

How low income households use electricity

Discussion paper

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January 2018

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INTRODUCTION

The cost to households of the electricity they use has been a sensitive political issue in Australia for at least the past six or seven years, and seems certain to remain so. That was certainly the case in 2010-11 when the then Labor government was negotiating passage of its package of carbon pricing/emissions trading legislation, which subsequently came into force on 1 July 2012. The government provided additional funds to the Australian Bureau of Statistics (ABS) to undertake a national survey of household income, housing and energy use (ABS 2013*a*, 2013*b*).

This survey was the first, and remains the only, large scale, national survey of households to make a simultaneous collection of information from households about their disposable income, housing circumstances, household composition, energy consumption, energy expenditure, and energy using characteristics. As such it is potentially a very valuable resource for understanding the relationship between household income, energy use, and energy expenditure, and for assessing, at least in qualitative terms, the vulnerability of low income households to further electricity price increases.

This report presents the results of an analysis of the confidentialised unit record file (CURF) data from the survey. The emphasis of the analysis, and of the discussion of results, is on lower income households.

SURVEY DESIGN AND ADMINISTRATION

All survey results presented by the ABS are based on a final sample of 11,978 households, carefully stratified to be representative of the total population. The survey fieldwork was undertaken in four “waves”, one in each quarter of calendar year 2012. This was a deliberate strategy, designed to ensure that the energy consumption and expenditure data collected was, in total, representative of the whole year.

This is important, because household consumption of electricity is typically higher during the winter and summer months than in the months between. For those households that use gas, consumption of gas is typically highest in winter and lowest in summer. Consumption and expenditure data collected were taken from the most recent bill received. Given that residential consumers are billed quarterly for both electricity and gas, this means that, in theory, the first data collected by the survey may cover the period from about mid July to mid October 2011, while the last may be for the period from mid September to mid December 2012. However, if the dates of bills included in the survey results are distributed uniformly across this period, bills from each of the twelve months in a year will be included in the data collected in three

of the four collection waves. Consequently, average annual electricity consumption values for the whole sample surveyed should provide an accurate estimate of the average for the total population.

Of the total sample of 11,978 households, 7,802 included a value in the electricity consumption field. It is this subset of unit records which are the subject of this report.

HOW REPRESENTATIVE ARE THE SURVEY RESULTS?

If policy-relevant conclusions are to be drawn from the survey results, it is essential that the survey sample be representative of the populations as a whole. This can be determined by comparing average characteristics of the sample with those of the population, where population wide data on relevant characteristics is available. This comparison has been undertaken for household electricity consumption, household income, household composition, and housing structure and tenure. The comparison was done at the state level.

Electricity consumption

The survey estimates of average annual household electricity consumption were calculated by multiplying the mean weekly household consumption for each state by 52. In Table 1, these estimates are compared with two independent and authoritative sources of similar data.

The column headed “AER RIN submissions” is calculated from annual data on total residential electricity consumption and total residential customer numbers in each state published by the Australian Energy Regulator (AER). The data are provided to the AER by each distribution network business in the NEM, i.e. excluding WA and the NT, in response to Regulatory Information Notices (RIN) issued by the AER. In every state except Victoria distribution businesses report on a financial year basis, and the numbers shown are for 2011-12. Victorian businesses report on a calendar year basis and data are for 2012.

Table 1: Comparison of Survey average electricity consumption with independent estimates

State/Territory	Sample size	Average annual electricity consumption (kWh)		
		Survey	AER RIN submissions	<i>Electricity Gas Australia</i>
NSW	1,436	6,555	6,457	6,450
Victoria	1,378	5,473	5,168	5,214
Queensland	1,113	6,450	6,983	6,497
SA	1,249	5,897	5,489	5,652
Tasmania	772	8,507	8,408	8,671
WA	1,102	5,734	NA	5,696
NT	233	NOT ANALYSED		
ACT	515	NOT ANALYSED		

The column headed “*Electricity Gas Australia*” shows the sales of electricity to residential consumers per residential connection in 2011-12, as reported in *Electricity Gas Australia*, the annual statistical publication of the former Energy Supply Association of Australia (now the Australian Energy Council). Most of the data compiled and published in *Electricity Gas Australia* are sourced from electricity supply industry participants.

It will be seen that for NSW, Victoria, SA and WA the average consumption values obtained by the survey are somewhat higher than values reported by the other two sources. This is to be expected. Both AER RIN and *Electricity Gas Australia* figures are calculated by dividing total electricity supplied to residential customers by the number of such customers. The number of residential customers (usually termed connections by distribution businesses) includes connections to unoccupied (but not disconnected) dwellings and holiday homes, and so is higher than the number of occupied dwellings. Over recent years the proportion of unoccupied dwellings has averaged about 10% of the entire stock (.id, 2016). The share of unoccupied but connected stock will be smaller than this, but definitely above zero. Consequently, average electricity consumption per household as recorded in the survey should be higher than average consumption per connection, as indeed it is for four states. For Tasmania, the survey value is higher than the AER value, but not the significantly higher *Electricity Gas Australia* value. For Queensland Table 1 shows that the AER RIN value is much higher. Looking separately at the AER RIN data for the two Queensland electricity distribution businesses reveals that average residential consumption per connection for Energex is almost the same as that calculated from the survey for Queensland. Energex supplies electricity in south east Queensland, including Brisbane, the Gold Coast, the Sunshine Coast and the Toowoomba area. Ergon, which supplies all of the rest of the state,

reports very much higher consumption per residential connection. It is possible that consumers in the areas supplied by Ergon may be under-represented in the survey.

Overall, however, average household electricity consumption as estimated from the survey results aligns very closely with the comprehensive total reported by both of the reference sources. This means that the survey results accurately reflect household electricity consumption in each state, with the possible exception of Queensland households outside the south east area.

Disposable income

As previously noted, average household disposable income as estimated from the Survey varies quite widely between states. The figures are shown in Table 2, as are separate estimates per capita (not per household) gross household disposable income, extracted from State tables of the National Accounts. It can be seen that the relativities between states are roughly comparable, though the National Accounts estimates for WA and SA are higher, and the estimate for Victoria lower.

Table 2: Comparison of Survey average income with National Accounts estimates

State/Territory	Survey average weekly household disposable income	ABS average weekly per capita gross household disposable income in 2011-12
NSW	\$1,631	\$856
Victoria	\$1,504	\$757
Queensland	\$1,465	\$807
SA	\$1,348	\$767
Tasmania	\$1,261	\$701
WA	\$1,608	\$940
NT	NOT ANALYSED	
ACT	NOT ANALYSED	

Housing structure, housing tenure and household composition

The Survey included several questions about household composition and dwelling type which allow direct comparison with the whole population, as described by the 2011 Census. The relevant questions are:

- Housing tenure
- Dwelling structure

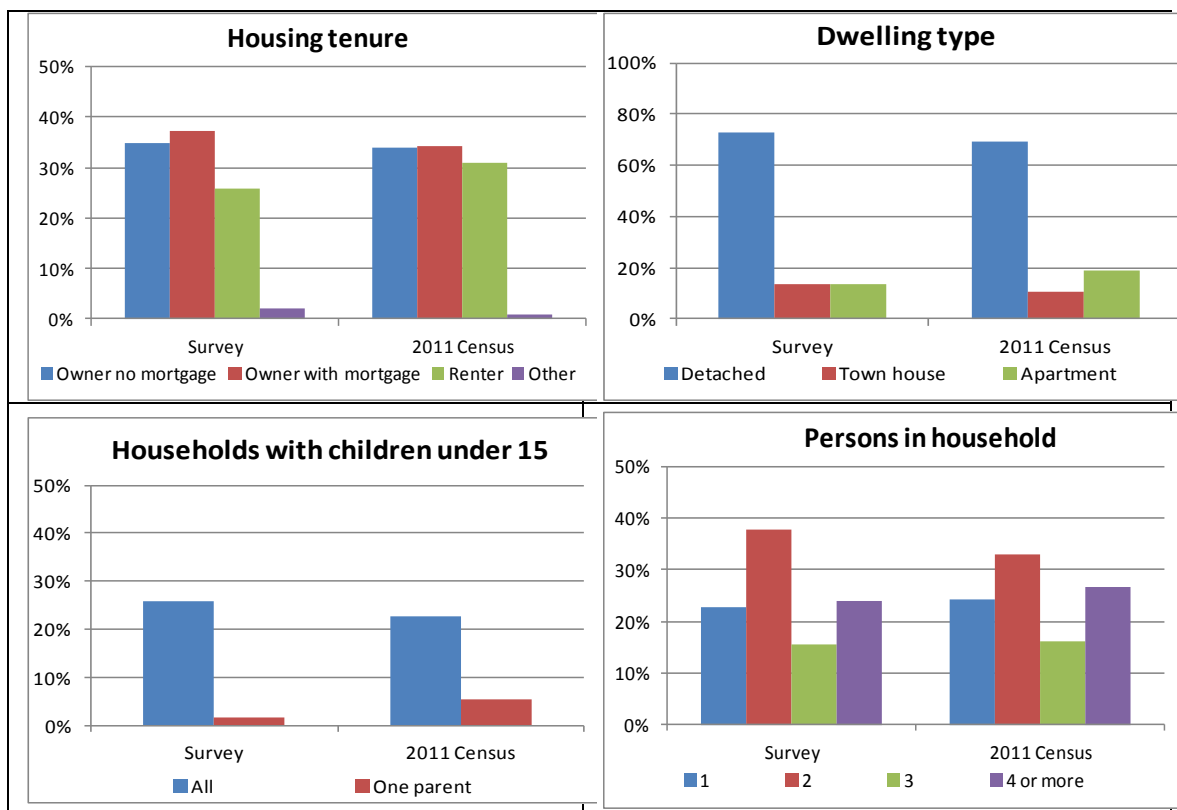
- Number of persons in household
- Number of households with children

Figure 2 compares the Survey sample for NSW with the 2011 Census on each of these characteristics.

