A sizeable proportion of consumers in all decile groups are on standard plans and therefore are likely to be paying higher bills than otherwise. This includes consumers in the most deprived meshblock decile. For this group, around 40 per cent of consumers are on standard plans versus 60 per cent on low fixed charge plans. And some consumers on low-user tariffs with consumption above approximately 6,500 kWh will pay more due to the regulations, as shown in Figure 8. Thus, almost half of consumers in decile 10 meshblocks will pay higher prices because of the low-fixed charge regulations.

This mixed pattern is unsurprising because the level of electricity usage is not a good predictor of deprivation. As shown in Figure 10, a sizeable proportion of consumers in the most deprived meshblocks have usage above 6,500 kWh per year (being the approximate threshold between those who pay less due the regulations, and those who pay more).

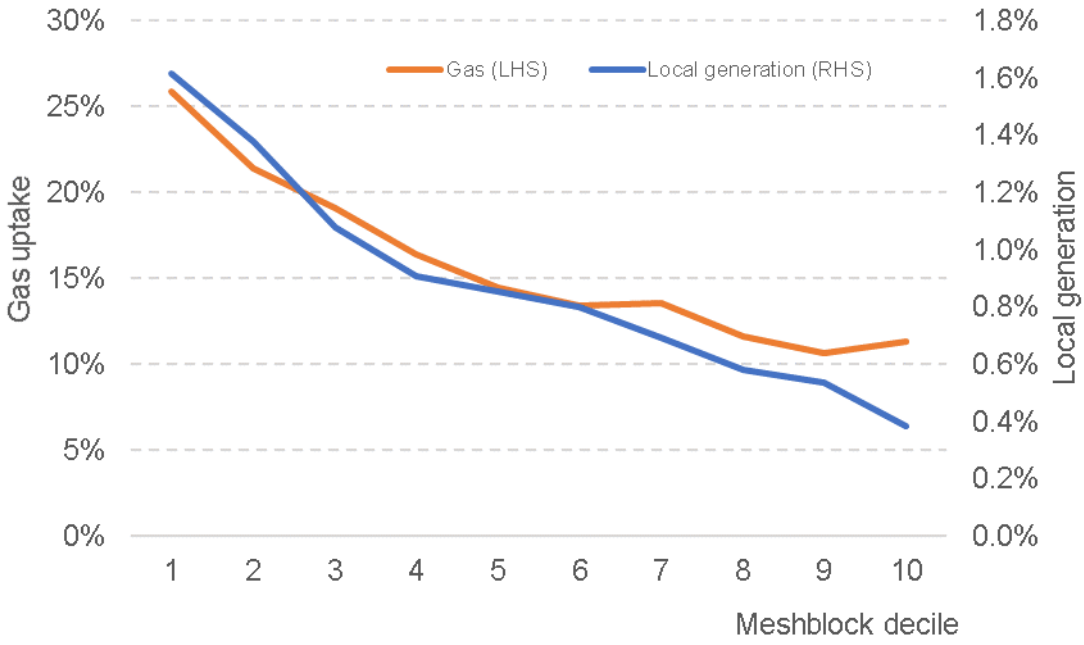
Figure 10: Distribution of annual usage by consumers



Similarly, a reasonably large proportion of consumers in the least deprived meshblocks have relatively low annual usage. This in part reflects a higher level of utilisation of other energy sources among less deprived consumers. The billing data supports this observation. Figure 11 shows the estimated proportion of households which purchase gas from their electricity retailer, or sell power to their retailer from local generation (mainly solar panels).[32] A higher proportion of households in the less deprived meshblocks have gas heating or their own generation, than those in more deprived areas.

[32] These estimates are based on a subset of data and may include sales of liquified petroleum gas. The proportion of households with their own generation is much lower than those with gas.

