



Residential electricity tariff analyses

Excerpt only – further details available upon request

John Gardner, Lachlan O’Neil and Adam Berry

May 2018

Report precis

The work here leverages real-world energy and demographic data collected through surveying conducted by CSIRO as part of the Energy Use Data Model (EUDM) project, and connects it with tariff data from five retailers and one network distribution business to estimate retail bills and underlying network charges for a cohort of 1,047 Victorian households. Though findings should be viewed as indicative, rather than representative, given the bias in the sample set, there is sufficient diversity in the data to explore retail and network charges through the distinct lenses of load shape, total energy consumption, vulnerability and solar uptake. Note that the sample is particularly biased towards older home owners and that there is a markedly higher uptake of solar PV in the sample than is seen generally in Victoria. No correction for sample bias is undertaken.

A number of key findings emerge from the study:

- Whether examining the complete cohort or specific consumer sub-sets¹, tariff structure consistently has no significant impact on typical retail price². Where tariff structure choice is meaningful, a flat structure is marginally cheaper³. That is to say that the choice of tariff structure is generally largely immaterial and, when it is not, there is typically no gain in moving away from traditional flat-rate tariffs. Indeed, as shown in Table 1 and Table 2, moving from flat to flexible or demand standing tariffs⁴ typically results in a minor bill increase (of around 2%). Even if a consumer moves from the worst offer presented by a retailer to the offer that serves them best (Table 3), savings are typically between 4% and 8% (depending on retailer).
- Though, in general, the choice of retail tariff structure on average has a minor bearing on cost, individual consumers may still be materially affected. Moving from flat-rate tariffs to demand tariffs sees impacts on individual households range from a 40% bill increase to a 15% bill decrease, while moving to a flexible tariff sees impacts on specific households for one retailer range from a 34% bill increase to a 28% bill decrease (see Table 1 and Table 2).
- While the absolute cost of bills is similar (see Table 4 and Table 5), potentially vulnerable low income households in the sample would typically spend a significantly higher proportion of their estimated household income on retail electricity bills than less vulnerable consumers (see Figure 1 and Figure 2). For such low income households, the average estimated spend as a proportion of approximate household income would be three-and-a-half times more than less vulnerable households in the sample.
- At a retail level, choice of tariff structure has no significant impact on bills for low income vulnerable consumers or for consumers who would spend a large proportion of their

¹ Consumers were sub-divided according to load shape, annual consumption, presence of solar panels, presence of gas, or vulnerability.

² Note that this study considers a range of standing flat, flexible and demand tariff structures and market flat and flexible offers currently available to residents of Altona Meadows, in suburban Melbourne. It does not consider alternative, theoretical or proposed tariff structures. No behaviour change due to tariff adoption is modelled.

³ The only meaningful exception found was for those consumers with controlled (off-peak) loads, where flexible tariffs are marginally preferred.

⁴ It is worth noting that, due to a lack of relevant market offers, for demand tariffs, only standing offers have been considered in this report.

household income on electricity (see Table 4 and Table 5). At a network level, however, demand charges are statistically significantly higher for such consumers (see Table 6 and Table 7). For consumers in the sample spending a large proportion of their income on electricity, flexible network tariffs are also significantly less expensive (see Table 6).

- Consumers stand to benefit significantly in moving from standing offers to market offers (see Table 8). On average, choosing the market offer would save consumers in the survey sample \$527 per year.
- Exploring estimated network charges across respondent segments grouped by solar uptake, load shape, vulnerability and annual energy consumption, current demand structures are consistently significantly more expensive than alternative structures, with the demand structure only being preferable to flat and flexible structures for highly consuming high income households.
- Retail and underlying network tariffs are very highly correlated across retailers (see Table 9), indicating that network tariff structures are generally passed through in retail tariffs. Note, however, that this relationship is weaker for demand tariffs. In particular, while network demand charges are frequently significantly more expensive than alternative structures, that trend is rarely seen at the retail level.
- Future work with an expanded dataset would allow for more nuanced analyses, ideally across a national frame. Further data would support an examination of the relative impacts of individual demographic, environmental and household factors on energy bills, better tease out the impact of gas on electricity bills, and provide a robust (and more representative) basis for designing and testing tariff structures that best drive effective residential behaviour change while minimising consumer impact.