For housing tenure, renters are somewhat under-represented in the sample, and, for dwelling type, apartments, are also under-represented. Given the practical realities of conducting a lengthy face to face survey, neither of these relatively modest differences is at all surprising. It is perhaps surprising that the sample contains a slightly higher proportion of households with children under 15 than the population as a whole. It is certainly not surprising that single parent households are under-represented. So far as the focus of this report is concerned, however, the under-representation of single parent households is unfortunate, because other data suggest that this group contains a particularly high proportion of households living in poverty.

These various qualifications notwithstanding, it is clear that, in terms of the characteristics examined here, the sample closely resembles the population as a whole. This should give confidence in the reliability and usefulness of conclusions that can be drawn from the analysis which follows.

Figure 1: Comparison between Survey and Census on key housing and household characteristics: NSW



The relationships between Survey and Census data for NSW, shown in Figure 1, are replicated across all the other states. Overall, the key differences are:

- Housing tenure: Owners with no mortgage slightly over-represented, renters slightly under-represented;
- Dwelling structure: Separate (detached) houses slightly over-represented, apartments under-represented (except in Queensland in both cases);
- Persons in household: Two person households slightly over-represented, four or more persons households slightly under-represented.
- Households with children: total households over-represented, single parent households under-represented.

Overall conclusion

In terms of the key characteristics examined, including electricity consumption, disposable income, household composition, dwelling type and housing tenure, the Survey sample is a good representation of the population as a whole in each of the six states. It is therefore reasonable to use the Survey results to draw conclusions about the population as a whole, both at the national level and at the level of individual states.

GENERAL APPROACH TO ANALYSING THE DATA

All analyses were undertaken on an individual state basis. This approach was adopted for two main reasons. Firstly, average household income varies significantly between states. The sample shows average weekly household disposable income ranging from \$1,631 in NSW to \$1,261 in Tasmania. If results from the whole survey sample were analysed together, NSW consumers would be heavily under-represented and Tasmanian consumers heavily over-represented in the lowest income quintile. The converse would apply to the highest income quintile. Secondly, states also vary significantly in terms of climate and access to alternative household energy sources, most particularly reticulated natural gas. Both of these factors have a strong influence on household electricity consumption and electricity-using behaviour.

The effects of climate and access to reticulated gas are in fact interrelated, because most Australian households are located in southern Australia where, on average, the two largest energy using functions are water heating and winter space heating. Electricity and reticulated natural gas are alternative sources of energy for both of these functions. *Prima facie*, therefore, it might be expected that connection to gas would have a significant effect on household electricity consumption. To put it

another way, all electric households would be expected to use more electricity than households which also use gas, all else being equal.

Comparing the six states on the basis of the proportion of households in the Survey sample using both electricity and gas, it was found that they fall into three groups. In Victoria and WA a high proportion of households in all five income quintiles use gas (more than 70% in all quintiles in Victoria and more than 50% in WA). NSW and SA are intermediate; more than 30% of households in all income quintiles use gas. In Queensland and Tasmania very few households use gas (less than 20% in all income quintiles in Queensland and less than 10% in Tasmania). The markedly higher average electricity consumption in Tasmania, seen in Figure 2, is consistent with the colder climate and lack of access to reticulated gas in that state.

Figure 2: Average daily electricity consumption for each state sub-sample



Average daily electricity consumption for each complete state sample is shown in Figure 2. No analysis has been undertaken for the NT and the ACT because the number of records is too small to give meaningful results.

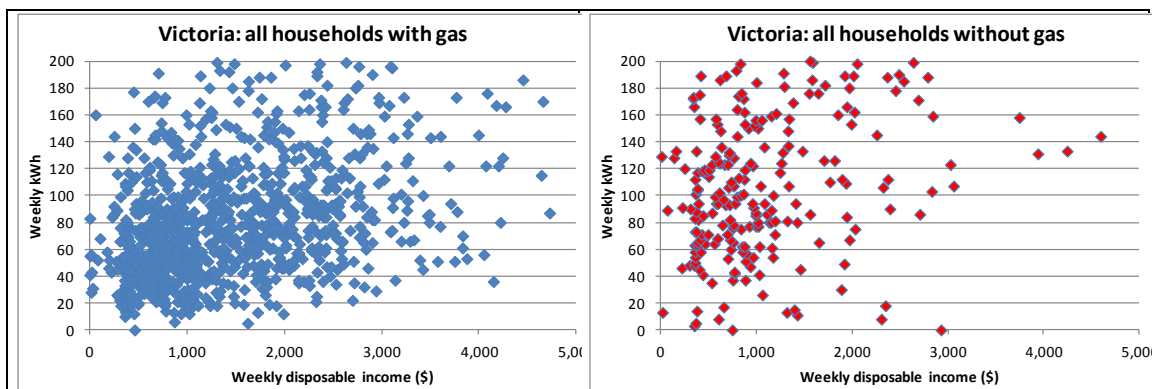
The Survey collected information about a number of factors which might be expected to have some influence on levels of household electricity consumption. Apart from disposable income, the factors included the following:

- Housing tenure (owner/occupier with no mortgage, owner/occupier with mortgage, tenant, other);
- Dwelling structure (separate/detached house, townhouse, low rise apartment, high rise apartment);
- Number of persons in household;
- Number of children under 15 in household;
- Main energy source used to heat dwelling (electricity, natural gas, LPG, wood, other, none);

- Other energy type(s) used (natural gas, LPG, wood, solar – electricity or hot water);
- Numbers and types of active cooling appliances used.

Electricity consumption varies between households across a very wide range. None of the factors listed above can, by itself, explain more than a very small fraction of the variation in electricity consumption between households. This will be seen clearly in the results presented in the rest of this paper. As an example, Figure 3 shows electricity consumption for the whole sample for Victoria split into two groups, according to whether or not the dwelling has a gas connection, and then plotted against household income. It is easy to see neither household income nor use of gas is in any way a good predictor of household electricity consumption, either alone or in combination. Similar results are obtained if consumption data are sorted against any of the other factors listed above.

Figure 3: Distribution of household electricity consumption with household income, for households in Victoria with and without a gas connection



All the results of the analysis presented in this report are based firstly, as already described, on separating the records by state and, secondly, on sorting individual records for each state into five income quintiles. Most of the remainder of this paper focuses on households in the two lowest income quintiles, i.e. the 40% of the households in each state with the lowest disposable income.

Before starting the examination of the results for lower income households, however, it is useful to explore several other ways of depicting the wide diversity of individual household electricity consumption, while simultaneously showing the relationship between income and electricity consumption within each of the five quintiles. The following three Figures show:

- average electricity consumption and average disposable income for each income quintile,
- curves for each quintile, plotting electricity consumption of each individual record within the quintile, from highest to lowest consumption, and

- for each income quintile, the number of individual records within each of a series of consumption ranges, from lowest to highest.

Each Figure shows results for a single state, as an example to illustrate the nature of the relationships found. Each analysis has been undertaken for all six states. The results found are in all cases similar in general form, though of course absolute values vary somewhat between states for the reasons already discussed. Complete results for all states are available in a Technical Appendix.

