



BANKWEST CURTIN ECONOMICS CENTRE

ENERGY POVERTY IN WESTERN AUSTRALIA

A Comparative Analysis of Drivers and Effects

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About the Centre

The Bankwest Curtin Economics Centre is an independent economic and social research organisation located within the Curtin Business School at Curtin University. The centre was established in 2012 through the generous support from Bankwest (a division of the Commonwealth Bank of Australia), with a core mission to examine the key economic and social policy issues that contribute to the sustainability of Western Australia and the nation, and the wellbeing of households both in WA and nationally.

The Bankwest Curtin Economics Centre is the first research organisation of its kind in Western Australia, and draws great strength and credibility from its partnership with Bankwest, Curtin University and the Western Australian government.

The centre brings a unique philosophy to research on the major economic issues facing the state. By bringing together experts from the research, policy and business communities at all stages of the process – from framing and conceptualising research questions, through the conduct of research, to the communication and implementation of research findings – we ensure that our research is relevant, fit for purpose, and makes a genuine difference to the lives of Australians, both in WA and nationally.

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Executive Summary

Energy poverty is a prevalent and growing issue affecting the wellbeing of millions of households across the globe. Access to affordable energy services is frequently seen as a pre-requisite for economic growth in developing countries and has been associated with improvements to health and social mobility in more developed economies.

The energy sector is undergoing an unprecedented transformation with potentially profound implications for the most vulnerable of Australian households in terms of economic security, social integration and health.

This report seeks to provide insights into the extent of energy poverty in Western Australia and expand the evidence base with respect to the effects of energy poverty on households. The report draws on unique data gathered through face to face interviews and an online survey of over 4,000 individuals to better understand the needs and practices of individuals facing the challenges posed by rising energy costs.

The economic boom in WA has meant rising wages, but those in the lowest income brackets have seen the least benefit from the boom and have had to contend with rapidly increasing house prices and rents. These factors increase the incidence of energy vulnerability with lower income households spending significant proportions of their disposable income on energy, putting them into a commonly accepted category of energy poverty.

The report findings draw attention to the fact that low income households are failing to benefit fully from the “low carbon dividend” that results from improvements to energy efficiency and access to home generation. This has the potential to push low income households deeper into energy poverty if fuel prices rise and the income gap between the wealthiest and the poorest continues to grow.

On a more positive note, those households which have been able to benefit from the installation of solar panels, for example, spoke of the reduced anxiety they felt with regards to their energy bills and the greater feeling of involvement it gave them in the management of their energy expenditure.

However, it cannot be overlooked that there is a risk that this remains nothing more than an aspiration for many households on low incomes who either cannot afford the investment or are in rented accommodation and have no control over the installation of such facilities.

The findings offered in this report are intended to shed light on the conditions under which energy poverty is likely to be encountered and generate a discussion around how the incidence of energy poverty can be reduced and its effects mitigated.

Key Findings

Low income households in Australia are spending 12.4% of their income on utility bills and fuel each week, compared with 2.9% for high income households.

Rising housing and utility costs are increasing the energy poverty challenge.

It is estimated that the burden of rents for the lowest income quintile in WA has increased from 32% of disposable income in 2003/4 to 43% in 2013/14. At the same time the utilities price index (including energy) in WA rose by 60% in the period from 2007 to 2012, significantly faster than the consumer price index.

Energy expenditure in WA is around the national average but transport fuel spending is relatively high.

Overall energy expenditure in WA was \$99/week, exactly equal to the national average, but spending on transport fuel was \$63/week, higher than all other states except NT. This suggests a need for more accessible and affordable public transport options.

One parent families with dependent children have the highest burden of energy spending.

Single parent families with dependent children spend, on average, 7% of their gross household income on energy, higher than any other household group. Single parent families require attention when attempting to deal with energy poverty.

A high proportion of survey respondents reported curtailing energy use despite discomfort.

Over 60% of low income families surveyed indicated that they either frequently or occasionally curtailed their use of heating or cooling despite feeling discomfort. This provides an indication that actual energy expenditure might be underestimating the underlying energy burden of households.

Low income households in WA are more likely to be renters with restricted energy options.

Around 40% of low income households in WA are renters and consequently have restricted options in terms of fuel switching and investment in energy saving measures such as high efficiency appliances and solar panels.

Rental properties in WA have a significantly lower incidence of energy savings measures.

Less than 40% of privately rented properties are fitted with insulation compared with over 80% of owned properties. While nearly 20% of owned properties now have solar power or hot water the equivalent figure in the rented sector is less than 4%. Providing fair and equal access to low carbon energy, including reduced reliance on grid electricity, is an important emergent theme.

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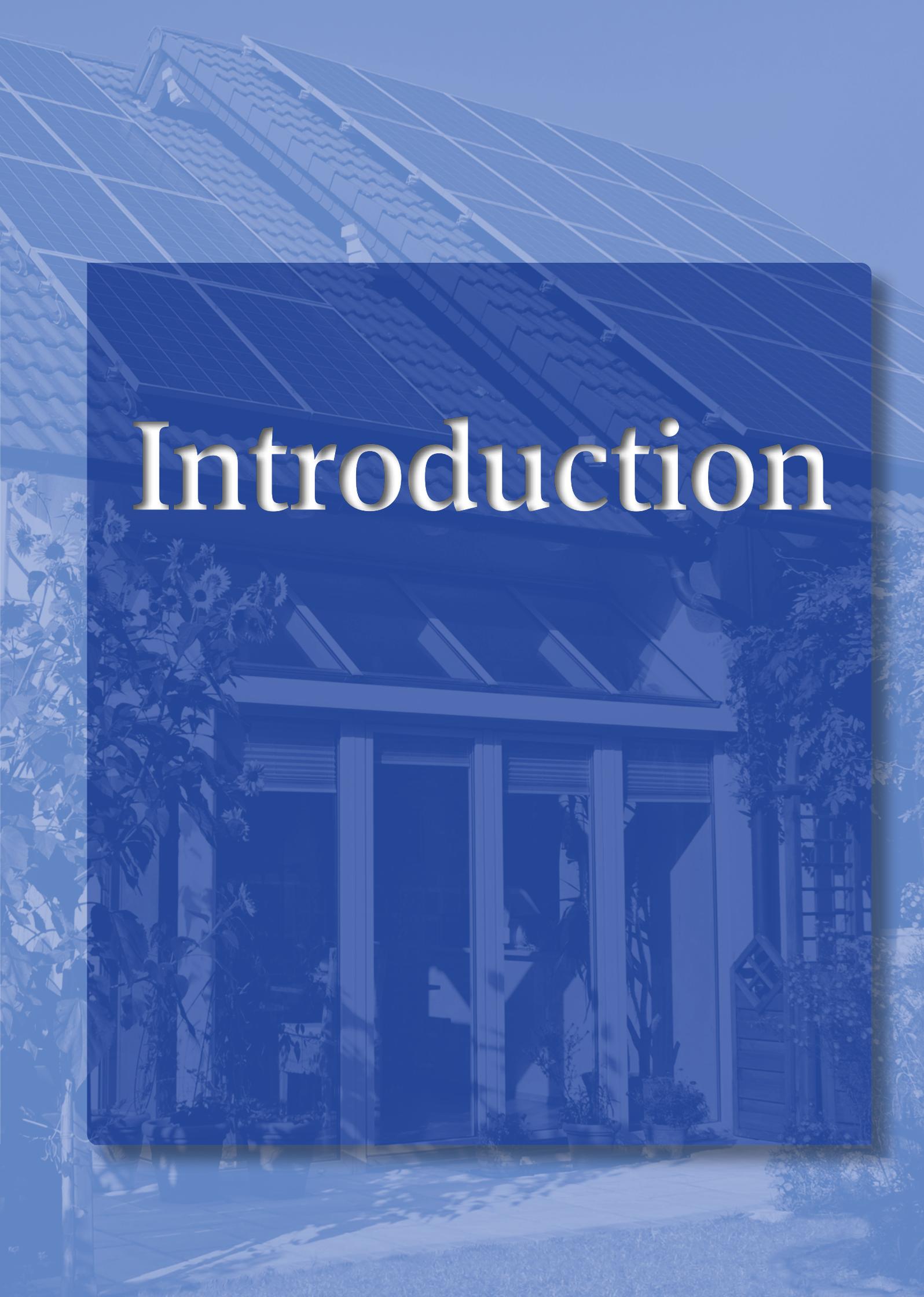
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Introduction

1 Introduction

1.1 Why study energy or fuel poverty?

Energy deprivation has been increasingly acknowledged as a key societal issue in developing and developed countries alike in recent years, and interest from scholars, industry and policy-makers has increased significantly. This developing awareness has been driven by a sustained period of high energy prices but it also reflects an improved understanding of the complex relationships that exist between energy and wellbeing. Two bodies of literature have emerged built around broad concepts of “fuel poverty,” primarily used in the context of developed countries, and “energy poverty” referring to the challenges faced by under-developed nations. The former tends to emphasise the affordability of energy while the latter is concerned with access although, as we describe in section 1.2, the distinction is not easily drawn. Among this growing body of literature, Australia remains under-represented and this research was motivated by a perception that, in common with many developed countries, energy poverty is on the increase and has not been adequately explored in a Western Australia (WA) context.

While WA has experienced a significant economic boom over the last 15 years, the wealth generated has not always been evenly distributed (Cassells, Duncan and Gao 2014). The boom has brought with it significant pressures on house prices and other goods and services, including energy. Domestic electricity prices have risen almost three quarters in the last 5 years. By comparison with other regions, the populated South West of WA enjoys a relatively benign climate, suggesting that energy poverty might represent less of an issue. However, the northern and interior regions suffer extremes of heat in summer and, in common with many southern European countries, its housing stock is poorly designed to provide comfortable conditions during cold weather periods.

The suburban sprawl around the one major city, Perth, is highly extended meaning that commuting distances can be considerable and potentially associated with higher than average transport fuel costs. Moreover, vast tracts of WA are not served by an interconnected electricity or gas grid, increasing reliance on off-grid solutions. The cost of delivering energy in these regions is often high, although prices are cross-subsidised in order to maintain even prices across the state. While there are undoubted similarities with other states, these features differentiate the conditions in WA from those found elsewhere in other Australian states. Moreover, WA has quite different characteristics from northern Europe, where much of the foundational work in fuel poverty has been carried out.

This report seeks to answer a number of questions. What do Australia’s and Western Australia’s economic and geographic characteristics and developments imply for their most vulnerable households in terms of energy policy? How are vulnerable households coping with energy costs that are rising faster than their incomes? What strategies are they employing to mitigate the worst effects of these changes? And what are the implications for the health and wellbeing of the individuals in those households most at risk? How do the unique characteristics of WA, such as climate and geography, influence and affect the answers to these questions and what conclusions can be drawn for policy formulation?

We attempt to provide insights into these questions through an analysis of key factors using both quantitative and qualitative methods, which interact to give us a picture of the energy poverty status of a household. Secondary data are supplemented by empirical evidence from a series of semi-structured interviews with individuals, including those in or at risk of falling into energy poverty. These primary data provide further insights on the impacts of energy poverty, what coping strategies are being employed and how households might be assisted in dealing with the issues. We were also able to take advantage of a wider survey on housing in the three states of WA, Queensland (QLD) and New South Wales (NSW) to gain a more comprehensive picture of specific aspects of energy usage and coping strategies.

A household experiences energy poverty if it is unable to afford sufficient energy services to satisfy its needs.

1.2 What is energy poverty and how is it measured?

1.2.1 Defining the issue

As discussed in section 1.1, two principal branches of literature have developed in relation to energy deprivation referred to as “fuel poverty” and “energy poverty”. The term energy poverty is frequently used in an international development setting to describe households that are unable to gain access to modern energy services. This branch of academic thought deals with a multitude of different issues including health (Gunningham 2013), infrastructure (Schaeffer et al. 2012) and poverty amelioration (Adkins et al. 2010). Fuel poverty, used somewhat interchangeably with the term energy poverty, is mostly applied in the context of developed countries to describe households that are unable to afford sufficient quantities of energy (or fuel). The United Kingdom (UK) and Ireland are “...the states that have developed the longest tradition in researching the problems of cold and energy-inefficient homes...” (Bouzarovski 2014) and were early to recognise the problem of fuel poverty; since then others have extended the theme to other parts of Europe and beyond.

A number of researchers, including those in Australia (Chester and Morris 2011), have taken the concept of energy poverty and applied it to developed world situations where the concerns revolve around the affordability of energy. As Bouzarovski (2014) points out, while the literatures surrounding fuel and energy poverty have emerged separately, their key questions and findings contain common threads. Consistent with the approach taken by Chester and Morris (2011), we employ the term energy poverty, recognising that household energy use includes both fuels (e.g. gas, solid fuel and liquid fuels for transport or heating) and electricity, which may be from the grid or generated on site.

With the importance of energy services in mind, we define a household as experiencing energy poverty if it is unable to afford sufficient energy services to satisfy its needs, in particular in order to maintain an acceptable level of comfort. This might result from the lack of an available supply, as in the case of a developing country or outlying region, or an inability to afford sufficient energy, as in the case of a developed country with existing energy infrastructure, or a combination of the two.

While it is reasonable to assume that within WA there may be communities or individuals that suffer from a lack of access to energy services, the main focus of the current study will be on those households that are challenged by the affordability of energy services. This is to say they must either curtail the amount of energy they consume below what might be considered "acceptable" or their consumption of energy is having an adverse impact on their ability to spend on other items of expenditure. As we will see, this can be important in understanding not only how we define energy poverty but also how we measure it.

One of the issues with many of the studies referenced above is that they are static, providing a snapshot of a particular household's ability to access and afford the energy services it requires. In this study we attempt to consider those at risk of falling into energy poverty, recognising that the components of energy poverty can be time-varying. Temporality stems from a number of factors including uncertainties with regards to income, which may result from changes in employment status, changes in energy consumption, which are a function of climatic conditions, or life events such as the birth of a child. Households move in and out of energy poverty, and a household's ability to influence these aspects of their situation may be limited by physical, financial or societal constraints. A view confirmed by discussions with one of WA's major electricity retailers, Synergy.

Recognising this, Bouzarovski et al (2014) propose a typology for energy vulnerability that encompasses the access and affordability factors already discussed but highlights four additional elements as shown in Table 1. Energy vulnerability is defined as "...the propensity of an individual to become incapable of securing a materially and socially needed level of energy service..." recognising that the factors contributing to vulnerability may be subject to either internal and external drivers.

Table 1 A typology of energy vulnerability factors and their constituent elements

Factor	Components	Stressors
Access	Poor availability of energy carriers appropriate to meet household needs	External
Affordability	High ratio between cost of fuels and household incomes, including role of tax systems or assistance schemes. Inability to invest in the construction of new energy infrastructures.	External / internal
Flexibility	Inability to move to a form of energy service provision that is appropriate to household needs	Internal
Energy efficiency	Disproportionately high loss of useful energy during energy conversions in the home	Internal
Needs	Mismatch between household energy requirements and available energy services; for social, cultural, economic or health reasons	Internal
Practices	Lack of knowledge about support programmes or ways of using energy efficiently in the home	Internal / external

Source: Bouzarovski et al 2014

Within this study we have attempted to consider both energy poverty *and* vulnerability. Some insights into these factors are apparent from the secondary data but, more importantly, we were able to explore them more fully during the primary research phase of the project. This was especially true when considering needs and practices where interview and survey data on aspects such as coping strategies was vital to understanding household vulnerabilities.

1.3 Measuring energy poverty

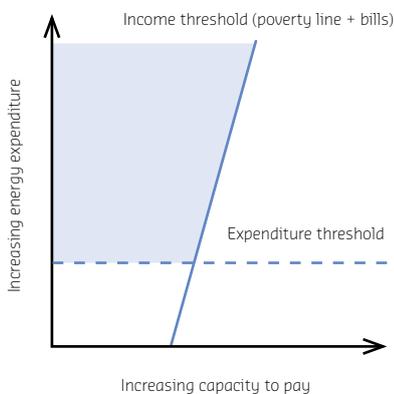
Cost and income measures have often formed the basis of energy (or fuel) poverty studies; for example, a household may be categorised as being in energy poverty if it spends more than 10% of its disposable income on energy. This type of measure informs our understanding of the burden that energy expenditure has on a household and the extent to which it limits spending on other goods and services. It might offer insights into the feelings of vulnerability that household members are experiencing and may also provide a useful indicator of the risk faced by the household of having its energy supplies disconnected.

However, this measure tells us little about whether a household is curtailing its energy usage in a way that is detrimental to its wellbeing, contributing to its vulnerability. For example, we could examine two households each spending 15% of its disposable income on energy but in one the internal temperature is maintained at a “comfortable” level and in the other it is not. We might argue that the latter household is more vulnerable than the first.

For this reason, the 2001 UK Fuel Poverty Strategy (“UK Fuel Poverty Strategy” 2001) proposed a required consumption rather than an actual consumption measure, whereby a household is considered to be in fuel poverty if it needs to spend more than 10% of its income on fuel to heat its home to an acceptable level (or to obtain the required level of energy services). Since the measure of energy consumption is based on need and actual consumption, it “...ensures that those households which under-utilise energy are not incorrectly omitted from the category of being fuel poor.” (“UK Fuel Poverty Strategy” 2001)

However, this approach suffers from a number of shortcomings and was later augmented to include the After Fuel Cost Measure (Hills 2012), which sets an additional boundary relating to the absolute measure of income, as depicted in Figure 1.

Figure 1 After fuel cost approach to measuring fuel poverty



Source: Hills 2012

According to the After Fuel Costs approach, a household is considered to be in fuel poverty if:

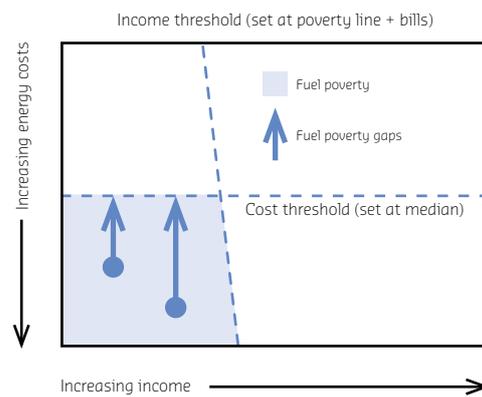
- its income is below the poverty line (taking into account energy costs); and
- its energy costs are higher than what is typical for the household type.

In this measurement, households are considered to be in fuel poverty where their equivalised income, adjusted for housing and fuel costs is less than 60% of the median¹. That is, the income threshold captures all households who, after paying for their energy bills and housing costs, are left with an income at or below the poverty line.

A combined methodology, referred to as the Low Income High Cost (LIHC) approach, allows us to identify the energy poverty gap. Households with lower incomes and higher costs are located in the shaded region in Figure 2. Using Hills' approach (Hills 2012), households that are below 60% of the median residual income poverty line and have fuel costs above the median level are classified as fuel poor. Under the LIHC definition, a household is considered to be fuel poor if:

- They have required fuel costs that are above average (the national median level)
- Were they to spend that amount, they would be left with a residual income below the official poverty line.

Figure 2 The Low Income High Costs definition of fuel poverty



Source: Hills 2012

According to the measure illustrated in Figure 2:

Income threshold = 60% of the weighted median for equivalised after housing costs income (AHCI), plus the equivalised fuel costs of that household

¹ In the BCEC report "Falling through the cracks" it is noted that the use of the 60% poverty line in Australia is quite limited since it aligns with the aged pension resulting in everyone receiving this payment being in poverty because of the number of people driving the mode.

Fuel costs threshold = the weighted median for the equalised fuel costs of all households

In addition to the above measures of fuel or energy poverty, researchers have noted a range of household characteristics associated with a relatively higher likelihood of experiencing fuel poverty, energy poverty or energy stress. According to Legendre and Ricci (2015), these include:

- Living as a sole adult and having dependent children
- Being tenants, single people, and among them, especially pensioners
- Living in an older property

Nance (2013), points some key characteristics in the Australian context that increase the likelihood of being in general poverty, the first three of which are consistent with Legendre and Ricci's findings:

- Single parent households
- People living alone, particularly Aged and Disability pensioners living alone
- Low income renters, particularly those who rent privately
- Dual fuel households – those reliant on mains or bottled gas

According to Chester (2013), the following descriptive characteristics will lead to higher energy bills in Australia, which complement Nance's findings:

- Old housing located outside capital cities without energy efficient appliances and no insulation
- Being a renter, having children and people with medical need in household

Meanwhile, the Western Australian Council of Social Service Cost of Living Report (WACOSS 2014) points to a number of groups impacted by energy stress who are the most likely to report difficulty paying their bills including single parents, couples with children and households that rely on government benefits.

In a review of the UK fuel poverty measure for UK energy regulator OFGEM, Owen (2010) discusses subjective measures as supplements or alternates to the objective measures (i.e. based on actual incomes and expenditures), such as questions relating to financial stress indicators that can similarly provide subjective indicators relevant to the research objective. These include aspects such as household composition, distribution of property types, availability of energy saving infrastructure and tenure type. In this report we examine both the expenditure-income, or relative energy poverty, measures and the wider set of indicators pointing to areas of energy vulnerability.

Given the availability of data from public sources and the constraints on primary data gathering we have focused on the fairly simple energy poverty measure of the ratio of average energy expenditure to average income. In common with other studies we compare this to a threshold ratio, nominally set at 10%. Our attention was given primarily to those in the first and second income quintiles, recognising that the average income of the second quintile in WA is slightly less than 60% of the average income.

1.4 Study design

The data contained in this report relate to a research project that has four main parts: (i) quantitative analysis of secondary data; (ii) analysis of qualitative, primary data collected via interviews; (iii) examination of combined findings; and (iv) policy critique and formulation. Figure 3 provides a summary of the key stages of data collection and analysis and each of the four research steps are described in more detail below.

Figure 3 Study design based on explanatory, sequential mixed methods framework

1. Quantitative	2. Embedded Qualitative	3. Integrated Analysis	4. Policy Implications
<p>Data: Secondary data</p> <p>Analysis: Descriptive statistics. Regression analysis of relationships between variables and extent of energy poverty.</p> <p>Scenario analysis.</p> <p>Outcomes: Indicators of energy poverty in Australian context.</p> <p>Interstate comparisons.</p> <p>Criteria for operational definition of vulnerable households</p>	<p>Data: Semi-structured interviews of vulnerable household members as defined by criteria developed in first stage of project</p> <p>N=20</p> <p>Analysis: Thematic analysis of experience and perceptions of energy poverty, including employment decisions.</p>	<p>Triangulation of findings through comparison of results</p> <p>Interpret links and causal processes</p> <p>Identify emergent issues for future research agenda</p> <p>Identify policy implications</p>	<p>Policy critique, implications and recommendations</p>

Source: Creswell and Plano Clark 2007

This type of project design is known as an exploratory, sequential mixed methods approach (Creswell 2007) and is intended to provide insights into both the patterns and causes of energy poverty. Since econometric analysis alone can be limited in understanding specific choices that households make or the direct effects on wellbeing that result from energy poverty, the primary research element is considered of critical importance to the findings. The combined methodology provides additional insights into the factors contributing to energy poverty and thus complements the statistical data obtained through secondary analysis. The approach is consistent with that followed for the Bankwest Curtin Economics Centre (BCEC) report on housing affordability (Cassells et al. 2014).

Secondary data collection and analysis: The initial phase of the project involved accessing key secondary locational data such as fuel prices, climatic data, income levels and distribution, cost of living indicators, characteristics of housing and commuting patterns and transportation options now and in the future. Comparative studies of Western Australia and the eastern states were used to assess the extent to which the drivers are different and this will inform the examination of policy implementation at a state level (see Appendix 1: Data sources).