Figure 11: Proportion of households with gas or embedded generation



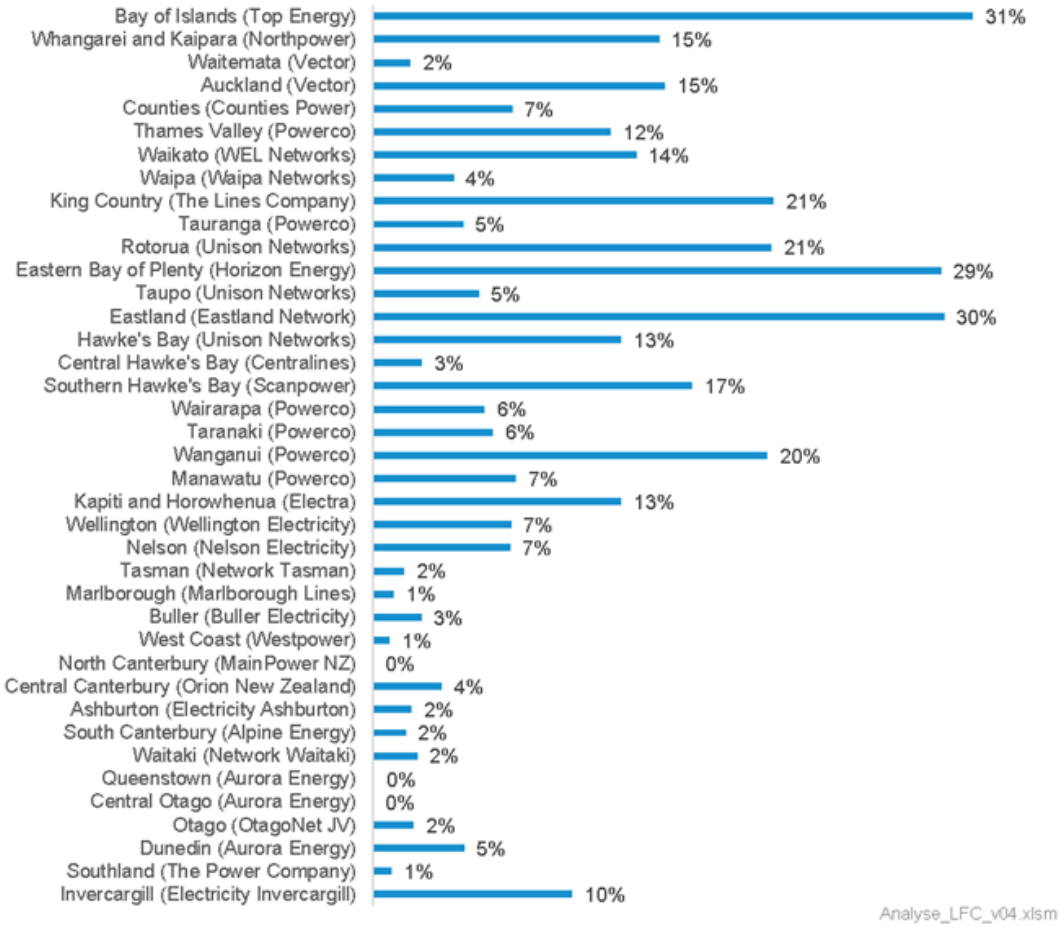
Overall, the analysis reinforces the observation from earlier studies that the low fixed charge regulations are not very effective at helping less well-off households. Some of these consumers benefit from the regulations, but others end up paying more. And for consumers in decile 10 meshblocks, the analysis to date indicates the two effects are similar in size.[33]

Furthermore, the regulations largely transfer money among consumers served by each distribution network. In theory, if a network only served relatively poor consumers, transfers would be entirely between those consumers.

While that extreme situation does not hold, some networks do have much higher proportions of households in decile 10 meshblocks than others, as shown in Figure 12. Thus, in the Eastern Bay of Plenty, the low fixed charge regulations are likely to result in money being transferred from one set of predominantly poorer consumers to another set of predominantly poorer consumers.

[33] This assessment is based on an estimate of the benefit or cost of the regulations for each consumer in decile 10 meshblocks according to their usage and prevailing tariff option. It includes the costs of being on the 'wrong' type of tariff plan as discussed later. We intend to undertake further analysis on the net impact of the regulations.

