Residential mobility and changing energy related behaviour

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ABSTRACT

It has become increasingly important to use energy more efficiently, through the pressures on resource availability and the effects on climate change. This thesis studies how household energy related behaviour can or does change during residential mobility. Energy related behaviour is difficult to change because people become 'locked in' to practices that are framed by their material and social contexts. Residential mobility has been shown as a promising period to influence energy related behaviour because it causes a disruption to the embedded routines of everyday life.

However despite numerous studies and theories supporting the notion that disruptions to everyday behaviour caused by changes during residential mobility provide opportune periods for intervention, there has been some difficulty in harnessing the seemingly enormous potential of this period.

The thesis argues that residential mobility needs to be understood more holistically to encompass the ways householders interact with each other during mobility, and looks to literature on household mobility to inform this. However mobility literature does not address how householders behave in new dwellings well, so the thesis addresses new literature on household norm formation to address the changing dynamics of householders in a new dwelling.

This thesis therefore explored how households' energy related behaviour changes as they embark on the process of residential mobility, to find the most important elements that could or do stimulate changes in domestic energy consumption. It engages with 16 households before and twice after they move home in order to establish their reasons for moving. The interview prior the move focused on, why participants chose their new dwelling, and how they expected energy related behaviour might be different. Once they arrived in the new house, they were interviewed again, and again three to eight months after in order to establish if normal behaviour had changed, and the reasons why.

The thesis has adapted existing methodologies to the study of dynamic moments between householders in a real world context. The investigation develops a framework by which to

study energy related behaviour during residential mobility holistically. It establishes six stages where energy related behaviour can potentially be influenced. The thesis shows how each stage requires different considerations when approaching householders as they move through differing pressures and decision making procedures.

The thesis finds that households with more experience, and a higher position along the housing ladder were more prepared to make swift energy related changes to a new dwelling and to make it fit better with their norms of comfort. Householders with less experience tend to take a longer term – wait-and-see approach.

The thesis finds that householders in mobility try to improve their material culture, which inadvertently changes the way in which they use energy in a new environment. It also highlighted how the social context of the new dwelling can be even more influential in shaping norms, depending on the circumstances. New environments do provide opportunities to stimulate more efficient energy related behaviours, but they must be approached within the context of the housing ladder, and the social context of the household. Depending on these conditions, policy writers and social agencies need to address the types of interventions, and the timing of those interventions.

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Chapter 1 INTRODUCTION

New Zealand is a small island nation in the South Pacific, with just over four million inhabitants. Like all other Western countries, however, it contributes to the declining health of the planet as it grapples with its thirst for energy. New Zealand, too, must take steps to improve its energy efficiencies and reduce its impact on climate change. While this is a concern for everyone, this thesis looks at the household level for opportunities to contribute to energy savings.

In New Zealand, the quality and type of housing varies considerably, with many uninsulated and stand-alone wooden or brick villas. Attempts to improve this reality by insulating houses, creating fuel efficiencies, and reducing domestic energy consumption, have been immensely difficult both in New Zealand and abroad, due to the challenge of implementing effective intervention strategies (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Lloyd, Callau, Bishop, & Smith, 2008; MoED, 2011) and the heterogeneity of household characteristics (Barton et al., 2013; HEEP, 2006; Lawson & Williams, 2012; Wilson & Dowlatabadi, 2007).

This thesis investigates how people's energy related behaviours change when they move home, as moving home has been identified as an opportunity to reduce domestic energy consumption. Moving home provides an opportunity for people to change their normal routines and adopt practices which use less energy. If the process of decision making and behaviour change during this critical time is better understood, it may provide an opportunity to create more effective interventions to reduce domestic energy consumption.

In New Zealand the amount of energy consumed per household has been increasing at a relatively low rate (approximately 1.5% a year), alongside a steady increase in the size of average floor space and the number of appliances within them (HEEP, 2006). Research shows that New Zealand's household energy demand constitutes around 12% of the nation's total energy use (MoBIE, 2011) and that this could be reduced through energy efficiency measures (HEEP, 2006).

One of the greater challenges facing New Zealand's domestic energy consumption lies in the heterogeneity of housing stock (Lloyd et al., 2008), and wide ranging fuel sources (MBIE, 2011). These variations have contributed to broad 'cultures' of energy users (Lawson & Williams, 2012), some of whom use exceptionally more energy, and are less prepared to change their consumption practices (Barton et al., 2013).

Energy related behaviours are difficult to change because they are entwined within the mundane practices of everyday life such as cooking, eating and socialising (Shove, 2003; Wilhite, Shove, Lutzenhiser, & Kempton, 2000). Such routines generally become habitual and automatic, and it is therefore easy to become 'locked in' to routines within the household (Maréchal, 2010). A wide range of disciplines has been engaged in the study of energy related behaviour and behaviour change. It encompasses a wide range of social, institutional and economic factors (Lutzenhiser, 1993; Wilson & Dowlatabadi, 2007). Theories contributing to our understanding of domestic energy consumption include those relating to individual behaviour (Ajzen, 1991, 2002; Bandura, 1977, 1989), social practice (Shove, 2003) and sociotechnical systems (Geels, 2004).

Individualised perspectives on energy related behaviour have usually attributed actions to higher attitudes and environmental values (Barr & Gilg, 2007; de Groot & Steg, 2010; Wouter Poortinga, Steg, & Vlek, 2004, Abrahamse et al., 2005; Kaiser, Schultz, & Scheuthle, 2007). Policy makers have targeted attitudes which are linked to energy related behaviours in an effort to improve environmentally responsible behaviour (Barr, Gilg, & Ford, 2005; DEFRA, 2008).

Psychological models have also provided insights into the influences of habits on energy behaviour, as providing information to change attitudes does not always combat the sub-conscious processes of habit that are cued by certain environmental conditions (Maréchal, 2010; Marechal & Lazaric, 2010; Schafer & Bamberg, 2008; Verplanken, Walker, Davis, & Jurasek, 2008; Wood, Witt, & Tam, 2005). However only targeting individual behaviours and attitudes still miss the wider norms of comfort, cleanliness and convenience which steer many household activities (Shove, 2003). Developed in sociology, practice theory has created important insights into mundane, inconspicuous consumption of everyday life that drive energy demand (Brand, 2010; Gram-Hanssen, 2008, 2010; Hargreaves, 2011; Pink, 2012;

Shove, 2004; Spaargaren, 2011; Warde, 2005). Practice theory has helped researchers understand how new technologies provide ever increasing 'cogs' that increase household consumption of energy (Shove, 2003; Shove & Walker, 2010).

The relationship between people and technology has become widely researched in the energy related literature, with new perspectives accounting for the agentive relationship of the material world on daily practice (Wilhite, 2008; Latour, 2005). Understanding the societal interactions with evolving technologies has given use to socio-technical transitions theories (Geels & Schout, 2007). These wider perspectives on energy related behaviour examine how social and technical systems interact to create and change energy demand, (Geels, 2004; Geels & Shout 2007). Systems perspectives have helped show the many levels of complexity involving energy related behaviour, and also the importance of understanding the different interacting elements that drive energy demand.

There have been attempts at providing integrated frameworks into energy related behaviour, from using systems perspectives (Hitchcock, 1993; E Shove, Lutzenhiser, Guy, Hackett, & Wilhite, 1998) to behavioural approaches (Raaij & Verhallen, 1983). While all of these various strands of research provide helpful insights into energy behaviour, their lack of a common theoretical platform and hence cohesion have created the need for a more inclusive and holistic view on energy consumption behaviours (Keirstead, 2006). Following the progress made by the energy cultures framework (Stephenson et al., 2010), in addressing the need for a more holistic approach, this thesis seeks to further deepen this perspective by further exploring the dynamics within and between the elements of the energy cultures framework introduced next.

Building from energy literature that uses theories of sociotechnical systems (Geels & Schot, 2007), practice (Shove, 2007; Shove, Trentmann, & Wilk, 2009), and habit (Maréchal, 2010; Neal, Wood, & Quinn, 2006), the energy cultures framework establishes that a change in material culture will create changes to energy related norms and practices (Stephenson et al., 2010).

1.1 THE ENERGY CULTURES PROJECT

The energy cultures project (Barton et al., 2013), has taken an interdisciplinary approach to addressing energy related behaviour in New Zealand. Recognising that energy related behaviour is embedded within a socio-technical system, the energy cultures framework was developed to address energy related behaviour as context-driven culture encompassing "knowledge, belief and behaviour which is reinforced by its material objects" (Stephenson et al., 2010, p. 6123). The framework has been applied to enquiries into energy behaviour at different scales such as the household, business and sector (Chai & Yeo, 2012; Lopes, Antunes, & Martins, 2012; Pelenur & Cruickshank, 2012).

The energy cultures framework is compatible with a range of different models of energy behaviour including theories of practice (Shove, 2003; Wilk, 2002), planned behaviour (Ajzen, 1991) and sociotechnical systems (Geels, 2002). It suggests that energy behaviours are influenced and reinforced through interactions between material culture, practices and norms. Energy practices in this instance include all interactions with energy using technologies, and/or actions that intentionally avoid energy use. Material culture includes physical appliances, technologies and physical infrastructure that use and/or influence energy consumption. Norms include people's expectations about their material culture and energy practices as well as their aspirations to change (D. C. Feldman, 1984).

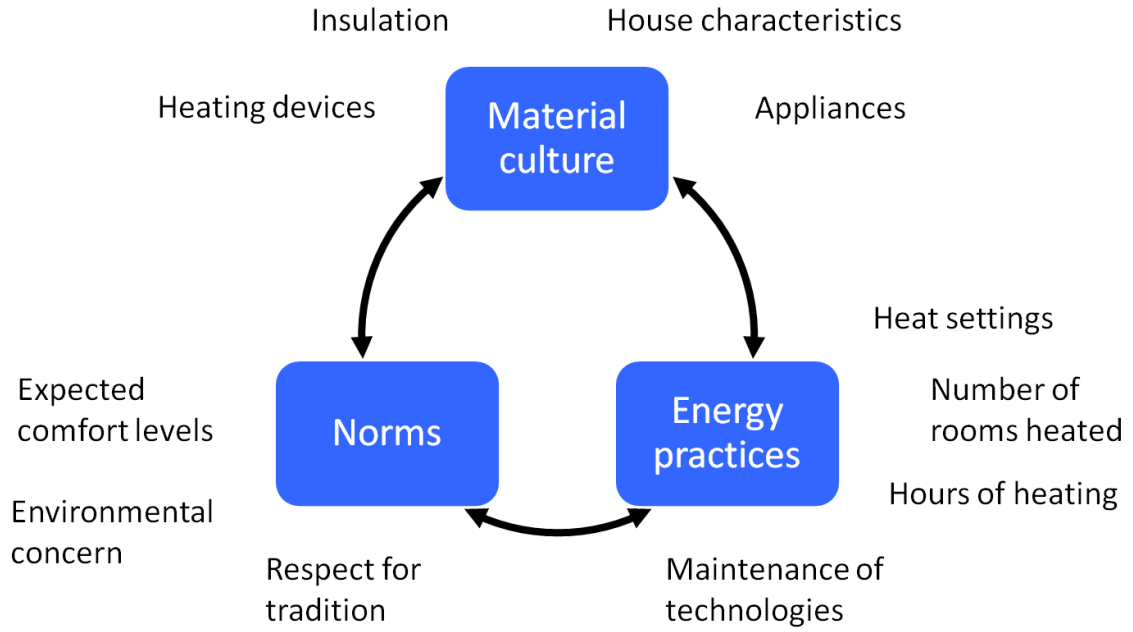


Figure 1: Energy Cultures Framework (Stephenson et al., 2010)

It is important to understand the heterogeneous drivers of energy related practices and the different ways in which these elements interact (Gram-Hanssen, 2010a), as an increase in energy efficiency will not be reached by a one-size-fits-all campaign to energy users. The energy cultures framework helps identify the sources of heterogeneity through inviting understanding of the dynamic relationship between norms, material culture and energy practices which gives rise to a distinct 'energy culture'.

The energy cultures framework is particularly useful to this thesis as it provides a broader understanding of the different facets that influence energy related behaviour, including the nature of the house and appliances with which householders interact. As residential mobility involves what the energy cultures framework would call a 'change in material culture', there is merit for using such a perspective in order to study the influences of moving home on energy related behaviour. Despite the flexible nature of the framework, there has been little application of the model to households as a unit of analysis. One of the biggest challenges in operationalisng the framework in this context is that it doesn't place enough emphasis on the relationships between householders as they establish norms of energy related behaviour.

The energy cultures framework provides an initial structure by which to study the changes in material culture on energy related behaviour. However this thesis argues that in order to fully understand the implications of residential mobility on energy related behaviour, one must also include the interactions between household members. This thesis therefore not only engages with changes in material culture, householder norms and energy practices during mobility, but also investigates the changes that mobility incurs on the social context of the household.

1.2 CONTEXT CHANGE

Context change is a phenomenon studied in psychology, whereby individuals have been found to be able to break habits when moving into a different environment (Verplanken & Wood, 2006). Habits associated with energy use have been found to be a barrier to changing energy related practice (Marechal, 2008; Maréchal, 2010), and have been argued to be one of the reasons why previous interventions based on rational consumer models have been found to have little effect (Gronow & Warde, 2001). Moving home is a natural context change

which provides an opportunity for householders to change energy related behaviours (Schafer & Bamberg, 2008; Schäfer, Jaeger-Erben, & Bamberg, 2012).

Verplanken and Wood (2006) distinguished three scenarios for interventions; upstream – before the behaviour has occurred, downstream – after the behaviour has occurred, and downstream plus context change – after the behaviour has occurred but using a change in behavioural context to increase the effectiveness of the intervention. This latter type of intervention was seen to be the most promising for creating behavioural change. It showed some promise for interventions to change domestic transport behaviour (Bamberg, 2006; Verplanken et al., 2008). Verplanken 2008 then took the idea of context change one step further by suggesting that householders may use residential mobility as an opportunity to live in a way which is more in line with their personal attitudes (in the context of domestic car use).

As suggested by Schafer and Bamberg (2008) and Verplanken and Wood (2006), residential mobility may be an opportune time to introduce interventions and new energy-saving measures that can be easily implemented or adopted due to the changes in physical environments which force householders to adjust, change, and adopt new behaviour. Residential mobility involves the study of why people move (Rossi, 1955), and what it means to move home (Winstanley, Thorns, & Perkins, 2002). However, this thesis will argue that there has been little focus on literature involving residential mobility in context change interventions.

There have been many approaches suggested to using moments of change to change energy related behaviour, such as moving out of the parents' house, retiring or having a baby (S. Thompson et al., 2011). The authors amalgamated literature across social science disciplines to address how individuals' habits could be influenced more effectively as the performance context of habits were disrupted. However residential mobility is a process that commonly involves multiple people, which have not been addressed in the individualised models of behaviour associated with the aforementioned studies.

In one of the largest studies to use context change as an opportunity to manipulate energy related behaviour in households during mobility (Bamberg, Fujii, Friman, & Gärling, 2010;

Schafer & Bamberg, 2008), they too focused on individual models of behaviour. The study trialled two interventions, one being a tailored consultation, and another involving targeted mail information about ways to save energy. In contrast with literature which suggested that the changed context of a new home would make interventions more effective (S. Thompson et al., 2011). Schäfer, Jaeger-Erben, and Bamberg (2012) found it more difficult to encourage energy efficient behaviours in people who moved, than for households which did not undergo residential mobility.

Schäfer et al. (2012) suggested that there were three main potential problems with the way in which their interventions were implemented.

a. The timing of the interventions may have already been too late to influence the behaviours they wished to change
b. Householders may have already decided upon how they wanted to live in the new dwelling before moving, making it difficult to change once they were in there
c. Other points of contact – such as real estate agents, may have provided a more effective medium by which to implement the interventions

In this context, New Zealand is a useful case to analyse the effects of moving home on energy use. The high percentage of home ownership (Dupuis & Thorns, 1998), the poor state of housing stock (Shannon, Lloyd, Roos, & Kohlmeyer, 2003), and the high mobility of households whereby on average New Zealanders move home around seven times in their lifetime. These factors create many context changes for the prevailing 'energy culture' of a household, with the potential for changing material culture, practices and/or norms. During these times of change, the possibility exists that more efficient energy related behaviours could be established. An opportunity exists to encourage change towards energy efficient behaviour when people shift houses, as that time usually constitutes a major disruption to lifestyles and habits[1].

1 See (S. Thompson et al., 2011) for an extensive review of literature relating to opportunities to intervene during different moments of change

1.3 RESEARCH AIMS AND JUSTIFICATION

Changing energy related behaviour in households is important to reduce domestic energy consumption, however interventions to change behaviour have struggled to reach their full potential. The chapter has shown that understanding energy related behaviour needs to encompass norms, practices and the material culture, however it also needs to include the interactions between householders that impact these relationships differentially.

Context change has been shown to be one of the most promising areas to create effective interventions to reduce energy consumption. However without a focus on the wider implications associated with mobility (such as the stages of group decision making or previous shifting experience), or the changes in social dynamics, current interventions have shown little ability to meet their potential.

The research proposed in this thesis will explore these points by studying people's behaviours both prior to their move as well as post-move. The research undertakes a longitudinal, in-depth investigation of the residential mobility process in order to find the implications of residential mobility on energy related behaviour. The aim is to explore how energy related behaviour changes as households go through the process of residential mobility, through changes in individual, social and material elements.

Chapter 2 explores current literature relating to the overarching aim and establishes five research questions which become the focus of the thesis:

1. In what way is household energy use considered when households search for a new dwelling?
2. What are the strategies by which householders choose and make changes to housing attributes that affect energy consumption as they move along their housing careers?
3. How are household norms concerning energy consumption established in a new dwelling?
4. How does a change in material culture (residential mobility) influence energy related behaviours?
5. How does a change in material culture influence the individual and social contexts of a household?

1.4 METHOD

The thesis undertakes 16 case studies of households undergoing the process of residential mobility in the city of Dunedin, New Zealand. The study does not focus on any particular type of mobility, such as home purchase, but instead seeks to develop a deeper understanding of the implications of different types of residential mobility on behaviour. The householders are interviewed together once before, and twice after moving to uncover normal behaviour in the first house, reasons for moving, and expectations of energy related behaviour in the second house. Householders are then interviewed around one month and again 3-10 months after moving to uncover how and why energy related behaviour did or did not change. The research uses a mixed methods approach. The investigation uses a case study framework and adapts methods such as concept mapping and value laddering to uncover the decision making processes, householder norms and individual motivations resulting in energy related behaviours. Case transcripts are analysed using thematic content analysis, firstly within cases to establish concept maps and case overviews, and then secondly across cases.

1.5 THESIS OVERVIEW

This thesis is arranged in five main sections. Chapter 1 has introduced the main themes and problem definition. Chapter 2 of this thesis addresses the literature on energy related behaviour and residential mobility. It develops a conceptual framework which draws from different understandings of the moving process and influences on energy related behaviour. The chapter establishes the four research questions which are then addressed through a series of case studies involving households who move home.

Chapter 3 outlines the methodology used in the thesis and Chapter 4 presents the findings of the investigation. Chapter 4 is broken into three sections; firstly the cases and their characteristics are presented. Then the changes in the social context are addressed through the kinds of decisions households make during mobility that influence energy consumption. This includes the choice criteria for energy related investments and fixture investment strategies. The chapter finally addresses how householders decide to use energy in a new dwelling, and the process by which new energy related norms are established.

Chapter 5 focuses on the influences of material culture on energy related behaviour. The chapter examines the dynamic relationship between material culture and the individual and social contexts through the process of appliance acquisition and disposal, and the influence of new technologies on energy related norms.

Chapter 6 revisits the conceptual framework presented in chapter 2 in light of the findings in chapters 4 and 5. Implications for policy makers and social agencies are discussed, as well as the limitations and opportunities for future research.

Chapter 2 LITERATURE REVIEW

This chapter explores literature that helps to understand how energy related behaviour may change as households go through the process of residential mobility. This chapter does this by focusing on literature relating to household energy use, studies of residential mobility and studies which have used residential mobility as an opportunity to encourage energy efficient behaviour. The chapter argues that integrating these literature streams may provide a better structure for decision makers because they can lead to more concrete measures that would be useful for planning, implementing and measuring the effectiveness of interventions.

The chapter presents an integrated framework to address the complexities of energy related behaviour during residential mobility. Through the gaps presented in the literature, five research questions are presented.

2.1 THE ENERGY EFFICIENCY PROBLEM

Globally, household energy consumption is a major issue that is linked to economic growth and quality of life expectations (Balke, Brown, & Yücel, 2008; Meadows, Meadows, Randers, & Behrens, 1972; Pasten & Santamarina, 2012). It is becoming commonly accepted energy should be used efficiently and effectively as possible, and in some cases efforts should be made to actively reduce consumption.

The dominant paradigm of government interventions to improve residential energy efficiency has been to work toward changing attitudes, providing information, or providing incentives and punishment (Abrahamse et al., 2005; Barr & Gilg, 2006; Barr & Gilg, 2007; DEFRA, 2008; Hansla, Gamble, Juliusson, & Gärling, 2008; Kaiser, Wölfing, & Fuhrer, 1999). However, it is well recognised that such measures have a limited scope, and an argument can be made that demand is shaped by practices that emerge from interactions between the social and material world (Shove, 2004; Shove, Lutzenhiser, Guy, Hackett, & Wilhite, 1998; Wilhite et al., 2000).

Efforts to curb household energy demand have intensified over the last thirty years, and a multifaceted body of literature has emerged that studies how people use energy in the home, (for a review see Wilson & Dowlatabadi, 2007). This research has begun to focus on energy transitions and interventions from both the national and local level of government policy (Barton et al., 2013), transitions and what they might look like, and which would be most effective at reducing energy consumption (Abrahamse et al., 2005; Mourik, 2009).

2.2 MATERIAL CULTURE AND ENERGY RELATED BEHAVIOUR

The demand side of energy efficiency has traditionally been researched using psychological perspectives of behaviour and models such as the theory of planned behaviour (Ajzen, 1991) which focus on individual actions that are guided by personal attitudes and beliefs. A large body of literature has been based on such models, with which there has been varied success at influencing demand (Abrahamse et al., 2005; Faiers, Cook, & Neame, 2007; Lutzenhiser, 1993; Wilson & Dowlatabadi, 2007).

The energy cultures framework invites researchers to consider energy related behaviour as context-driven culture encompassing "knowledge, belief and behaviour which is reinforced by its material objects" (Stephenson et al., 2010). The framework is relevant at different scales such as the household, community or national level.

The energy cultures framework Stephenson et al., (2010), suggests that energy behaviours are influenced and reinforced through interactions between material culture, practices and norms. Energy practices in this instance include all actions and activities that involve interactions with energy using technologies. Material culture involves the physical appliances, technologies and infrastructure that embody energy and energy use. Norms include the acceptance (or rejection) that a given pattern of material culture and energy practices are appropriate and acceptable in a given context.

Theories of practice Shove, (2003), planned behaviour Ajzen, (1991) and socio-technical systems (Geels, 2002) all provide relevant insights into how householders potential responses to a changing material culture. As the context change framework (see 2.9 Figure 1) will use both individual responses within a wider household social context, the lens of the energy cultures framework provides a good starting point to understanding the relevant facets by which material culture can influence energy related behaviour.

Moving home disrupts the dynamic relationship between norms, material culture and energy practices. An increase in energy efficiency will not be reached by a one-size-fits-all campaign to energy users (Abrahamse & Steg, 2009; Abrahamse et al., 2005). It is important to understand the heterogeneous drivers of energy related practices and the different ways in which these elements interact (Gram-Hanssen, 2010).

The chapter will now review energy related behaviour within the context of New Zealand's housing stock and material culture.

2.2.1 Domestic energy consumption in New Zealand

New Zealand consists mainly of two long and narrow islands in the South Pacific Ocean. The islands point roughly from northeast to southwest, meaning that the southern island suffers from substantially cooler temperatures on average than the northern island. Most of domestic energy demand comes from electricity (69%), but despite the broad range in temperatures across regions, there is little variation in annual electricity consumption (HEEP, 2006). Annual household electricity consumption ranges from the bottom 20% of the population using around 4860kWh and the top 20% using 10,380kWh (HEEP, 2006).

Around two thirds of household energy in New Zealand is used for space heating and hot water heating, with the final third including other appliances, refrigeration and lighting respectively (HEEP, 2006). Most water is heated by electric hot water cylinders; however the use of space heating appliances is very diverse. For most households, space heating is achieved through electric heaters and increasingly heat pumps. Many houses have dual fuel

sources, and 20% of household energy use comes from solid fuel (mostly wood), and 11% gas and LPG which constitute the rest of heating and hot water loads (HEEP, 2006). On average, households spent $40 per week on electricity in 2013, 3.6% of total net expenditure (Statistics New Zealand, 2013a).

Research has identified four 'energy cultures' in New Zealand households, which serve to categorise patterns of energy related behaviour according to household norms and material culture (Barton et al., 2013). The largest energy-culture group, the Energy Easy culture (31%) is the least concerned about their usage, are middle-aged, and have the second highest income. The Energy Economic culture (24% of New Zealand's population) is younger and poorer, environmentally aware, and use their ingenuity or practical tricks to save on energy costs. The Energy Efficient (20%) are older and often retired and value practicality, but have also lower ownership of appliances, while the Energy Extravagant culture (19%) have the highest income and the largest houses, but not necessarily best insulated ones, and they own many appliances (Lawson and Williams, 2012).

2.2.1.1 New Zealand—a very diverse and poor housing stock

Historically, New Zealand has had a long standing tradition of home ownership and owner occupied dwellings which have been used for family wealth creation and financial security (Dupuis & Thorns, 1996, 1998; Murphy, 2007; Thorns, 2000, 2006). Unfortunately, New Zealand's housing stock is often of such a poor standard due to slow and inadequate changes in governmental regulation and the cultural desire to have separate owner occupied dwellings leading to immense variances in housing quality and thus the ability for effective retrofitting initiatives.

Through the culture of ownership and slow uptake of housing regulations there are a large number of dwellings which are detrimental to householder health, see (Howden-Chapman, 2002, 2004; Howden-Chapman et al., 2000; Howden-Chapman, Saville-Smith, Crane, & Wilson, 2005; Mackenbach & Howden-Chapman, 2002) for information on Dunedin specifically see (Shannon et al., 2003). The burden to home owners is twofold as the cost to

retrofit houses to an appropriate standard is substantial (Callau, Lloyd, & Bishop, 2006; Lloyd et al., 2008).

The types of heating options for New Zealand are also very diverse, with dwellings having either one, or many fixtures, such as log burners, gas fires, coal fires or central heating systems, as well as portable electric heaters (BRANZ, 2004). Air to air heat pumps have become very popular in recent years, which has brought about a substantial change in the way people heat their homes, by slowly shifting norms of heating single rooms with many different appliances to heating multiple areas with one device. Unfortunately, many of the advantages of heat pumps can be lost through lack of insulation resulting in poor thermal conservation in much of the housing stock.

New Zealand has committed itself to reducing carbon emissions and its reliance on fossil fuels (MoED, 2011). Part of the strategy by which to do that involves measures of energy efficiency. New Zealand is in a good position to reduce the emissions associated with electricity use, as it is only reliant on fossil fuels for around 20% of electricity consumption (MoED, 2015). Decreasing fossil fuel demand through the reduction of used and increase in efficiency in household energy consumption will require a detailed understanding of the drivers of domestic energy consumption, and the ways in which those drivers can be influenced.

2.2.2 Influences on energy related behaviour

According to the energy cultures framework the process of moving home would be considered a change in material culture (such as the physical dwelling and the technological fixtures within it). There is a broad body of literature that supports the notion that the material world can influence energy related behaviour (discussed later in section 2.6.2). At a general level, Geels (2002, 2004) uses the notion of socio-technical systems as a way of understanding the interconnectedness of social practices and meanings with the service provided by the material world.

Therefore, a socio-technical transition assumes that changes in material elements go hand in hand with changes to the social systems with which they are intertwined. Actor network theory also argues for a strong correlation between technology and behaviour (Latour, 2005), to the point where energy consuming technologies can shape and create new energy behaviours (Wilhite, 2008).

The way in which new technologies are embedded with energy related practices is also well established by theorists using theories of practice such as Shove (2003) and Wilhite, Shove, Lutzenhiser, and Kempton (2003). These authors have highlighted the importance of mundane everyday behaviours on overall energy consumption and how people can become locked into different practices through the technologies that they own (Maréchal, 2010; Shove, Chappells, & Lutzenhiser, 2009).Lead up to context change interventions through changing material culture.

Energy related behaviours also become reliant on certain configurations of material culture, especially when they have become habitual, or automatic. Wood, Witt and Tam (2005) have shown how habits can change when people are subjected to a new practice environment with a different material culture; psychologists call this context change (Verplanken et al., 2008).

2.3 CONTEXT CHANGE AND ENERGY USE INTERVENTIONS

Interest in interventions during context change has been increasing in recent years, at both the macro- and micro-levels (Bamberg, Rolle, & Weber, 2003; Maréchal, 2010; Schafer & Bamberg, 2008; Thaler, 2008; Verplanken et al., 2008). So far, the major focus of intervention during residential mobility has maintained the traditional information based approaches such as household efficiency rating schemes[2]. Household efficiency rating schemes assess the energy efficiency of a dwelling in order to give consumers a quantifiable comparison of the dwelling's energy consumption compared to others.

2 Studies involving efficiency rating schemes have often focused on how houses could be rated, and what the requirements would be. There has been little attention as to how well such schemes would actually work in a marketplace. There has been work in the UK and some states in the US. New Zealand's energy efficiency and conservation authority has looked into the idea but not implemented it nationally.

Burke (2006) showed that from a wider systemic level, the integration of new household efficiency information schemes are difficult to bring into the moving process and the householders' decision making process, where efficiency schemes become most effective. Purely information-based approaches are well known to have limited success influencing the process of consumer decision making (McChesney, Smith, Baines, & Taylor Baines & Associates, 2006; Pérez-Lombard, Ortiz, González, & Maestre, 2009), and little is known about how householders actually change their energy related behaviour in a house that has a higher efficiency rating.

For some time, policy makers have been aware of the difference between upstream and downstream interventions, and often argued that it is more effective and less costly to change a behaviour before it is actually manifested. Verplanken et al. (2008) took this idea one step further and argued that if an unwanted behaviour had already manifested, the most effective time to encourage a change would be during context change, i.e., when the behaviour or habit was already in a period of potential transformation. Some of the first studies to take this idea on board, which were highly successful, included interventions that encouraged uptake of public transport measures after people had moved (Bamberg, 2006; Thøgersen, 2009; S. Thompson et al., 2011; Verplanken et al., 2008).

There is ongoing research on how to create more energy efficient houses, from building materials through to heating and household appliances. However, the way consumers actually use energy using technologies, despite their improved efficiency remains extremely heterogeneous (Gram-Hanssen, 2010). Even with more efficient and passive solar houses, studies such as that conducted by Monahan and Powell (2011) have shown that this does not necessarily reduce overall energy consumption, nor change energy behaviour in the dwelling.

Other studies of new building complexes with integrated heating systems have given insight into how people respond to new environments (Bretzer & Thynell, 2013). Despite the efficiency designed into the building, householders often cannot understand how to use the

appliance, or they still use it in a way which is counterintuitive and less efficient (Engvall, Levin, Öfverholm, Lampa, & Wickman, 2013).

The most thorough research on environmentally conscientious behaviour and context change was done by the life stage project in Berlin (Schäfer et al., 2012). This project studied two different life stages: moving home and having a baby. Post transition qualitative interviews showed large variances in how householders used energy before and after moving, and provided some insight into the way everyday behaviour changed after residential mobility. During the transition, some interventions were trialled to increase the uptake of energy efficient behaviours after moving home, however there was less success than with the earlier studies which involved transport. The project shed some light on the complexities of involving householders during a mobility transition and showed that more research on the mobility process was necessary in order to provide more effective interventions during this context change.

One part of mobility which was not well covered in the Schäfer et al. (2012) study was householders' intentions before moving. Verplanken et al. (2008) argued that some people may already use a context change as an opportunity to change their behaviour to something more congruent with their personal goals, this suggests an opportunity to include the aspirations of householders in an investigation of residential mobility, and whether or not these aspirations were realised.

Little is known about how energy related behaviour changes in a household as it goes through a context change. Most studies thus far have not investigated householders longitudinally across the moving process, and few have given an indication of what behaviours and intentions were like before people moved. This lack of understanding, during a very complex sociotechnical transition, clearly leaves room for more investigation, considering the substantial gains that could be made if residential mobility, in the context of energy use, were better understood.

Moving home has been seen as an opportunity to influence energy related behaviours, because people are forced to rebuild habits and practices in a new environment with new configurations of material objects (Schäfer et al., 2012). Schäfer et al., (2012) found that moving home made some people more susceptible to interventions to encourage energy efficiency, than people who were going through other life stages such as pregnancy. The study also found that participants' energy use patterns changed very heterogeneously when moving, and that it was more difficult to change energy related behaviour during this time than previously anticipated. Understanding residential mobility is therefore paramount to making more improved changes to energy efficiency during context change. As there are many different elements involved in the process of residential mobility, these need to be understood before interventions can have any real effect.

2.4 MOVING HOME, THE STUDY OF RESIDENTIAL MOBILITY

Residential mobility is a culturally embedded phenomenon whereby households move from one dwelling to another to "adjust their housing to the housing needs that are generated by the shifts in family composition that accompany life-cycle changes" (Rossi, 1955, p. 10). Housing adjustments have also been found to involve other changes in circumstances such as changes in employment status, as well as moving along a housing career (Abramsson et al., 2000; Borgersen, 2013; Kendig, 1984; Pickles & Davies, 1991).

The literature on residential mobility consists of two dominant paradigms; one suggests householders are driven to find equilibrium in the relative utility of their house versus the rest of the relevant housing stock, and the second assumes that the decision to move arises from dissatisfaction with the characteristics of their home or neighbourhood (Clark, Deurloo, & Dieleman, 2006). Amongst these theories are literature streams that focus on the macro and meso level of the household, as a way to understand changes in mobility in various cultures as well as in decision making processes of householders (Dieleman, 2001). The macro level involves the wider societal or national level of households, and the meso level involves the individual household (and sometimes community, but not in the case of this research) (Reid, Sutton, & Hunter, 2010). A further driver of mobility involves the less clearly defined

characteristic ‘right time’ or ‘Kairos’ which involves householders’ responses to elements of crisis, opportunity or identity (Metcalfe, 2006, p. 255)

According to Winstanley, Thorns, and Perkins (2002), mobility literature has generally focused on life stages, economic models, effects of transient populations on communities and issues with analysing the mobility process. Mobility has often been studied at a macro level (Dieleman, Clark, & Deurloo, 2000; Dieleman & Mulder, 2001) by looking at population flow, but it has also been thoroughly investigated at the micro level by looking at the motivations of householders according to a changing life stages approach (Dieleman, 2001)[3]. Mobility literature has therefore focused more on understanding motivations for moving and the impacts of mobility, rather than on understanding how everyday behaviour may change from one house to the next, see reviews: (Clark & Dieleman, 1996; Dieleman, 2001; Dieleman & Mulder, 2001; Quigley & Weinberg, 1977)

Brown and Moore (1970), who developed a framework for residential mobility, proposed that householders were faced with three options when making a decision to seek a new residence. This included the option to 1) adjust their aspirations and not move, 2) adjust their current housing and not move, or 3) choose to relocate. Once a household has made the decision to relocate, they commonly undergo joint search procedures based on choice attributes in order to find a new dwelling (Molin, Oppewal, & Timmermans, 1996, 2002). Gärling and Friman (2001) present one of the few longitudinal studies of householder choice and satisfaction after moving into new dwellings[4]. They found that householders sometimes choose less preferable options based on contextual factors and available housing stock. Interestingly, householders would adopt positive attitudes of satisfaction after moving in, presumably in order to avoid both cognitive dissonance and having to repeat the moving process.

3 For wider studies of residential mobility (outside of the scope of this chapter) see (Eluru, Sener, Bhat, Pendyala, & Axhausen, 2008).

4 See also (Galster & Hesser, 1981; Landale & Guest, 1985; Lu, 1998; A. Speare, 1974) for earlier research into housing satisfaction or (Diaz-Serrano, 2006) for more recent work. Generally satisfaction research is used to help understand householders fit within a new neighborhood and to predict future potential moves, or to improve levels of dwelling quality (Vera-Toscano & Ateca-Amestoy, 2008).

The family lifecycle has been long recognised as a basis for modelling consumer activities (Lawson, 1988; Wells & Gubar, 1966). Lifecycle models have traditionally been used to understand residential mobility, as many adjustments to housing requirements can be linked to events such as starting a family or retiring (Kendig, 1984; Pickvance, 1973; Quigley & Weinberg, 1977; A. Speare, Jr. , 1970; Stapleton, 1980).

It is clear that moving home can be associated with different life stages, and lifecycle models can help understand such patterns, but they have also been criticised for their oversimplification of the factors which drive residential mobility. Other problems with lifecycle models are their temporality, as they do not adjust well across cultures or to changing norms of populations, such as the rise in single parent households (Winstanley et al., 2002).

There is a high correlation between the size and tenure of a dwelling and the rate of residential mobility. Households typically experience 'room stress' as the number of people in a household increases (Dieleman, 2001). The level of tenure has also been found to be highly important in mobility, with people in rental situations having a much higher rate of residential mobility than homeowners (Winstanley et al., 2002).

Residential mobility involves a broad range of social, geographical and political factors which determine the rate of mobility as well as the cultural implications of the moving process (Dieleman, 2001). Roseman (1971) describes that residents typically undergo one of two types of displacement when relocating. The first is partial displacement, which typically involves moving within city boundaries, and therefore causes little disruption to the social and institutional networks of the householders. The second Roseman (1971) describes as full displacement, which involves moving to a geographical area which breaks the social and institutional ties that the householders had. Before reflecting on the implications of residential mobility on energy related behaviour, residential mobility will now be discussed within the New Zealand context.

2.4.1 Home ownership and mobility in New Zealand

In New Zealand households, ownership is the dominant tenure which "reflect[s] the intersection of strong socio-cultural preferences, favourable policy conditions and a widely held belief in the wealth creation potential of homeownership*"* (Levy, Murphy, & Lee, 2008, p. 272). Home ownership is also many New Zealander's main investment, and housing accounts for 75% of householders' assets on average (Murphy, 2007). This means that mobility decisions, for many New Zealanders, are also significant financial investment decisions.

As houses are a main asset, many New Zealanders' seek to increase their capital by moving home and purchasing a larger or more expensive property. This process is recognised as a 'housing career', whereby householders improve their standard of living as a part of the mobility process (Borgersen, 2013; Sovacool, 2011; van der Kroon, Brouwer, & van Beukering, 2013; Winstanley et al., 2002). Housing careers have also been aligned to socially constructed 'housing ladders', whereby a householder's equity increases with each level of investment (Borgersen, 2013).

Patterns of mobility differ across cultures and nations, and compared to other western nations, residential mobility is very high in New Zealand and Australia (Long, 1992). In New Zealand, households move on average seven times during their lifetime (Statistics New Zealand, 2006), the highest average of lifetime moves in OCED countries (Long, 1992).

The process of moving home usually involves much more than financial decisions, as moving home is associated with changes in life stage, relationships and tenure (Clark & Dieleman, 1996; Dieleman, 2001). As mobility often affects many people in a household, decisions are usually made at a group level, based on emotional and economic factors (Levy et al., 2008; Munro, 1995). Householder decisions usually undergo a 'muddling through' process (Park, 1982) where householders seek outcomes which cause the least resistance for the household as a whole.

Mobility literature has mainly focused on householder motivations and purchase decision making processes, with little focus on the actual process of establishing new or old routines in a new dwelling or the intricacies of changes in family life (Winstanley et al., 2002). Some literature has looked at householder satisfaction (Gärling & Friman, 2001), but this has provided a limited understanding of the implications of how energy use may change through the process of residential mobility.

As householders go through the moving process, many elements will directly and indirectly affect how they will use energy in the new home. Whether householders seek a different lifestyle, or whether they are forced to move because of particular circumstances, the decisions they make during their household search, through to how they establish life in their new dwelling, can have an effect on how they behave, and subsequently on how they use energy.

2.4.2 Housing careers and economic rationality

There are consistent correlations between a person or household and what is considered their housing career and events in other parts of life courses, such as the start of a new relationship or getting a new job (Kendig, 1984; Mulder & Hooimeijer, 1999; Pickvance, 1973; Quigley & Weinberg, 1977; A. Speare, Jr. , 1970; Stapleton, 1980).

Economic theories of behaviour have traditionally had a strong standing in mobility literature (Winstanley et al., 2002). Householders have been modelled as rational actors. Such actors make informed planned decisions using careful selection processes. They involve information searches and the weighing of attributes (Clark, 1982; McLeod & Ellis, 1982). As with other economic decisions such as choice of job career, there exists the expectation that householders are driven by economic gain through home purchasing (Clark & Moore, 1982). Consequently, householders have been found to make strategic investment decisions regarding their dwellings as they move along their housing career (Borgersen, 2013; Sovacool, 2011; van der Kroon, Brouwer, & van Beukering, 2013; Winstanley et al., 2002).

The notion of housing careers follows the same line of thinking as employment careers, where researchers have observed that householders increase their wealth as they move across housing stock (Kendig, 1984). Householders who move along a housing career generally try to move in an upwards direction as improved quality of houses become more attainable. This trajectory has been referred to as the housing ladder (Borgersen, 2013). Borgersen (2013) suggested four steps of the housing ladder which starts with households upgrading from rental situations, moving to starter homes, intermediary homes and then finally, family homes. As householders move up the housing ladder, it is implied that housing services and the quality of life within each subsequent dwelling also improve (Abramsson et al., 2000; Pickles & Davies, 1991).

With the improvement to dwelling characteristics and energy services, there is the opportunity for cleaner, more efficient forms of energy consumption (Sovacool, 2011). Sovacool (2011) observed how household cultures in lower income-strata move from kerosene or wood fired stoves through to electrical induction cookers as householder wealth increases. Sovacool (2011) also noted that with greater wealth came an increase in energy consuming services (such as computers, televisions and other home entertainment options). As householders move up the housing ladder, Sovacool (2011) argued that householders increase their use of energy services, but that as the more fundamental needs have been met, their focus shifts incrimentally from the number of services to the quality of their energy services. For example, once a household has shelter, warmth and cooking facilities, the household may wish to find a more comfortable type of warmth such as moving from a simple wood fire for cooking to an easier gas or electrical oven. Although the volume or number of energy *services* purchased can plateau at a certain demographic threshold, the intensity by which householders then keep on consuming those services can still increase as they move on to more luxurious items such as from a bath to a spa pool.

Residential mobility, however, not only involves changes in the lifecycle and movement through housing careers, but it can portend the potential improvement of energy services and housing quality, as householders use mobility as stepping stones to higher aims for the individual or family. As Abramsson et al. (2000, p. 2) noted, the housing career "implies a progress in standards and quality of housing which is often also a normative public goal". In

this way, housing careers are subject to cultural differences, and the parameters by which they function are socially constructed phenomena of which has attributed a type of materialistic consumerism, particularly in western society.

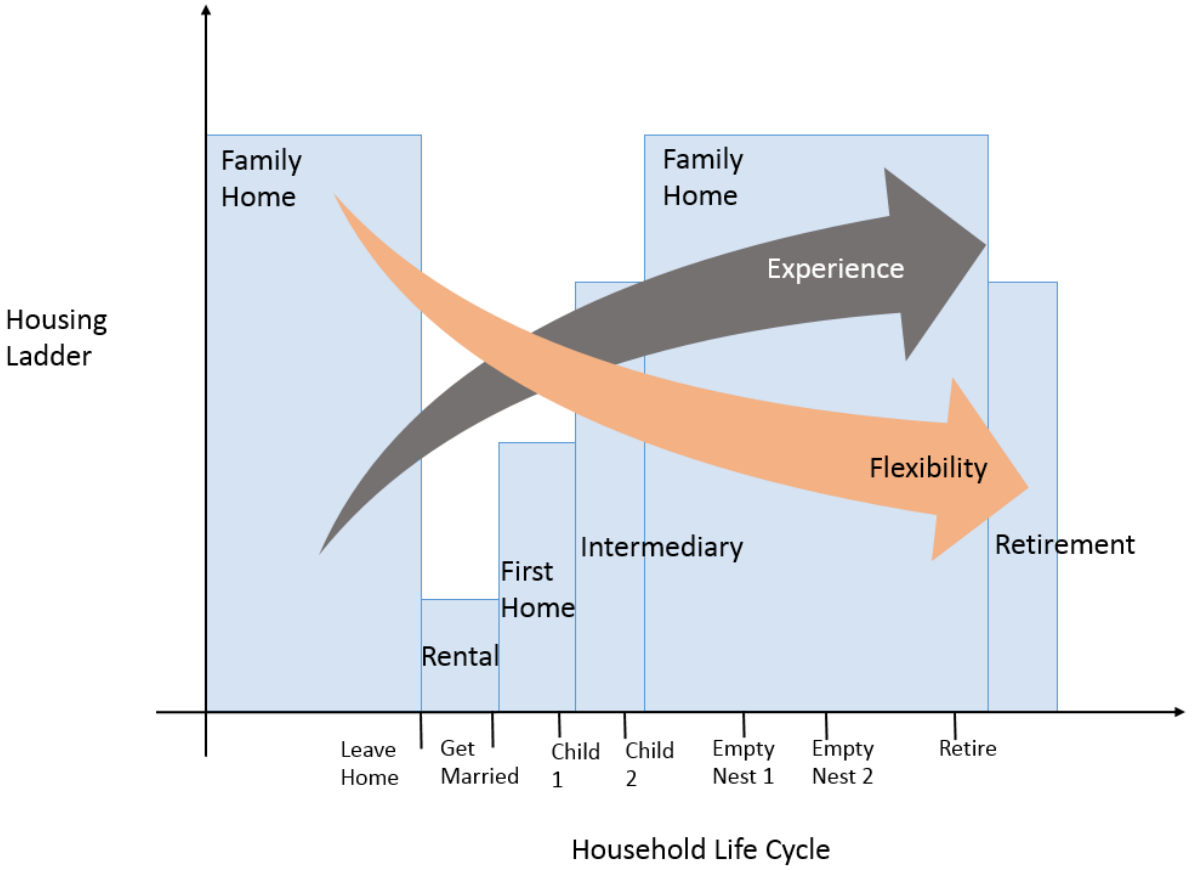


Figure 2: Overview of housing ladder and the family lifecycle concepts

Figure 2 presents a simplified overview of how a householder may move up the housing ladder as they progress along the household lifecycle. Although households do not necessarily follow these stages, they still try to improve their housing stock as they move through their housing career, but may experience changes in relationships or income which shift a householder up and down the ladder over time.

The upward arrow in Figure 2 indicates how householder experience increases through time, and that their knowledge of housing as well as how to live and be comfortable in a dwelling increases. The decreasing arrow indicates that through the improvement of housing stock and

householder comfort levels, householders find it difficult to go back down the housing ladder which makes them less flexible about living with inferior housing alternatives.

Housing careers and the household lifecycle provide a good starting point for understanding the different adjustments householders make when moving home and how these might impact their energy related behaviour. As householders have a family and make housing adjustments to improve their quality of life, their norms of increased comfort and their knowledge of how to achieve it make it difficult to reverse their housing situation. In Germany, for example, retired households use the most energy in their dwelling as they have reached the top of their personal housing ladder and have found their ideal level of comfort, and are home to enjoy it more (Deutsch & Timpe, 2013).

2.4.3 Changing dwellings and creating home

Housing markets differ according to the availability of housing options, and each household has situational characteristics and time pressures, which force some households to choose less favourable housing options when relocating (Goetgeluk, 1997; Hooimeijer & Oskamp, 1999). There is some evidence that householders sometimes prefer to adjust the price they are prepared to pay for housing than have to forgo housing preferences (Dieleman, 2001). However, the preferences of householders under different housing market circumstances have been found to be geographically and culturally defined (Clark & Mulder, 2000; Lee & Collins, 2000; Lu, 1998).

The act of changing household energy use has been discussed through the process of creating home by Aune (2007). Aune (2007) describes the home as not only an ‘arena for activities’, but as an ongoing project whereby householders renovate and develop the house into a ‘haven’. Residential mobility is also closely tied to the process of creating home, to ideas of security, family and identity (Winstanley et al., 2002).

The embodied energy use represented by dwellings, and their future energy costs are rarely considered by householders when building single family houses (Palm, 2013) and they rarely

consider energy related elements of dwellings when searching for new homes (Burke, 2006), instead focusing more on the aesthetic elements (Mullens, Hastak, & Syal, 2004). The variation between the energy using potential of different houses can be large, making residential mobility potentially responsible for massive shifts in energy consumption if home performance was given more consideration at this time.

In some cultures and social levels, the act of renovating and creating a home is never finished (Wilhite & Lutzenhiser, 1999). The importance of a family's input for readjusting a dwelling to fit their identity was exemplified through a social process whereby Norwegians keep money aside with the specific purpose of adjusting a new house to fit their tastes when they move into it. The literature therefore suggests that energy fixtures change both meaning and features across cultural and situational boundaries, not only as expressions of lifestyle but also as expressions of home and identity.

The cultural associations with energy related consumption create important distinctions to how differently people use energy in their homes. A classic study by Wilhite et al., (1996) compared Japanese and Norwegan norms associated with domestic energy consumption to highlight how differences in common practices such as lighting, bathing and heating were heavily influenced by culture. For example, lighting was found to be important part of home presentation in Norwegan households, and multiple 'warmer' incondecent lights were commonly placed throughout the home creating a high demand for lighting. In Japan little importance was was attributed to lighting, and houses would more commonly have whiter, more efficient florescent lights.

As households move and create home, they are not only locked in by the types of materials they have in their environment but also by the cultural importance associated with the use of those materials. New Zealand will now be discussed according to the ways in which householders 'create home through' renovations and changing their material cultures.

With the high rate of residential mobility, owner occupier dwellings, and housing renovations in New Zealand (Murphy, 2007), there is a strong case for a thorough understanding of how these elements influence domestic energy consumption. The next section therefore investigates how energy related technologies change during residential mobility by focusing on the types of decision strategies householders used to acquire and use new energy related technologies.

2.4.4 Housing retrofits and improving housing stock

With the large variation in housing stock and the high rate of owner-occupation, it is common for householders to make adjustments to their dwelling over time. Specific elements of renovation are also culturally embedded in New Zealand culture. There exists a strong 'do it yourself' culture (Winstanley et al., 2002), whereby housing renovations are often done unprofessionally and to varying standards. On the other hand, it is uncommon in New Zealand for householders in rental positions to make any adjustments to a dwelling at all, as is often found in central European situations where rental rather than owning is more common. This would make the act of a renter choosing an appropriate dwelling much more important than for householders who are in an ownership position.

Housing retrofits (e.g., adding stone-wool insulation batts, double-glazing etc.) are gaining significant attention in the energy efficiency literature, as they have great potential for reducing carbon emissions and overall energy demand (Friege & Chappin, 2014). Despite the potential long term savings for homeowners through lower energy consumption, retrofits are still not implemented to a desirable scale in many developed nations (Friege & Chappin, 2014). As mentioned in the previous section, many New Zealand houses also require substantial insulation retrofits.

In efforts to stimulate renovations which improve energy efficiency, it has been found that householders are motivated to renovate when there is a disconnect between how they want to live, and their current housing situation (Wilson, Crane, & Chryssochoidis, 2013). The decision processes around energy related renovations are being increasingly scrutinised

(Friege & Chappin, 2014), what is currently missing is an understanding of when such decisions lead, or are part of the residential mobility process.

Other research has referred to the social, environmental and economic elements of energy related retrofits (Organ, Proverbs, & Squires, 2013), but it has somehow missed the wider concepts around norms of comfort which have been well established (Shove, 2003). The creation of 'home' is an ongoing process which can include both aesthetic and comfort driven renovations (Aune, 2007) and there is some evidence of a link between motivations and decision processes affecting housing retrofits and residential mobility, however, this line of enquiry is as yet unexplored in the context of domestic energy use.