Primary data collection and analysis: Building on insights from the analysis of secondary data, an interview schedule was designed to explore the choices that households are making about location, house type, employment and expenditure, and how they see those changing over time. Using thematic analysis, the data are explored to identify links with the earlier secondary data analysis and additional emergent themes that appear to have been neglected in existing research and/or data collections. The target was to interview approximately 20 individuals face-to-face, by telephone or in focus groups (Baker and Edwards 2012) and we were successful in recruiting 18 interviewees from a wide range of financial and housing situations who participated in face to face interviews. In addition to the interviews, we took advantage of a wider survey encompassing three states to ask questions regarding household energy usage and practices. This allowed us to explore some of the broader themes with 4,500 households.

Examination of combined findings: Phase 3 of the project involved an integration of the data collected and analysed in phases 1 and 2. Recognising the shortcomings of the purely statistical or panel data approach (Jefferson et al. 2014), the aim was to utilise the primary data collected to explore the causal relationships between, for example, an individual's (or household's) expenditure decisions and changes in energy prices. There are limits on the extent to which general conclusions can be drawn from this interview data but they provided direct evidence of cause and effect and also provide qualitative descriptions of the impact of energy poverty.

Review/formulation of policy and commercial arrangements: In the final phase of the project, the extant policies at Federal and State level to address the issue of energy poverty will be reviewed in the light of the findings of the research. The effectiveness of these policies will be examined and the likelihood of their achieving their stated purpose analysed given expectations regarding changes in economic, environmental and societal conditions over the coming years. Where appropriate, and making reference to international comparisons where necessary, alternative policy measures will be explored and their potential effectiveness discussed, once again in light of the findings of the study. In addition, the commercial arrangements with respect to energy markets may be examined to assess their robustness in meeting the challenges facing the most vulnerable households. It is envisaged that a two workshops will be held involving relevant stakeholders including government, industry and community groups intended to both inform and gather further input on the findings of this research project. This analysis will be carried out after the initial report has been published.

1.5 Details of primary data collection

As discussed in section 1.4, primary data collection consisted of two main activities, face-to-face interviews with individuals in the Perth area and a survey of approximately 4,500 households in WA, NSW and QLD. In addition, we had a number of meetings with the WA electricity utility, Synergy, which provided further intelligence on aspects relating to hardship customers.

1.5.1 Interviews

We carried out a total of 18 interviews with individuals living in the Perth area between November 2015 and April 2016. Interviewees were recruited through a number of channels including direct mailing, letter drop and advertisements at community groups and in the Curtin University and Curtin Business School newsletters. Interviews were typically conducted at the individual's home, as this allowed the interviewers to gain a better understanding of the household environment. However, for those recruited from Curtin, the interviews were conducted at their place of work.

We made an effort to target the mailings and letter drops to neighbourhoods we knew to be relatively more deprived and made contact with community groups that specifically dealt with those in straightened financial circumstances to recruit interviewees. However, we did not seek to entirely direct our recruitment towards those in energy poverty for two principal reasons:

- We wanted to be able to compare the responses across a wider range of households in differing circumstances
- We understood that household circumstances frequently change and we did not want to limit ourselves to those currently in challenging circumstances

The interviews typically lasted between 45 minutes and 1 hour and followed the basic script set out in Appendix 2. The interviews covered a variety of topics in relation to the household's energy usage, such as how much energy they used, what appliances and energy sources (including self-generation) they had available and whether they had experienced difficulties with paying their energy bills. In addition, we collected basic data on issues including who lived in the household, what their tenure was and what was their sources of income. The questions related both to their energy use in the home and their expenditure and habits regarding transport fuel.

It should be noted that there are certain limitations to the interview data given that participants were self-selecting, were drawn from a relatively small geographical area and the sample size was small. We take care not to generalise the findings from this data but use it to illustrate the effects and impacts on individual households of rising energy prices.

1.5.2 Survey

A housing affordability survey as part of a Bankwest Curtin Economics Centre funded study included questions on energy usage and practices designed specifically for this study. A total of 4,357 people completed the survey and the figures below show the characteristics of the survey respondents by state (Figure 4), income bracket (Figure 5) and housing tenure (Figure 6). As these data demonstrate, there was a good response across the spectrum.

Figure 4 Survey respondents by state

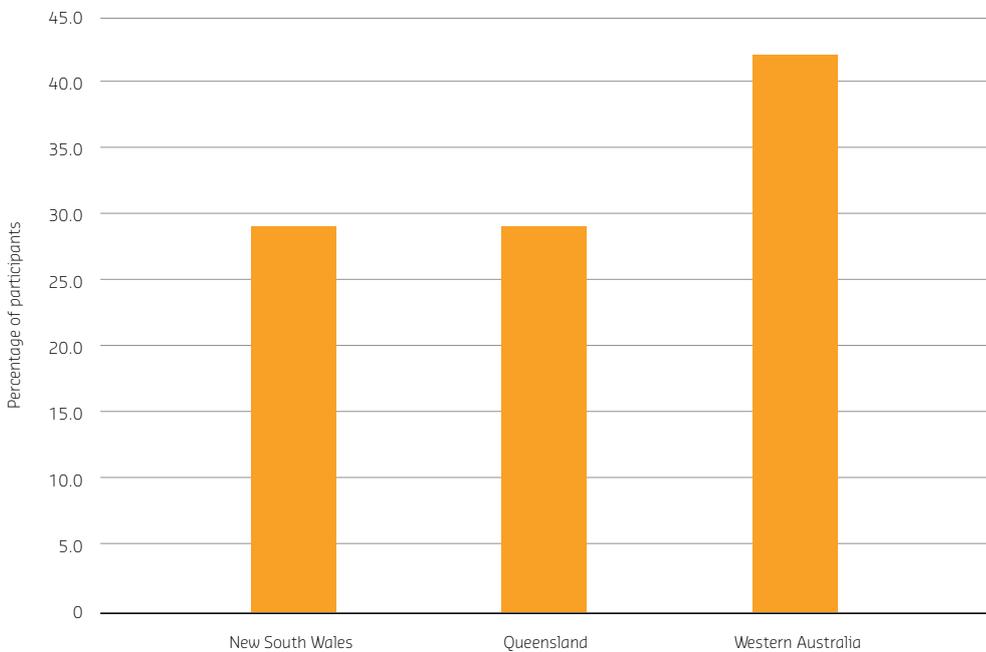


Figure 5 Survey respondents by household income bracket

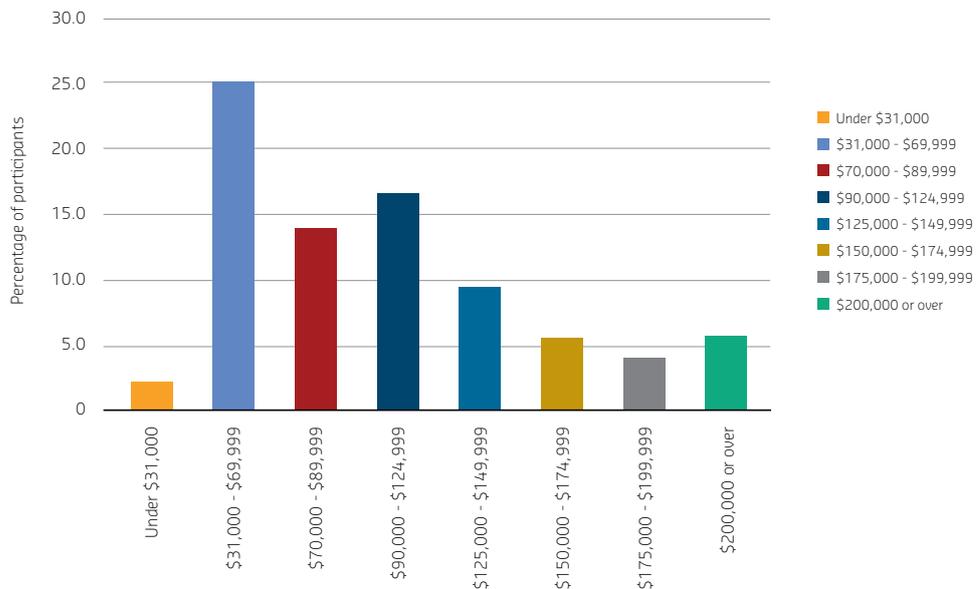
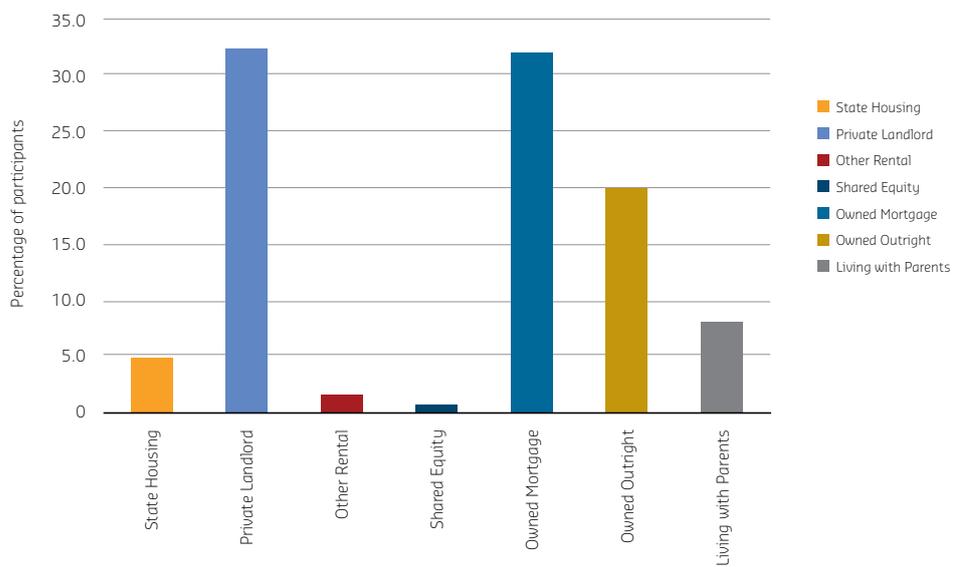
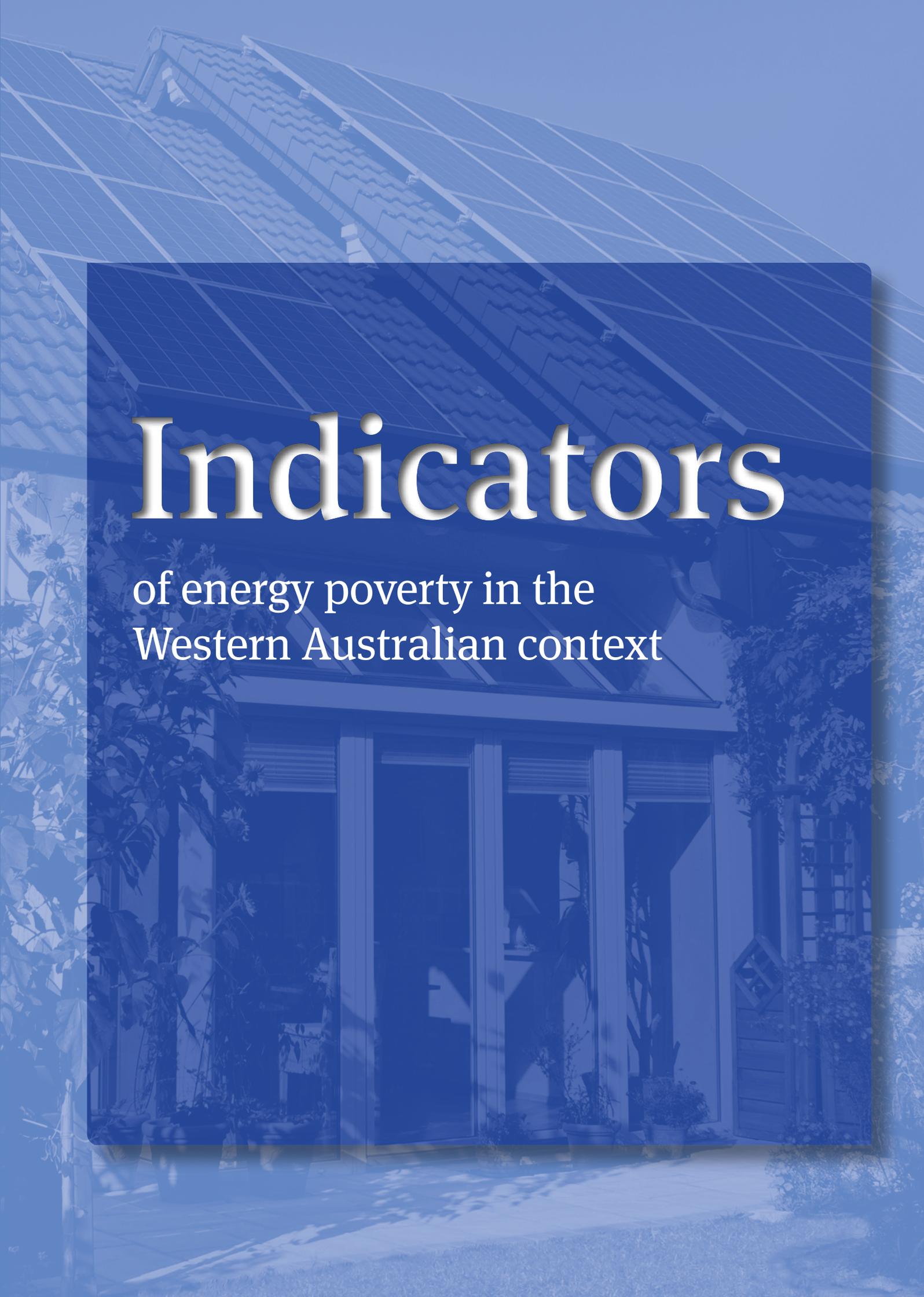


Figure 6 Survey respondents by housing tenure



The survey posed three sets of questions (see Appendix 3) relating to three key aspects of energy use: ways in which households seek to reduce energy usage which may be synonymous with energy vulnerability; restrictions on transport fuel use; and householder's interest in other ways that they might be able to manage their energy usage. As well as analysing these results in isolation, the responses were cross-tabulated with data on income, tenure and household composition. In addition, efforts were made to draw out consistent messages emerging from the free text answers under the "Other Strategies" question in the first set.



Indicators

of energy poverty in the
Western Australian context

2 Indicators of energy poverty in the Western Australian context

2.1 Overall methodology

In order to better understand the extent of energy poverty in Australia in general, and WA in particular, income distribution data were first examined, which provide an overall perspective on the numbers of households facing financial hardship. In addition, the evolution of housing costs was investigated and how that may be further affecting hardship levels. Data on energy expenditure among the different income groups were examined next in order to make an initial broad assessment of the extent of energy poverty. Trends in energy prices, and present data on typical consumption levels, were studied allowing an understanding of how the extent of energy vulnerability might be evolving over time. Finally data on household composition and property characteristics are presented in order to gain insights into the types of household that are most at risk.

2.2 Income and housing expenditure in WA relative to Australia as a whole

An extensive account of income distributions can be found in Cassells, Dockery, and Duncan (2014) and Cassells et al. (2014), but in this section a few of the most relevant data are presented. In this report Equivalised Disposable Household Income (EDHI) is mostly used as an income measure rather than gross or disposable income alone as it enables comparison of the relative economic wellbeing of households of different size and composition. Gross Household Income (GHI) is also used within the analysis where EDHI estimates were not available. See technical notes for further information.

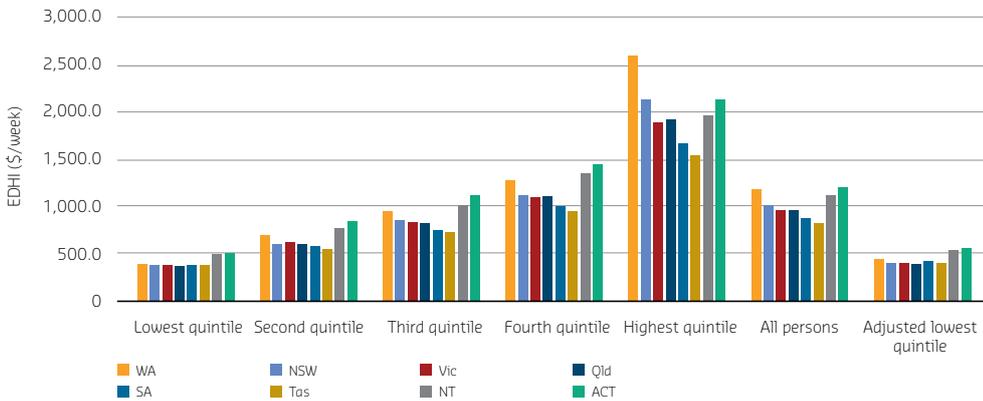
Incomes in WA are generally higher than the national average...

While it is observed that the average EDHI in WA is higher than in all states and territories, with the exception of the Australian Capital Territory (ACT) and Northern Territory (NT) in most quintiles. Within the fifth income quintile, EDHI is the highest in WA, averaging just above \$2,500 per week in 2013-14 (see Figure 7). EDHI growth has been significant in WA and above the national average in the years since 2005-6, due mainly to the resources boom.

...but the gap between the worst and the best paid has been widening

EDHI for the lowest quintile in WA in 2013-14 was \$402 per week, 34% of the overall mean for all households of \$1,180 per week, a wider gap than the national average (37.5%). EDHI for the lowest income quintile has moved in lock-step with the national average, emphasising a widening gap between the lowest and average income levels in recent years. EDHI for the highest income quintile is more than 6 times that of the lowest income quintile in WA. Moreover the low income group has endured a bumpy ride over the past 15 years, with changes in mean EDHI fluctuating between periods of significant decrease and substantial increase.

Figure 7 EDHI by quintile and state 2013-14 (\$/week)

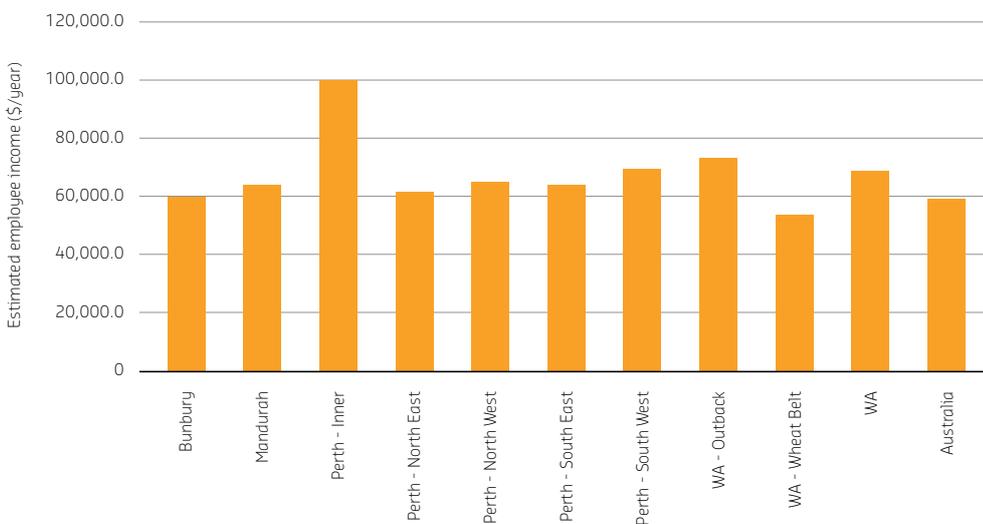


Source: ABS. Cat. No. 6523

...and significant differences in income exist between regions...

Incomes vary significantly across WA as shown in Figure 8, with the Wheat Belt having the lowest average employee incomes and Perth Inner the highest. Data at the statistical area level from ABS reveals that average incomes vary between \$41,698 in Plantagenet, a region in the state’s south and \$133,100 in Cottesloe, a beach-side area in Perth.

Figure 8 WA regional area: Average estimated gross employee income 2012/13 (\$/year)

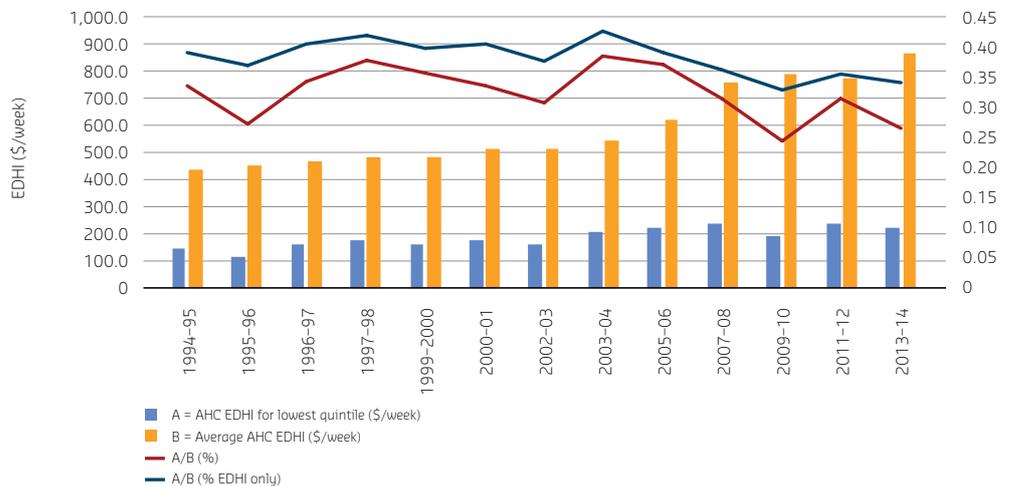


Source: ABS. Cat. No. 6524 (data based on Australian Tax Office)

Once housing costs are taken into account, those with lowest earnings are often even worse off...

The BCEC report into poverty in Australia (Cassells, Dockery and Duncan 2014) defines the income poverty rate as the percentage of households whose real EDHI after housing costs (AHC) falls below 50% of the median. The AHC income for the lowest quintile is estimated at \$226 per week, or 31% of the AHC income of the average household and this situation has been worsening as can be seen in Figure 9.

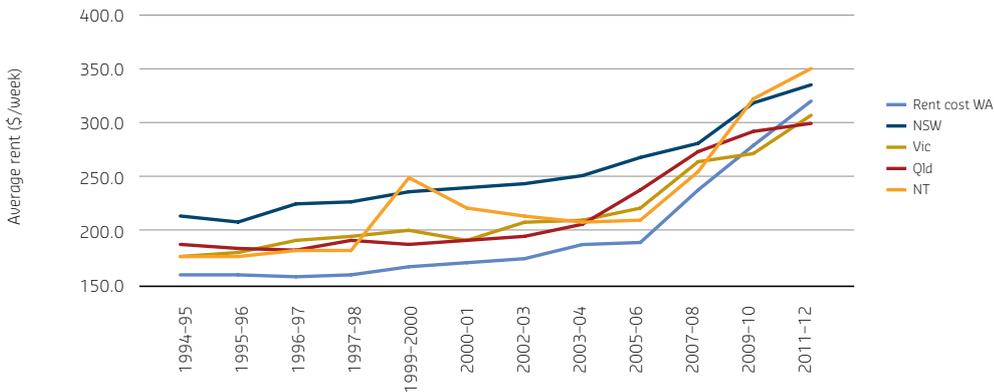
Figure 9 AHC income in WA for the lowest and average income quintile 1994/5 to 2013/14



Source: ABS, Cat. No. 6523

and the situation is exacerbated by rising rents...

Poorer households are more likely to rent their property and data suggest that households that are renting are twice as likely to be in poverty as home owners or buyers. Figure 10 shows that rents in WA have been increasing rapidly and the ABS Housing and Occupancy Costs 2013-14, WA households faced the highest national increases in rental costs since 2003/4, with prices jumping a hefty 77% over a ten year period. The lowest quintile households were seeing, on average, 32% of their EDHI go towards rental payments in 2003/04 but this had risen to 43% by 2013/14 (Australian Bureau of Statistics 2015b).

Figure 10 Average housing costs for renters by state 1994/5 to 2011/12 (\$/week)

Source: ABS Cat. No. 4130.0

...and increasing utility prices.

In addition to housing costs, utility costs have an important impact on household wellbeing and the utilities price index in Perth has risen 60% between June 2007 and June 2012 (ABS. Cat. No. 6401). The dramatic increases in the cost of gas, electricity and water has meant that low income households, who spend a greater portion of their income on utility bills², are feeling the pressure of the rising cost of utilities more than other West Australians.