Figure 12: Proportions of consumers in decile 10 meshblocks in each network[34]

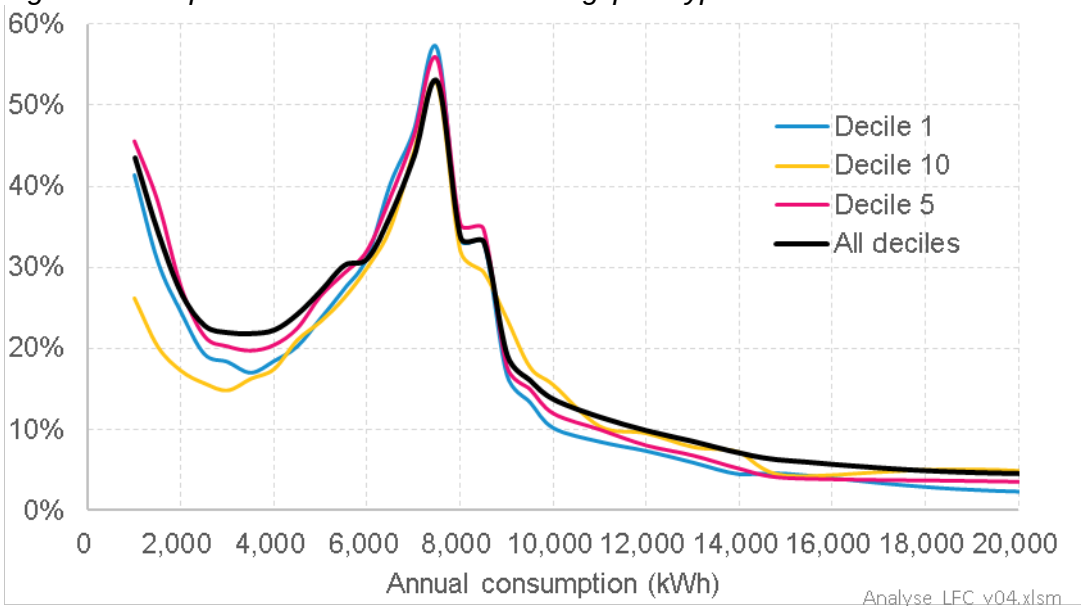


Effect of being on the 'wrong' type of tariff plan

We also used the data to examine the proportion of consumers on the wrong type of tariff plan – i.e. those with relatively low annual usage on a standard plan, and those with higher annual usage on a low fixed charge plan.[35] The results are summarised in Figure 13.

[34] Proportions are estimated from data provided by retailers.
[35] Based on comparing the estimated annual consumption for each consumer with the relevant low user threshold in their region.

Figure 13: Proportion of consumers on 'wrong' plan type



A sizeable proportion of consumers appear to be on the wrong type of plan. Some of these instances may not be 'wrong' in practice as they reflect factors not reported in the billing data. For example, some households with low use on a standard tariff may be holiday homes, which do not qualify for a low fixed charge tariff. We suspect this explains why many accounts with usage below 3,000 kWh appear to be on the wrong tariff.

The visible 'hump' slightly below 8,000 kWh probably reflects situations where consumers have annual usage close to the threshold between low usage and standard usage but haven't decided to switch to a low-user plan (or haven't been moved by their retailer onto a low-user plan). For consumers with usage close to the low-user threshold, small variations in usage can move them into the wrong type of plan – but because their usage is close to the threshold the effect on their annual bill would be relatively small.

Having said that, neither factor fully explains the 'tails' at either end of the distribution, where the additional cost to a consumer of the being on the wrong plan type will be much larger. In particular, around 23 per cent of consumers with usage well below the low fixed charge threshold are on a standard tariff option. Some of these may be holiday homes (which don't qualify for a low fixed charge plan). However, this is unlikely to fully explain the 17 per cent of households in decile 10 meshblocks (which are less likely to be holiday homes) that have low usage and are on a standard tariff option. At the other end of the usage spectrum, some households with relatively high usage are on low fixed charge plans. This will appreciably increase their bills.