Figure 4: Average household income, electricity consumption and expenditure on electricity by income quintile, NSW

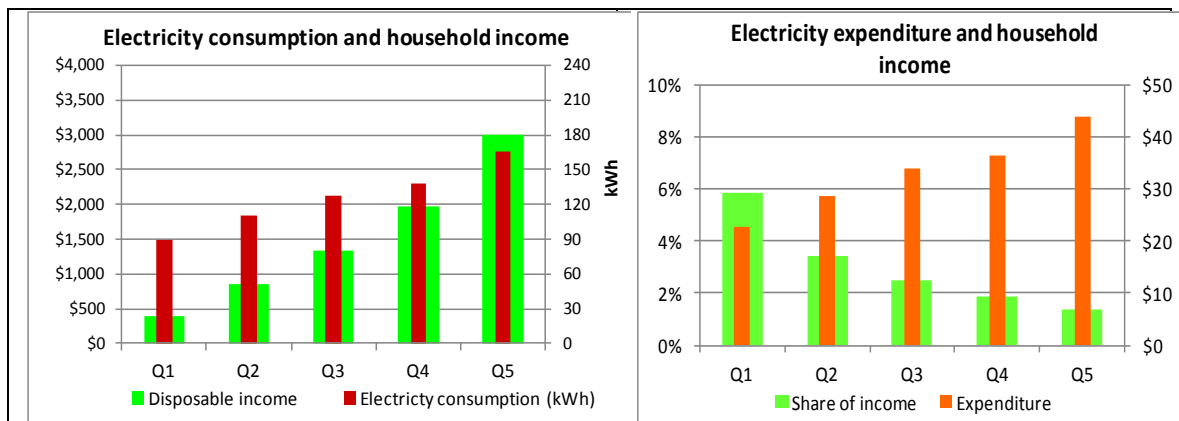


Figure 5: Electricity consumption by individual survey respondents, sorted by income quintile and ranked from highest to lowest consumption, NSW

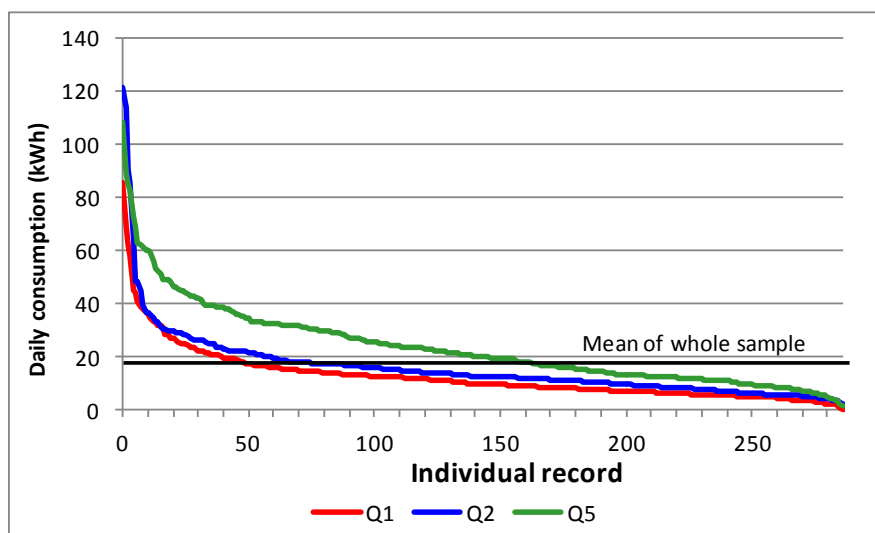


Figure 6: Electricity consumption by individual survey respondents, sorted by income quintile and ranked from highest to lowest consumption, Victoria

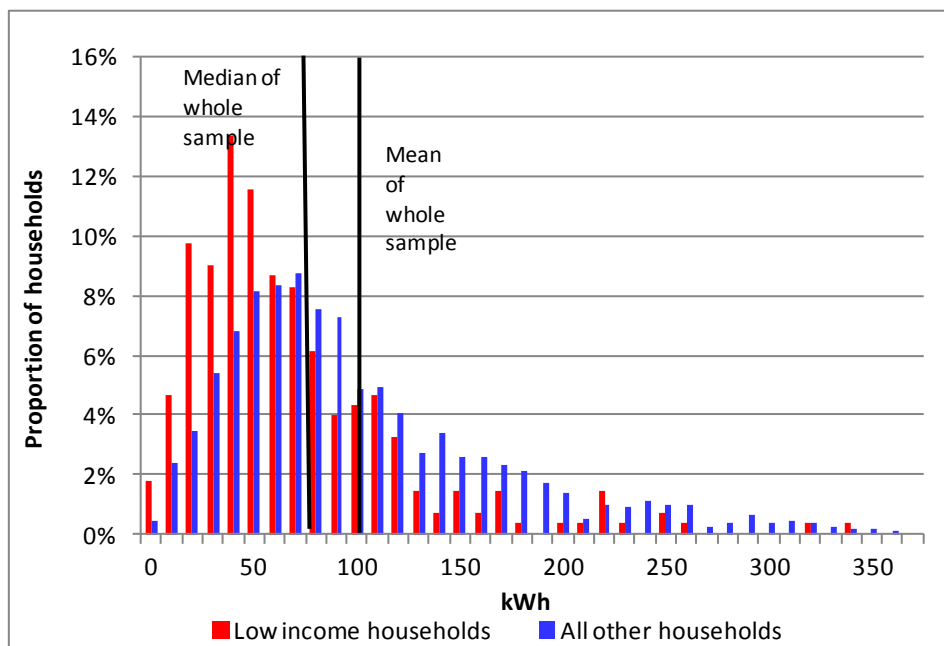


Figure 4 shows, as would be expected, that average electricity consumption increases with income, as does average expenditure on electricity, but each increases more slowly than average income. Figure 5 makes two separate but related points. Firstly, the increase in average electricity consumption with income is caused by a larger proportion of households in the higher income quintile consuming slightly more electricity. Secondly, there are small numbers of very high electricity consumers in all five income quintiles. Figure 6 makes the same points, but in a different way, showing, in particular, that the mean consumption for the whole sample is much higher than the median, because of the skewed shape of the distribution of consumption against income in all income households. This skew has very important implications for the conclusions drawn at the end of this report.

Overall, there can be no doubt that variations in electricity consumption between households are caused by many more factors than those listed above. Moreover, many of these other factors will relate to household tastes, preferences and behaviours, as well as to particular circumstances, such as chronic illness. Not only are such factors unknown, they are also resistant to simple quantification.

For this reason, this paper takes an essentially descriptive approach to explaining how household electricity consumption is affected by changes in various relevant factors. It makes absolutely no attempt to calculate how, hypothetically, consumption might change if any particular factor were changed.

We now turn to examining electricity consumption by households in the two lowest income quintiles.

CHARACTERISTICS OF ELECTRICITY CONSUMPTION BY LOWER INCOME HOUSEHOLDS

General approach

The 40% of all households in each of the two lowest income quintiles in each state were further sorted, within each income quintile, by electricity consumption. They were then separated into two groups in each income quintile: a larger group with electricity consumption below the average level for the whole state sample, i.e. the consumption level shown in Table 1 above, and a smaller group with above average electricity consumption. The smaller, high consumption group consists of those records lying above the line showing the mean in Figure 5 or to the right of the corresponding line in Figure 6. The two groups as designated respectively as Low and High. The relative sizes of the High groups in each quintile in each state are shown in Table 3. Households most likely to be, or fall into financial hardship because of high electricity costs are those in these High groups in Q1 and Q2 in each state. It can be seen that in households meeting this definition account for 9% and 11% of the total number of households in each state sample, in other words, on average, between 9% and 11% of all households.

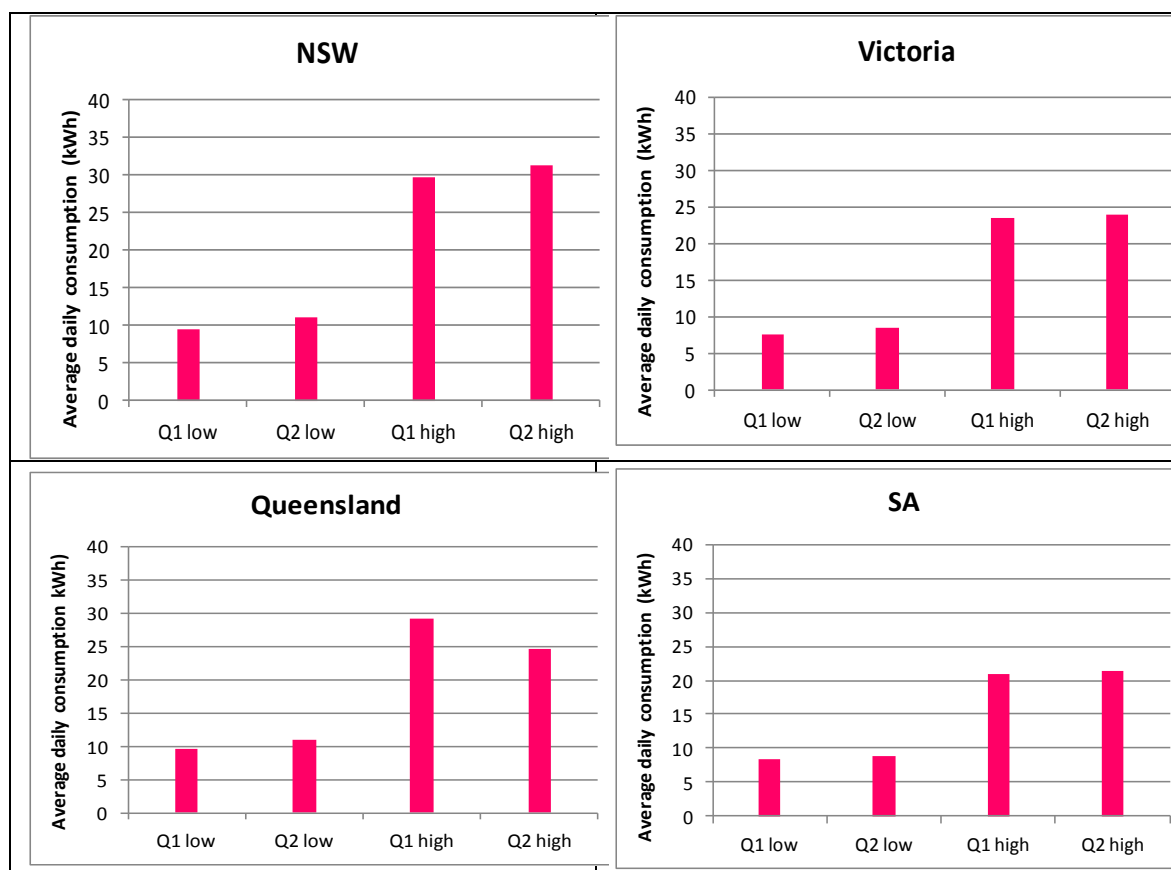
Table 3: Proportion of households with High electricity consumption in each income quintile and each state