2.3 Historical energy price trends

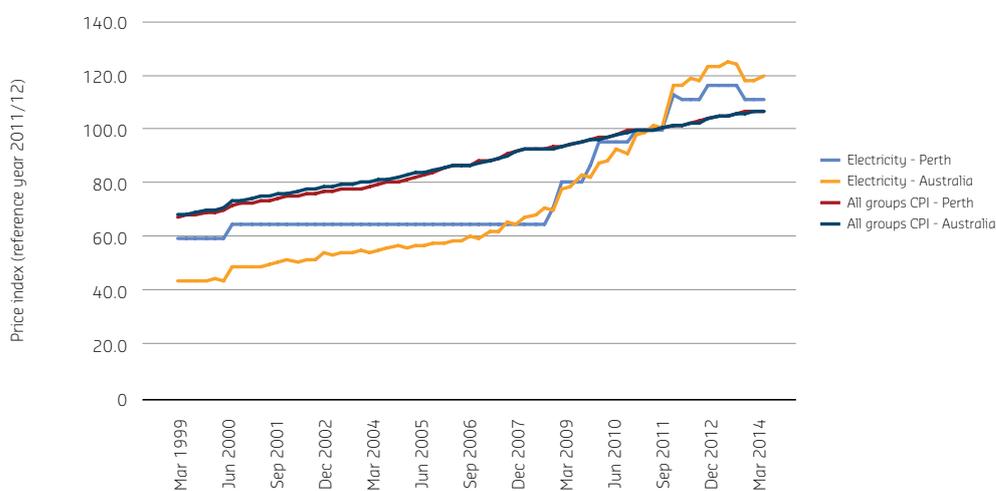
Household energy expenditure is determined by three factors: the mix of energy sources available; the price of those energy sources; and the quantity of energy consumed. In this section we examine how energy prices and the consumption of different forms of energy have changed over time, together with some national and international comparisons.

² According to ABS. Cat. No. 4670 (Table 4), energy expenditure as a proportion of gross income is about 6.5% for the lowest income quintile, which is the greatest proportion in comparison to the other quintiles.

2.3.1 Electricity prices, consumption and bills

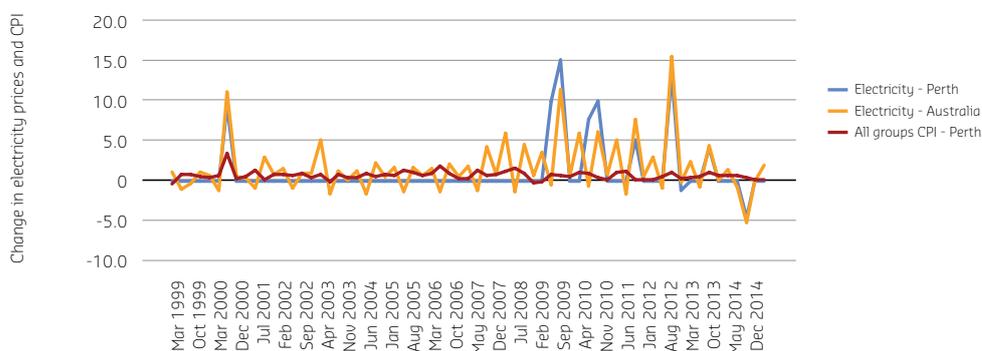
Figure 11 compares the price index for domestic electricity since 1998 in WA and in Australia against the Consumer Price Index (2011/12=100.0). Figure 12 shows the annual price changes over the same period.

Figure 11 Electricity price index for Perth and Australia against CPI 1999–2014



Source: ABS. Cat. No. 6401 (Reference period of index 2011/12=100)

Figure 12 Electricity price changes for Perth and Australia against CPI 1999–2014

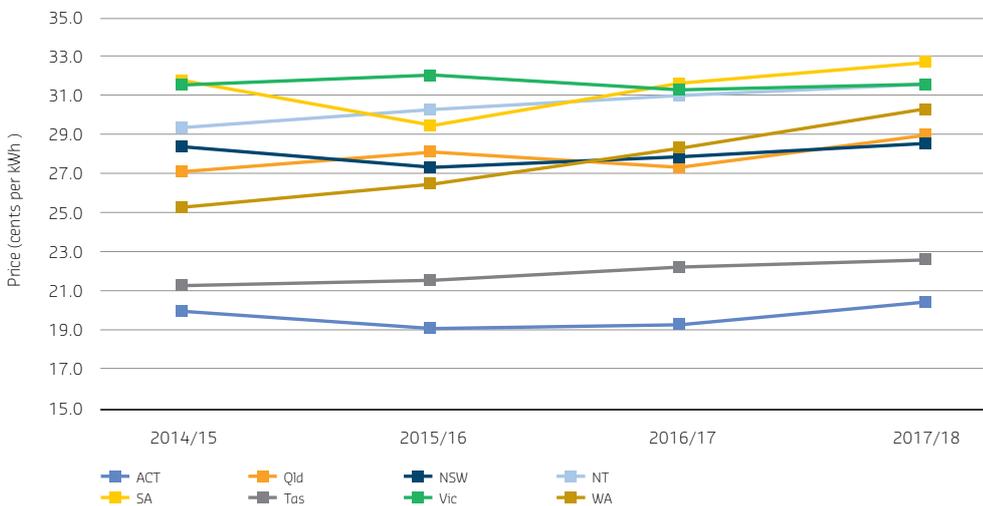


Source: ABS. Cat. No. 6401

As the chart shows, 2009 marked the first calendar year in over a decade that electricity prices increased from the previous year. This reflects the regulated price regime that existed prior to 2009 and the attempt to create a competitive market from that point on. According to the Residential Price Trends Report 2014 from the Australian Energy Market Commission (2014 Residential Electricity Price Trends 2014), the prices rises mark "...a move toward prices that reflect actual costs of supply, higher cost of fuel used for generation, increased network operating costs following a period of under investment and increases attributable to environmental policies."

Prior to 2009, electricity prices (excluding GST) for residential customers had not increased since 1997/98 ("Electricity Market Review, Phase 1 Terms of Reference" 2014). Despite increases of 86% since then, in 2013/14 the price was still less than the estimated total cost ("Electricity Market Review, Phase 1 Terms of Reference" 2014), suggesting more rises may be on the way. In 2009, there was a 25% tariff increase in electricity prices which was quickly followed by rises of 17.5% in 2010. Increases were more modest in subsequent years averaging around 4% and while prices actually decreased (-4%) in 2014 due to the carbon price repeal, AEMC project (2014 Residential Electricity Price Trends 2014) that electricity prices will continue to climb in WA leaving them among the highest in Australia by 2016-17 (Figure 13).

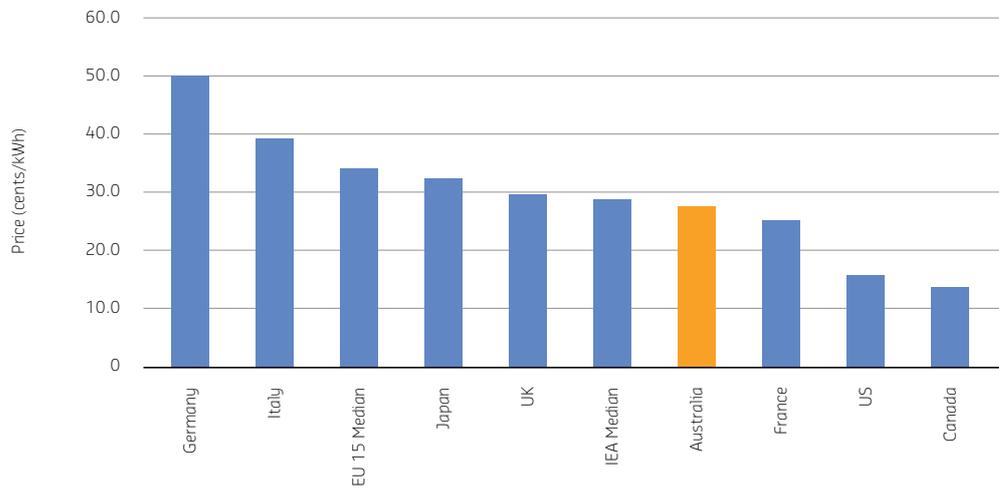
Figure 13 Forecast electricity prices to 2017-18



Source: AEMC (2014 Residential Electricity Price Trends) & Energy White Paper ("Energy White Paper" 2015)

Figure 14 below is a comparison of 2011 household electricity prices for comparable countries, states and provinces across the globe. Until 2010 electricity prices in Australia were a little below the OECD average but persistent price increases have eroded Australia's position as a low energy cost country. As a result of these increases, average prices in Australia in 2011 were about 10% higher than average prices in Japan, 20% higher than the EU, 70% higher than the U.S. and 130% higher than Canada. As Figure 14 shows, currency movements have had an effect and in 2013 household electricity prices in Australian were close to the IEA median.

Figure 14 Household electricity prices by country, state and province in 2013



Source: International Energy Agency (IEA), 2013

In WA the electricity tariff by-laws set out the fees and charges that Synergy, which supplies domestic customers in the South Western Interconnected System (SWIS), and Horizon Power, which supplies the areas outside the SWIS, may charge for supplying electricity to domestic customers. Changes to electricity tariffs, fees and charges are considered by the Western Australian Government annually as part of the State Budget process; in this sense, prices are regulated in WA and the rule of one price applies. Table 2 shows the daily standing and per unit electricity prices in September 2014.

Table 2 Electricity tariff and charges for Synergy and Horizon Power interconnected areas

Home Plan (A1) Tariff	Prices Effective 1 Sept 2014 (excl. carbon)
Supply charge – cents per day	47.1834
Electricity charges – cents per unit	25.7029 (first 20 units)
Electricity charges – cents per unit	29.4275 (next 20 units)

Source: Synergy

Average consumption varies between jurisdictions and, as Table 3 shows, consumption in WA is among the lowest between states being 7% below the national average.

Table 3 Average annual electricity consumption (kWh)³ in 2015

Tas	NT	ACT	SA	WA	QLD	NSW	VIC
8,080	6,750	6,730	5,980	5,600	5,400	5,310	4,050

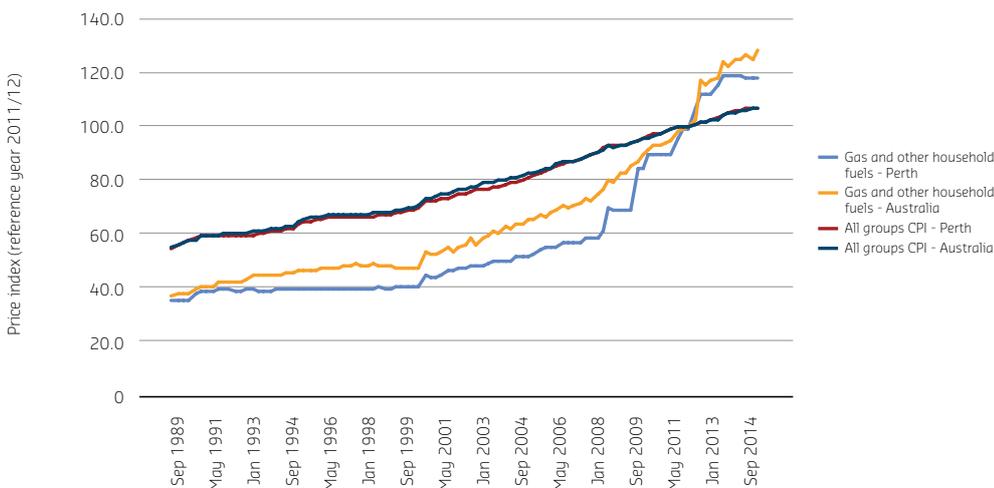
Source: Alviss Consulting

According to the 2014 SWIS Electricity Demand Outlook report³, average electricity use per household has fallen by 8.7%, from 6,134 kWh in 2007/08 to 5,598 kWh in 2012/13. The recent decline in residential electricity sales and average use per household is largely a result of price increases since 2009. Increasing prices have driven consumers to reduce electricity consumption by installing more energy efficient appliances, installing solar PV, or changing behaviour (for example, switching off lights in unoccupied rooms as revealed by the survey). As will be discussed in section 2.4, the most vulnerable households have diminished ability to manage household consumption.

2.3.2 Gas prices

Figure 15 below shows the price index for domestic gas since 1998 for WA and Australia and compares these with CPI while Figure 16 shows the rate of change of gas prices.

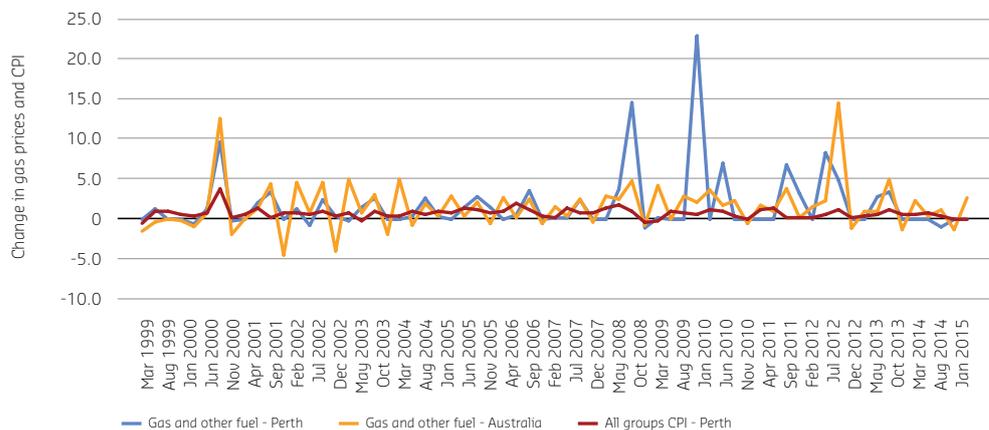
Figure 15 Gas Price Index (reference period of index 2011/12=100)



Source: ABS, Cat. No. 6401

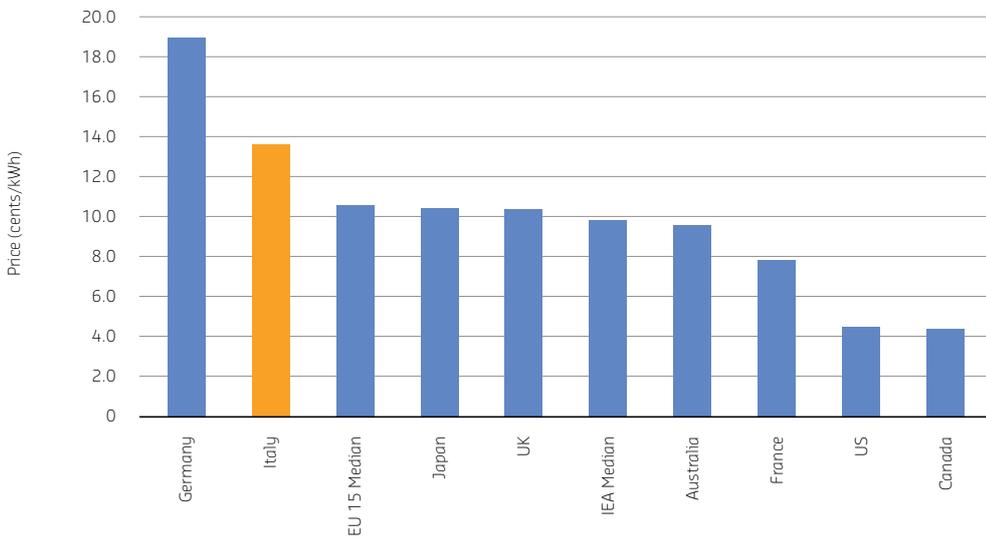
³ The electricity consumption values chosen in different states are based on the ACIL Allen Consulting report for the Australian Energy Regulator (AER), Electricity Bill Benchmarks for residential customers, October 2014 for 3 person households with reticulated gas and no swimming pool. For Western Australia, the annual consumption level is based on the Independent Market Operator's report (Swis Electricity Demand Outlook 2014).

Figure 16 Changes in Gas Price Index



Source: ABS, Cat. No. 6401

Before 2009, gas prices grew at a rate slightly below the national average but the sharp increment in gas prices in Perth since 2009 saw prices reach the national average by 2011. This was largely attributed to the increase in exports of liquefied natural gas (LNG), which commenced from WA around this time and led to a tightening of the domestic gas market. Strong price increases in the eastern states, often linked to the commencement of exports from the new LNG trains at Gladstone, have seen prices in that region move ahead of WA recently. Over the past 10 years, the retail price of gas for households has increased, on average, by 8% a year, significantly faster than the rate of inflation (“Gas Market Report” 2014). Domestic prices are now high compared with other International Energy Association (IEA) countries (Figure 17) despite Australia’s wholesale gas prices being low by international standards.

Figure 17 Natural gas price for households in 2013 (Australian cents / kWh)

Source: IEA, Domestic Natural Gas Prices, 2013

It is important to note that gas for household use in WA represents less than 5% of the total gas market (on an annualised basis) and that prices for this segment of the market are regulated by the WA Government under the Energy Coordination Act 1994 (“Energy Coordination Act 1994” 1994). Gas tariff prices from Alinta Energy in 2015 by region are given in Table 4; it is interesting to note that there is a significant disparity between the charging schemes applied in the three regions of Perth, Albany and Kalgoorlie-Boulder.

Table 4 Alinta Energy gas prices

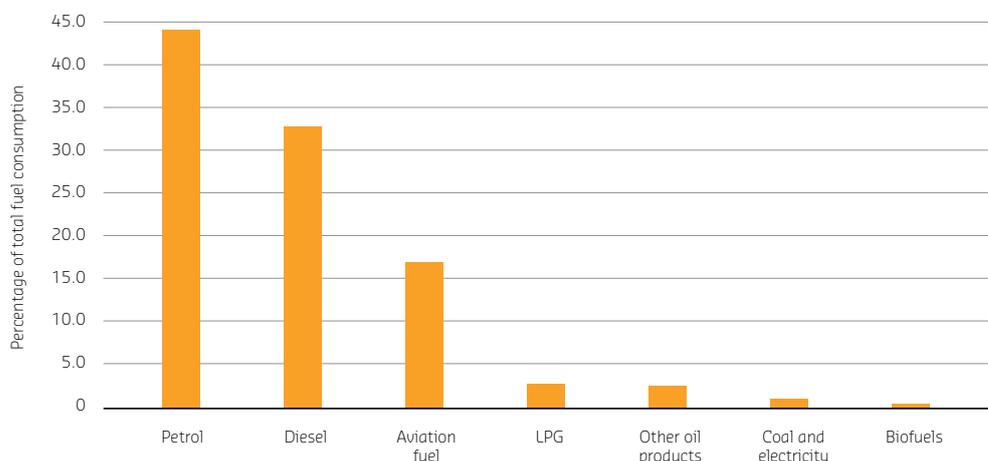
Alinta Energy Residential Charges	Price in cents (including GST) applicable from 1 July 2015	Annual cost based on consumption of 13 units per day (4750 annually) in AU\$
Perth		Cost Perth
Supply charge (per day)	20.58	744
First 12 units of gas used on average per day (per unit)	14.20	
Subsequent units of gas used on average per day (per unit)	12.81	
Albany		Cost Albany
Supply charge (per day)	22.21	847
Energy charge (per unit)	16.15	
Kalgoorlie-Boulder		Cost Kal-Boulder
Supply charge (per day)	46.26	795
Energy charge (per unit)	13.19	

Source: Alinta Energy 2015

2.3.3 Petrol and other vehicle fuel prices

Petrol and diesel fuel are the dominant transport fuels for domestic consumers, and accounted for around 75% of total transport energy used nationally in 2012/13 ("Energy White Paper" 2015). The share of petrol in the transport fuel mix has decreased slowly over recent decades, outstripped by growth in diesel fuel. Alternative transport fuels accounted for 5% of energy consumption in 2012/13, including liquefied petroleum gas (LPG) (2.7%), natural gas (1.6%) and biofuels (0.6%) as shown in Figure 18.

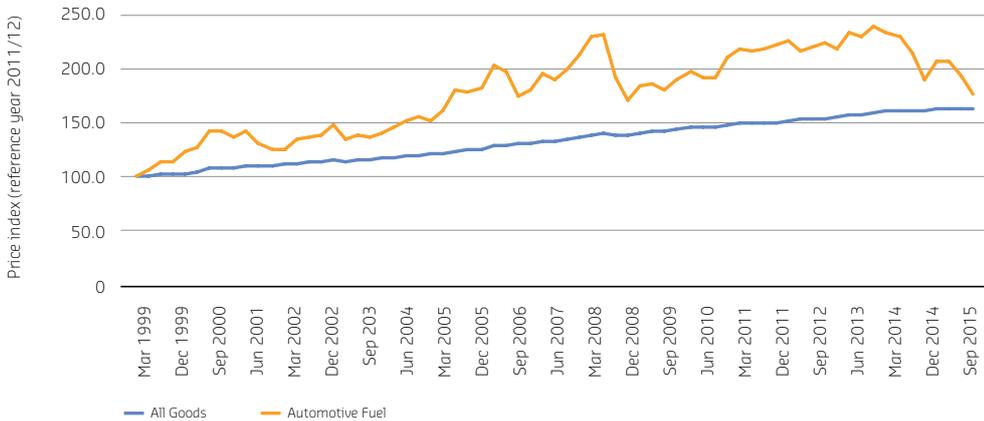
Figure 18 Energy consumption in the transport sector, share of fuel, 2011/12 (%)



Source: BREE 2014

Australian wholesale petrol and diesel prices closely follow movements in Singapore petrol prices because around 43% of Australia's imports of refined petroleum products are imported from the Singapore hub ("Gas Market Report" 2014). Transport fuel prices have risen faster than inflation but the recent oil price correction leaves the 16 year price change very nearly in line with CPI (see Figure 19).

Figure 19 Fuel price index compared with CPI for Perth



Source: ABS, Cat. No. 6401 (Consumer Price Index; Mar 2015)

The Australian Competition and Consumer Commission (ACCC) and Bureau of Resources and Energy (BREE) Australian Petroleum Statistics have consistently reported that Australian petrol and diesel prices are lower than most countries in the Organisation for Economic Cooperation and Development (OECD), with only the United States (US), Canada and Mexico being cheaper. This is confirmed by data from BREE (International Price Comparison of Petrol Prices 2015) shown in Figure 20.

Figure 20 Petrol and diesel prices in selected OECD countries



Source: Australian Petroleum Statistics, Bureau of Resource & Energy Economics (BREE, 2015).

Figure 21 shows the historical retail pump price for petrol and Figure 22 the same for diesel. As can be seen the diesel price in WA has been running consistently ahead of the national average, while the petrol price has been largely in line with national prices.

Figure 21 Average petrol retail price in Australia and Perth (Australian cents/l)



Source: Australian Institute of Petroleum (AIP) 2015

Figure 22 Average diesel retail price in Australia and Perth (Australian Cents/l)



Source: Australian Institute of Petroleum (AIP) 2015

2.4 Energy expenditure

Energy expenditure data are taken from the 2011/2012 ABS (Household Energy Consumption Survey). In calculating fuel consumption, the fuel costs are modelled dependent on the following factors, which are discussed in more detail in the following sections:

- The dwelling characteristics
- The heating/cooling system and the fuels used
- The economic circumstances of householders (for example, whether they are unemployed or retired and at home for longer periods of the day).

2.4.1 Overview

According to the ABS, in 2012 Australian households spent an average of \$99 per week on energy. This comprised \$39 per week on energy sources used within the dwelling (such as electricity or gas) and \$60 for fuel for vehicles. Around \$29 (75%) of the amount spent on fuel in the house goes toward electricity and the rest (\$10) is for gas and other fuels.