It is not clear why so many households – at both ends of the deprivation and usage spectrums – are on the wrong tariff options. Especially as retailers must notify consumers at least annually of their consumption, and the potential benefits of being on a low fixed charge plan. It is possible that consumer inertia, or fear of making the wrong decision, accounts for some of the apparent misallocations. It is possible those consumers who have chosen a low-fixed charge tariff but have consumption higher than the threshold may have been confused and made the wrong choice. This possibility is strengthened by the large number of plans offered – many hundreds in some network areas, and over 14,000 in total for the country.

We have also estimated the additional revenue collected by retailers due to consumers being on the wrong type of tariff plan. This amounts to approximately $40 million per year inclusive of GST.[36]

In addition, in some instances where consumers are on the wrong plan for their consumption, the data appears to indicate retailers have paid distribution charges based on the right type of plan. This would net retailers a further $7 million in reduced costs. However, offsetting these situations, we identified instances where the consumer was on the right retail plan type but the retailer appears to have paid distribution charges on the wrong plan type, raising retailers' costs by around $8 million.

The net impact of these effects is estimated to raise retailer revenues (and hence prices) by up to $39 million. In theory, retailers may have anticipated the proportions of different-sized consumers who would be on the wrong type of plan when setting their prices. If that were the case, the principal impact would be to alter the allocation of charges among consumers, with no net gain to retailers. However, given the complexity of the interactions, we doubt such effects could be fully anticipated. It seems more likely there is some net increase in charges for consumers.

The analysis also raises a question about whether the low fixed charge regulations are contributing to increased pricing complexity – and in turn making it harder for consumers to shop around.

In conclusion, the analysis shows some consumers benefit from the low fixed charge regulations while others are harmed, but the regulations are not particularly effective at providing assistance to the most deprived households. Furthermore, the regulations have some unintended consequences – increasing pricing complexity and confusion, and likely raising average prices for consumers.

[36] This calculation is based on the observed proportion of consumers on the wrong plans, and excludes a substantial proportion with usage below 3,000 kWh/year, many of which are assumed to be holiday homes. The analysis assumes most consumers with observed usage above 3,000 kWh/year are not holiday homes.

Appendix A. Scope of data request and caveats

Data request

Retailers were asked to provide billing data for all residential and business consumers they supplied between March 2016 to April 2018 who had an estimated annual usage below 50,000 kWh/year. The data sought included:

- Power usage and meter configuration data – quantities of electricity supplied in the billing period for each metering category (uncontrolled, controlled usage etc).
- Power charges – charges associated with the 'vanilla' supply of electricity and assuming the consumer pays by the due date. The power charge data included fixed (c/day) and variable charges (c/kWh and/or c/kW). The power charge data was intended to reflect the retailer's prevailing offered standard rates (including fixed term contracts) and exclude any marketing rewards (see below). However, in some cases, retailers were not able to readily provide data which excluded such discounts, and they were embedded in the power charge data.
- Prompt payment discount (PPD) lost – a debit to reflect the amount added to 'power charges' where a consumer does not receive the full PPD.
- Marketing rewards – credits (net of contract break fees) applied to bills which are discretionary for the supplier. For example, these include acquisition (such as 'friend get friend'), retention or win-back discounts where these were applied in the form of a credit. As noted above, marketing benefits exclude any financial reward provided in the form of a lower power charge to acquire or retain a consumer. Nor does it include any benefit from a higher rate of PPD offered to retain or acquire a consumer. It also excludes non-monetary rewards, such as loyalty scheme "points" or concessionary prices for household appliances.
- Payment channel charges/discounts – debits or credits directly related to the form of payment/billing used by the consumer. For example, some retailers applied a discount for bills paid by direct debit, and some charged a fee for paying bills at NZ Post shops. In some cases, retailers offer payment discounts in the form of an increased prompt-payment discount. In these cases, the effect of these discounts is captured within the power charge in our analysis because they reduce the pay-on-time charge.
- Debt charges – debits directly related to the collection of overdue payments. For example, retailers may charge fees for using a collection agent, or apply a disconnection fee where power is cut-off for previous non-payment. Some retailers provided data which allows such explicit debt-related charges to be identified (e.g. separately identifying a disconnection fee relating to debt issues rather than disconnection due to a property becoming vacant). Other retailers didn't provide the data in a form which allowed for such distinctions (e.g. a generic 'disconnection' charge without differentiating by cause).
- Special service charges – debits or credits for services which are electricity

related, but not part of the 'vanilla' service. For example, retailers may have charged for out-of-cycle meter reads, or paid for power exported from a consumers' solar panel onto the distribution network.