Table 1. Typical estimated bill reduction in moving from standing flat tariffs to standing flexible tariffs (negative numbers represent a bill increase).

	Retailer A	Retailer B	Retailer C	Retailer D	Retailer E
Mean	-0.4%	-4.7%	-3.4%	-1.7%	-0.6%
Median	-1.2%	-6.2%	-4.0%	-2.7%	-1.3%
Std. Deviation	3.1%	6.8%	5.5%	4.3%	2.7%
Minimum	-8.7%	-34.0%	-16.9%	-14.8%	-7.2%
Maximum	16.6%	28.0%	22.8%	21.1%	14.0%

Table 2. Typical estimated bill reduction in moving from standing flat tariffs to standing demand tariffs (negative numbers represent a bill *increase*).

	Retailer A	Retailer B	Retailer C	Retailer D	Retailer E
Mean	-0.1%	-4.4%	-0.7%	-3.9%	0.2%
Median	0.4%	-3.8%	-0.3%	-3.4%	0.5%
Std. Deviation	5.8%	4.9%	4.5%	5.5%	4.0%
Minimum	-33.3%	-39.5%	-33.0%	-40.1%	-21.2%
Maximum	15.4%	7.0%	10.4%	9.6%	11.0%

Table 3. Typical estimated savings associated with moving from highest cost to lowest cost tariff within each retailer (calculated for standing offers only).

	Retailer A	Retailer B	Retailer C	Retailer D	Retailer E
Mean	5.1%	7.6%	6.6%	6.1%	4.0%
Median	4.5%	7.2%	6.1%	5.4%	3.7%
Std. Deviation	3.1%	3.7%	3.5%	3.5%	2.3%
Minimum	0.1%	0.1%	0.1%	0.4%	0.1%
Maximum	25.0%	28.3%	24.8%	28.6%	17.5%

Table 4. Typical annual electricity bill by electricity bill affordability* for households.

Affordability	Offer	Tariff	Mean bill	Median bill	Std. Deviation
Vulnerable	Market	Flat	\$1,496	\$1,265	\$758
		Flexible	\$1,491	\$1,281	\$722
		Total	\$1,493	\$1,271	\$740
	Standing	Demand	\$2,088	\$1,783	\$1,072
		Flat	\$2,123	\$1,798	\$1,147
		Flexible	\$2,106	\$1,795	\$1,072
		Total	\$2,106	\$1,794	\$1,104
Less Vulnerable	Market	Flat	\$1,245	\$1,072	\$734
		Flexible	\$1,260	\$1,102	\$734
		Total	\$1,245	\$1,087	\$734
	Standing	Demand	\$1,748	\$1,515	\$1,020
		Flat	\$1,736	\$1,522	\$1,089
		Flexible	\$1,772	\$1,481	\$1,088
		Total	\$1,752	\$1,508	\$1,066

*Households are considered to be vulnerable under the affordability metric if their estimated mean electricity bill is at least 4.34% of their household income

Table 5. Typical annual electricity bill by household situation*.

Household situation	Offer	Tariff	Mean bill	Median bill	Std. Deviation
Vulnerable	Market	Flat	\$1,063	\$948	\$492
		Flexible	\$1,077	\$969	\$470
		Total	\$1,070	\$957	\$481
	Standing	Demand	\$1,481	\$1,320	\$687
		Flat	\$1,475	\$1,294	\$738
		Flexible	\$1,486	\$1,319	\$705
		Total	\$1,481	\$1,314	\$710
Less Vulnerable	Market	Flat	\$1,337	\$1,164	\$788
		Flexible	\$1,363	\$1,196	\$782
		Total	\$1,350	\$1,181	\$785
	Standing	Demand	\$1,900	\$1,655	\$1,095
		Flat	\$1,897	\$1,628	\$1,173
		Flexible	\$1,926	\$1,668	\$1,160
		Total	\$1,908	\$1,651	\$1,143

*Households are considered to be vulnerable under the household situation metric if they are very low income, a low income renter, a low income household with a large number of occupants, a low income household in an apartment, or a low income household with at least one old age occupant.