2.4.5 Changing ideas of comfort, implications for culturally defined housing careers

Traditional economic approaches to understanding mobility have shed insight into householder investment strategies along the culturally defined housing ladder. Early study's such as Kendig (1984), followed more rational economic models by using social facets involved in the mobility process. These showed the varying conditions of mobility by examining the interrelationships between the family lifecycle, housing careers and levels of tenure (such as renting or owning with or without a mortgage).

Decisions around household mobility have long been understood to be an integrative process between household members and other social structures (Levy, Murphy, & Lee, 2008; Park, 1982). Early modelling of household energy consumption used similar parameters to understand the influence of changing elements of mobility (Fritzsche, 1981). Although the variables that influence household energy consumption are complex (Lutzenhiser, 1993), many of the frameworks previously used to understand householders' decisions regarding energy consumption have been criticised for focusing too much on the individual (Wilhite et al., 2000).

With Burke (2006) identifying that householders rarely consider energy related elements of

dwellings when purchasing new homes, and Aune (2007) showing how ideas around the creation of 'home' have inadvertent implications on energy use regardless of whether these are consciously thought about by home owners.

Following the literature presented, it suggests that as New Zealanders' norms of comfort change, so too will their expectations around what is required in a new dwelling. Although Burke's 2006 finding showed how energy related elements of housing choice seldom came into householders' minds in America at the time, the ongoing public information campaigns by government agencies in New Zealand show that attitudes towards housing energy efficiency in New Zealand are changing. This has potential impacts on the future improvements of housing stock in New Zealand, if householders are considering energy related elements where as previously they had not. This chapter therefore looks at the overall process of moving and choice criteria to find out where energy related decisions come into the decision making process. As residential decisions however are seldom made at an individual level, this chapter will firstly review literature on group decision making with relevance to residential mobility.

Insulation retrofits significantly improved householders health in New Zealand (Barnard et al., 2011). With the government insulation scheme, a significant number of houses were retrofitted with insulation. Research on the norms of new zealanders regarding insulation still needs to address how much of an impact this has had on attitudes towards insulation.

2.5 DECISION MAKING AND RESIDENTIAL MOBILITY

Decision making literature has been dominated by the theory of planned behaviour which has two social elements in it, namely social norms and efficacy (Ajzen, 1991; Tversky & Kahneman, 1981). Such models have also influenced much of the household energy literature (Wilson & Dowlatabadi, 2007), often glossing over the interactions and influences that householders have on each other in the decision making process.

Decision making has been studied as a linear process involving several stages (Davis, 1976; Engel, Blackwell, & Kollat, 1978; Olshavsky & Granbois, 1979; Solomon, 1999). Although the number of stages has been contested, most studies include problem recognition, information search, alternative evaluation, final choice and post purchase evaluation (Solomon, 1999). Decision making stages can differ in the order in which they are conducted, the length of time they take, and who is involved in the process. It is often thought of as a constructive process, whereby consumers use a raft of different strategies and heuristics based on previous experience and contextual circumstances (Bettman, Luce, & Payne, 1998).

In the residential mobility literature, it has been well established that decisions are rarely made at an individual level and often involve interactions in a wider social context (Brown & Moore, 1970; Levy & Lee, 2004; Levy et al., 2008). Moving home, and the procedure involved in choosing a home, are seen as a 'muddling through' process by which householders use a variety of heuristics and assumptions about other householders' preferences in an effort to reduce conflict, sometimes settling on what might be considered less favourable options (Park, 1982). When householders make decisions together, they have been found to take on different roles in order to guide the decision process and to break up responsibilities (Assael, 1987; Cunningham & Green, 1974; Davis & Rigaux, 1974; Engel et al., 1978; Sharp & Mott, 1956; Wolfe, 1959; Wolgast, 1958).

The roles of decision makers and their strategies depend on how householders exert their influence on each other during the decision making process (Christina & Sharon, 2002; Corfman & Lehmann, 1987; Ferber & Lee, 1974; Filiatrault & Ritchie, 1980; Kim & Lee,

1996; Kirchler, 1990; Levy & Lee, 2004; Levy et al., 2008; E. S. Thomson, Laing, & McKee, 2007). The next section will discuss these roles and influences separately in the context of decision making, before describing how they are instrumental in the development of householder norms.

2.5.1 Householder roles

Studies of householder roles in decision making have generally focused on who is actually responsible for various parts of the decision making process, such as who chooses the type of dwelling and who makes the final purchase (Commuri & Gentry, 2000). An early study into household purchasing behaviour introduced the importance of the role of the 'family financial officer' - the person responsible for the economic decisions of the household (Ferber & Lee, 1974).

Gender is a common determinant of householder roles (Rosen & Granbois, 1983). Earlier studies into gender roles and home purchasing found husbands to have more influence on the economic aspects of a decision, whereas women were more involved with decisions around the aesthetic elements (Assael, 1987; Davis, 1971; Davis & Rigaux, 1974; Woodside & Motes, 1979). However, simple gender classifications have been criticised for neglecting the changing nature of decision making roles, which may be more related to householder influence and social power structure (Davis, 1970).

2.5.2 Householder influence

Qualls (1988, p. 443) defines influence on household purchase as the "perception of the action taken by one spouse to obtain his or her most preferred decision outcome while simultaneously stopping the attainment of their spouses' most preferred outcomes". Householder roles in group decision making has often considered occupants to be interacting in a competitive environment, rather than a cooperative one (Davis, 1976; Kim & Lee, 1996; Kirchler, 1990; Qualls, 1988; Su, Zhou, Zhou, & Li, 2008).

As with the findings of Park (1982) and Commuri and Gentry (2000), householders who live together usually adopt strategies to avoid conflict. It is rare for householders to adopt a purely rational, self-driven economic processes to get their own way in a household context. A joint decision involves a combination of individual preferences of multiple family members (Sheth, 1972). Researchers have used different terminology to classify the different types of decision strategies used to influence the decision-making process (Davis, 1976; Qualls & Jaffe, 1992; Sheth, 1974; Spiro, 1983). The following sets out the different strategies used to influence a family decision (Lee & Collins, 2000).

The use of influence strategies with which householders gain traction in group decision making has been well established (Kirchler, 1990; Palan & Wilkes, 1997; Spiro, 1983). Levy and Lee (2004) proposed a framework that amalgamated different elements of the household purchasing process based on householder influence. The framework helped establish how influence mediated the social context of a household, which in turn guided the different roles of householders in the decision making process. The Levy and Lee (2004) framework showed how decision making roles and influence strategies can vary across cultures and social classes, and can also be influenced by family structure, such as whether or not a family had children.

Kim and Lee (1996) established a sound taxonomy of the influence that strategies used by couples have, which included bargaining, reasoning and the use of authority. Assael's (1987) six roles (see Levy & Lee, 2004) have been used to model the process of home purchasing (Lee & Collins, 2000; Levy & Lee, 2004). Kim and Lee (1996) were able to group the different influence strategies used by participants into four decision making typologies: wife driven, light influencing, dogmatic couples and compromising.

Figure 3 below is designed to represent the different levels of influence of householders on each other in a household context. Reflecting on research discussed above, the concepts relating to householder relationships have been nested to represent the relative power on energy related decisions.

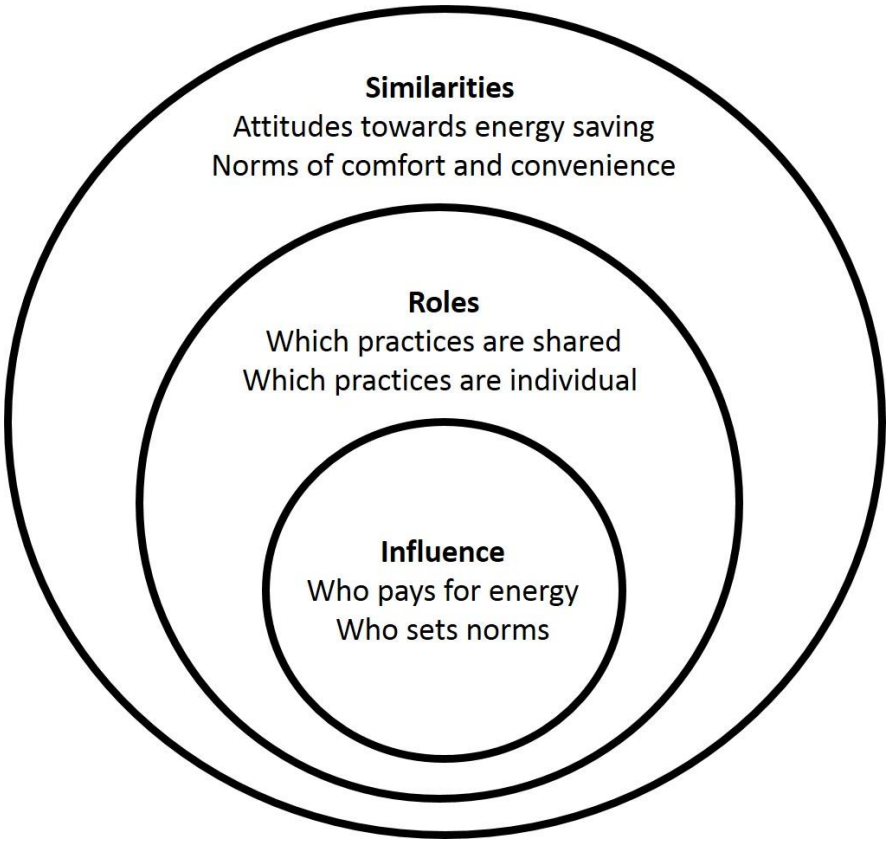


Figure 3: Factors affecting energy related behaviours within a social context

At the heart of is the influence structure of different householders on each other, based on who pays for energy and who has the ability to set a mandate for energy related rules. In the middle are the different roles played by household members, and whether or not practices are shared or individual. On the outside lie the similarities between householders' attitudes around energy use, and whether there are discrepancies between household members concerning saving energy. These three factors will now be discussed in relation to current research on household energy related behaviour.

2.6 DECISION MAKING AND HOUSEHOLD NORMS—SOCIAL INFLUENCES ON ENERGY BEHAVIOUR

Householder norms, although well understood within the macro level of practice (Shove, 2003; Shove, Chappells, et al., 2009; Shove, Trentmann, et al., 2009; Shove & Warde, 2002), have had little attention at the meso level, with most discussions centering on interpersonal communication and influencing children (Grønhøj, 2006; Grønhøj & Thøgersen, 2009) and overlooking the importance of understanding the household as a unit (Reid et al., 2010). Understanding householders' influence on each other is important not only when deciding which appliance to purchase, but also during the more subtle process of creating a norm around the use of that appliance.

Household norms are "informal rules that households adopt to regulate and regularize household member behaviour" (Feldman, 1984, p. 47). Norms reflect the social side of energy related behaviour, and are held within an individual consumer's mind, but are then shared with other householders to help guide consumption (Grønhøj & Thøgersen, 2012)

Only recently have consumer studies focused on the development of norms involving energy use in the household (Grønhøj, 2006). Section 2.9.3 shows how energy related norms are established by the social context of a household, but are still framed by the external material culture of the dwelling. With a research focus of households as being competitive in nature, some studies have looked at householder conflict. Kirchler (2001), however, showed that most households have periods free of prolonged or frequent conflicts, and, on average, economic discussions resulted in conflicts only 3.6% of the time.

If explicit decision making does not arise through the process of conflict, then other factors, such as householder role structure and influence are more important in the setting of householder norms (Grønhøj, 2006). The following section will discuss how these two concepts interrelate within a social context, to provide different levels of householder autonomy influencing preference based patterns of behaviour.

Consumer socialisation studies have generally focused on the transactions of knowledge and influence from parents to children in a household (Grønhøj, 2006; John, 1999; E. Thomson, 2004). This influence has included the use of electricity in the home (Aguirre-Bielschowsky, 2013; Grønhøj & Thøgersen, 2009, 2012). The theory of transactional family dynamics (Schermerhorn & Cummings, 2008) provides a platform for understanding a household structure that is based on roles and influence.

As households are not in a constant state of explicit conflict, norms are established and maintained through less forceful means of influence (Kleinschafer & Morrison, 2014). It has been noted that the more peaceful influence-strategies may be even more effective in gaining autonomy over household normative processes (Raven, 1965; Szinovacz, 1987).

Recent studies have found that some households with children apply explicit rules for the use of energy (Kleinschafer & Morrison, 2014), partially to teach and enforce the parents' ideals/practices on children (Grønhøj & Thøgersen, 2009). However it has also been shown that what parents think they are teaching their children about energy saving and what children actually understand can be very different (Aguirre-Bielschowsky, 2013). It is also likely, however, that parents desire to save money as well and hence teach their children suitable habits. Other ways that energy related norms have found to be established have been through the use of householder roles and critical incidents.

The roles which householders play in decision making bear a resemblance to the different roles that members of the householders have in other daily tasks (Ericksen, Yancey, & Ericksen, 1979)**.** The division of labour amongst householders and household activities - such as the payment of bills (Fischer, Rupert, & Wartick, 2014) ties into the roles that householders have over certain decisions, for example the person responsible for washing clothes may also be responsible for acquiring the laundry detergent and deciding when to do the washing.

The specialisation of consumption roles around the use of particular technologies in the household has also been observed (Kleinschafer & Morrison, 2014). Another recently noted

important role of householder influence is the ‘efficiency champion’ (Kleinschafer & Morrison, 2014); the person who cares more, and as such, becomes responsible for setting the energy saving measures in the household. Grønhøj (2006) found that discussions around energy use often depended on the similarities between householder members’ opinions and attitudes of energy consumption. If householders agreed on a norm around energy conservation, it was more likely to be discussed and followed through. However, when one householder cared more about a topic than others, they often found it difficult to discuss their opinions and bring others around to see things their way.

2.6.1 Life disruptions—critical incidents

As previously discussed, there has been extensive literature supporting the notion that life disruptions (context changes) can influence household behaviours as they disrupt habit (Thompson et al., 2011), however they have failed to adequately acknowledge the interactions between householders. Literature which has addressed the interactions between householders has usually involved the study of roles and influence, and the use of household (Kleinschafer & Morrison, 2014). Unfortunately studies on consumer socialisation still lack understandings of how normative processes change during life disruptions and critical incidents (Commuri & Gentry, 2000; Gentry, Kennedy, Paul, & Hill, 1995).

An early study into changing household roles and norms by Iii (1975), found different priorities and strategies were used by households as they moved along the household lifecycle. Sillars and Kalbflesch (1989) found that householder arguments or discussions usually surfaced only when there was a mismatch of expectations. If consumers were ‘happy’ with the outcomes of decisions, they were less likely to be aware of their decision making processes. Gentry et al. (1995) argued that households that undergo a life disruption may be more likely to have been explicit about their decision making processes.

Commuri and Gentry (2000) argued that research on disruption in consumption through a life event could bring about important insights into the establishment of consumer behaviours within the home. Life events have been found to change the patterns of householder

behaviour by disruption of the household structure, their roles, and different householders' influence on each other (Fellerman & Debevec, 1993; Gentry et al., 1995).

The disruption or adjustment to energy related norms has already been found to be established during critical incidents, such as getting an especially high power bill (Kleinschafer & Morrison, 2014). The chapter so far has established that the changes to energy related norms after residential mobility are still under-researched as there has been little research involving householder norms during the residential mobility process.

2.6.2 Understanding context change on householder individual and social norms

There are large social and individual changes that occur which impact energy use during residential mobility, but the current focus is on the influence of the changes in the material world on behaviour only. As suggested by practice theory (Shove, 2003) and performance theory (Thrift & Dewsbury, 2000), the material world has a large influence on how people use energy, as well as the types of choices they make around energy using technologies.

There has been some research done around the disruptions around the use of computing technologies (Dimond, Poole, & Yardi, 2010; Mark & Semaan, 2008; Massimi, Dimond, & Dantec, 2012), however the focus has usually been on householders who are moving to new cities, and there has been little attention on interactions between householders and larger energy using technologies such as heating and cooling appliances.

Following the systems perspective (Geels, 2004), changes to one element within the dwelling will cause changes to the other. Moving home creates a change in the material structure of a dwelling, potentially influencing the other fixtures and appliances within the new dwelling (See below).

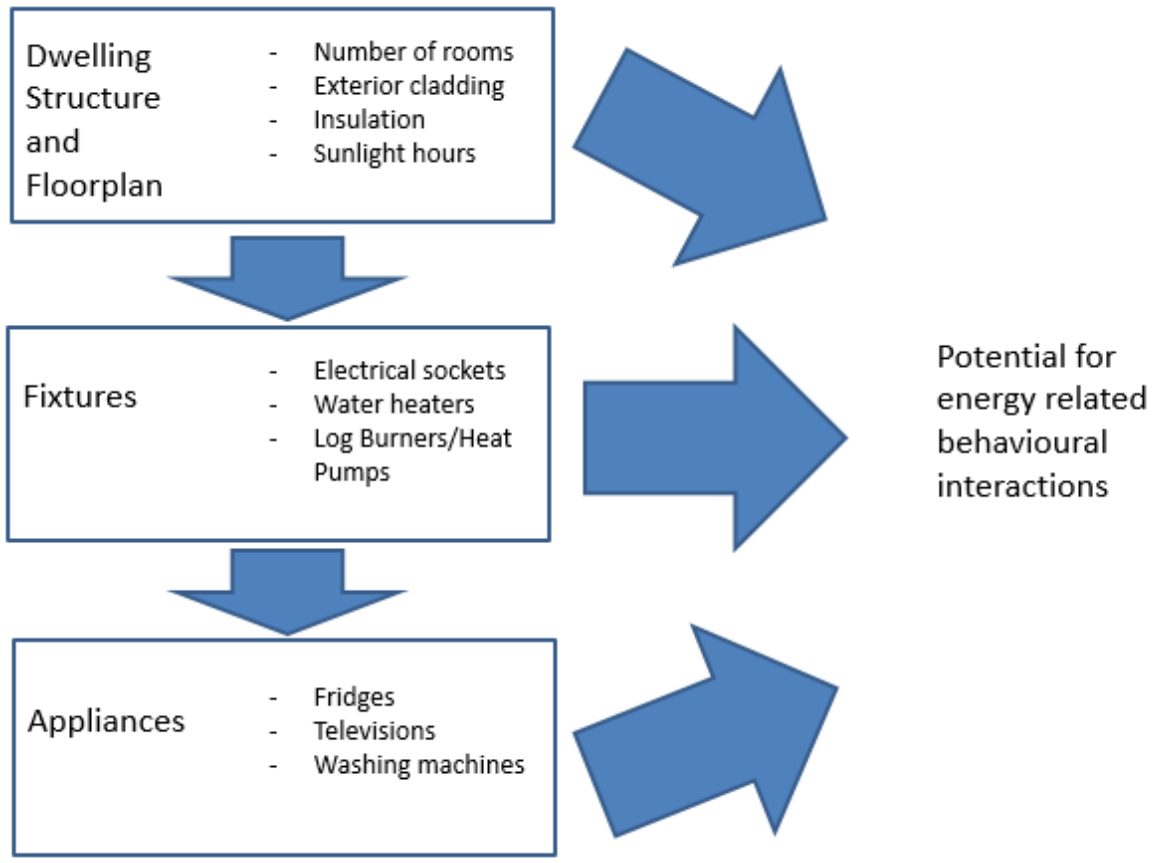


Figure 4: A household material culture, following from conceptual framework in Chapter 2

Building on the literature relating to the influence of the material world on energy related behaviour presented earlier (Stephenson et, al., 2009), the figure above breaks down the various elements of a household's material culture to show that each element can have different implications for energy related behaviour. When people move home, some elements of their material culture may change dramatically (such as the dwellings structure), whereas some may stay exactly the same (for example those appliances which householders decide to take with them).

Earlier, section 2.4 showed how householders had different levels of flexibility around their choice of material culture depending on householder tenure. Those who were in rental situation were less likely to make changes to a building's structure or fixtures after moving in. In a similar way, the more 'fixed' elements of a dwelling can have a different kind of influence on energy related behaviours than those appliances which can be moved or changed more easily. Once a household has chosen a dwelling to move into, the parameters of how energy can be used have already been set to a large degree. The size of the new dwelling, position of electrical sockets and types of heating fixtures may all be set, leaving the householders to adjust and structure their appliances and rituals around them.

Wilhite (2008) argues that the agency of the material world rather than social practices is much stronger at shaping individual behaviours, because material technologies physically frame how people interact with them. In a similar way, dwellings are agentive in framing the types of appliances and fixtures that can be used in them, through such things as insulation properties and angle to the sun (Wilhite, 2008). Although individuals have autonomy over energy related decisions, the material culture by which those decisions and behaviours are practiced are highly interdependent with the technologies that they involve. As residential mobility involves changing and moving energy related technologies into a new dwelling, householders have a chance to reorganise their material world (Gregson, Metcalfe, & Crewe, 2007; Shklovski & Mainwaring, 2005), and therefore a chance to reorganise how they use energy on a daily basis.

Finally, those appliances which householders decide to take with them into a new dwelling can either be placed in a position to be used, or in storage. Some appliances may be used or not used according to the householders' preferences, but these could also be set and mandated by the new dwelling itself: for example there might not be enough space for the appliance, or the right type of energy fittings. Therefore there is a difference between householders' actively used appliances, and those which are in storage, with the potential for later energy consumption.

The previous sections have also reviewed literature which establishes the importance of the individual and social contexts that frame energy related behaviour. What has not been covered yet in the individual context involves the presence of habit, which will now be discussed.

2.6.2.1 The individual context

Section 2.4 groups the influences upon the individual within the psychological and sociological literature, encompassing an individual's life stage, experience, preferences and autonomy. Residential mobility is strongly linked to the household lifecycle and significant life stages (Dieleman, 2001; Kendig, 1984; A. Speare, Jr. , 1970). As householders move along the lifecycle, so do their needs and consumption practices (Gourinchas & Parker, 2002; Lawson, 1988; McLeod & Ellis, 1982). Early on, Fritzsche (1981) noted that because many household consumption practices involve energy use in one way or another, energy demand could also be attributed to the lifecycle.

Energy related behaviour can involve individual automatic habits which are contextually dependent (Marechal, 2008; Maréchal, 2010; Neal et al., 2006; Wood et al., 2005). Habits strengthen over time, making them harder to change. As energy related habits involve behaviours that try to align with individual attitudes and aspirations (Barr & Gilg, 2007; de Groot & Steg, 2010; Faiers et al., 2007; Wouter Poortinga et al., 2004) material environments can be agentive for 'locking in' energy related behaviours (Geels & Schot, 2007; Maréchal, 2010).

The individual context also involves the feeling states (such as being warm and feeling comfortable) associated with using technologies in the home, such as heaters (Pink, 2004). Embodied knowledge is an individual's knowledge associated with material environments, that involves sensory elements that are more difficult to verbalise (Ignatow, 2007). As householders gain experience of how to make themselves comfortable and what routines they consider convenient (Shove, 2003), such knowledge and individual preferences are not only expressed through individual attitudes and intentions, but also through more sub-conscious preferences for feeling states (Pink & Leder Mackley, 2012).

Through the context dependency of habits, the material environment can be agentive in aiding or counteracting energy behaviours, and overriding individual autonomy over individual behaviours and decisions (Wilhite, 2008; Wood & Neal, 2007). In such a way, material environments can enable energy saving behaviours, or hinder them by framing the types of behaviours that householders can do.

2.6.2.2 The social context

Most dwellings in New Zealand are occupied by two or more occupants (Statistics New Zealand, 2011). This means that most energy related behaviour occurs within the social context of the household (Grønhøj, 2006), and that more than one person may influence or be influenced through the use of a particular energy using technology. Even if dwellings are a single occupancy, most will still experience visitors which will have expectations derived from social norms. In this way, householder practice is not only influenced by a particular technology, but through their interactions with the technology and each other householders influence each other (Grønhøj & Thøgersen, 2012). Three areas where the social context has been previously researched are in practice theory, household purchase decisions, and the relationship between parents and children in setting energy related norms.

Practice theory has become an integral part of understanding energy demand in households (Lutzenhiser, 1993; Shove, 2004; Spaargaren, 2011). Social practices surrounding energy related technologies and fixtures help to understand cultural differences in how energy is used (Wilhite, Nakagami, Masuda, Yamaga, & Haneda, 1996). However, householder interactions at the meso level are less understood (Kleinschafer & Morrison, 2014; Reid et al., 2010). The interactions between householders have been found to help maintain and establish household norms around the use of energy (Grønhøj, 2006; Grønhøj & Thøgersen, 2009, 2012; Kleinschafer & Morrison, 2014), showing the importance of the social context at a meso level as well.

Household purchase decisions (both in choosing a dwelling and making dwelling investments) have been characterised as a muddling through approach whereby multiple members use a raft of different strategies, usually with the aim of reducing conflict (Park, 1982). Although there is a relatively large body of literature on household decision making, there is much less on how householders actually decide how devices should be used and who should be responsible for determining their use (Kleinschafer & Morrison, 2014).

As energy related technologies become more efficient, and as individuals find more ways to save energy, there has been some concern that consumers would use the extra time or money to use even more energy services (Berkhout, Muskens, & Velthuijsen, 2000). Rebound is a concept attached to energy related behaviours which can sometimes have counterintuitive reactions that are contrary to a desired energy related intervention.

Grønhøj & Thøgersen (2012) provide some insight into how parents steer their children's energy consumption patterns through mediation and creating pro-environmental attitudes and values. However, there is still little understanding of how householders use energy related technologies in order to influence other householders or how new technologies set norms at a household level.

The remainder of this chapter will outline the residential mobility process from the decision to move, to the establishment of new routines in a new dwelling and will further clarify what householders are going through, how these processes might be categorised, and what may be the most appropriate strategy for intervention within the dynamic interaction of these categories. So far few integrating models have captured householder behaviour from the search phase to settling in processes, the chapter therefore tries to amalgamate understandings from relevant mobility sources. Merging the concepts of mobility with those used in the energy behaviour literature enables one to draw a more in depth understanding of the implications of residential mobility on energy related behaviour.

2.7 AMALGAMATING FRAMEWORKS

So far the chapter has presented relevant themes associated with energy related behaviour such as material culture, norms, practices. It has shown how the themes of residential mobility such as group decision making and life stages and housing careers now need to be amalgamated to understand the dynamics of context change on energy related behaviour.

As many authors of amalgamating frameworks on energy related behaviour argue, there are social, material and individual elements which shape household energy related behaviour (Keirstead, 2006; Stephenson et al., 2010; Wilson & Dowlatabadi, 2007)[5]. Intervention literature has shown that stimulating change is more successful when multiple elements of the behaviour are targeted at once (Abrahamse et al., 2005). Since behaviour and material culture are so heavily intertwined, it can be very difficult to change behaviour without some level of material context change.

Moving home presents an opportunity for changing energy related behaviour as it creates a disruption to the material culture that householders interact with on a daily basis. As the interaction between people and their energy consuming technologies repeats and strengthens over time, a change in that connection can potentially create a change in energy consumption. Moving home is a regular life event for many householders throughout the world making the need to understand this process in terms of a change in energy consumption highly important.

5 The social and material elements of dwellings are also closely interlinked with energy demand, such as floor space and number of occupants (HEEP, 2006; Yohanis, Mondol, Wright, & Norton, 2008).

2.8 THE MOVING PROCESS

The moving process has been broken into six stages; trigger, search, sale, acquisition, move and establishment come from an amalgamation of different literary sources which will be discussed in turn (see Table 1). These represent different facets of literature but are also stages through which householders generally move. The framework is loosely based on that presented by Stanbridge Lyons and Farthing (2004) who presented a conceptual framework that broke the mobility process into five stages. The authors argued that householders could be targeted differently when considering transport options during the mobility process.

Each stage of Table 1 involves different implications for material culture, social influences, individual characteristics and behavioural aspirations. It is also important to note that although the categories are presented in a linear fashion, the moving process may often have a different order, or timing of events (Gärling & Friman, 2001). Although householders moving from rented accommodation need not go through a 'sale' phase, they still need to release themselves from their tenancy agreements which may have similar implications.

Table 1: The process of moving home and relevant influences on energy related behaviour

	Trigger	**Search**	**Sale**	**Acquisition**	**Move**	**Establishment**
Material	• Size (room stress) • Tenure • Housing career	• Size • Type • Price	• Insulation • Heating fixtures	•Tenancy agreements •Bargaining on future improvements needed	•Removal & acquisition •Packing/ unpacking •Placement active storage	•Fixtures •Placement active storage •Removal & acquisition
Social	•Family/ social formation & dissolution	• Influence • Roles • Similarities (needs & preferences)	•Price negotiation •Investment subsidies		•Family or company assistance •Negotiations	•Power relationships •Norms, implicit/ explicit •Needs & preferences •Length of relationships
Individual	•Life stage •Aspirations •Autonomy	•Experience •Aspirations •Autonomy				•Habits •Aspirations •Feeling states •Autonomy
Behavioural	•Lifestyle •Norms					•Lifestyle •Norms

Adapted from: Stanbridge Lyons and Farthing (2004), see also Scheiner (2013).

The first two categories align with Brown and Moores' (1970) trigger and search functions of mobility. At these stages, householders come to the decision to move and undertake the search process for a new dwelling. As householders go through these phases, there are many interacting elements, such as different householder aspirations for location and dwelling types, and household size issues such as the number of extra rooms and garage space that are perceived to be necessary, and these decisions may need to be negotiated at a group level[6].

6 Price is also one of the most influential factors determining householder choice. However as price can be very varied across markets and market timing, dwelling size, structure and location will be used as more universal determinants in this study.

The second two stages involve the sale and new dwelling acquisition. It can be assumed that by this time, most householder decisions have been finalised and discussions centre on the economic and legal aspects of acquiring a new dwelling. Household acquisition can be an especially stressful process as householders may be in competition with others who are trying to acquire the same property.

The fifth and sixth stages involve the actual physical move and how it is enacted, followed by the establishment of 'home' (Aune, 2007; Pink, 2004; Winstanley et al., 2002) in the new dwelling by arranging possessions and creating new routines. All of these stages potentially have consequences on energy related behaviour through changes in material culture—namely the changes that result in technology disposal, acquisition and how household members subsequently interact with these (Geels & Schot, 2007; Gram-Hanssen, 2010; Gram-Hanssen & Bech-Danielsen, 2004; Verplanken & Wood, 2006). The Move and Establishment stages can also change the social context, power relationships and social norm (Grønhøj & Thøgersen, 2012; Kleinschafer & Morrison, 2014; Steg, 2008), group decision making processes (Levy & Lee, 2004), and the quality of outcomes and compromises achieved (Iii, 1975; Kirchler, 2001; Lackman & Lanasa, 1993; Qualls, 1988).

Finally the residential mobility process also has implications for the individual, as they accommodate changes in their own life stage as well as execute their personal aspirations (Eluru et al., 2008; Gourinchas & Parker, 2002; Gram-Hanssen & Bech-Danielsen, 2004; Quigley & Weinberg, 1977). Through the residential mobility process, individual patterns of behaviour within a household context can be greatly changed as they go through the process of uprooting their lives and adapting to changes in the material and social contexts.

Table 1 includes four differing elements which have implications for energy related behaviour, the material, social and individual contexts. The table shows how these four elements differ at different periods of the residential mobility process. These will now be discussed in more detail.

2.8.1 Trigger

As discussed earlier, the decision to move usually comes from a dissatisfaction between the householders and their current housing. As the process of moving home is very labour intensive, the actual decision to move usually comes from an amalgamation of factors "such as marriage, birth of children, divorce, death of a partner, entering or finishing stages in one's education and income changes" (Dieleman, 2001, p. 253) see Table 2. The trigger phase may not only influence future energy consumption through the changes in energy consuming technologies and their relative energy using potential, but also through the desire of the householder to use energy differently to what they are able to achieve in their current dwelling.

Table 2: Trigger Phase

	Trigger
Material	Size (room stress) Tenure Housing career
Social	Family/social formation and dissolution
Individual	Life stage Aspirations Autonomy
Behavioural	Lifestyle Norms

The cost, size of dwelling and tenure are often large contributors to influencing a decision to move as well as major factors in housing choice (Clark & Dieleman, 1996; Dieleman, 2001; Molin et al., 1996). Aspects contributing to a desire to move may have energy related elements such as the ability to heat the dwelling, the amount of sun it receives and the types of energy fixtures and services available, such as whether the dwelling is connected to gas or electricity. Other energy related aspects include the type of heating system[7] and the location

7 However research on such factors is currently limited, and are therefore examined in chapter 3

of the home in relation to the workplace (Clark & Dieleman, 1996; Kim, Pagliara, & Preston, 2005), and all these factors have a potential impact on household energy consumption.

The trigger phase can also include the formation or dissolution of the family structure (Eluru et al., 2008). This can be linked to changes in material needs such as size, surrounding environment, proximity to other friends and family, or educational reasons (Mulder & Hooimeijer, 1999). Disequilibrium or dissatisfaction can also be felt at an individual level and can trigger residential mobility (Hassan et al., 1996; Rossi, 1955) as seen during changes in individuals' life stages (Mulder, 1993). Life stages refer to periods along the family lifecycle, such as moving out of the family home or retiring. Lifestyle changes and changes in aspirations also affect how a household may wish to live (Liu & Li, 2009). All of these impacts result in different requirements for household energy services, such as warmer room temperatures for an older couple or more laundry appliances for a younger couple with a baby (Gram-Hanssen & Bech-Danielsen, 2004; Lutzenhiser & Gosard, 2000; Shove & Warde, 2002).

Mobility associated with changes in lifestyle and life stage may have certain types of accommodation associated with it (such as a flat, first house or retirement home). McLeod & Ellis (1982) described how housing needs and housing consumption changed over the family lifecycle, and Kendig (1984) established how different life stages can be associated with housing careers.

As households move up the housing ladder (Borgersen, 2013; Dieleman, 2001), there is also an implicit notion that this also brings an improvement in energy services (Sovacool, 2011). Households who are in rental situations have, in some cultures, as much as a 75% turnover rate compared to households in home ownership positions (Dieleman et al., 2000) demonstrating that renters require less motivation to seek a new dwelling than owners (Diaz-Serrano, 2006), and may imply that renters are more likely to move if they are unsatisfied with energy services.

The initial decision to move home can involve many factors which contribute to a final trigger that initiates the search for a new dwelling. Although many factors are associated with

individual life stages and changes in family structure, indirect energy needs through the changes in lifestyle (Schipper, Bartlett, Hawk, & Vine, 1989), and desires for different types of material culture can also be part of the reason to move home.

2.8.2 Search

The second stage of residential mobility is the search, which suggests that householders look for a new dwelling to alleviate problems they are currently facing or to fulfil some desires or ambitions (Brown & Moore, 1970). Despite the important physical characteristics that householders must agree upon, as well as the financial decisions involving housing investment (Borgersen, 2013), household choice is also based on emotion (Levy et al., 2008; Munro, 1995).As discussed earlier; reviews can be found at (Clark & Dieleman, 1996; Dieleman & Mulder, 2001; Strassmann, 2001). For example, the decision may hinge on an individual's intangible feeling state (Pink, 2004, 2012) where householders look past the physical characteristics of a dwelling to the more emotional aspects of whether a house could fit their idea of 'home' (Aune, 2007; Gram-Hanssen & Bech-Danielsen, 2004; Winstanley et al., 2002). Encapsulated within an individual householder's experience lies socially defined preferences and understandings of what constitutes a 'warm' (Pink & Leder Mackley, 2012) or 'comfortable' (Shove, 2003; Wilhite, Nakagami, Masuda, Yamaga, & Haneda, 1996) dwelling. These all result in individual aspirations for different types of material cultures, which have implications for future energy consumption (Table 3).

Table 3: Search Phase

	Search
Material	Size Type Price Tenure
Social	Influence Roles Similarities (needs and preferences)
Individual	Experience and embodied knowledge Aspirations Autonomy Emotion

Search behaviours can involve multiple household members who are assigned different roles and responsibilities (Levy & Lee, 2004; Molin et al., 2002; Park, 1982). The process by which householders search for new dwellings, and the types of attributes they search for differs depending on who is involved (Dieleman, 2001; Molin et al., 2002) and the relationships between them (Lee & Beatty, 2002; Davis, 1976; Park, 1982). Park (1982) established that householders found it easier to negotiate on the more tangible elements of a dwelling and argued that efforts are made to make decisions in the least confrontational way. Depending on the relative influence of householders on each other (Levy & Lee, 2004), decisions involving householder preferences are often determined through strategies such as persuasion or compromise (Kim & Lee, 1996).

As householders go through life stages and their 'housing career', their experience of knowing what dwellings work for them increases, as well as their aspirations for larger and more comfortable housing (Abramsson et al., 2000; Borgersen, 2013; Kendig, 1984). The increase in dwelling size and improvement of comfort standards associated with upward mobility also make it more difficult for householders to revert to lower standards after they become used to a certain level of comfort (Shove, 2003), or 'locked in' to a particular set of behaviours that are determined by the type of material environment (Maréchal, 2010). Part of the socially and culturally determined elements of mobility and household choice can thus arise from past experiences and householder expectations of comfort and convenience.

2.8.3 The sale

The process of disestablishing oneself from the original dwelling depends on the kind of tenure consumers are involved in. Levels of ownership along the housing ladder can vary and naturally households in rental situations would not need to consider selling when moving out see Table 4 below.

Table 4: The Sale

	Sale
Material	Insulation Heating fixtures
Social	Price negotiation Investment subsidies

If there is a level of ownership or investment in the dwelling, householders may consider whether to invest in energy-related fixtures that are currently popular within the market. In New Zealand, for example, whether a house has insulation or not and whether there is a heat pump could be seen to add value to one house over others (Barton et al., 2013). Other modern fixtures such as solar hot water could also be seen as worthwhile investments which would help the sale of a property.

As houses often tie a large amount of householder capital within them, sometimes the sale of a house needs to be done swiftly so that the owners have the capital to invest in their new dwelling. If a family is looking to sell a dwelling in the near future, there may be little incentive to invest in fixtures which have a slow payback period, providing more relevance for government investment subsidies (Rosenow & Eyre, 2012).

Some countries have adopted energy rating schemes which require an assessment of each dwelling upon sale and purchase (Pérez-Lombard et al., 2009). Part of the precedent for such schemes has been for home owners to improve certain aspects of their dwelling in order to

comply with standards and to encourage investment in energy efficiency. The sale of a dwelling can potentially provide opportunities to encourage investments that will not only increase the value of the dwelling but also its energy efficiency potential. Similar measures or negotiations can also be present during household acquisition, as household efficiency standards or fittings could become aspects of the price negotiation.

2.8.4 Acquisition

Tenants and owners face both pitfalls and opportunities at the time of acquiring a new dwelling. In rental situations, tenants may be able to influence a landlord's future behaviour during the signing of tenancy agreements. If a renter wishes to see changes to material aspects of a dwelling that they are considering, it may be easier to have the landlord agree to those changes before a contract is signed. In this way, material elements of house can become part of the bargaining process during acquisition.

Similarly, the costs of energy use associated with a new dwelling can sometimes be directly billed to the renter, or included as part of the overall rent. Such differences could create varying levels of autonomy for landlords' control over tenant behaviour, as well as tenant's autonomy over their own consumption (Table 5).

Table 5: Acquisition Phase

	Acquisition
Material	Tenancy agreements Bargaining on future improvements needed

Retrofitted rental buildings have been shown to be appealing to some renters, but not all (Bretzer & Thynell, 2013). Although investing in a dwelling can make it more comfortable for the renter, the extra cost associated with retrofitting dwellings must still be accepted by the market (Bretzer & Thynell, 2013).

For householders in ownership situations, incentivising investments to improve household efficiency is also a complex process (Burke 2006). Although mortgage schemes have been devised to help householders make efficiency retrofits during the purchase of new dwellings (Burke, 2006), the financial risk is sometimes still seen as too large (Rosenow & Eyre, 2012). House acquisition can be a difficult process, especially when houses are sold in competitive environments such as auctions. There are many opportunities to influence the process of housing acquisition to include negotiations around the future energy costs and comfort standards of a dwelling (Burke, 2006).

2.8.5 The move

The actual move can also have potential implications on energy use in the new dwelling[8]. As possessions are packed up and shifted, householders need to decide which items to take with them and which to throw away. There may also be a need to purchase more items in anticipation for the new dwelling which were not needed before. Once arriving in the new house, householders will also need to consider where commonly used appliances should be placed, to fit with the design of the home as well as to help the flow of everyday activities (Shklovski & Mainwaring, 2005; Shove & Warde, 2002; Shove, 2007).

Table 6: The Move

	Move
Material	Removal and acquisition Packing/unpacking Placement – active and storage
Social	Family or company assistance Household composition

8 Unfortunately the residential mobility literature and energy related literature do not focus on the stages of moving and establishment directly. As discussed earlier, the main focus has followed Rossi (1955) on why families move. References are one step removed from the specific context of residential mobility.

The process of moving can involve disposing of old items in preparation for the new dwelling (Gregson, Metcalfe, & Crewe, 2007), which can be an emotional and cognitively taxing process (Roster, 2001). Moving can also involve new appliance acquisition (Shklovski & Mainwaring, 2005). Shklovski and Mainwaring (2005) discuss the process of becoming settled, whereby householders place their appliances in a way that is comfortable and satisfying, as they become familiar with the new environment.

Increasing dwelling size helps to ease the burden of room stress (Vera-Toscano & Ateca-Amestoy, 2008) created by household members, especially if there are new entrants to the dwelling. It can also be easier for householders to move into a dwelling which is larger, taking away the need to disguard any of their possessions and instead make room for more. It has been recognised by Shove & Warde (2002) that consumers feel compelled to increase possessions that match the rest of their material culture.

As householders shift their possessions and their lives, a significant rearranging of material and social elements of life occurs. Householders need to envisage how they best see their possessions fitting into a new home, as well as how they wish to live on a daily basis (Shove & Warde, 2002). This is a complex task which can involve arranging technologies differently, as well as adding or removing energy using technologies and possessions. Once enough energy services have been installed to re-establish daily routines, householders go into the establishment phase.

2.8.6 Establishment

The establishment phase involves the creation of new behaviours, or the restoration of previous energy related behaviours, effectively the reformation of daily life, from conspicuous to the inconspicuous and mundane (Shove, 2003, 2007; Shove & Warde, 2002) see Table 7.

Table 7: Establishment Phase

	Energy related elements active during establishment
Material	Fixtures Placement active storage Removal & acquisition
Social	Power relationships Norms, implicit/ explicit Needs & preferences Length of relationships
Individual	Habits Aspirations Feeling states Autonomy
Behavioural	Lifestyle Norms

As new dwellings change the performance context of routines and habits (Wood, Quinn, & Kashy, 2002), the more dissimilar a new house is, the more likely that different habits will be created (Wood et al., 2005). The new dwelling can be agentive in enabling broader changes in lifestyle (Gram-Hanssen & Bech-Danielsen, 2004; Palm, 2009; Shove & Warde, 2002), which may have also been part of the householders' aspirations when acquiring the dwelling ((Rossi & Shlay, 1982; Shumaker & Stokols, 1982).

Becoming established also involves familiarising oneself with the different aesthetic and sensory elements in the new dwelling (Pink, 2004; Pink & Leder Mackley, 2012). The embodied knowledge associated with places and things (Pink, 2004) helps householders create rituals of comfort and convenience (Shove, 2003). It may take some time during establishment for householders to learn what is required to make the house comfortable for them, such as finding appropriate thermostat settings or which windows to leave open for ventilation, behaviours which could increase the differences in energy related householder behaviours (Gram-Hanssen, 2008).

A new material environment is also agentive for the establishment of different social practices and norms around the use of energy (Wilhite, 2008; Wilhite et al., 1996). As householders become established and social practices around technologies changes, so too can the meanings associated with those resources (Feldman, 2004).

The social context of a dwelling is also influential in establishing energy related norms (Grønhøj, 2006; Grønhøj & Ölander, 2007; Grønhøj & Thøgersen, 2009, 2012; Kleinschafer & Morrison, 2014). As mobility is often associated with life stage transitions, a new dwelling might have different household members than the previous one. If this is the case, the norms around energy use can differ as the different roles around household tasks become established (Rosen & Granbois, 1983). A new household composition will also involve the establishment of a new household structure, through the different amounts of influence that householders have on each other (Commuri & Gentry, 2000; Grønhøj & Thøgersen, 2011; Schermerhorn & Mark Cummings, 2008). Exactly how these norms are established within a new dwelling around the use of energy is still poorly understood (Kleinschafer & Morrison, 2014).

Within a household, the relative autonomy of individuals (Bandura, 1977, 1989) to use energy how they wish relies on the interactions between their new material environment as well as negotiations in the new social context. Not only is individual autonomy important for their belief in their ability to behave how they wish (Bandura, 1977), but it is also important in regard to the influence they have over other household members (Schermerhorn & Mark Cummings, 2008).

Consumers will often look favourably on their housing choice after moving, even if it does not serve them as well as they had anticipated (Aragonés, Francescato, & and Gärling, 2001; Gärling & Friman, 2001). Householders, therefore, may not live in exactly the way they had planned before their move as they face the reality and potential challenges the new dwelling and household situation may bring for them.

During the establishment phase there are multiple facets to creating new energy related behaviours, some of which are instigated before the move, and some of which come after the household settles in. By breaking down the mobility process into stages, this chapter has shown how each stage involves different interacting elements that all have implications for energy consumption behaviour. At all stages there are decisions and changes according to the material elements of a dwelling, and as the household goes through the search and establish phase, there are changes and decisions that happen at a group level and also at an individual level. The following section proposes a unifying framework of how these elements of material culture, individual and social contexts interact.

2.9 CONTEXT CHANGE FRAMEWORK

So far the chapter has reviewed literature relating to domestic energy consumption and residential mobility. It has shown that contest change provides a unique opportunity to potentially change energy related behaviour, and it has presented different frameworks relating to energy related behaviour (Stephenson et al., 2010), and residential mobility (Dieleman, 2001; Levy et al., 2008), and incorporated them by looking at energy use implications of the residential mobility process as a whole (Table 1). Assessing household behaviour through the process of mobility highlights the importance of the social context on household decisions as well as the establishment of household norms. Both energy related literature on context change (Schafer & Bamberg, 2008; Schäfer et al., 2012), as well as residential mobility (Dieleman, 2001; Kendig, 1984; Winstanley et al., 2002) provide a basis for how households use mobility in part as an opportunity or consequence to change behaviour. However few models manage to capture the interactions between household members within the household system. For example, earlier models of socio-technical interactions (Hitchcock, 1993) frame individual behaviours within a dwelling in relation to the material systems of provision, but do not include the interactions between other household members within the social context. Similar issues are found with Geels (2002) and Geels & Schot (2007) which focus on the relationships between actors and structures, as well as Shove et al., (1998) where householders are seen as social agents. Such perspectives have been crucial to understanding household practices and the relationship between householders and their technologies, but they miss the dynamic interrelationships between household members (Schermerhorn & Mark Cummings, 2008), which are crucial to the processes of mobility and decision making (Kim & Lee, 1996; Levy et al., 2008; Levy & Lee, 2004; Park, 1982), as well as in the establishment of household norms (Grønhøj, 2006; Grønhøj & Thøgersen, 2012; Kleinschafer & Morrison, 2014).

The conceptual framework developed in this chapter follows a systems perspective to incorporate the material, normative and behavioural elements that constitute an individual's 'energy culture' but also include the social context by which their behaviour is mediated. The framework conceives of energy consumption as a result of the behavioural interaction of the

individual with material culture, who is simultaneously interacting with other household members to establish the social context.

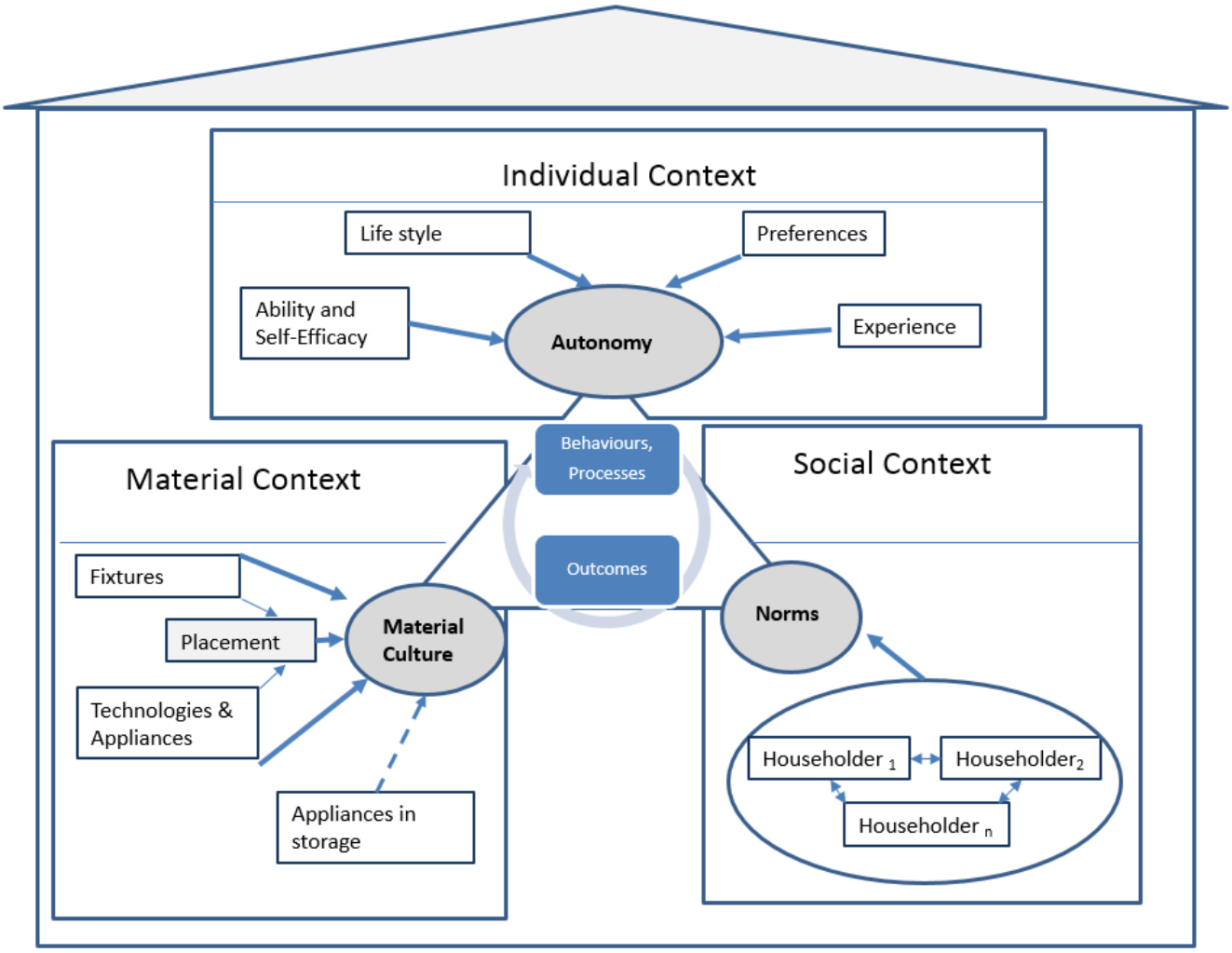


Figure 5: Context change framework

Figure 5 brings together the three core elements involved during the mobility process which have been discussed earlier, and the nature of their influence on energy behaviour. It focuses on interactions within the household walls. Householder interactions can also be analysed from a systems perspective (Cox & Paley, 1997; Minuchin, 1985), where householders are theorised as subsystems within a family unit, and are seen as a structured whole (Cox & Paley, 2003).

The effect of their complex and dynamic interactions result in different decisions made individually and socially resulting, in turn, in differing energy consumption patterns. The framework draws insights from across the various literatures discussed above, and will subsequently go into more detail in how these interact in the current framework.

The context change framework in Figure 2 focuses on the behaviours of the individual (micro level), within the context of the meso level – (household level) (Reid et al., 2010). The relationships between householders at the meso level will be discussed further in chapter 3.

Systems theory's concept of panarchy suggests that changes within one element of a system will cause changes on another (Gunderson, 2001; Holling, 2001). The context change framework identifies the three elements being affected by their interactions with each other. For example, if there is a new electronic device within the dwelling (material environment), this will impact on the ability of the individual to use energy (behaviour) but will also add a dimension between the individual and other members of the household (social context).