- Meshblock codes – to allow consumer records to be matched to a socio-economic indicator.

Caveats to bear in mind

A range of caveats apply to the analysis. These include:

- A range of cross-checks were performed to test the data provided by retailers. For example, total charges and customer numbers were compared to public sources – and data was compared across retailers. Where specific integrity issues were identified (such as incomplete or duplicated records), these were followed up with retailers. Where it was not possible to obtain 'clean' data, such records were excluded from the analysis. This reduced the sample size, but the remaining set still constitutes millions of records. In addition, although cross-checks and cleaning of data was undertaken, the data provided to the review has not been subject to an audit to original sources within retailer billing systems.

- Filtering of the 'clean' data was necessary in some cases. For example, records for The Lines Company network area were excluded from some aspects of the pricing analysis because this data does not include any network cost recovery, unlike records for all other network areas.

- Retailers were asked to provide data for residential users and small businesses with estimated annual consumption below 50,000 kWh/year. The review used the ANZSIC codes supplied with the data as the primary means to exclude businesses from the residential data. Nonetheless, some further filtering was applied to residential data to exclude records with annual usage below 1,000 kWh or above 20,000 kWh, as they appear less likely to reflect households.

- Where customers had more than one property with a retailer, the properties were excluded from the analysis. This is because retailers can apply discounts or fees to customers, rather than for provision of electricity services at specific properties, and we have no reliable way to consistently apportion such discounts or fees for these cases.

- The raw dataset represents approximately 1.7 million residential consumers. After applying the filters (described above), this reduced the set to represent approximately 1.3 million consumers. As a point of comparison, Electricity Authority data indicates there are approximately 1.8 million residential installation control points in New Zealand.[37] Although a substantial number of records were excluded due to filtering, we are not aware of any reason to believe this introduced a specific bias. Indeed, comparing information from the remaining records (such as average total bill) with public data (from MBIE), indicates the records are reasonably representative.

- Individual charges and discounts were allocated to the categories based on

[37] See www.emi.ea.govt.nz.

the billing information supplied by retailers. In many cases this was straightforward (such as fixed daily charges), but for others a degree of judgement was required – for example a one-off credit on a consumer's bill labelled 'Friend get Friend' was treated as a marketing reward.

- Retailers' practices and systems differ in the way they treat some issues. For example, some retailers offer retention rewards in the form of a lump sum credit, whereas others provide a reward via a reduced power charge. It was not possible to convert all underlying data to a consistent format. Instead, where specific issues have been identified, they are noted in the analysis.

- Non-monetary factors are excluded from the analysis. For example, rewards such as FlyBuys are not included because we have no data on their monetary value. Similarly, the analysis does not account for any differences in service quality among retailers – such as call answering times. However, we note also that the underlying service (power supply) is fairly homogeneous.

- Plans linked to spot prices were generally excluded from the analysis of pricing dispersion as these types of plans are not directly comparable with conventional plans. However, data for these plans was included in analysis on the effect of low fixed charge tariffs.

- Meshblock data was not available for some consumer records due to difficulties retailers had in matching data, or because supplying the data could raise privacy issues (particularly where meshblocks have very few households). Nonetheless, meshblock data was provided for approximately 80 per cent of consumer records providing an extensive data set for analysis.

- Some energy trusts make distributions to their beneficiaries through electricity retailers. Where these are annual or periodic payments, they have been excluded from the analysis as they are made by retailers on behalf of a third party.

- Where data was provided on fees for 'non-standard' services – e.g. in relation to vacant property disconnection this was excluded from the analysis.