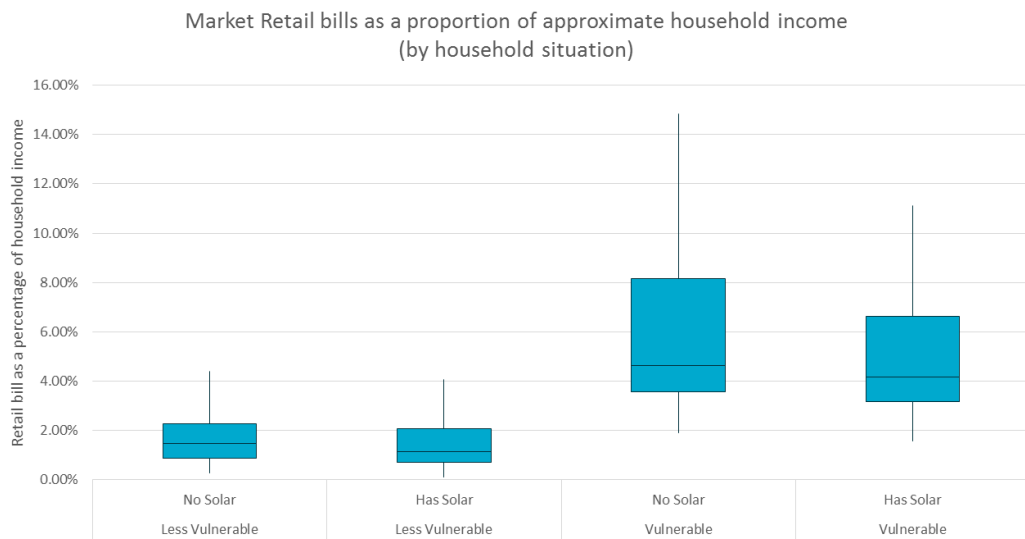


Figure 1. Distribution of estimated (market offer) retail bills as a proportion of household income for consumers in different household situations.

Households are considered to be vulnerable under the household situation metric if they are very low income, a low income renter, a low income household with a large number of occupants, a low income household in an apartment, or a low income household with at least one old age occupant.