2.9.1 The material system

The term 'material culture' is used in reference to the energy cultures framework (Stephenson et al., 2010), whereby the material elements of a dwelling is seen as a "technical system in its own right" (p.6124). Burke (2006, p152) similarly describes a dwelling as a "complex technical system with many subsystems including structural elements, exterior sheathing, insulation, electrical wiring, plumbing, lighting, and interior coverings".

In this thesis the material system follows Stephenson et al's. (2010) concept of material culture. The system has two main functions, firstly as mentioned above, the technical elements within the material system are dependent on each other, based on the types of materials in the dwelling and the types of appliances which fixtures can support (Geels, 2002). Secondly the material system is also made up with the social and cultural meanings associated with those technologies (in reference to Stephenson et al., 2010), thereby

presenting the material system with social implications; a material culture (Shove, 2003; Giddens, 1991).

In the context change framework, household fixtures are classified as those elements which are part of the building's fabric and which cannot be easily removed when shifting and are therefore included as part of the sale. Fixtures may include the water heating, ventilation and heat transfer systems, and in some cultures such things as oven and fridge are also required to be part of the household sale.

The placement of household fixtures is often determined by the dwelling structure and layout, and this in turn determines household activities within the dwelling (Thrift & Dewsbury, 2000). For example, a kitchen has various appliances and it is unlikely to undertake similar activities as another part of the house. The household services and fixtures also determine the type of energy sources available for various technologies (such as wood heating or gas hot water) and also influences the types of appliances and energy consuming technologies which householders can fit into their new dwelling. The placement of appliances and technologies that householders choose to bring with them or acquire for the new dwelling are thus determined by the building's structure and fixtures. The dwelling structure also influences which possessions householders may have available for active use, or which are put in storage or disposed of.

The material culture of the dwelling can be a trigger that stimulates residential mobility (as discussed earlier), and is also one of the main factors influencing housing choice (Clark & Dieleman, 1996). As the dwelling structure codetermines the possible lifestyles within (Spaargaren & Van Vliet, 2000), it is understandable that there is a large amount of effort put into house design. However, housing choice also involves emotional decision making elements that are part of individual desires, experience, life stage and lifestyle aspirations. Intertwined with the energy related behaviours associated with a dwelling, are the individuals' own competencies and autonomy.

2.9.2 The individual context

It is important to recognise the individual within the household, as most technologies are designed to be operated by an individual, and most energy related behaviours are constituted at some point through an individual's interaction with an energy using technology (Barr, Gilg, & Ford, 2005). Although residential mobility is often a social process, the effect of an individual's preferences for stimulating and steering group decisions is also important (Levy & Lee, 2004).

At the individual level, technology can become agentive for changing behaviours and energy related habits (Wood et al., 2005). Habits, although context dependent in the case of domestic energy consumption (Maréchal, 2010; Verplanken & Faes, 1999; Wood et al., 2005), are held within the mind, and acted on by the body of the individual (Verplanken, 2006; Wood et al., 2002). Habits are also important in the context of changing consumption and changing contexts because they can be difficult to break (Neal, Wood, & Quinn, 2006), but are easier to break during context change (Wood et al., 2005).

Regarding energy consumption decisions, individuals are also important at the household level as they vary in autonomy, and therefore the ability to live in a way which is congruent with their own personal attitudes and desires (Ajzen, 1991; Bandura, 1989). Their own attitudes and experiences which guide energy related behaviours and lifestyles (Barr & Gilg, 2006; DEFRA, 2008; Faiers, Cook, & Neame, 2007; Poortinga, Steg, & Vlek, 2004; Steg & Vlek, 2009). Socially constructed norms of comfort and convenience help guide individual preferences around energy related practice (Shove, 2003). As an individual's household routines become more automated, less cognitive effort is required to achieve the desired outcomes.

Individuals' preferences for norms of comfort, habits and routines around using energy in a home are socially and culturally constructed but maintained through the automatic guidance of habits, and the persistence of social contexts. Exactly what practices individuals engage in does, in part, relate to their own personal preferences, however, when individuals are faced with new situations they are more likely to revert to conscious decision making processes for

a time (Ouellette & Wood, 1998). This also relates to their past experience and position in the family lifecycle (Fritzsche, 1981; Kendig, 1984). As the householders' position in the family lifecycle often involves more than one person, the framework will now discuss the interactions between energy related behaviour within the social context.

2.9.3 The social context

Mobility can be aligned with changes in life stages (Dieleman, 2001), which influence the social context of a household. Secondly, decisions around mobility (Levy et al., 2008; Levy & Lee, 2004), and the establishment of subsequent norms (Grønhøj & Thøgersen, 2012; Kleinschafer & Morrison, 2014) of energy related behaviour are determined by the social context of the household group. Thirdly, social practices within a household depend on the different interactions between household members and technology (Gram-Hanssen, 2010; Shove, 2004).

The social context differs depending on householder's life stages and position along the housing ladder. As a household's composition changes during mobility, so too can the energy requirement and the practices which constitute energy use (Schäfer et al., 2012). For example, university students in a shared living situation may have different types of restrictions placed on them, but also have different social practices around eating and entertaining, than would a family with small children.

The social context mediates consumption practices through the types of people involved and the actions that they are undertaking (Nye & Hargreaves, 2010; Palm, 2009). In the same way a material culture can be enabling or inhibiting, other household members can influence individual behaviours around the use of energy (Grønhøj & Thøgersen, 2011), and individuals can influence energy related norms of the household (Grønhøj & Thøgersen, 2011; Kleinschafer & Morrison, 2014). Similar social structures are prevalent during processes of household decision making and residential mobility (Dieleman, 2001; Levy & Lee, 2004; Levy, Murphy, & Lee, 2008), such as the use of householder roles (Davis, 1970; Engel, Blackwell, & Kollat, 1978), and householder influence (Corfman & Lehmann, 1987;

Ferber & Lee, 1974; Filiatrault & Ritchie, 1980; Kim & Lee, 1996; Kirchler, 1990; Thomson, Laing, & McKee, 2007).

The social context is connected to householder life stage, dwelling type and household relations (Winstanley et al., 2002), all of which are reproduced and recreated through behavioural interactions and social practices. The social context is extremely relevant to understanding changes in energy related consumption during residential mobility, as it is highly interconnected with energy related behaviour and the mobility process.

2.9.4 Time

One factor which flows through all household interactions during context change is the relevance and relativity of time. Firstly, the material culture of a household is heavily influenced by the social and cultural era from which it was produced (Dooley, 2006), as well as its relative age within the dwelling. The agency of a dwelling to determine energy related behaviours is relative to the cultural norms of the time (Wilhite, 2008), which can endure past what is considered culturally acceptable.

The household system of energy related activities is heavily influenced by time; the time it takes for individual habits to form and the time it takes for household norms to change. The stronger norms and habits become, the more sensitive they are to changes in the environment, that is, to systems that have not been influential during their construction (Luhmann, 1995).

An individual's experience of material culture, as well as associated norms of comfort are also subject to temporality. As householder preferences change over time, they can become less malleable. Habit is also related to time, in the time it takes to foster and develop a habit (Lally, Jaarsveld, Potts, & Wardle, 2009), as well as the reoccurrence of the habit once established in a person's life.

As households move along the family lifecycle, they are also subject to changes in household composition, such as when starting a family and retiring (Kendig, 1984; McLeod & Ellis, 1982; Speare,1970). The importance of temporality is that household needs and preferences will change over time (Gourinchas & Parker, 2002) regardless of external influences, so any intervention involving household energy use must recognise that adaptation may be necessary as householders themselves change. It is also important to recognise that the longer householders spend together, the more similar they become in their likeness and action (Anderson, Keltner, & John, 2003).

The context change framework brings together different elements of mobility within a household to show that material culture, social context and individual context interact and over time influence energy behaviour and behavioural change when householders move home. These elements interact differently at different stages of the mobility process and all are subject to the amount of time they have been interacting, and the amount of time that they will interact.

2.10 DISCUSSION

Moving home disrupts the material environment by which energy related behaviours are formed. These in turn are influenced and influence the individual and social contexts of the household and the shape of energy related behaviours. The stages of the moving process involve different decisions and potential points of intervention for changing the way energy will be used in a new dwelling. The mobility process can change a household's energy requirement; either through changing the household composition to adjust to a different life stage, or through changing the material culture associated with movement along the housing ladder. The six stages of the moving process outlined in the chapter show that some interventions may be more relevant to certain stages than others. What is most important to consider is the timing of those interventions. In reference to the context change framework established above, the chapter will now discuss the opportunities for interventions to increase energy efficiency during the mobility process.

As with all interventions, timing is important and this is especially the case with mobility. There are many different stages of the mobility process by which householders have to make decisions at both group and individual levels. Some stages may take longer than others, and only some directly involve decisions around energy related behaviour.

The context change framework suggests that at many stages householders should be approached at a group level, as many decisions and changes involve multiple members. Policy makers must choose carefully what parts of the household system they are addressing at any given time. If only one element (such as the individual context) is targeted when householders are considering multiple (such as the needs of individuals as well as trying to reach a compromise between household members), an intervention may not be taken up as it does not fit the processes the householders are undergoing. As householders have different roles or influence on others during the mobility process, it is important to identify and enable those actors who are willing to make improvements to their material culture or energy related behaviour.

Literature has shown that interventions to encourage energy efficiency that target multiple elements around behaviour have more success (Mourik, 2009). It could be that interventions targeted at households undergoing a search phase across multiple levels of a behaviour will be more successful. For example, targeting the practice of keeping the heat pump temperature at a low setting may work better with households moving to more insulated dwellings. Also if interventions were targeted before moving when householders are considering what they want in a new dwelling, and then afterwards to help them establish energy efficient behaviours in the new dwelling, one would expect greater uptake than interventions that only address one side of the mobility process.

As the mobility literature has shown, householders undertake the moving process during changes in life stage and family formation and dissolution. The modern family lifecycle is not always a linear process, but as household configurations change, so do the expectations around what is desired from householders during the move. As lifecycle changes are associated with natural life events, the relevance of interventions during mobility strengthens. Changes in household structure as householders move through their housing career are prime periods to address household intervention as long term decisions are made toward improving housing quality and standard of living.

2.11 CONCLUSIONS

This chapter has shown how moving home can create changes in the way energy is used through changes in material culture and the social and individual contexts of the householders. In some cases, householders may already be moving into situations where they actively use less energy than in their previous dwelling, and in others they may be seeking to use more energy. Residential mobility involves a muddling through process, whereby householders make decisions at a group level. Mobility is therefore a social process, which involves social interactions based on householder roles and influence. As mobility is already a natural transition in people's lives, policy makers need to intervene during these changes to facilitate more effective energy use.

By breaking the mobility process into stages, it is clear that there are many opportunities where energy related behaviour can be influenced. In order for policy makers and researchers to make better use of context change interventions during mobility (Schäfer et al., 2012), this section brought together findings from mobility and energy studies to better inform interventions and future research by identifying what the moving process means for energy use in a particular cultural or economic context, but also more specifically to help identify the potential impacts and opportunities associated with mobility.

The context change framework is effective at showing the different stages involved in residential mobility, and how energy related behaviour could be influenced through changes in the material, social or individual contexts. The framework represents interactions between householders and material culture at the meso level, whilst including the autonomy of the individual to act within those constraints.

The context change framework provides new insights into the stages of mobility and how they relate to energy related decision making, and the development and changes to householder norms and habits. By integrating social influence structures of the social context into the wider household socio-technical system, the context change framework can better predict and understand the changes to energy related behaviour during mobility. The context

change framework provides a structure to understand the different things householders are considering during mobility which could potentially influence energy consumption in the new dwelling.

The context change framework delineates the interactions between individual and social contexts as they progress through the family lifecycle. As social adjustments to life stage involve natural material adjustments to dwellings, these are constituted through culturally constructed housing careers and the search for larger and more appropriately 'fit' dwellings. As many New Zealanders use their house as their main investment, moving home becomes more than an individual emotional decision. It is also a financially and socially calculated decision to move up or down the housing ladder, increasing or decreasing capital. Some investments to dwellings therefore not only provide improvements to individual householder comfort, but potentially add value to the family investment in the home. As householders move through their housing career, not only can they improve dwelling equity and residential comfort, but they can also move up the energy services ladder (Sovacool, 2011).

As residential mobility has been observed as an opportunity to stimulate more energy efficient behaviours, the context change framework provides a structure whereby interventions can be planned and actioned. The context change framework shows how important understanding household's position along the housing ladder is as it frames the parameters by which householders are acting. The framework also highlights how crucial the timing of potential interventions is, as householders are considering very different things at different stages of the mobility process.

The chapter suggests that more grounded research is needed in order develop efficiency intervention measures that take account of householder autonomy, social contexts and life stage. In order to make the most out of a context change, researchers need to account for more than just the changes in the material elements in order to be effective in changing energy consumption behaviour. More research is needed to understand the changing dynamics between the individual, social and material contexts during mobility.

2.12 RESEARCH JUSTIFICATION

Changing energy related behaviour in households is important to reduce domestic energy consumption. The chapter revealed that context change is one of the most promising areas to create effective interventions; however, interventions to change such behaviour have hitherto struggled to reach their full potential. The chapter showed that an understanding of energy related behaviour within a framework of context change needs to encompass norms, practices and the material culture and be cognisant of life stages, housing careers and experiences. Most importantly, to approach interventions efficiently one also needs to understand the interactions between householders. The consideration of these interactions and their empirical study is still limited and the focus of this thesis.

The mobility literature indeed recognises life stage and housing ladder concepts, but the integration of social interactions is sparse. While Burke (2006) shows that householders do not often consider energy related elements of dwellings during home acquisition explicitly, the mobility literature falls short of fully addressing the decision making processes of householders (Levy et al., 2008). Likewise, the mobility literature is overly focused on the acquisition of dwellings, and overlooks the actual experiences of householders after moving into their new dwellings (Gärling & Friman, 2001).

Previous studies attempting to curb energy related behaviour during mobility have thus shown a lack of addressing the complexities of the mobility process (Schäfer et al., 2012), especially those that come about with the changes in the social context of a dwelling. While recent studies into household dynamics have begun to shed light on the ways in which householders assume and negotiate energy related norms (Grønhøj, 2006; Grønhøj & Thøgersen, 2011; Kleinschafer & Morrison, 2014), this has not been addressed in studies involving residential mobility.

This thesis therefore addresses particularly the dynamics underpinning decision making processes that have previously been ignored. It will also address the actual experiences of the households after moving and as they develop new behavioural patterns in the interaction with their socio-material environments. The aim of this thesis is not to trial an intervention during context change but rather to better understand the changing dynamics of domestic energy consumption through the lens of residental mobility. Understanding the phenomena of

context change throughout the moving process will provide better insights into how and when energy efficient interventions may be implemented.

2.13 RESEARCH AIMS

The thesis therefore investigates:

1. In what way is household energy use considered when households search for a new dwelling?

The context change framework proposed by this author has merged understandings from the study of residential mobility. It shows how residents can move along housing careers as householders make investments in housing. However there is little understanding of the strategies that householders use when choosing and making changes to dwellings during stages of their housing careers. This is therefore addressed by investigating:

2. What are the strategies by which householders choose and make changes to housing attributes that affect energy consumption as they move along their housing careers?

The context change framework has highlighted the importance of understanding householders at the group-level. However there has been little research done on householder norms in relation to energy use, and even less in understanding how these change when people move home. This gap is addressed with the research question:

3. How are household norms concerning energy consumption established in a new dwelling?

This chapter has shown, furthermore, how changing material culture can influence energy related behaviours. However there is little understanding of how this affects behaviour at a household level during residential mobility. Therefore:

4. How does a change in material culture (residential mobility) influence energy related behaviours?

The context change framework has also highlighted how a changing material culture has influences on the individual and social contexts of a household that can have implications on energy related behaviour. Therefore:

5. How does a change in material culture influence the individual and social contexts of a household?

2.14 RESEARCH CONTRIBUTIONS

The main methodological contribution of this thesis is that it expands on existing theory, by building on and adapting existing methodologies to a new application. It involves the study of dynamic moments that come through the interaction of all the elements described.

The contribution of the thesis lies with the systematic identification and recognition of the creation and the often unpredictable development of new norms, decisions and habits. It further contributes to methodology in mobility and energy research because it employs a longitudinal, empirical study, and it takes in multiple dimensions, as it looks at the household situation before and after the 'intervention' of moving home. In addition, it innovates study methodologies in this area as it validates the researcher's interpretations and understanding through multiple presentations of the findings to participants.

As the research questions focus on the interaction between individual, social and material elements, the thesis also focuses on instantiated, momentarily created decisions in a household's flow of life. The thesis further recognises the different starting points and dynamic evolutions as they happen while recording complexity issues that enter the decision and behavioural arenas of the moving and settling-in phases. These issues often appear as ending in irrational deviations from stated plans or as inconsistencies.

The context change framework especially provides a structure that deals with these dynamics, to help inform different types of householder interactions and the situations to address under context change.

Chapter 3 METHODOLOGY

This chapter outlines the methodological approach used to answer the research questions presented in the previous chapter. After discussing the nature of the data to be collected and analysed, a brief section on the ontology and epistemology will follow. Next, the methods employed will be presented followed by how they were applied in the field. These discussions seek to justify as well as inform on changes made to the methods, and to report on lessons learned.

Because of the exploratory nature of the research questions, the ontology of the subject matter, and the complexity of interactions being studied the thesis approaches the investigation with a mixed method approach to help structure and capture the field in question. As much of the research focuses on influences on changing behaviour, a longitudinal approach to its study is needed.

The previous literature review and subsequent context change framework revealed that household energy consumption is multi-dimensional. Whilst the physical and material dimensions involved in energy consumption behaviour are relatively straightforward to quantify, measuring individuals' behavioural interaction with a material element can be difficult to capture. Furthermore, the social context within which behaviour manifests itself and the individual motivations for said behaviour become increasingly abstract. It is therefore appropriate to write a few words on the;

Nature of the processes under investigation:

In its essence, moving home can be observed as a physical phenomenon in space and time. However, residential mobility in its broader sense is a culturally embedded phenomenon that encompasses wider social and motivational implications.

Earlier studies on residential mobility focused on the triggers that bring householders to decide to move. They then moved on to the decision processes involved in making a new dwelling choice. The traditional approach to such enquiries often followed a rational economic perspective, and aligned householder choice with tangible household characteristics. As has been discussed, the actual process of making decisions and creating

practice is often a ‘muddling through’ approach (Park, 1982), in which compromises are made on the basis of the human condition as prevalent in households and as based on householders’ subjective impressions in their flow of life. The group decision processes involved in residential choices in the literature, however, were studied through an empirical lens, with few researchers delving into the more qualitative approaches to understanding choice interaction (Winstanley et al., 2002)

Furthermore, energy related behaviour studies often focused on reflective habitual behaviours within a new dwelling, through empirical surveys or reflective interviews (Schäfer et al., 2012). Such studies recognised that their methods may have missed capturing how actual behaviours were pre-ordained through house choice, here identified as the structural constraints and enablers that is the physical, material environment.

The measurement of influences on energy related behaviour in this thesis therefore needed to capture the decision-making context and processes before a move, as well as the new context once householders had arrived in a new dwelling. The aim of this thesis is therefore not to develop new theory detached from previous work, but rather to expand on what has been critiqued as its shortcomings. It therefore seeks to build on established methodologies to gain deeper insight into mobility phenomena, within the researchers own ontology.

3.1 ONTOLOGY

I have approached this project as a phenomenological search for knowledge, which fits well with my interpretivist understanding of the world. I view reality as being shaped through experience as felt by the individual. It makes it easy for me to align my ontology with Heidegger (1962) and Piaget (1971). I recognise that we all experience through our own point of view (Moustakas, 1994); I therefore attempt to conceptualise each individual idea before trying to fit it into my own understanding.

Simultaneously, I recognise that the theory I construct (and adopt from previous research) is a constructed reality, which I interpret and use for explaining what happens in households. As I construct theory from practice, and as I question my theory through practice, I employ both constructivism and rationalism in a hermeneutic cycle as I believe that the subject matter at hand, energy-related behaviour, must be both viewed as constructed to be explained, and lived, to be understood.

3.2 EPISTEMOLOGY

The theory of knowledge following the interpretivist paradigm elicits a subjective understanding of truth (Guba & Lincoln, 1994). As the perspective argues that we cannot decipher any one true reality it is important to acknowledge that any of the findings of the thesis need to be interpreted and critically tested within the researcher's own constructed understanding.

In the social and psychological sphere of the current enquiry, it is difficult to decipher and to remove the researcher's own subjective interpretation of householder truths. However in the interpretation of the physical reality of households (such as dwelling characteristics), there was the opportunity to seek some objective (if yet modified) interpretation.

In order to capture the multi-dimensional elements of the subject matter in question, and to reduce complexity, some research methods were borrowed from the realist epistemology. However in the true nature of understanding, and interpretation of results, the researcher

works within a constructivist paradigm and applies hermeneutics in the creation of knowledge.

The researcher recognises that behaviour is the manifestation of the mental plan into a physical action, and that even with the observable ability of the physical action, the mental understanding of that action can be different for both the subject and the observer. Especially with habits, being automatic and often unconscious responses to a stable context, the participant's stated behaviours could only be seen as one part of the household reality (Thompson, Locander, & Pollio, 1989). Each utterance from participants was therefore observed within the context of which it was said, and also from the householder who said it.

Similar to Piaget's (1952) learning theory, the researcher saw hermeneutics as a way of 'assimilating' and 'accommodating' new information into his own current understanding. Although Piaget's theory of cognitive development has generally focused on children, the approach by which a researcher is a 'passionate participant' in the household being investigated has many similarities to how a child would try to understand a new phenomenon.

When information lay outside of the researcher's theoretical understanding he would use 'accommodation' to find ways to adjust his theory or find new theory that could support that understanding. In the same way, hermeneutics goes between *a-priori* and *a-posteriori* knowledge to test, validate and build on theoretical understandings derived by data.

There is no question that the researcher went into the investigation with an understanding of theory underlying household behaviour before beginning data collection. The researcher therefore tried to use that understanding to initially frame research questions and structure findings (Gummesson, 2003). However as the research unfolded, the methodology evolved as the researcher accommodated new understandings from householders and theory to support it. The longitudinal approach, and the contrasting cases being studied provided the researcher with a unique position to hone and target his investigation specifically to each household.

Some approaches employed required the researcher to attempt objectivity in his application of the approach, but the overall strength of the method derives from the multiple iterations and engagements with participants to validate and build on the understandings found.

3.3 RESEARCH METHODS

Interpretivist social science uses a wide range of methods to investigate phenomena. It is not within interpretivism to seek out functional abilities to change society, but rather through subjective understanding to understand a phenomenon (Burrell and Morgan 1979). Although there are real-world applications that come out of the current investigation, the author argues that many of the shortfalls elicited by previous studies came about through the goal of understanding context change in order to utilise the phenomena, rather than to understand how the phenomena actually work.

The exploratory nature of the research questions leads this investigation towards a qualitative approach. Qualitative enquiries seek to explain a phenomenon, rather than validate it. Because the investigation sought to understand potential changes in behaviour within the process of moving home, a longitudinal approach was required. Longitudinal studies are a vital part of understanding social phenomena, however they are frequently avoided because of the resource burden they place on participant and researcher.

Within the constructivist paradigm, subjective experiences by the researcher are embraced, and the researcher recognises that they influence the creation of knowledge. The researcher is therefore seen as a 'passionate participant', whereby they try to engage in and take part in the phenomena being studied. The researcher engaged with householders directly to try to capture and observe the householders' reality within the context that it occurred. This meant that the researcher would visit participants in their homes, at a time when they would normally be there, and tried to speak to all the householders where possible. The researcher would usually be shown around the house, and have some of the interactions with different appliances explained. The researcher also helped some of the participants in their actual move when the time came.

Due to the nature of residential mobility, the researcher had to take a pragmatic approach in order to reduce pressure on participants. As the process of residential mobility can take a long time in some cases, and can also be very stressful through such diverse things as the high financial uncertainty, packaging, temporary or actual loss of household items, the researcher employed a mixed method approach in order to both capture and understand data in context – householders' lived reality. This allowed the researcher to observe elements of the

participants' reality when appropriate, but also used other methods to help capture other dimensions that could not be measured within the timeframe available.

The flow diagram Figure 6 outlines the process undertaken, adapted from Yin (2016). The linear character leading from planning to execution and from one interview in one moving-period to the next was interrupted by on-going reflection, integration of new theory, and checking with householders whether interpretations and understandings were correct – see Figure 6 below.

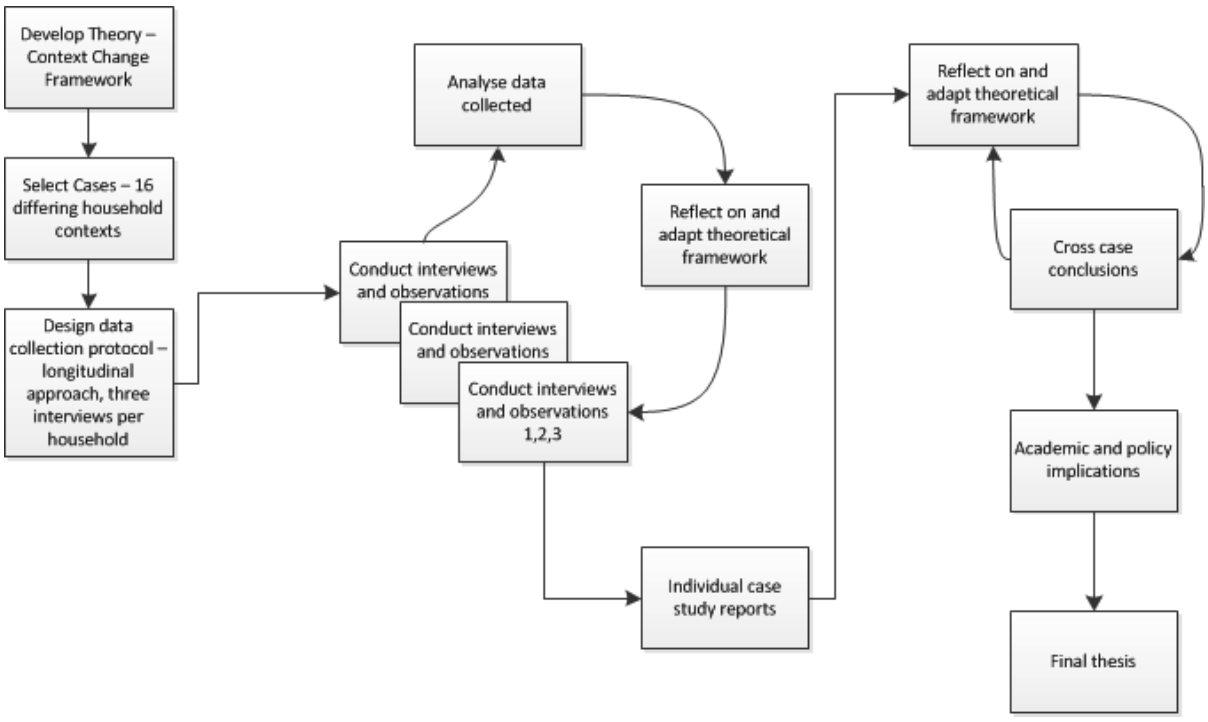


Figure 6: Research Method Overview

The application of the longitudinal, mixed method approach involved multiple stages of data gathering and analysis. These different stages will be discussed throughout the methodology chapter.

3.4 CASE STUDY METHODOLOGY

Case studies are empirical enquiries that "investigate a contemporary phenomenon (the "case") in depth and within its real world context, especially when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2014, p16). The case study method involves a range of structures by which to undertake empirical research. The approach is an iterative process, and uses a sequential iterative design, going between theory and data to test and validate assumptions.

3.4.1 Theory – energy cultures and context change framework

The context change framework discussed earlier had been established through reviewing the literature related to energy behaviour. Following from the energy cultures framework, the model to test needed to encompass material, social, normative, and behavioural dimensions. The current methodology was designed to capture and analyse the effects of these dimensions within the context of residential mobility. It used the pre-defined theoretical propositions that built on the energy cultures framework.

3.4.2 Case selection design

*3.4.2.1 **Units of analysis***

The context change framework highlighted how the household can be interpreted as a distinct system involving material, behavioural and social interactions. The case study method allowed the researcher to treat each individual household as a separate 'case' in their own right. As the use of households as a unit of analysis was relatively new (Kleinschafer & Morrison, 2014; Reid et al., 2010), applying a case study structure provided a framework by which to structure a multidimensional enquiry and include multiple methods of data acquisition and analysis.

The case study "copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relied on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result

benefits from the prior development of theoretical propositions to guide data collection and analysis" (Yin, 2014. p17).

Within the household itself, the context change framework allowed the researcher to frame the material, normative, social and behavioural elements within the household context, and to observe and analyse the interrelationships between them over time. Cases were limited to partial displacement (intra-urban relocation) in order to manage for other variables such as geographical climate and housing prices.

3.4.2.2 Longitudinal enquiry

The case study uses a longitudinal enquiry as the research questions wish to understand the influences on behaviour that occur before moving (such as motivational and decision making processes) and after moving (such as material and contextual influences). As many previous studies have only captured a snapshot in time, respondents often had to reflect on their previous behaviours post-hoc.

The main use of the longitudinal approach was to gain an understanding of the difference in behaviour before and after residential mobility. Due to the challenge of capturing householders during this time, a broad timeframe was allocated to the before and after period. Householders were to be contacted within two months before moving, and then after moving within the first two months. The final interview, to capture the lasting effects of the context change, was to be taken 3 months to one year after moving, depending on when the first interview could be held.

The length of time elapsed between move and interview allowed the researcher several reality checks on both the incidents of changing norms, and their importance in the longer term, as comparisons could be made across cases in the final analysis. The lived reality in each household made straight comparisons of incidents unrealistic; however, the recognition of patterns and similarities versus individual and unique incidents resulted in fruitful findings and evaluations in individual and cross-case analyses, especially because the researcher was able to follow up with participants after going through each stage of analysis.

Table 8: Points of data collection with participants along the mobility process

	Interview 1					Interview 2	Interview 3
Trigger	Decision to move	Search	Selection	Purchase /Sell/Rent	Move	Establish	Evaluate

Table 8 above represents the different points of contact according to the household moving process identified in Table 1 (Chapter 2). Interviews were able to follow this format in most cases, however due to volatile nature of residential mobility there were some variations in this format (discussed in the case overviews).

Throughout the thesis, cases are referred to as moving from 'House 1' to 'House 2'. House 1 referring to their initial permanent dwelling (at least a year) to their next permanent dwelling (at least a year).

3.4.2.3 Case selection

Due to the high involvement required by the researcher to interview households, the researcher chose to focus on the city where he was studying. Dunedin has a population of 120,249 people, with 50,691 dwellings – 67.9% of which are owner occupied (Statistics New Zealand, 2013b). Dunedin lies on the east coast of the south island in New Zealand and is the fifth largest city by population. The largest industries involve health care and education, with Otago University servicing over 25,000 students annually.

Dunedin is one of the country's colder locations, with a mean winter temperature of 6.5 degrees Celsius (Shannon et al., 2003). The quality of housing stock is one of the poorest in the country, with a large number of poorly insulated dwellings (Lloyd et al., 2008), that are also in varying stages of disrepair (Shannon et al., 2003). Most dwellings are timber framed stand-alone buildings with wooden weatherboard or brick veneer cladding. Most households use electricity for heating, with around 10% using wood burners for space heating (Shannon et al., 2003).

Dunedin has a very hilly geography, and many of the houses within the inner city receive only a few hours of direct sunlight during the winter months. The low sunlight hours, colder climate and poor heating and insulation options have been shown to be detrimental on health, and lead to higher rates of mortality during winter months (Shannon et al., 2003).

The fragmented availability of housing with reasonable sunlight hours, decent insulation and heating means that residents can be very conscious of these issues when choosing new dwellings during residential mobility (Khoo-Lattimore, 2009, Khoo-Lattimore, Thyne, 2008). Dunedin residents may therefore be slightly more astute towards the energy characteristics of buildings than in other parts of New Zealand where the temperatures are warmer and the effects of poor insulation less severe.

3.4.2.4 Participant recruitment

The first stage of the interviewee recruitment included sending an invitation request to participants from an earlier nationwide study into domestic energy consumption (which included a random sample of Dunedin residents). Households who had indicated on the survey that they may be relocating within the next year and were interested in further research were specifically targeted by the interviewer (see Appendix 1) for example of email sent.

The second stage involved emailing an invitation for Otago University students to participate. Thirdly a prominent and well-established local real-estate agent was approached by the interviewer to help increase case variation and provide specific case portfolio requests (such as older couples higher on the housing ladder).

In order to find households who were relocating, the interviewer used multiple approaches to gather a broad range of cases. As an incentive for householders to take part in the study, the interviewer offered to help participants move on the day (four households accepted). Participants were also given a small box of chocolates as thank you gift after the study to thank them for their time and participation. This was not mentioned to them before they took part in the study.

The number of cases was determined through saturation of variation in cases, as well as saturation of themes. Time constraints and difficulties in participant recruitment also contributed to keeping the number of cases to 16.

3.5 FIELD WORK

3.5.1 Data gathered

The main form of data collection involved different forms of observation whereby the researcher attempted to be 'passionate participant' within the householders' lives. This involved visiting the householders at their original dwelling, and at their new one.

Table 9: Primary Data Types Captured

Data collection instrument	**Data collected**
Audio recorder	Participant responses, utterances
Digital camera	Energy using technologies, household characteristics
Paper based survey	Householder demographics, behaviours and attitudes

The main data collected was recorded in three forms. Interviews were recorded via an audio recorder, photos of appliances were taken with a digital camera, and a paper-based survey was used in the final interview. The survey was used to help gain a broader comparison of householders, by asking such things as age, income and electricity prices from house one to house two. The survey questions included a selection from that used by Mirosa et al., (2010) (see Appendix 8).

Table 10: Secondary Data Types Captured

Data collection instrument	**Data Collected**
Energy bills	Monthly energy consumption
Field notes	Observations, thoughts and feelings of the researcher
Thermometers	Indoor and outdoor temperatures over a month period
Field notes	Observations around moving process from the researcher
Audio recorder	Overview context of residential mobility and energy related enquiries within Dunedin

3.5.2 Household visits

Participant observations were gathered at three separate intervals outlined earlier. During these visits the researcher would attempt to visit the dwellings when all the householders were normally at home, which was generally on a weekday during the evening.

The researcher attempted to involve all the householders where possible to engage in discussion. This helped to capture the range of different behaviours that the different householders had, and helped the researcher understand the social context and social dynamics by which energy related norms were established.

The researcher was shown around the house, and able to take photos of energy consuming appliances. Participants would often be able to help illustrate some of the themes discussed by pointing out the varying devices used.

3.5.3 Interviews

Householder interviews were used as the main tool in eliciting householder insights into energy related behaviour. Interviews were designed to elicit responses around normal energy related behaviours, and depended on the researcher's ability to keep participants engaged and comfortable. Being a guest in the participants' homes, the researcher made every attempt to be courteous and empathetic towards participants' responses.

Interviews used open-ended questioning undertaken in a semi-structured manner, using every attempt to create a natural dialogue between householders and researcher (see Appendix 5 for interview question sheet). As efforts were made to keep interviews relaxed and informal, questioning could follow a different order at times to maintain the flow of conversation.

Apart from the interview protocol, two main techniques were used to further gain insights into householder responses as interviews unfolded. This included the probing used in value laddering, and the visual elicitation used in visual mapping which will now be discussed.

3.5.3.1 Value laddering

Value laddering is a technique commonly used to elicit the overarching value and attitudinal based motivations of consumer choice (Reynolds & Olson, 2001). The laddering technique involves a process of 'probing' by the researcher, who strategically asks for the motivations behind consumer choice. The technique is called laddering as it assumes that there can be multiple levels of attitudinal justification for choices, some of which are mediated by higher order values, and some of which are not. In order to find out how connected particular behaviours are to values and attitudes, researchers continue to ask 'why' until the participant no longer has any further level of justification. This technique has been adapted to cover motivations behind energy related behaviours in New Zealand (Mirosa, Lawson, & Gnoth, 2013) and was used when possible to delve into the higher order constructs guiding certain decisions and behaviours of participants.

3.5.3.2 Visual mapping

The researcher used a visual mapping technique to help structure, analyse and validate his interpretation of participants' experiences. Building on the theoretical model (context change framework), the researcher would present visual maps to participants following their first interview. The mapping process drew on three different theoretical methodological propositions following value laddering (Reynolds & Olson, 2001), cognitive mapping (Novak, 1984, 1993) and concept mapping (Eden, 1988, 1998, Ackerman et, al., 1992).

Cognitive mapping is a process that evolved from George Kelly's personal construct theory (1955). The approach was developed as a form of therapy in order to help patients explore their own understandings. Cognitive mapping has been commonly used in managerial situations to help strategic thinking.

The cognitive mapping approach was adapted for this project to help illustrate the interactions between material and normative processes on energy related behaviours within a social context. In other words, the process of cognitive mapping aided the structuring of householder interviews and responses according to the context change framework.

Cognitive mapping, and arrows between concepts are designed to suggest causal relationships. In the process of this enquiry causal relationships were directed towards behaviour, within the household context. This process will be further discussed in the interview protocol section.

Concept mapping is another approach to visually organise thoughts and processes. The process has been applied in a wide variety of research and learning contexts, and when used appropriately can be a powerful tool to understand and express complex ideas. A concept in this process has been defined as "a perceived regularity in events or objects, or records of events of objects, designated by a label" (Novak & Canas, 2008. p1).

Concept maps have also been used in many research and learning contexts to express the relationship between concepts. The notion of concept maps is helpful in this research because they can involve the influence of physical elements as well as more abstract ideas. The systemic interactions of householders with their energy using technologies was sometimes better expressed using a concept mapping approach as it could involve the different influences of material and motivational elements on energy related decisions and behaviours.

Value laddering was used as part of the interview process, but what was more important was trying to gauge what normal behaviour actually was in relation to householder values and the material world they occupy. So concept maps and questions involved both directions, from asking about behaviour and the motivation for doing so, but also around the technology and how that was enabling or constraining for that particular behaviour.

The use of visual maps in this thesis, drawing from the mapping techniques discussed were used in the interactions with participants were designed to express causality between one or more influences on energy related behaviour. Mapping techniques have been more commonly used in interviews to help researchers probe and test themes elicited from earlier interviews (Kirchin et al., 2000).

When appropriate, the main three elements in the mapping approach involved those of the energy cultures framework being norms, practices and material culture. The use of the two dimensional space tried to frame normative and more abstract concepts in the upper page, and

more concrete tangible energy using technologies at the bottom of the page. The middle of the page was used to show the different behaviours that were then elicited between the material world and the goals and ideals of those within the households.

The maps were used to display relationships and infer causality between these three dimensions. Following from the theories expressed in the context change framework, both material culture and norms have been shown to influence energy related practices. The maps used in the thesis are called concept maps, however it is important to note that these are used in many variations to those suggested by Eden (1988).

The dimension of the social context evolved to express the differences and influences of individuals within the dwelling. If a norm or practice was different from one householder to the next, this was displayed by creating a separate norm and practice for the householder in question. This technique was used to express the influence of different householders on the overall energy practices within the dwelling, and also show their influence on each other.

Concept maps were used to describe the different dimensions studied in five different ways:

1. Energy related behaviours, and decision processes within the home
2. Expressing reasons for moving, and choice and decision criteria within the context of domestic energy consumption
3. Expressing expectations and motivations of householders for how energy related behaviour will manifest within the new dwelling
4. Eliciting the reasons for a change/sameness within the new dwelling
5. Expressing the main elements within the mobility process, influences and changes in space and time

The maps were used in the second and third household visit used to help structure questioning, refer to past discussions, and to elicit responses based on previous insights and statements. Also then used to frame the response within the context of an individual motivation or a physical influence or choice.

See interview protocol in Appendix 7 to see a detailed account of each stage of interviewing and data elicitation.

3.6 ANALYSIS

Following the hermeneutic method, the analysis was an iterative process going between theory and findings. The main process of analysis followed Braun & Clarke, (2006) thematic content analysis procedure. Other case study approaches such as pattern matching or time series analysis were not used in this case as the interaction with participants and concept maps was found to elicit similar structures and events.

Braun and Clarke's (2006) thematic content analysis method involves an iterative process of reading and coding sections of transcripts into broad 'themes'. Once these themes have been developed, transcripts are then re- coded in order to establish the themes further throughout the documents (see examples of in text coding in Appendix 6). The iterative stages of analysis followed each data collection method as represented in Figure 7.

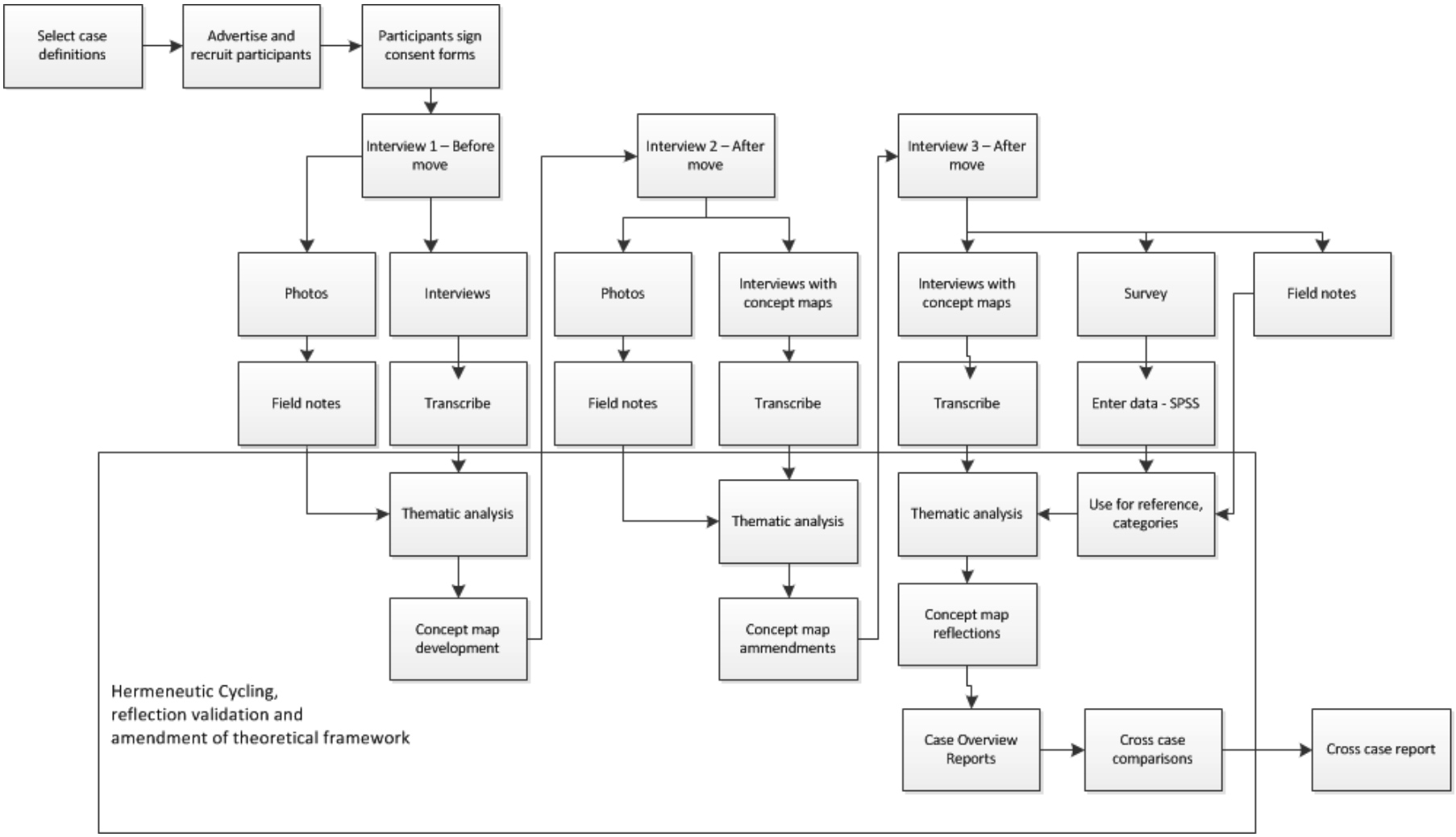


Figure 7: Data Analysis Overview

3.6.1 After interview 1

Step 1, collation of different data types (pictures, notes and transcripts).

Step 2, reading over each and coming up with broad themes.

Step 3, coding printed transcripts by hand, according to pre-defined themes

Step 4, reflecting on findings of codes, and amalgamating them on Banxia Decision Explorer – cognitive mapping software.

Step 5, displaying different codes and concepts according to their dimension between behaviour, norm and material culture

Step 6, creating lines to infer relationships and causality between concepts and themes

3.6.2 Added steps after interviews 2 and 3

Step 7, amending themes (if after second or third interview)

Step 8, collaboration with respondents following analysis

Step 9, writing case overviews, reflecting on householder responses, themes and insights. Using backing information and survey, photographs and field notes to help provide detail.

3.6.3 After all cases completed – cross case synthesis

Step 10, collating broader themes across all cases from case overviews

Step 11, creating overall conclusions and results

As the methodology involved multiple points of contact, and multiple iterations of transcripts and concept maps, themes were generally broken into very broad categories such as: ‘reasons for choosing house 1’, ‘normal behaviour in house 2’, before being further classified into the concepts shown in the concept map examples to follow.

As the themes involved interactions between multiple dimensions, the use of cognitive mapping to help the researcher structure participant responses helped the researcher move outside of a purely text based analysis.

However with the difficulty in ascertaining consistency in concept mapping relationships, as well as the difficulty in maintaining householder engagement with concept maps, the final analysis focused on the emergent themes within transcripts.

3.7 VALIDITY

It has long been argued that qualitative research requires a different set of principles by which to judge the reliability of research than traditional quantitative approaches (Lincoln & Guba, 1985). The authors proposed four measures that are commonly used in qualitative research (credibility, transferability, dependability, consistency), which will now be discussed.

The measure of credibility involves the extent to which participants agree with the findings, as it is only the participants who truly understand the phenomena being studied (Lincoln & Guba, 1985). The use of concept maps to affirm the researchers understanding and analysis was the main source of credibility. Participants had the ability to affirm the findings, and to change anything that did not resonate with their own understanding.

Transferability relates to the ability to observe similar findings in different context and to the extent by which those findings can be transferred. The best way to ensure transferability has been argued to be in providing a true account of the context in which observations were made (Ulin, 2005). A large amount of effort has been dedicated to account for the contexts in which the research was taken, and the main influences that affected the themes. This has been done through detailed case overview reports that discuss the environment and circumstances by which the phenomena observed occurred. The better that these observations were accounted for the easier similar results can be transferred or replicated to another setting.

Dependability involves the description the settings by which the study was taken, to account for the contextual influences that effected the observations (Guest et al., 2012). To enhance dependability of the investigation, the researcher has given an account of his epistemological standing and the way in which this lead to the acquisition of data from participants.

Confirmability involves the degree to which findings can be confirmed or supported by others (Lincoln & Guba, 1985). The researcher didn't use multiple coders, but did present the themes and different stages of analysis to peers, supervisors and at conferences to check the conformability of results. The researcher also sought consistency in the approaches used, same researcher, and the same logic for coding throughout (Guest et, al., 2012).

3.8 FIELD WORK AMENDMENTS AND DISCREPANCIES

One of the main discontinuities involved households who moved to temporary accommodation whilst searching for, or building their more permanent residence. In some cases households were approached whilst already in their temporary dwelling and therefore interviews involved discussions about their previous house, the temporary dwelling, and the new dwelling they were moving into. Such cases involved an extra dimension of complexity that is not reported on much in the thesis, as the focus of the study was on the move from one house to another.

There is a dedicated section in 4.3.1 which focuses on the changes observed in temporary dwellings, and any case variations are presented more thoroughly in the individual case overviews (see Appendix 9). These factors account for some of the differences in the depth of knowledge of each household.

Efforts were made to involve as many householders in the study as possible, however it was not always possible for all household members to be present for all interviews or to take part in the study entirely. The study used a category B ethics application, which limited the age of participants to over 18 years of age (see Appendix 4). Although younger participants were often present in the household their interactions were not recorded and omitted from analysis.

Participants younger than 18 years of age were primarily avoided because there was a parallel study focusing on the energy literacy and influence of children on energy related decision making in houses happening at the same time of this thesis (see Aguirre-Bielschowsky, 2013). Instead of duplicating research efforts and creating an even broader

scope, the focus of this thesis remained on understanding the dynamics of the household as a whole, and use insights from the Aguirre-Bielschowsky (2013) study to provide further evidence of children's influence.

Chapter 4 MOVING HOME, MAKING DECISIONS AND CHANGING NORMS

The results of this thesis are broken up into two chapters (4 and 5). Both chapters present findings and then follow with a discussion. The current chapter firstly presents an overview of the cases before focusing on the energy related decisions and norm establishment observed during residential mobility.

4.1 DESCRIPTION OF HOUSEHOLDS

The sixteen households chosen for the study varied in both demographic and situational characteristics. The cases ranged from students to pensioners and each case was representative of a particular life stage, such as moving out of a student flat, moving in with a new partner, buying a first home, moving into a home to retire in, and downsizing to a more manageable section.

Table 11: Case Overviews

Case #	Case Name	Overview
1	Onwards and upwards	Young family comes across some extra capital and takes the opportunity to purchase a first home
2	From flatmate to landlord	Young professional female wants to get out of flatting and put some of her money towards a housing investment
3	From temporariness to semi-permanence	Young male moves out of his parents house to live with his new partner
4	Moving from a 'house' to a 'home'	Older couple purchase a larger and more comfortable home
5	A couple restricted	Younger couple who are financially restricted struggle with the poor housing options available
6	Down the housing ladder, upping the equity	Middle-aged family seek a cheaper house with a lower mortgage so they can spend money on other things
7	A first home for a growing family	Younger family have saved for some time and now have the equity to buy their first house together
8	Quietening down	Older female moves out of the family home to find a smaller more manageable section with better memories
9	For a city life	Younger family seek a house in the city suburbs after their rural location becomes a transport and lifestyle burden
10	An opportunity you can't turn down	Younger couple move out of their shared flatting situation into a managed apartment with free utilities
11	Regaining control	Middle aged lady moves into a larger house with more responsibility after recovering from an illness
12	Warmth comes to those who wait	Younger couple move into their first home with a high level of comfort after renting and saving for a number of years
13	Lets build a REALY warm house this time!	Middle aged family build their second home together, this time with an even bigger focus on effective heating
14*	A step in time	Younger family look to move out of looking after the parents farm and buy another investment property in the city
15	Moving on	Older couple retire and move to a warmer holiday destination to pursue a new lifestyle
16	One step forward, two steps back	Middle aged family build a new house in the suburbs after previously becoming redundant

*Case 14 involved a household that wanted to move, but did not manage to within the space of this study. The case has been kept in the results as it provides insight to an important part of the housing ladder.

The longitudinal nature of the study meant that some participants moved home more than once during the duration of the thesis. Discrepancies and differences will be elaborated upon throughout the results section. Detailed overviews of each case can be found in Appendix 9.