According to ABS (Cat. No. 6530), the overall increase in average weekly household expenditure on goods and services between 2003/4 and 2009/10 was \$343, representing an increase of 38% over the period. At the same time, the price of goods and services, as measured by CPI, rose by 19%. Among all expenditure categories, the largest increase was in housing costs, which rose by 55%, followed by transport and domestic fuel and electricity, both of which rose by 40%.

As Figure 23 shows, WA household expenditure on energy equalled the mean for all Australian households (\$100/week) suggesting that WA is neither a heavy nor light user of energy. NT, ACT and Victoria (VIC) households all spent more on average (\$110/week) than WA with NT having the heaviest expenditure. Tasmania spent roughly the same amount as WA while South Australia (SA), QLD and NSW all spent less. It is important to note that the expenditure on vehicle fuels formed a higher proportion of total spend in WA (65%) than in most other states; only in NT did households spend more on vehicle fuel than in WA. This makes households in WA relatively more vulnerable to increases in fuel prices than those in other states.

Figure 23 Household energy expenditure by state 2011/12 (\$/week)



Source: ABS. Cat. No. 4670

Figure 24 below shows proportion of energy expenditure to household’s income in WA in 2011-12, suggesting that the overall burden of energy expenditure is lower in WA than most other states with the exception of the ACT. This reflects the higher average incomes as discussed in section 2.2.

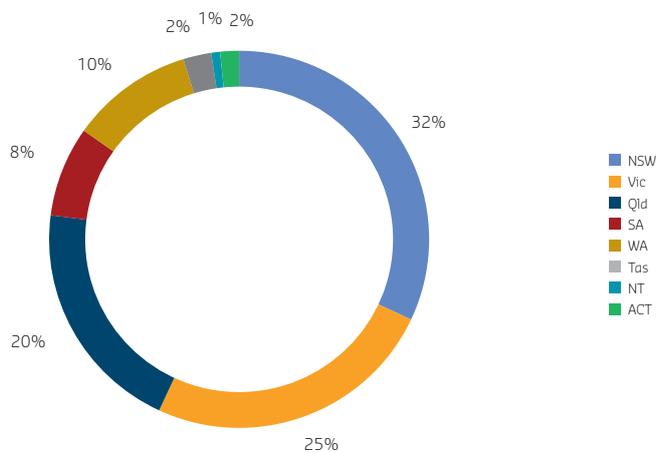
Figure 24 Energy expenditure as proportion of EDHI by state 2011/12 (%)



Source: ABS. Cat. No. 4670

In Figure 25 we illustrate the expenditure patterns of the lowest income quintile. This suggests that on average roughly 6% of their total expenditure went on fuel for domestic and for transport.

Figure 25 Total expenditure composition for lowest income quintile WA 2009/10



Source: ABS. Cat. No. 6530

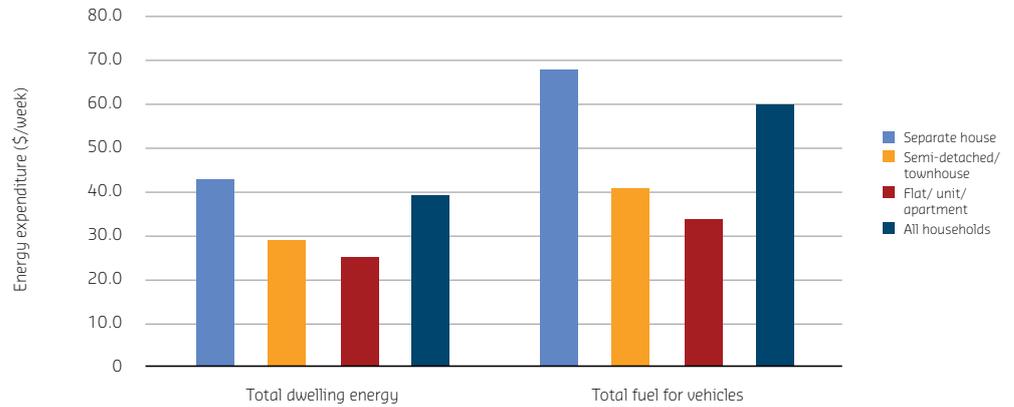
2.4.2 Dwelling characteristics and energy expenditure

Household size, composition and energy-related behaviour are likely to vary in accordance with dwelling characteristics, which is an important determinant of energy consumption⁴. Average expenditure on energy by dwelling structure type is presented in Figure 26. Households living in separate houses, representing about 80% of the population, had significantly higher energy costs per week than those in other types of dwellings.

The average energy cost among separate houses was \$109 per week, while the corresponding figure for semi-detached houses was \$70 and for flats, \$59. These findings underline the need for housing diversity, providing increased scope to match housing types with housing needs. Expenditure on dwelling energy and fuel for vehicles, as well as the quantity of mains electricity and gas consumed, followed similar patterns according to dwelling type.

⁴ In general there is a correlation between energy expenditure and both the number of occupants of a household and the size of the dwelling, which in turn will often be correlated with the number of occupants. We do not, at this time, have access to the raw data to test these relationships but need to be mindful of the possibility they exist in the following examination.

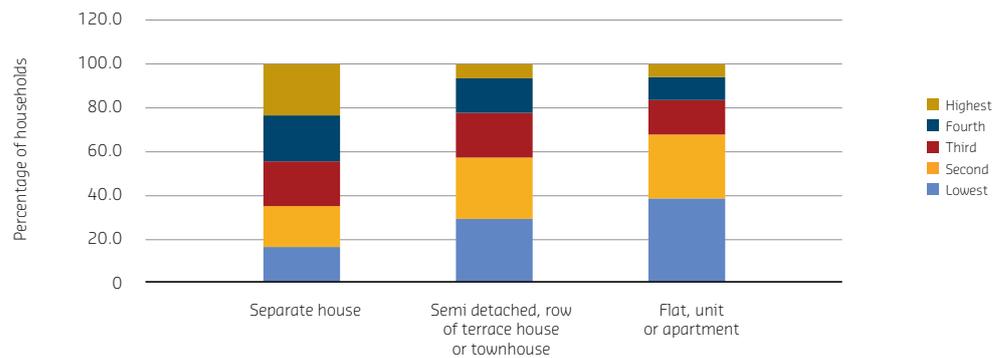
Figure 26 Household average energy expenditure in Australia, by dwelling structure 2011/12 (\$/week)



Source: ABS. Cat. No. 4670

As Figure 27 confirms, apartments have generally lower energy expenditure with almost 40% of this dwelling type being in the lowest expenditure quintile. This reflects the fact that, on average, flats will be smaller and have fewer occupants.

Figure 27 Dwelling structure by household energy expenditure quintile in Australia (2011/12)

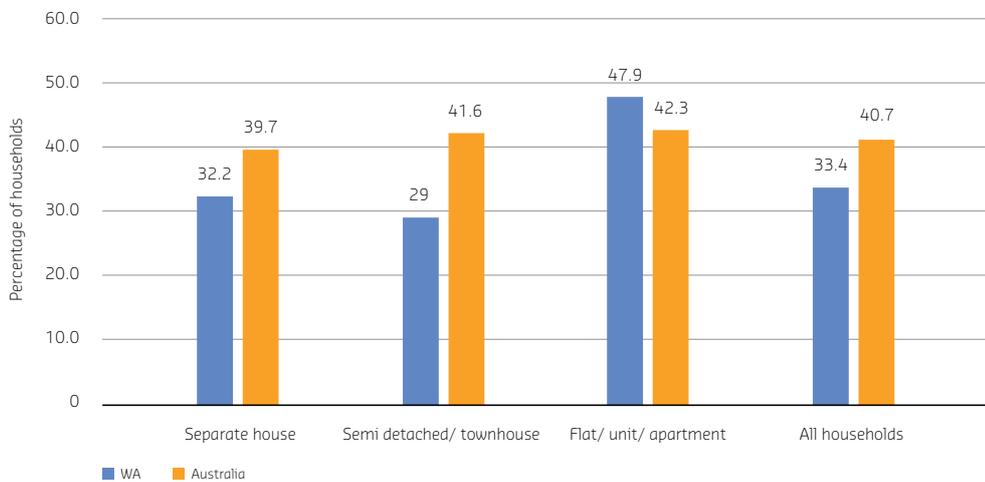


Source: ABS. Cat. No. 4670

According to the ABS ("Household Energy Consumption Survey, Australia: Summary of Results 2012" 2013), energy expenditure as a proportion of gross income is, on average, highest for households residing in separate houses at 5.5% followed by semi-detached houses (4.4%) and is lowest for those in flats (3.7%).

While not directly comparable, data from the ABS Housing Occupancy and Cost Survey in 2013/14 (“Housing Occupancy Costs 2013-14” 2015), indicates that 48% of households living in flats in WA were considered to be in housing stress; that is their housing costs were greater than 30% of their GHI (see Figure 28). While in the case of separate houses the proportion is lower than for Australia as a whole, it is higher for flats, where many lower income families reside.

Figure 28 Proportion of low income households paying more than 30% of GHI on housing



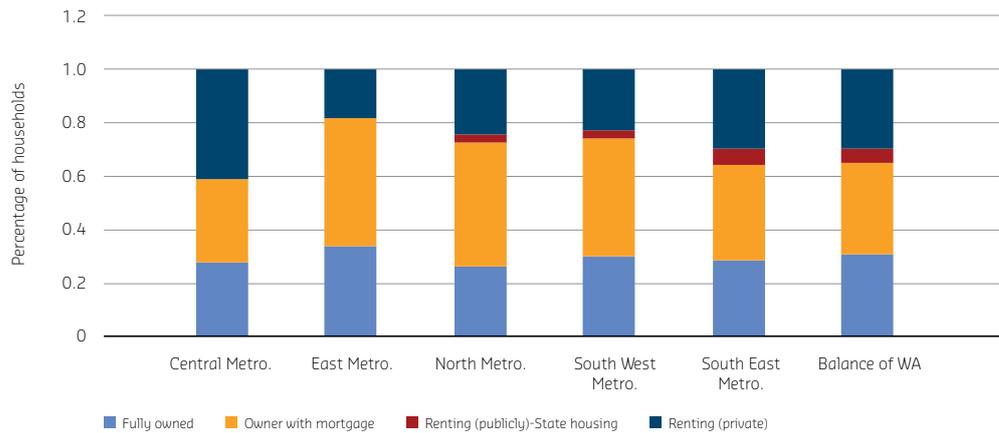
Source: ABS. Cat. No. 4130

Interestingly, the dwelling age does not appear to have much influence on household energy consumption in Australia, since according to the Household Energy Consumption Survey (“Household Energy Consumption Survey, Australia: Summary of Results 2012” 2013), consumption across the property age range is close to the national average weekly expenditure of \$39 per week. This suggests that modern properties have failed to take advantage of improvements that aspects such as insulation have been able to bring to energy efficiency. It may also reflect that householders in older properties have already taken action to remediate energy inefficiencies.

2.4.3 Energy consumption and tenure type

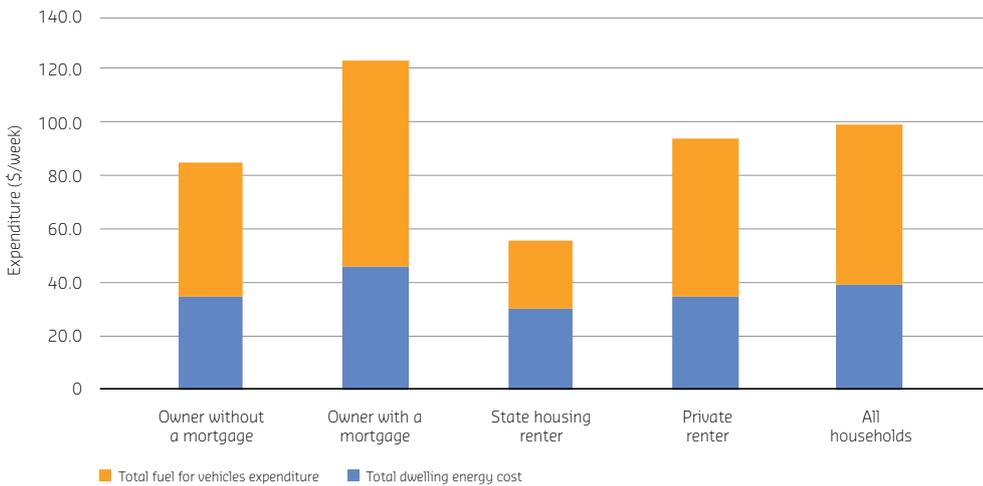
As Figure 29 shows, in WA the majority of households are owner occupiers with, on average, nearly 70% of households in that category, although this can fall as low as 59% in some areas such as Central Metro and rise as high as 82% in East Metro. Of these owner occupiers, 40% on average are paying off a mortgage. The remainder of households are renters, with around 4% of households across the region living in state housing, with the largest proportions evident in the South Eastern Metro area and the balance of WA. This is consistent with the income distribution discussed in section 2.1, which showed that the proportion of lower income households was highest in South East Metro and the non-metro area of WA. Renters (public and private) make up a larger proportion of households in the Central Metro (all private), South East Metro and the balance of WA than in other parts of the state.

Figure 29 Housing tenure by region of WA 2009 (%)



Source: ABS, Cat. No. 4656-5

Of the different tenure groups, households living in state/territory rented accommodations had the lowest energy expenditure across Australia as a whole (\$56/week in 2012), whilst owner occupier households with a mortgage had the highest costs (\$123/week in 2012). This is illustrated in Figure 30. Most state housing is separate houses rather than apartments and this indicates that households are curtailing expenditure in the face of reducing disposable income rather than lower expenditure being a function of property size.

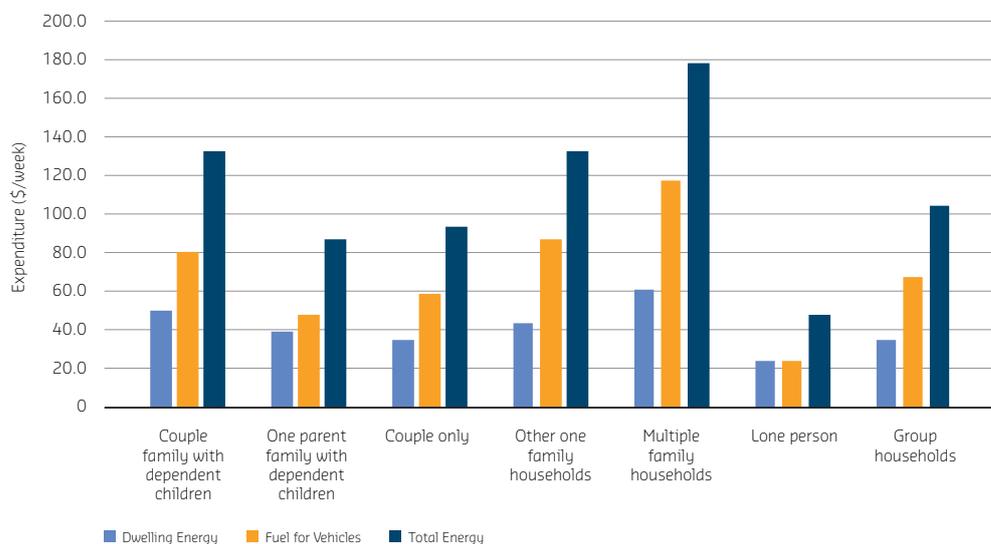
Figure 30 Household energy expenditure by tenure type in Australia 2011/12 (\$/week)

Source: ABS, Cat. No. 4670

2.4.4 Family composition and energy expenditure

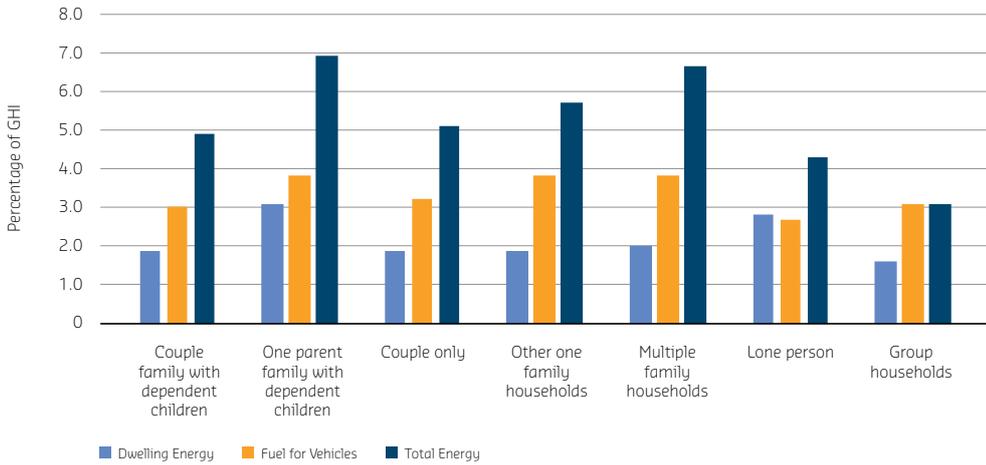
Energy expenditure by family composition is shown in Figure 31. Among single family households, couples with dependent children and 'other' one family households had the highest total household energy expenditures (\$133 and \$132/week, respectively). Although couples with dependent children included more people on average (4.1 persons) than 'other' one family households (2.9 persons), their total energy expenditures was similar. This suggests that energy costs associated with having dependent children are lower than for households with non-dependent children or with other adults present. Accordingly, one parent families with dependent children (3.1 persons on average) spent the least on energy costs (\$87 per week), while couple only households (2.0 persons) spent slightly more (\$94 per week). Once again this suggests that income constraints are leading to curtailment of energy use although care should be taken with the expenditure measure given that some households will receive concessions from utilities. Among other household types, lone person households had the lowest total energy costs (\$49 per week), while multiple family households had the highest average number of people (5.3 persons per household) and the highest average energy expenditure (\$176/week).

Figure 31 Household energy expenditure by family composition (\$/week)



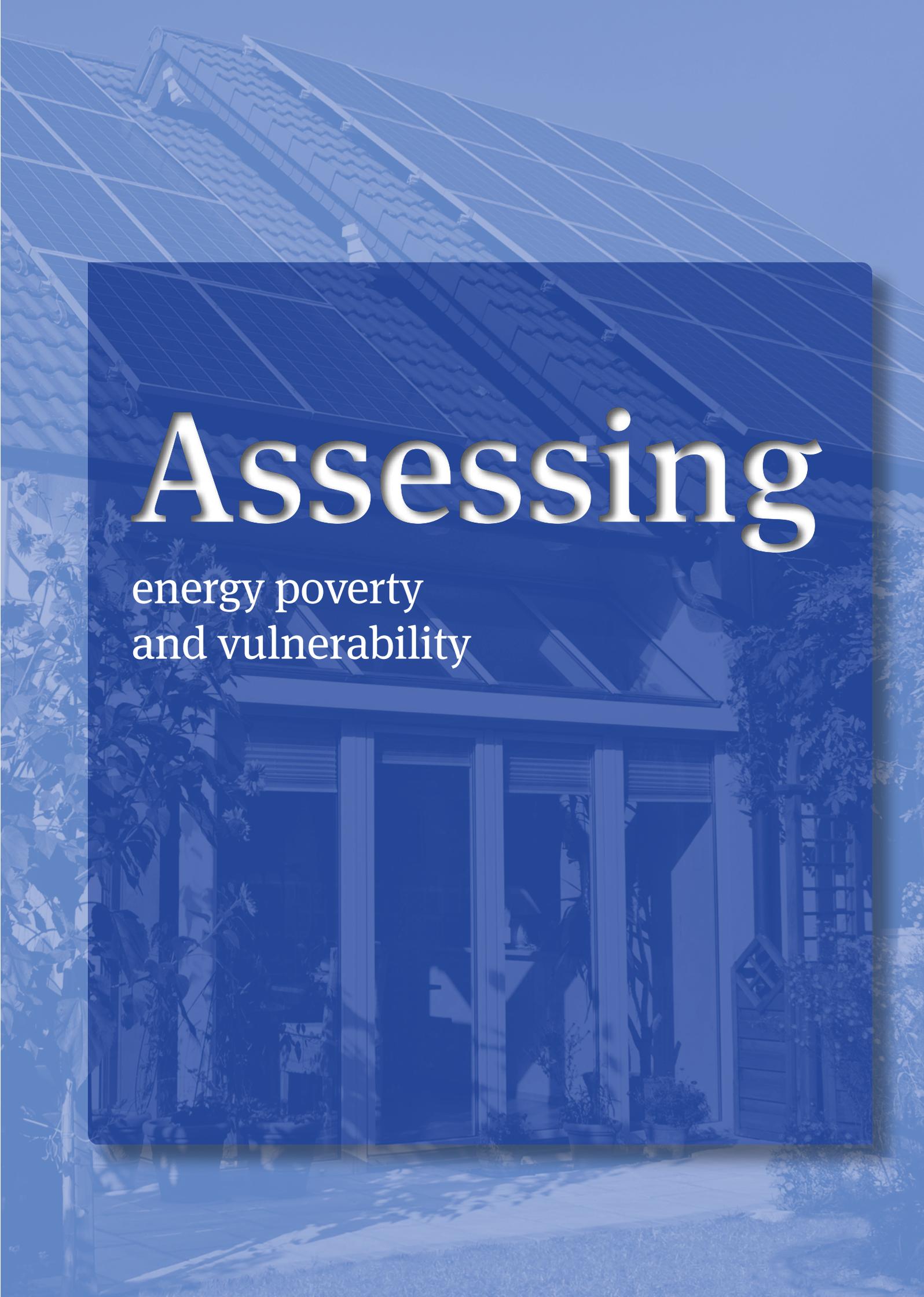
Source: ABS Cat. No. 4670 (Summary of findings)

Looking at energy costs as a proportion of gross household weekly income across household composition, it can be seen in Figure 32 that one parent families with dependent children have the highest relative energy costs, representing 6.9% of their gross household income, significantly higher than that of all other household types. Couple with dependent children, couples only and group households had the lowest relative energy costs (5.0%, 5.1% and 4.7% respectively).

Figure 32 Household energy expenditure as a proportion of gross household income (%)

Source: ABS Cat. No. 4670 (Summary of findings)

These data re-emphasise the potential vulnerability of one parent families, but seem to suggest that this does not hold for families as a whole.



Assessing

energy poverty
and vulnerability

3 Assessing energy poverty and vulnerability

We draw on the elements of the typology shown in Table 1, and seek to assess the current picture of energy poverty in WA, presenting some initial perspectives regarding future trends.

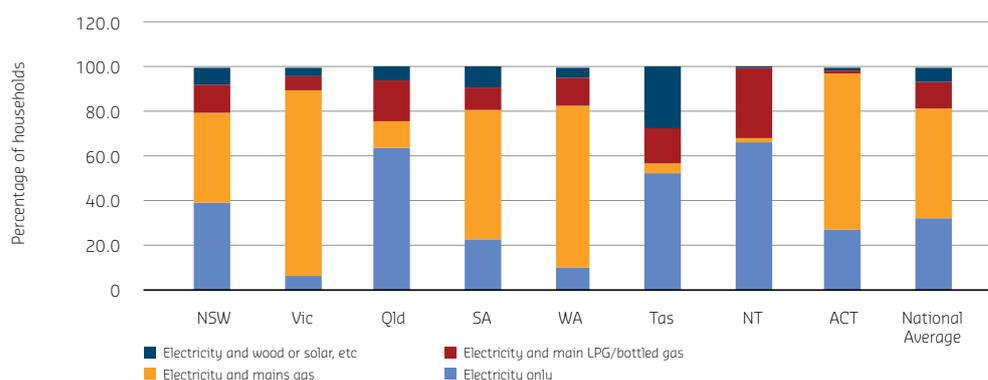
We first consider whether households have access to the most appropriate sources of energy and how access can affect their ability to reduce their energy expenditure and cope with rising energy prices. We go on to tackle the question of how energy affordability has changed before considering two possible routes to reducing energy expenditure; flexibility and energy efficiency. Finally, we discuss in detail the needs and practices of households through an examination of the primary data.