Income quintile	Q1		Q2	
	Share of quintile	Share of Sample	Share of quintile	Share of Sample
NSW	17%	3.5%	24%	4.8%
Victoria	21%	4.2%	24%	4.9%
Queensland	15%	3.2%	30%	6.1%
SA	21%	4.2%	30%	6.0%
WA	19%	3.9%	26%	5.2%
Tasmania	18%	3.6%	37%	7.4%

Electricity consumption and expenditure

Average daily electricity consumption of the four groups is shown in Figure 7. It can be seen that in every state the average consumption of the High group is more than twice the average consumption of the Low group. As would be expected, in four of the six states average consumption by households falling into Q2 is higher, though only slightly, than average consumption by households in Q1. In Queensland and WA, however, average electricity consumption by households with High consumption in Q2 is slightly less than consumption by High consumption households in Q1.

Figure 7: Average daily household electricity consumption by low income households, showing low and high consumption households separately.



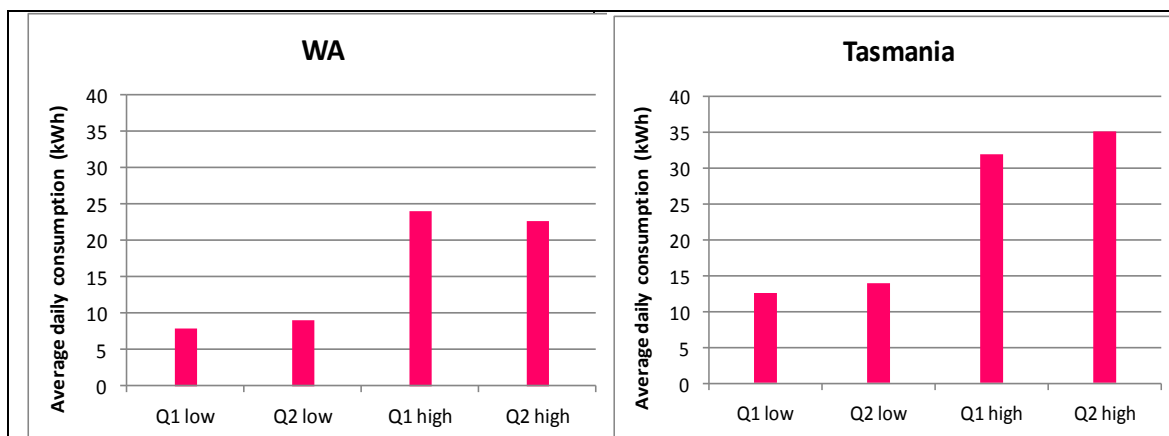


Figure 8 shows expenditure on electricity and relates it to disposable income. Unsurprisingly, households which use more electricity also face higher electricity bills. They also spend a much higher share of their disposable income on paying their electricity bills. The relationships between states, in terms of average consumption by high users, is slightly different from the relationship in terms of average expenditure, reflecting differences between states in average prices for electricity at the time of the Survey.

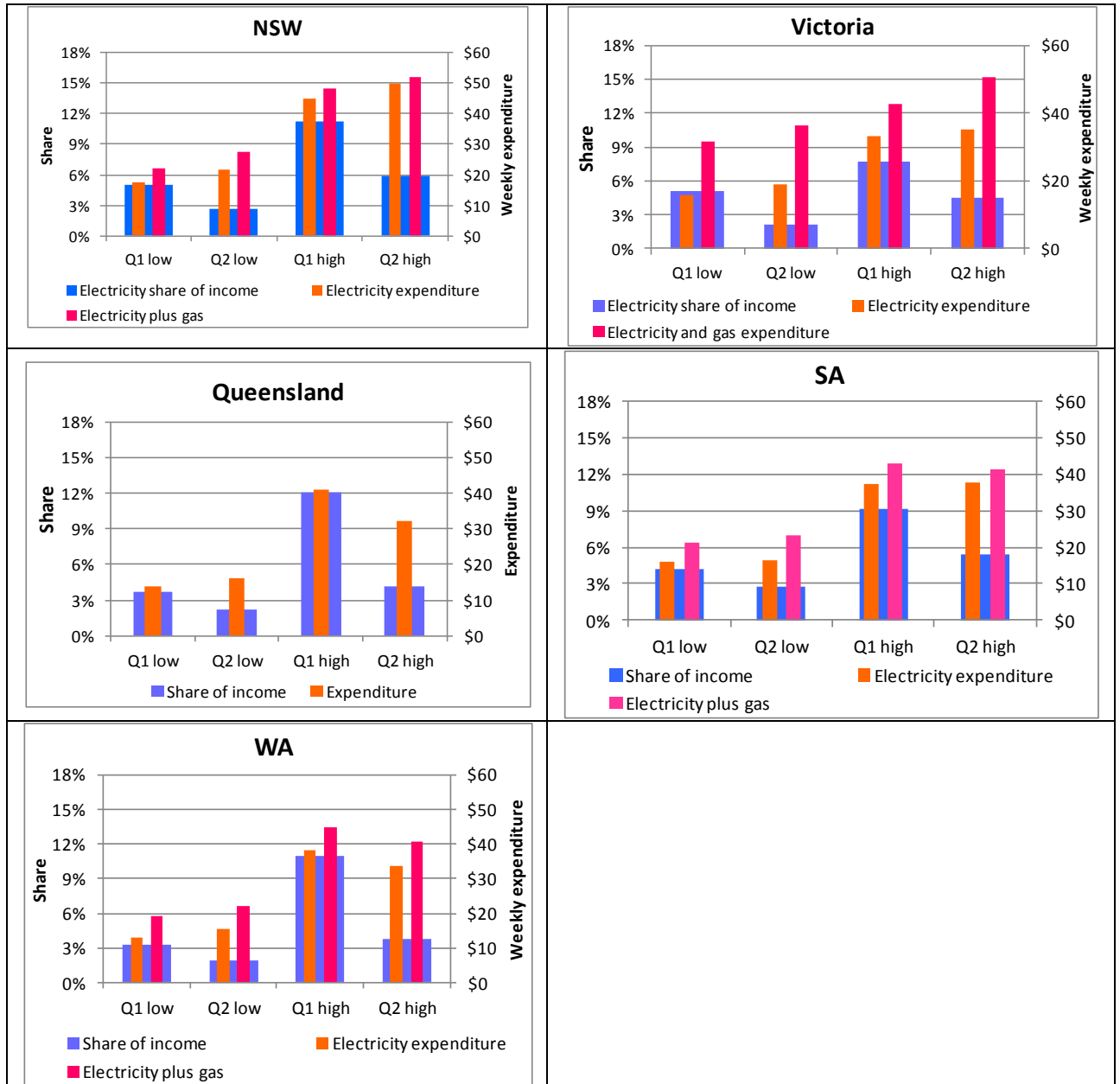
An additional analysis, combining expenditure on electricity with expenditure on natural gas, was undertaken for the states where use of natural gas is significant. The results are shown as a third set of bars in the relevant state graphs in Figure 8. The results show that on average the cost of natural gas adds only a little to household energy costs for low income households in NSW, SA and WA. In Victoria it adds considerably more. The data reveal two main reasons for this difference between Victoria and other states. Firstly, a much higher proportion of low income households, including those with high electricity consumption, are connected to gas, as Figure 12 shows. Secondly, not graphed here, most households in Victoria with a gas connection use gas for space heating, whereas in the other states many households use gas for water heating only (and presumably also cooking, though that is a relatively minor consumer of energy).

However, as a share of disposable income, expenditure on electricity is lower in Victoria than in NSW for High consuming households, and that remains the case even when expenditure on gas is added. The relevant figures for NSW are 11.2% for electricity only and 12.2% for electricity plus gas, whereas for Victoria the relevant figures are 7.7% and 10.1%.

Obviously, the households most vulnerable to any increase in the price of electricity are those which fall into the High electricity consumption group in the two lowest income quintiles. The remaining analysis focuses on identifying characteristics of these

groups which may help to explain why their electricity consumption is so high, and on comparing the High group in each income quintile with the corresponding Low group.