Table 12: Case Demographics

Case #	Social Arrangement	Ages (in years, approximate)	Household Income (approximate)	Gender	Ethnicity
Case 1	Family	(40-45)x2, 6,9,13	$60,000	M,F,M,M, M	New Zealand European
Case 2	Flat	(20-25)x3	$80,000	F,F,F	New Zealand European
Case 3	Family to Couple	(25-30), (55-60)x2 to (25-30)x3	>$100,000 to $50,000	M,M,F to M,F	New Zealand European
Case 4	Couple	(55-60)x2	$50,000	M,F	(European, Maori)
Case 5	Couple	(30-35)x2	$40,000	M,F	(Asian)
Case 6	Family	(45-50)x2, 18	>100,000	M,F,M	New Zealand European
Case 7	Family to Family +Baby	(40-45)x2, 7 then <1	$70,000	M,F,M then added F	New Zealand European
Case 8	Solo to Guest to Solo	65+ - 65+	$35,000	F to F, to F	New Zealand European
Case 9	Family	(35-40)x2, 2, 4, 5	$90,000	M,F,F,M,M	New Zealand European, Maori
Case 10	Family to Couple to Flat	(20-25)x5 then (20-25)x2 then (20-30)x5	$70,000 $30,000 $70,000	M,M,M,F,F, to M,F, to M,M,F,F,F	New Zealand European for H1,H2 then American and New Zealand European
Case 11	Solo to Flat	(35-40)x2	$50,000 to $100,000	F to F+M	New Zealand European then German
Case 12	Couple	(30-35)x2	>$100,000	M,F	New Zealand European
Case 13	Family	(40-45)x2, 11,13	>$100,000	M,F,M,M	New Zealand European
Case 14	Family	(35-40)x2, 4,6	>$100,000	M,F,M,F	New Zealand European
Case	Couple	(65+)x2	$50,000	M,F	New Zealand

15					European
Case 16	Family	(35-40)x2, 9,12	$70,000	M,F,F,M	New Zealand European

Table 12 presents a brief overview of some of the demographics of householders in the study. The table shows how cases had a broad range of incomes, ages, genders and ethnicities, some of which also underwent changes as the household composition changed. Most cases were spread across ages, however there is a slightly larger group of householders in their 20's and 30's with a slight shortage of householders in their 50's. This is however more representative of New Zealand's mobile population, with most householders moving in their 20's and 30's. Cases were slightly skewed to the younger age bracket, but there were three cases that involved retired, retiring and semi-retired householders. Two of the families moved into newly built houses which they had had input into the design themselves.

Cases were slightly skewed to the younger age bracket, but there were three cases that involved retired, retiring and semi-retired householders. Two of the families moved into newly built houses which they had had input into the design themselves. There was a relatively broad spread of ethnicities for the small sample size, as most inhabitants in Dunedin are New Zealand European. Ethnicity and background have been discussed specifically in the case overviews or findings where relevant.

The sixteen households chosen for the study varied in both demographic and situational characteristics. The cases ranged from students to pensioners and each case was representative of a particular life stage, such as moving out of a student flat, moving in with a new partner, buying a first home, moving into a home to retire in, and downsizing to a more manageable section.

4.2 ENERGY RELATED INVESTMENTS

The chapter will now investigate the kinds of decisions households make during mobility that influence energy consumption, by focusing on dwelling choice criteria and fixture investment strategies made by householders in 16 case studies. The chapter will firstly present the cases studied, then address decision making. Finally the chapter explores how these householders decide to use energy in a new dwelling, and the process by which energy related norms are established.

The research questions were therefore:

1. In what way is household energy use considered when households search for a new dwelling?
2. What are the strategies by which householders choose and make changes to housing attributes that affect energy consumption as they move along their housing careers?
3. How are household norms concerning energy consumption established in a new dwelling?

The findings of this study reaffirmed the notion that residential mobility is closely associated with life stages, as was argued in the literature review earlier. Section 4.2.1 covers the decisions and decision criteria relating to energy investments along the housing ladder. It shows that as householders' experiences of residential mobility increase so too does their desired comfort level and ability to choose or alter dwellings that meet those levels. Section 4.2.1 argues that householders' comfort levels are based upon their dwelling experience through the examples of sunlight hours, insulation, and heat source. Section 4.2.3 applies this relationship to the housing ladder to show how a householder's position on the ladder affects decision making strategies afforded to energy related investments and behavioural responses to new environments.

4.2.1 Energy related choice criteria during the residential mobility process

As residential mobility involves making decisions about a new dwelling, householders needed to agree on the dwelling attributes that suited how they would like to live. Energy related decisions around the physical aspects of a dwelling were often bundled within ideas of what it meant to them to be warm and comfortable. The results showed that as householders dwelling experience increased, so too did their desired levels of comfort.

Three common themes associated with a house's potential thermal comfort emerged from the study: these were the availability of sunlight, insulation, and the type of heating method available. As Dunedin lies in a relatively hilly area with cold winter months and poor housing stock, all of the aforementioned variables were crucial to householders' overall comfort levels in a new dwelling as captured by the statement below:

> *In Dunedin you just have to have a warm house and . . . I always think to myself, how do I advertise the property and those things would be in your ad; sun. . .insulation and a heat source [log burner or heat pump], great. Those three things alone are such a magnet for people and I mean as long as the house is, you know, the house has got to be nice as well, but you'll grab people with those three factors alone. . .*
> C14I2R1P9[9]

[9] The quotation references are as follows:

C = Case Number
I = Interview Number
R = Respondent Number
P = Page Number

These three material elements were commonly associated with what was considered to be a warm or comfortable house (expressed by Cases 1,2,6,7,9,11,12,13,14,15,16), which was a goal for many people looking for a new dwelling, such as Bronwyn in Case 2:

> *When I move to my house, I wanna be warm in my own house, not having to worry about it.*. C2I1R1P14

4.2.1.1 Being warm - Sunlight hours

Given the limited amount of sun that many dwellings receive in Dunedin during winter, it was common for those who had previous experience of choosing dwellings (Cases 1,2,3,7,9,10,11,12,13,14,15,16) in the area to emphasise the importance of receiving sun and having a warm house as demonstrated by the statement below:

> *The major thing [that would help a house save energy] would be the position of the house in relation to the sun. So, basically being up out of valleys on a sunny face. The longest number of sun hours possible. And having lots of windows facing the sun.* C3I1R1P3

The two concept maps below show the importance of sunlight hours within a householder's dwelling preference. The first figure represents how an unpleasant experience (lack of sun) drove the shared desire for a new dwelling which received optimal sunlight hours. The second figure represents the importance of the sun's ability to heat the house which was reinforced by the participant's emphasis on the benefits of the new dwelling's conservatory.

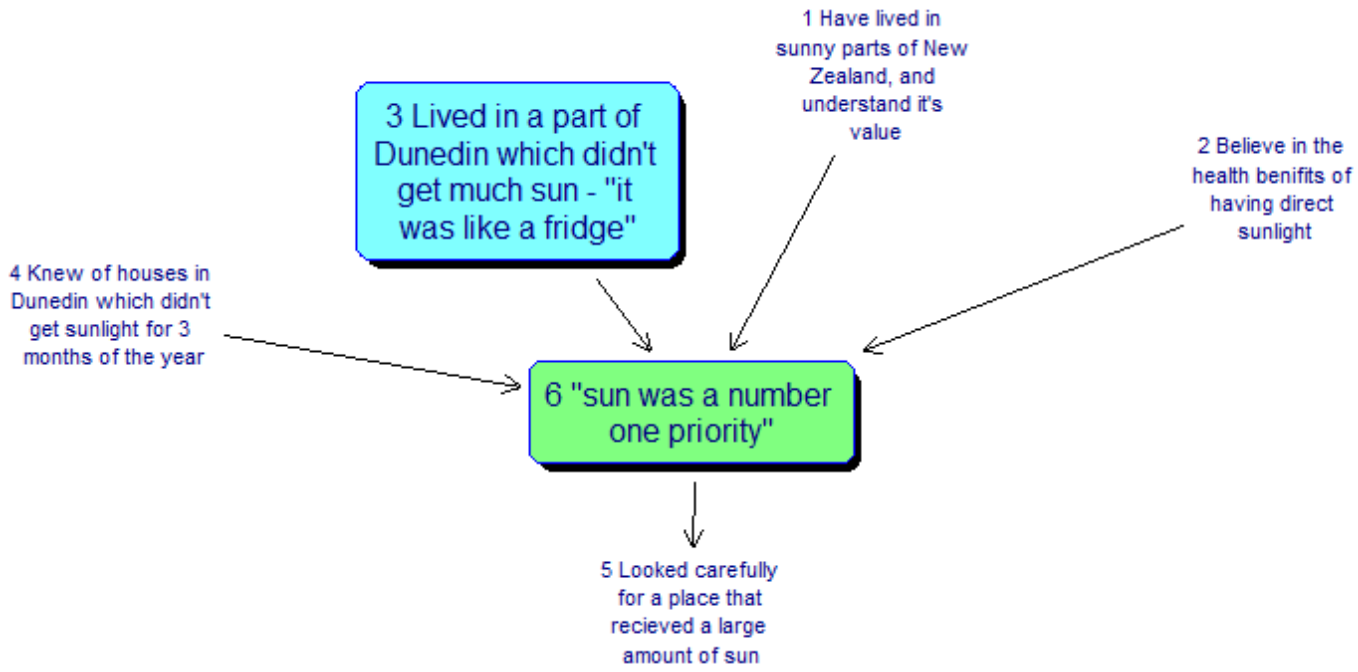


Figure 8: Case 15. Reasons for choosing House 1—sunlight was the number one priority

The householders in case 15 had learnt about the importance of sunlight in Dunedin the hard way in their experience of a cold house that received little sun. This drove the couple to make sure that their dwelling received as much sunlight as possible when choosing house 1 and 2 (Figure 8). The shaded concepts (box 3 and 6 above) show the mutually reinforcing perspectives of the two householders after sharing the same unpleasant experience which led to them both desiring sun in their next dwelling.

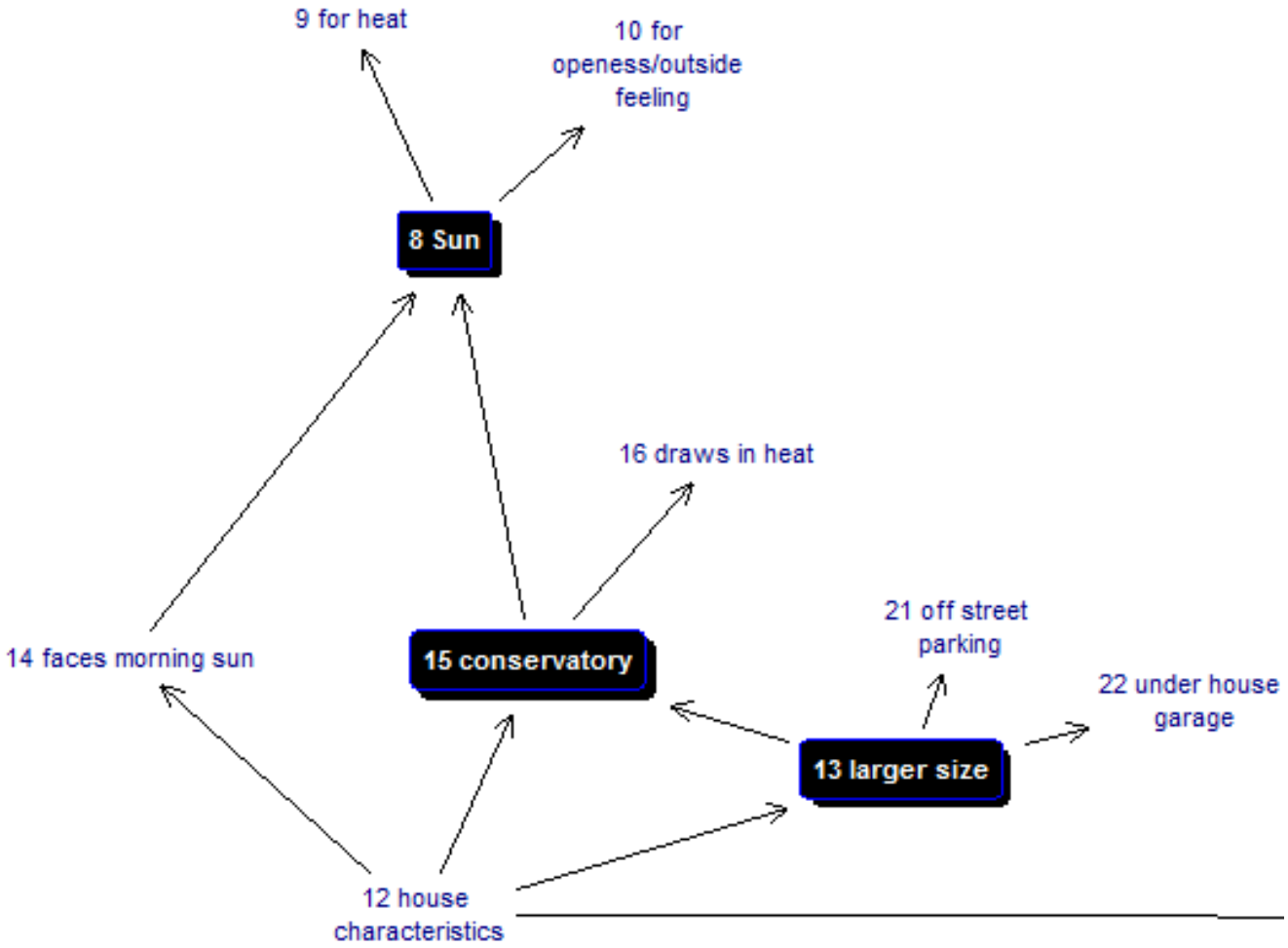


Figure 9: Case 4: Reasons for choosing House 2.

Figure 9 above shows three important elements which were part of Case 4 householders' choice criteria for house 2. As is demonstrated, two of the three most important attributes of the new dwelling were sun related. The first related to the dwelling's orientation to the sun and how many sunlight hours it received, and the second in the dwelling's structure in that it had a conservatory.

The concept map above shows that although householders did not consider energy use of the new dwelling directly, the value they attributed to sunlight inadvertently drove a decision which resulted in a house that utilized passive solar characteristics.

4.2.1.2 Being warm and comfortable – Insulation

Insulation is something which is often unseen and householders had a range of perspectives as to what exactly constituted household insulation. Although most participants recognised that insulation was important and desirable, they did not always explicitly check for insulation during their purchase process. Furthermore, householders were seen to prioritise the need for insulation depending on their levels of experience.

Case 9 aptly demonstrates the relationship between increasing experience and comfort levels in relation to insulation. Having increased their experience by retrofitting a dwelling with insulation in the past, Jane [10]and Mark's desired levels of comfort had also increased. When looking for a new dwelling, insulation or the ability to insulate the dwelling was seen as a priority that they were unwilling to compromise on due to their past experience (this is discussed in more detail in 4.3).

> Jane: *So it was pretty, yeah, we certainly found that the insulation and the double glazing transformed the way we lived, to be honest; not just Mike, but the whole family. And so we sort of went from running, like not just talking in the purely in an energy sense but you know [going from using] three oil heaters a night for the kids to just the house being pretty warm really, and really cosy. . .*
>
> C9I1R1P2

Zelda and Dieter (Case 5) on the other hand, were both motivated to find a warmer and nicer dwelling but ended up choosing one that was colder than their original dwelling due to a lack of experience with Dunedin housing options and energy efficient technologies. Such an instance adds to Burke's argument (2006) that while many people claim to care about

[10] Please note – all names used in this thesis are fictitious. All identifying information has been removed as part of the ethics approval agreement. Synonyms have been used for easier identification and reading.

efficient housing technologies such as insulation, these desires can be forgotten during dwelling selection. When taking both of these cases together, one could postulate that as experience levels increase so too do desired comfort levels, while lower experience levels could hinder a household's ability to achieve or desire higher comfort.

First home buyers also claimed that insulation was important, but in some cases financial restrictions meant that the priority of obtaining a dwelling with insulation decreased. For Case 1 insulation was considered a secondary priority so long as this could be remedied later on, as their first priority was to find a dwelling which worked for them (see 4.2.3.5).

4.2.1.3 Being warm and comfortable – heat source

Heat sources were a more explicit reference point which householders could use to decide on a new dwelling, so the type of heating fixtures that the dwelling offered was a more obvious selling point for householders. Heating fixtures were another element which householders used to determine if a house would provide the levels of thermal comfort they were seeking. The two most common heating fixtures available were log burners and heat pumps (see Table 13).

Heat pumps, which are air to air units that work on the same principle as air conditioners. All heat pumps in this study involved an outside unit with compressor and interior unit with a fan. Heat pumps typically are more efficient than other forms of heating as they can provide around three times the amount of thermal energy output for the amount of electrical energy used to run the device. Bar heaters referred to in this study involve all electric heaters which use electrical resistance to create energy (through the flow of electric energy through a bar which creates heat). Bar heaters, have an output of 1 to 1, meaning that the amount of energy involved to create the heat is the same amount of energy which is released from the heat source. Regardless of the way in which that heat is dispersed (such as through the use of a fan, or by heating up an oil column), the method of heat creation is the same as well as the thermal efficiency of the heat source.

Log burners mentioned in this study involve wood fuelled fireplaces which are enclosed, and can be either free standing or built into the fireplace of a dwelling. Log burners are generally less efficient than electrical heaters as some of the heat energy is released into the atmosphere after combustion. More modern log burners are able to capture much of this heat and disperse it back into the dwelling, and both are much more efficient than open fires.

Gas heaters described are either portable or fixed into the wall. More modern gas fireplaces can effectively utilise the heat produced from combustion and are more efficient than many wood burners. However the gas heaters involved in this study were older ones which were less efficient.

Coal was used in two cases for heating, but in two very different systems. In case 7, coal was used in a range to heat the house and also for cooking. This was an old system where much of the energy released went up the chimney. Coal was also used in case 13 as part of a new central heating system which heated the house's hot water, underfloor heating and radiators. The burner of this coal system was significantly more efficient and effective than the older coal range, however it needed to run all day and night in order to perform its heating functions (all of which were automated).

Table 13: The energy services ladder and changing heating devices

Main heating source	Own (O)/ Rent (R)?	Size - Upscale/ Downscale	Aesthetic comfort - Upscale/ Downscale	Insulation	**Case #**
Bar heater to heat pump	R-R	Same	U	Same	Case 3
Bar heater to bar heater	R-R	U	U	Improve	Case 5
Bar heater to heat pump	R-R	Up	U	improve	Case 11
Log burner to heat pump	O-O	U	U	Improve	Case 4
Heat pump to heat pump	R-R-R	U-D	U	Improve	Case 10
Heat pump to log burner	R-O	U	S	Improve	Case 2
Gas/to log burner	R-O	U	U	Improve	Case 12
Log burner to log burner and heat pumps	R-O	U	U	Downgrade - invest	Case 1
Coal range, open fire to log burner + heat pump	R-O	U	U	Improve	Case 7
Bar heater + heat pump to heat pump	O-O	D	U	improve – invest	Case 15
Gas fire to log burner but remove, bar heater	O-O	U	D	downgrade - but they invest	Case 6
Log burner and heat pump to – (no move)	O-	?	?	-	Case 14
Log burner + heat pump to heat pump	O-R-O	D-U	D-U	Improve	Case 16
Log burner + heat pump to electric night store + heat pump to log burner + heat pump	O-R-O	D-U	D-U	downgrade - but they invest	Case 9
Bar heater to bar heater	O-R-O	D	U	improve	Case 8
Heat pump to coal central heating	O-R-O	U	U	improve	Case 13

Table 13 above displays changes in desires relating to warmth and comfort as householders moved home. In reference to the second column, O-R for example refers to householders moving from an ownership to a rental position. Insulation and heating methods, usually improved, and if moving resulted in a poorer quality heating source this was often followed by a subsequent retrofit investment (to be discussed later).

As households moved up the housing ladder, they tended to improve the efficiency of heating device and subsequent energy services in the house. Generally, improvements to the heating source meant that more of the dwelling would be heated, and it would be heated to a higher temperature than before the move.

4.2.2 Summary – energy related choice criteria

Due to the specific geography and climate of Dunedin, and the poor quality of housing stock, residents placed a high value on warm dwellings regardless of their experience levels. The energy related experience of householders, as well as their preferences for efficient and effective thermal comfort measures were expressed by how householders tried to improve the type of heating fixtures when moving and in the effort they made to find houses which received maximum sunlight hours. As householders' experience and knowledge of what made a dwelling comfortable in Dunedin increased, so too did their desired comfort level and ability to achieve it. While most participants claimed to understand what elements helped to create a warm efficient environment, previous experience was notably influential in how successful they were at achieving this.

4.2.3 Housing careers and the search for the ideal home

This section applies the previously noted relationship between experience levels and desired comfort levels to the housing ladder.

Table 14: Cases grouped according to position along the housing ladder

Position on Housing Ladder	Lifecycle Changes - House Composition	Number of Previous Rentals	Number of Previous Purchases	Comfort Norms	Moving Experience	Case #
Renting	Single – Flat	5	1	Medium	Low	11
Renting	Flat –Couple – Separated, back to Flat	3	0	Low	Low	10
Renting	Couple (no change)	3	0	Low	Low	5
Renting	Parents – Couple	5	0	Medium	Medium	3
Starter House	Family (no change)	3	1	Low	Medium	7
Starter House	Flat – Landlord/Flat … Couple	5	0	High	Low	2
Starter House	Family (no change)	4	0	Medium	Low	1
Intermediary House	Family – Guest – Family	2	2	High	Medium	16
Intermediary House	Family (no change)	?	3	Medium	Medium	14
Intermediary House	Single – Guest – Single	?	1	Medium	Medium	8
Intermediary House	Family (no change)	2	0	High	Medium	6
Family House	Couple (no change)	?	3	Medium	High	15
Family House	Family (no change)	?	1	High	High	13
Family House	Couple (no change)	2	0	Medium	Medium	12
Family House	Family (no change)	?	1	Medium	High	9
Family House	Couple (no change)	3	1	Medium	High	4

Table 14 summarises the different positions of cases along the housing ladder (according to Borgesen, 2013) and the different life stages that the householders are operating within. It shows that many housing adjustments were made by households to accommodate changes in family structure such as moving in with a partner or having a baby.

The level of moving experience was developed through the number of times householders had moved, the number house purchases householders had undertaken (if specified), and the householders ages. The comfort norms scale involved the householders energy behaviour characteristics and the types of material culture that they were accustomed to.

Table 14 shows that each household is going through different changes in their habitation, some with greater periods of disturbance than others. Some of those who have been in ownership positions have gone through an intermediary period of renting, which sometimes changed the social configurations of their living situation as well.

As can be seen in Table 14, the first five households stay within rental situations, and therefore have different levels of autonomy over their decisions than the other cases. The next four cases move out of the rental market into positions of ownership, showing perhaps the greatest change in autonomy of the cases in this study.

There are three cases which involve households who already own a home, and are moving to ‘intermediary houses’ and five cases which involve ‘family houses’. Case 8 involves a pensioner who moves out of her ‘family house’ into a pensioner apartment. Table 14 also shows that 6 cases changed the composition of their households when relocating.

4.2.3.1 Relationship between movement along housing ladder and changes in material culture

Table 15 below shows the changes to the some of the physical elements from House 1 to 2 across the cases. Firstly, one can see that almost all households increased their living standards by increasing the size of dwelling (through number of rooms) and levels of comfort (through the type dwelling materials). This finding aligns with typical models of western mobility as households move up the housing ladder.

Table 15: Housing ladder position and improvements in material culture

Case #	Housing Ladder Position	External cladding	Bedrooms	Insulation	Sunlight hours (winter)
1	Starter House	Wood-Brick	3-3	Same	6-8
2	Starter House	Concrete Brick- Brick	3-3	Improve	5-7
3	Renting	Wood/Plaster - Wood	3-2	Improve	4-5
4	Family House	Brick-Brick	2-3	Improve	7-6
5	Renting	Brick-Wood	1-1	Improve	7-3
6	Intermediary House	Wood-Wood	3-4	Improve	6-7
7	Starter House	Wood-Wood	3-3	Improve	3-5
8	Intermediary House	Brick-Brick	3-1	Downgrade - Invest	7-7
9	Family House	Wood-Brick-Wood	3-3-4	Improve	5-6-8
10	Renting	Wood/Plaster-Concrete-Brick-Brick	5-1-5	Improve – Invest	5-4-4
11	Renting	Brick-Wood	2-3	Downgrade - but they invest	6-5
12	Family House	Brick-Wood	2-4	Improve	3-7
13	Family House	Plaster-Brick-Brick	4-3-4	Improve	6-5-8
14	Intermediary House	Composite	4-	-	7-
15	Family House	Brick-Wood	4-5	Downgrade - but they invest	7-6
16	Intermediary House	Brick-Unsure-Stone	4-4-5-4	Improve	8-5-5-8

The participants in Case 14 were very explicit about their efforts to move up the housing ladder and considered each move to be a stepping stone closer to their 'ideal' home.

> *. . .we'd probably buy a place in Dunedin in the city which would turn into a rental and the next one after that would either be finding the dream home already built and move in and love it . . . but yeah, you know, what are the chances of finding that house you really, really, really want . . . so the dream would probably be building a house that we really love and that would have all those features of [sustainability], you know, being quite self-sufficient and really well insulated and you know, a pleasure to live in, for once in our lives. . .*
> C14I2R1P12

One of the most common factors sought by participants was to improve, or at least maintain the level of thermal comfort in the new dwelling. Participants also chose new dwellings that had improved thermal efficiencies—with better insulation, materials and sun aspects. This was especially true for householders who were renting, as they had less opportunity to improve a dwelling's thermal comfort after moving in. Case 10 moved from a cold university flatting situation to a well-insulated and well heated studio apartment where heating was included in the cost of rent:

> *. . . because we don't have to pay for the power we were kind of imagining just living in like a tropical sunset somewhere in the middle of winter, like in our room, like an oven . . .* C10I1P15

Those households who owned homes all invested in insulation if their new house was not as well insulated as their previous dwelling. Case 1, which involved a family purchasing their first home also wanted to improve their thermal comfort—but took a more long term view:

> *. . . we like the sun, we like being warm. Insulation was important but . . .we can get that government insulation package, where they subsidise insulation so that wasn't our primary concern... as long as the house could be insulated [in the future] . . .* C1I1P4

As households moved up the housing ladder there were many strategic investment decisions made to improve future levels of comfort. Those who had less financial means made different energy related decisions to those higher up the housing ladder as discussed in the following sections.

4.2.3.2 At the bottom of the housing ladder - Renting and household decisions

The potential for renters to alter their dwelling after moving in is substantially lower than for those who owned their own home. Out of the five cases where households moved from a rental situation to another rental dwelling (Cases 3, 4, 5,10, and 11), all sought warmer dwellings by seeking changes in the new dwelling in the amount of sunlight hours (Case 3), insulation (Cases 4, 11, and 10), and heating source (Cases 10, 5, 3 and 11).

Laura and Rodney (Case 10), moved from a shared flat of six people to a studio apartment. The couple found a room which included power in the price of rental, as well as having access to a spa, cinema, and gym. This case showed a large change in available resource use, as well as an increased autonomy as the couple were no longer hindered by the cost of energy, nor the previous energy related rules of the flat.

Laura had had enough of "*scummy flats*" (C10I1R1P3) and stumbled across an apartment which had many more amenities than they could have hoped for. This included the use of a gym, sauna and a cinema, for Laura, "one of those opportunities you can't pass up" (C10I1R1P14). Households who were in a rental also strived for a 'nicer' dwelling relative to the one they had been in previously (Cases 4, 5, 10 and 11).

4.2.3.3 First home purchases a "wait-and-see" approach

Four of the households interviewed were going through the process of purchasing their first home. Each of the four cases in Table 16 below were at different lifecycle stages with different levels of experience. As will be argued in 3.8.2.4 the strategies applied by first time buyers explained in this section are often noticeably different to those employed by experienced dwelling owners.

Table 16: Reasons for moving into home ownership market.

Case	Tenure	Life stage / household structure	Motivation for moving
Case 2	R-O	Flat – Landlord/Flat . . . Couple	Get out of renting
Case 12	R-O	Couple – Couple	Making the most of a financial opportunity
Case 1	R-O	Family – Family	Getting a 'push' after saving for many years
Case 7	R-O	Family – Family	Having the equity after saving for many years

For Case 12 there were a multitude of factors that led to the purchase of house two, but Jeff summed it up by saying that it was the ". . . *right place at the right price*" (C12I1R2P8). Teresa also stated ". . . *we could see how we would live in it. . .* " (C12I1R1P9), showing they could see how the new dwelling fitted their lifestyle preferences. The couple didn't have a specific location in mind, but instead were looking for a house that fulfilled their requirements, such as a larger size, newer materials and better sunlight hours than their last house.

Households who were purchasing their first home were less likely to make immediate changes to a dwelling after moving. First home purchasers had plans to make changes in the future, but did not enact them in the same time frame as those householders who were already in a position of home ownership.

When discussing House 2 before moving in, Jeff from Case 12 said,

> *We don't know how warm it's going to be to live in. They don't give you that rating when you buy it so we figure that rather than rush and go, right, 'Let's put some heat pumps in,' we may as well figure out what it's like . . . "* C12I1R2P19

Lucy from case 7 had a similar perspective when discussing what she expected of her husband in the new house:

> *. . .he's not allowed to do anything in the first year. Because I figure that you need to live in a house for a year when you own it before you decide to change anything majorly. . .* C7I1R2P21

Although the 'first home' purchase households expressed desires to make changes to their new dwelling, they took much longer to make those changes. Households 1 and 2 both made changes to their main heating systems about a year after moving in.

4.2.3.4 Experienced home buyers' "just do it" approach

Householders who had already owned a home were sometimes more ready to make changes to their dwelling if they felt that it did not fit their desired comfort levels. The difference between more experienced buyers and first home owners was shown in the timeframe in which they made energy related investments (see Table 17 below). The more experienced home buyers did not always take a wait-and-see approach because they had more established expectations of comfort and experience of how to achieve them.

Table 17: Heating investments for homeowners

Own/ Rent?	Structure investment	Fixture investment	Timeframe	Case #
R-O	No	No	-	7
R-O	No	No	-	12
O-O	No	No	-	4
O-R-O	No	No	-	8
R-O	No	Yes	after – long (8 months)	2
R-O	Yes	Yes	after – long (7 months)	1
O-R-O	Yes	Yes	Decide before-changes medium + long term (1-6 months)	9
O-O	Yes	Yes	Before + after	15
O-O	Yes	Yes	Before + after	6
O-R-O	Yes	Yes	New build (before)	16
O-R-O	Yes	Yes	New build (before)	13

The availability of housing stock would sometimes restrict the options for home buyers, giving them additional reasons to change a dwelling that was almost right. Driven by their past experience and their normalised comfort standards, Case 9 made changes very swiftly after arriving in their new home.

Cases 15 and 6 bought their second dwelling some time ago as an investment property. Now that they had decided to move into the second house they were prepared to make changes to the dwelling to fit their preferences. Case 15 made changes to the structure of the house by upgrading with insulation and double glazing, and also installed a new heat pump as they prepared their home for retirement.

Case 9 retrofitted their first home and were pleased with the experience, so they were prepared to make investments in their new house. When the householders in Case 9 were discussing House 2, Jane mentioned,

> *. . .we can see that we want the same lifestyle that we had in our old house. . . The first thing we are going to do is replace . . . one massive window down the end of the hallway so we'll double glaze that. . . and then it's got really good roof space so we'll place the insulation in it and then we just got to sort of sit back and see what's it's like and try and maybe double glaze it, before winter, the rest of the house. . .So we do have a lot of plans for the house [including insulating and retrofitting [double glazing] but it's just because . . . we've had that experience of being warm and healthy and we want to get back to that as soon as we can . . .* C9I1R1P12

Cases 16 and 13 were householders building new dwellings to move into. They had both been through the process of building before and were practiced at making decisions about the material culture of a new dwelling. The Case 13 couple had been happy with the aesthetics of House 1 but were disappointed with its thermal effectiveness. Francine and

Doug undertook an extensive product search to make sure their next build would be as warm and efficient to heat as possible.

The Case 16 couple also built a new home, but to the same design as one they had built some years earlier. Apart from the savings they received by not having to pay for more design costs, the family was happy with the house design and comfort levels, so instead made adjustments to the dwelling to fit the new environment they were building on. This actually meant downgrading some of the insulation properties as their first house had been built for a much harsher climate.

Experienced home owners were thus prepared to make energy related investments in their new dwelling to fit their desired comfort levels. When possible, this was achieved quickly, before the householder moved in. The difference in approach to householders who were new to home ownership was that experienced home owners wanted to get back to their norms of comfort as soon as possible, whereas new homeowners already experienced increases in comfort and autonomy through their home purchase and were willing to take their time before undertaking retrofits. The types of trade-offs that householders made when weighing up acquiring new dwellings will now be discussed.

4.2.3.5 The economics of household decision making

> *You know, we're torn between the things that we'd like to purchase and what we realistically can afford to purchase. And there's things that we chose [that] we wouldn't compromise for the house and there's things that we chose that we can replace in the future. . .*
>
> C13I1R1P10

Households in an ownership position did show some economic rationality in their investment decisions. As first time homeowners had little extra capital, it made sense that they would take their time to decide on other larger financial decisions. Interestingly, in the

two cases where householders built new dwellings, the priorities seemed to be the reverse to those who were buying pre-built dwellings. For the householders who were building dwellings from scratch, making sure the dwelling would be thermally effective was very important.

> *There were things that you can't change and the insulation is one of them . . . and the heating was the other . . .* C13I1R1P32

For other home buyers, the priority was purchasing the right house, and thermal and heating requirements were compensatory items which could be added on later (see Case 1 overview).

The way that householders juggled priorities was shown in the differences in financial capability and experience, as well as personal motivations to achieve thermal comfort.

4.2.4 Summary – Purchase Decisions

The results show the prior experience of householders informed the types of characteristics they sought in a new home. Experienced buyers in Dunedin were more aware of what was required to make a dwelling match their desired comfort levels and were prepared to swiftly invest in energy related retrofits even before experiencing what it was like to live in the new dwelling. In contrast, less experienced home owners took a wait-and-see approach before making changes, and instead were more prepared to experience what it was like to live in the new house.

Energy related investment decisions were aligned within the parameters afforded to householders moving along stages on the housing ladder. As households moved up the housing ladder, their experience often grew as did their knowledge of their comfort norms and how to achieve them through investment in new energy efficient technologies.

4.3 CHANGING NORMS IN A CHANGING CONTEXT

Household decisions on how energy should be used were generally made in a social context involving other household members. This included different householder preferences and opinions which were then sometimes explicitly or implicitly negotiated between householder members. Households were found to interact differently according to such things as size, relationship status and age of relationship.

The findings revealed some of the strategies householders used when deciding how energy should be used in the home. Firstly, the section outlines the varying social situations of the cases. Then the process by which householders adapted to changing composition and changing social context will be explored. Finally, the results will reflect on some of the strategies used by householders to establish or re-establish energy norms.

Table 18: Changes in household structure and composition

Composition change	House 1	House 2	House 3	Social context	Case #
Yes	3 adult	3 adult then 2 adult		Flat-Flat-Couple	2
Yes	3 adult	2 + 1 adult		Family-Couple	3
Yes	2 adult 1 child +2 child	2 adult 2 child +2 child		Family-Family+Baby	7
Yes	1 adult	2 adult	1 adult	Solo-Guest-Solo	8
Yes	5 adult	2 adult	5 adult	Flat-Couple-Flat	10
Yes	1 adult	1 adult		Solo-Flat	11
Yes	2 adult 2 child	2 adult 2 child	2 adult 2 child	Family-Family-Guest-Family	16
No	2 adult 3 child	2 adult 3 child		Family-Family	1
No	2 adult	2 adult		Couple-Couple	5
No	2 adult 1 child	2 adult 1 child		Family-Family	6
No	2 adult 3 child	2 adult 3 child	2 adult 3 child	Family-Family-Family	9
No	2 adult	2 adult		Couple-Couple	12
No	2 adult 2 child	2 adult 2 child	2 adult 2 child	Family-Family	13
No	2 adult 2 child	2 adult 2 child		Family-Family	14
No	2 adult	2 adult		Couple-Couple	15
No	2 adult	2 adult		Couple-Couple	4

In Table 18, the cases which underwent a change in household composition during the mobility process are shaded (Case 2–16). In two cases (8, 16), this was only temporary as the households stayed with friends and family whilst they waited for their new dwelling to become available. The other cases saw changes such as having a baby (Case 7), or moving into a flatting situation. There were also three cases where householders moved from a flat or family situation, or changed their living situation through starting or ending a monogamous relationship (Cases 2, 3, and 10).

4.3.1 The household structure - framing the decision making context

To introduce the social nature of how energy related norms were shaped in new dwellings, the four cases which moved into temporary dwellings will be discussed first. These temporary dwellings cases (shown in Table 19) highlight how the social context can mandate energy behaviours, regardless of the material culture that envelops them.

Four of the stable households interviewed moved into temporary accommodation with two main distinctions: they either moved into an empty dwelling, or into a dwelling that already had other household members occupying it. If householders stayed with others as guests, they normally adjusted their patterns to the social norms of the hosts. However, If householders moved into an empty dwelling, rules were ‘temporarily’ adjusted to manage in the short term environment

Table 19: Social contexts of short term intermediary dwellings

Case #	House 1 social context	Social context in temporary dwelling	Timeframe
8	Solo (1 occupant)	Guest (with friend), (2 occupants)	Short term (3 months)
16	Family (4 occupants)	Guest (with grandparents), (6 occupants)	Long term (6 months)
9	Family (5 occupants)	Renting (5 occupants)	Short term (3 months)
13	Family (4 occupants)	Renting (4 occupants)	Long term (1 year)

4.3.1.1 Abide and suffer – adapting to others norms

Cases 8 and 16 stayed with friends or family whilst waiting for their next dwelling to become available (see Table 19). In guest situations, norms of thermal comfort were adjusted to go along with their hosts. Both cases expected that they would be adjusting their behaviours somewhat to the host norms, as well as to the fixtures and house layout that the temporary dwellings offered.

In Case 8, Victoria was a retired lady who moved in with a friend whilst she searched for a new house. Victoria was aware that the dwelling had a different heating system, and that her hosts routine for drying clothes was different to what she was used to.

> *Well she has a heat pump going a lot and she doesn't even put her clothes out on the clothes line, she just dries them with the heat pump, so that will be probably [be different] . . .* C8I1R1P13

Case 16, a family of four, moved in with their grandparents as they built their new home. Although the dwelling had a similar material culture to what they were used to, the norms of the grandparents were somewhat different.

Jerry: Oh they get up early, they do. They actually live vampire hours. They're up about 4, 5 o'clock. They fall asleep about 8 so, yeah it takes a bit of getting used to. . .they do feel. . .the cold more.

> Berthilda: *They'll start the fire up when they're cold and. . . – We're sitting there in singlets and they're in their Swanndris [woollen jersey]. . .*
>
> Jerry: *It was at 22 degrees when I went to bed last night. Stifling, yeah. . .* C16I2R1,2P18,19

Guests in temporary accommodation were found to be more influenced by the norms of the hosts, rather than that of the material change that they incurred. Instead of the householders forcing their own energy norms on the hosts, they adapted to fit the current social context. The fact that there were different social protocols, as well as a short time period, householders were more prepared to adjust temporarily.

4.3.1.2 Hotel freedom – whatever it takes to be comfortable

For the householders who moved into a temporary rental situation, there was a different social precedent. Householders only needed to adjust to the new material environment, however this also caused adjustments to energy related norms—rather than a need to adjust to a different family's norms.

In the temporary rental situation, time was one of the more crucial factors influencing energy related behaviour. As householders were not in their 'ideal' situation and would be

there for only a limited time, they may have been more relaxed about saving energy for the sake of being comfortable.

> *I think that we have just been doing in this house doing whatever makes us feel good. And whether that's doing dishes six times a day because we just want the bench to be clear. It's just gone all out the window really. And it's just a bit different to what we are used to where we would try to think about these things [energy efficient practices]. . .*
>
> C9I1R1P6

Although both households made adjustments to their energy related behaviours, Case 9 was substantially greater for two reasons. Firstly, the dwelling's material culture differed substantially to what they were used to, with poor insulation, poor heating options, and an unsafe outside play area for the children.

Secondly the household was staying in their temporary accommodation for a shorter period of time; three months versus one year. Case 9 therefore made more radical steps to feel comfortable, and explicitly decided to behave in a more 'frivolous' way as they knew it would be short term. In contrast Case 13 was able to re-establish many of their previous energy related behaviours.

What household appliances householders could take with them into a temporary dwelling was also important to continuing similar energy related routines. In cases 8, 16 and 9, most of their possessions were in storage and they therefore needed to adapt to the technologies in the temporary dwelling.

As Case 13 stayed in a long term temporary dwelling, they had also moved many of their own appliances with them into the house, or purchased new ones in anticipation of their new house.

Francine: . . .*we've actually bought new appliances, like that's not our fridge because our last fridge had to stay at the house, so we've bought a new fridge, of course bought a new oven, we bought a new microwave. . .*

C13I1R1P8

This meant that the material culture had been well adapted to their preferences, and there were far less issues with adapting to the environment than with Case 9.

In both cases (8,9), some energy saving measures were relaxed in order to maintain a certain level of comfort. Householders found it easier to talk about their energy saving practices than how those practices came about. Many of the routines that householders had adopted were habitual, and therefore implicit. When there was a social context change, the norms of the host families set the precedent for how energy should be used. If householders' social context did not change and they stayed in a short term dwelling, energy saving behaviours were more relaxed.

The results will now elaborate on how changes to the social context of the household set new norms in a new dwelling. The results will firstly focus on those cases that underwent a change in household composition before reflecting on the social context as a whole.

4.3.2 Changing household composition

The previous section showed how social contexts can mandate the energy related norms of a new dwelling. Seven of the households that moved home in this study also changed one or more of their household members. Changing the composition of a household caused varying degrees of re-alignment of householder norms. This also changed the nature of the relationships of the householders. Only case 7 maintained a family arrangement, as the change in composition was a new-born baby.

Table 20 below shows the cases who changed in composition after moving. At the bottom of the table are the two households who were guests in another's dwelling which have been discussed above. The first four cases in Table 6 below show households who underwent a composition change swiftly after moving into House 2. Household 2 also underwent a composition change, but this was months after having moved in.

Table 20: Cases, which underwent a change in household composition

Case #	Own/Rent	House 1	House 2	House 3	Context
10	R-R-R	5 adult	2 adult	5 adult	Flat-Couple-Flat
11	R-R	1 adult	2 adult		Solo-Flat
3	R-R	3 adult	2 adult +1 adult		Family - Couple
7	R-O	2 adult 1 child	2 adult 2 child		Family-Family+ (New Baby)
2	R-O	3 adult	3 adult, then 2 adult later on		Flat-Flat-Couple
16	O-R-O	2 adult 2 child	4 adults 2 child (temporary)	2 adult, 2 children	Family – Guest - Family
8	O-R-O	1 adult	2 adults (temporary)	1 adult	Solo-Guest-Solo

For cases where the composition of the household changed as they moved in, there was a change in the nature of householder relationships. The occupants in Case 10 moved from being in a flat with shared occupants to being a couple in a studio apartment. In Case 11, Dorothy went from living on her own to living with a flatmate who she had not met before. As the social context changed, energy related norms were adjusted as the householders found the most appropriate ways to use energy together.

Changing household composition affected the social context of the household. Different social contexts provided varying pressures on energy related norms. The chapter will now

look more deeply into the ways that householders established energy use patterns when changing their material and social context.

4.3.2.1 Changing contexts and changing roles

As householders moved, sometimes roles were changed to accommodate for changes to the household composition. Case 7 involved an established family moving into their first home (ownership). At the same time, they were expecting the arrival of their second child together. The new addition to the family disrupted householder roles, as the mother stayed at home with the baby whereas previously both parents had worked full time.

Before moving, the parents in Case 7 did not anticipate that the baby would change energy consumption much, except for the need to do more washing. This was partially due to the parents' uncertainty around how warm the new dwelling would be, and whether it would be easier to heat than their last house (see Figure 10 below).

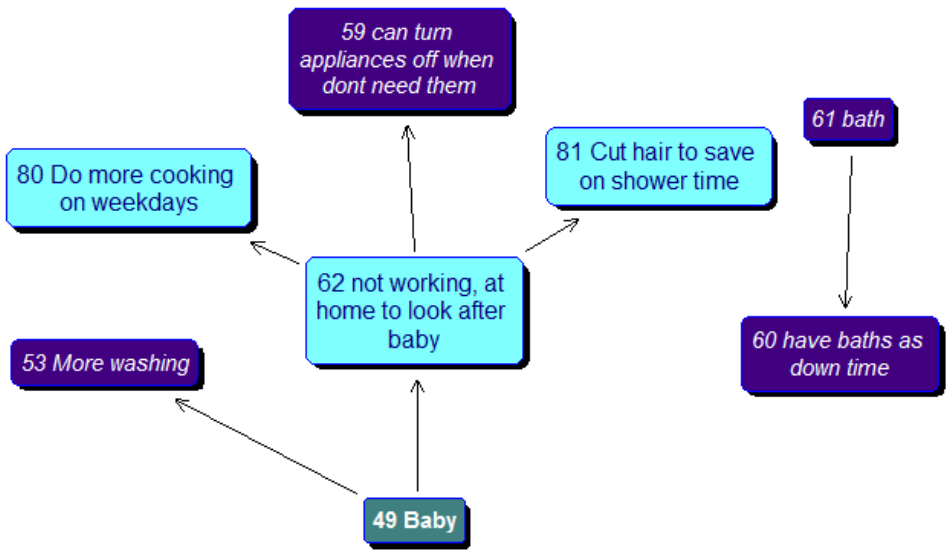


Figure 10: Actual new behaviours after the baby arrived in House 2. From case overview 7, p. 11.

When they moved into their new dwelling, the new addition to household 7 changed the roles of the householders. Along with adapting new routines for the family's new environment, the mother was now primarily responsible for managing the heating of the household, whereas previously the parents had shared the responsibility. Concepts 80, 62 and 81 above refer to the new roles of the mother in House 2. The other concepts with white lettering (53, 60, 61, 59) refer to the new energy related behaviours that occurred in the new dwelling due to the wife's changing roles (due to the baby) and the new material elements of the dwelling (such as now owning a bath)

Although the change in energy roles was not expected, nor explicitly decided by the parents in interview one, their decision to have the mother at home gave way to her taking over more of the household chores, and therefore having more autonomy to use energy in the way that she wanted to[11].

As expected there was more clothes washing done (Figure 10), but also more cooking done during the day. In case 7, the change in household composition necessitated changes to householder roles, energy use patterns and autonomy of the mother to make energy related decisions.

4.3.2.2 Attitudes and autonomy

The other three cases (Cases 10, 11, and 3) of households with changes in composition saw much more significant changes in their social structure. There were differences in the nature of the householder relationships as well as changing autonomy over energy related decisions afforded to household members. As the social structure of these cases changed, so too did the roles and power structure of household members. As householders adapted to these changes, they adopted different strategies in order to reach an understanding of how energy would be used.

11 The autonomy of the mother also changed in her ability to heat the house in the way she wanted to. This however will be discussed in chapter four, as it was more closely related to the change in the material culture than the change to household composition.

Case 3 involved Eric, a male in his twenties who moved out of his parents' house and into a house with his new partner. By moving, Eric was no longer restricted by his parent's rules of using energy and gained increased autonomy to live how he wanted to live. This meant he was able to conserve energy the way he wanted to. One way that he liked to save energy was by making sure that doors were closed in unused parts of the house, something which he had struggled to maintain in the house with his parents.

In House 2, Eric was more responsible for the household income and expenses. His new partner Jolene was responsible for paying the energy bill, whilst Eric looked after the phone and internet.

Jolene: *Yes, I am [responsible for electricity bills]. We pay shares.*

Eric: *We pay evenly*

Jolene: *He always pays me back, but I'm responsible for paying it and getting the bills in or whatever.*

Eric: *My name's on the other bill. I handle the phone and internet and she handles the power bill. . .* C3I2R1,2P4

Eric and Jolene divided responsibilities over household tasks, but both were responsible for maintaining energy saving practices. The couple stated that they rarely had many explicit discussions around energy use. Jolene put this to the possibility that they had similar attitudes towards using energy:

I think our parents both taught us similar energy conservation rules . . You know, don't leave lights on if you're not in the room. . .

C3I3R2P15

The similarities in attitudes towards using energy, as well as the role specialisation around household bills seemed to create a shared level of responsibility, and a low level of householder conflict. However there may have also been some flexibility afforded to the new relationship[12].

Jolene*: I don't think we've ever argued about [using energy], aside from [Eric] getting annoyed at the bathroom light is on and moths get in.*

Eric: *Oh, just accidental moths, yeah.*

Jolene: *That's about the only time we've argued over the power usage*.

Eric: *Yeah, that wasn't really about power, though, was it? It was about moths.*

Jolene: *No, moths and wasting power. . .* C3I3R2P28

Case 3 saw Eric go from having little responsibility or autonomy over how energy was used, to becoming much more involved in the decision making process. Although there were many new social elements to get used to, the couple had not had many disagreements over energy, and this seemed to be an area where they both had common values and attitudes. This similarity between the householders' attitudes towards energy and the

12 The idea about being 'gracious' with other household members as they settled into a new dwelling was also discussed by Francine in case 13.

subsequent energy related norms will be discussed further in the influence strategies section later.

4.3.2.3 The adjustment of householder norms

Case 11 involved a single lady (Dorothy) who moved from a flat by herself into a larger house where she sublet to a flatmate to help with rent. Having lived by herself for some time, she needed to make herself comfortable with the idea of releasing some autonomy over how power was used in the new home.

Dorothy had two different flatmates in House 2 over the course of the interview period. The first flatmate was a chef, who worked different hours from Dorothy, and was therefore rarely in the living areas at the same time. This meant that there were few shared activities between them (such as cooking), and in many ways, they both lived as if they were on their own.

The presence of another person in the house did have some influence on Dorothy's practices however, as she had noticed that her flatmate did some things differently she considered trialling those behaviours herself.

> *I do notice it that habit of his of leaving the [bathroom] door open and it does a much better job of keeping that room clearer of the moisture . . . these last few days I've taken to leaving the door open myself just so I'm sort of adopting, learning sort of things that I assess and think, 'Good idea, I might try that . . .*
> C11I2R1P20,21

When Dorothy's second flatmate came, they both worked in the same building with similar work hours. This meant that they shared more activities and responsibilities together such as cooking or watching television:

> *. . .there's a lot more days when she is here in the evening, like for example, tonight she was here sort of not long after I got here… I have to admit, [I] do spend a lot more time with [Flatmate 2] and myself in the same room in the evenings than I ever did with [Flatmate 1]. . .*
>
> C11I3R1P2

Having flatmates caused Dorothy to adjust her normal routines to involve other household members. Because of Flatmate 1's contrasting work hours, this allowed Dorothy to have a relatively gentle transition into living and coordinating with another household member.

4.3.2.4 Maintaining control, and influencing others

Dorothy took some rigorous measures in order to understand the influence of Flatmate 1's energy use and behaviour patterns. As Dorothy was subletting the house, she maintained responsibility over managing and paying the electricity bills, and had spoken with the flatmate explicitly about how energy could or should be used in the new house. This will be elaborated upon in section 4.3.3.3.

By the time her second flatmate had moved in, Dorothy was much more comfortable with having a shared arrangement, and felt that they had similar ideas about energy[13].

> [Flatmate 2] *is a sensible person. She doesn't just leave heaters on and things like that. She's, you know, aware of not wasting electricity so I feel like that's a fine sort of situation . . .*
>
> C11I3R1P2[14]

4.3.2.5 Summary - Changing household composition

In the cases discussed above, changes in household composition caused changes to the social context, which in turn changed individuals' autonomy to influence household norms. Sometimes this was explicitly discussed, in others it happened through a relatively implicit process. Case 7's arrival of a new-born gave the mother more autonomy over household appliances by allowing her to manage them in the way she felt most comfortable with. In Case 3, Eric was no longer restricted by his parents rules, and now had a greater hand in energy related decisions and the setting of household norms.

In Case 11, Dorothy, after being solely responsible for her electricity consumption when she lived on her own, needed to relinquish some control over how energy was used in her new

13 Similar to attitudes in Case 3 discussed above, also see "Sameness" section below

14 However, her now more relaxed attitude towards energy use also caused her to change her attitude towards how she heated the house (See case 11 Overview P11, 12)

home, especially in the beginning with Flatmate 1. Dorothy adopted measures to maintain some autonomy over energy consumption which will be further elaborated on in the following section.

4.3.3 Influence strategies, and setting household norms

The muddling through process (Park, 1982) by which householders make decisions was found to have implications in other areas of everyday life. In order to reduce conflict, some householders would avoid pushing their own ideas around using energy. In Case 5, Martha had a different attitude towards energy saving than her husband Stewart, Martha's attitude had also rubbed off on their son Doug.