3.1 Access to appropriate energy sources

In this section we examine which energy sources householders in WA have access to and discuss whether these are appropriate to meet their needs.

Taken at face value, physical access to energy does not seem to be an issue in WA except for a small minority living in remote areas where the electricity and gas grids do not extend. WA dwellings have proportionately more access to mains electricity and gas than in other states, with the exception of Victoria, reflecting the abundance of natural gas within the region (see Figure 33). This is in contrast to NT and Tasmania (TAS), where few homes are connected to the gas network and most rely on a combination of electricity, LPG or wood for their energy needs.

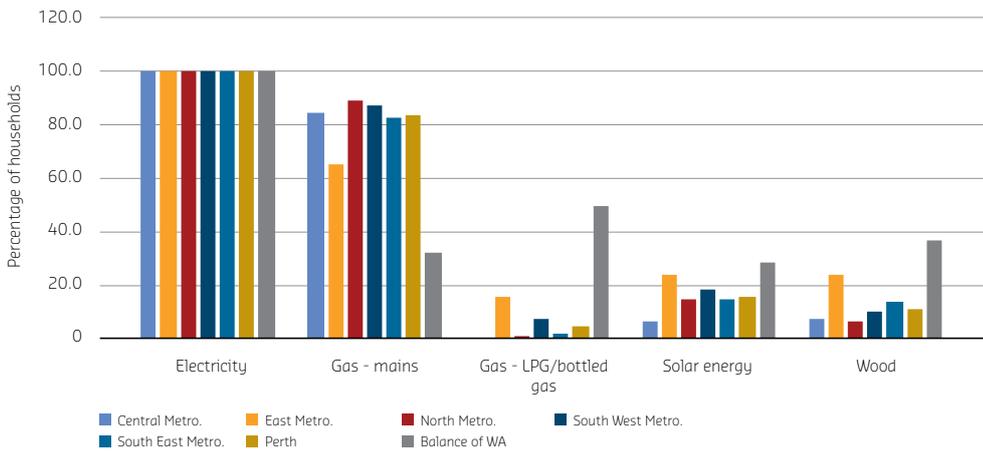
Figure 33 Proportion of dwellings with access to different energy sources 2011-12 (%)



Source: ABS Cat. No. 4670

Access to mains electricity is almost universal to dwellings across WA as Figure 34 shows, with only a small proportion of homes (0.2%), all of them in the balance of WA, lacking access to the electricity grid. In the Perth region, with the exception of the East Metro area, over 80% of dwellings are connected to the mains gas network while coverage is patchy in the balance of WA (32%). This lack of access to mains gas is somewhat compensated by the presence of alternatives such as LPG and wood, with one in five households using LPG/bottled gas and one in seven using another source of energy. Interestingly, roughly one in five households uses solar energy and access to solar has increased significantly in recent years; solar usage in WA households is more than 10% ahead of the national average.

Figure 34 Proportion of households with reported access to different energy sources by region 2009/10 (%)



Source: ABS Cat. No. 4656-5

While physical access to energy is not in question for the vast majority, the sources available may or may not be appropriate to household needs. Low income households would benefit from having access to the lowest cost form of energy and being able to switch sources in the face of changes to energy prices. In general, solar water heating or solar photovoltaic (PV) panels offer the best hedge against changes in the cost of primary energy but we can infer from the data that the lowest income households have the poorest access to this type of system, either because they cannot afford the upfront cost or they are renting (or both).

As will be discussed in section 3.3, there has been an increase in the number of households using electricity to provide water and space heating over the last 5 years while the use of gas has declined. At the same time, the use of solar water heating has remained steady. These shifts were likely in response to increases in the price of gas relative to electricity (see section 2.3) but may not offer the most cost effective solution over the medium to longer term, depending on the relative movements in future prices. This ability to switch fuels may be denied to the least well off, whether because of lack of access to multiple sources of energy at home or other factors such as lack of financial resources for the initial investment.

During the interviews we asked householders to talk generally about their household energy supplies as well as specifically about the presence of solar power in their homes. Similarly, in the survey we asked respondents to indicate whether access to funding for renewable power systems would assist in reducing energy bills. A large number of the survey respondents (13%) indicated that they had access to solar systems and were able to control electricity bills through the use of solar power in an effective way. This desire was reflected in many of the comments from interviewees who lived in households on lower incomes and was frequently cited as a real benefit

by those who already had access to solar. For many lower income interviewees, the upfront cost was considered prohibitive, despite government incentives to support the deployment of solar.

"I have thought about the solar panels, but the outlay to start with for me is too much." Anne

"I mean the government has helped heaps with the incentives and what not, you know, but that's helpful to people that have the money to make it happen as well. You can't make it happen if you're struggling." Brian

One interviewee made an interesting comparison with her experience in Africa where the roll-out of solar for wider society seemed to be progressing more quickly, the implication being that more support should be forthcoming.

"When I went to Africa...in my previous job, even in the houses in the really rural area the Government put solar panels on every one of them and then I wanted to say what are we doing, why can't we have it here...as a building regulation?" Gwen

The issue of the upfront cost of investing in energy efficient technologies and the capacity to realise a 'return on investment' is a concern. The payback period can be affected by factors such as a person's age and/or their expected tenure in a given location. For older participants or those with insecure tenure there are strong perceptions that they would not be able to achieve the full benefit of their investment.

"... it probably wouldn't warrant me at this point to put one [solar panels] on anyway, ... Well I've thought about it, but at this stage I don't know that I'd worry about it, you know, there's other things I can do..." Graeme

In addition to tenure, the type of housing in which people resided raised a different set of concerns. Participants living in sets of units or apartment blocks wondered how they could manage the negotiation of installations with other residents and appropriate mechanisms for dealing with installation costs and billing arrangements.

"When you live in an apartment you would all have to agree to get the solar panels. I don't think that's going to happen. Not in this block anyway." Emma

Those who had been able to take advantage of the opportunity to install solar power clearly identified the benefits that this had brought in terms of managing their bills. Participants in this situation were often articulate in describing technical and economic aspects of their investment. There was also interest from some participants in accessing clear and convenient information about the costs and returns associated with solar panels and power generation.

"We invested in solar panels this time last year, so we've had a full year of them. We got a five kilowatt system. I think it's something like 22 panels, mainly because our roof line was a little bit complicated. It wasn't as simple, so they needed to put them in all sorts of different orientations and in different places over the roof and they all have their own little

microprocessor apparently...my goodness it's worked well for us. It really has made a huge difference." Fleur

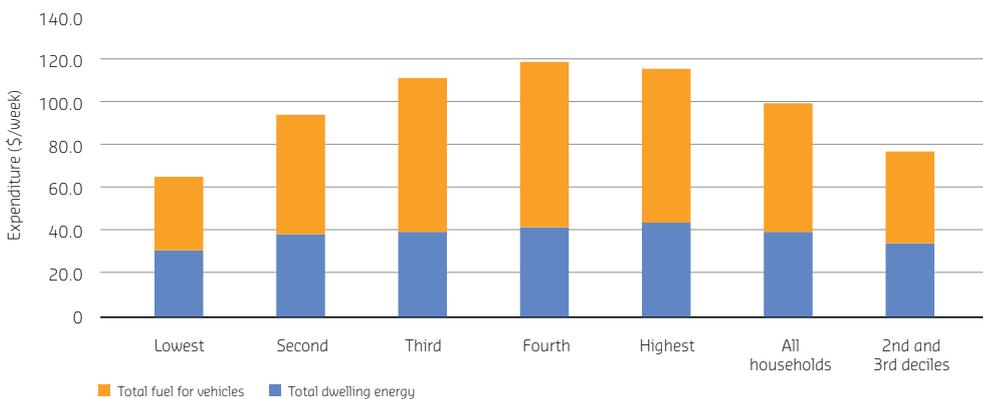
"One thing, which perhaps I am looking at is an expert or someone who can just...discuss with me on telephone that, yes, my electronic requirements are this, this, and this, and this will cost me that much, and what kind of solar panel system would be feasible for my house." Henry

Interest in receiving financial assistance to make homes more efficient, including the application of solar power, was also strong across all income levels and housing types. A total of 40% of survey respondents indicated that this would be helpful in managing their energy usage and bills. There was generally weaker support for this among households in smaller properties, e.g. one and two bedroom apartments, although it is interesting that support was pretty strong across all dwelling types. Providing fair and equal access to low carbon energy, including reduced reliance on grid electricity, was an important emergent theme.

3.2 Affordability

As discussed in section 2.4.1, energy expenditure is a significant and recurrent component of total household living costs. According to the ABS ("Household Energy Consumption Survey, Australia: Summary of Results 2012" 2013), average weekly expenditure on energy for dwellings and vehicles increased in relation to household income compared to the previous year. Lower income households (2nd and 3rd quintile) spent significantly less on energy (on average \$77 per week) than higher income households (\$116) (see Figure 35).

Figure 35 Mean energy expenditure in Australia per EDHI quintile 2011/12 (\$/week)



Source: ABS Cat. No. 4670

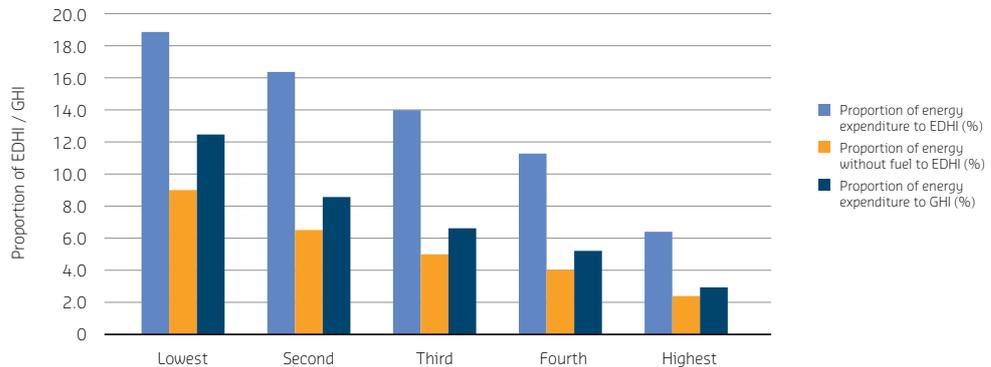
Energy costs had more impact on the economic wellbeing of lower income groups with the poorest 20% of households spending 9% of their income on power and gas.

In Figure 36 we present three measures of energy expenditure against income which are as follows:

1. Total energy expenditure, including transport fuel, as a proportion of EDHI
2. Total energy expenditure, including transport fuel, as a proportion of GHI
3. Dwelling energy expenditure, excluding transport fuel, as a proportion of EDHI

As can be seen, energy costs had more impact on the economic wellbeing of lower economic resource groups with the poorest 20% of households (lowest quintile) in 2011-12 spending 9% of their EDHI on power and gas, around four times that spent by the wealthiest households. If transport fuel is included in the total energy expenditure of households, this figure rises to 18.8% for the lowest quintile, more than 3 times the equivalent figure for the wealthiest households.

Figure 36 Energy expenditure as proportion of EDHI and GHI in Australia 2011/12 (%)



Source: ABS Cat. No. 4670

In WA, electricity retailer Synergy, which supplies over 970,000 residential and commercial customers, reported that 240,000 customers (1 in 4) receive assistance from State Government in the form of concessions and rebates. As can be seen in Table 5, the number of residential customers disconnected for failure to pay an energy bill declined between 2007 and 2010 but jumped 178% from 2,744 to 7,631 disconnections in 2010/11. It is unclear to what extent this represents a real change in circumstances or a change in policy or both. Our conversations with Synergy suggest that there had been a change of policy aimed at trying to ensure customers had lower debt when they were disconnected; this would seem to at least partly explain the jump in disconnections.

Table 5 Residential energy customers disconnected for failure to pay a bill (Synergy)

	2007	2008	2009	2010	2011	2012
Per 100 customers	0.81	0.58	0.49	0.32	0.86	0.86
Actual	6,535	4,833	4,188	2,744	7,631	7,723

Source: Economic Regulation Authority. (2013), Annual Performance Report 2011-12 - Energy Retailers

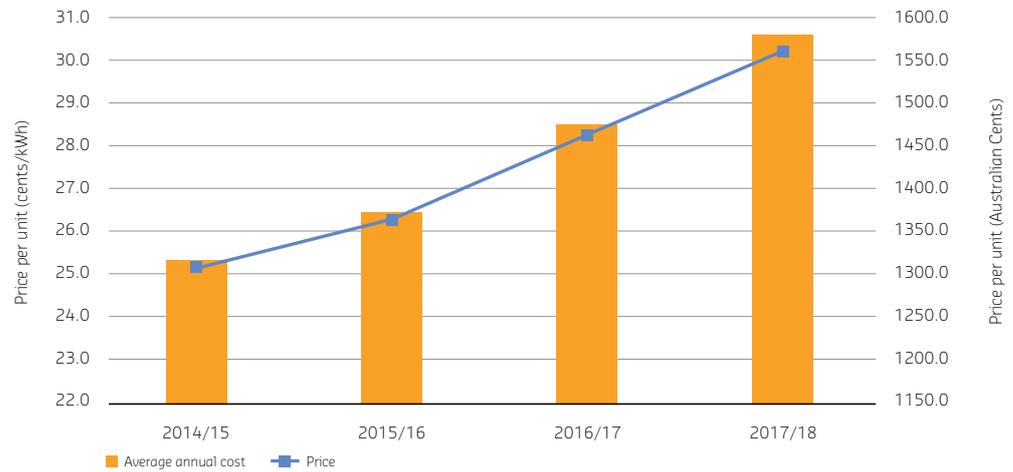
3.2.1 Trends in energy expenditure

In general, any change in the level of energy affordability will be a function of income and expenditure changes on the other which, in turn, will be a function of consumption and price. It is anticipated that energy prices and energy consumption are both likely to increase over the medium term, which would see energy expenditure trend upwards. Analysis commissioned by the Department of the Environment, Water, Heritage and the Arts (“Energy Use in the Australian Residential Sector 1986-2020” 2008) suggests that energy consumption in Australia will continue to rise in the period to 2020. The most significant growth is likely to be seen in VIC, QLD and NSW, with WA and ACT also contributing to higher overall levels of demand; by contrast consumption in the other states and territories is expected to remain flat or decline.

The same report shows that the expected contribution of electricity to residential energy consumption will increase from 46% in 1990 to 53% by 2020 meaning that household expenditure will be increasingly sensitive to electricity prices compared to gas. The contribution of gas consumption is also expected to increase from 30% of total energy consumption in 1990 to 37% in 2020 while wood is predicted to decrease from 21% to only 8% over the same period. LPG use is expected to remain relatively unchanged and is expected to contribute to 2% of residential energy demand in 2020.

Short term forecasts suggest that domestic electricity prices for grid connected customers will rise in WA as shown in Figure 37.

Figure 37 Projected trends in residential electricity prices and annual costs in WA



Source: AEMC, 2015

Table 6 below, meanwhile, provides ACIL Tasman’s (*Gas Prices in Western Australia, Review of Inputs to the WA Wholesale Energy Market, 2010*) wholesale gas price projections in the eastern and western markets under the “central planning” scenario. They project that the eastern and western market prices will converge by 2030 under the normal expected Australian economic conditions over the course of the scenario. As indicated, while the average ex-plant price of gas in Western Australia has generally been below that of gas in eastern Australia (and well below domestic wholesale gas prices in the US, UK and Europe according to The Western Australian Mineral and Petroleum Digest of Statistics (“The Western Australian Mineral and Petroleum Digest of Statistics” 2010), prices on the east and west coasts are likely to find similar levels going forward.

Table 6 Projected wholesale gas prices, 2010 (\$/GJ)

Year	Eastern market price (\$/GJ)	Western market price (\$/GJ)
2012	5.20	8.10
2015	5.50	7.50
2020	6.20	7.60
2025	7.00	8.00
2030	7.50	7.90

Source: ACIL Tasman, 2010

That said, the decline in wholesale gas prices is unlikely to have a significant impact at the household level since the cost of gas is a small part of the final cost of delivery. This appears to be borne out by the relatively high retail prices experienced in Australia.

Many of our interviewees and survey respondents expressed concerns about the affordability of energy, even those on relatively high incomes. Concerns about their capacity to pay energy bills were often associated with feelings of 'worry' or 'stress':

"[Increasing energy cost] is a bit of a worry. Just because of the way that it's been going the last 2 or 3 years particularly." Frank

"I was actually a little bit stressed [when I couldn't pay my bills] and I was thinking what to do, and during that time I discussed it with one of my friends." Henry

"[Before solar, power bills were concerning us] very much, by the time they started to get regularly into that \$450-\$480 bracket it became very concerning mainly because it was at that level despite us making all the savings that we felt we could make comfortably using off peak power; not using the a/c's during the day; only using as much as possible at night in the off peak bracket." Fleur

Concerns were expressed not just over energy use in the home but also for transportation and some placed high priority on remaining mobile. Participants described a range of different strategies for when and where to fill up, recognising prices and budget constraints. The use of fuel vouchers and close attention to prices were relatively common approaches to lowering fuel costs. There were also examples where petrol prices could constrain other areas of expenditure such as clothing and children's toys:

"[For petrol] I get my vouchers from IGA and always go for the cheaper. I very rarely pay the full price for it. ... I don't often fill up. I put \$30. ... When I was working and I wasn't running around in the car as much as I do now ... if I put \$30 that would last me 3 weeks. [Now it lasts me] probably 2 weeks." Anne

"Well we do the fuel watch thing so we try and chase down the cheapest place to fill up." Eddie

"I use the fuel watch website ... I make sure the tyre pressure is always to the standard..." Connor

"If I didn't get my tank filled and I need fuel on the days when it is expensive, I will not fill the tank, I will get, for example, less fuel, like ten or fifteen litres just to complete the things which I want to, and then when it gets cheaper, then I'll fill the tank." Henry

"[If I can't afford petrol, I will give up] buying some clothes if it is not necessary or toys for [my son]." Caitlyn

The survey data also supported the view that households are making trade-offs between spending on transport fuels and spending on other essential items. Nearly half of low income households stated that the cost of transport fuels had affected their ability or intent to pay other bills. Data from Cassells et al. (2014) suggest that utility bills were the second most important item of expenditure behind mortgage/rent and ahead of food. Only 3% of respondents would sacrifice bill payments to meet housing costs and 72% would sacrifice holidays in order to ensure they were able to make bill payments.

For those on the very lowest incomes, finding the money to pay the bills is a constant cause for anxiety and quite a number of respondents reported having periodically to borrow money from friends or family in order to pay their bills. One of our interview participants described this scenario and how it affected his approach to paying bills;

“Yes, I have to actually make some preparations before that, because most of the times there was an issue...if due date of a bill is coming up, and I don’t have money, so that was a problem; I had to borrow money or do some other measures.” Henry

As Brian’s situation demonstrates (see “Brian’s Story,” below), low, fixed incomes are associated with the clearest descriptions of the challenges of budgeting for energy. While some approaches to budgeting may appear slightly haphazard, the ever present need to pay bills was a key concern:

“I don’t actually budget, I just, you know, I make sure I don’t spend all my pension and you keep it – and you’ve got it there when a bill comes in like this one. I get a bit fed up with the bills.” Graeme

Many interviewees clearly put paying their bills as a high priority and made every effort to avoid falling into arrears. However, many described other expenditures as taking priority over the payment of energy bills.

“I’m pretty ... good at [paying bills in the timeframe]. I hate having people ringing me up and saying that you’re overdue...but...these bills – the 190 – I paid half and then next fortnight when I got my pension I paid the other half.” Anne

“I mean you can’t cut on the milk or other necessities like Pampers, or some other things, you can’t cut down anything on their food, but what you can do you can just delay the clothing.” Henry

Others had more sanguine attitudes towards utility bills although this did not tend to be amongst the poorest.

“Yeah, [energy bills [are] sort of up there with one of the bigger costs in my life], pretty well. Yeah. But again, they’re just a fact of life, and they happen, so there’s not much I tend to do about it. So I don’t think about it much at all.” Frank

Brian's story

Brian is unemployed and lives alone in state housing. His 11 year old son stays with him every other weekend. This has some important implications for Brian's energy usage. He is concerned that his son should not have to suffer discomfort when staying with him owing to the flat being too hot or cold and should be able to continue to play computer games of which he is an avid enthusiast. In the past it also meant that he had to drive to a country town and back, a round trip of 250km, to pick up and drop off his son each time he comes to stay but now his ex-partner has moved closer.

"Yeah, I'm struggling [to pay to run it] – the whole thing is a struggle. Like electricity-wise, bill-wise. Mission Australia have helped me out with bills in the past. Also with Mission Australia with food vouchers and stuff like that, because just the cost of everything, and petrol being a killer."

"Well I could have \$20 and go, all right, well the tank gets \$10 and then \$10 will go to the shops so I can get a loaf of bread, a couple of litres of milk and, you know, get something that I need. So if I had \$20 at the moment with my petrol tank not real good I would probably put \$10 in for petrol and I would do bread, milk and vegemite because we are out of vegemite."

Brian's approach to managing his bills continues to present challenges, despite having reached an agreement with the utility company over payments.

"[The utilities] get their money when they get their money. Like I am paying \$20 a fortnight out of my dole to each of them. ... I had to [arrange this with the utilities] because it was getting out of hand. I was getting big bills and no way to pay them. ... But it can still get out of hand ... Because it wasn't enough. Basically it's probably enough during winter, the \$20, but not during summer. And that I think is just due to having my boy more as well...because as I say I have him every school holidays and in summer time while the cricket is on that TV is on as well as the other TV because that's all he does is play games all day every day."

"With \$30 [a month mobile phone plan] I get infinite for the whole month – infinite everything. I've learnt that because I helped my mum do it and then I'm going that's a better plan than I'm on. ... I can't afford not to [have a phone] – I have the boy – the phone is on 24/7, 7 days a week."

"I never go without food. ... I won't pay the bill – I will eat before paying the bill."

Interviewees indicated a number of strategies for managing their energy usage or their bills and we explored some of these through the survey. Both the survey and the interviews demonstrated that efforts to manage energy involve specific approaches to allocating their time and activities.

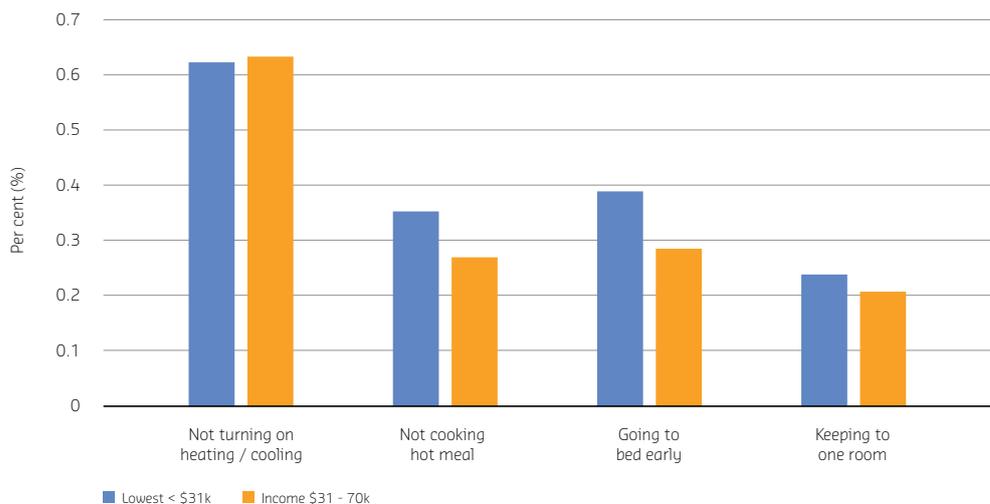
"[During the day] to make things cheaper I just go to bed. That makes it cheaper." Brian

"In the winter, just this area, living room, is very cold. So what we do usually we go to the master, even me and my son when my hubby's not at home we are going to the master and do whatever we like. He wants to do the homework or whatever because the master even in the day time, the sun is coming directly through the windows there so it's very warm. So we don't need even to have any heater or whatever. So he's warm still and we are using the clothes just making it warmer. At night I'm turning on the heater from around 9 until 2 and then I'm automatically it will be off." Caitlyn

"Well I feel the cold. I don't like the cold so I put the [plug in gas] heater on. And I can move that over towards the door and I can concentrate on one room, because when I'm watching tellie and that, I pull it out and aim it in here." Graeme

Figure 38 shows the proportion of respondents in the two lowest income brackets (less than \$31,000 and \$31,000 to \$69,999) who reported using particular cost reduction strategies to manage energy costs.