Appendix B. Description of price dispersion analysis

The price dispersion analysis seeks to ensure that bill comparisons are made on a 'like for like' basis across consumers. In particular, it seeks to account for factors other than a consumers' choice of price plan which can affect price dispersion. These include the amount of electricity used by consumers, whether they pay late or on time, the distribution network where they live, and whether they have controlled load and an associated metering configuration.[38]

To address these issues, the analysis proceeded with the following steps:

- Determine the effective rates for the fixed and variable 'power' charges applying to each consumer if they pay on time:
    - fixed daily charge = the total fixed component divided by the number of days in the billing period, and
    - variable tariff = total variable charges divided by total usage – with such calculations being specific to each meter register (e.g. if a consumer has a controlled and an uncontrolled meter register, a unique variable tariff would be calculated for each register type).
- To ensure consistency, these calculations:
    - Exclude: payment-related charges or discounts such as fees for paying at NZ Post shops, one-off marketing rewards, and debt-related charges.
    - Include any prompt-payment discounts – irrespective of whether or not the individual consumers did pay before the due date. I.e. they are 'pay-on-time' rates.
    - Use data from bills in January 2018 to create a snapshot of rates at a moment in time.[39]
- Calculate the annual bill each consumer would pay on these effective charges if their usage was at the observed average level for consumers of their 'type' – where 'type' means they are served by the same network, have the same meter configuration, and are a 'low user' or 'standard user'. This latter categorisation was made based on whether their annualised consumption was above or below the low-fixed charge threshold applicable to their network area.
- For example, low-fixed charge tariffs for consumers in the Wellington Electricity network area with an 'Inclusive' meter configuration would be evaluated on the observed average consumption for all consumers of that type (i.e. in that network area, with that meter configuration, and whose annualised consumption was less than the 8,000 kWh low-fixed charge threshold). Likewise, the equivalent standard tariffs would be evaluated on the observed average consumption for all consumers of that type (i.e. whose annualised consumption was greater than the 8,000 kWh low-fixed charge threshold). Nationally, the average consumption was approximately

[38] Typically, consumers without a controlled hot-water cylinder will have a single 'Uncontrolled' meter. If they have a hot-water cylinder they may additionally have a second 'Controlled' meter and associated rate, or they will have a single meter with a so-called 'Inclusive' rate that is different to the 'Uncontrolled' rate. Other common variants include having two separate meters that each record 'Day' and 'Night' consumption, and with different associated rates. Each network area will tend to have common meter configurations that the vast majority of residential consumers in that area tend to have, and our analysis has focussed on these most common meter configurations.

[39] These rates were cross-checked with rates derived for the full period.

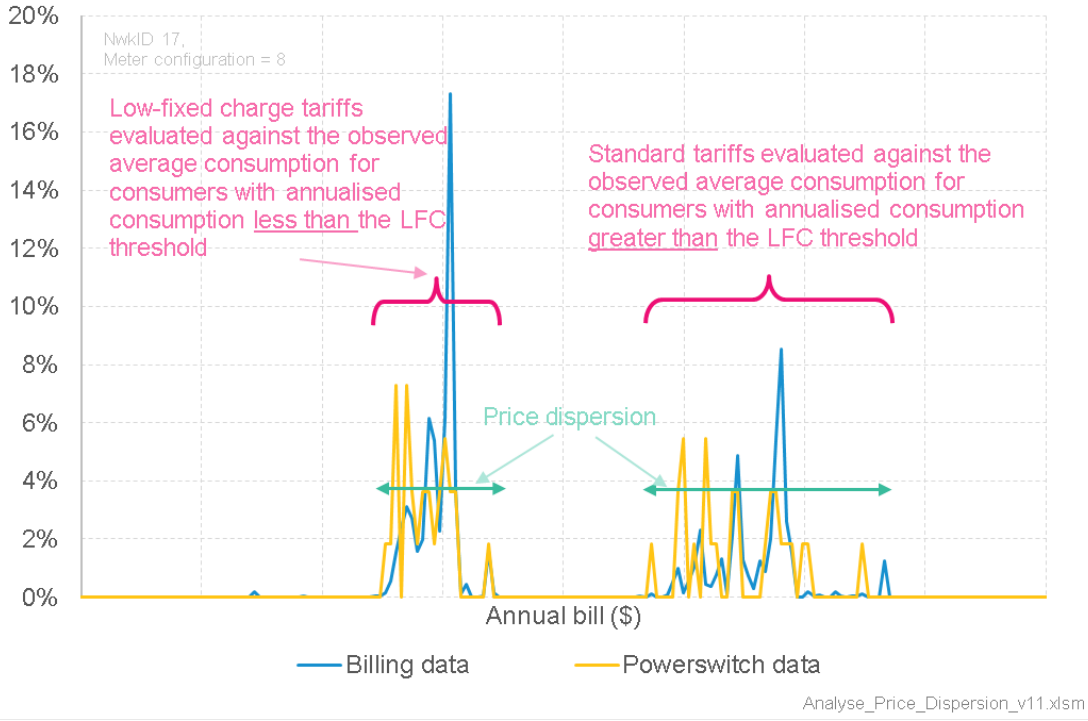
5,000 kWh for consumers with annualised consumption less than the LFC threshold, and approximately 11,000 kWh for consumers with annualised consumption greater than the LFC threshold[40] We note data for the southern part of Vector's network was excluded from the pricing dispersion analysis due to uncertainty about the reliability of some metering configuration information.[41]