Stewart, who found it important to save energy, was outnumbered by the rest of the family in his attempts to instigate efficient practices.

> Stewart: *I tend to, I've always been in the habit of, as I leave the room, turn the lights off. And it's just me, just long standing habit. Whereas others . . . [in the household behave differently]. [When] I got up and came down in the morning, . . . all the lights everywhere were on.*
>
> Martha*; Doug, he's a sad man isn't he, Doug, to be honest we don't really care, Doug and I.*
>
> Doug*: No.*
>
> Martha*: It's a light and that's all, whatever. . .*
>
> C6I1R1,2,3, P5,6

As Stewart had little influence over the rest of the householders when it came to switching lights off, he was cautious in his responses to the others' attitudes.

> Martha: *We can't be bothered [about switching lights off], and why should we? It doesn't matter . . . [laughing]. It's just not important . . [laughing]*.

> Stewart*: I can't control, I'm biting my tongue. But it is important to switch things off . . .* C6I1R1,2, P7

It was evident that the same processes family members used to make group decisions prior to the move carried through to the setting or adjusting of household norms in the new house. Influence strategies that reduced or avoided householder conflict were observed, even if this meant going with an option that would knowingly use more energy.

4.3.3.1 Compromising

Some households compromised. In Case 7, both parents in the household actively tried to save more energy. However, the father was not as thorough and persistent at keeping as many rituals as the mother:

> Lucy: *I like everything turned off, he likes everything on standby so we have disagreements on that one"* C7I1R2P6

Lucy was often the rule enforcer, and the husband would compromise:

> Lucy: *Yeah, we try to have a consensus. I mean . . . as you know [it] is more about how much is actually used because she does the electricity thing on Power Shop*[15] *she does all the tracking and I mean.*

> Lucy*: I can tell him what days he's used the drier.*
> C7I1R1+2P3

Lucy liked switching all appliances off at the wall, however Hank's interest in electronics meant that it was a massive task so instead he would turn some items off and leave other items on:

> *Hank: Yeah, but now you don't leave the printer on and the scanner on and all those extra bits. We've compromised . . .* C7I1R2P10

15 Power Shop is an electricity retailer that allows customers to pre-pay for power with discounted rates. If customers know roughly how much power they will consume they can shop ahead of time and save money.

4.3.3.2 Sameness

Where differences in energy behaviour and comfort levels had the potential to cause conflict between householders (see 3.12.4), sameness in energy related behaviours reduced this risk. The more time that householders spent together, the more they shared in the consumption of energy services. Case 15 involved a retired couple who were now spending more time together at home:

> *Because [of] our way of living, our lifestyle is very much blended. It's not as though we do different things or we cook separately or you know, everything's blended so what one is doing the other is doing . . .*
>
> C15I2R1P11

As seen in 3.11.1, similarities in householder attitudes towards energy also reduced conflict. The concept of samness in the example above (case 15) shows how similar attitudes which come through the sharing of similar routines and responsibilities can reduce tension between householders. In this instance, both householders had lived together for long time and had similar energy related attitudes. What further helped their congruence with one another was the way in which they shared energy related activities and responsibilities which were held by both household members.

4.3.3.3 Overt mandate setting

Households which underwent a change in household composition would sometimes be more explicit in expressing preferences for new norms for the new dwelling. The respondents in Case 10 had previously lived with an especially enthusiastic rule setter.

Laura: . . .last year we used to live with like a real power Nazi guy who used to like completely ban the use of anything that would [use energy], like any heaters or anything . . . It was pretty . . . yeah . . . there were quite a few disputes around that. . .

C10I1R1P7

In order to reduce future conflict but still maintain lower power bills, Laura's flat in Case 10 set explicit rules around the use of energy before they moved into their first house. A female flatmate took over the role of power enforcer, actively researching ways to save energy and then passing them on to the flatmates. This did not always go down well, and generally the group would need to come to a compromise.

The negotiations and compromises that occurred in Case 10 were accepted by householders to a degree as energy was a shared and expensive commodity. By learning from past experience and having flatmates who were responsible for managing the household's energy consumption, flatmates were able to come to a consensus and agree on how energy should be used both individually and at a group level.

In Case 11, Dorothy had suggestions for how her new flatmate's room could be heated before he arrived. When Flatmate 1 arrived, Dorothy spoke to him around how she liked to heat the house, and found that although he came from a different culture, he had a similar approach to energy use.

Dorothy planned to use her spreadsheet for monitoring energy consumption in the new household to help decide on the best way energy could be used in House 2 with her flatmate:

> *I'll be able to talk to him about how much is he using the convection heater, has he tried using the heated towel rail, how's he finding both of them and just you know, this is how much electricity we're using. And because we [are] sharing the costs of the electricity, there's a sense of responsibility from him as well. . .* C11I2R1P22

With an engaged and detailed understanding of the household's energy consumption, Dorothy was able to have explicit discussions around the outputs of various activities, and the expense of the energy bill for each householder through their own individual actions. By the time Flatmate 2 came, Dorothy understood the new house's energy portfolio relatively well, and decided to take a different approach to setting energy related rules and the payment of electricity by bundling it into a flat fee.

4.3.3.4 The energy instigator

Many of the cases had a person in the household who took on a larger responsibility, or had a deeper interest in energy use than the other household members. Sometimes this was because the householder had the bill payer role, but sometimes the individual was simply more concerned and had stronger preferences towards energy use.

The energy instigator would sometimes become apparent in households who had conflicts around energy use, where one householder would try to get the others to see or do things their way (as suggested by Grønhøj, (2006) and latter named the 'efficiency champion' by Kleinschafer (2014)). One of the biggest household conflicts around energy use was in Case 1, a flat of four professional females. Three of the flatmates found it more important to be warm and comfortable than to save energy, and were happy to have two heat pumps running for longer periods of time. One of the flatmates, however, was more concerned about

frugality and therefore more conservative about the power use and this was a constant point of contention between the flatmates (*Unfortunately it was requested that the dialogue about this issue be omitted from publication*).

Previous examples of the energy instigator have been touched on in Case 7's 'power Nazi' (4.3.3.3). The difference between the energy instigator and other household members seemed to be through their overt discussions around energy, and their efforts to coerce others into using energy their way. Depending on the social situation, energy instigators had varying success at influencing energy related behaviour in the household and steering energy related decision making.

The energy instigator generally tried to be the rule maker and enforcer of energy related practices in the home, but this often required that they adopt different strategies to coerce the other householders to go along with them. One of the more common ways to achieve their energy conserving goal was through knowledge specialisation, and having the tools to argue their case. However, the energy instigators did not necessarily know all the answers, and sometimes this would thwart their credibility or lead the other householders down less energy efficient paths despite intentions.

4.3.4 Summary – Influence strategies

Householder dynamics guided both decision making during dwelling acquisition and the setting of energy related norms in a new dwelling. This study showed the importance of householder influence or social structure in establishing energy related norms. Three main influence strategies (compromising, sameness, and overt mandate setting) were used by householders to establish energy related norms in a new dwelling all of which required the householders to compromise on energy related attitudes and norms of comfort. The findings of this study also supported the notion of an 'efficiency champion' (Kleinschafer & Morrison, 2014), with the emergence of the household energy instigator who would take to setting (or trying to set) energy related norms in the household.

4.4 DISCUSSION

Section one addressed the energy related choice criteria that householders use when searching for a new dwelling. As households go through the moving process, they engage in a range of decisions which directly and indirectly influence how energy will be used in the new dwelling. Moving rarely involves individualised decision making, as householders use each other to help guide the acquisition and settling-in process.

The social nature of household decision making and the changing nature of householder relationships are at the heart of understanding residential mobility. As households go through material changes, they are generally adjusting to life stages, new relationships, new jobs or new arrivals, such as babies or new housemates. Interventions to encourage household energy efficiency can be innefectual if they do not take into account the social context of householders.

The chapter then showed how the different roles of householders and their varying autonomy over decisions was generally set by the social context. Householder roles changed with new technologies or changes to household composition, which in turn resulted in changes to norms of energy consumption. As householders moved, there was a desire to maintain or increase autonomy over how energy should be used. This was partially established through changing the material environment, but also through the explicit setting of rules by household members.

In section two, household norms were addressed during residential mobility. The heterogeneity of householder behaviour is reflected in the different circumstances that householders live and the changing nature of their social contexts. The results show that where etiquette was well established (such as being a guest in another person's home), the social situation would set the precedent for energy related behaviour. However, if householders were living together for the first time, there was likely to be more explicit discussion around the establishment of new norms for energy use.

Even if some householders were comfortable with new practices around energy consumption, these could easily revert if they created householder conflict. As norms were set in new dwellings, the relationships between householder members set the precedent for the kinds of discussions householders had around energy, and the ability for householders to influence each other.

4.4.1 Moving up the housing ladder – improving energy services and increasing energy consumption

The housing ladder was found to be a useful concept to help understand consumer choice processes. Cases were dispersed along the housing ladders, most moving up, and some, at times, moving down. Borgersen's (2013) housing ladder fits well with the New Zealand culture, where most households made efforts to maintain or improve their housing situation through mobility, and were represented clearly within the four broad categories (rental, starter home, intermediary house and family home). However, it is important to recognise the concept of housing careers which can explain the phenomenon of householders moving up as well as down housing ladders depending on life stage. For example, the housing ladder does not easily account for the retirement phase in life stage where some householders may seek smaller and easier to maintain dwellings with a lower financial burden.

The context change framework presented in chapter two provides a structure by which to address householders differently according to their position along the housing ladder. Those households who are higher up the housing ladder may need to be approached before moving home, whereas householders who are buying a first house may be more open to interventions after settling into the new dwelling.

Households who were at the lower end of the housing ladder made specific efforts to improve their autonomy over energy decisions, as well as improve the level of thermal comfort in the new home. Social norms of comfort (Shove, 2003), clearly influence decisions around dwelling choice and types of heating preferences. Those cases who were in a position to purchase a dwelling made specific investment decisions to improve their

level of thermal comfort, either through building a new dwelling or through changes made to a dwelling after moving in.

Younger households moving into starter homes were happier to wait-and-see how a new dwelling felt and to fully adjust to the new material culture before making any decisions around changing it. This was reflected in householder's available income, but also in their amount of experience with different fixtures and dwelling types. This group of householders were more open to behavioural adjustments to save energy, as they still sought norms and routines which worked best for them.

Householder experience clearly was an important factor behind investment decisions and choice criteria, which normally reflected a household's position along the housing ladder and lifecycle. Older couples who knew the city of Dunedin well were very aware of the importance of finding sunny locations in order to save on heating energy but were also less flexible about their levels of comfort becoming diminished, which often led to added investment to make a dwelling work for them.

4.4.2 Changing household composition and changing social contexts. The dynamics around new norm setting

The family lifecycle (Fritzsche, 1981; Kendig, 1984), is still an important concept to understanding residential mobility as it captures some of the assumptions of householder motivations and situations. But perhaps more importantly in the context of domestic energy consumption, lifecycle stages capture some of the changes in household composition and the changing social contexts by which energy related norms are established. Householder experience also helps the development of householder norms, as discovered in the current study and by Kleinschafer & Morrison (2014), and initially by Feldman's (1984) group norm development.

The context change framework presented in chapter 2 provides a structure to address the changing dynamics of householders during residential mobility by acknowledging the social

context. Changing household structure was influenced by those who were responsible for paying energy bills. Those who had control over how energy was used in the household generally tried to set the mandate for others' behaviours, to varying levels of success. The more householders with similar attitudes towards energy use, the easier it was for energy instigators to convince other household members of following their advice.

The results showed that changing household composition caused a different disruption to household norms than a household who did not change composition. For those households whose composition changed, there generally was a change in householder relationships and an adjustment of householder roles. Over time, householders were found to assimilate their norms through the sharing of practices and time spent together.

For those households who stayed the same from house one to house two, similar role structures were re-established around the use of new technologies. It was common for householders to feel like little had changed from house one to two, because they were with the same people, doing the same things. It was often only through explicit questioning around the use of technologies that differences in their interaction with them was noted.

As the outcomes of using household fixtures would generally be similar, householders did not pay much conscious attention to the process by which those outcomes were established. It was only through a change in outcome (such as a warmer or colder thermal aspect) that householders could tell that their behaviours were different as a consequence of the new dwelling.

4.4.3 Implications for policy makers and social agencies

The social nature of household decisions is important to recognise as policy makers and businesses look to increase household energy efficiency. Recognising individual preferences is important, but finding tools to help households reach compromises that are still energy efficient may be the most appropriate way forward to changing household energy related behaviour.

The context change framework provides a way to help understand the difference between first home buyers and experienced buyers, and address the timing of interventions. For policy makers wishing to stimulate the efficiency improvements of dwellings, this study has shown how some new home owners take a wait-and-see approach regarding energy investments. This group would be relatively easy to target in New Zealand as there are already government support incentives for householders buying their first home[16], which could be followed by appropriately timed interventions around one year after the household has settled in to the new dwelling.

For those householders who already have investment capital and are experienced in home purchasing, governments should consider assisting housing retrofits that are already happening during home acquisition. This study has shown how experienced home owners make substantial investments in purchased dwellings that don't fit their comfort norms, thereby providing an opportunity for both government and businesses to take advantage of this particular phase of the mobility process.

There are also possibilities for household markets to drive their own changes, through the sharing of information about what it is like to live in a dwelling and enabling others to ask pertinent questions and make better decisions. Especially for households in flatting situations, there are more and more opportunities for web based platforms to increase renter autonomy and put pressure on landlords to invest in their dwellings. This has become a popular process in Dunedin whereby students have found a need to improve dwellings, and have found a way to both inform renters and stimulate landlords into improving dwelling characteristics[17].

16 See government 'kiwi saver' website: http://www.kiwisaver.govt.nz/new/benefits/

17 See: http://www.ratemyflat.org.nz/

Another challenge confronting residential mobility is the cultural identity of what it means to move house and be comfortable. The cases in this study typically progressed up the housing ladder as they moved through their housing career. Culturally, this vertical move is associated with higher levels and expectations of comfort, which unfortunately make it difficult to avoid higher energy use. The increasing occurrence of householders in renting situations to demand more energy efficient technologies in Dunedin could potentially be replicated within the wider housing market. Such a phenomenon could drive residential mobility culture away from the expectation that a shift up the housing ladder means more energy consumption and a larger house, to instead embrace a culture where vertical movement on the ladder refers to increased energy efficiencies and more efficient householder autonomy.

New Zealand is currently undergoing a housing crisis in the ammount of affordable housing available, so there are pressures to create buildings which have the most basic of housing standards. Knowing the high costs associated with retrofits, as well as how householders respond to 'uncomfortable' dwellings, it is important to recognise that people may use energy less efficiently if they move into a dwelling which does not meet their comfort norms. The rapid speed at which experienced householders undertook retrofits to their new dwellings in this study suggests that the current housing stock rarely met householder comfort norms. In view of these findings it would be wise to consider implementing mandatory energy rating schemes for dwellings in New Zealand, as older houses are constantly being retrofitted by householders with limited skills or advice on resources, and significant regulatory oversight. This finding also shows such advice and behaviour could also be possible in new builds which are currently still in danger of fostering energy intensive lifestyles while new practices need to be created and established.

A goal held by some households was to maintain a similar power bill despite increasing their dwelling size. Helping householders' to achieve this, rather than allow them to become accustomed to higher energy prices could potentially be an important business opportunity and area for future research. Moving home provides a useful avenue to integrate feedback from energy monitoring from households one and two. Any businesses who could provide

solutions to help householders maintain similar bills in a new dwelling, through material or behavioural changes, could find a unique market opportunity.

The timing of interventions can be better organised if the housing ladder and lifecycle changes are considered. Businesses can better assess when to approach consumers around household heating investments, knowing where households are moving on the housing ladder. Policy makers could also time possible technology and information campaigns more effectively by stimulating thinking on thermal efficiency and appropriate investments in technologies.

4.5 CONCLUSIONS

The chapter answered three research questions relating to how energy related behaviour changes when people move home. Firstly, it addressed the energy related choice criteria of households as they chose new dwellings. The section found that although householders' energy related characteristics are generally not the main reason for choosing a dwelling, however factors such as the amount of sunlight hours did play a major role in dwelling choice. Householder experience was also found to play a large role in shaping choice for dwelling factors such as comfort norms.

The chapter then addressed the types of energy investment strategies that householders used when moving home. It found householders adopted different approaches depending on their position on the housing ladder and their previous experience. Householders who were higher on the housing ladder were more prepared and able to investigate swift changes to make a new dwelling fit their desired comfort levels, whereas first home buyers were more flexible in adapting, and took a wait-and-see approach before making energy related investments.

Finally the chapter investigated how energy related norms were established in a new dwelling. The results showed that norm formation was closely associated with the social

context of a dwelling, and whether there was a change in household composition. The social structure of households heavily influenced the ways in which norms were established, through the relative influence that householders had on each other. Householders were found to use three main influence strategies in order to establish new norms, which involved compromising, sameness and overt mandate setting. Householders were found to use these strategies differently depending on the social context.

The findings of this chapter support the three elements (individual, social and material context) of the context change framework presented in chapter 2. Even though residential mobility involves a change in material culture, sometimes the change in social context can be more influential in changing energy related behaviours. The chapter has shown how the context change framework provides a structure by which to understand householder decision making strategies when relocating, by focusing attention on how householders can have different priorities, and also different behavioural responses during the mobility process.

Chapter 5 CHANGING TECHNOLOGIES AND CHANGING ROUTINES

This chapter explores the dynamic relationship between householders and the energy using technologies in their homes during a time of socio-technical transition. Moving home is often associated with changes in life stage, such as leaving home, getting married, starting a family, or retiring. This section focuses on the behaviours associated with energy using technologies and how and why they may change when people move into a new environment.

The energy cultures framework (Stephenson et al., 2010) argues that a change in material culture can cause a change in energy related practices and householder norms. This chapter builds on the assumptions of the energy cultures framework to include the implications of changing material culture on the individual and social contexts of the household during residential mobility, which have been expressed in the context change framework presented in chapter 2.

5.1 CHAPTER AIMS

The life stage of moving home was chosen as a unique opportunity to study energy related behaviour because it involves a reorientation of the objects that involve energy practices, and sometimes the acquisition of new technologies. This chapter seeks to provide insight into the dynamic relationship between people and their appliances under changing circumstances by interviewing householders before and after they move home. It focuses on the following research questions:

1. How does a change in material culture (residential mobility) influence energy related behaviours?

2. How does a change in material culture influence the individual and social contexts of a household?

The results will use the 16 case studies presented in chapter 4, but focus on householders' responses to changing heating appliances, showers and refrigerators. Reflections will be made across cases in the study and examples will be given from specific householders responses. The results of this chapter are structured slightly differently to those in chapter 4, whereby relevant literature is discussed in relation to the findings after each section.

5.2 RESULTS

The results will be discussed according to the context change framework presented in Chapter 2. First, energy related behaviours are discussed according to the changes that occurred in material culture, such as dwelling structure and the appliances and fixtures within it. Second, the impacts on the individual context are discussed according to habits, attitudes and embodiment. Third, the impacts on the social context are covered in relation to group norms and the use of changing technologies to influence others are discussed.

5.2.1 Moving home – a changing material culture.

Across the 16 cases that completed a move, households moved to and from a wide variety of physical dwellings (see Table 21[18]). The housing construction varied in materials, number of rooms, insulation levels and sunlight hours.

Table 21: Dwelling construction across case

Case #	Own/Rent?	External cladding	Bedrooms	Insulation	Sunlight hours (winter)
1	R-O	Wood-Brick	3-3	Same	6-8
2	R-O	Concrete Brick- Brick	3-3	Improve	5-7
3	R-R	Wood/Plaster - Wood	3-2	improve	4-5
4	O-O	Brick-Brick	2-3	improve	7-6
5	R-R	Brick-Wood	1-1	Improve	7-3
6	O-O	Wood-Wood	3-4	Improve	6-7
7	R-O	Wood-Wood	3-3	Improve	3-5
8	O-R-O	Brick-Brick	3-1	Downgrade - invest	7-7
9	O-R-O	Wood-Brick-Wood	3-3-4	Improve	5-6-8
10	R-R-R	Wood/Plaster-Concrete-Brick-Brick	5-1-5	improve – invest	5-4-4
11	R-R	Brick-Wood	2-3	downgrade - but they invest	6-5
12	R-O	Brick-Wood	2-4	Improve	3-7
13	O-R-O	Plaster-Brick-Brick	4-3-4	Improve	6-5-8
14	O	Composite	4-	-	7-
15	O-O	Brick-Wood	4-5	downgrade - but they invest	7-6
16	O-R-O	Stone-Brick-Unsure-Stone	4-4-5-4	improve	8-5-5-8

In almost all cases, participants aspired to move to a house that was ‘better’ than their old place. House improvements such as larger floor space, newer building materials, or more pleasant decor were common factors that were reported to have influenced the choice of the new dwelling. If the house was smaller or had lower material standards than a previous

18 Note to reader –Table 21 is modified version of that in 4.2.3

house, householders aimed to upgrade those parts of the house to make it more in line with their desired level of comfort.

5.2.1.1 A new dwelling structure – framing technologies and practices within the home.

Unsurprisingly the structure and layout of the new dwelling set many of the precedents for how energy would be used after moving. Respondents generally anticipated that larger dwellings would require more energy to heat, similarly with houses that were less insulated, older or which received less sunlight. Interestingly, some households aimed to spend a similar amount of money on energy in their new dwelling, even if it was larger than House 1. If House 2 had newer more thermally effective and efficient materials householders believed that they would not need to spend more on energy after moving (Cases: 12,4,13,5,7).

Apart from Case 13 and 16 where the householders were building a new dwelling, all others moved into houses that already had some form of heating fixture installed. Heating fixtures are discussed in the next two parts of this section according to householder's responses to them.

5.2.1.2 A new household layout – a chance for a different style of life

Acquiring a new dwelling brought about a change in space that householders often wanted to use differently from their previous house. Having an extra room or area for dining or recreation was a common theme, giving householders a chance to separate different activities into different areas, or even take up new routines.

Eight cases involved some adjustment in life stage; two cases (15 and 4) who were preparing for retirement, and case 8 which involved an older retired lady who was moving into a smaller dwelling that was easier to manage. These cases all wanted to find more comfortable dwellings that would be warmer and easy to manage. Case 4 wanted to move from a 'house' to a 'home' where they would have more space to entertain guests. Case 15 also wanted to have a larger space where they could spend their weekdays inside warm and comfortable, as they were no longer working full time.

Changes in life stage also involved households who were still growing, such as Cases 16, 13, 1, 9 and 7. Householders made adjustments to such things as the dwelling size, number of rooms and types of spaces that would accommodate new needs and new lifestyles. Case 16, for example, built a new dwelling with their growing family in mind, separating teenage bedroom spaces from the parents, as well as adding a new entertainment room.

With new spaces came opportunities for different activities, or similar activities that could now be separated to different spaces, so that family members would not get in the way of each other. In some cases, the change in lifestyle was immediate – such as case 12 and 11 who moved into dwellings that had more rooms and space than their first house. Both cases soon received multiple bookings from friends and family to visit and stay with them as soon as they had moved into their new dwelling (See concept map below).

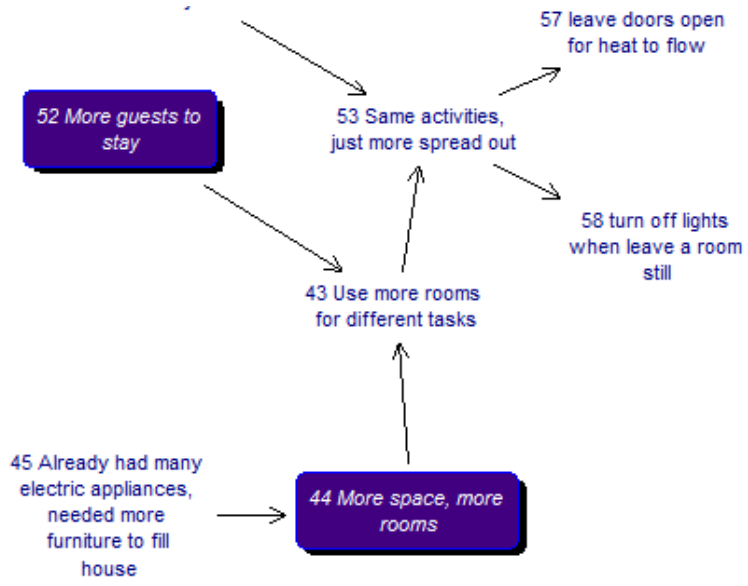


Figure 11: Concept Map Case 12: Changes to householder norms due to extra space and the chance to entertain more visitors in House 2[19]

The concept map shows how a change in living space can create or enable a change in lifestyle, putting new demands on energy resources as well as changing the way people heat or use electricity in those spaces. Concept 44 above 'more space, more rooms' was used to

19 Please note the numbers on the left of concepts relate to the sequence in which they were entered into the computer, and are otherwise arbitrary

reflect how the householders did tasks in different rooms after the move, and that although the activities didn't change in nature they used more space to do them (concept 53). This in turn meant that the householders in Case 12 would spend less time in a single room and therefore left doors open to heat the different rooms (also because of the different heating source – see case overview) whereas each room was heated individually in House 1.

Thermal efficiency also had a substantial impact on the behaviours adopted within a new dwelling. Householders who experienced dwellings which were 'warmer' (Cases 16, 4, 15, 13, 12, 11, 10, 3, 2, 1) or 'colder' (Cases 5, 6, 9) often changed the number of clothing layers worn, amount of time spent in different rooms and the amount and/or type of heating used.

Sunlight hours were considered to be an important housing attribute for many. Getting used to the warmer and sunnier parts of a house took some time, but brought about noticeable changes to some participants routines as they adjusted to spaces where they felt most comfortable. In House 2, Case 5 a behaviour was to sit near the window or door during the morning sun, where the light would stream in and heat up the room and or balcony outside, whereas in House 1 the couple stayed away from their home as much as possible and rarely got out of bed because the house was so cold. The participants in Case 4, House 2, spoke about how they now used their conservatory to sit in during sunny days and Teresa (Case 12) and Jerry (Case 16) were both extremely happy with how the sun would heat up different parts of the house as it shone in at different parts of the day.

Changes brought about by the new house were often intertwined with the householders' desires for different practices and different lifestyles. Although these may have included householder intentions, the new dwellings were agentive in allowing new behaviours to actually take place. In some circumstances householders over or underestimated the impact a new structure or fixture would have on their daily life. The unplanned or unintended way in which a new material structure or fixture influenced lifestyles and householder practices will be elaborated on in 5.2.4.1.

Housing adjustment through residential mobility has been shown to involve residents' efforts to improve their material culture, which results in changes to energy related fixtures

and appliances. As residents make efforts to move up the housing ladder, this results in increases dwelling sizes as well as improvements to the thermal efficiency of the dwelling and the energy efficiency of better and cleaner heating fixtures.

5.2.1.3 A dwelling's structure; the case of the humble fridge

Kitchen white-ware was often changed during household transition. In New Zealand, most houses purchased must include an oven, and often include a fridge as well. In some cases, participants used moving home as an opportunity to upgrade their fridge or oven through purchase. In other cases, householders were happy to find that their next dwelling had a better fridge or oven than House 1, which added value to choosing their new dwelling (especially in rental situations).

House structure, and in this case, kitchen layout, led to swift appliance replacement if a previous item of white ware did not 'fit'. Consumer choice around the type of fridge in this instance was not always around efficiency or preference, but was instead mediated by the new dwellings structure.

> *Yeah and we did look at, 'do we go just for standard fridge?', but what happened when you went for [a] standard fridge was you had one lever door and because of the space of bench and where the fridge was going to be that wasn't actually a really good viable option and so partly the design of how the kitchen was going to sit affected what we ended up choosing* C13I3R1P33.

Some families took the opportunity of moving to invest in a new fridge or freezer. Here both the physical agency of the dwellings structure plus the desires of the household members met, causing a new appliance uptake. Participant 2 in Case 13 was very pleased to find that their new dwelling had a much larger gap that their old fridge could not fill, which gave her an 'excuse' to purchase a larger one she had always wanted. In this case the household provided an opportunity to increase the fridge size that aligned with the participant's aspirations.

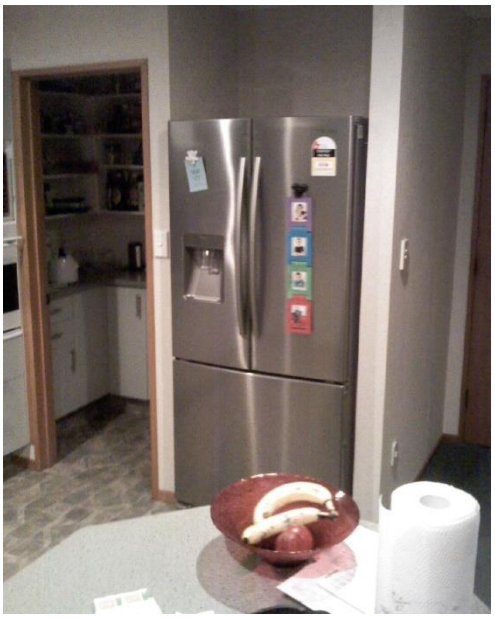


Figure 12: ‘The only one which fit’ – dwelling structure shaping appliance uptake

The fridge example shows how a new dwelling could be agentive in stimulating new appliance purchases and in shaping the parameters of those purchases. The structure of the house, as well as the appliances available in the new house in this example were found to be agentive in stimulating new changes in material culture, and ultimately changing the potential household energy demand.

Two cases that moved into rental accommodation already owned their own fridge, despite there being one in the house they were renting. Instead of choosing to put the fridge in storage, the householders decided to use both:

> *Yes, I’ve got two fridges and it’s so good because you know, every now and then there will be a big couple of pots or something with food in them. It’s nice to just be able to put them in the fridge without having to sort them into little containers or anything like that*
>
> C11I2R1P2

In this instance, householders did not find the most efficient option after context change instead allowing desires for convenience to influence their behaviours (Shove, 2003).

Along with a changing structure, new households often had varying fixtures, which caused different responses by participants. This section reflects part of the agentive nature of dwellings as expressed by (Wilhite, 2008). A new building allowed some householders to reach personal aspirations (Scheuthle, Carabias-Hutter, & Kaiser, 2005), whereas for others it was more restricting in the way that householders could live. The next section reviews how participants responded to changes to household heating fixtures.

5.2.2 Changing fixtures –anticipating, adopting and adapting

Heating device types varied across cases and from House 1 to 2 (see Table 22 below). It was not uncommon for households to have two forms of heating fixtures (such as a log burner and heat pump), as well as portable electric heaters. Heating fixtures were not generally the reason why respondents chose a new dwelling, however some included certain preferences as part of their choice criteria. This was especially common for households who were renting, where changing fixtures was more difficult (see Chapter 3).

Table 22: Changes in material culture

Case #	Main heating source
3	to heat pump
5	Bar heat to bar heater
11	Bar heat to heat pump
10	Heat pump to heat pump
2	Heat pump to wood
12	Gas/to log burner
1	Wood to wood - and invest. Ignore heat pumps
7	Coal range + open fire to log burner heat pump
15	+ heat pump to heat pump
6	Gas fire to log burner but remove, bar heater
4	Wood to heat pump
14	Wood to – (no move)
16	Wood/heat pump to heat pump
9	Wood burner + heat pump to electric night store/heat pump to log burner but invest in heat pump
8	to bar heater
13	Heat pump to coal central heating

Fourteen cases involved dwellings that had some form of heating fixture in place. Newer houses generally came with such things as enclosed log burners or heat pumps, whereas older houses were found to have such things as electric night store heaters (Case 9), coal ranges (Case 7) or electric bar or fan heaters fixed in place (Case 8,5). Most of the cases that had older technologies (aforementioned) moved to houses that had improved heating fixtures.

Table 23: Heating fixture investment

Case #	**Own/Rent?**	**Why move primary**	**Structural investment,** *(insulation or double glazing)*	**Heating device investment**	**Timeframe**
2	R-O	first home purchase	n	y	after – (7 months)
12	R-O	first home purchase	n	n	-
1	R-O	first home purchase	y	y	after – (8 months)
7	R-O	first home purchase	n	n	-
15	O-O	retire	y	y	Before + after (1 month)
6	O-O	situational	y	y	Before + after (1 month)
4	O-O	upgrade - buy	n	n	-
16	O-R-O	upgrade - build	y	y	New build
9	O-R-O	lifestyle	y	y	Decide before-changes (1-3 months)
8	O-R-O	upgrade - buy	n	n	-
13	O-R-O	upgrade - build	y	y	New build

The heterogeneity of heating options available and chosen in new dwellings brought about various responses by participants. These will be discussed according to purchase decisions before and after moving, as well as responses to new fixtures in turn. Most heating investments recorded in this study were made to participants' new dwellings either before or after they had moved in. As discussed in Chapter 3, householder experience and life stage gave precedent to the speed and strategies by which investments were made. The other factor not focused upon in Chapter 3 was the extent to which a new dwelling influenced a household's investment in new heating technologies, which is discussed here.

Some of the cases made changes to household fixtures before moving in, rather than waiting to see what it was like to live in the new house. New dwellings therefore had an influence on householder expectations, whereby householders who had the means to do so would adapt houses to their own specifications.

Many of the cases made changes to household fixtures before moving in, rather than waiting to see or adapt to the fixtures that were already there. Other families made changes once they had settled into their new dwelling, and been able to make a judgement on the heating system that would suit them best (See Chapter 3 experienced home buyers; heating investments section). Heat pumps were the most common new heating fixture to be installed after moving in, because of their convenience in use, and because of the potential cost savings for space heating.

The varying responses to new appliances could be either adapting to new technologies, ignoring new technologies or maintaining previous routines. In most cases, new houses would contain a different main heating device than what was available in a householders' previous dwelling (see Table 23). Around half of the households adapted to the type of heating source that was available, whereas the other half made changes by either removing, adding to or ignoring heat sources that were in their new home. This section will outline the different responses to context change in the case of heating devices.

For fifteen of the cases, moving home involved a desire to change some part of the households' material culture. For those households who had the means and the desire, new dwellings were retrofitted with new heating fixtures before, or shortly after, the household had moved in. Households were able to voice their intentions to make changes before moving (Ajzen, 1991), or were already in the process of retrofitting House 2, showing that these householders could already anticipate that the new dwelling would not suit their desired comfort or convenience levels.

Cases 16 and 13 who both built new houses also had experience in building dwellings and undertook varying levels of information gathering before making decisions on the types of heating fixtures they wanted. In both cases the couples designed their houses around their central heating. However Case 16 sought a completely new system to what they had previously owned (going from a heat pump system to an under floor coal powered radiator system), in contrast to Case 13 who planned on using a heat pump and log burner combination that they had past experience with.

Householders who took a more long term, wait-and-see approach to making changes to their new dwelling first learned to adapt to the structure and fixtures that were already provided. This allowed participants to make a more informed decision around what changes (if any) they might wish to make in order to increase their levels of comfort and/or thermal efficiency (See wait-and-see approach, Chapter 3).

In summary, the changes to material culture during residential mobility were found to be extremely heterogeneous. Some of the changes could be anticipated through the type of dwelling that the householders moved into, as well as through the types of comfort norms held by the individual residents.

5.2.2.1 Anticipating and investing (before moving in to House 2)

This section will focus on the strategies householders used when anticipating what a new environment would be like to live in, and the types of investments they made in order to make the new dwelling meet their desired comfort and convenience needs. Modern heating fixtures were sometimes mentioned by participants as a reason for choosing a particular dwelling, as the fixtures gave insight into the thermal comfort and convenience that the new house offered. This was explicitly stated in Case 14 who always sought either a heat pump or a log burner since they felt these fixtures were what other householders sought when purchasing or renting a dwelling:

> *In Dunedin you just have to have a warm house and yeah, definitely and you know, I always think to myself, how do I advertise the property and those things would be in your ad; sun … insulation and a heat source [log burner or heat pump], great. Those three things alone are such a magnet for people and I mean as long as the house is, you know, the house has got to be nice as well, but you'll grab people with those three factors alone.* C14IR1P9 (See 4.2.1).

In Case 15, a retiring couple made an energy related change to their home before they moved as part of their sales process (see Chapter 2, moving home phase 3 – selling). The couple had decided that a heat pump would add value to their property and subsequently purchased one before they put their house on the market. After installing the device they began using it as well. The new technology (along with a change in their employment status) brought about a massive shift in the way in which they lived in their house. The couple began using more of the living space than they had previously; spreading out activities to different rooms and increasing the overall temperature of their house[20]. The couple subsequently installed heat pumps at their new dwelling also, after becoming more trusting, and more used to the new technology[21].

Investment into House 1 before sale rarely included heating fixtures[22]. As most participants (11), had lived in their House 1 for a number of years, those householders who had made investments into the thermal effectiveness of the dwelling usually spent some time reaping the benefits.

In these instances, householders were able to voice intentions before acting on subsequent behaviours. These findings are in line with Janzen's (1991) theory of planned behaviour, whereby intentions were shaped by householder attitudes and past experience.

20 Another factor was adapting to changes in life stage, as the couple were preparing for retirement, and therefore spending more time at home, and also becoming less frugal around their heating.

21 See comfort norms section around previous energy technologies and technology choice criteria in Chapter 3.

22 Apart from case 6 who planned on increasing the value of the house for resale when moving in, and case 15 who purchased a heat pump to add value to the dwelling – discussed in Chapter 3.

5.2.2.2 Adapting to new fixtures

Adaptation to new heating fixtures was usually out of choice (for instance the new dwelling had the householder's preferred heating method), whereas others who were more restricted by things such as financial cost would make do with what was available. Eric in Case 3 would have preferred a log burner in the house he moved in to, but because he was renting the house, the decision was out of his control. Eric may have chosen a different dwelling to move in to had it not been the house of preference for his new partner.

When a household did adapt to new heating fixtures in House 2, this involved changing some elements of their heating practices. The householder's anticipated some of these changes before moving into the dwelling, but not necessarily accurately. Case 16 for example involved an older couple that had been living in a house with a log burner. The new house they had chosen had a heat pump installed, which they decided they would adapt to. The couple anticipated that they would set the thermostat to around 22 degrees Celsius, and have it going when they were in the dwelling. Once the couple in Case 16 had moved in, they found that themselves to be quite happy with the temperature set at 16-18 degrees depending on the time of day and what they were doing. They also found that the way heat was circulated allowed them to shift heat into other parts of the house. This brought about a change from how they lived in House 1 as heat had been restricted to only one room.

Participants often needed to do a slight adjustment to their anticipated practices when using new technologies, in order to find the most appropriate way to use them. Case 7 changed from having a coal range and an open fire to having a log burner and a heat pump. Although Hank didn't like having to chop wood for the log burner, they soon found a balance between using the heat pump in the mornings and the burner at night.

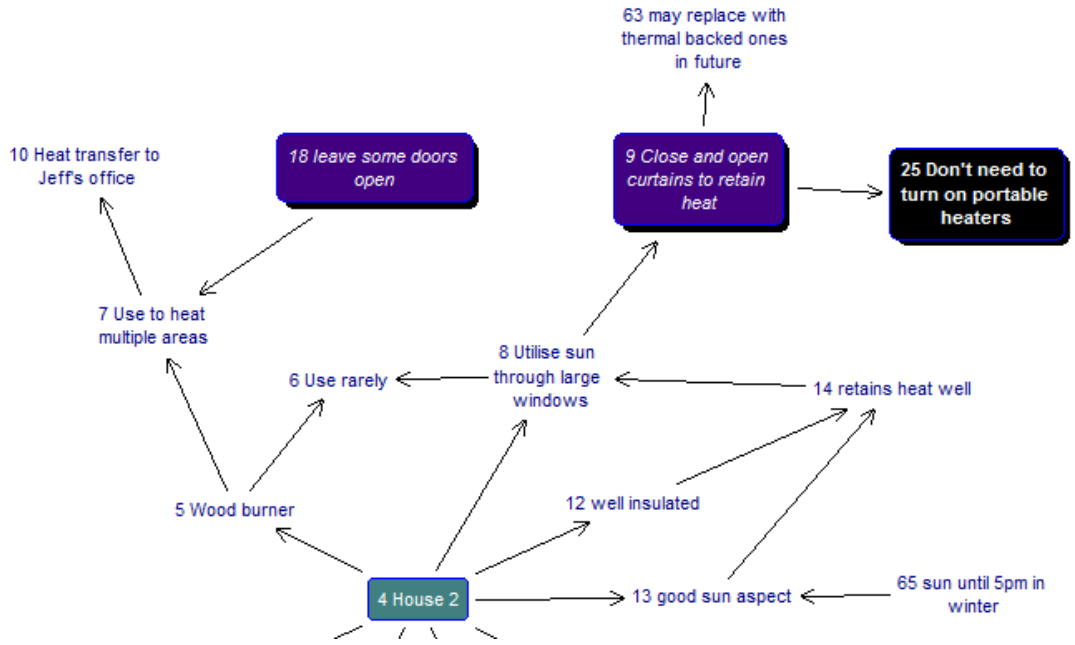


Figure 13: Case 12 Concept Map. Interview 2, House 2, new heating fixture and new dwelling structure leading to new routines

Case 12 (see concept map, Figure 13 above) involved moving to a relatively new dwelling (less than 15 years old), which brought a significant change in household fixtures. The couple changed from having several portable electric heaters in House 1, including a wood burner and a gas enclosed fire. The new log burner in House 2, along with the houses good sun aspect and insulation led to the couple being able to heat multiple parts of the house at once with the single heating fixture.

Wilhite's (2008) notion of the agentive nature of dwellings was present in case 12. Householders' energy related behaviours were influenced by the change in material culture, compared to practises that remained more stable across household contexts. Similar to findings from (Gram-Hanssen, 2010), material culture produced extremely varying patterns of behaviour around heating.

The change in material culture did cause changes in participants' energy practices; however the influences on energy practice during this time were more complex than simple material –practice interaction. To illustrate this, the chapter will now look at the changing behaviours

of householders with respect to portable heating devices before examining the influence of a changing material culture on the individual and social contexts.

5.2.2.3 Ignoring new fixtures

In some cases householders ignored un-preferred, or seemingly less efficient heating devices. Cases 5 and 8 ignored older looking electric heaters that were fixed in place as they were not their preferred heating method, or they thought they would be less effective.

The family in Case 1 preferred to use their wood fire to the two heat pumps that were also installed in their House 2. They had trialled the heat pumps briefly but found them to be ineffective and noisy:

> *... [the heat pump] doesn't seem to be, it doesn't seem to be getting as hot as it should be, so we don't use it, so I'm not quite sure what we'll do with it. There's not really market for second-hand heat pumps. Especially because it's not working well. We can't flog it off to somebody... we got it checked out and the electrician said it was working fine, but it just doesn't seem, it's noisy and it doesn't seem to be effective. Better to put a little heater in here than that thing.* C1I3R1P1,2

Case 5 also did not approve of one of the bar heaters in their new dwelling, being older and seemingly less effective than the oil heater they had brought with them. Because of this they had not tried to use the fixture, despite the house being relatively cold.

In these examples, new fixtures were not always agentive in stimulating new behaviours. As per (Wilhite, 2008), if practices could be maintained through the use of other fixtures, individual choice and preference had greater agency over the material influence in this instance. In this way, householder preferences and experience could override the influence of fixtures in a dwelling if householders did not find them acceptable or trustworthy.

5.2.2.4 Placement

The new dwelling's structure and fixtures also led to the position or placement of items within the dwelling as with the fridge example earlier. A similar influence of dwelling structure was found in relation to the buildings' energy infrastructures, such as where and how many electrical sockets there were[23]. This influenced where householders could place appliances (such as televisions), or which ones could sit plugged in all the time. Dorothy in Case 11 partly moved into House 2 in order to get more space for her arsenal of kitchen appliances, and the ability to cook at home more

> …*yes I think* [I do use the coffee machine more] *because of the more cooking. I'm using the coffee machine a lot more than I did in the other place because there was so little bench space at the other place. It just got buried in piles of dishes*…
>
> C11I2R1P9.

Access to wall switches was found to hinder participants' ability to manage their appliances' standby electricity consumption in their new dwelling. If participants did not switch appliances off at the wall (instead of leaving them on standby) this was often because they could not access the switches to those appliances easily. Those participants moving into more modern or new houses (Cases 16, 13, 12), all had televisions fixed to the wall which had internal wiring (often including hard drives, amplifiers and receivers, disk players and satellite receiving boxes). Although the modern fixtures improved the householders' access to media, they had little option but to interact with the appliances remotely. This meant that householders relied on the appliances managing their own power consumption, rather than having full autonomy over what was fully switched off and when.

23 The agentive nature of dwellings will extend to other household appliances in this section to show the discursive nature of householder positioning of technologies amongst the setting established by the dwelling itself.

Adapting to the new dwelling was also tied in with the flow of daily life, as exemplified here:

> (Francine) *I suppose, what is it, we adapt to the space that we've got and we had smaller space so you only utilise what you've got, we've got more space* [now]*, so you're trying to work out how best to use that space without it just being, I suppose, a sort of wasted space or yeah it's just how to best use the space that you've got, even though it's more, it's yeah, kind of strange. I think you can end up with too much stuff when you've got more space because it's just much easier. When you've got too slack at putting things away because there's actually room to have them there. There wasn't in the last place.* C13I2R1P14

Where appliances and fixtures could be placed in a home influenced what appliances were able to be active and which ones had to be put in storage or disposed of. As householders balanced the fit of their old technologies with their new environment (Shove & Warde, 2002), the influence of the new dwelling interacted with the placement of appliances and the process of 'becoming settled' as described by Shklovski and Mainwaring (2005). Those appliances that could be accessed more easily were more likely to be used often and to be left on standby, especially if they were difficult to turn off. This extends on the descriptions by Shklovski and Mainwaring (2005) by showing how the placement of old and new dwellings is in part set by the dwelling's structure, thus hindering or enabling a householder's satisfaction and comfort. The next section looks at what happened to different household heating appliances as participants moved into their new home.

5.2.2.5 Appliances – bringing, buying, throwing away and storing

Moving home can be a stressful experience. It involves uplifting and reorganising one's possessions, which requires planning, effort and sometimes periods of uncertainty and pressure. Some participants sold their houses before being able to find a new dwelling, which involved moving into a rental property or friends' place. This meant that possessions needed to be handled twice, often being placed in storage, without knowing exactly when they could be accessed again.

Many householders would bring portable heating devices with them from House 1 into their new dwelling. These were usually smaller portable electric heaters that either used fans, oil or radiator coils. The way portable heaters were used in the new dwelling depended on the new social context, as well as the availability of other household heating fixtures. Two cases which used portable heaters as the main form of heating (Case 5, 8) continued these practices in the new dwelling, despite other options being available. Victoria in Case 8 had very specific preferences for how she liked to heat a room, and therefore used the same in House 2 that she had used in House 1. Victoria did not like heat pumps and did not try to use the fixed heater that was installed in House 1. In this way portable devices allowed some participants to maintain their old energy culture in their new environment.

Case 12 went from needing a large number of portable heating devices to almost solely relying on a single log burner and the heat from the sun. However, Case 12 did bring some of their portable heating devices with them however, which were used in individual rooms for specific short term purposes; for example an oil heater was used in the guest bedroom and a portable heater in Teresa's office (see Figure 14 below).

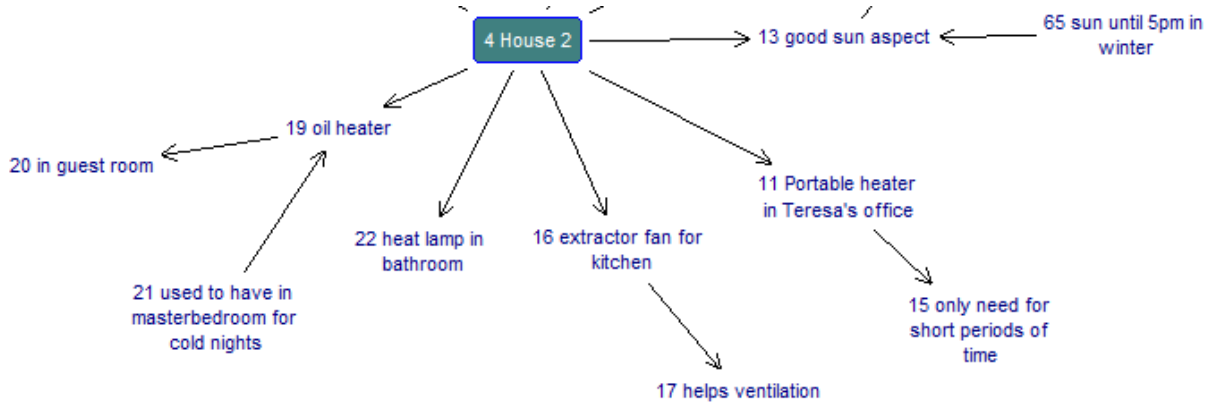


Figure 14: Case 12, Concept map. Interview 2, House 2. New and old heating appliances and subsequent use.

Portable heaters were also a common appliance to be disposed of when participants moved. Some households had a surplus of heaters that were no longer considered to be required due to a superior heating source or more thermally effective building. This was also common with other household appliances such as fridges, which were either replaced with a better technology within the new dwelling, or upgraded as the householders used moving home as an opportunity to get rid of the old appliance and upgrade with a new one, similar to the findings of Shklovski and Mainwaring (2005) in the case of computing technologies.

Figure 15: A portable electric heater was used by this family as they did not want the inconvenience of using the log burner that came with their new house (Case 6)

Some portable heaters were not thrown away, but merely retired into storage in case they were needed in the future. As shown with case 12, some heaters could be left in a spare room for guests, or other areas that could not be easily heated by the main heating method.

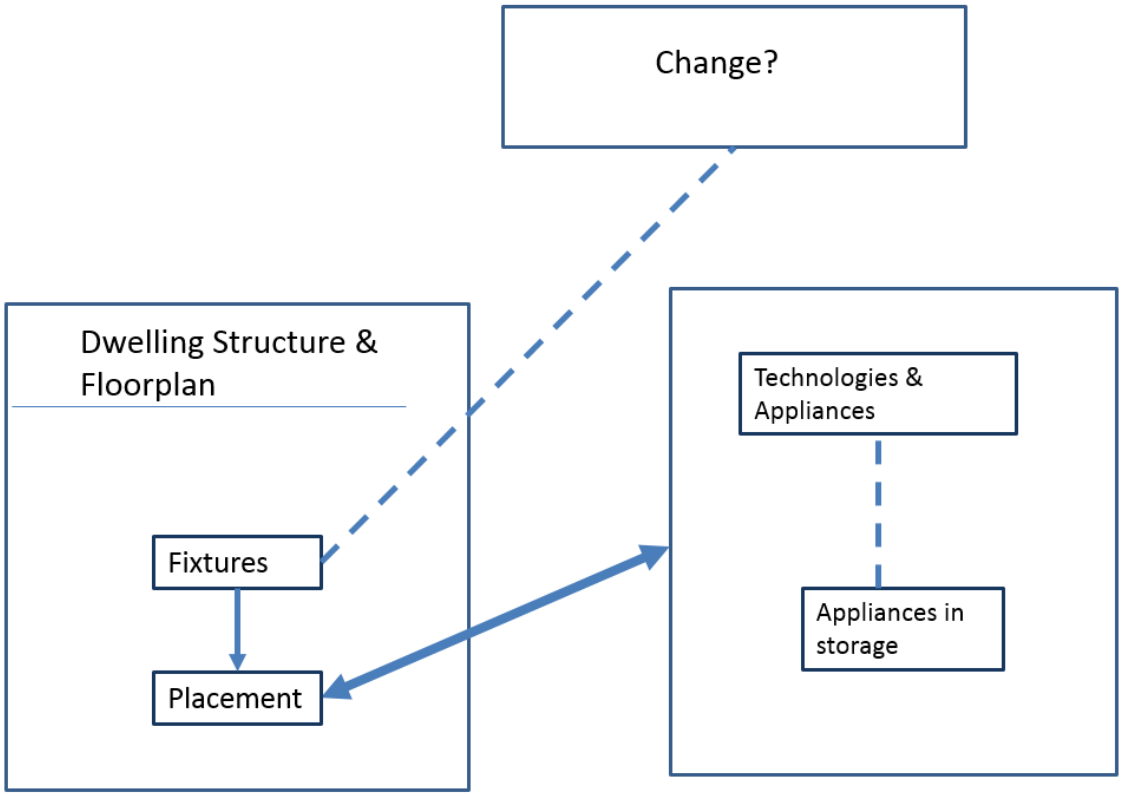


Figure 16: A changing material culture – the agency of a new dwelling

Figure 16 above extrapolates the context change framework to show the agency of a new dwelling on a households' material culture, and subsequent energy related behaviours. Those appliances that householders choose to bring into the new dwelling are subject to the layout of fixtures and structures. If the new dwelling does not have the 'right' space for a fridge, it becomes immediately agentive in stimulating appliance uptake. Similarly, if the new dwelling has appropriate insulation and heating fixtures, portable heaters may be discarded.