Figure 38 Proportion of low income households reporting use of cost cutting measures



Many pointed to energy-saving practices that saved energy but had no adverse impact on their wellbeing:

"We don't use the dryer often because I believe in using the sun, natural. Even in winter I tend to hang up clothes because we've got an open space living area so when everyone goes to bed I just put it out there." Gwen

"Because I live alone too I don't wash every day. In fact sometimes it's fortnightly. I can't see any point in putting 2 or 3 things in the washing machine." Anne

"Most of my cooking is done in the microwave and on the cooktop. I don't use the oven that much because I'm mindful that it costs a lot to use an oven." Barb

"[Regarding strategies for keeping warm] Yeah, mostly we cover ourselves with more clothes." Henry

Mitigating use of heating and cooling was an overarching theme to emerge from the interviews and we were keen to explore the extent to which householders were restricting the use of heating and cooling despite experiencing excessive cold or heat in their homes. Among our survey respondents, nearly two thirds of all respondents in the two lowest income brackets indicated that they aimed to cut costs through reducing heating and cooling, either frequently or occasionally, even though this left them feeling uncomfortably cold or hot (Figure 38). Use of other strategies was less prevalent but going to bed early to avoid putting on heating or using electric light unnecessarily showed a 40% response.

Overall, curtailment behaviour appears to be particularly prevalent amongst low income single parent households. Roughly three quarters of all respondents across all three states report frequently or occasionally limiting use of heating and cooling despite feeling uncomfortable among this group of consumers.

The type of accommodation households live in seems to matter regarding energy use. Those on low incomes in state or community housing seem more likely, for example, to use strategies such as going to bed early (nearly 50% of respondents) than do other low income families (40%). This might be explained by poorer insulation or energy efficiency in these properties forcing occupants to seek alternative ways to lower energy bills.

The correlation between use of these strategies and income was quite strong, with lower income households much more likely to employ them (63% avoid using heating or cooling) than higher income households (45%). The fact that even higher income households report curtailing use suggests that either financial constraints remain a concern or that there are other factors, e.g. environmental concerns, driving behaviours. One respondent, for example, stated that "Any energy conservation is for environmental reasons" rather than cost concerns.

There was some evidence from the survey to suggest that curtailing heating and cooling was more common in WA than in either NSW or QLD. For example, 67% of

respondents from WA in the lowest income bracket stated that they either frequently or occasionally endured uncomfortable conditions in order to save money on heating or cooling compared with 63% in NSW and only 58% in QLD.

Table 7 shows the reported levels of heating and cooling curtailment for those areas within WA where there were more than 50 respondents. Two of the inner suburbs of Perth, Canning and Stirling, show above average levels of heating / cooling curtailment, while outer suburban towns Mandurah (significant retiree population) and Rockingham feature highly too. Sandstone, meanwhile, is a country area some 700km NW of Perth that also shows a high rate of curtailment. This suggests that the issues are cannot easily be pinpointed to a particular type of region.

Table 7 Heating and cooling curtailment by region

Region	Reported rate of heating / cooling curtailment
Mandurah	76%
Sandstone	71%
Canning	70%
Rockingham	66%
Stirling	64%
Wanneroo	61%
Gosnells	58%
Perth	58%
Swan	57%
Joondalup	56%
Bunbury	54%
Armadale	47%

Women consistently report using all the strategies explored more frequently than men. For example, curtailment of heating / cooling is employed by 62% of all women and only 52% of men over the whole range of income brackets.

These same issues were found amongst the interviewees as the typical quote below illustrates:

“I’m just mindful not to overuse the air conditioner, the heater and the oven. ...you know, one of the ladies that lives across the way there, she would use her oven every day. She said, ‘I just shove everything in the oven’. Well, and her energy – she did ask me a couple of times what my energy bill was. Hers was a lot more than mine.” Barb

Approximately 15% of those who completed the survey chose to add a comment in answer to the question “Do you ever seek to save money on your energy bills by any other strategies?” Many of these reported making efforts to switch off lights or appliances in order to conserve electricity; approximately one third of all those who completed the free text question, indicated that this was their main strategy. There was more focus on keeping lights turned off, although a significant proportion of

respondents did mention power points or appliances. This was also reflected in the responses from interviewees:

"I do have a nit-picky thing where if you're in the lounge and your room light is on, switch it off – I say, come on, these are bills!" Connor

"[Electronic appliances] are usually on standby but if I go away, they all get switched off at the wall." Barb

"It's actually amazing what a difference it makes when you switch [the power] off completely [at the wall] – a \$20 difference." Emma

"[In general our strategy is] to turn off everything." Alan

"Yeah I am [energy conscious] with the lights. Usually at night time I only have this one on. And yeah, and I don't have the lights on upstairs until I go to bed and I've got a security light out the front that is not coming on. ... So I think I do make an effort to save electricity and that." Anne

Another important strategy related to water use with many respondents making the connection between water use and energy use, e.g. showering for short periods or in cold water, recycling of grey water in the garden, etc. Over 15% of those who answered the free text question mentioned this aspect.

A small but appreciable number (2%) mentioned wearing additional clothes or using blankets in order to combat the cold in winter. Again, a small but appreciable number of respondents (3%) mentioned the use of off peak power in order to control expenditure. The number of households with an appropriate meter is limited in WA. A large number of respondents (13%) indicated that they had access to solar systems and were able to control electricity bills through the use of solar power in an effective way.

A number of other emergent themes became apparent from the interviews with householders which are discussed in the following sections.

3.2.2 Managing variability

Many interviewees remarked on the problems that the variability of bills between summer and winter caused. This made planning budgeting a challenge and was a cause of anxiety for many as they reached the height of summer and the depth of winter. The following quote was typical.

"[I use more energy in the winter], yeah for sure, yeah you run your lights longer, and that gets used during the winter, like at night time on a real cold night. Cooking is probably not a lot different. ... As far as I can remember my last [electricity] bill was seventy odd dollars, I think. For about two months ... Oh it was only sixty-five, sixty-six dollars, that's all. ... And I use no gas in summer. ... There won't be any gas now, until it gets cold and I decide to use it. I can't remember the gas bill that I had. ... I thought the gas was pretty pricey. [It would have been] over a hundred [dollars for a 3 month period]."
Graeme

A number of respondents indicated that a good strategy for managing the situation was to keep the energy company informed, as the following quote highlights:

"The big difference is for the electricity bills between summer and winter because in winter when we are using the heaters they are huge consumption ... [Sometimes] I'm calling them [the energy company] letting them know there will be a delay in paying the bills." Alan

3.2.3 How it affects other expenditures and activities

Interviewees from a wide range of income backgrounds reported that budget constraints meant that rising energy bills had had an impact on other expenditure, especially socialising.

"Because putting more money into these ones [energy bills] I had to reduce for example my going outside in the city on the weekends, you know, to see a movie or to go to a pub, to have a social life." Henry

"I think there's quite a few people, when you're younger and ... super wasn't compulsory, so you ... didn't worry about it. So now I have to ... try and live on the pension, which is a bit of a shock to the system. ... I have to change my lifestyle quite a lot." Anne

"I think in general the energy bills take up a huge chunk of the budget. When recently we got a bill of about \$700 and because that happened when my husband is out of work as well so we do have to really cut down on eating out and, you know, we hardly go for movies anymore and just finding more activities that doesn't involve too much money. ... And if we do go out I usually pack a picnic basket, so home cooked, homemade stuff just to reduce the costs." Gwen

"... in that period, specific period of four or five months, I actually tried to reduce my social gatherings. So, like if I was using car it was used for, maybe only for work, or maybe to drop the kids; more often for these two purposes, or maybe for grocery, but not to visit friends' houses so frequently." Henry

This anecdotal data when combined with the survey responses in regards to the cost of transport fuel and how it interferes with people's social lives, raises concerns over potential social exclusion. A third of all respondents indicated that concerns over costs had affected their decision to join family and friends for a get together either frequently or occasionally. This figure rises to 40% of those in the two lowest income brackets on average. Similarly, nearly one third of those in the two lowest income brackets reported that they had foregone taking part in pastimes like sport owing to the cost of transportation.

3.3 Flexibility

A degree of flexibility in terms of energy sources or type of appliance can offer householder a useful means by which to manage their energy bills. Table 8 provides a proposed framework for considering the extent of flexibility available to households with respect to energy consumption. The table has two dimensions, flexibility type and timeframe. The type of flexibility incorporates three aspects, reducing consumption, changing the fuel source used and changing the payment terms which covers aspects such as tariff, payment regime and so on. The timeframe is divided into three periods, from short to long term.

Certain aspects of flexibility require simple decisions and can be achieved quickly, such as negotiating repayment terms with a supplier or changing behaviours such as reducing consumption through turning off lights when they are not needed. Others may require more significant behavioural or administrative changes such as switching from car to bike for the commute to work or switching energy suppliers. Still others might require a significant investment, such as the installation of a solar PV system and be open only to certain types of household. In each case, barriers might exist that prevent the household from achieving the degree of flexibility they would like. Barriers might be technical (no gas supply exists so fuel-switching is not possible), social (a household may not wish to be seen cycling to work) or financial (new energy-saving equipment is simply too expensive).

Table 8 Energy expenditure flexibility

	Short term	Medium term	Long term
Amount of consumption	<p>Actions:</p> <ul style="list-style-type: none"> Turning off devices when not in use Use heating or airconditioning less frequently Change means of commuting to work <p>Barriers:</p> <ul style="list-style-type: none"> May be no suitable alternatives to private car 	<p>Actions:</p> <ul style="list-style-type: none"> Replace devices with more energy efficient ones Buy more fuel-efficient car <p>Barriers:</p> <ul style="list-style-type: none"> New car may be too costly 	<p>Actions:</p> <ul style="list-style-type: none"> Install solar PV or wind generation Install solar heating system Install insulation <p>Barriers:</p> <ul style="list-style-type: none"> May be renter and not have the right to fit solar system
Fuel source used	<p>Actions:</p> <ul style="list-style-type: none"> Favour cheaper fuel source; e.g. prepare fewer meals in electric oven and favour gas hob <p>Barriers:</p> <ul style="list-style-type: none"> May not have multiple fuels present in the home 	<p>Actions:</p> <ul style="list-style-type: none"> Purchase vehicle which uses cheaper fuel <p>Barriers:</p> <ul style="list-style-type: none"> May be too costly 	<p>Actions:</p> <ul style="list-style-type: none"> Switch type of heating system to take advantage of cheaper fuel Take advantage of gas connection in area <p>Barriers:</p> <ul style="list-style-type: none"> May not have multiple fuels present in the area
Payment terms	<p>Actions:</p> <ul style="list-style-type: none"> Negotiate payment holiday Move to smoothed payments Move to pay-as-you-go metering <p>Barriers:</p> <ul style="list-style-type: none"> Income situation may be too acute 	<p>Actions:</p> <ul style="list-style-type: none"> Sign up to new tariff which offers, e.g. dual fuel discount <p>Barriers:</p> <ul style="list-style-type: none"> May lack necessary information to make choice 	<p>Actions:</p> <ul style="list-style-type: none"> Move to fully-flexible smart metering taking advantage of sophisticated time-of-use tariffs <p>Barriers:</p> <ul style="list-style-type: none"> Smart metering system may not be offered by utility

Some interviewees reported having taken decisions to give themselves more flexibility, like this one who had installed gas at their property:

“Not very long ago gas was very much cheaper than electricity. But that’s gone up massively in the last 2 or 3 years. ... That’s why I got the gas system here in the first place. It cost a lot to get put in. ... [I] needed to get a line put up from the road. It was about \$4,000 or \$5,000.” Frank

As he states, at the time gas was cheaper than electricity but now the situation may have reversed. Flexibility may still be available in terms of heating devices but for other aspects of heating use, like hot water or cooking, switching between gas and electricity can be costly and can only be managed over time. However, in the short term opportunities do exist as this interviewee says:

“[The high cost of gas] is why I prefer to use electricity rather than gas. For example if I want to just to heat up something I use microwave rather than turn on the stove.” Caitlyn

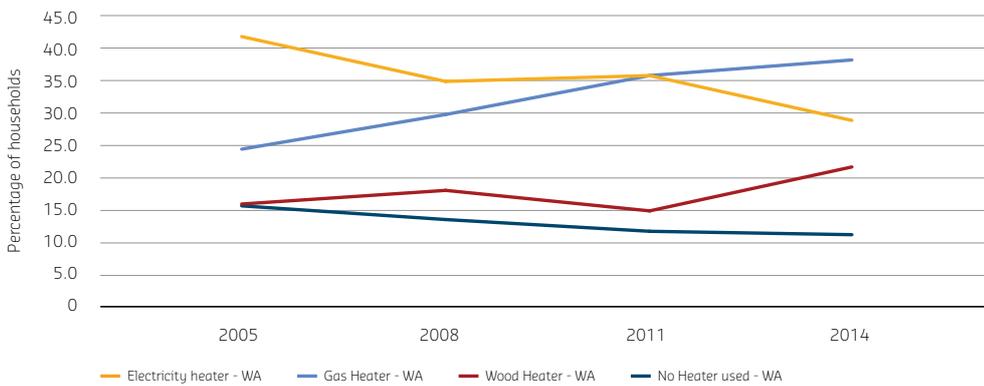
Another area of flexibility which has largely been closed to consumers in WA but which has been available in the eastern states for some time is flexibility over choice of supplier. Contestability in gas is starting to emerge in WA and full contestability in electricity supply is on the horizon. One of our interviewees reported having used contestability as a lever to obtain lower bills.

“My gas bills have dropped by \$20 a month, purely because I threatened [Alinta] to leave.” Henry

A number of survey respondents in answer to the free text question on strategies for reducing energy bills mentioned using the BBQ (their own or municipal was not made clear) instead of the oven or stove top. They argued that BBQ gas was cheaper although it is not clear the evidence support this.

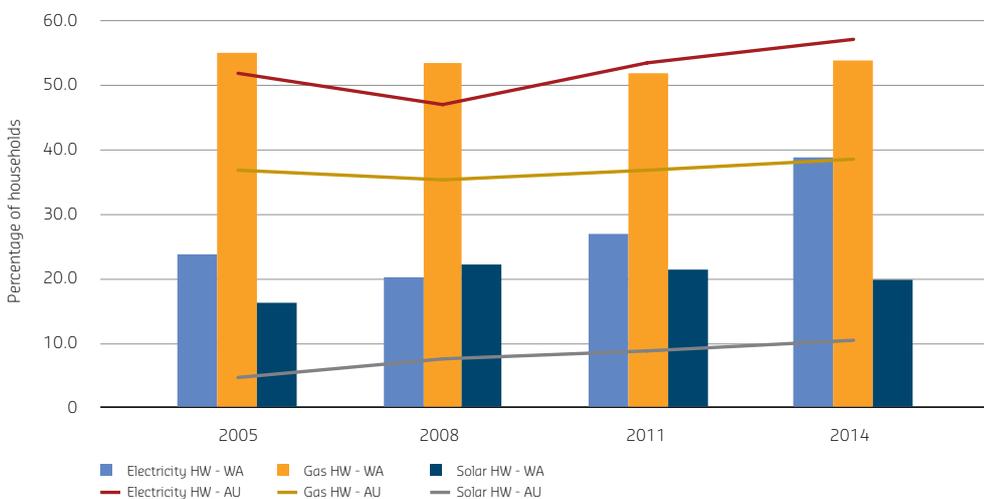
3.3.1 Flexibility illustration: Heating and hot water

According to the ABS (“Household Energy Consumption Survey, Australia: Summary of Results 2012” 2013), over one third of households (38%) used electricity as the main source of energy for heating, and under one third of households (30%) used gas. Wood was used by 10% as the main source of energy for heating. Approximately one in five households in Australia (20%) did not use any heating. Between 2005 and 2014, the proportion of households using electricity for space heating in Western Australian increased from 24.5% to 38.4%, while the use of gas for heating the house has decreased from 42% to 29% in WA (Figure 39).

Figure 39 Proportion of households using different energy to heat their house in WA (%)

Source: ABS, Cat. No. 4602-05

As can be seen, fuel switching is occurring in space heating and, as Figure 40 shows, there is also evidence of fuel switching in water heating too. Just over half of Australian households used electricity for their hot water system (56%), over one third used mains gas (38%) and 10% of households used solar hot water systems. A household may use more than one source of energy due to more than one hot water system, or boosters on solar hot water systems. Meanwhile in WA, households tend to use mains gas more for their water heating system rather than electricity (53% for gas against 38% for electricity), and the rate of solar hot water systems in WA is almost double the national average.

Figure 40 Trend in hot water energy source usage in WA and nationally (%)

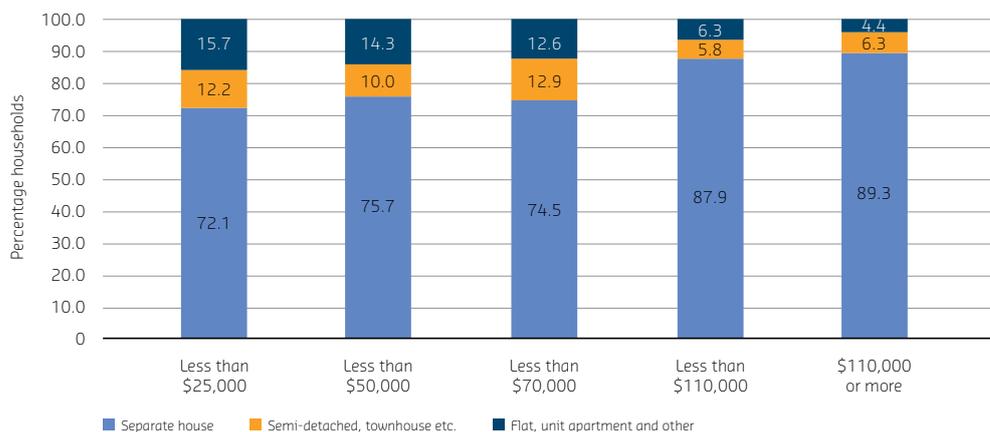
Source: ABS, Cat. No. 4602-05

The ability to fuel switch for these key components of energy demand is limited and may only be achieved over a longer period of time. Many components of energy

demand, such as refrigeration or air-conditioning only operate using electricity and switching may simply not be an option. If only a single form of energy is available (electricity only homes) then no choice exists. Flexibility for low-income households and those facing energy poverty is often limited and this is especially true for renters.

As Figure 41 shows, over 40% of the lowest income households in Perth are renting either privately or from the State Government. Renters have less ability to change their dwelling to be more energy efficient and low income households may not have the means to effect such changes. It has also been shown that rented accommodation is typically less energy efficient to start with as is discussed in section 3.4.

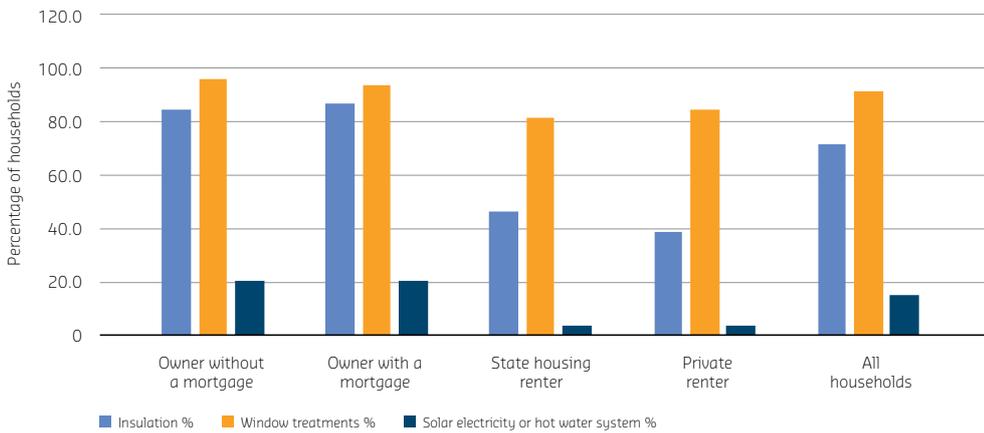
Figure 41 Household tenure type of GHI distribution in Perth 2009/10 (%)



Source: ABS. Cat. No. 4656-5

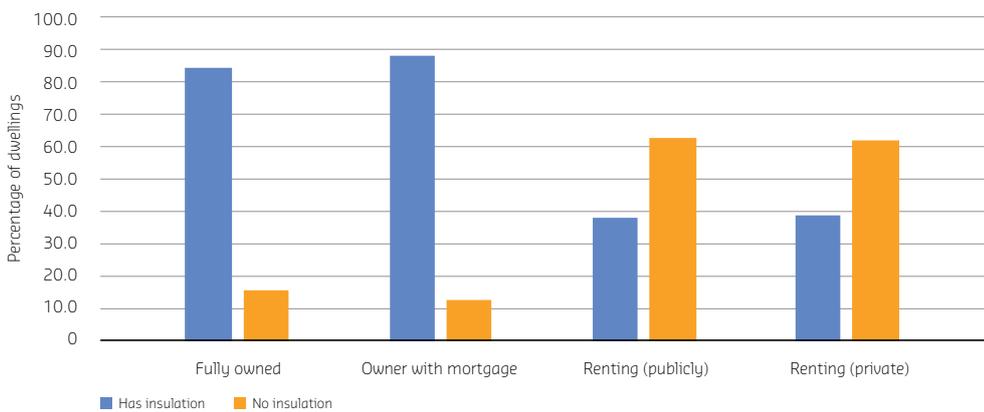
3.4 Energy efficiency

One key means by which households are seeking to reduce their energy expenditure is by investing in energy efficient appliances or in better insulating their homes. Energy efficiency is a key determinant of energy consumption and may represent a limit on what a household can achieve through behavioural change. Significantly fewer private and state rental dwellings have energy saving features compared to dwellings in Australia as a whole (Figure 42). As was previously discussed, households in the lowest income bracket are more frequently in rental accommodation and consequently are likely to have higher energy consumption.

Figure 42 Energy efficient and dwelling characteristics by tenure type in Australia 2011/12 (%)

Source: ABS, Cat. No. 4670

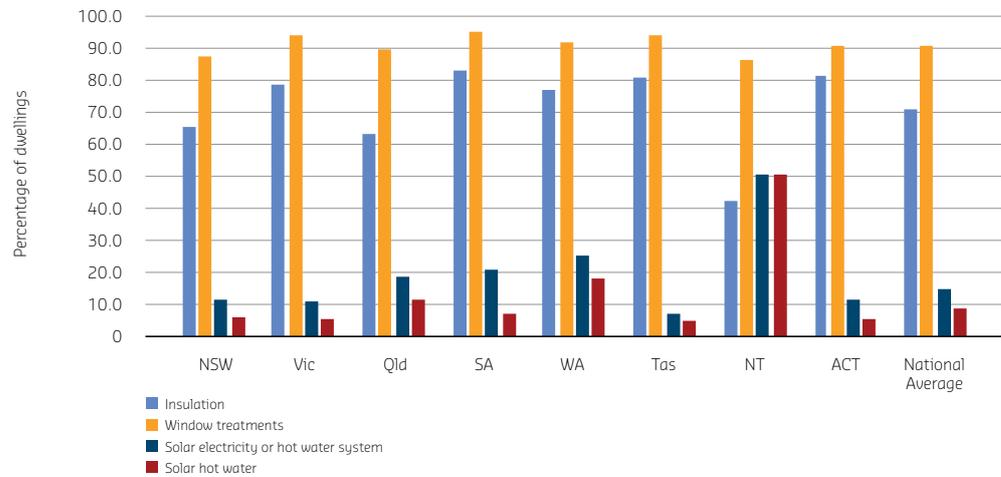
Data for Perth shown in Figure 43 confirms the picture, showing that while more than 80% of owner-occupier dwellings have insulation, only around 37% of rented houses have this benefit. This emphasises one of the critical issues associated with low income earners, the majority of whom rent and who would benefit most from energy saving measures.