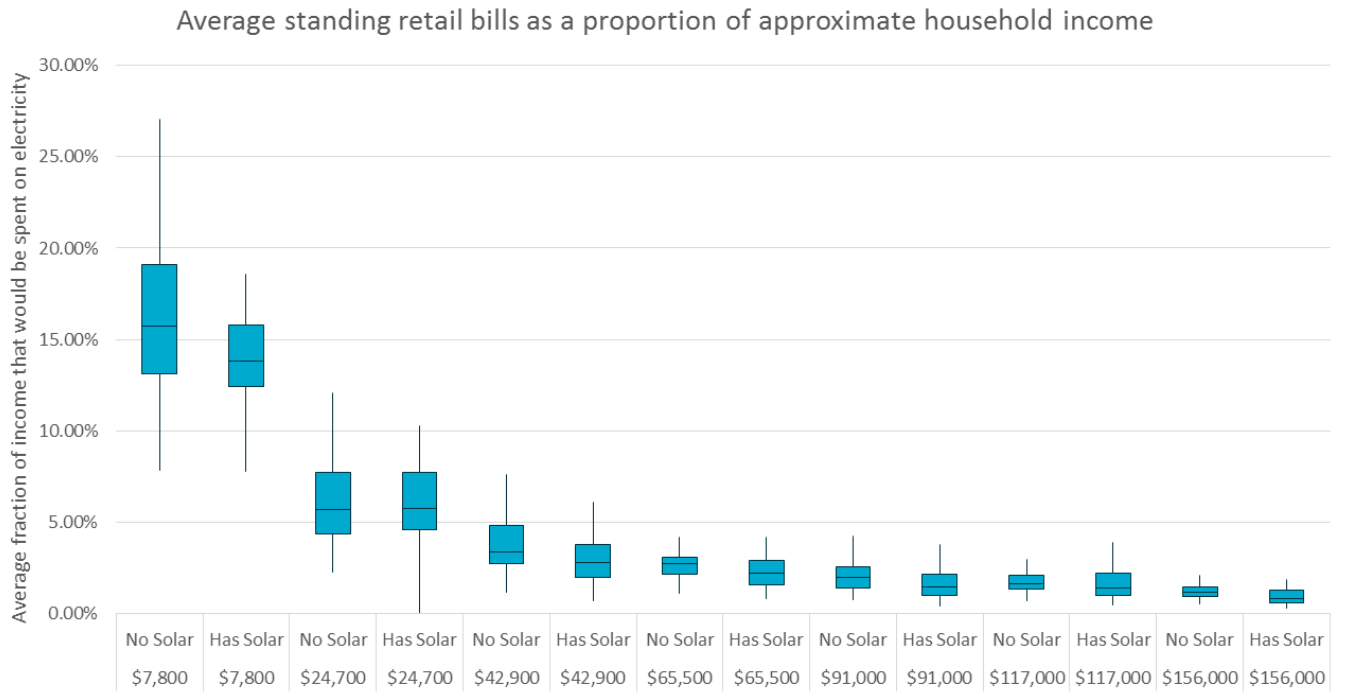


Figure 2. Distribution of average retail bills as a proportion of household income (shown per income bracket and for standing offers only). Centre values of each income bracket are reported.

Table 6. Estimated network charges for vulnerable and less-vulnerable consumer classes according to the affordability metric*.

Affordability	Network Tariff Type	Avg. Yearly Cost	Median Yearly Cost	Std. dev. of Yearly Cost
Less Vulnerable	Demand	\$475	\$434	\$213
	Flat Rate	\$434	\$372	\$250
	Flexible	\$442	\$385	\$246
Vulnerable	Demand	\$523	\$460	\$233
	Flat Rate	\$521	\$453	\$272
	Flexible	\$499	\$432	\$242

*Households are considered to be vulnerable under the affordability metric if their estimated mean electricity bill is at least 4.34% of their household income

Table 7. Estimated network charges for vulnerable and less-vulnerable consumer classes according to the household situation metric*.

Household situation	Network Tariff Type	Avg. Yearly Cost	Median Yearly Cost	Std. dev. of Yearly Cost
Less Vulnerable	Demand	\$507	\$458	\$227
	Flat Rate	\$473	\$408	\$270
	Flexible	\$476	\$413	\$260
Vulnerable	Demand	\$396	\$368	\$151
	Flat Rate	\$368	\$324	\$171
	Flexible	\$364	\$328	\$156

*Households are considered to be vulnerable under the household situation metric if they are very low income, a low income renter, a low income household with a large number of occupants, a low income household in an apartment, or a low income household with at least one old age occupant.

Table 8. Typical annual electricity bills for the sample population.

Tariff Offer	Mean	Std. Deviation
Market Flat	\$1,281	\$746
Market Flexible	\$1,304	\$738
Standing Flat	\$1,810	\$1,111
Standing Flexible	\$1,836	\$1,097
Standing Demand	\$1,814	\$1,039
Overall	\$1,609	\$995

Table 9. Correlation (coefficient of determination) between retail bill and network charge across retailers.

Offer	Tariff	Retailer A	Retailer B	Retailer C	Retailer D	Retailer E
Market	Flat	0.987	0.978	0.977	0.986	0.985
	Flexible	0.982	0.977	0.981	0.985	0.981
	Total	0.985	0.976	0.977	0.985	0.983
Standing	Demand	0.964	0.963	0.963	0.966	0.963
	Flat	0.992	0.993	0.99	0.993	0.994
	Flexible	0.986	0.991	0.99	0.99	0.987
	Total	0.979	0.98	0.977	0.982	0.979

Table 10. Typical annual network bills for the sample population.

Tariff Offer	Mean	Median	Std. Deviation
Flat	\$451	\$387	\$257
Flexible	\$453	\$393	\$246
Demand	\$484	\$439	\$218
Overall	\$458	\$401	\$246

CONTACT US

t 1300 363 400

+61 3 9545 2176

e csiroenquiries@csiro.au

w www.csiro.au

AT CSIRO, WE DO THE
EXTRAORDINARY EVERY DAY

We innovate for tomorrow and help improve today – for our customers, all Australians and the world.

Our innovations contribute billions of dollars to the Australian economy every year. As the largest patent holder in the nation, our vast wealth of intellectual property has led to more than 150 spin-off companies.

With more than 5,000 experts and a burning desire to get things done, we are Australia's catalyst for innovation.

CSIRO. WE IMAGINE. WE COLLABORATE.
WE INNOVATE.