Discarding possessions and adopting new ones is considered to be a natural part of the residential mobility process (Gregson et al., 2007; Shklovski & Mainwaring, 2005). The heterogeneous behaviours of householders regarding household appliances exemplify the transience of portable technologies during residential mobility and the complex ways in which energy related behaviour can be reshaped. The context change framework presented in Chapter 2 helps to clarify the different ways in which the material, social and individual contexts interact during mobility to bring about changes in appliance acquisition and disposal.

5.2.3 The individual context

Although new environments can be agentive (Geels, 2004; Wilhite, 2008; Wood et al., 2005), the ways in which householders respond depends on their individual and social contexts. This section focuses on the individual and social context in turn.

Individual behaviours and habits around energy consuming technologies changed in profound and subtle ways after residential mobility. Case 12 involved a couple in their early thirties who moved into their first home. After saving for a number of years, the couple were able to afford a much more modern dwelling, and in doing so received much greater thermal comfort through insulation and sunlight hours.

In their first house, Jeff had been the 'energy monitor' of the dwelling, checking the power meter almost daily and putting the results into an application on his phone. In this way he was able to know exactly how much energy the household was and had been using. This helped him decide the most effective ways to use energy in the home. Jeff loved computers, and had many hard drives and screens throughout the house. Teresa on the other hand, liked to be warm but struggled to regulate the rom temperature. The couple therefore had a temperature sensor in the living room which Teresa used to let her know if it was cold enough to turn a heater on, or warm enough to turn the heater off. Jeff, who didn't mind a colder dwelling temperature would rarely turn heaters on, but made sure that they were not being used unnecessarily, or to excess.

When the couple moved into House 2, the new dwelling's thermal effectiveness was substantially greater than that of their last house. The dwelling was also almost twice the size, but the couple were able to maintain a similar energy bill to what they had had previously. This was the result of changing routines to suit the new dwelling's structure and heating fixtures. Instead of using portable electric heaters to maintain the houses temperature, Teresa would now pull curtains in the evenings to keep the heat in after a sunny day. The new dwelling's thermal characteristics were so much better that little base heating was needed. Since the dwelling maintained heat much more effectively than the first, Teresa did not need to constantly monitor her own thermal comfort as actively as she had in House 1.

The small thermometer was moved to Teresa's office in House 2 where she sometimes used a small fan heater. Jeff's role around managing the houses energy consumption became more relaxed after finding that the energy bills were still similar to that of their last house.

The change in householder role was also influenced by the position of the energy meter in House 2, which was slightly harder to monitor than what it had been in House 1. This changed Jeff's routine whereby he now checked the meter less frequently, and therefore spent less effort monitoring the household's overall energy consumption patterns.

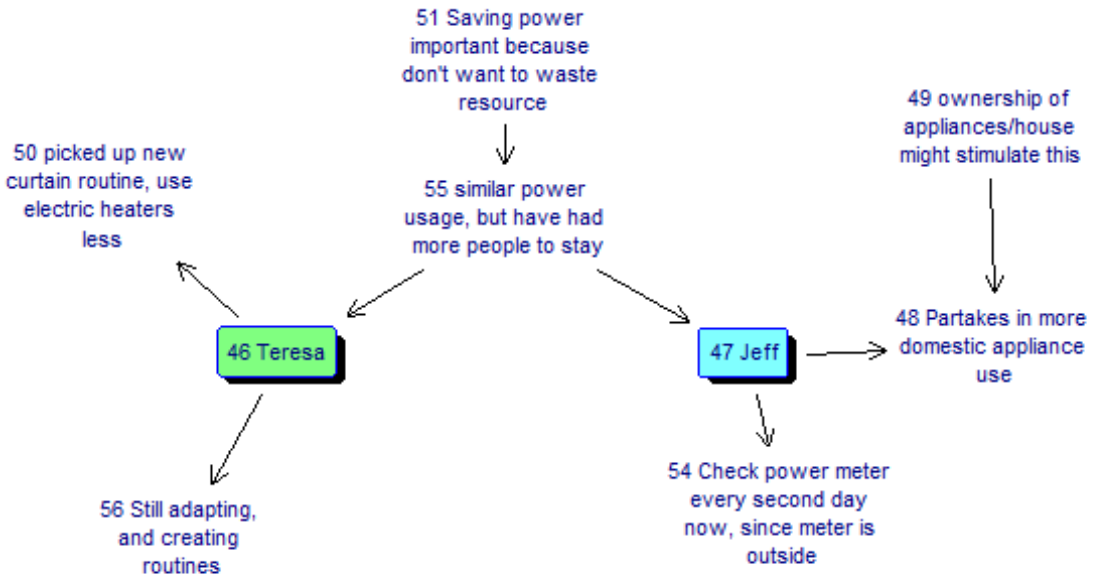


Figure 17: Concept map: differences of changing material culture on individual participants

The example in Case 12 shows the subtle and influential ways a changing material culture can have on energy related behaviour in a household (Figure 17). Although new technologies and structures produce changes in routines, these are also influenced by the different householder roles of the occupants.

Following from the context change literature into habit (Schafer & Bamberg, 2008), householders could sometimes state how a new context changed habits from what they had had in House 1. Although it was rare for householders to be able to consciously verbalise energy using habits, such things as switching lights and appliances off needed to be consciously restored in the new dwelling, supporting the notion of contextual effects around goal directed behaviour (Scheuthle et al., 2005).

Stewart in Case 6 took some time adjusting to the new lights within House 2. The position of the lights on the wall, and the large number of switches on the wall panel meant that he had to spend a long trial and error process to find the most appropriate switches for his desired activity. Jeff and Teresa managed to avoid getting lost on their way to the bathroom in the middle of the night by installing a small LED light in the hallway. This avoided them needing to turn on (and find) the brighter room lights, and also took away the fear of falling down the stairs.

Following from the settling in process described by Shklovski and Mainwaring (2005), the placement of possessions within a new dwelling helped re-establish identity (Gram-Hanssen & Bech-Danielsen, 2004; Winstanley et al., 2002). When going through the process of building a new home, Francine in case 4 described how the ability to make a home more her own required a certain number of household fixtures to be established:

> *I don't feel completely settled yet, you know, it's like I haven't put much of myself out and the showers had to be painted and you know, well the walls had to be repainted because they got damaged when the showers were going in that sort of thing so you can't put your personals up.* C13I1BR1P12

5.2.3.1 Changing autonomy

Moving into a new dwelling gave some householders the chance to live more in line with their individual aspirations. This could involve changing their lifestyles that better met their desired levels of comfort, or changing their comfort norms. Cases 16 and 13 both built new houses for House 2, and were able decide (within financial parameters) exactly how they wanted their house to be designed as well as how they wanted to live in it. New structures and fixtures could also be inhibiting, forcing behaviours that were not in line with individual desires. For example in Case 3, Eric did not want to use the heat pump and would have preferred to use a log burner, and in Case 7 Hank would have preferred a bigger log burner as he found it frustrating having to chop wood into small pieces.

Case 13 had built their new dwelling to be warm, and efficient to heat. The mother had found their previous house too cold, and too expensive to have at the temperature that she wanted so after an extensive product search the household found a solution which allowed them to live as they wanted. This included having thermostats in each room, allowing the children and parents to choose the level of comfort which suited them best for that environment.

Autonomy was also increased through heaters that were easier to use, or houses that were easier and cheaper to heat. Personal autonomy of individual actions (Ajzen, 2002; Bandura, 1989) was enabled through the change in material culture in such cases. The interaction between material culture on enabling lifestyles was shown here to be closely interlinked, supporting the notion of performativity (Thrift & Dewsbury, 2000).

5.2.3.2 Feeling states and embodiment

As householders moved into their new dwelling, they went through a process of discovery to find out the most effective ways to use appliances, heat their house and live their daily lives. Through the placement of items, and the different roles adopted by householders, individuals were able to build up their own personal embodied knowledge around how to live in the dwelling most comfortably (Pink, 2004, 2012; Pink & Leder Mackley, 2012).

Participants could generally verbalize some of the thermal feeling states that they experienced between House 1 and House 2.

> (Francine) *… [House 2 is] warmer than the last house because you know, like as soon as we get the sun in it heats up quickly and holds the heat better than the last house.* (Doug) *Oh yeah, it definitely holds the heat really well. The heat doesn't drop, yeah. (Francine) Because even our last house was set up as good as this was for the sun, but this is certainly a lot warmer …* C13I3R1,2P18.

Sometimes participants were also able to explain how their new dwelling reached its particular thermal characteristics and how they were able to use different thermal elements of the house for different activities accordingly:

> (Teresa) *Yeah, it's certainly warmer than it was in the old place... If I'm opening the curtains in the mornings and I've got bare feet you certainly notice the difference, whereas before they all used to come in, now it's pretty good. Upstairs in our bedroom, if we want it to be 18 degrees we'd need to heat it, but I don't like sleeping in a warm room. I spent my life growing up in Northern Southland sleeping in unheated bedrooms. If it's too warm I don't sleep.* C12I3R1,2P29.

The experience that householders built through living in different dwellings and using different fixtures was often found to influence householder choice and preferences for heating technologies (see Chapter 3). The assumptions used by householders to make changes to a dwelling even before moving in, may have partially come through the embodied knowledge about different heating fixtures over time.

> (Berthilda) *But we purchased like the latest heater you could get because yeah, we've had a few heat pumps and yeah, we find, we put it on for about ten minutes and then we turn it off in the morning because it's just warm. (Jerry) Older houses tend to leak a bit of heat, so you know, you're better to go up a, you know, a model, if you like. I mean a*

> *new house it's not going to escape through your double-glazing and through your walls and everywhere else, but you know, when there's, when you've got an older house, this was '70s, you're going to get some leaks in your seals and whatever, so you know, but you can, I mean we've done as much as we can as far as putting you know, seals all around the windows and doors and resealed the whole place, but you still will lose a wee bit of heat.* C16I1R1P6,7

As householders experienced different heating fixtures over time, their preferences were shaped through their embodied understandings of how those fixtures made them feel. The preferences for different comfort levels and different types of fixtures therefore were shaped and guided by participants embodied knowledge.

5.2.3.3 Gender differences – and differences in personal thermal comfort

Preferences for temperatures, types of heating, power and gender differences were found to dynamically interact. The process of embodiment and feeling states has been known to be affected by gender differences in past research (Pink, 2004). In the current study, women reported to 'feel the cold' more than their partners and would therefore be more likely to instigate turning heating on or making sure that the new dwelling they were moving into would meet their desired comfort levels. Teresa in case 12 and Debbie in case 15 both mentioned that they were sensitive to the cold, and therefore made sure that their new dwellings would have a higher level of thermal comfort than their previous dwellings. This was also the case for Francine (Case 13) who built a house specifically with thermal comfort in mind.

Gender differences in energy choices were also found in Case 6. Martha would not allow a new heat pump to be installed into House 2 because she didn't like them. Although Stewart had initially planned on putting a heat pump in because of their thermal efficiency and because it would add value to the house, Martha didn't like the type of heat and therefore the family went without any main heating fixture.

Differences in thermal preference and embodied knowledge of a dwelling or past dwellings both influence their future decisions and create a precedent for different householder roles. The stronger a householder's preference was for certain types of heat and heating systems, the more it shaped and legitimised their roles in shaping thermal and appliance standards. Those that had particular preferences for comfort states were found to be drivers of the wider householder comfort norms. This idea will be elaborated upon in the social context section 5.2.4 below.

The shared value of a 'comfortable life' materialised in preferences for different thermal qualities and appliances that legitimised influence and created power positions based on altruistic and compassionate willingness to create harmony in the household. It shaped individual attitudes towards different types of appliances. This is in line with Park's (1982) findings that householders seek to reduce conflict.

5.2.3.4 Values and attitudes

Material culture has been argued to shape householder norms around the use of energy, and their subsequent attitudes and values (Stephenson et al., 2010).

One of the most influential impacts a new dwelling had on householder attitudes occurred in Case 6. In House 1 Martha did not care much for saving energy because she did not see it as important. She couldn't see the point in turning off lights when leaving rooms;

> *It's a light and that's all, whatever… We can't be bothered, and why should we? It doesn't matter.. (laughing). It's just not important. (Laughing)* C6I1R2P6,7

When the family in Case 6 moved into House 2 they were confronted with a very different dwelling to what they had been used to in House 1. One particular feature of the new dwelling was an installation of 18 halogen lights in the kitchen. Stewart, (who cared

somewhat more about saving energy in the home than Martha), had planned on changing the number of lights:

> *Oh yeah we bought lighting for the room in here, changed that over because what we're going to do is get rid of all those halogen lights and there's 18 lights in that wee area there*. C6I2R1P7

To which Martha responded: "*It's ridiculous*" C6I2R2P7

Later Martha was able to explain how her attitude towards using lighting had changed, after finding that there was a point where one could have too many lights which was just unnecessary.

> *I find that I'm being more aware of what lights are on and what lights are off. I'm being more proactive about turning them off when I'm not going to be around.* C6I2R2P14

For other householders, changing attitudes towards using energy went in the other direction. Patrick and Debbie in Case 15 were both preparing for retirement and were going to be spending much more time at home. After spending years living like 'skinflints' with minimal heating and very extensive energy saving behaviours, the couple planned to use more energy in the home so that they would be more comfortable, but also because the warmer temperatures would keep them healthier in their older age.

A material culture change during residential mobility has shown to be both enabling and restricting towards householder autonomy and preferences. The householders' interaction with a new material culture also develops over time, as a householders experience and preferences develop, their autonomy around energy using fixtures can as well. The embodied knowledge and feeling states around a material culture grows over time as well as a householder adjusts to living in the new environment.

The energy cultures framework (Stephenson et al., 2010) supports the notion that a material culture can influence personal beliefs and attitudes. As mentioned earlier, knowledge and attitudes and have long been used to analyse and influence environmentally responsible behaviour (Barr, 2007; Barr & Gilg, 2006; de Groot & Steg, 2010; Kaiser et al., 1999; W. Poortinga, Steg, & Vlek, 2002; Wouter Poortinga et al., 2004; Steg, 2008). As such models based on Ajzen (1991) are contextually cued, changing an environmental context has been argued to assist in individuals behaving in ways which are more congruent with their personal values (Verplanken et al., 2008), and help them to attain personal goals (Scheuthle et al., 2005)

5.2.4 Social context

In most cases, households had more than one occupant[24]. This meant that the change in material culture was not experienced by one, but by many. The individual context has shown how individuals respond to a new household context through the changing of householder roles, habits, feeling states and values. The impacts of these individual responses and subsequent actions often crossed over to other householders. Norms such as dwelling temperature rarely influenced a sole individual in a dwelling, and therefore the actions of one householder responding to the new environment would have subsequent impacts on the other householders.

The individual context section showed how individual thermal preferences and feeling states could drive changes in material culture, which in turn changed energy related behaviours. This section now looks at the energy related norms that were influenced by a material culture, and how they changed when the household moved to House 2. The section will first focus on the differences felt by householders with unpleasant showers and their subsequent rebound effects. The chapter will then discuss how householders used a changing material culture to influence the norms of others in their household before focusing on how changing material cultures influenced householder autonomy.

24 Only case 8 involved an individual moving into another home by herself, but she too stayed with a friend whilst looking for a new dwelling

5.2.4.1 Group norms and rebounding – the case of cold showers

The most common method of heating hot water in New Zealand is through the use of electric immersion cylinders. The finite capacity of the cylinder does cause some restrictions on norms such as shower times – especially when there are a large number of people in a dwelling. Case 10 involved a flat of five students, whose hot water cylinder took a very long time to heat up. This meant that the tenants decided to agree upon set shower times, otherwise people would end up missing out. When Laura from Case 10 moved into House 2, she and her partner Rodney both enjoyed having unrestricted shower times as their new dwellings hot water was heated by gas, and their energy bills were bundled within the monthly rent. Both Laura and Rodney's conservative shower times from House 1 rebounded to something much more excessive, after having previously experienced an unpleasant shower.

In some cases when material culture was no longer inhibiting, it caused a large rebound in the use of hot water (see Figure 18 of a typical hot water cylinder below).

Figure 18: A common electric hot water cylinder in New Zealand (Isaacs, Camilleri, French., 2007)

The family in Case 9 stayed in a rental house while they waited for a new home to become available. Unfortunately, the shower was so unpleasant that the family reduced their

showers to be as short as they possibly could. From an energy efficiency perspective, rebound occurred once they moved home to a shower heated by gas. With both Cases 9 and 10, shower times increased substantially in the new dwelling because their hot water supply became essentially infinite. It was also affected by the fact that House 2 had under floor heating in the bathroom. Initially Jane was tentative around using the new fixture, but after getting used to it found that it was a luxury that she could no longer do without. Jane subsequently taped the dial shut to a specific temperature for the under floor heating so that the children couldn't change it, and to make sure that the heating stayed on (see Figure 19 below).

Figure 19: Case 9 under floor heating dial, taped to a specific temperature

In the case of the cold shower, both individual and group norms changed depending on the material agency provided in the new dwelling. Jane in Case 9 was also happy with the gas hot water system in House 2 because it meant there was always enough water for guests. Seeing that part of the reason for moving was to be closer to town and be able to take part in more social interactions, having a dwelling that guests to felt comfortable in was something important to the family which was made possible through the new material culture.

The context change and energy cultures frameworks (Stephenson et al., 2010) argue that a change in material culture enables new norms and aspirations for showing practices to be

achieved. Rebound, in this case, is shown through householders response to new environments through a way of over-compensating from a prior period of disconnect between material culture and individual and social contexts. Rebound in this instance is therefore not directly economic as argued by (Berkhout et al., 2000).

5.2.4.2 A footstool to influence others

The ability for a new material culture to change behaviour was observed in many of the cases. Some of the participants tried to use the move to find a material culture that eased some of the household tensions around particular energy using norms. As part of this, some families did make a direct effort to change their hot water usage in their new dwelling, or expressed the desire to have solar hot water installed in the distant future. Case 16 installed low flow shower heads in their teenager's shower as they built it. The parents knew that it would continue to be a struggle to get their children out of the shower, so they had their shower altered before they moved in – with their children none the wiser.

As discussed earlier with Jeff and Teresa in Case 12 (5.2.3), the couple no longer needed to be as vigilant around household temperatures because House 2's temperature was easier to maintain than in House 1. This also meant Teresa's preference for a warmer indoor temperature did not need to be as heavily managed as before, because the new dwelling required much less electrical energy to heat.

Case 13's central heating system also heated the dwelling's hot water. There was a hope that hot water might not be as expensive in the new dwelling with a more efficient system, as showering times were also something that the parents sought to enforce on their almost teenage boys. In the past, this had generally involved banging on the door to get the boys out. This was not always successful however, with their oldest child, Greg, reported as having used all the hot water from a 300 litre cylinder in one shower.

Even old habits to help save energy needed to be adjusted to the different environment. Francine was no longer able to hear the shower or fans going in the boy's bathroom so was not able to gauge how long they were in there. Her ultimate incentive to get them out by

turning on a tap and therefore changing the water temperature was now also hindered by the new plumbing. In her old dwelling Francine was able to get her children out of the shower by taking advantage of the way the plumbing was installed; "you could turn on the hot tap somewhere … and the shower will go cold" C13I1BR1P17. However, in her new home this didn't work and her only strategy left was "banging on doors" C13I2R1P11.

5.2.4.3 Maintain gain autonomy/power

Material change not only forced householders and energy instigators to change behaviour and methods of influencing others, but also could potentially increase the prominence of energy instigators role within households. The family in Case 13 built a new house which was not only better suited to their changing needs, but was designed in a manner which gave Francine more autonomy over how the entire house was heated due to its inclusion of a central heating system. Through this, Francine was able to monitor and alter which rooms in the entire house were heated which increased her influence and autonomy over the household and ability to affect household energy use. Jerry in Case 16 also maintained his autonomy over household energy decisions in the new house they built, as he did most of the building himself.

Doug in Case 6 took advantage of material change to challenge the energy instigator's role. House 2 was a larger dwelling than House 1, and Doug hoped to convince his parents that this was an opportunity to get more electronics. Doug managed to convince his parents to purchase a new television and laptop for House 2, as there was more space for them. Doug was also more interested in some of the new fixtures of House 2 than his parents, and had subsequently trialled the moisture master ventilation, and heat transfer systems that had already been installed in the house. His knowledge of these fixtures was therefore greater than that of his father's, giving Doug a position of authority around that particular aspect of the house.

Changes to material culture also brought autonomy to householders through enabling use of different technologies. This was common with families who had children at home, whereby rules associated with the use of different appliances sometimes changed in a new or

temporary dwelling. In Case 16 Berthilda did not allow her children to use any appliances in the kitchen, or go near the log burner. Their new dwelling however did not have a log burner installed, and the kitchen had been fitted with safer appliances than they had had in the previous dwelling (for example going from a coil electric range to an induction range top). This therefore had the potential of changing the autonomy of the children for what appliances they were allowed to use. This had not yet eventuated however, as Berthilda used the move as an opportunity to re-enforce other energy rules on the children:

> *We were slack at my parents, but here there's no iPods Monday to Friday, they get it back Friday night". (Jerry) "Just made that rule up where they can't use those iPod games.*
>
> C16I3R1P40

Family dynamics are becoming increasingly important in helping to understand energy related behaviour (Grønhøj, 2006; Grønhøj & Thøgersen, 2009, 2012; Kleinschafer & Morrison, 2014). Addressing householder influence provides a more realistic understanding of how a changing material culture can affect energy consumption as norms associated with energy use rarely affect the individual. This section has shown how householders use a changing material culture to achieve their own aspirations within a social context, which is a novel insight into understanding energy related norms.

The context change framework has provided a base to help understand how moving home influences household energy related behaviour, through changes in material culture and individual and social contexts. Incorporating the social context and householder interrelationships provides a better understanding of the influence of material culture on behaviour, not only as an enabler for individual behaviour or social practice, but also as a tool to influence other householders.

5.3 DISCUSSION

This chapter has shown that residential mobility does cause changes in the way people use energy, predominantly by causing shifts in the types of technologies they are able to use and how they are able to use them. The changes in material culture were found to be influential in stimulating changes in energy related practices and subsequent energy consumption .

The sociotechnical literature gives some insight into the responses of participants during context change. Participants were often restricted or enabled by the dwelling structure and fixtures available in the household (Schatzki, 2002). One further development on this theme was found with the case of fridges, whereby a particular dwelling structure would be enabling for only certain sizes of devices. Following the ideas of (Wilhite, 2008), there did appear to be an element of agency in the way participants interacted (or didn't) with the new technologies in their dwelling. Those participants (such as case 16) who chose to adapt to a new heating device found that their practices around the number of rooms, as well as household temperature changed after adapting to the new appliance. However, the adaptation was only possible because the participants' norms around using such appliances allowed it – even though they had not used a heat pump before, they were able to anticipate the circumstances around which it should be used before moving.

The energy cultures framework (Stephenson et al., 2010) is also supported by the findings of this study. Changes in energy related behaviour were influenced by changes in material culture, but only when those changes aligned with the householders' norms. Otherwise, participants made efforts to change the material culture again – so that practices and norms could be left unchallenged.

It is evident that sole focus on the socio-technical elements of context change misses out other important influences on behaviour. The context change framework demonstrates how participants' choices were also largely influenced by their own life stage, which is also not included in the scope of the sociotechnical lens. Including life stage as part of the analysis gives a more holistic understanding as to the reasons for moving, the choices around particular household characteristics and the use of material possessions.

Theories of practice and habit also help understand participants' responses during context change. The more different the new household environment was, the more different new practices would be, because the old habits could no longer be reproduced in the same manner. Most participants reported that many routines stayed very similar to those in their old house, and that significant changes in practice always coincided with significant changes in norms and or material culture. When the material culture could not support a particular norm of practice, participants were swift to implement different technologies in the dwelling. In case 7 (Image 2), the use of a log burner was too taxing on their normal energy practice, and instead of making any real changes, they simply used a cheaper portable electric heater that allowed them to receive heat as conveniently as they had previously.

The context change framework helped to uncover how energy related behaviour was influenced at an individual level, such as through theories of planned behaviour (Ajzen, 1991). For example, participants in three cases (see 5.2.3.1) were able to voice their intentions on changing heating devices before moving which indicated that they were making a somewhat informed decision about how they planned to behave in the new dwelling. In such instances, behavioural norms were influencing consumer choice and subsequent technology acquisition. The new material environment had not yet had a chance to influence practice because the opportunity had not occurred yet. Those participants who had chosen to make changes to reduce hot water use also showed intentionality to reduce their personal energy consumption through the way they lived on a daily basis.

If a new dwelling did not provide the participants' expected norms of comfort, participants would use their own personal appliances (such as portable heaters), or install new fixtures such as heat pumps. Even if there were new, more efficient technologies available in a new dwelling such as a heat pump, this did not guarantee their use (or their proper use) because participants needed to have accepted such technologies into their own personal energy norms. Those participants who had more flexible energy norms were more willing to try new energy technologies, and instead of making changes in the new dwelling simply adapted their behaviours to the characteristics of the new fixtures.

The context change framework also helped uncover how a changing material culture influenced householder norms, which were found to depend on the individual or group context by which they manifest. Differences in individual feeling states (especially those of thermal comfort) could heavily influence the heating norms of the rest of the household, as space heating is more difficult to personalise. In this research, that person who 'felt the cold more' often had more authority around influencing energy consumption and driving temperature norms. If they didn't, sometimes the change in dwelling construction would 'fix' the thermal problems that had been associated with House 1. Finding that person in the household who has veto power, or is the stimulator for finding more thermally efficient buildings may provide much insight for changing householder energy norms in the future.

Thermal changes to a dwelling brought about changes to clothing layers, ways of heating and temperatures of heating. Householders went through an adjustment phase of discovery when arriving in the new dwelling; finding the most appropriate ways to reach their desired level of comfort. This included finding out the best position for appliances and possessions to find the most efficient and effective ways to maintain the flow of activities involved in everyday life. The process of discovery may be something that can be supported, through the right stories or messages through the right mediums at the right time. Examples from those who had lived in the house before may provide more tailored and potentially more trusted knowledge about a new dwelling and its characteristics than those from an external medium who has not experienced the house for themselves.

5.3.1 Implications for policy

Policy makers can more accurately target householders if they know the types of movements they are making along the housing ladder. For example, knowing that experienced buyers will make swift changes to houses which do not fit with their current ideas of comfort provides policy makers with chances to steer consumers towards energy efficient choices during this time.

Moving home provides a unique opportunity for intervention, because it captures a household during a time of behavioural and material transition. One intervention that would prove to be useful in the present array of cases involves providing a checklist with the most

energy efficient ways to use the fixtures for new homes. This would also align with smart-meter implementation, especially those which offer disaggregated feedback. Householders would then receive information about what the previous base loads were from the earlier occupants to use as a reference as they begin to shape their new energy practices. Better understanding the types of people who would be susceptible to an energy meter in a new home would also be beneficial.

Knowing how a dwelling's structure can stimulate the uptake of different appliances will help policy makers know which households are in danger of upsizing technologies, such as fridges. Moving home presents one of the few opportunities where householders knowingly consider appliance acquisition. This makes context change a unique and important opportunity to address the problems with increasing consumption and rebound effects.

If householders had unpleasant or restricted experiences in House 1, there was a greater likelihood of rebound effects in House 2. This provides a challenge for policy makers as there are opportunities to still curb consumption in a new environment for those who are used to living on restricted consumption – as they have had the experience to live accordingly. Finding ways to reduce the capacity of rebound may be possible. Making the actual usage of an appliance or fixture more known to the householder as they are changing their consumption patterns may have more effect on those who already have lived on the extreme end of their comfort restriction balance.

5.4 CONCLUSIONS

This chapter has explored how a changing material culture influences the dynamic relationships between norms and energy practices. Moving home disrupted the previous interactions that had been established in the initial dwelling, and subsequently caused changes in energy related behaviour. Two research questions were addressed, namely how does a change in material culture influence energy related behaviours, and how does this influence the individual and social contexts of a household during residential mobility.

The research found that a dwelling's structure influenced appliance acquisition and disposal, and was agentive in setting new energy related norms in the household. Supporting theories of mobility, householders were found to choose dwellings that alleviated problems with past material culture, and helped to align their desires for a particular lifestyle.

Changing material culture influenced householders at the individual level through experiences and the establishment of embodied knowledge. Householders were found to be capable of having extensive understandings of what they personally considered to be a warm and comfortable house.

Habit was found to change in some cases, however this was often more attributed to the physical position of fixtures in the new dwelling – such as light sockets. Even householders who had energy saving habits in their previous dwelling needed to spend some time re-establishing those habits in the new dwelling before they became automatic. The concept of placement was presented as an important concept that frames the ability for different appliances to be either in an active position where they can be plugged in, or in a passive position in storage. Householders commonly tried to increase dwelling size in order to have access to more appliances, and increasingly lost autonomy over their ability to manage appliance standby consumption as their connections to energy became more integrated with the dwelling's structure.

The context change framework was shown to help understand how new technologies and new environments influenced energy related behaviours in the household. By focusing on the influence of material culture on the individual and social context separately, the context

change framework has helped to disaggregate the differences between individual desires and contextual responses that result in heterogeneous energy related behaviours.

By incorporating the social context into the changes associated with residential mobility, the study found that householders take advantage of a new environment to influence others in their household. The new dwellings environment was found to not only be agentive in providing individuals with the ability to use energy how they wanted to, but also helped householders set and frame the way other members of the home could use energy – such as providing individuals with control over the way the house could be heated, or in choosing technologies such as low flow shower heads in anticipation for increasing teenage shower times. The new material environment in this way was found to be agentive in reducing householder conflict, as family members did not have to have direct confrontation around particular energy related behaviours.

The chapter found that simply changing material culture can diversely affect behaviour. But these were usually framed within a social context that can ultimately override the potential influence of the material culture. Instead, consumers need to also have a change in their personal norms, or the norms of the other householders around energy use before they will embrace a change in practice associated with a change in energy using technologies.

Chapter 6 CONCLUSIONS

This thesis has examined how energy related behaviour changes when households go through the process of residential mobility, through the changes in individual, social and material contexts. This chapter revisits the findings from chapters 2-4 before providing final conclusions and recommendations. The conceptual framework presented in chapter 2 is revisited, and used to reflect on the changes that occur during residential mobility that affect domestic energy consumption.

Chapter 2 explored current literature relating to mobility and household energy related behaviour and established five research questions. The research questions were addressed in chapters 4 and 5 after studying 16 cases of households who were moving home. The thesis was broken into three main chapters; chapter 2 presented a conceptual framework based on concepts from residential mobility and energy efficiency literatures, chapter 3 empirically tested the framework by focusing on household decision making processes of dwelling choice and the setting of household norms, and chapter 4 focused on the influence of a changing material culture on energy related behaviour in relation to the individual and social contexts.

Chapter 4 addressed:

1. In what way is household energy use considered when households search for a new dwelling?
2. What are the strategies by which householders choose and make changes to housing attributes that affect energy consumption as they move along their housing careers?
3. How are household norms concerning energy consumption established in a new dwelling?

Chapter 5 addressed:

4. How does a change in material culture (residential mobility) influence energy related behaviours?
5. How does a change in material culture influence the individual and social contexts of a household?

6.1 CHAPTER FINDINGS

Chapter 2: Overview/ key findings

- The conceptual framework proposed by this thesis, called the 'Context Change Framework', sought to rectify the shortfalls in other studies by allowing researchers to consider the different influences on energy related behaviour along six stages of the moving process

Chapter 2 showed that previous intervention studies that used residential mobility might have failed to approach households at a time when they would be able to respond desirably or account for their changing social dynamics appropriately. Previous studies also failed to consider which behaviours householders would be prepared to adopt during mobility interventions and their trials were not supported by the theoretical assumptions associated with context change – that moving home would create more effective interventions to change energy related behaviour.

To address these failings, chapter 2 proposes the use of a conceptual 'Context Change Framework' (see Figure 5), which incorporates changes and decisions relating to material culture, the social context, and individual context on subsequent energy related behaviour. The framework uses a systems perspective to bring the three elements together and argues that they are interdependent, as a change in one element causes change in the others.

Chapter 2 further showed that many existing perspectives either focus on the macro or micro elements of energy consumption, missing the social interactions between household members. The household lifecycle and housing ladder were introduced as energy related variables that are embedded in residential mobility, and it was argued that these concepts must be considered when understanding household consumption changes.

The conceptual framework represents a holistic view of how the drivers' domestic energy consumption change over the period of moving home. It expressed the importance of timing, which is crucial to the implementation of interventions and is affected in turn, by different household contexts.

Chapter 4: Overview/Key findings

Moving home was found to change the way participants used energy, as it created a disturbance in the material and social contexts by which energy related norms were practiced.

- The amount of sunlight a dwelling received was found to strongly influence householders choice criteria when choosing a new dwelling
- Householders' notions of comfort were guided by their existing norms and previous experiences. As householders moved up the housing ladder or became older their flexibility to lower their norms of comfort decreased.
- Householder investment strategies into energy related fixtures varied according to life stage and position on housing ladder.
- Householder norms were closely associated with the social context of a dwelling and changing household composition
- Householders used three main influence strategies in order to establish new norms in a dwelling which involved compromising, sameness and overt mandate setting

Chapter 4 focused on the social side of the conceptual framework by examining energy related decision making strategies during residential mobility. The chapter stressed the importance of understanding the social dynamics of a household, as decisions around dwelling acquisition and energy related fixtures were found to occur at a group level. The chapter found that householders try to improve elements of their material culture when moving, which includes progressing up the housing ladder, and improving the quality of energy services.

Householder experience was found to be an important factor in influencing dwelling choice and characteristics that would maintain householder comfort and keep energy bills low. Households who were further along the household lifecycle were more aware of how to achieve desired comfort levels, and were also less flexible in adapting to new environments.

The housing ladder was found to be a useful concept to help understand energy related investments into new dwellings. Households who were in rental situations tried to improve their autonomy around how they could use energy, as well as seeking better energy services.

First home buyers adopted a ‘wait-and-see’ approach to energy investments and were more willing to adapt to a new dwelling and learn what it was like to live in it before making any significant changes. Householders further up the housing ladder were more prepared to make energy related investments to match a dwelling with their preferred levels of comfort either by building a new one, or making changes even before moving in.

The social context was found to be an important factor in understanding how a household adapted to a new dwelling and set energy related norms. Households who underwent a change in composition were more likely to change household norms, which were organised according to householder influence and householder roles. Households who did not have a change in composition were more likely to realise a change in material culture and adapt or adopt new norms around new energy fixtures and appliances.

Householders were found to use three main influence strategies in order to establish new norms, which involved compromising, sameness and overt mandate setting. Householders were found to use these strategies differently depending on the social context. Those who had similar attitudes towards energy, and who shared energy related roles and practices had less conflicts around energy related norms. Some households were found to have ‘energy instigators’ who took on the role of enforcing energy saving measures, and generally cared more around saving energy than other household members. It was found that the amount of influence energy instigators had over other householders depended on the amount of influence they held within the households’ social context.

Incorporating learning’s of the changes in dynamics within the households’ social context gave a much clearer understanding towards how energy related behaviour was framed in a new material environment. In some cases, the social context was more important at mediating energy related norms and practices than the material culture in which they occurred.

Chapter 5: Overview/ Key findings

- Dwelling structure influenced appliance acquisition and disposal and was agentive in setting new energy related norms in the household
- Householders chose new dwellings to find ways to alleviate problems with past material culture and to help align desires for particular lifestyles better.
- Residential mobility provided opportunities for householders to increase their autonomy over energy related behaviours through the agency of different material cultures

Chapter 5 examined the influences of a changing material culture on energy related behaviours during residential mobility. Supporting existing literature on context change (Maréchal, 2010; Wood et al., 2005), it was found that dwellings that were substantially different to the last yielded greater changes in energy related behaviours. The dwelling structure was found to be agentive in householder decisions around appliance acquisition and disposal, as well as which appliances could be utilized and which needed to be placed in storage. Moving home was associated with upgrading technologies and energy fixtures, providing a chance for householders to get rid of old or obsolete technologies. New dwellings also provided an 'excuse' to invest in new technologies when old ones did not 'fit'.

New dwellings were agentive in aiding householders to adjust their lifestyles and energy related autonomy. New fixtures did not always influence householder practice or stimulate new behaviours if the technology seemed un-reliable or did not fit within the householders' norms. Also, if a previous dwelling provided an unpleasant experience, householders were more likely to rebound and use energy more extravagantly if they were able to. The influence of a new material culture was sometimes underestimated; households would aim to keep similar energy bills when moving, even if the second dwelling was larger than the first.

Habits such as turning lights off when leaving a room and switching appliances off standby were found to be context dependent across cases. Householders who reported practicing energy saving behaviours in the home needed to consciously re-learn ones which were

triggered by new environments. Embodied knowledge around different material cultures was found to help guide householders during dwelling acquisition. Adjusting to a new environment required periods of trial and error as householders got used to the different thermal aspects of a new dwelling and how to achieve ones that they were satisfied with.

By addressing residential mobility holistically, this thesis gained new understandings of how residential mobility affects energy related behaviour. The findings presented in this thesis will now be reviewed according to the conceptual framework presented in chapter 2.

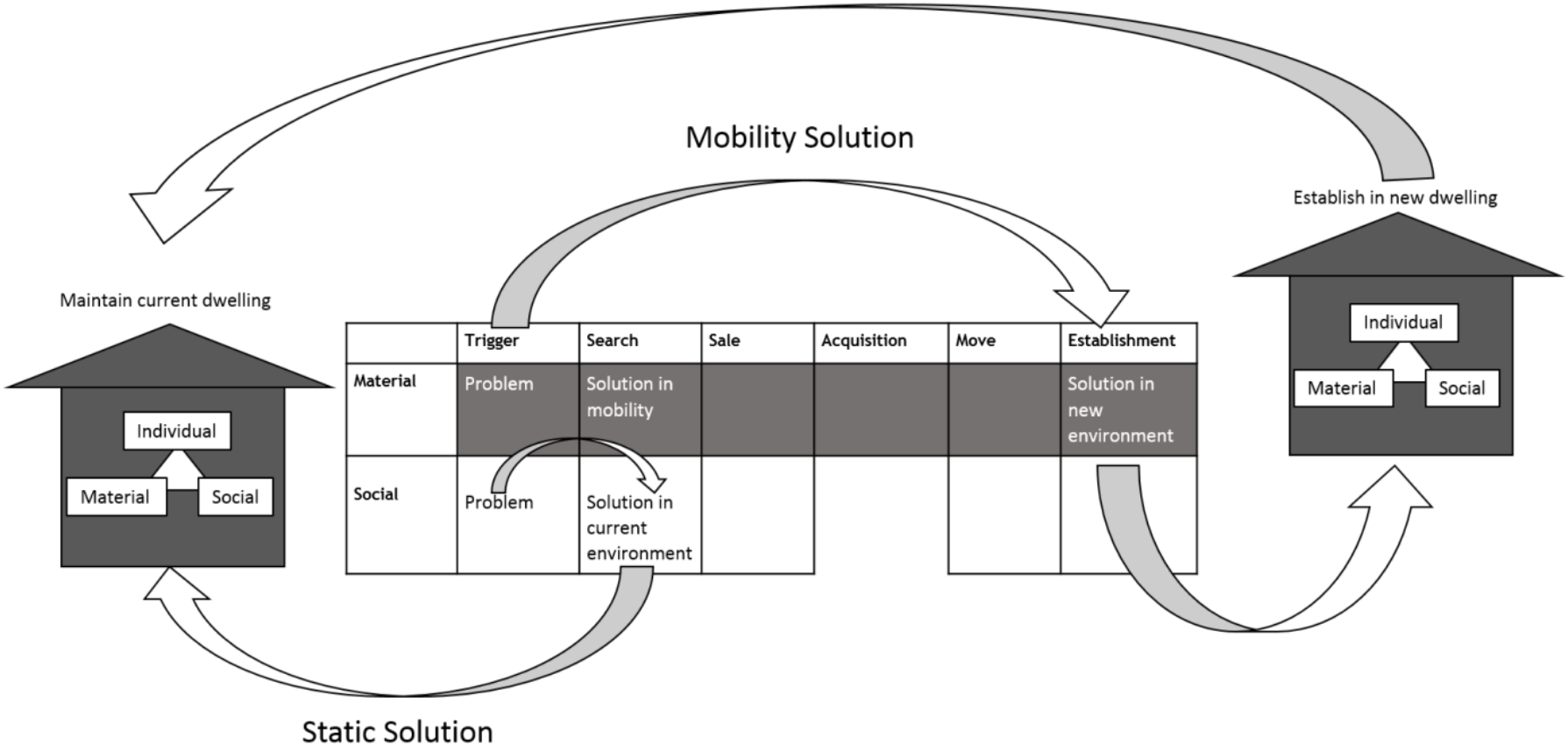
6.2 CONTEXT CHANGE FRAMEWORK

The findings from the longitudinal case studies supported the context change framework that was presented in chapter 2. The context change framework provides a holistic understanding of mobility at the meso and micro level, and uses a systems perspective which argues that changing one element of the household system will create changes in the others (Gunderson, 2001; Holling, 2001). By investigating relationships between the material, social and individual contexts, the thesis has shown that integrating all three aspects is vital for understanding changes in domestic energy consumption and therefore essential in creating effective interventions to reduce energy demand.

As residential mobility commonly coincides with adjustments to such things as the household lifecycle, housing career and household composition, interventions during residential mobility will only be effective if they account for the most relevant changes to the household – which may not always be a change in material culture. The context change framework was shown to be extremely useful in understanding how householders change energy related behaviour during residential mobility. By capturing normal energy related behaviour before and after moving, the thesis was also able to show the changes in systemic interactions between householders and their material culture.

As energy related behaviour is central to the interactions between the social and material systems in a household, the context change framework has provided a structure by which changes can be examined during residential mobility (see Figure 20 below).

Figure 20: The new context change framework – structuring energy related influences during six stages of the mobility process



The temporal dimension discussed in 2.9.4 associated with energy related behaviour and residential mobility is elaborated upon in Figure 20. Extending from Brown and Moore's (1970) trigger and search phases, the context change framework has incorporated the other processes involved in mobility (as discussed in chapter 2). The figure above expresses how householder problems expressed by Brown and Moore (1970), are either solved through residential mobility, or through some other means that allows householders to stay in their current dwelling. As the context change framework uses a dynamic systems perspective, energy related behaviour is something that adapts and changes within a household, with or without residential mobility. This thesis has shown how residential mobility can change energy related behaviour even through the main reasons for a change (such as a disruption in household composition) may be due to something else entirely. If the elements of residential mobility that disrupt the household system are recognisable, researchers and policy makers can more accurately use the residential mobility process to change energy related behaviour.

The thesis has shown how residential mobility provided opportunities for householders to improve elements of their material culture that they could not do within their current dwelling. It also showed how householders were sometimes able to anticipate what material changes they would need to do on their new dwelling before moving in there, showing that some energy related behaviours were pre-determined with dwelling choice. As the individual, material and social context evolve and adapt over time, the context change framework helps to recognise which elements require adjustments to re-establish equilibrium.

6.3 CONTRIBUTIONS TO ACADEMIC THEORY

- Thesis has merged understandings from the study of residential mobility and energy related behaviour to provide a new conceptual framework that outlines a better structure for interventions.
- It has shown how some householders incorporate both internal, embodied knowledge and attitudes associated with efficient and warm buildings when considering home purchase and acquisition.
- The study has shown how variable householder behaviour can be in regards to technology acquisition and disposal.
- The thesis has adapted existing methodologies to the study of dynamic moments between householders in a real world context

This thesis has built upon the energy cultures framework (Stephenson et al., 2010) by exploring the dynamic relationship between a changing material culture on norms and energy practices. The energy cultures framework provided a basis for understanding how a change in material culture can influence energy related behaviours in the household. The thesis found that residential mobility involves many interactions between householders, and therefore extended the understandings of (Stephenson et al., 2010) to create the context change framework presented above.

Understandings of how disruptions such as mobility influence household dynamics are still limited in social studies and have therefore missed the importance of how householder configurations are re-established with environmental change and life changing events. This thesis has provided some insights to the shortcomings found by Schäfer et al. (2012) when trialling context change interventions, by providing a structure to show that some householders may be more open to changing energy related behaviour before moving home as this is when they are making decisions of how they plan or expect to live in the new dwelling.

Verplanken et al. (2008) suggested that householders try to reduce the gap between dissonant attitudes and behaviours when undergoing context change. This thesis has shown

how the trigger and search phases of residential mobility incorporate desires for better lifestyles and material culture. The context change framework that incorporated the concept of the housing ladder shows the importance of understanding the cultural assumptions associated with the housing ladder and the expectations householders have of what a new dwelling will achieve.

Integrating findings with Sovacool (2011), the residential housing ladder provides a tangible structure by which researchers can address different scenarios of residential mobility. The context change framework provides a platform by which researchers can assess the different decision criteria that householders face in regards to energy use depending on whether they are in a rental, first home or experienced buying position.

Householders vary their investment strategies as well as their behaviour patterns depending on levels of experience and their position on the housing ladder. The housing ladder therefore provides the first stage of analysis for researchers and policy makers wanting to take advantage of residential mobility to change energy related behaviour. These findings add to earlier studies such as Burke (2006), who integrate efficiency mortgages and household energy ratings into the acquisition phase of residential mobility by giving a consumer centred understanding to energy in the home acquisition process.

Previous intervention studies have addressed the household acquisition process with efficiency mortgages and energy rating schemes (Burke, 2006) as well as the establishment phase with information and personal consultations Schäfer et al. (2012). This thesis has shown that there are many other areas where interventions can be implemented, which can all influence energy related behaviour in a new household during residential mobility and has illustrated these along the six stages of the moving process (Table 1 & Figure 20).

This study has shown that there are potential opportunities for habit-related interventions at various stages of the mobility journey, supporting studies that have measured the prevalence of habit in changing performance contexts (Schafer & Bamberg, 2008; Verplanken et al., 2008; Verplanken & Wood, 2006). This study provides new insights into the habit-goal interface by incorporating the influences and changes of the social context. The context change framework has shown which circumstances can lead to changes in energy related

behaviours, as habits are not only contextually driven by material environments but by social circumstances as well.

The context change framework argues that residential mobility is a process by which households fix problems incurred in the last dwelling, including energy related issues. This was alluded to in Schäfer et al. (2012) and context change framework provides a structure to understand what kinds of problems may be being alleviated. The expectations of what should be achieved by the process of mobility are perhaps the most important issues to be tackled if researchers want to turn mobility into a process of reducing energy consumption.

The findings support household energy rating scheme interventions and also other information or attitude-based interventions that are targeted at different household types. Householders incorporate both internal, embodied knowledge and attitudes associated with efficient and warm buildings when considering home purchase and acquisition. The study has also shown how householders make energy related decisions together, and that outcomes depend on the relative influences that householders have on each other.

This thesis provides evidence that stresses the importance of understanding energy related consumption at the meso level, supporting Reid et al., (2010). Although it has been well known in consumer science that householders make decisions together when choosing a new dwelling, this understanding is often lost in studies that address household energy consumption. Aligning with literature by Grønhøj and Thøgersen (2012) and Kleinschafer and Morrison (2014) who address household norms, this study has shown how concepts such as household influence and householder roles are not only used in dwelling acquisition but in the establishment of household norms in a new dwelling.

This thesis has contributed to the study of technology acquisition and disposal during mobility by including the use of portable heaters, fridges and televisions as well as the acquisition of new heating fixtures such as heat pumps and dwelling insulation. These findings build on understandings provided by Shklovski and Mainwaring (2005) on the changes to technology use, acquisition and disposal during residential mobility and provide insights into how these processes influence domestic energy consumption. Householders were found to use residential mobility as an opportunity to upgrade old and obsolete

appliances, and also to increase their appliance stock through the availability of more room space. Larger dwellings also provided opportunities for householders to use appliances that had previously been in storage, which included the increase or doubling up of fridges or freezers.

Shklovski and Mainwaring (2005) and Wilhite (2008) alluded to the agency of new structures in changing behaviours and as well as framing the placement of new technologies which have wide reaching implications for new energy related behaviours after residential mobility. The thesis has added to the understanding of residential mobility and provides insights into why and how personal technologies are either put into storage or active use in a new dwelling. It also revealed how new dwellings can trigger increasing consumption, or how they can dampen old energy efficient behaviour, by the simple access to wall switches or cupboard space for different technologies.

Personal preference and trust in technologies can still override the agency of new dwelling structures and the influence of changing social contexts. The study revealed complex ways in which residential mobility provides solutions to energy issues as well as complicates interventions as householders use mobility to purchase new appliances.

6.3.1 Implications for policy makers

The context change framework provides a structure that could help policy makers time interventions better in order to reduce household energy consumption during the residential mobility process. The thesis has provided insights that suggest this could be done by addressing householders' positions on the housing ladder, and changes in the social context.

Key findings:

- Framework provides a new structure to target energy related habits and householder norms
- Decisions rarely involved a single individual and therefore need to be targeted at a group level

- Householders could be targeted according to their position along the household lifecycle
- Policy could address the meaning associated with residential mobility by targeting attitudes associated with warmth and comfort

The biggest challenge facing residential mobility and reducing energy consumption lies in changing the meaning associated with mobility to be one where householders can improve quality of life but also decrease their impact on the environment and the intensity of energy consumption.

Policy designed to intervene in energy related behaviours should recognise that many households make energy related decisions at a group level when undergoing residential mobility. Interventions which use targeted information campaigns to change attitudes or to trigger attitude changes around energy consumption may find value if implemented before householders move, rather than after.

As residential mobility often provides solutions to problems by improving comfort and convenience, this thesis has provided a structure by which policy makers could target different household categories according to their expectations of comfort and their adaptability to new environments. Older householders, for example those preparing for retirement, may place more importance on residential thermal comfort and will therefore require support to make appropriate energy related investments.

Younger householders buying their first home may need support in choosing appropriate energy related investments once becoming established in their new home. Householders in rental situations put more emphasis on improving material cultures as they had less ability to make changes to the material cultures after moving. First home buyers are more willing to adapt to their new environment to understand what it is like to live in it before considering substantial energy related investments. Experienced home owners are more likely to make energy related investments soon after moving, or even before moving in, that fit with their norms of comfort and convenience.

It is important to recognise residential mobility as a crucial stage where householders make significant investments regarding energy. There are two crucial differences in timing between new home owners and experienced home owners that provide opportunities for government intervention to aid the quality of housing investments in both situations.

The context change framework provides a structure to assess and influence the social context of a household. As mobility is often associated with changes in household composition or householder roles and influence, policy makers should focus on equipping those people responsible for influencing energy related norms. Legitimising the role of the energy instigator in the establishment of energy efficient norms could provide a much more powerful outcome than simply addressing attitudes or changing material environments.

The context change framework allows policy makers to target different household types and make realistic assumptions of how different households will respond to socially targeted interventions. Householders moving into flatting situations for example could be given support packs to delegate an energy instigator along with provisions for enforcing efficient practise which work for that particular household. Any kind of intervention that eases tensions and reduces conflicts will have a better outcome than ones that will create polarising opinions or distrust between occupants or external establishments.