Figure 43 Percentage of dwellings with insulation in Perth 2009/10 (%)

Source: ABS, Cat. No. 4656-5

Rates of implementation of energy efficiency measures in WA are relatively high compared to other states especially where the introduction of solar hot water and solar PV are concerned (Figure 44).

Figure 44 Energy efficient dwelling characteristics in all states 2011/12 (%)



Source: ABS, Cat. No. 4670

Interviewees generally reported wanting to get the most efficient devices they could within their budget constraints.

"[When buying appliances] We went basic, for the basic information, you know, we were looking for that label ... sticker displayed on them and we went for the best products – the best products within the budget." Alan

"[The washing machine gets a work out] on the weekends ... probably two or three loads a week. It is, I think, a four star- pretty efficient. So we did look at that. We did pay a bit more extra in terms of finding the right model. The particular ones that I've done to actually help minimise the bills was to install LED lights. ... Yeah they are expensive, but they are getting very effective now ... so the idea is to transition down to that, eventually." Connor

A number had taken advantage of schemes to install energy saving means, like insulation for example, but did not necessarily feel any benefit.

"[The roof is] tiled ... and it's insulated. But to be quite honest when the insulation went in afterwards I couldn't feel any difference." Anne

There was also recognition that some energy use is difficult to mitigate, especially if the property is poorly designed. In the past, less emphasis was placed on building for energy efficiency which has left many properties ill designed to provide comfortable ambient temperatures across a wide external temperature range. However, even the design of more recent homes can be relatively inefficient in terms of comfort and energy use. This increases anxiety, especially when moving into periods of high energy use.

“Upstairs gets really hot in summer but down here when I was working and it was closed all day you’d come in and you’d think that there was an air conditioner on. But it didn’t last for long.” Anne

“... because it’s a newer house it didn’t have any eaves built, so what you get is the full sun on the windows without any respite at all. ... I actually find that quite significant because you can’t often open the windows because if it rains that rain could come straight in the windows because there is no eaves to protect it...” Judy

It emerged that those on the lowest incomes often found themselves in a “Catch 22”. As discussed in section 4.1, they felt unable to reap the benefits of higher efficiency appliances and self-generation of energy owing to the upfront costs. They were often forced to buy cheap, older, higher fuel consumption cars and might drive rather than walk in order to take advantage of lower priced food, for example, even when a closer (but more expensive option) existed. Similarly, one interviewee who is unemployed, described how the requirement to attend the Job Club entailed him driving back and forth “unnecessarily” when he could ill afford the fuel.

“Like I’ve got a bit of a bitch with the Job Club at the moment. They want me to come backwards and forwards, backwards and forwards to this Job Club thing.” Brian

3.5 Needs and practices

Once again a number of emergent themes were apparent through the interviews and the survey in the area of needs and practices, which are described in the following sections.

3.5.1 Billing information and smart metering

Access to pertinent information was considered important across a wide range of interviewees. Many expressed an interest in smart metering and felt that this could provide benefits in terms of understanding their energy usage and which appliances were contributing most to their consumption.

“[If I had a smart meter] yeah, I think I probably would [find it a useful tool to reduce my energy usage], I would certainly be interested.” Anne

Fleur's story

Fleur is in her fifties and lives with her husband and one of her two grown-up sons. Her husband works in an environmental engineering field and as a household they appear to be relatively well informed about their options when it comes to energy use. Fleur is an example of someone who is thrilled with the impact that solar panels have had on their household energy bills. Whilst Fleur and her husband have not often encountered problems paying their energy bills, due to steady and decent employment, they were nonetheless finding their bills were getting worryingly large. It was the size of their bills that led them to install solar panels. Now that they have done so they are delighted with the amount they are saving and the reduced amount of worry they have about the amount of energy they are using.

Despite having manageable energy costs, Fleur remains interested in the household's energy usage and enjoys the process of receiving information via their energy bills and considering ways of becoming more energy efficient.

"What I really love [on the energy bills] is the graph that tells you compared to this time last year how much you've used in this particular billing period. That gives us a much better sense of- initially when solar panels went in it was like wow it's only half and now of course it's okay can we still be kind of decreasing our energy use. So that kind of visual comparison with our own house is great.

"I think the reason we pay attention [to our energy bills] is because to get off peak power, even before the solar panels came, ... you have to pay \$25 a period or something to have access to it so we have always been concerned to make sure that we use enough off peak power to at least cover that \$25 so that we feel like we're not wasting our money if not our energy. So kind of analysing what periods we use the power in has always been kind of on the agenda right from when we first had it put in and a couple of times when we ended up using a lot of peak power we had sit downs with the boys and said look we've got to try and make sure we're using the off peak rather than the expensive peak. ... Because of course the on peak power is hugely expensive under that regime. It's kind of double what the standard rate is so it's really a big incentive.

"I get a paper bill and it shows me what my consumption is - I can turn it over and see how much off peak power we've used and how much peak power we've used, and have a bit of a discussion about how we're travelling; whether we're using our resources cleverly or not so I think just maintaining that control over when we pay the bills has increased our sense of control I suppose and understanding of what's in that bill."

"[A wall meter] would be great. ... obviously the first thing that hits my head is how much is it going to cost? ... It shows me what's been used – I mean that would help." Connor

Interviewees mentioned that they found the information contained in their bills relating to their usage was informative and linked with behaviour relevant to energy usage:

"We just pay them as they come and most of, only the water bill is direct debit the rest are, we pay as they come because I like to, well it's electronic copies it's not paper but when it comes I like to have a look and compare the usage. And if, if it's exceptionally high or it has increased then I'll highlight it and say, okay look our electricity bill has gone up this period, we've got to monitor and cut down. So, there's that constant feedback. ... [Whereas if it's direct debit] You tend to just glance because you don't have to worry about going into the bank account making a payment because when you do the extra stuff and typing in the amount I think it reduces the impact subconsciously." Gwen

However, one interviewee identified that more information from energy companies regarding options would have been helpful when he at one point ran into some financial difficulties.

"I think ... the problem is with energy companies ... sometimes I feel they don't disclose such information, that there is another option available to people if they are not able to pay their bill in a lump sum, so they can do it in instalments. But they should make this information public, which was not there. I learnt it from one of my friends. ... They should have mentioned that, yes, if you don't want to pay in full, you contact us, we will make instalments for you, like this, so information was ambiguous, I found it." Henry

Perhaps surprisingly, changes to billing arrangements was generally valued more by higher income households with support for this measure being highest in the \$70 – 200k bracket than in the lowest two income brackets. Support at the highest level of income was as strong as at the lower end. This may be interpreted as those on lower incomes simply living week to week rather than really being able to plan ahead.

3.5.2 Health issues

Health issues can affect household energy consumption and while we did not encounter a significant number of instances where this was the case, two important cases stand out. The first related to an interviewee who had apparently suffered from mental health issues and also some physical issues, which or may not have been related. This meant he had to:

"...have a half an hour shower every morning just to get physical enough to manage the day basically otherwise [I] would be still in bed." Brian

This exacerbated an already difficult situation regarding paying his energy bills. The other instance related to an interviewee who was partially incapacitated and required a mobility scooter to get around. Charging this represented an added burden to the household energy consumption. This appeared to be manageable, but it nevertheless represented an important point of connection for him with society.

"[I use my gopher every day] almost, I go around to the church or I go down to the Men's Shed. [I plug the gopher in] day time and night time. So long as it shows that it is fully charged it's okay. ... You can leave it plugged in because it's trickle charge after that." Doug

Households with young children were particularly conscious of the need to keep their dwelling at a reasonably constant temperature, as the vignette below reveals.

"Because we have a toddler, when we entered into this house he was only one year old at that time, and it was too cold at night, so I needed a fan heater. I bought it, and since it's not an economic option, but we hardly use it, mostly for an hour or so in winter. Not too much. In summer it's really good, because I have big trees in my back yard, three of them, and they provide shade to my house and it stays cool. And there is one big tree at the front, also. So it's covered in summer. But in winter it's a bit cooler, and yeah. I mean reverse cycle air con, yes we can use it for a couple of hours at night [in summer], but not for the whole night." Henry

3.5.3 Transport behaviours

We felt that attitudes to transport options might be an important factor and explored people's attitudes to changing their transport behaviours as a way to conserve energy and save money. As expected, some interviewees were not keen to relinquish their cars. This partly reflected the perceived lack of satisfactory, affordable, public transport links in their vicinity. As these quotes demonstrate, satisfactory public transport is not only defined by cost but is closely linked with the flexibility to respond to unexpected trips and the need to negotiate cumbersome or heavy equipment and shopping:

"No, I ... don't want to give up driving my car. The transport from here, it's not really good." Anne

"...there's a bus stop just in front of my house with a direct bus to Hastings, and per trip is about \$1.80. ... And for parking is \$4 a day. So it's 3.60. I mean for short distance it's actually not worth it for us to take the bus. \$3.60 as compared to \$4, and I have to bring my son too, I'd rather pay for parking. Yeah it's not, it's not a really attractive option. ... [and] the convenience is if any time the child care centre calls and say he's not well I can just hop in my car and can pick him up and go home but if I take the bus then it's a- it'll take me half an hour to 45 minutes to get home. With the car it takes 6 minutes." Gwen

While this analysis does not recognise the true cost of car use, it nevertheless is consistent with the comparison being made by many when making the choice between private car and public transport. The quote below highlights the convenience aspect which is frequently the over-riding one.

“Last Saturday I wanted to go [to the hospital] for an EGM, I couldn’t go there in time because I was using the public transport. 3 buses and 1 train ride.” Doug

Life circumstances, is clearly an important factor, as this quote from one interviewee with a small child attests.

“I think for the young child it’s still convenient to have the car because it’s just that you have so many things to carry with you.” Gwen

As expected, transportation factored into people’s thinking with regards to where they choose to take employment or to live in relation to their work. The uncertainty over the job market in WA at present was highlighted as having an effect on people’s choices.

“People might have a job, but where they can afford a house is not in the same area.” Emma

“[If my job was harder to get to than it currently is in terms of transport] I don’t think I would change house. I probably would not take the job.” Diana

“... it’s not a feasible option to me that I look, oh okay this is my office, I should buy a house near or very close to it, because I don’t know for how long I’ll be working there. So, if there is no sustainability in the job market, I think it’s useless to buy a house near the office. ... mostly my first preference was to live closer to my other family members who are living in the same area.” Henry

The survey also revealed that concerns over the cost of transport fuel has some impact on individuals’ job search and employment decisions. Nearly one quarter of respondents in the lowest income bracket indicated that concerns over the cost of getting to an interview had affected their decision whether or not to attend. Almost one third of all respondents indicated that the cost of transport fuel had influenced their decision on whether to take a particular job, with a fairly consistent picture across all income bands up to \$150,000 per annum. The data suggest that this effect is more prevalent in WA than in the other two states surveyed, with 33% of all respondents citing this as having an impact on their employment choices compared with 31% in QLD and 27% in NSW.

Support for affordable and reliable public transport was high across all income brackets but, once again, higher in the higher income brackets (42% of respondents in the lowest income bracket cited this as important while in the \$150,000 to \$175,000 support was at 55%). This suggests that other factors other than costs may be relevant such as environmental concerns.

3.5.4 Cultural aspects

Several interviewees from a variety of ethnic backgrounds other than white Australian, pointed to their or their parents' experiences overseas, where they had learned to be frugal and not to waste energy and resources. This affected their attitude towards energy use in their current context and appeared to make them more concerned about energy use.

"Culturally I have been brought up to be quite stringent with these expenses, because I do come from a family that has been, sort of, poverty stricken."
Connor

Similar opinions were evident with certain Australians who had grown up in different circumstances from the ones they currently found themselves in. One interviewee, for example, had grown up in a farming community which appeared to make him more aware of conserving energy.

"We're also a bit more conscious of our energy usage. Like, [my partner] grew up in a farming background so he understands the importance of preserving our electricity, and because I study sustainability I also want to preserve what we can." Emma



Discussion

and summary

4 Discussion and summary

Energy poverty is an issue which has attracted increasing attention from a diverse range of concerned groups ranging from policy-makers to non-governmental organisations serving households on low incomes across the globe. It has been recognised as a growing problem as a transformation in the energy sector has seen prices rise and the way that households access and use energy change

Energy poverty has the potential to severely impact on the most vulnerable of Australian households in terms of economic security, social integration and health. However, despite the importance of the issue and the widespread interest shown in energy poverty elsewhere, relatively little research into the subject has been undertaken in Australia. This is especially true in WA, where the understanding of the extent and effects of energy poverty is sketchy.

The data presented in this report offers the opportunity to increase the knowledge base with respect to energy poverty in WA and to inform those involved in managing poverty in general and energy poverty in particular.

The energy sector is currently undergoing a significant transformation in response to market factors such as the rising costs of energy production, the demand to reduce the carbon footprint of energy use and the emergence of new technologies which afford energy consumers more control over the way they use energy.

This transformation presents an opportunity to deal more effectively with energy poverty but also risks worsening the position of many if the transition is not handled effectively.

The results of the analysis show there is little doubt that energy poverty is widespread. Low income households, already suffering from increased housing costs, are on average spending 12.4% of their income on utility bills and fuel each week, compared with 2.9% for high income households.

The survey findings pointed to a high incidence of households curtailing heating and cooling despite experiencing discomfort. As discussed in section 1, a more appropriate indicator of energy poverty would take account of the *required* energy expenditure rather than actual expenditure as this measure might underestimate the extent of the energy burden. This result suggests that the depth and extent of energy poverty may be underestimated.

Interviews with householders revealed high levels of anxiety with respect to energy bills, with individuals borrowing money from friends or family ensure they do not fall into arrears. They confirmed that many individuals seek to curtail their use of heating and cooling in order to reduce consumption despite suffering discomfort as a result. Survey respondents also reported not attending social functions owing to the cost of transport fuel in getting to these events. The implications of such social exclusion could be profound.

For many, not being able to access high efficiency appliances or solar panels as a means to reduce their energy expenditure was a source of frustration. Financial

constraints are the primary impediment to low income households achieving these benefits but the fact that low income households often rent also means they are not at liberty to undertake the modifications that would be involved. A number of interviewees also pointed to strata arrangements as a reason for not seeking to install solar panels.

This inability to benefit from the “low carbon dividend” presents the risk that those on lowest incomes will fall deeper into energy poverty as the cost per user of delivering energy services increases. Providing greater assistance for low income households to access energy efficient appliances or to install insulation may present an opportunity to reduce the impact of energy poverty. Similarly, support could be provided for investment in home generation such as solar panels. The survey results showed strong support for this kind of assistance across the board.

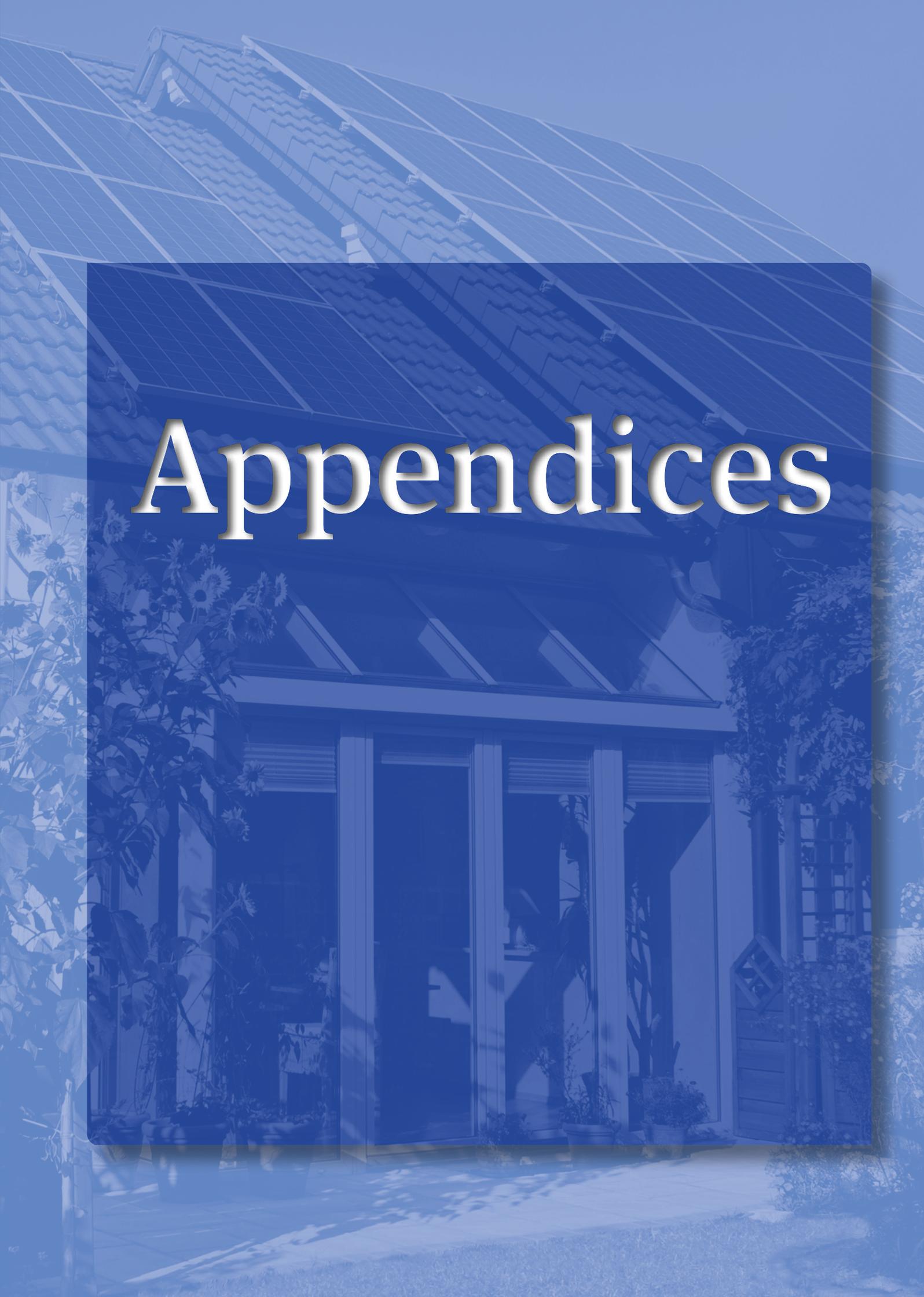
The evidence reported here suggests that the incidence of energy saving measures, like home insulation, was much lower in rental properties offering the potential for significant gains if this addressed. Easing the burden placed on low income renters by legislating higher levels of energy efficiency in rental properties could be seen as an effective policy measure. Similarly stricter efficiency requirements for new build properties could result in a longer term reduction in energy expenditure for householders.

All these measures would have the dual benefit of reducing energy poverty and helping to meet carbon targets by reducing overall consumption and increasing the proportion of low carbon generation in the mix. These findings are important because they point to a need to involve all of society in the drive for decarbonisation and to ensure that all benefit from the resulting reduction in the energy burden.

In other key findings, it was observed that expenditure on transport fuel is higher in WA than in other states. It was also reported through the survey results that a significant number of individuals were foregoing social functions owing to the cost of fuel. The potential this has for increasing social exclusion of those on lower income needs to be considered.

It was also revealed that one parent families with dependent children have the highest burden of energy spending. This suggests a need to make special provisions for this group which have a particular set of needs and constraints.

On a more positive note, WA has the highest incidence of solar installations of any state and those households lucky enough to benefit from the installation of solar panels spoke of the reduced anxiety they felt with regards to their energy bills and the greater feeling of involvement it gave them in the management of their energy expenditure.



Appendices

Appendix 1: Data sources

The analysis presented in this report draws on three principal data sources, all produced by ABS as follows:

1. Household income and wealth, Australia: Income data are taken from the ABS ("Household Income and Wealth, Australia, 2013-14" 2015). This publication presents estimates of the income and other characteristics of households and persons resident in private dwellings in Australia and in each state, compiled from the Survey of Income and Housing ("Survey of Income & Housing (SIH) 2013-14" 2015). It includes estimates of the distribution of income across the population.
2. Household expenditure survey, Australia:
 - a. All expenditure data have been taken from the ABS Household Expenditure Survey (HES) 2009-10 ("Household Expenditure on Goods and Services 2009-10" 2011). This publication presents a subsample of the households comprising the 2009-10 Survey of Income and Housing (SIH). The HES collected information on the expenditure, income, net worth and other characteristics of households resident in private dwellings throughout Australia.
 - b. Housing related costs have been taken from the ABS Housing Occupancy and Costs, 2013-14 ("Housing Occupancy Costs 2013-14" 2015). This publication presents data from the Survey of Income and Housing (SIH) on Australian housing occupancy and costs, and relates these to characteristics of occupants and dwellings such as tenure, family composition of household, dwelling structure, age, income and main source of income.
3. Household Energy Consumption Survey, Australia:
 - a. Energy expenditure data are taken from the ABS Household Energy Consumption Survey, 2011-12 ("Household Energy Consumption Survey, Australia: Summary of Results 2012" 2013). The HECS collected information on household energy expenditure, consumption, behaviours, perceptions and other characteristics related to household energy use based on different dwelling characteristics in Australia in detail and generally in each States.
 - b. Particular energy choices in WA (Perth metropolitan region) have been taken from the ABS Household Choices Related to Water and Energy, WA, 2009 ("Household Choices Related to Water and Energy, WA, October 2009" 2010). This publication contains information on dwelling profile and household choices related to water and energy in WA and includes statistics on topics such as types of energy consumption in the home, sources of heating and cooling, domestic electrical appliances, and public transport use based on different dwelling characteristics.
 - c. Energy usage data are taken from the ABS Environmental Issues: Energy Use and Conservation ("Environmental Issues: Energy Use and Conservation, Mar 2008" 2008; "Environmental Issues: Energy Use and Conservation, Mar 2014" 2014). This publication shows all data relating to sources of energy used by households with different dwelling characteristics in Australia and

state-by-state. The Survey collected a range of information on factors which can affect how much energy a household consumes including dwelling structure, the type of insulation a dwelling has and the number and types of electrical appliances within the household.

- d. Fuel usage for vehicles are taken from ABS Survey of Motor Vehicle Use (SMVU), Australia 2013-14 ("Survey of Motor Vehicle Use, Australia, 12 Months Ended 31 October 2014" 2015). This publication contains statistics on passenger vehicle, motor cycle, truck and bus use for characteristics such as kilometres travelled, tonne-kilometres and fuel consumption.