Figure 8: Average weekly household expenditure on electricity and gas by low income households, expressed as a share of total disposable income

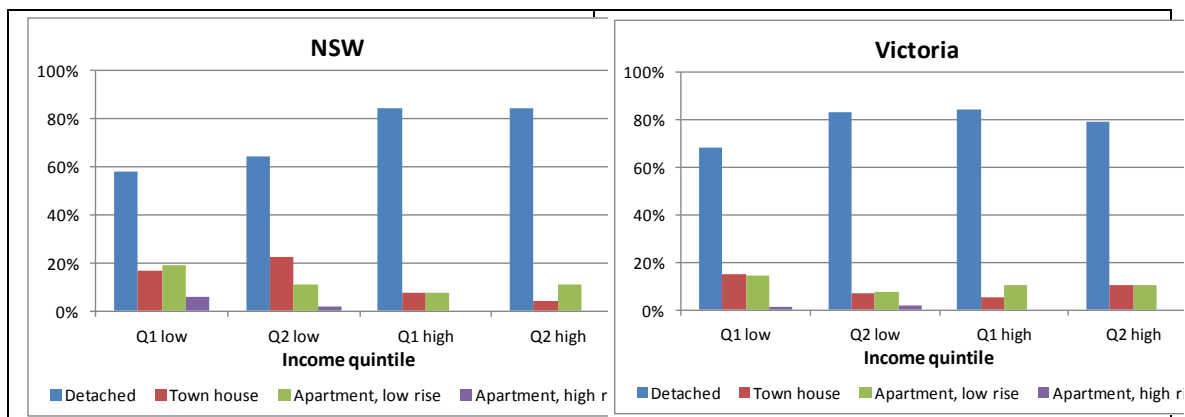


Dwelling type, housing tenure and household composition

This part of the analysis starts by looking at housing structure, housing tenure and household composition. Figure 9 shows housing structure type for the two groups for

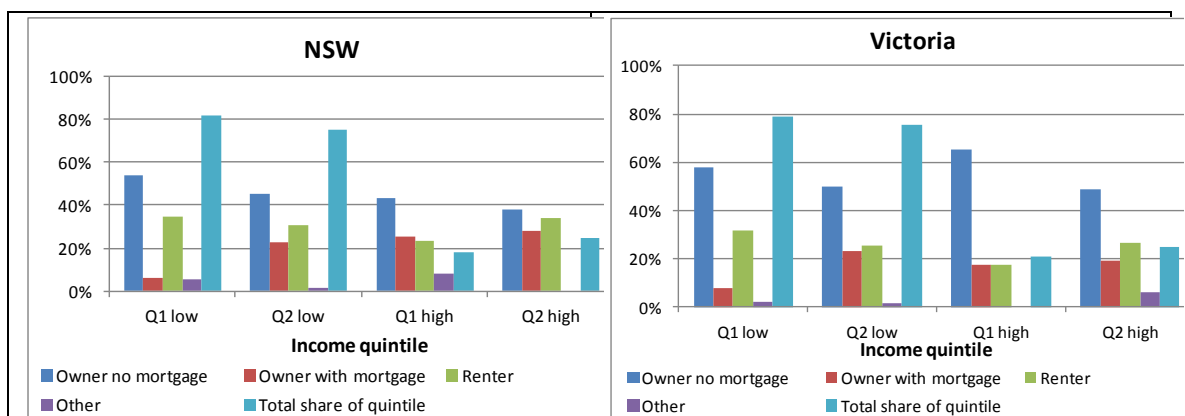
NSW and Victoria. It can be seen that high consumption households include a slightly larger proportion of households in separate houses, but the differences are not great. Similar results were found for the other states.

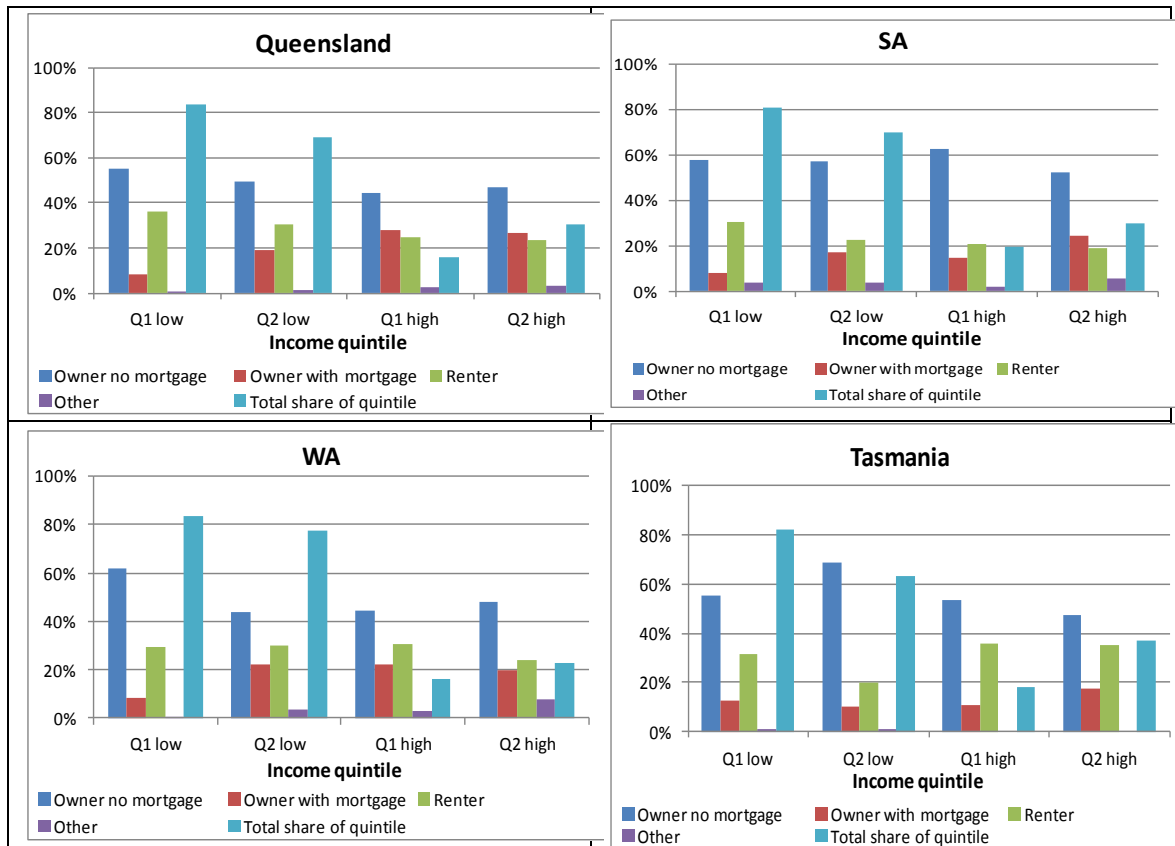
Figure 9: Proportions of housing types occupied by low and high electricity consuming households



Differences in terms of housing tenure categories are also not great. Owner-occupiers who have paid off their mortgage are the largest category in all four groups in all six states. This has potentially important policy implications. All else being equal, a given level of electricity cost will impose less hardship on these households than the same cost level will on households which also must be able to cover regular mortgage repayments or rental expenses. We return to this issue later in the report.

Figure 10: Proportions of housing tenure categories of low and high electricity consuming households