This thesis has been written at a time when New Zealand is undergoing a housing crisis where there is a significant lack of affordable housing. Currently there are suggestions to increase the amount of owner occupied dwellings available however because of the pressure to do so there are dangers that houses will be built to a minimum standard. This study has shown how vital appropriate dwelling construction is for triggering energy efficient behaviours as well as setting norms of comfort. Any new dwelling being built in New Zealand must consider the implications of the construction and fixtures for a much longer term than previously thought, as it is well understood that cheap housing costs much more in the long term in terms of energy use.

6.3.2 Implications for business and social agencies

Residents were found to adopt different strategies around the use and investment in energy related fixtures depending on their position along the housing ladder, and preferences for norms of comfort. Although householders adopted different strategies to adjust to their new dwelling, they also left their old dwelling with detailed knowledge of how to make the house comfortable, and how to use energy effectively.

There is an opportunity during the household sale and moving phases for residents to pass on such knowledge to the next set of residents coming in to their old house. Instead of residents having to learn how to make a house function efficiently through trial and error, previous inhabitants may be able to provide house specific knowledge around what the most appropriate renovations might be, as well as how to use heating fixtures most efficiently. Smart meters can potentially become extremely useful for residents during the establishment phase, if they can provide disaggregated feedback that compares energy load profiles compared to the previous inhabitants, along with information on how those inhabitants achieved those particular energy bills.

The context change framework provides an actionable platform by which businesses and social agencies can target householders during residential mobility. This thesis provides some evidence that could support energy rating schemes for rental dwellings that can help tenants choose dwellings that will improve their material culture. There is a strong case for these schemes both for tenants and businesses, as tenants who are satisfied with the comforts of their chosen dwelling they may be less inclined to wish to move. As such schemes have already begun in Dunedin[25], there are opportunities for businesses and social agencies to use such schemes to create opportunities for investment strategies and improve their competitive advantages.

25 See http://www.ratemyflat.org.nz/

6.3.3 Limitations

The qualitative nature of this study meant that results couldn't be extrapolated to a larger population easily. Efforts were made to gather a broad spectrum of demographic and situational variables amongst the case study, but the findings will still need to be tested with a larger population in order to be generalizable.

Although the longitudinal nature of this study provided an in depth understanding of changing behaviour over time, this also made it difficult to interview households at similar times of year. Variables discussed around changes to heating behaviour differed over time as householders adjusted to the climate outside. As it was common for householders to discuss the thermal effectiveness of a new dwelling, they would commonly mention that they would need to live through a winter before knowing how comfortable the house would be.

- Although there are many variables associated with behavioural change, this thesis primarily focuses on the influence of a change in material culture and the interaction of pre-determined goals.
- Although habits can take a long time to become completely automatic, the focus of this study is to understand the process of discontinuity and new habit formation, rather than overall habit strength.
- The use of a systems methodology always provides challenges in defining boundaries. This project has focused on the household (meso) level and individual level, which can provide difficulties in theoretical comparisons. To counter this problem, two different analytical techniques were used; concept mapping methods were used to look at the meso level of data whereas the individual motivations for behaviour were informed through value laddering.
- Other influences outside of the physical boundaries of the household, including information to the householders that may have influenced their decisions such as advertising from print and television are counted as externalities in this project. This does not exclude them from interpretation and/ or analysis, but they were not being pursued directly as the main focus of this study. The advantage of the semi-structured interviewing technique allowed for an open ended enquiry where

interviewees could include such external influences when they felt they were appropriate.

- It is often difficult for people to identify self-behavioural patterns, habits especially are difficult to recollect and describe, as they are often automatic and even unconscious. This issue has been addressed through the use of context dependent interviewing – where the interviewer questioned the respondent on behaviours within the performance environment (of the dwelling) in order to identify potentially supressed behaviours. This was hoped to increase the recall of actual patterns of behaviour and even provide opportunities for the participant to show examples of how habitual behaviour is carried out. The methodology also involved questioning the development of new habits in their formation stage.
- Applying a mixed method approach provided many advantages in allowing for explaining variation and externalities in results. However not all variables could be accounted for, and the semi-structured approach in gathering data provided differing results across case studies that should not be extrapolated to other areas carelessly. The aims and method of this study did not require larger sample populations, and data analysis used member checking to improve intersubjective validity.
- While attempts were made to control interview environments and conduct them in participants' homes, sometimes they needed to be recorded in other places participants felt comfortable or where it was more practical given the reality of moving.
- As most interviews were conducted in the evening it is possible that interviewee fatigue influenced results. However as this was a constant throughout most interviews and interviewees were communicated with on multiple occasions, the researcher believes this has not altered findings in any detrimental or significant manner.
- Having only one primary investigator available for all data gathering analysis and interpretation always creates opportunities for interpreter bias. Resource constraints also do not allow for more participants or multiple data coders. Many steps have been taken, including member checking, to improve intersubjective validity. However the ontology of the researcher and methods of investigation were specifically chosen to address interviewer subjectivity

- Given time constraints upon the thesis delivery, data collection had to be undertaken within two years potentially limiting the thesis' ability to identify long term behavioural shifts.
- In order to ensure the interviewer was not being too intrusive, the original methodology was altered from taking photos of the layout of the inside of houses to photos of individual appliances. This would not have impacted on analysis in any significant manner, as the photos were only ever envisioned to be used for illustrative purposes in the thesis.
- While a third party transcribed interviews, the interviewer checked through transcriptions to assess their accuracy with recordings and any mistakes were rectified thereafter.

6.3.4 Further research

- Interventions need to be trialled according to different housing ladder stages
- The context change framework should be tested on larger studies over a longer timeframe
- The changes in social dynamics associated with energy related norms still provide many opportunities for further investigation

Residential mobility has been found to provide many opportunities for intervention to reduce domestic energy consumption, however there still need to be real world trials. After findings from Schäfer et al. (2012), this study has shown that interventions need to be even more targeted at the particular situation of a household, and that the timing of interventions is paramount for an interventions success. Further research should therefore initially focus on choosing specific examples of residential mobility and test interventions on a particular position along a housing ladder with understood household dynamics.

Currently there are projects being considered in the United Kingdom to study households and their energy consumption over a long (10 year) period. Such insights will be invaluable to helping understand and predict the ever changing cultural and material dynamics of domestic energy consumption and further build on the insights of the current thesis. This

thesis has provided a framework on which further long term projects could build, as well as help researchers to hone in on which variables are most applicable to understanding changing household energy consumption over time.

Although there are benefits to understanding how different households respond to a single dwelling over time, this thesis has shown that there is perhaps more value in following householders as they move from one house to another instead. This thesis has stressed the importance of the social dynamics within a new material context, and how these can still be more agentive than the influence of a changing material culture. In order for research to successfully shift household energy demand, studies must include the dynamics between household members, and recognise that social influence processes at a meso level can take precedent over all other factors.

6.4 CONCLUSIONS

It has been well recognised that changing energy related behaviour is easier to achieve when both the social and technical elements associated with demand are addressed. Residential mobility has been seen as a natural point to influence energy related behaviour, as it is a time where the household sociotechnical system is disrupted. However, intervention studies during residential mobility are still relatively rare, and those that have been trialled have produced contradictory results to what theory suggests.

This thesis has examined the process of residential mobility in order to understand how energy related behaviour changes, and seeks opportunities for effective interventions to reduce energy consumption. Previous intervention studies that used life stage transitions such as mobility may have failed to approach households at the right time, or approach the changing social dynamics of the household appropriately. They also failed to consider which behaviours householders would be prepared to adopt during mobility and therefore provided interventions that were not successful

- The thesis has provided a conceptual framework by which to understand changes to energy related behaviour during residential mobility
- As households go through the moving process, they engage in a range of decisions that directly and indirectly influence how energy will be used in the new dwelling.
- The social nature of household decision making and the changing nature of householder relationships are at the heart of understanding residential mobility
- The heterogeneity of householder behaviour is reflected in the different circumstances in which householders live and the changing nature of their social contexts
- Even if some householders were comfortable with new practices around energy consumption, these could easily be overturned if they created householder conflict
- The housing ladder was found to be a useful concept to help understand consumer choice processes. Cases were dispersed along the housing ladders, most moving up, and some, at times, moving down. Households who were at the lower end of the housing ladder made specific efforts to improve their autonomy over energy decisions, as well as improve the level of thermal comfort in the new home.

Reducing energy demand through changing behaviour and the efficient use of energy is of paramount importance to reducing the growing pressures on energy infrastructures, as well as social and ecological wellbeing. This thesis has contributed towards greater understandings of energy transitions, showing that households regularly adapt and adopt different routines amongst extremely varying circumstances, and almost always with better outcomes.

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APPENDICES

APPENDIX 1 PARTICIPANT RECRUITMENT LETTER

UNIVERSITY OF OTAGO

Daniel Gnoth—PhD Candidate

Moving Home?

Participants sought for energy efficiency study

Dear «Name»,

I am a PhD student at the University of Otago investigating energy use in the household. If you are looking at moving home it would be great to talk to you! This study aims to understand how energy related behaviour changes when moving home, and what can be done to make the most of this opportunity to increase energy efficiency. If you decide to take part I would be happy to help you with the move on the day!

If you are interested in taking part please contact me either by the email or phone details provided below. Please also see the PDF attachment for more details of the study.

Thank you very much for taking the time to read this email and I look forward to hearing from you in the near future!

Sincerely,

Daniel Gnoth

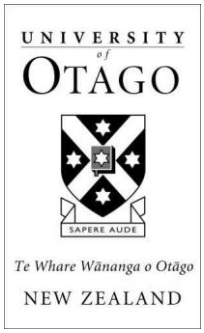
University of Otago

Email: daniel.gnoth@otago.ac.nz
Phone: 03 479 3928

This project has been approved by the University of Otago ethics committee

How did I get your email address? This project is being supported by the living corporation for recruitment purposes. If you would no longer like to receive emails from the University of Otago please reply to the address above stating your request.

APPENDIX 2 INFORMATION SHEET FOR PARTICIPANTS



CONTEXT EFFECTS ON HOUSEHOLD ENERGY RELATED BEHAVIOUR INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

This project is being undertaken as part of the requirements for a PhD in Marketing at the University of Otago. The study aims to understand how energy related behaviour changes when moving home and what can be done to make the most of this opportunity to increase energy efficiency in the household.

What Type of Participants are being sought?

This study is seeking to recruit participants who are in the process of moving home. Participants have been chosen from a nationwide survey into household energy use conducted by the University of Otago in 2011. Some participants may have been selected through referrals or print adverts. The study wishes to gain insights into how energy is used by a household and therefore wishes to interview all members of the household over the age of 18. Around fifteen households are to take part in this study and the interviewer will offer to help them move house (such as pack boxes or shift furniture) as token of appreciation for their time.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to answer questions about how you use energy in your household. The study will be conducted in three stages, the interviewer will first interview you before you move home and then twice afterwards to see how you use energy differently and what things have remained the same. Each interview will last around an hour. If you have not taken part in the earlier energy survey you will be asked to fill a shortened version to gain a comparable understanding of your energy use patterns.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?
Interviews will be recorded on a personal voice recorder so that the researcher can sort responses into themes. These themes will then be presented back to the participant to be discussed in the next interviews. The interviewer will ask if he can take a photo of some of your electrical and heating appliances as well as some of your main living spaces which will be used for comparison of the two houses. The interviewer will also leave a thermometer in your main living area to compare the difference in temperature. Personal information from the survey including age, income and energy bills will be recorded and used for comparison amongst households.

The data collected will be securely stored in such a way that only those mentioned below will be able to gain access to it. At the end of the project any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

Results of this study will be made available in the Otago University library upon completion of this thesis. However you are welcome to personally request a copy of the results from Daniel. The interviewing methodology will encourage you to observe your own responses once they have been analysed, and you have the opportunity to correct or withdraw information as you see fit at any time during the interview process.

This project involves an open-questioning technique. The general line of questioning includes questions about how you and your household use energy and how that might change when you move home. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the project at any stage without any disadvantage to yourself of any kind.

This proposal has been reviewed and approved by the Department of Marketing, University of Otago.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

What if Participants have any Questions?
If you have any questions about our project, either now or in the future, please feel free to contact either:-

Daniel Gnoth and/or Rob Lawson

Centre for the Study of Agriculture, Department of Marketing

Food & Environment

(03) 479 3928 (03) 479 8158

daniel.gnoth@otago.ac.nz rob.lawson@otago.ac.nz

This study has been approved by the Department stated above. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph. 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.
I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. Personal identifying information (*residential address and name)* will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

4. This project involves an open-questioning technique. The general line of questioning includes questions about how I use energy in my home. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
7. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

.....

.....

(Signature of participant) (Date)

APPENDIX 3 CONSENT FORM

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.
I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. Personal identifying information (*residential address and name)* will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

5. This project involves an open-questioning technique. The general line of questioning includes questions about how I use energy in my home. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any dn isadvantage of any kind.

6. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

8. This project has been reviewed and approved by the department of Marketing, University of Otago

I agree to take part in this project.

....
(Signature of participant) (Date)

APPENDIX 4 ETHICS APPROVAL

Form Updated: February 2011

HUMAN ETHICS APPLICATION: CATEGORY B
(Departmental Approval)

1. **University of Otago staff member responsible for project:**
   Lawson Rob Professor

2. **Department: Marketing**
3. **Contact details of staff member responsible: Marketing Department**
4. **Title of project: Context effects on household energy related behaviour**
5. **Indicate type of project and names of other investigators and students**:

Staff Research

	Daniel Gnoth
Student Research *Level of Study)*	PhD
External Research/ Collaboration *Institute/Company*	

6. **When will recruitment and data collection commence?**
   20 June 2011

When will data collection be completed?
   20 June 2012

7. **Brief description <u>in lay terms</u> of the aim of the project, and outline of research questions**

The aim of this project is to investigate the opportunity of moving home on making changes to energy related practices and purchases. The study wishes to understand the context of moving home and how best to make changes to appliance use, especially household space and hot water heating during this time. The thesis focuses on behaviours within the home and how these are often constituted as habits. Many habits can be difficult to break once formed and it is through the phenomena of context change (shifting home) in which this study wishes to make informed decisions on possible interventions in the future.

The research questions are as follows.
1. What opportunities are there to increase energy efficiency when moving home?
2. How does energy related behaviour change when moving home?

a. how are these new behaviours formed?

3. What is the relation between goals and context change on behaviour when moving home?
4. When does a new environment trigger new routines?
5. How does context change influence appliance acquisition and disposal?

8. Brief description of the method.

This is study uses an exploratory qualitative methodology that will mostly consist of open ended semi structured interviews. The method follows a soft-systems line of enquiry (see Checkland 2000) where the participants actively take part in the analysis of the interview and assist the interviewer through the use of 'rich pictures'. The interviews will be conducted in three stages, the first will commence within the month before the participants move home, the second will be within the month that they arrive in their new house and the third will be one to three months after moving (see Appendix A for a list of the question guide to be used in the interviews). The interviewer will ask to take some photos of the house to use for comparison of the two dwellings. Thermometers will be placed in the main living areas to measure the difference in household heating temperatures

The participants will be selected within the wider Dunedin area between the ages of 25-65. All members of the household who are over the age of 18 will be interviewed. Participants will initially be sought from a database of survey respondents to an earlier nationwide survey on household energy use conducted by the Energy Cultures project at the University of Otago. Those who had ticked a box suggesting they may be moving in the next year as well as selecting that they would be happy to be contacted by the University for future research will be contacted if they fall within the study quota. The research design aims to find a broad contrast between householder types and this will be distinguished using earlier survey data. If further participants are required they will be contacted through media adverts (see Appendix B), real estate agents and/or referrals. Those participants will be given a shorter version of the ationwide survey before the study commences.

9. Please disclose and discuss any potential problems:

The project uses an open ended interview technique which involves some probing by the interviewer to delve deeper into responses made by the participant. Such a technique can in some cases lead to discomfort by the participant. The interviewer will take all precautions to avoid any discomfort to the participant and make sure that they understand they are free to decline from responding at any time, as well as change any statement they make either during or after the interview.

Reference:

Checkland, Peter B. (2000). Soft Systems Methodology: A thirty year retrospective. Systems Research and Behavioral Science, 17, 11–58.

DATE OF CONSIDERATION: 28/06/11

Signed (Head of Department): ..... pp .....

Name of Signatory (please print): ..... Leah Watkins. .....

[Reference Number *as allocated upon approval by the Ethics Committee*]
[*Date*]

APPENDIX 5 INTERVIEW GUIDE

Questions pre-shifting

Obtain copy of power bills

May I take a photo of outside your house/living room, bed room, kitchen and bathroom?

And hot water cylinder

Showing main heating appliances in each.

Why did you choose to live in your current house?

What aspects of this house have you changed since moving in/ practices? Why?

Which rooms do you use most often? How do others in your household use the rooms?

What things in your house use the most energy? – why?

What behaviours do you do which save energy?

What rules or expectations do you have in your family for using appliances? – if someone came from outside your culture?

When/how do you decide to turn your heater on?

When/how long are showers and baths?

Who uses the most/least?

Who sticks to the rules and who doesn't?

Lights, heating, water

Which rules work, which ones don't?

Are there any you would like to change when you move into your new house?

What made you decide to move home?

Have / will you make any alterations to your house before you leave?

What things would you change about this house to help you use less energy?

What things in this house seem to use lots of energy, have you any tips on how to use them more efficiently for someone moving into your house next?

Have you / will you got rid of any appliances for when you move? Why?

Why did you choose your new house?

How do you anticipate living / using energy will be different in your new home?

Are there any goals you have when you move into your new home? Any energy related habits you would like to break or create?

Do you anticipate you will use energy differently? Why? How?

Do you anticipate needing to change any appliances in the new house?

Send copy of concept map – check for definitions of roots as well as linkages

Where possible have a face to face – how does this represent reality?

Questions post shifting

Did you keep with the same electricity supplier?

Did you keep the same kind of payment plan after moving?

May I take a photo of outside your house/living room, bed room, kitchen and bathroom?

And hot water cylinder

Showing main heating appliances in each.

Show systems model of life before and anticipated after, discuss these in context with interview

What things are different about your new house?

Have you discarded or acquired any technologies? Why?
How is general life different/same?
Do you use appliances differently? How? More often, different buttons..
What habits have you had to change? What habits are you wanting to create?
Which heating sources are different, how do you use them differently?
What parts of your house are more/less comfortable? Temperature – spaces/hot water?
Which rooms do you use most often? How do others in your household use the rooms?
Are you able to live the way you had anticipated?
Which things are different, why?
Are there any traps you see yourself falling into? –things that you would rather not do

Follow up - one to three months later

Obtain copy of power bill
Look back to model, which things are still the same, which things could be changed back which things have become habit?
Have you discarded or acquired any technologies? Why?
Which behaviours have stayed the same? Which have changed?
Have you formed any new habits?
Looking back at your desires before moving, have you managed to set
What rules do you have in your family for using appliances? – if someone came from outside your culture?

APPENDIX 6 TRANSCRIPT CODING EXAMPLES

Initial codes were scribbled on transcripts to familiarise the interviewer with the data

Different coloured pens were used to identify different themes, when multiple themes were identified multiple lines were drawn under or around the text (this thesis has been printed in black and white)

The first example shows some of the initial coding and familiarising with the transcript.

The second two examples on the following pages shows some of the higher level analysis across cases.

r. and it only heats this room. We've never ever had, although there's a small fan heater in the living area, we don't tend, we tend to use this more as a living room. Like even in the mornings we've never had a fire heater on in the living room.

I. right so it keeps its heat over night, that's pretty awesome.

r. most of the time too we're away, in the mornings pretty early anyway. So we don't need to have the heater on and, its cosy in the living area.

I. who decides to turn the heater on? When do you decide that it's a time that we should turn the heater on?

R2. We probably would be having tea; we would be sitting in here having tea. All together and just one of us, any one of us might say oh we're getting a bit cold and turn the heater on and we'd say that's a good idea and yeah go for it.

I. yip cool, and there's no kind of unspoken rule when it's right to turn it off and right to turn it on?

R2. No sometimes people might say, oh its getting a bit hot in here, should we turn it off and then we all just say yeah that's a good idea. Turn it off.

I. fair enough, what about other appliances in the house, like lights for example? Do you just use them in each room as you move around the house or?

r. I tend to, I've always been in the habit of, as I leave the room, turn the lights off. And it's just me, just long standing habit. Whereas others, I was crook today, didn't go to work. And I got up and came down in the morning, and all the lights everywhere were on

r2. Thomas, he's a sad man isn't he Thomas, to be honest we don't really care, Thomas and I

I – Excellent and so those are the ideas? Okay, good, around this particular one, and you're happy with the log burners being gone

R2 – Yeah definitely

R – I mean-

R2 – Put the table and chairs there now

I – Cool, so yeah and I think there was the hassle factor and that the unsightliness as well

R2 – Mmmm hmmm

I – Of the old ones, cool, and are you still thinking, weighing up around electric and gas for the other room, or

R – Yeah, moved away from gas probably we'll put in one of those eco-type heaters, you know the very thin panel ones that warm because that's not going to be a living area anyway. That particular room would be reasonably easy to heat, so it wouldn't need a gas fire. It would be nice to have a gas fire going in there, but then that comes down to economics and –

R2 – And also where would we put it?

R – Well, we'd put it where it was

R2 – Yeah well we've got the TV here

R – That's why we decided not to put the gas fire in

R2 – Righty-o

I – Oh cool-

change - Thought gas now Think e- panel...

got new tv. but that stopped gas fire..

I – And there was also a few things around potentially making alterations to the house, expanding garage and doing something to the bathroom, has any of that taken place yet?

R – Not physically, we organised the fittings and that for that bathroom, well priced them all in and –

R2 – New lighting

R3 – Yeah

R – Oh yeah we bought lighting for the room in here, changed that over because what we're going to do is get rid of all those halogen lights and there's 18 lights in that wee area there

R2 – It's ridiculous

18 lights

R – We've already, there was already in Tom's room and the main bedroom, when you turn the one switch on the main light came on along with how many halogens

R3 – Four halogens

wiring/ lights

R – Four halogens in your and four halogens in ours. So I've had the electrician from work tidy up a lot of the wiring in the ceiling. It was pretty dodgy. It was like a spaghetti junction up there. It's still not that flash, but he's also, I've got him to split off the halogen lights from the main lights so we've got two switches and you just turn on one or the other in both rooms and we'll make the ceilings just a tad lower but keep it reasonably high, tidy them up and have less lighting there, more efficient.

R3 – And I suppose they're just waiting on the lights, like painting the ceiling before you put the, oh no we'll put the-

had halogens switched off from others...

R – We'll put the lights up

R3 – Paint the ceiling (??) just kind of other things holding that up. It's not like-

APPENDIX 7 INTERVIEW PROTOCOL

This section outlines the interview protocol and use of visual maps in more detail. The purpose is to give the reader a more detailed understanding of the variations in data collection that occurred in during the household visits. Some information is repeated slightly to the methods section to help establish context.

Efforts were made to keep interviews relaxed and informal, which sometimes included asking questions in different ways to maintain the flow of conversation.

Interview periods according to the moving process stages:

	Interview 1					Interview 2	Interview 3
Trigger	Decision to move	Search	Selection	Purchase /Sell/Rent	Move	Establish	Evaluate

The table above represents the different points of contact according to the household moving process identified in Table 1 (Chapter 2). Interviews were able to follow this format in most cases, however some cases involved different moves and interviews outside of the framework set above. One of the main discontinuities involved households who moved to temporary accommodation whilst searching for, or building their more permanent residence. In some cases households were approached whilst already in their temporary dwelling and therefore interviews involved discussions about their previous house, the temporary dwelling, and the new dwelling they were moving into. Such cases involved an extra dimension of complexity, which is not reported on much in the thesis, as the focus of the study was on the move from one house to another. However there is a dedicated section in 4.3.1 that focuses on the changes observed in temporary dwellings, and any case variations are presented more thoroughly in the individual case overviews (see Appendix 8). These factors account for some of the differences in the depth of knowledge of each household. Further reasons for differences will be mentioned below.

Throughout the thesis, cases are referred to as moving from ‘House 1’ to ‘House 2’. House 1 refers to their initial permanent dwelling (at least a year) and House 2 to their next permanent

dwelling (at least a year). These differences are covered within each case overview, and are referred to in 5.2.4 when discussions around changing social contexts are discussed.

Before taking part in the interview process, all participants were asked to read an information sheet about the study (see Appendix 2) and sign a consent form (see Appendix 3 for signed consent forms). Ethics approval was granted by the marketing department (see Appendix 4). Participants were informed that interviews were confidential, and that no identifying information would be kept about them. Participants were also assured that all data from the interviews would be kept securely for 5 years before being destroyed, as per university protocol. Participants were informed that they were free to not answer any questions, and to leave the study at any time with absolutely no repercussions to them.

Where possible, interviews were conducted at householder's dwellings in order to help the interviewer gain a greater insight into the type of dwelling and the ways in which householders lived within them. Interviews followed an open ended, semi-structured format, whereby the interviewer made efforts to keep dialogue relaxed and informal. The interviewer used a question sheet to help guide the interviews and make sure that the same areas would be covered in each interview (see Appendix 5). All interviews were recorded and transcribed before the next interviews with households followed (see disk attached for copy of interview transcripts). Case 14 involved only one interview since the participants subsequently decided not to move. However data from the first interview was still relevant to the some of the research and was thus retained.

As studies in mobility have shown, the reasons for moving and choice criteria are broad and complex (Dieleman, 2001). Case interviews therefore asked more general questions around householders' reasons for moving and choosing their new dwelling in order to ascertain where energy related criteria fit within householders' selection process.

Concept maps were drawn using Banxia decision explorer and displayed on a computer or television screen to the participants during the interview. The process of concept mapping is discussed later.

Efforts were made to involve as many householders in the study as possible, however it was not always possible for all household members to be present for all interviews or to take part in the study entirely. The study used a category B ethics application, which limited the age of participants to over 18 years of age (see Appendix 4). Although younger participants were often present in the household their interactions were not recorded and were omitted from analysis.

Interviewer bias is a common obstacle with in-depth interviews. The interviewer therefore took measures to reduce subjectivity and give room for participants to answer questions in their own words. When a new theme or idea was discussed, the interviewer re-phrased the comments through his own understanding to clarify the concept and make sure the interviewer understood the participant's perspective.

Decision phase – interview 1

The first contact was usually made less than a month before moving home. Most respondents had therefore chosen the new dwelling they were planning to move into, and had only recently undergone the search and acquisition phases for their new dwelling.

Where possible, cases were interviewed once before moving and twice after. The first interview was designed to understand what behaviour was normal and habitual within the original house (House one). The interviewer then asked why respondents were moving and why they had chosen their new dwelling (if they had found one already). Householders were then asked how they expected life would be different in the new dwelling, and how this may influence their energy related behaviours.

After the interview, the interviewer took photos of energy using appliances if the householders felt comfortable with that. The interviewer also placed temperature meters *(i buttons)* in the living areas and outside of the dwellings in both houses. However, due to the hectic nature of relocation, many I buttons were lost or damaged from one interview to the next – making the ability to compare house temperatures across cases difficult. Temperature comparisons were therefore omitted from analysis in this study.

Establishment phase – interview 2 (within the first month of moving)

The second interview occurred within the first month of householders moving into their new dwelling. The interview was structured around concept maps which had been created by the interviewer (see analysis section and examples below) which were usually cast on a television screen in the living room, and occasionally on the interviewer's computer).

Concept maps were used to confirm findings of the previous interview and to help structure questions about energy related behaviour in new dwellings. The interviewer tried to establish how energy related behaviour was the same or different in the new dwelling, and what the causes were for changes in behaviour. For those householders who had anticipated changes before moving in, the concept maps provided a starting point for participants to reflect on whether those changes had occurred. The interviewer would also consult the interview sheet to make sure all topics were covered, and ask what changes might still be planned for the short term.

Photos of appliances were taken when possible, and the interviewer was often given a tour of the house to get an understanding of the new dwelling's layout and how householders used the new space. Participants were also given opportunities to confirm or change elements of the concept maps that they were unhappy with or which needed further clarification. This process not only allowed the researcher to gain a deeper insight into householder decision processes, but also allowed clarification and confirmation of researcher observations and analysis. Householders were able to discuss their decision rationale to the interviewer, who was able to make changes to the concepts during the interview. This was then used to validate the householder responses, in the second interview, as well as record changes that occurred in the new dwelling.

Evaluation phase – interview 3 (three to ten months after moving)

The third interview was taken around three to ten months after settling in to the new dwelling. The now updated concept maps were then used again to structure the start of the interview and help reflect on what had been covered in the last interview to see if anything had changed since. Householders were asked about other changes which might still happen in

the long term, which also helped the interviewer garner further understanding of the motivations for household investments that had already been covered.

The interviewer also presented the participants with a survey in the last interview (see Appendix 8). Participants were given a choice of either filling the survey out themselves, or by the interviewer, who would ask them the questions. The survey was used to help gain a broader comparison of householders, by asking such things as age, income and electricity prices from house one to house two that householders may have been uncomfortable speaking to the interviewer directly about. The survey questions were a variation taken from Mirosa et al., (2010) (see Appendix 8).

Analysis and householder feedback

Interviews were undertaken in a semi-structured manner and took around forty minutes to two hours depending on the number of issues raised by participants. Each household was treated as a separate case study and members were interviewed on three separate occasions to establish how energy related practices and appliances had changed (or not) according to their new physical context and previous expectations. All interview transcripts can be found the CD attached, or please contact the author for a copy.

Phases 1 and 2, content analysis and concept mapping

After interview one, a thematic content analysis (Braun & Clarke, 2006) was conducted in order to ascertain the main reasons for moving, choice of dwelling and aspirations for life in the new house (see Appendix 6 example of initial content analysis). After the development of themes, these were then used to draw up the initial concept maps of the household during the moving process. Concept maps were primarily used to help the interviewer find the main influences on energy related behaviour during mobility, within the context of residential mobility. Recognising that mobility involves many different agencies, people and influences, concept maps helped tie together the relevant influences on energy related behaviour, within the context of everyday life.

Around six concept maps were generally drawn after the first interview, showing a case overview, reasons for choosing house 1, normal behaviour house 1, why moving, why chose house 2, expected behaviour in house 2 and energy attitudes. After the second and third interviews, concept maps amended to include changes in energy related behaviour, and if enough changes occurred new maps would be created to incorporate the reasons for new energy related behaviours in the household.

In the concept map shown below an overview of the moving process is presented for Case 15[26]. The number 83 on the top left of the concept refers to the energy related motivations for choosing House 1, and points its arrow to House 1 as a motivation for why the house was chosen (sunny location). In turn this influenced utterance 87 explaining how the household viewed and managed their resources (saved money; saved energy etc.). The dynamics within House 1 and emerging opportunities triggered 84 and the intention to move to a warmer more pleasant environment that 88 qualified as a way to live more conveniently. House 2 was then chosen which used to be an upgraded investment property in which they could retire comfortably. Concept 86 indicates that this house now was compensation for all the sacrifices made in House 1.

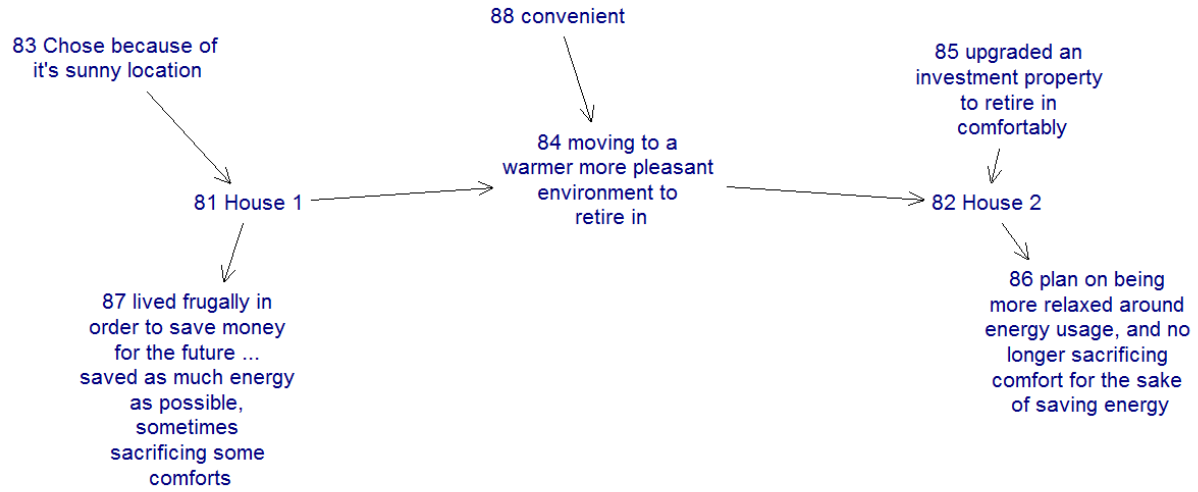


Figure 21: Example Concept Map 1 (Case 5)

26 The numbers attributed to the left of each case refer to when they were entered into the software program, these are useful to use as points of reference, but are otherwise arbitrary.

The two concept maps below involved another householder's reasons for choosing house one. These were generally geographically specific, with higher order values and motivations placed at the top of a screen, energy related behaviours and practices in the middle, and more physical material appliance and dwelling aspects at the bottom[27]. The figure below replicates why moving away from the school was seen as 'convenient' (number 5) as a higher order value: the life style became more private as fewer random visitors showed up which made it all more quiet and peaceful. The concept '14 away from school' was shaded black to show that it was one of the more important concepts to the householders.

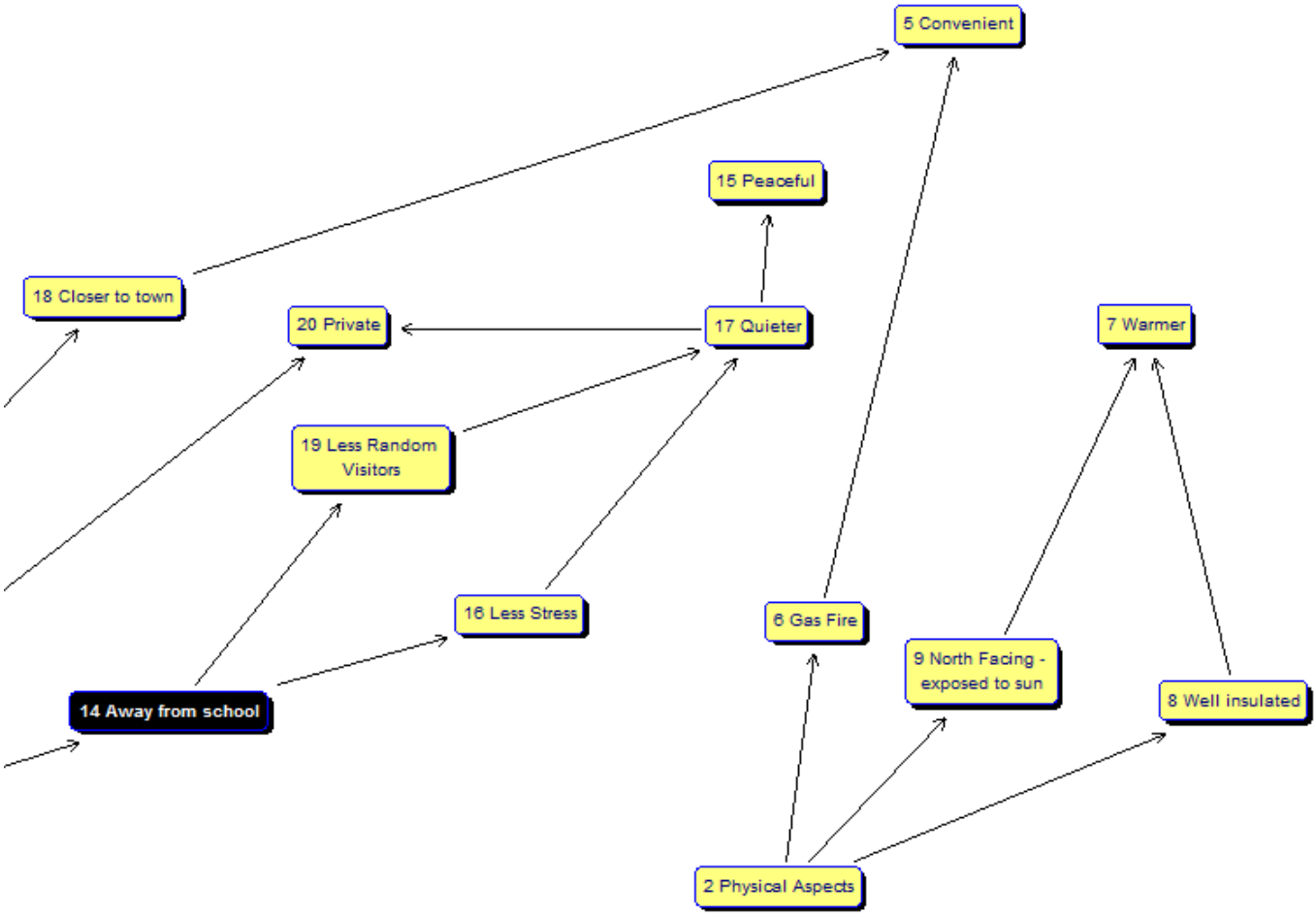


Figure 22: Reasons for choosing house 1 (an extract taken from Case 6)

27 Numbers on the left of concepts relate to the stage in which they were entered, and are otherwise arbitrary.

The figure above shows how householder interests in dwelling aspects interacted with their other motivations for dwelling choice. The concept maps in this instance tried to incorporate implications for energy related behaviour within the householders' decision making framework. Higher order values that drove certain desires for comfort and convenience also had indirect implications on the way in which energy was used in the new dwelling.

The third map (see below) shows normal, every-day energy related behaviours, including the uses of different appliances, and the differences in energy use between household members for case 15. It reveals attitudes (e.g. "don't like hot bedrooms") and substantiates practised behaviour. Other cases showed different 'normal energy related behaviours' depending on the number of householders and household appliances. For example, if households had children in the dwelling, norms associated with energy-using technologies would be different for parents from what they would be for children. Important influences or consequences on energy related behaviour were shaded black for ease of recognition, and ideas or influences which only came from one particular household member were shaded a particular colour for that particular householder.

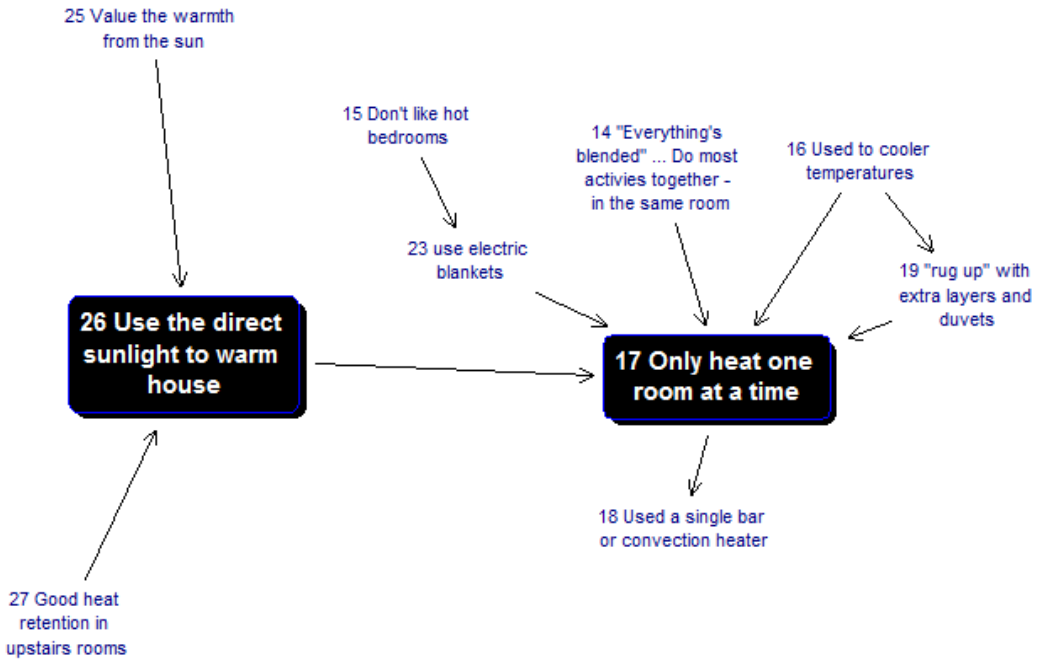


Figure 23: Concept map – normal behaviour in House 1. From Case 15

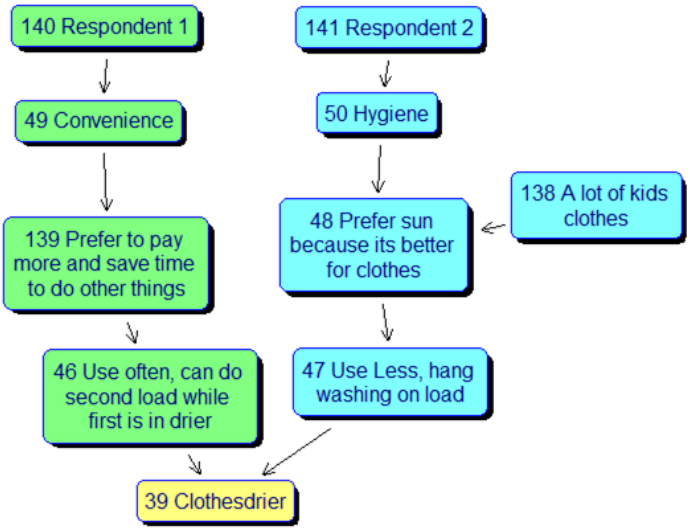


Figure 24: Concept map – Normal behavioural motivations around a single appliance, with differences between householders (Case 7)

The fourth map shows the reasons for moving and the fifth showed the reasons for choosing the second dwelling. The above figure exemplifies how Respondent 1 and 2 views (attitudes) the use of a clothes drier. In this case Respondent 1 chooses to pay for its use so as to save time while R2 prefers to dry clothes in the sun that is also driven by hygiene reasons. The fifth concept map incorporated expectations for energy related behaviour in the new dwelling. When enough data around householder attitudes was shared, this was sometimes followed by a sixth map showing the energy related attitudes of the different householders.

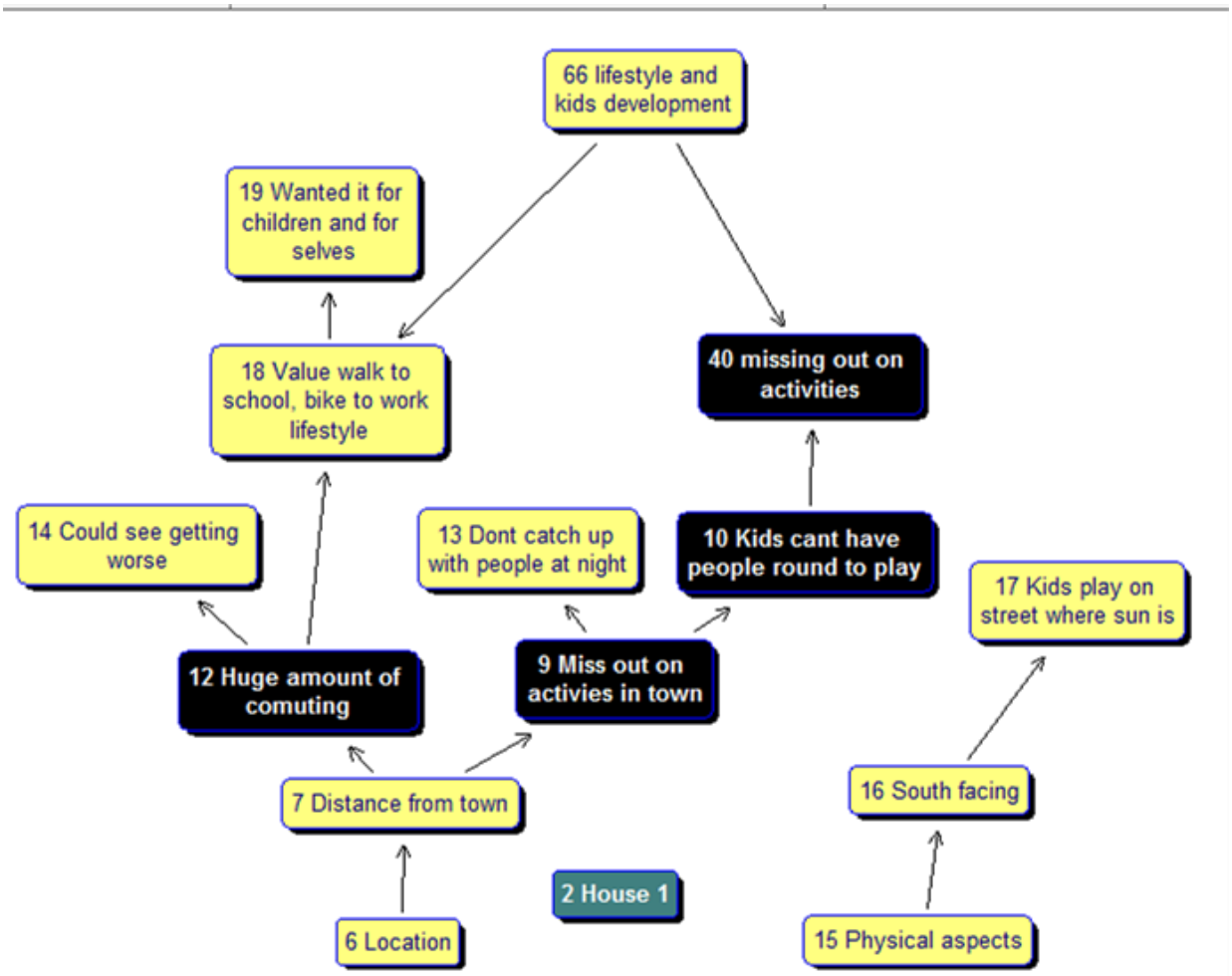


Figure 25: Figure: example of concept map – reasons for moving. Taken from case 9

The above figure displays the reasons for moving for case 9. The interactions between desires and material constrictions, making housing adjustments are shown, as well as potentials for changes in energy use that are closely connected to changes in lifestyle. The householders in case 9 above wanted to relocate because they were wanting to live closer to town to be closer to friends and not have to commute as much.

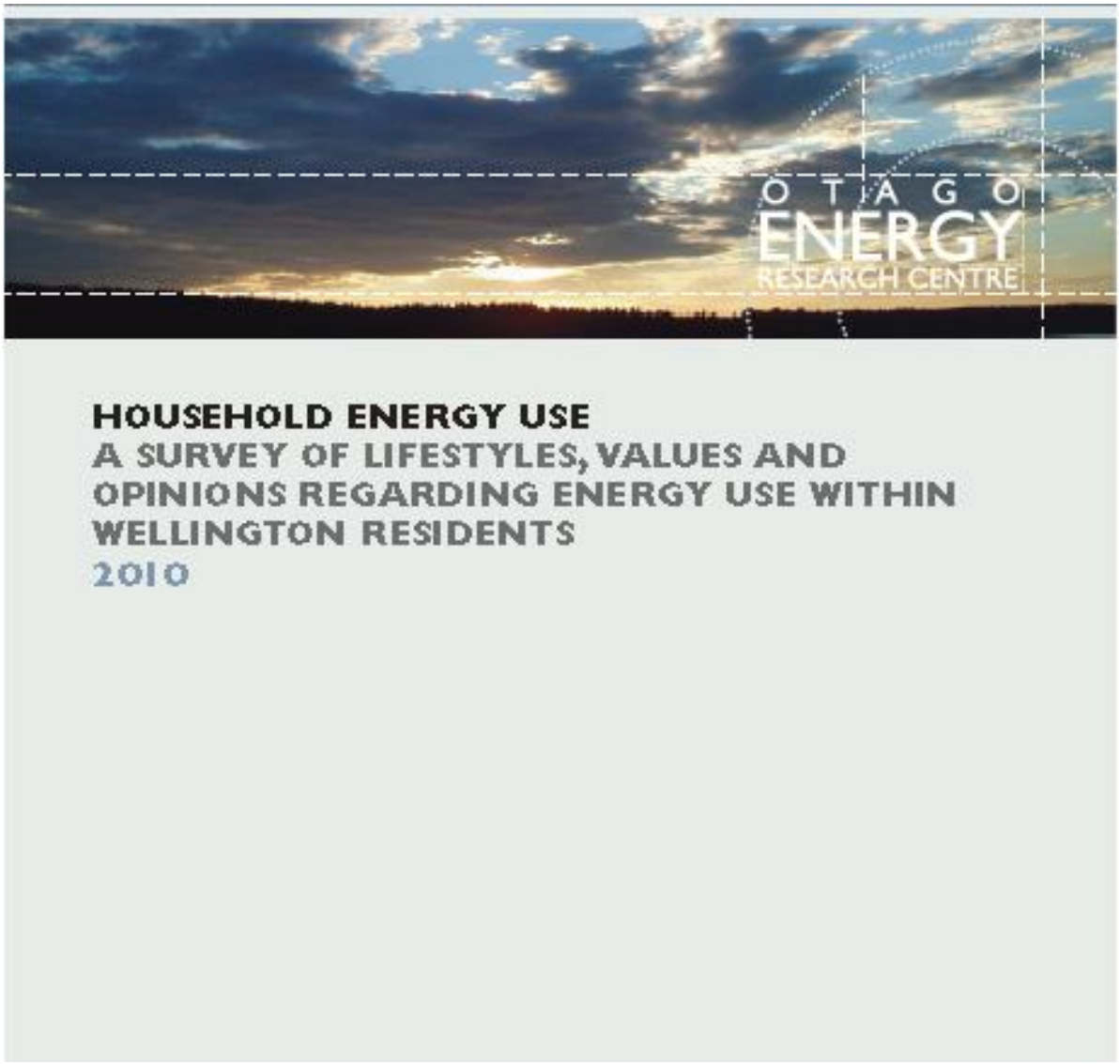
After interview two, transcripts underwent a similar process of content analysis as with interview one. Concept maps were then edited if participants had made any suggestions for changes to the maps. Secondly, another concept map was often developed to incorporate normal energy related behaviour in the new dwelling. If there was little change between house one and two, changes could be added to the same map that had been established in interview one.

After interview three, another content analysis was conducted on the third interview transcript. Concept maps were revisited in order to add any changes that had been suggested by participants, as well as to add any changes to energy related behaviour or fixtures since the last interview.

Maps were then added to after interviewees responses to the concept maps were incorporated. Changes were also made according to householder responses (which were only occasionally necessary). Changes to concept maps also included variations to householder behaviours from what they had previously anticipated, and shaded purple for ease of recognition.

APPENDIX 8 HOUSEHOLDER SURVEY

**Please note only a selection of questions were used from this survey to provide additional contextual information. This survey was a precursor to the energy cultures project survey. The original version of this survey was made up from a number of other literary sources and first implemented by Lawson and Williams (2012*



TO THE PERSON WHO PAYS THE ENERGY BILLS:

Thank you for agreeing to take part in this Household Energy Use Survey. This is designed to help us learn how people use various forms of energy and to better understand values and attitudes towards energy use.

The survey covers your opinions and behaviours to do with energy, as well as the technical aspects of how your household is designed and run. It is important that you give **your own views** on all of the items in this questionnaire. Please answer all questions.

To thank you for your time, your completed survey will go into a prize draw to win one of 5 x $100 New World vouchers.

The survey is completely anonymous and no identifying information will be kept about you.

Please attempt to answer all questions which apply to you by placing a **tick** √ in the box or **circle** the number e.g. 1 2 3 (4) 5 next to the statement that best describes your situation.