Since the ABS data is not complete in all areas, especially at State level, we have accessed some additional data sources which complement the principal datasets. These include:

- WACOSS Cost of Living Report (WACOSS 2012, 2014)
- Government of WA, Department of Regional Development – Regional price index 2013 ("Regional Price Index 2013" 2014)
- Synergy Standard Electricity Prices and Charges 2014 (Standard Electricity Prices and Charges 2014)
- Horizon power electricity tariff and charges 2014 (Electricity Tariffs and Charges 2015)
- AEMC electricity price trend final report 2014 (2014 Residential Electricity Price Trends 2014)
- DomGas Alliance, Australia's domestic gas security 2012 (Australia's Domestic Gas Security 2012)
- Australia government, Bureau of Resources and Energy Economics Gas Market Report 2012 ("Gas Market Report" 2012)
- Australian Institute of Petroleum Petrol and diesel price report 2014 (Petrol and Diesel Price Report 2014)
- Australian Energy Regulator WA, Annual performance report for energy retailer 2013/14 ("AER Annual Report on the Performance of the Retail Energy Market 2013-14" 2014)
- AEMO electricity and gas forecasting report 2015 (National Gas Forecasting Report 2015; National Electricity Forecasting Report (NEFR) 2015)
- IMO electricity and gas statement of opportunities 2015 (2014 Electricity Statement of Opportunities 2015)

Appendix 2: Interview outline

Bankwest Curtin Economics Centre Project Energy poverty in WA: A comparative analysis of drivers and effects

Interview questions and prompts

Household membership and broad energy usage patterns

1. I wonder if you could take a couple of minutes to give me a description of the different people in your household.
Check:
 - Number of adults in household
 - Number of children in household
 - How many go out to work
2. Could you describe the house you live in, e.g. is it old/new, brick/timber/concrete, does it feel hot in the summer/cold in the winter, in a good state of repair?
Check:
 - Characteristics
 - Perceptions
3. How do the members of your household use energy in their various daily or weekly activities?
Check:
 - What appliances they have
 - ▶ Fridge, freezer, washing machine, tumble dryer, dishwasher, consumer electronics
 - Any vehicles available
 - ▶ What type, e.g. car/ute
 - ▶ Size and age (=consumption)
 - ▶ Diesel / petrol
 - Energy sources available at home
 - ▶ Gas – ‘town supply’
 - ▶ Electricity
 - ▶ Gas – bottled
 - ▶ Other – generators, rooftop PV or solar thermal
 - Any business related usage
 - Any vehicles usage
 - Check what a typical weekday/weekend day looks like
4. Can you describe how the household’s use of gas and electricity changes at different times of the year, say when it is hotter/colder/school holidays/school term?
Check:
 - Marked seasonal patterns – e.g. heating/cooling.

Usage and paying for home energy

5. Could you tell me roughly how much you spend on electricity and gas per week (or month or year whichever is easiest)
6. Could you tell me about how you budget for your electricity and gas bills?
Check:
 - Do they make trade-offs between paying for energy and saving on other household expenses?
7. What sort of options are open to you if it is difficult to pay an electricity or gas bill?
Check:
 - What could they do?
 - What do they do?
8. Can you describe any types of assistance or help that are available to you if you are having trouble paying for an electricity or gas bill?
Check:
 - Are they aware of assistance options?
 - Have they had to make use of them?
9. Can you tell me about any particular strategies that you have used to reduce your expenditure on electricity or gas?
10. Could you describe any features about your home that make it particularly easy or difficult to change the amount of electricity or gas that you use?
11. Can you tell me about any particular activities that make it particularly easy or difficult to change the amount of electricity or gas that you use? (E.g. medical appliances)
12. Could you tell me which appliances or activities you think contribute most to your household's energy bills, and what gets in the way of being able to reduce those bills?
Check:
 - What things would they like to be able to do to reduce their energy bill?
13. Could you describe to me how you get information about opportunities to reduce your energy consumption?
14. Can you tell me if you track or monitor your energy usage?
 - a. If so, how do you track it?
 - b. Are these methods or tools useful for tracking your usage?
 Check:
 - How would they prefer to keep track of their consumption?
 - ▶ Smartphone app? (Computer) web page? Wall monitor?
 - How often would they like to track their consumption?
 - ▶ Daily or weekly or monthly?
 - What other information about their usage is useful to them?
 - ▶ Comparisons with neighbours?

15. When you make decisions about reducing energy consumption (e.g. buying a new energy efficient appliance), are you influenced by:
 - a. What third parties do, such as neighbours, friends, colleagues, family, school, celebrities (who)?
 - b. How you receive the information, such as pamphlets in mailbox, notes with energy bill, media advertisements (tv or newspaper)?

Usage and paying for transport fuel

16. Could you tell me roughly how much you spend on diesel / petrol per week (or month or year whichever is easiest)
17. Can you tell me about how you budget for petrol / diesel
Check:
 - Do they have to use a car to go to work?
 - Are there any alternative options to get to work?
18. What strategies do you employ to reduce the amount of fuel you use if you're finding it difficult to afford fuel in any given week?
19. Can you describe features about your daily routine that make it difficult to reduce the amount of petrol / diesel you use

Effects of energy prices on daily life and well being

20. Could you tell me about any effects that the costs of gas and electricity have on other parts of your life or the type of activities you engage in?
21. How do these changes affect you or your family/household?
22. Can you tell me about any experiences of being disconnected from electricity or gas?
23. How do you view the affordability of your energy bills (home and transport) compared to your other household expenditures?
24. Has the cost of transport affected your decisions about where to live and where to work?
Check:
 - Has the cost of transport affected their ability to take a particular job?

Appendix 3: Technical notes

Definition of EDHI

EDHI is calculated by adjusting disposable income by the application of an equivalence scale. The scales differ in their detail and complexity but commonly recognise that the extra level of resources required by larger groups of people living together is not directly proportional to the number of people in the group. They also typically recognise that children have fewer needs than adults in the sense that they consume less. The equivalence factor, derived using the 'modified OECD' equivalence scale, is built up by allocating points to each person in a household. Taking the first adult in the household as having a weight of 1 point, each additional person who is 15 years or older is allocated 0.5 points, and each child under the age of 15 is allocated 0.3 points. Equivalised household income is derived by dividing total household income by a factor equal to the sum of the equivalence points allocated to the household members. The equivalised income of a lone person household is the same as its unequivalised income. The equivalised income of a household comprising more than one person lies between the total value and the per capita value of its unequivalised income.

Definition of housing costs

Housing costs are the recurrent outlays by household members in providing for their shelter for themselves. The data collected on housing outlays in the ABS Survey of Income and Housing (SIH) are limited to major outlays on housing, i.e. mortgage repayments, rent, property and water rates as well as body corporate fees. Housing costs are shown in the ABS (Cat. No. 4130) as weekly equivalents. Only payments which relate to the dwelling occupied by the household at time of interview, that is, a respondent's usual place of residence, are included. Housing costs only include mortgage/loan payments if the purpose of the loan at the time it was initially taken out was primarily to buy, build, add to or alter the occupied dwelling.

Appendix 4: Survey questions

The questions posed were as follows:

Do you ever seek to save money on your energy bills by any of the following means? (possible answers Never, Rarely, Occasionally, Frequently except for the last question which allows a free text answer)

- Not turning on air conditioning/heating even though it is uncomfortably hot or cold in your home
- Deciding not to cook a hot meal to avoid using gas/electric
- Going to bed early to avoid using heating or lighting
- Having all the members of your family remain in a single room in the house
- Other strategies

Thinking specifically about transport, has the cost of fuel ever affected your, or your family's decision to? (possible answers Never, Rarely, Occasionally, Frequently)

- Attend a job interview or jobs network
- Take a particular job e.g. where the place of work is far from your home
- Limit the number of days/hours you work
- Join friends or family for a social activity
- Take part in a pastime e.g. sport

Would the following options be of use/interest to you in terms of managing your energy bills? (possible answers Yes, No I see no benefit, Not relevant to me)

- Changes to billing arrangements to fit your preferences e.g. more or less frequent billing
- Access to finance to make your home more energy efficient
- Access to cheap and reliable public transport to reduce car usage

Appendix 5: Interview summaries

Whom did we speak with?

The following vignettes describe some of the participants who generously agreed to be interviewed for this project. Their names have been changed to preserve their anonymity.

Alan

Alan immigrated to Australia with his wife and son over ten years ago and is pleased with the move. His son is now a young adult but remains living at home with his parents. Alan is careful with his energy use and thrifty with his spending. Currently, Alan's energy bills do not pose any difficulties but he is concerned about future energy costs rise because he will soon move from a small flat to the larger house he is building. He intends to investigate installing solar panels on the new house, which will help with the bills, but he is not yet sure if he can accommodate the upfront cost in his budget. Nevertheless, in a bigger house, he realises his energy use will rise and this is a concern to him.

Brian

Brian lives in a state government owned two bedroom, one bathroom unit, which he shares part-time with his 11 year old son. Drugs and alcohol appear to have played a role in Brian's past and he is dealing with mental health issues. Brian is currently unable to work and financially he relies on support from Centrelink, charities and friends. His decisions about energy use are heavily constrained by his financial situation. Energy bills are hard to pay. He will often go to bed in winter when it's cold rather than put the heating on. That aside, he was aware of the need to be energy efficient and had a desire to do the best he could. Brian would like access to solar power, but can't afford the upfront cost of PV panels and believes it should be mandatory on state housing.

Anne

Anne is retired and lives alone after separating from her husband about ten years ago, and this has negatively affected her financial situation. She lives in a small brick single-storey unit and is paying off a mortgage. Retirement was somewhat forced upon her, and she'd rather be working. Anne's love of travel and socialising, combined with her sudden loss of income and assets, has resulted in a tight financial situation. Anne realises that she will need to adjust her lifestyle, particularly in distinguishing between necessary and discretionary spending. Anne raised the subject of solar rooftop panels but believes the installation cost would be out of her reach. All in all, she is unsure what the future holds for her and is concerned about how she will handle her finances in the face of rising energy costs.

Connor

Connor's actions suggest he is energy-conscious, money-saving and technology-savvy. He lives with his mother in a three bedroom, one bathroom brick single-storey home owned by his older brother, for which he pays below-market rent. Connor takes charge of most of the bills and payments related to maintenance of the house in return. Connor appears very aware of his expenditure and extremely organised with his payments and saving. He makes extensive use of automated alerts and reminders. When it comes to energy use, he believes his appliances are the best he can get efficiency-wise within his budget, and his energy use behaviours are geared to using as little energy as possible and saving as much money as he can. Connor has no difficulty paying his current energy bills but is aware that when he buys his own home he will find things a lot tighter. He is planning and budgeting for the expected higher costs.

Doug

Doug is retired and in his 70s. He moved to Perth from Malaysia some years ago after his wife died, partly to assist with care for his grandchildren when they were young. Doug lives on his own in an older, small three bedroom, one bathroom brick home. He has a few hobbies, such as growing orchids and sailing boats, that don't require energy use. His main mode of transport is his two gophers, and public transport. Doug does not appear wealthy, but seems happy enough with his life. His main concern is for his health. He says he can handle his bills with his pensions (from Malaysia and Australia) but if his health fails then he believes he will be in trouble financially. At the moment his energy bills are almost non-existent due to the fact that he installed solar PV panels. Currently, his energy bills are largely covered by the solar panels.

Emma and Eddie

Emma and Eddie are a married couple in their 20s. They live in a small one bedroom apartment, centrally located, but spend a lot of time at Emma's parents' house where they get free meals and often do some washing and drying. In this way, some of their energy costs are incurred by Emma's parents. This couple appear interested in and knowledgeable about energy conservation, and are keen to keep their costs low to save as much as they can. Their energy use is low, but since they have become more aware of the impact of their lives on energy use and the environment they have started turning their appliances off at the mains every night and have noticed a further reduction in their energy bills as a direct result. Emma and Eddie are interested in solar panels but don't have a roof due to being in the middle floor of a set of apartments.

Barb

Barb is a retired 72 year old lady who lives by herself in an apartment complex. She took voluntary redundancy from her job six years ago, as she was planning on retiring the following year in any case. Barb's apartment is a two bedroom, one bathroom brick dwelling on the top floor of a double-story apartment complex. She estimates the building is about 25 years old. It is a strata management unit, which she owns outright. Barb is now in a position where, whilst not wealthy, she can be comfortable in her retirement and not be too concerned about budgeting. That said, she describes careful and efficient ways to manage expenditure and regular bills, including energy, are set up to be paid immediately and in full by direct debit to her bank account. This ensures she doesn't incur any extra fees or interest charges. She's never had any problem paying bills. She described her motto as: "if you can't afford it, you don't have it".

Frank

Frank is a retired pensioner who lives by himself in a brick 2-bed 1-bath apartment on the bottom floor of a 2-level complex of about 45 apartments. Frank doesn't pay much attention to his energy usage. His usage is reasonably low because he lives alone, mostly uses public transport (which is free for pensioners during the day) and believes he isn't extravagant in any area of his life. Frank thinks he could probably lower his usage a little, but as he isn't a high user to start with he's not that interested. He can usually afford to pay his energy bills. If he had to cut back on spending it would be on discretionary entertainment such as going to music concerts, which he loves. Frank is interested in trying to get solar panels for the apartment block and would like to pursue this with the body corporate. He would be happy to reduce his energy usage further if it was easy to do so and didn't cause much of a change to his lifestyle. He anticipates that in the future, if energy costs continue to rise, he might encounter more problems with covering bills than he currently does.

Caitlyn

Caitlyn is in her 30s and married with an eight year old son. Caitlyn is from a non-English speaking background and until recently both she and her husband were working. Currently she isn't working, but she hopes to again soon. Caitlyn (and her family) is already interested in energy efficiency and conservation. This is mostly for financial reasons – particularly since she is not working – but also for reasons of altruism, and preserving resources for future generations. Caitlyn is attuned to the amount of energy she uses, which appliances or activities generate the most usage (heating, cooling and washing/cleaning activities, plus the fridge) and actively minimises the amount of energy she and her family consumes. Caitlyn would be interested in installing solar panels but hasn't fully investigated this option yet.

Graeme

Graeme is a widower aged in his 80s who lives by himself in a three bedroom, one bathroom brick, single level, semi-detached unit. He feels a bit lonely since his wife died a couple of years ago but he catches up with some mates at the local senior citizens' centre. Graeme is careful with his use of energy but his discussions suggest this is not just because of the cost. It is in a large part borne out of the environment and times in which he grew up, whereby there was little wastage, and money was hard to come by. Graeme does not leave lights turned on unnecessarily and he often turns off appliances at the wall, as he knows this saves energy. He uses a little cooling in summer but in the winter he prefers to rug up instead of using the heater. He describes his energy bills as low, and there appears to be little opportunity to lower them further. He is interested in solar panels, but not sure at his age that it's worth the upfront cost, as he might not be around long enough to reap the financial return.

Diana

Diana is young and single and lives by herself in a large four bedroom, two bathroom house, which is on a large block of land. She commutes about 60km each way to work every day via public transport (train). While she acknowledges that she lives in a house that is too big for her needs and lives some distance from her work, Diana is interested in saving energy. This seems partly related to time spent as a volunteer in third world countries and which increased her awareness of the importance of preserving energy sources and not being wasteful. Diana does all she can to minimise her energy usage – she turns off power at the wall, has few lights on, rarely uses the air-conditioner or heater and has solar panels. In fact, Diana uses the solar panels as a source of income. Not only has she not paid an electricity bill in the 18 months, but she regularly receives a healthy rebate from the electricity company for the energy she puts back into the grid.

Fleur

Fleur is middle aged, married and has two grown-up sons, one of whom still lives at home occasionally. She lives in a brick two-storey home which is fine downstairs but a bit of a heat trap upstairs. Fleur is thrilled with the impact that solar panels have had on their household energy bills. Whilst she and her husband have not often encountered problems paying their energy bills, due to steady employment, they were finding their bills were getting worryingly large. This led them to install solar rooftop panels. Now that they have done so they are delighted with the amount of money and energy they are saving and the reduced amount of worry. They have also found that the panels have provided shade to their roof that has reduced the ambient air temperature in the upper storey. Fleur believes they were lucky to be able to afford the upfront cost of installation of the panels. Whilst financial issues are not a major concern for the household, the cost of increasing energy bills that was motivated the solar panel installation.

Gwen

Gwen has a husband and two month old son, as well as two teenage stepsons. She believes her Asian cultural background contributes to her outlook and philosophy on a lot of things, including energy use. Whilst her concern about energy use is partly financially motivated and partly associated with her upbringing of being frugal and not wasteful, she also is concerned about how current generations treat the environment and in what state we are leaving it for future generations. Gwen's house is not well suited for rooftop solar panels and the associated cost means that they are not an affordable option currently. Gwen's husband lost his job last year and so far doesn't have another one, so energy bills are a big concern for this one-income family. Gwen does all she can to reduce, reuse and recycle but finds that there's only so much you can do when you live with other people who are less interested in this approach.

Henry

Henry lives with his wife and two young sons and appears knowledgeable about his family's energy use. The household uses little energy besides what they need to adequately heat and cool their house, cook and wash. Times have been tough over the past couple of years. Henry was without work for a while, and the energy bills were hard to pay, so he had to seek assistance from the energy company to allow him extra time. He also had to cut back on discretionary spending for holidays and visiting friends and family nearby. Henry's approach to new purchases and renovations is to do things bit by bit when he can afford it. This is the case, for example, with a newly purchased dishwasher – he will now wait until he has the money to pay someone to adjust his shelves and cupboards in order to fit it in and install it. Henry is interested in solar panels, but can't afford the upfront cost at present.

Ian

Ian is in his 40s and lives with a wife and two young children in a two income household. He works in a professional occupation and lives reasonably close to the city in a 1940s single storey brick three bedroom one bathroom home. He believes that the design of the house makes it hard to take advantage of sea breezes, and it is also hard to move cool or warm air around the house, meaning multiple points of heating and cooling are required. Plug-in fans are sometimes used to move the air around. So, quite a lot of energy is used in heating and cooling the house. For this reason, and because of the associated cost of energy, Ian installed rooftop solar panels just under a year ago, and also switched his electricity plan to off-peak. As a result, he is careful as to when he uses power. His behaviour is to have energy systems off during the start and end of the day where possible. He is happy to use energy through the middle of the day as it's covered by solar, and he will then try to use systems at night under his off-peak energy scheme. Ian's strategy is to time his energy use efficiently rather than reduce overall usage. Ian thinks public transport should be free, as users are doing the city and planet a favour and should be rewarded. He would like to purchase an electric car when plug in technology is affordable and accessible.

Helen

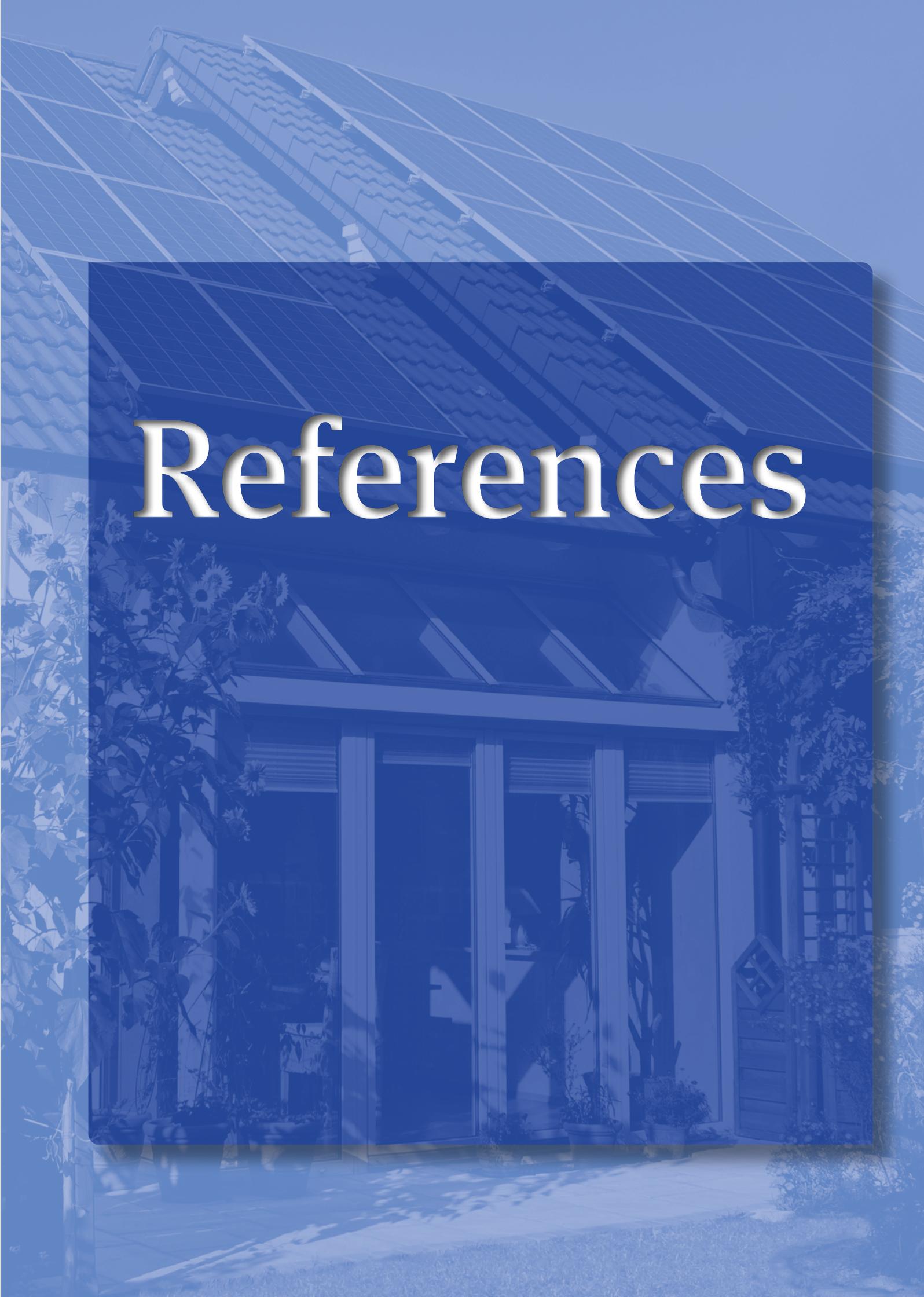
Helen is middle aged, divorced and lives alone on the top floor of another couple's house that has been converted to a two bedroom, one bathroom flat. She works full time, but money is tight and she has to watch her spending carefully. Helen believes she uses very little energy yet finds that her bills are relatively high. Because of this, she would like more information about energy usage to be available to customers, to help them manage their usage. Helen favours more choice and competition regarding energy suppliers, and more transparency in terms of the energy supply source they use. Helen drives to work and most other places, not because of the cost of fuel vs public transport, but purely because of the time it takes to get places (particularly to work) on public transport. If energy costs continue to rise, she will probably have to cut back on the small amount of travel she does to participate in triathlons. She might cut back on equipment costs as well, but she would hate to have to give up the sport all together. She has considered choosing cheaper brands when food shopping and reduce the number of 'treats' she buys herself.

Ingrid

Ingrid lives in a large wooden four bedroom, two bathroom (plus granny flat) home in the hills with her husband and three teenage children. The house is always full with lots of friends, and there is lots of use made of the swimming pool, reticulation, phones, computers, fridges and other appliances. Ingrid is aware that her family's energy use is high, and it bothers her. The energy bills are large and starting to have an impact on their lives. They can afford to pay for essentials, but there is a negative impact on discretionary spending such as travel and going out for meals, both of which they are cutting back on and/or doing without. Ingrid's previous house had rooftop solar panels, and this current house doesn't. However, she has delayed installing them for two reasons. One is the upfront cost, although they would be happy to pay it off over a period of time via their energy bills. Secondly, at their previous house (nearby) the solar panels would freeze over in winter and not work, which left them without hot water, a problem that she doesn't want to repeat.

Judy

Judy is a single mother who lives with her two children in a four bedroom, two bathroom, double storey brick suburban house. She is mindful of energy costs, and is aware of increasing energy bills. Her strategy to manage this is to reduce her energy usage and also to manage her finances well. Her main energy reduction strategy is to put the air-conditioners on a higher setting of 24°C in summer, rather than a lower temperature. She also installed a large, insulated patio at the back of her house which has drastically improved the temperature inside the house and is currently installing curtains and blinds on all the windows of the house to keep the temperature more steady. Although Judy's house is relatively new, it was built with no eaves and this means there is little shade for the windows and limited protection from the rain and other such elements. In short, the house limits her ability to open windows and ventilate the house. Judy bakes a lot, and uses a lot of kitchen electrical and gas BBQ appliances for this. Her boys also use a lot of electronics, which are unlimited – computers, iPads, iPhones, etc. Judy recently bought a hybrid car to replace her previous 'gas guzzler', and that has generated a lot of savings in fuel. She uses these savings to pay for the servicing of the car. Judy is reasonably energy conscious but this has had a limited influence on her family's use of electrical appliances.



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