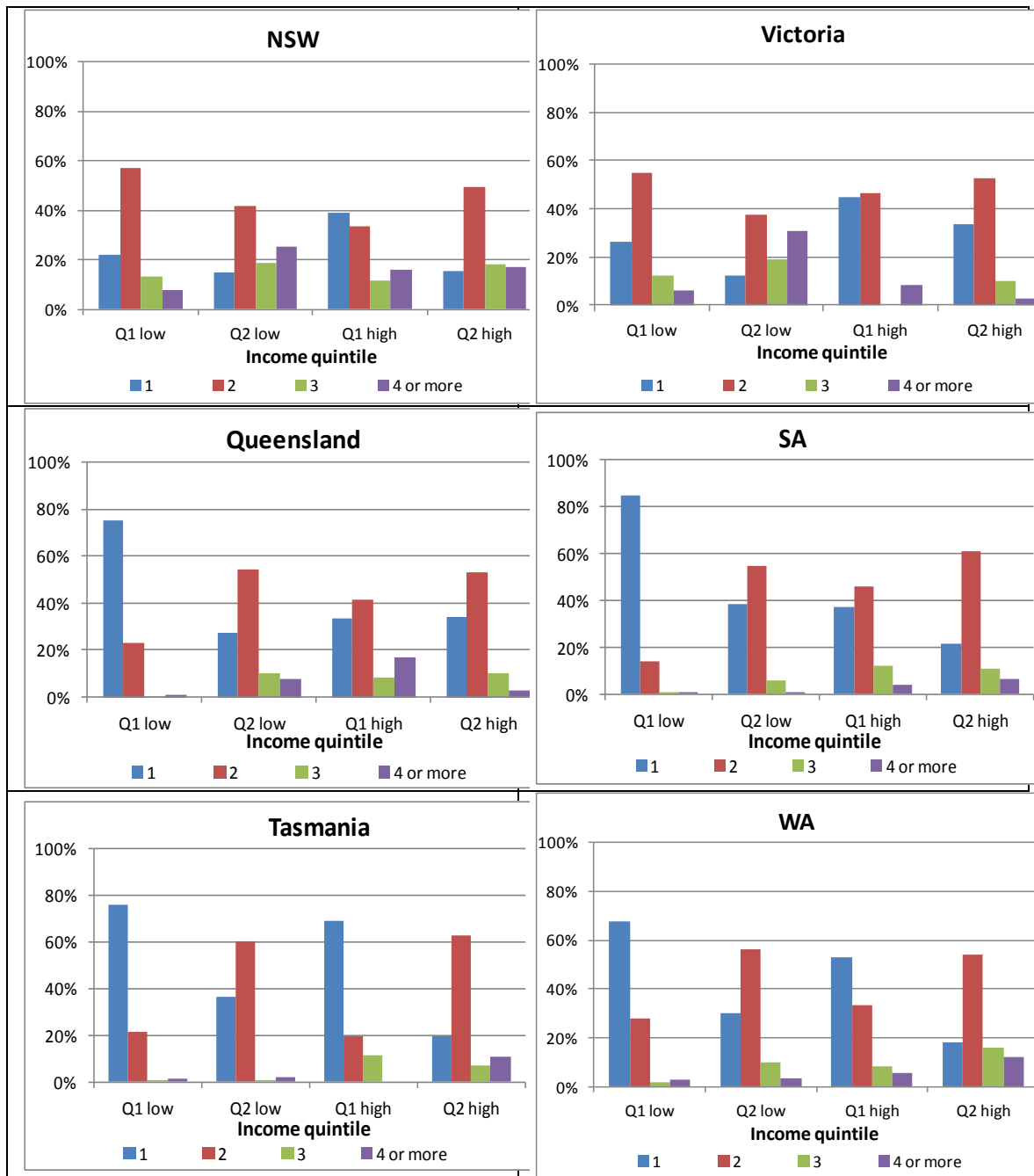




Household size and the number of small children in the household are often thought to have an important influence on energy consumption by a household. Figure 11 shows the distribution of household size (number of persons) across the four groups in each state. Again, there is no clear or consistent pattern of difference between the groups. This could well be because the sample numbers are simply too low to reveal clear trends at this level of disaggregation. It is relevant that the average number of persons per household rises steadily with household income; the lowest income quintile contains the largest proportion of one and two person households in every state, and the highest income quintile contains the smallest proportion.

Households which include children are often thought to consume more energy than households without children, all else being equal. It is, however, difficult to draw firm conclusions from the Survey, because only a small minority of households in the two lowest income quintiles include any children at all. Because results are so uncertain, no graphical summary is shown here. The strongest conclusion which can be drawn is that, with the possible exception of Victoria, the Survey results are not inconsistent with the proposition that households with children use more electricity, on average, than those without.

Figure 11: Proportions of households with different numbers of persons amongst low and high electricity consuming households



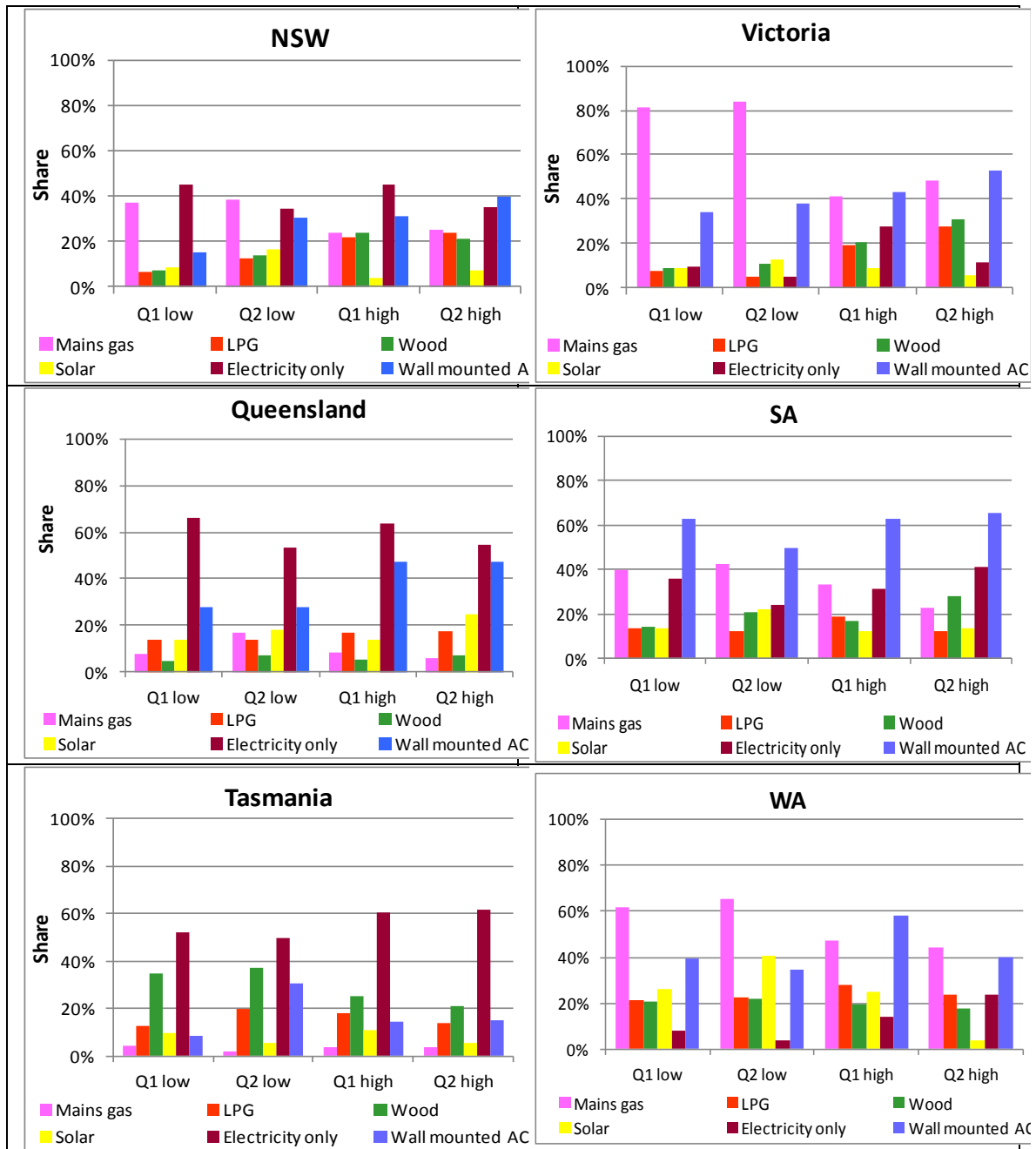
Energy using characteristics

The Survey included a number of questions about factors which might be expected to affect how much electricity households use, and the functions for which it is used. These questions included what other energy sources were used by the household in the home, i.e. excluding transport fuels. Fuels listed included natural gas, LPG, wood

and “solar”. Note that the latter includes under the one heading both solar water heating and solar electricity (photovoltaics). By definition, all households in the Survey use electricity. Records within each group and sub-group were analysed by counting and recording the number of households which use mains gas, the number which use LPG and the number which use wood. Mains gas and LPG are strict alternatives, i.e. a household uses either one or the other. Many households, however, use both gas, particularly LPG, and wood. These are mostly households located in non-metropolitan locations without access to mains gas. Households which use neither mains gas, nor LPG, nor wood are classified as “electricity only”. A separate count is made of households which use “solar”. Some of these are electricity only, but many also use gas and/or wood.

Another question covered whether households use cooling, and, if so, what type: reverse cycle, mounted, and portable air conditioners, evaporative coolers, ceiling fans and portable fans. For the purpose of this analysis the proportion of households using reverse cycle and/or mounted air conditioners was calculated, the rationale being that these types in general use more electricity than the other types of cooling. Reverse cycle air conditioners, of course use electricity for both cooling and heating and, on analysis, it was found that in every state they are much more common than wall mounted air conditioners.

Figure 12: Energy using characteristics of households



The results of this analysis are shown in Figure 12. It is clear that there are some important differences between states, as well as clear differences, at least in some cases, between Low and High groups. Looking first at differences between states, the most obvious is that a much higher proportion of households in Victoria and, to a slightly lesser extent, WA use natural gas than in other states. NSW and SA are intermediate in terms of the number of households using natural gas, but in SA a higher proportion of households uses wood and solar than in NSW. The proportion of

households using natural gas is low and very low in Queensland and Tasmania respectively. The proportion of electricity only households is correspondingly higher than in other states. Tasmania is also notable for the high proportion of households using fuel wood.