- Calculate the consumer-weighted average bill for each specific consumer type.
- Calculate the difference between the bill each individual consumer would pay and the consumer-weighted average for their type.

This approach accounts for the major differences in usage characteristics and provides a 'normalised' metric to facilitate comparisons.[42]

To test the validity of the approach, we compared the effective charges from the billing data with Powerswitch information for all networks. An example of a cross check is shown in Figure 14.[43]

Figure 14: Comparison of billing information and Powerswitch data



The chart shows the frequency distribution of annual bills (blue lines) for one meter-setup and distribution network, based on the application of the approach

[40] As set out in more detail in the main body of this paper, retailers are required to offer a low-fixed charge tariff option whose daily fixed charge cannot be greater than 30 cents (excluding GST and including PPD) and whose annual bill cannot be greater than the equivalent 'standard' tariff option for consumers whose annual consumption is at a particular 'threshold' – being 8,000 kWh for all areas except the lower South Island where the threshold is 9,000 kWh.

[41] This information is more important for analysis of price dispersion, but less significant for analysis of average price effects. For that reason, the data was used in other aspects of analysis discussed in this report.

[42] We excluded networks where there is within-network variation in network pricing (e.g. Rural / Urban pricing) as this will increase the observed variation in prices for reasons unrelated to choice of price plans by consumers.

[43] Some information has been redacted to protect confidential data.

described above. The left-hand cluster represents the consumer 'type' on low fixed charge plans, and the right-hand cluster the consumer 'type' on standard plans.

Focusing on the left-hand cluster, the blue spike shows a large proportion of consumers are on a plan which would result in a bill of around $1,500 if they had consumption equal to the average usage for their type. It also shows some consumers are on cheaper and more expensive plans. The yellow line shows the average bills based on Powerswitch tariffs as at January 2018. In this case, the frequency distribution reflects the number of plans shown by Powerswitch, rather than consumer numbers.

In general, the clusters calculated from the billing data coincide with the Powerswitch data. The chart also indicates two small 'anomalies'. For the low fixed charge cluster, the billing data shows a small number of records with annual bills well below the level expected from Powerswitch data. While these observations are in the billing data, they are likely to be outliers. As discussed in the main body of this paper, to address such instances we used the 5th and 10th percentiles to characterise price dispersion, rather than the absolute lowest level of observed charges.[44]

Similarly, in the cluster for the standard plans, there is a small blue spike above the level of charges indicated by Powerswitch data. This is likely to reflect a historic price plan that continued to apply to existing consumers, but was no longer being offered to new consumers in January 2018.

More generally, Figure 14 illustrates the effect of price dispersion. This is lower for the low-fixed charge plans than the standard plans. This is probably due to the much lower consumption against which low-fixed charge plans were evaluated. Put another way, both sets of charges have similar levels of dispersion in relative terms.

[44] There is a trade-off between filtering specific records from the data, and applying a generic xth percentile threshold for price comparisons. In broad terms, additional filtering of data would imply a lower threshold and vice versa. This is an issue which we plan to examine further.