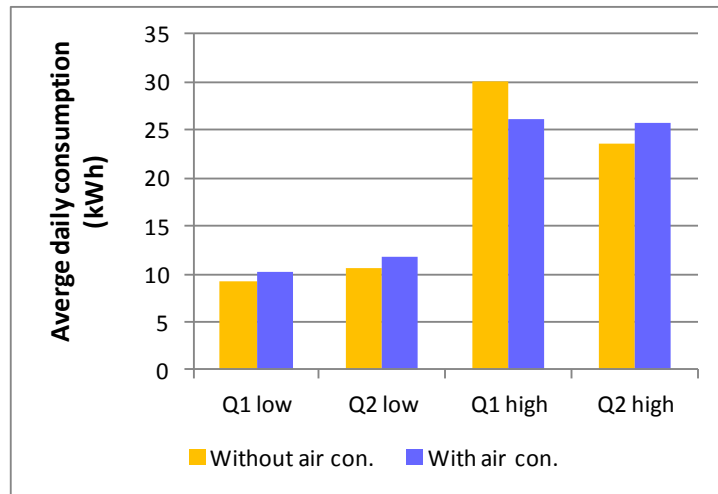
Comparing the Low groups with the High groups across all six states, several differences are clear.

The proportion of households using reticulated natural gas is higher in the Low groups than in the High groups. This effect is particularly marked in Victoria and WA, the two states with the highest proportion of gas-connected households, but is also clear in NSW and SA. In Victoria and WA, and less clearly in SA and also in Tasmania, the Low groups contain more households which use electricity only. Amongst households with gas connections, most in both Victoria and WA use it for space heating, but in NSW and SA many households with a gas connection use gas for water heating and cooking, but not space heating. As previously mentioned, this difference reduces the effect of a gas connection on electricity consumption in those two states. The effect is smaller in WA, despite the number of households using gas for space heating, because the mild climate of WA means that the intrinsic demand for space heating is much lower than it is in Victoria. In Tasmania wood has a somewhat similar effect to gas in Victoria and WA – it is used for space heating as an alternative to electricity, so that households which do not use wood tend to have higher electricity consumption.

Turning to use of air conditioners, it is clearly the main difference between Low and High consumption households in Queensland. The proportion of High consumption households using reverse cycle and wall mounted air conditioners is nearly double the proportion of Low consumption households. In other states there is little or no relationship between use of air conditioners and electricity consumption.

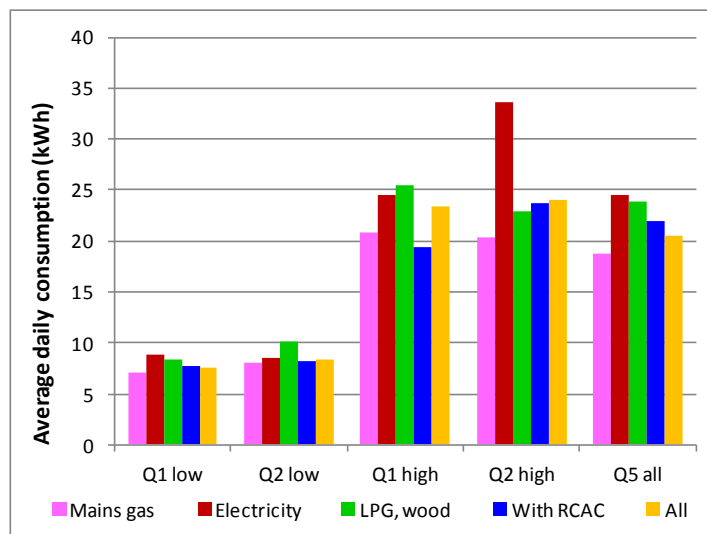
However, a correlation of this kind does not mean that ownership of an air conditioner is the reason that these households use more electricity. Figure 13 shows average electricity consumption by Queensland households which do and do not have wall mounted or reverse cycle air conditioners. It can be seen that there is no appreciable difference between the two groups. In other words, ownership of one or more air conditioners is apparently not the primary reason why a minority of low income households have very high electricity consumption.

Figure 13: Electricity consumption by Low and High consumption households with and without air conditioners in Queensland



A separate analysis, but one pointing to a similar conclusion, was undertaken for the Victorian households, and is shown in Figure 14. It shows the average daily electricity consumption for households depending on the main fuel they use for space heating, which is the largest use to which energy is put in most Victorian dwellings. It is clear that, with the possible exception of High consumption households in the second income quintile, choice of fuel of space heating has no effect on total electricity consumption. In other words, households which use gas as their main heating fuel use no less electricity than households for which electricity is the main fuel. The Figure also shows, for comparative purposes, that this conclusion applies equally to high income as to low income households and, incidentally, that on average households in the top 20% income group use about the same amount of electricity as High consumption households in the two lowest income groups.

Figure 14: Electricity consumption by Victorian households in relation to the main fuel used for space heating



CHARACTERISTICS OF LOW INCOME, HIGH CONSUMPTION HOUSEHOLDS

The preceding analysis has shown that in all states except Tasmania the majority of households in both the two lowest income quintiles spend on average under \$20 per week on electricity, and this expenditure accounts, again with the exception of Tasmania, for under 6% – in some states well under 6% – of household disposable income. But a minority of households, termed High electricity consumption households, spend much more than this. All in these groups spend on average over \$30 per week and most, especially when expenditure on gas is included, spend an average of over \$40 per week. In some cases the average spend is over \$50 per week. This spending amounts on average to between 9% and nearly 12% of household disposable income.

It is this relatively small minority of households which is likely to be significantly affected by electricity price rises. The remainder of this report looks in more detail at this minority of low income, high electricity consuming households. Before doing so, however, a note of caution is needed about low income households which have relatively low electricity consumption and low expenditure on electricity. Anecdotally, some low income households keep their electricity consumption low by avoiding the use of space heating and cooling appliances, even during very cold or very hot weather. In winter, they sit down all day, wrapped in blankets, or even spend all day in bed, just to keep warm. In summer, they endanger their health by not switching on cooling appliances. There is doubt that these behaviours do occur in some

households. But they could not possibly account for the relatively low electricity consumption of the more than 15% of all Australian households which, on the basis of the Survey data, fall into the low income, low consumption category. Real welfare and policy concern must focus on the roughly 4% of all households which fall into the lowest income quintile and have high electricity consumption. Some attention should also be given to the 5% to 7% of households falling into the second income quintile and also have high electricity consumption.

One of the most important factors affecting the ability of a household to meet its living costs is the cost of housing. The graphs in Figure 10 shows that owner-occupier households, which have paid off the mortgage on their house, form the largest sub-group of all households, including high electricity consuming households, in all states and both income quintiles. Because the Survey included questions about major housing costs (mortgage payments and rent), it is possible to further divide low income, high electricity consumption households in each state into further sub-groups: owners without a mortgage, owners paying of a mortgage, and tenants paying rent. Expenditure on electricity was then expressed as a fraction, not of total disposable income, as in Figure 8, but as a fraction of net disposable income, defined as income minus mortgage repayments and minus rent. The results are shown in Figure 15, for all six states.

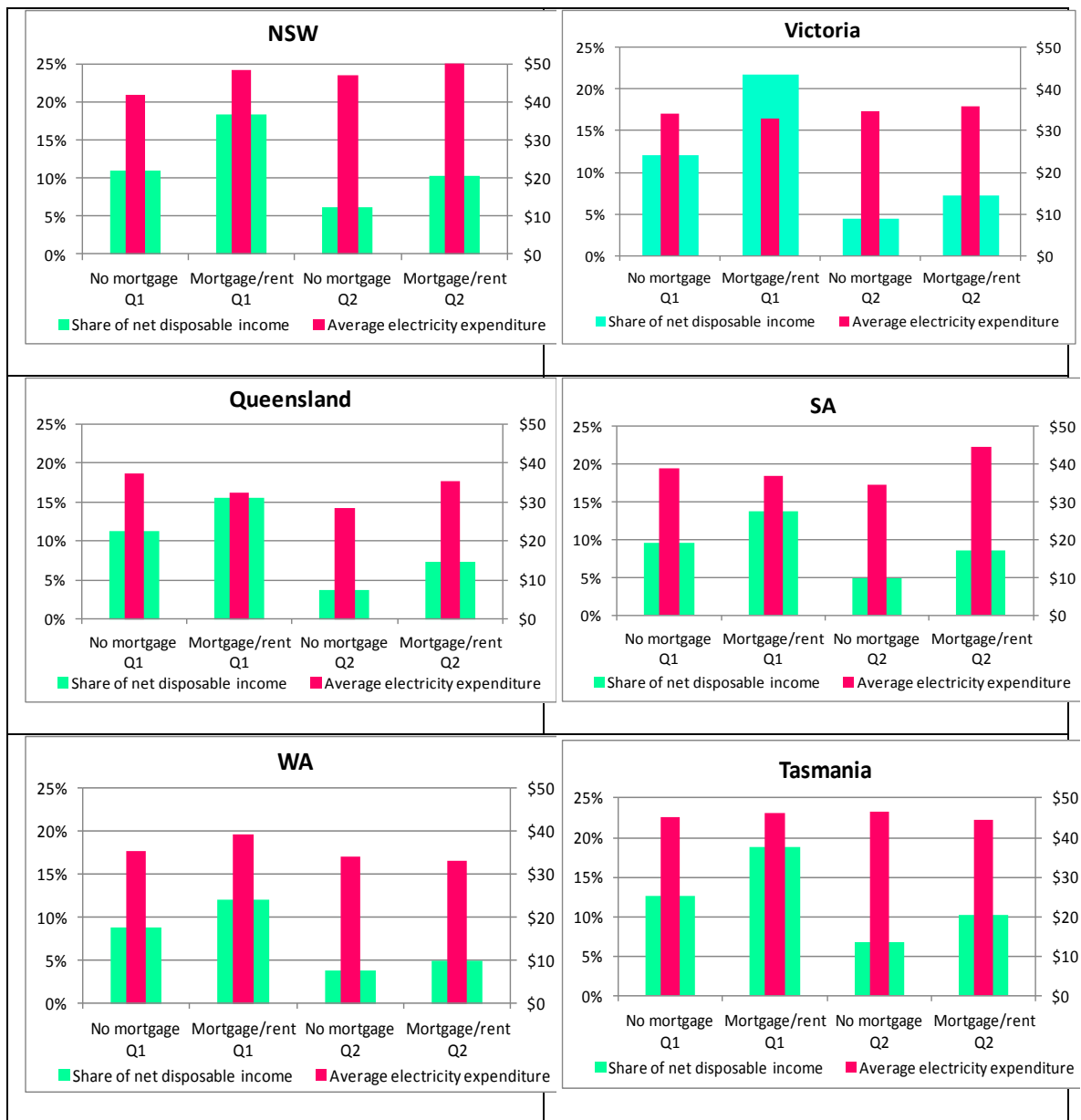
It can be seen that, in every state, average electricity expenditure is much the same in all four groups. However, when expenditure is expressed as fraction of net disposable income, households with mortgage and/or rent payments face a relatively much higher impost on their remaining income. It is these households, in each state, which are most financially vulnerable to electricity price rises.

What are the characteristics of these households? As previously described, very few of these households include children. They do, however, include a range of different household sizes (number of persons). However, the relatively small numbers of these households in each state Survey sample makes it difficult to obtain meaningful results by further separating the records at the state level. Therefore, to obtain an approximate national breakdown of the various tenure types by persons in household, results for all six states were combined.

This was done by calculating each category of sub-division of households in each state as a fraction of all households (records) in the state sample. Results for each state were combined by weighting the state distribution by that state's share of national population as a June 2012. The results of this analysis are shown in Figure 16. Owner occupier households with no mortgage are the largest group. The great majority of these households contain either one or two persons only. Putting these

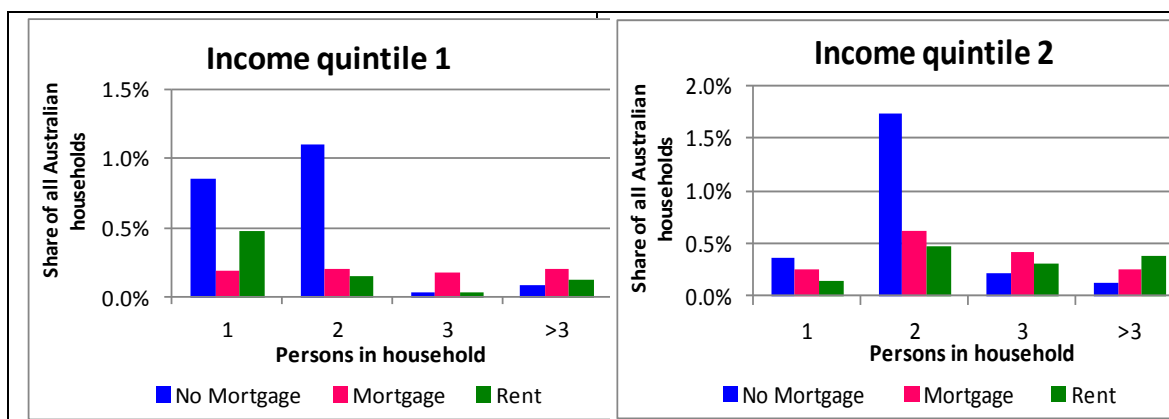
characteristics, it is highly likely that most of the occupants of these households are aged pensioners. A higher proportion of households with either mortgage or rent payments contain three, four or more persons. Prima facie, these are the most disadvantaged group in the whole population, so far as electricity costs are concerned. Not only do they have to meet mortgage or rent payments, but they also have to meet all the other household needs of a larger number of occupants.

Figure 15: Electricity consumption by low income, high consumption households, expressed as a fraction of disposable income, net of rent and/or mortgage repayments



On the basis of this very approximate calculation, households with high electricity consumption, in the lowest income quintile, and containing three or more members comprise 0.56% of all Australian households. Similar households in the second lowest income quintile comprise a further 1.4% of Australian households. It is these approximately 2% of all households which will be particularly vulnerable to any increases in electricity prices. Further groups also likely to be affected, though on average slightly less severely, are one and two person households in the lowest income quintile, with high electricity consumption and mortgage or rent payments to meet. These comprise a further 1% of households. Finally, high electricity consumption households, in the lowest income quintile and living in their own house, comprise a further 1.1% of households, of which most consist of one or two persons. Overall, on the basis of this analysis, just over 4% of all households are estimated to be facing electricity expenses which amount to 10% or more of their net, i.e. after rent and mortgage payments, disposable income.

Figure 16: Households with High electricity consumption; household size by tenure type, Australia (estimated)



CONCLUSIONS

The analysis of the 2012 national survey of household income, housing and energy use, described in this report, has concluded that around 4% of all households nationally may be particularly financially vulnerable to increases in electricity prices. They are all households with higher than average electricity consumption (in some cases, very much higher than average), and most are in the lowest income quintile. Households in this group are found in all states. They vary in terms of their household size, housing tenure, and use of fuels other than electricity. However, what they all have in common is that they have very high electricity use.

The primary criterion, used in this report to identify those likely to be vulnerable to higher electricity prices, is that the households have electricity consumption which is higher than the average consumption of the whole Survey sample for the relevant state. It is this high electricity consumption which is the primary cause of their vulnerability to high electricity prices. The majority of households in the lowest household income quintile (75% to 80%, depending on state) have below average electricity consumption. On average, in every state, electricity bills account for less than 5% of household disposable income in this large group.

Why do a minority of households consume so much electricity? The analysis presented in this report shows that it is not because of the large number of persons in the household – most have only one or two persons. In Victoria, and to a lesser extent in some other states, the fact that fewer of them are connected to reticulated gas may be a factor, but is by no means the only factor. The main reasons for their higher electricity consumption must relate to factors not picked up by the Survey.

The finding that household electricity consumption varies across a very wide range, for reasons which are difficult to identify, is by no means novel. [PUT IN REFS.] Experience supports some speculation about possible causes. Probably most obvious, living in a house with very poor thermal performance, meaning that keeping warm in winter and/or cool in summer requires large electrical energy consumption. In colder locations, notably Tasmania, this effect would be exacerbated by the widespread use of energy extravagant electric resistance space heating appliances. These factors fall under the general heading of inefficient energy using appliances and structures.

Some households have unavoidably high consumption of energy for heating, cooling and hot water because of the infirmity or ill health of one or more household members. For such households, the problem would be made worse by inefficient appliances or housing.

For all households in situations of this kind, the optimal policy approach should be to address the underlying problems, not to subsidise the cost of electricity, let alone to hold national climate change policy hostage to the very real financial difficulties (over and above physical hardship) being faced by this relatively small group of households. The challenge of course is, firstly, how to identify the households needing help with these problems in a respectful and non-obtrusive way, and, secondly, how to find the material resources needed to make the needed physical upgrades to buildings and appliances. Probably the simplest widely relevant measure for identified households in colder parts of Australia would be to replace electric resistance space heating with reverse cycle air conditioners, which use roughly a fifth as much electricity to deliver a given level of heating.

Other possible factors are more individual and limited; examples include home use of arc welders, large banks of electronic equipment which is never turned off, and similar. Such factors can be grouped under the general heading of energy using behaviour, which covers a very much wider range of choices made by householders. For many households, particularly those with higher incomes, choices to use electricity in ways which others might see as extravagant are often made deliberately and in full knowledge of the cost consequences. However, it is likely that, amongst the relatively small group of high electricity consuming, low income households, lack of knowledge or understanding about energy using behaviours and their consequences.

It is now nearly thirty years since government agencies first started to promulgate advice about how to reduce energy consumption by using energy more efficiently. Such advice is now very widely available, from energy retailers, welfare agencies, environmental NGOs and other sources, as well as still from governments. There is now abundant evidence that knowledge and understanding of efficient energy using behaviour has become widespread and, in some aspects, may have become a social norm. The most obvious macro expression of this change has been the decline over the past few years in average electricity consumption per residential customer. It is likely that some high electricity consuming low income households may be among the minority of households not yet reached by information about efficient energy use. By definition, because they remain unaffected by available energy efficiency advice, these households are likely to be hard to identify and even harder to help with education about energy using behaviour. But further efforts in this direction are a far better option than using the financial hardships of this relatively small group as a reason for refusing to countenance any policy which might increase the cost of electricity.

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