DWELLING CHARACTERISTICS

1. **What type of dwelling is this?** *(please circle the number which applies to you)*

   Separate house (1)

   Flat/apartment adjoining other flats (or buildings) (2)

   Other *(Please Specify)* _____

2. **When was your house built?**

   Before 1978 (1)

   Between 1978-1999 (2)

   After 2000 (3)

3. **How are your external walls constructed?**

   Timber or steel framing (including those with brick veneer cladding) (1)

   Concrete, brick or solid timber (2)

4. **How many rooms does your dwelling have and which ones do you heat regularly?** *(please write the number of rooms in the boxes provided)*

	NUMBER OF ROOMS OR AREAS	NUMBER HEATED REGULARLY
Bedrooms		
Lounges or living rooms		
Dining rooms or kitchen/dining areas		
Separate kitchens		
Studies or offices		
Bathrooms		
Separate toilets		
Laundries		
Rumpus room		
Other rooms		

5. **How many hours of direct sunshine would your house get for heat on a clear winter's day in June-July?**

   _____ hrs

HOUSEHOLD HEATING

6 **Can you apply a temperature setting to your whole house** *(e.g. with a thermostat for heat pump or central heating)?*

   Yes (1)

   No (2)

   6b. **If Yes, what temperature do you set your house at in degrees Celsius?**

   _____

7. **Which of the following methods do you use for heating your house? Please also indicate which items you use and do not use.**

	DO NOT HAVE	HAVE & USE	HAVE & DO NOT USE
Heat pump	○	○	○
Electric night-store	○	○	○
Portable electric heaters	○	○	○
Oil heater	○	○	○
Electric heaters fixed in place	○	○	○
Enclosed coal burner	○	○	○
Enclosed wood burner	○	○	○
Open fires	○	○	○
Portable gas heater	○	○	○
Gas heaters fixed in place	○	○	○
Central heating – gas (flued)	○	○	○
Central heating – electrical	○	○	○
DVS or other heat transfer system	○	○	○
HRV or other ventilation system	○	○	○

   Other *(Please Specify)* _____

8. **Which of the heating methods given above is your main method of heating?** *(select one)*

   _____

9. **Have you changed your main method of heating in the past year?**

   Yes (1)

   No (2)

   9b. **If Yes, what was your main method of heating originally?**

   _____

   9c. **Why did you change your main method of heating?**

   _____

10. Please indicate how many **rooms** or **areas** are heated by your **main method of heating** by placing the number in the corresponding box.

Bedrooms	
Lounges or living rooms	
Dining rooms or kitchen/dining areas	
Separate kitchens	
Studies or offices	
Bathrooms	
Separate toilets	
Laundries	
Other room:	
Other room:	

10b. How satisfactory is your **main method of heating**?
(Please choose **One***)*

I am happy with it and don't want to change (1)

I like it but would like to get something better if the opportunity arose (2)

I am unhappy with my current method and want to get something else (3)

If you are **unhappy** with your main heating method **what** is the reason?

What **alternative** heating method would you consider purchasing?

11. Do you use any heat transfer ducts to spread the heat between rooms?

Yes (1)

No (2)

HOUSEHOLD HOT WATER

12. Which of the following methods do you use for heating your water?

	DO NOT HAVE	HAVE & USE	HAVE & DO NOT USE
Electric hot water cylinder			
Electric – Instantaneous			
Solar			
Natural gas – cylinder			
Natural gas – instantaneous			
LPG – cylinder			
LPG – Instantaneous			
Coal burner with wet-back			
Wood burner with wet-back			
Other (specify)			

13. Do you have a hot water cylinder?

Yes (1)

No (2)

13b. If **known**, what temperature have you set your hot water cylinder to? (if **no** please move on to question **14**)

°C

13c. Have you replaced your hot water cylinder in the last 10 years?

Yes (1)

No (2)

13d. If **No**, has your cylinder been fitted with any insulation wrapping? (for example a woollen or fibreglass wrap).

Yes (1)

No (2)

13e. If **No**, why not?

14. Have you changed your hot water heating system in the last 10 years?

Yes (1)

No (2)

Don't know (3)

14a. If **Yes**, how does your current hot water system differ from the original?

14b. Why did you change your hot water heating system?

HOUSEHOLD APPLIANCES

15. Please indicate **which** of the following appliances you have and **use**

	DO NOT HAVE	HAVE & USE	HAVE & DO NOT USE
Waterbed			
Spa pool or heated swimming pool			
Dehumidifier			
Plasma screen TV			
LCD or LED Large screen or monitor			
Tubular TV			
Set top box (e.g. Free-to-air)			
Video recorder			
DVD player			
Games console			
Washing machine			
Clothes dryer			
Dishwasher			
Fridge/freezer unit			
Separate deep-freeze unit			
Separate fridge			

	DO NOT HAVE	HAVE & USE	HAVE & DO NOT USE
Home computer – Desktop	○	○	○
Laptop	○	○	○
Heated towel rail	○	○	○
Electric blanket	○	○	○
Rechargeable small vehicles; including mobility scooters or ride-on "toys"	○	○	○

16. If you **have** a washing machine what **setting** do you usually wash with?

Hot water (1)
Warm water (2)
Cold water (3)

17. Do any of the appliances that you **have** in the list above include a delay function **that you use**? *(a switch that can control the devices time of use)*

Yes (1)
No (2)

17b. If **Yes** could you please write which one(s)

18. Do you have energy-saving light bulbs in more than half of your light fittings?

Yes (1)
No (2)

19. Have you changed or added any of the above appliances listed in the past year?

Yes (1)
No (2)

19b. If **Yes** please specify what items you have:

Acquired

Replaced

Got rid of

ENERGY BEHAVIOURS

20. The following is a list of possible energy saving behaviours. Please indicate how **often** you do each of the following actions.

	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS
Turning appliances off at the wall *(not just leaving on standby)*	1	2	3	4	5
Rinsing the dishes with cold water	1	2	3	4	5
Reduce heating in unoccupied rooms	1	2	3	4	5
Switching off lights in unused rooms	1	2	3	4	5
Wait for a full load before using washing machine	1	2	3	4	5
Put on more clothing before turning up heating	1	2	3	4	5
Keep household heating low to save energy *(below 18 °C)*	1	2	3	4	5
Line drying of laundry	1	2	3	4	5
Taking shorter showers	1	2	3	4	5
Doing dishes by hand	1	2	3	4	5
Pulling curtains at night	1	2	3	4	5

21. Please indicate how **likely** you would be to consider the following energy related changes.

	NEVER	UNLIKELY	WOULD POSSIBLY CONSIDER	WOULD ACTIVELY CONSIDER	ALREADY DO
Cooking on gas	1	2	3	4	5
Installing double glazing	1	2	3	4	5
Buying an energy-efficient fridge-freezer	1	2	3	4	5
Purchasing an energy-efficient washing machine	1	2	3	4	5
Installing energy-saving light bulbs	1	2	3	4	5
Insulation of hot water pipes	1	2	3	4	5
Reduce hot water temperature	1	2	3	4	5
Applying hot water cylinder insulation	1	2	3	4	5
Install house insulation - Ceiling	1	2	3	4	5
- Walls	1	2	3	4	5
- Under floor	1	2	3	4	5
Seal drafts around doors and windows	1	2	3	4	5
Installing an energy-efficient heating system (such as a heat pump)	1	2	3	4	5
Buying a smaller refrigerator	1	2	3	4	5
Changing to a more efficient water heating system	1	2	3	4	5

22. If energy prices were to rise significantly, please list **three purchases or behaviours** from the lists above that you would be most likely to adopt

1
2
3

23. In the last 12 months, have any alterations been made to the **insulation** of your **building**?

Yes (1)

No (2)

23b. If **Yes**, what alterations were made?

24. Do you **agree** or **disagree** with the following energy statements?

	DISAGREE STRONGLY	DISAGREE	NEUTRAL	AGREE	AGREE STRONGLY
I only buy appliances with high energy efficiency ratings even if they cost more	1	2	3	4	5
I don't think very much about ways of saving energy in my own home	1	2	3	4	5
I don't pay much attention to what my energy bill is each month	1	2	3	4	5
I find it hard to find information about being energy efficient around the home	1	2	3	4	5
It's difficult to know what information to trust in regards to energy efficiency	1	2	3	4	5
Making choices about energy efficiency in the home is complex	1	2	3	4	5
I am confident I can invest the time and effort to make changes towards being energy efficient	1	2	3	4	5
I am confident that I have the right skills to make informed decisions in energy efficiency	1	2	3	4	5

25. Select **ONE** of the following statements that best describes **your overall attitude** to energy usage.

I would like to reduce my consumption in order to save money (1)

I would like to reduce my consumption in order to help conserve the environment (2)

I am happy with my current level of consumption and don't want to change what I do (3)

I am happy with my current level of consumption, but would like to use it more efficiently (4)

I would like to increase the amount of energy that I consume (5)

WORK

26. Do you work from home?

Yes (1)

No (2)

26b. If you **do not** work from home, what factors might make you decide to work from home *(tick all that apply)*

Commuting costs ☐

Operational costs ☐

Less impact on the environment ☐

Better time management ☐

Better social activity/networking ☐

Working more efficiently ☐

I would/could not consider changing my workplace in my current occupation ☐

Other *(please specify)* ☐

27. Please answer this question if you do any **paid** work from home. *If **not**, please go to the next section.*

If you use a **computer** for your work, how many hours is your computer/work station turned on? *(Choose **one**)*

Less than 1 hour a day (1 hour in 24 hours) (1)

Less than 2 hours a day (2)

Less than 5 hours a day (3)

Less than 8 hours a day (4)

More than 8 hours but less than 12 hours (5)

More than 12 hours but less than 24 hours (6)

24 hours a day 5 days a week (7)

I do not turn my workstation off (8)

27b. Do you let your computer go into sleep or standby mode when you are away from it?

Never (1)

Sometimes (2)

Always (3)

ENERGY SHARING INFORMATION

In this next section we are interested in how you acquire and share information about energy. We would like you to think back to when, where and with whom you had discussions on energy use, products, prices, efficiency etc. over the last 12 months.

28 In the last 12 months, which of the following have you heard about energy efficiency from, or had information provided by? *(tick **all** that apply)*

My local council ☐

Energy Efficiency and Conservation Authority (EECA) ☐

My power company ☐

Newspaper ☐

Television ☐

Magazines ☐

The internet ☐

Consumer NZ magazine or website ☐

Friends and family ☐

Energywise ☐

My children ☐

Energy Spot on TV ☐

Fellow staff members ☐

Other *(please specify)*

PERSONAL VALUES

39. To what level do you **agree** or **disagree** with the following statements about the environment?

	DISAGREE STRONGLY	DISAGREE	NEITHER	AGREE	AGREE STRONGLY
The balance of nature is very delicate and easily upset	1	2	3	4	5
Modifying the environment for human use seldom causes serious problems	1	2	3	4	5
Plants and animals exist primarily to be used by humans	1	2	3	4	5
The earth is like a spaceship with only limited room and resources	1	2	3	4	5
There are limits to economic growth even for developed countries like ours	1	2	3	4	5
Humans were meant to rule the rest of nature	1	2	3	4	5
Technology will solve many environmental problems	1	2	3	4	5
Exploitation of the earth's natural resources should be stopped	1	2	3	4	5

40. Below is a list of values that many people find important. Read through the list first to get an idea of how to answer, and **circle the numbers next to your most and least important value(s) first**. All other values should score between these extremes.

You may find it easiest to answer if you ask yourself this question; **HOW IMPORTANT IS THIS VALUE AS A GUIDING PRINCIPLE IN MY LIFE?**

	OPPOSED	NOT IMPORTANT		IMPORTANT		SUPREME IMPORTANCE
BEING INTELLIGENT *(logical, thinking)*	-1	1	0	2	3	4	5
BEING HELPFUL *(working for the welfare of others)*	-1	1	0	2	3	4	5
PROTECTING THE ENVIRONMENT *(preserving nature)*	-1	1	0	2	3	4	5
HONOURING PARENTS AND ELDERS *(showing respect)*	-1	1	0	2	3	4	5
BEING CAPABLE *(being competent, effective, efficient)*	-1	1	0	2	3	4	5
RESPECT FOR TRADITION *(preservation of time-honoured customs)*	-1	1	0	2	3	4	5
ENJOYING LIFE *(enjoying food, sex, leisure)*	-1	1	0	2	3	4	5
SOCIAL RECOGNITION *(respect, approval by others)*	-1	1	0	2	3	4	5
SOCIAL ORDER *(stability of society)*	-1	1	0	2	3	4	5
BEING CLEAN *(being neat, tidy)*	-1	1	0	2	3	4	5
UNITY WITH NATURE *(fitting into nature)*	-1	1	0	2	3	4	5

HOUSEHOLD SITUATION

Now for some more general questions about the situation of your household.

41. Do you rent or own the dwelling you live in?

- Rent from private owner 1
- Rent from Housing NZ 2
- Rent from Local council 3
- Own debt-free 4
- Own, with mortgage(s) on it 5

42. How long have you lived in your current house?

[ ] Years

43. Are you considering leaving this house?

Yes 1

No 2

41b. If **Yes**, in how many years' time are you planning to leave?

[ ] Years

44. Now, some questions about people joining and leaving your household permanently.

In the past year how many people joined this household?	
In the past year how many people left this household?	
How many people will be joining your household in the next year?	
How many people will be leaving your household in the next year?	

45. What are your households approximate **monthly** energy bills in the **summer**?

	ELECTRICITY	GAS	COAL	WOOD	PETROL	OTHER
Do Not Use	0	0	0	0	0	0
Less than $50	1	1	1	1	1	1
$51 - $100	2	2	2	2	2	2
$101 - $150	3	3	3	3	3	3
$151 - $200	4	4	4	4	4	4
$201 - $250	5	5	5	5	5	5
$251 - $300	6	6	6	6	6	6
$301 - $350	7	7	7	7	7	7
Over $350	8	8	8	8	8	8

46. What are your households approximate **monthly** energy bills in the **winter**?

	ELECTRICITY	GAS	COAL	WOOD	PETROL	OTHER
Do Not Use	0	0	0	0	0	0
Less than $50	1	1	1	1	1	1
$51 - $100	2	2	2	2	2	2
$101 - $150	3	3	3	3	3	3
$151 - $200	4	4	4	4	4	4
$201 - $250	5	5	5	5	5	5
$251 - $300	6	6	6	6	6	6
$301 - $350	7	7	7	7	7	7
Over $350	8	8	8	8	8	8

47. What is the approximate annual income of your **household** (before tax)?

Less than $20,000	1
$20,000 - $29,000	2
$30,000 - $39,000	3
$40,000 - $49,000	4
$50,000 - $59,000	5
$60,000 - $69,000	6
$70,000 - $79,000	7
$80,000 - $89,000	8
$90,000 - $99,000	9
$100,000 - $109,000	10
$110,000 - $120,000	11
Over $120,000	12

48. In which of the following areas have you spent most of your life?

In a NZ town or city *(please specify)* 1

In a NZ rural area *(please specify)* 2

In an overseas town or city *(please specify)* 3

In an overseas rural area *(please specify)* 4

49. Would you be willing to take part in future research? If so, please provide your contact details here.

Name

Phone

Email

YOU AND YOUR HOUSEHOLD

49. Finally, we have some questions about you and your household members. Please fill in each section for each member of your household by ticking the appropriate box, starting with **yourself** as Household **Member #1**.

	GENDER		AGE														WORK STATUS							ETHNICITY																	On an **average weekday**, how much time does each member of your household spend **away** from home? *(Time in hours)*
	Male	Female	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Over 65	Working for someone else full time	Working for someone else part time	Self-employed	Do not work	Retired	Student	Full-time homemaker	New Zealander (European descent)	New Zealander (Maori descent	Samoan	Cook Island	Māori	Tongan	Niuean	Tokelauan	Fijian	Other Pacific Peoples	Southeast Asian	Chinese Indian	Other Indian	Other Asian	Other	Non-response	
Member #1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #4	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #7	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #9	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
Member #10	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

THANK YOU FOR CONTRIBUTING TO THIS OTAGO ENERGY RESEARCH CENTRE SURVEY

PLEASE FOLD AND PLACE IN THE PRE-PAID ENVELOPE PROVIDED AND PUT IT IN YOUR NEAREST MAILBOX!

DON'T FORGET TO ENTER THE PRIZE DRAW, TOO!

5 PRIZES TO BE DRAWN

WE APPRECIATE YOUR PARTICIPATION!

APPENDIX 9 CASE OVERVIEWS

Case overview introduction

This appendix shows part of the analysis process, whereby the researcher wrote case overviews in order to help capture the different stories of the householders. The overviews summarise the outcome of the iterative processes involved and the themes analysed by the researcher. They provide insight into the rich detail of the cases without losing any of their complexity.

The case overviews also illustrate how the analysis was assisted by other parts of the data gathered, such as selected photos, that then resulted in concept maps. Full transcripts of the interviews can be found in the CD attached, and extra photos or 'decision-explorer' concept maps can be requested from the researcher.

Due to the varying nature of the cases, their situations, demographics and characteristics, there are some variations in the ways in which case overviews are presented. The realities of longitudinal in-depth social research causes differences in the times and ways in which householders were approached, and these are documented in each case separately.

The case overviews differ also in length and content, depending on how informative the participants were, and how much progress could be made across the interviews in terms of bringing on the envisaged changes in energy practices, equipment and installations. In some cases there was little to talk about other than why the envisaged change had not happened, for example.

The hermeneutic approach involves moving from observation of practice to theory and from consideration of theory back to practice. Constant comparison of data within cases and across cases, the extraction of themes, and their interpretation in light of new theory improves the process of understanding.

As the researcher got to know the respondents and became more experienced at interviewing, he also managed to refine the amount of data gathered and collated. Thus some interviews gathered many additional statements and imagery whereas in other cases this was less opportune. Some of the former have been included in the case overviews for a deeper understanding of selected households' dynamics and how they developed their energy practices.

Some interviews had technical issues and the transcription began after the interview had begun. Similarly, other interruptions meant that the interviews have recording gaps. These were later filled with the help from field notes and reflections which were assisted by photos and additional phone calls to the households. All of the latter helped create the final overviews.

Contents

Case 1 Overview - “Onwards and Upwards”

Mathew and Samantha lived in a large four bedroom house in a valley in Dunedin. They had three children, all boys, the youngest starting primary school and the oldest starting high school. Their house was made from brick and received sun throughout most of the day. The building was two storied, with the three bedrooms on the south side of the house, and an open plan kitchen and dining area on the north side. Downstairs was a rumpus room, an office and the wash house. The dwelling had insulation in the ceiling, but was not double glazed. The house was built in the 80’s and had a freestanding enclosed log burner in the main living room, as the main source of heating. The first interview was taken in two stages, as the interviewer was still trialling the methodology, and wanted to make sure that he had gathered enough pre-move information.

1.1 Interview 1

1.1.1 Normal Behaviour in House 1

Samantha was the main energy user in the house, as she was at home for much of the day when she wasn’t at her part time job. Samantha would usually light the fire, and do the washing and cooking, and therefore had most of the autonomy around how energy was used. Mathew was in charge of paying the energy bill, and seemed to do most of the finances for the family.

They enjoyed living in house 1. The area was calm, quiet and full of nature. However, the house was in a somewhat dilapidated state, and had a tilted floor. While it kept Samantha fit, running up and down the stairs to the washhouse, this was not an ideal situation.

There was an older electric oven in the house, which worked, but Samantha was not entirely satisfied with it. They had one television in the house, and a computer which Mathew used for work. While they were not exceptionally wealthy, the family lived comfortably in the dwelling, and used firewood from a plantation that they had recently acquired (which they would chop and prepare themselves), to heat the house during the winter.

The house was a large four bedroom house with open plan living spaces, and two stories with a rumpus room and double garage beneath. The house mostly faced north, with large windows. Most of the valley in which the house was situated saw little of the sun in winter months from about 2pm onwards. The parents were well aware of their consumption and its impacts to the wider world, and consciously tried to make purchasing and lifestyle decisions which reflected a low energy household. With the opportunity of being able to own their own home, the ability to become even more efficient through purchase decisions would likely increase, however because the behaviours associated with energy were already relatively frugal, the chance that their behaviours would become even more stringent could be difficult to manage.

1.1.2 Reasons for house 1

The house had been given to the family to use as part of Mathew’s job. The family had some say over the location of the dwelling, but they had to do so within the bounds of Mathew’s employer. They were happy with the dwellings’ layout (mostly), and what it was like to live there. The house was chosen more for where it was located, near bush, and with a lot of sun, rather than because of its practicalities.

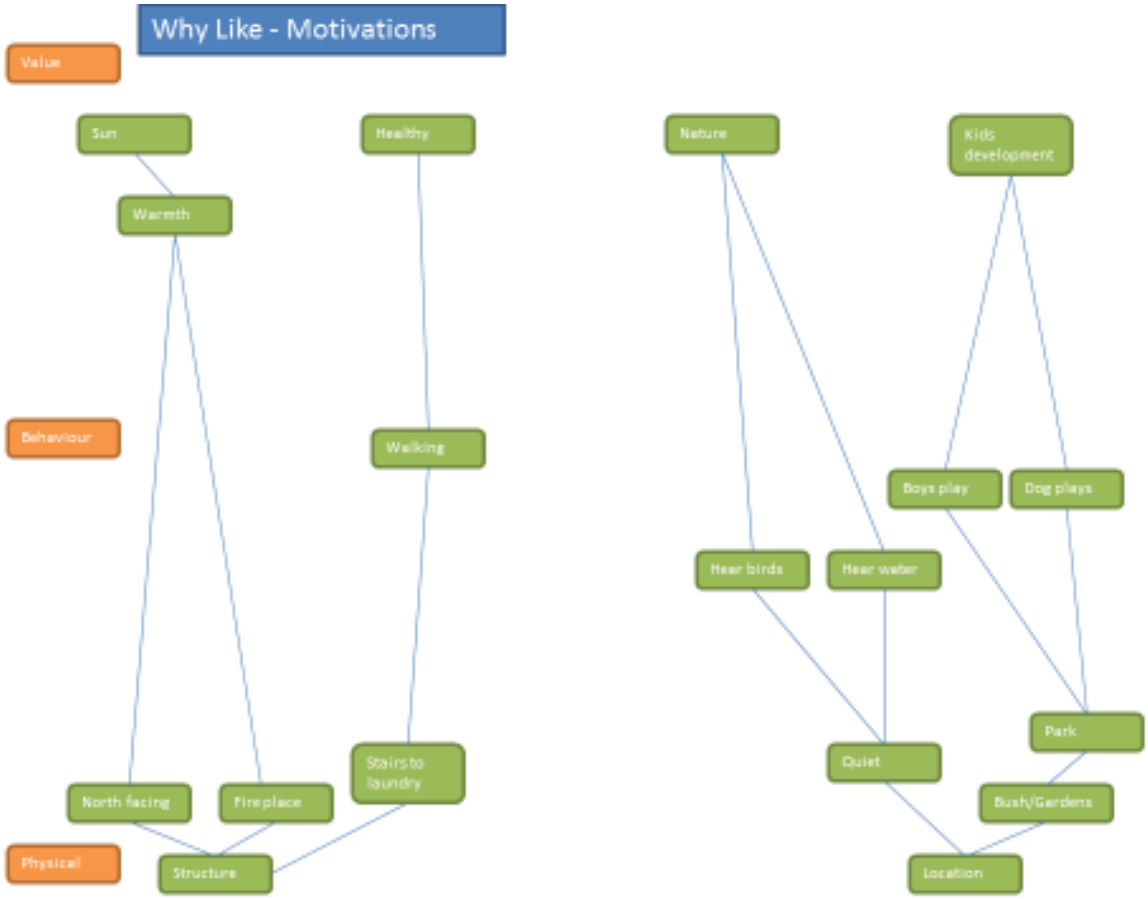


Figure 0.1

The figure above shows the first attempts at creating concept maps, before the purchase of Banxia decision explorer. All other interviews used Banxia modelling, but followed a similar concept layout and analysis structure.

1.1.3 Reasons for leaving house 1

Because of the open plan nature of the house, most social activities would be shared by the householders in the main living room. The parents could see that this might become a problem as the boys got older, as they liked to have guests around in the evening, and this could interfere with the boys being able to have their own space and do their own things.

The parents also felt that it was time to move. Because of their age, and because of how they saw their lives evolving, they thought that they needed to buy a house now before they missed the opportunity. Thanks to the generosity of extended family they were able to put a deposit on a house. If they left it any later, they felt that they would never be able to afford to finish paying off a mortgage.

They wanted their children to be able to walk to school, and to be connected to work, shops and the community. Although where they currently lived offered some nice lifestyle options, they did not own the house, and were therefore mostly moving to acquire a house as capital.

1.1.4 Why chose house 2

The couple is interested in good quality homes to raise their kids, and to know that they would be safe when playing outside. The house needed to be solid, not drafty and have decent curtains. They don't like having a lot of 'stuff', and therefore did not mind moving to a dwelling which was smaller than house 1. The parents felt that this would help them prioritise their possessions and reduce unnecessary ones.

(Samantha) "Its only probably 10 minutes walk to [the supermarket] … if the boys change schools, and we haven't really sort of discussed this with them but it will only take them 4 minutes to walk to primary school. Rather than go to the car. Matthew can walk to work" (P7).

The new dwelling was chosen because of its location, and because of its construction. The new house was close to Mathew's work and relatively close to the boy's schools. The boys would have to shift schools, but the parents felt that this was worth it for the other benefits they would receive. Even though the dwelling did have some insulation, this was not a priority as they knew that they could do this later with the help of a government incentive scheme.

1.2 Expected behaviours for house 2

The family was looking forward to finding simpler ways to organise their household, like using the old-fashioned drying rack from the ceiling, and vents from the fire to the hall to keep the moisture out, which they thought of as a bonus.

They thought that energy costs in the new house may be about the same or a little less. But they felt that the new dwelling itself should suit their lifestyle far better, because they would walk more, use the car less and be closer to school and work.

They were expecting to have to do some small changes to the dwelling, such as adding an extra shower, and a garden. The house seemed to be reasonably well insulated, but the night store heater needed to be replaced.

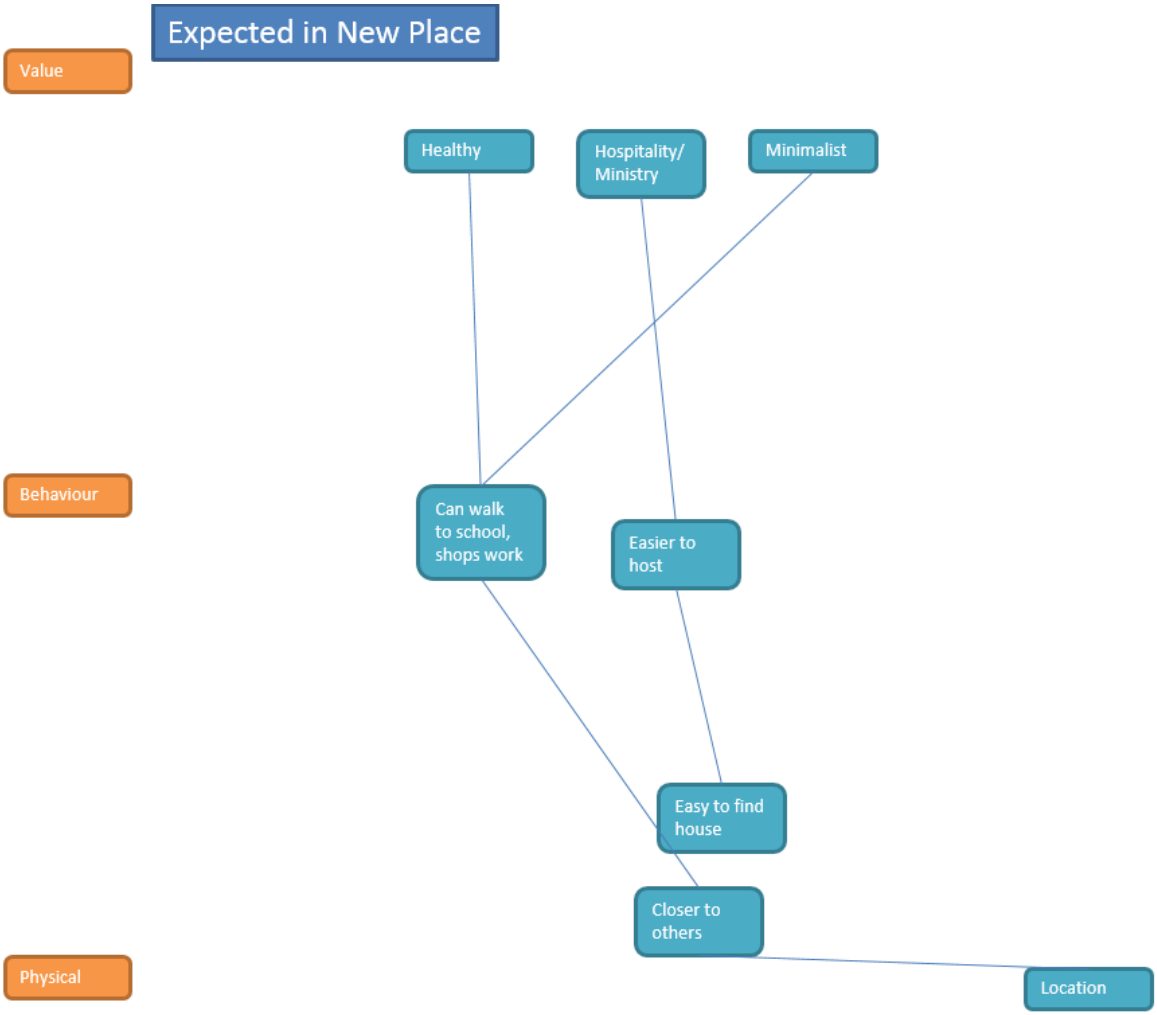


Figure 0.2

The parents planned to continue using energy sensibly and efficiently in the new house, as well continue habits such as switching off lights when leaving the room, closing curtains when it gets dark and opening windows in the morning if there is condensation. Showers should be used sensibly and electric blankets switched off.

Samantha planned to use as much of the sun as possible like in house 1 not just because it saves money, but because she valued having a sunny house. While there were two heat pumps in the new dwelling, Samantha was unsure if she would need to use them as there were also two fireplaces, and they had access to ample free wood. The family was used to having a colder house at night, and so they were unsure what life would be like with all the heat sources.

1.2.1 Interview 2

Unfortunately the recording of this interview was lost after a copying error. Responses from the interview that were remembered were included in the final interview and discussed with the participants for confirmation and clarification.

The second house was made from red clay brick. The house was positioned high on a hill, about 100 meters higher than the previous house. The dwelling had unobstructed solar aspects to the east and west, but the northern aspect was somewhat shaded by neighbouring houses. The house was oblong shaped and pointed north, and gained most of the morning and evening sun. It also had large windows

which were single glazed and had wooden frames. The house had a living room and a dining room, as well as three bedrooms. The house was substantially smaller the previous one, but the house did not feel cluttered or cramped for the amount of people living there. The kitchen had a small hole through the wall to the dining room, by which food could be passed through, but otherwise all rooms were separate, connected by a central corridor. The house was built around the 60's but was in good condition; a lot of the interior still resembled that era.

The house was fitted with a moisture master system which ran automatically, whether this reflected the age of the house and thereby created a certain dampness was uncertain. The house had a wide range of fixed heating options installed. There was a log burner and a heat pump in the dining room, an open fire in the living room, and a heat pump in the hallway. The heat pump in the dining room looked well over ten years old, but both were of relatively large capacity (over a meter in length).

1.3 Interview three

1.3.1 Normal Behaviour House 2

The kitchen held most of the appliances to be seen visibly, with a dishwasher, oven and fridge. The small television and DVD player had been brought with them and placed in the living room. The family did not regularly use electric heaters, but preferred to use the sun's heat – as expected before moving in. Samantha continued her fire laying rituals in house 2 and carefully organised the fire places to make sure they were ready two hours before the children got home from school. Samantha was able to use the fire places strategically to heat the house to avoid the use of the electric heaters.

The heat pumps did not rise to their expectations or change their behaviours as they were found to be not working well, and the parents considered them an eyesore. However they did use them occasionally when they had visitors over. (Samantha) "[The heat pump] doesn't seem to be, it doesn't seem to be getting as hot as it should be, so we don't use it, so I'm not quite sure what we'll do with it. There's not really market for second-hand heat pumps. Especially because it's not working well. We can't flog it off to somebody… we got it checked out and the electrician said it was working fine, but it just doesn't seem, it's noisy and it doesn't seem to be effective. Better to put a little heater in here than that thing" P1-2.

1.3.2 Changes in house 2

The family continued their energy saving behaviours by closing doors and curtains when night fell, and (government funded) insulation had been put into the house recently which helped keeping the warmth in.

A new fireplace with wetback had been installed into the dining room. They continued to burn wood from their plantation, and also managed to use it occasionally for cooking. The family was not too sure about the saving it made on the water heating bill though, but it definitely required Mathew and the boys to chop and gather wood for the fireplaces.

Recently the family had purchased a Freeview box but only for a certain channel they prefer. They did not utilise the extractor fans in the bathroom or the kitchen. They also exchanged some light bulbs back to incandescent ones as there was a bright florescent one in the dining room they did not like. But the rest of the house still had some energy saving bulbs. While buying incandescent they knew it was a false economy.

The family kept to some practices like walking to work and school but used the car for shopping when on other errands (the family lives in a very hilly area). The moisture master was now being turned on in the evening and off in the morning, which they found made a big difference (Samantha) "from my perception if it's not a cold day I won't have it on, a cold night, but what's been happening now, for

the last few weeks is I turn it on when I go to bed and turn it off in the morning and I didn't turn it off this morning, because it was still cold. So usually it's just on from half past nine to six o'clock, yeah and it makes a difference to the condensation" P8. Even if the fire was not on, Samantha felt the moisture device pushed warm air from the ceiling down into the room.

When setting up the wetback, the hot water cylinder was also upgraded, which later saw a drop in power bill. Samantha found that the cupboard with the water tank was too well insulated, and no longer warm enough even to rise dough. The house was now so warm that when the fire was going there was no need for the drying rack – so it was dismantled.

The concept maps presented in interview two were re-confirmed and no changes made, but it was noted that the family still has a way to go to become proficient in gardening (a plan that they had hoped to improve upon before leaving house 1). The appliances remained the same to those in the old house, but they invested in a further laptop. They still avoided using the dryer and the main reason for all frugality would be costs.

As a routine the family turned the TV off at the wall but not necessarily the laptop or the stereo because of convenience. They usually rinsed dishes with cold water, turned lights off most of the time (3/5), and shut doors to keep the house warm. They used the washing machine 5-6 days a week, and sweatshirts needed to be worn only if it was colder than 10 degrees. The clothes dryer was used very often and the dishwasher always, and the curtains were always drawn.

The family would install energy efficient devices – they have a good fridge/freezer already, but it is a matter of money. While they do not know whether the walls have been insulated they were surprised that one could insulate hot water pipes.

Further attitudinal questions were asked confirming the statements made in the interview which had been lost. The family is conscientious and well-meaning with regards to energy consumption but the individual circumstances drive energy related behaviour more than the principles.

1.3.3 Interviewers reflections

The family, having a lower amount of disposable income were relatively well resourced for a city dwelling household. The availability of free firewood meant the main winter cost of heating was significantly lowered, and the family's ability to make decisions around energy were much more empowered than other families who were in a renting position. The parents were well aware of their consumption and its impacts to the wider world, and consciously tried to make purchasing and lifestyle decisions which reflected a low energy household. With the opportunity of being able to own their own home, the ability to become even more efficient through purchase decisions would likely increase, however because the behaviours associated with energy were already relatively frugal, the chance that their behaviours would become even more stringent could be difficult to manage.

I was happy to see that a large amount of expectations of how the family were going to live were realised very quickly. They were able to keep away from using the electrical heating options (heat pumps) and continue to use wood for the most part.

Case 2 Overview – "From flatmate to landlord"

1.4 Case overview

Case 2 involves Bronwyn a young professional female buying her first home. She moves from being in a house with her two flatmate friends who then move with her to the new house (see concept map below). Bronwyn changes from being just another flatmate to being the landlord. Bronwyn was aware of how becoming a 'landlord' would bring on other responsibilities, including the provision of an environment which was comfortable for her 'tenants.'

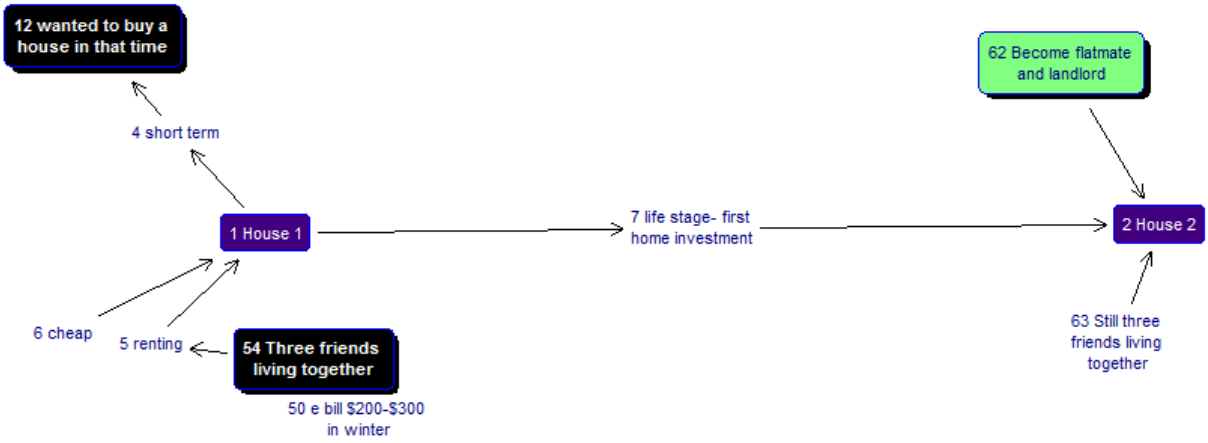


Figure 0.1

1.5 Interview 1

The first interview was recorded on a cold winter's evening, with all of the flatmates in the house. Bronwyn was the only one officially interviewed, the others were sometimes in the living room where the interview was taking place, and occasionally made some responses, but they were never officially included in the study.

The house was a concrete brick house with a rough cast rub on the exterior. The building was located on the east side of the Roslyn suburb above Moana Pool. The house was next to the busy Stewart Street. The house received morning and day sun, until around 3pm on a summer's day. The west of the house was shaded behind trees and a westerly facing hill. The house was made up of three levels; a garage, the second level, comprising of three bedrooms, and the upper level with the kitchen and living areas. The house had one bathroom on the second floor, and the living areas were on the southern side of the house. There were two heat pumps, one in the hallway of the second floor, and one in the main living room upstairs. There was a large balcony on the top floor which was the roof of the second floor. The house had a large number of windows, however it lacked proper curtains in the upper section.

The house was built around forty years ago, and had wooden framed single glazed windows. It had no obvious insulation, due to the lack of ceiling cavity, and there didn't appear to be any underfloor. The walls, being concrete, also did not allow for any extra insulation. The flatmates seemed to share the communal areas frequently, and were comfortable having the interview take place whilst they were watching television.

1.5.1 Why chose house 1

The friends had chosen this house because they felt that it was a 'nice house', and that it would be warm – mostly because it had two heat pumps. The dwelling was close to town and had a good view over the city, but did not receive a large amount of sun after the middle of the day (but this was not enough of an issue for them not to choose it).

1.6 Normal behaviour house 1

Apart from having two heat pumps, one downstairs and one upstairs, the flatmates also had personal heaters in their bedrooms. Bronwyn would normally turn her heater on in the mornings when she got up. Before she left the house she would turn off her bedroom heater and open up the window to let it air during the day.

It turned out that the house was actually quite difficult to heat during the winter, being shaded from the sun, and having no real curtains to close in the evenings. The flatmates were unsure whether the house was very well insulated, and found that they used both heat pumps quite often in the evenings.

The tenants liked how convenient and effective the heat pumps were at heating up the house, and would usually turn them on when they got home from work.

The flatmates, bar one, wanted to be comfortable and therefore didn't mind using a large amount of heating to meet their comfort norms. Unfortunately one of the flatmates was not very happy with this, and it became an area of contention between the household members. Consequently it was requested that any more dialogue around this issue should be omitted.

Each flatmate would usually do their own load of washing around once a week, but did not do hot washes. They would normally turn the television on when arriving home, and often eat out rather than cooking at home. The flat did practise some energy saving behaviours, such as turning lights off when leaving a room, but were not pedantic around saving energy.

1.6.1 Reasons for moving

For Bronwyn, it had become time for her to get out of renting and buy her first place. She felt that she had been paying rent for long enough, and that it was about time that she put that money towards a mortgage instead. Bronwyn was able to get some support from her parents for the down payment, and keeping the flatting situation in the new dwelling meant that Bronwyn would not have to carry the load of the repayments on her own. (Bronwyn) "I realised, that it's better to be paying my own mortgage than someone else's for starters. It works out to be what I'd be paying a week, pretty much, with tenants it's going to work out. Renting anyway. It's a good asset to have. I found that just because I've been flatting for seven years, I just want a place where I can make my own" P8.

1.6.2 Reasons for choosing house 2

Bronwyn had found a house just out of the main city high in a hilly suburb. It was a brick house which was well positioned to receive sun for most of the day. Bronwyn's father was a structural engineer, and had recommended the dwelling based on how well it was constructed. Bronwyn had chosen it because it was brick, three bedroom and sunny. Being of brick construction meant that it would be well insulated, and there wouldn't be too much maintenance.

Bronwyn was happy with the location, and felt that it was a nice area, and not too exposed to the elements. There was also a back yard that she looked forward to using for barbeques in the summer.

1.6.3 Expected behaviours in house 2

Bronwyn was wary of the extra responsibilities for her as a landlord, needing to keep the garden tidy and the house pleasant to live in. The new house was only a one storey dwelling, and somewhat smaller and possibly better insulated than house 1, so she knew that it should be easier to heat.

The new house had a wood burner and no heat pump, so Bronwyn envisaged that it would be somewhat different heating the new house than house 1. Bronwyn planned to stick with the log burner and was hoping to find someone who would be able to sell her wood cheaply. She hoped that not having a heat pump might also save her money if she could source wood cheaply enough.

Bronwyn did not expect that their daily life would change much, or that their energy using patterns would change substantially. She said that she would still be wary of the house's energy consumption so that they did not waste money.

1.7 Interview 2

The second house was built in the 1960's and made out of double clay bricks. There were three bedrooms, and an open plan kitchen and living area which sat on the northern end of the house. The house was significantly smaller than the previous flat, but had insulation in the ceiling. The windows were single glazed wooden ones, and there were thermal drapes throughout. The floor was mostly carpeted and there was an enclosed log burner in the living room which was set back into the wall. The flatmates were the same in the new house as in the first one, and they took their personal heating appliances and heating electronics with them. The electric fridge, freezer and range were different but similar to what they had had in the previous arrangement.

The house was situated in a hill suburb, which was higher on the hill than the previous one, around 240 meters above sea level. The house was well sheltered from the prevailing southerly winds, tucked behind the large Flagstaff hill, however it was far away enough from the hill to get sunshine until around 6pm on a summer's day. The house had a good and clear northerly aspect and would be able to gain sun from early in the morning. The house was well tailored to gather most of the sun's energy with only one bedroom which faced south which would have got very little sun because it was cut into the hillside slightly.

1.7.1 Normal behaviour house 2

The three flatmates had settled into house two nicely by interview two, and had re-established similar energy related behaviours. They continued to have heaters in their own rooms, and Bronwyn was happy to find that she hadn't needed to put the fire on very often because the house kept the heat from the sun very well.

Bronwyn would usually light the fire on colder days, but found that the house's insulation seemed to be relatively effective, and she only needed to use a smaller electric heater occasionally.

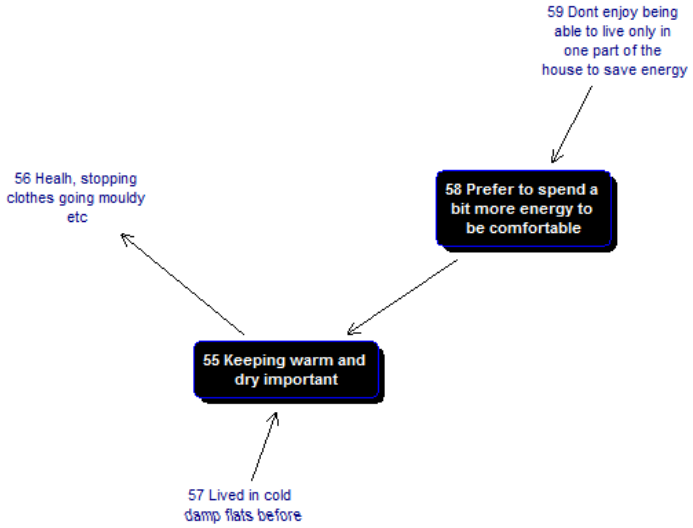


Figure 0.2

The two flatmates who were happy with using a little more energy to be comfortable found that it was easy to maintain their comfort norms in the new dwelling.

Bronwyn was also happy to find that initial electricity bills were much lower than in the last house, going from around $200 a month to around $100 a month, but there was the element of the seasons changing from winter to spring which she also noted.

1.7.2 Unexpected changes house 2

Bronwyn did not expect to need the fireplace as infrequently as she had. (Bronwyn) "Got the fire, but I haven't had to put that on as much because it's really quite warm, the house keeps the heat. With that other place it was bigger to heat. It was freezing. This actually has insulation in here, so, yeah" P2. It seemed that the new dwelling was much warmer than house 1, allowing for much less heating to be used in general.

1.8 Interview 3

The household composition had changed somewhat when the interviewer came for the final interview. Because this was one of the earlier households, the researcher was able to wait much longer to give the final interview. The two flatmates had moved out to different jobs outside of Dunedin, and Bronwyn had found a partner who had moved in with her. Bronwyn had since bought a heat pump, which was a significant change, considering she initially bought the house because of the log fire. The heat pump was going when the interviewer arrived in the evening, and most doors were open throughout the house allowing for the heat to travel throughout. The heat pump had been installed in the hallway which was central to the house, but that did mean that you would have to leave doors open to heat up the living room and kitchen anyway.

1.8.1 Researcher Reflections

The group of flatmates knew each other well, and therefore found it difficult to reconcile their comfort/energy norms with each other diplomatically, given how these were often informed by their socioeconomic status and previous backgrounds. These differences in expectations caused a large amount of bickering between the flatmates (behind each other's backs – which has also been linked back to an occurrence in all female flats).

The dynamics of the household continued to suffer under the disagreements around power use. One of the girls continued to heat her own room which annoyed the more frugal one. The girls felt that any heating was not allowed by the frugal one and this caused continued conflict. Other issues around the cost of rent, and the changes in roles through one friend becoming landlord and owner also made the situation suffer.

Case 3 Overview – ‘From temporariness to semi permanence’

1.9 Household Overview

This case followed a young man (Eric) in his mid-twenties who moved into a house with his new partner (Jolene). He had been previously living temporarily at one of his parents’ houses and had spent much time there by himself, working on plans for a new business he was developing. The first interview unfortunately came shortly after he had moved, but the interviewer was still able to view and discuss behaviours at House 1 as Eric still visited there often. The first interview therefore covered what is normally split into two separate interviews. In order to maintain the same structure, the first interview will be called “interview 1 and 2” to help distinguish motivations and behaviours before and after moving.

1.10 Interview 1

The first interview was taken in House 1, a two storied semi attached house in the inner city. The building was timber framed and had an external plaster and concrete scrub, built around the 1960’s. The house had large windows facing north and was attached to a block of four buildings to the east, which were of the same construction. The lower level was open plan with a small kitchen and laundry on the south side. A staircase lay in the middle of the building which went to three bedrooms upstairs and a second bathroom. Eric lived upstairs in one of the smaller north facing bedrooms and mostly lived alone. His parents and other family members occasionally used the house as well and would use the other bedrooms provided.

1.10.1 Reasons for House 1

Eric was living temporarily at one of his parent’s houses as he was working on plans for a new business he was developing.

1.10.2 Normal Behaviour in House 1

The large windows to the north allowed for a lot of direct sunlight during the hottest part of the day, meaning that sunny days often saw the place requiring very little heating in winter during the day. There was insulation in the ceiling, but the inhabitants were unsure of insulation in the walls. The house would normally fluctuate from having just Eric to as many as five household members; the most common occupants of which were Eric’s mother and sister who took the adjoining upstairs rooms.

The house was heated mainly by an old electric bar heater at the foot of the stairs in the main living area. Normally the device would be turned on by the first person up in the morning and turned off by the last person to go to bed in the evening (in winter). Eric was frustrated with the use of the device because it was often left on for long periods of time and most of its heat would go straight up the stairwell to the unoccupied rooms upstairs instead of heating the living area. Eric also had little control over the other family members who would use the house and leave doors and windows open, the worst of whom was his mother who would leave a sliding door partially open all day so that their dog could go in and out – even when the heater was going. He tried to minimise the effects of this pattern by having a drape hung over the open door but still felt that this was a great waste of energy. Eric had a general rule that he would keep all doors closed when the main heater was on – especially the upstairs ones, but he could not control how other family members would behave.

Most family members would use the main living area when they were around but Eric spent more time in his room upstairs, mostly because that was where his computer was. Eric heated the small room with a fan heater when necessary in short bursts, but otherwise tried to keep heaters turned off.

Because of the high fluctuation of householders, the electricity bills would sometimes change dramatically, according who came and for how long. Although Eric was not particularly unhappy with his family members' energy use, he preferred to have more autonomy over energy decisions, rather than being restricted to a household where he was under the rules of his parents. Behaviours like turning off lights and having short showers were relatively well engrained, and Eric noted that his mother had started to make sure the hot water cylinder was turned off if people were away from the house for more than a few days. Using less energy was simply seen as common sense for Eric and his family members – however some simple things were not always observed by Eric's eyes.

The house had a small fridge in the kitchen and the rest of the kitchen appliances were new and electric. A window was next to the electric hob which made for easy ventilation, and some of the light bulbs were either compact fluorescents or halogens. Many bulbs were still incandescent and Eric wanted to change them, but it not being his house he felt that he couldn't do so.

The house was small, and could not fit a large amount of excess clutter. There was a small tubular television in the corner of the main living room but otherwise Eric said the other family members would use laptops in the evenings, allowing them to use the main living room more. There was a large chest freezer in the laundry, as well as a washing machine and drier which would be used only when necessary, as there was an adequate washing line on the sunny side of the house.

Even though the house received a large amount of sun, it was still not enough for Eric. He had previously lived in shaded flats with others and this had built a desire to live in a dwelling that received as much sun as possible. Eric had been wanting his own place for some time, where he would have the autonomy to live the way he wanted. This included being able to do his own gardening as well as live as efficiently as possible in the use of products and energy.

1.10.3 Reasons for Leaving House 1

Eric had been looking for a new place for some time but was no longer interested in flatting with others as he had done in previous years. After starting a new relationship with Jolene, the couple had decided to move in together. Jolene had recently returned to Dunedin after living in a different city and had managed to acquire a house that her parents rented out in the northern part of the city. This was not only a good opportunity for Eric to get out of his parent's house, but also to live in a dwelling with the autonomy that he had been looking for.

1.10.4 Reasons for choosing House 2

House 2 was not explicitly sought out by Eric because of its physical characteristics but more through circumstance. The physical characteristics of the dwelling did however meet many of Eric's desires that he held for a dwelling, especially regarding the large amount of sunlight hours it would receive. House 2 had more available space than House 1 (larger bedroom and living area) and was also all on one level which made Eric believed that it would be easier to heat. The location was more private than House 1 and the fact that the landlord did not live too close ensured that there was more flexibility than in other rental situations. Also the rent was relatively cheap.

1.10.5 Expected Behaviour in House 2

The main change that Eric hoped to utilise from the structure of the new dwelling was regarding its superior sunlight hours. Eric hoped that he would be able to use the sun more to heat the house, and also be able to have more direct sunlight in the living areas for "[I planned to] sit in the sun more, to absorb heat into the body while the sun's still there. Have all the curtains open to heat the room as much as possible during the day basically to heat it up using the sun and in the evening ... you can maintain the heat ... that was the most exciting thing about it" P5-6.

Eric looked forward to having more autonomy over energy decisions in House 2 because he was no longer constrained to the previous energy rules of his parents, nor the frustrating inefficiencies created by the houses construction such as House 1's stairwell. Eric expected that the new dwelling would be easier to heat, being all on one level, and the fact that it wasn't open plan would give him more autonomy over only heating rooms which were being used at the time.

Eric was not happy that there was a heat pump in the dwelling and would have preferred a fireplace. He had considered speaking with the landlord about this if the couple decided to live in the dwelling over the long term. Although he knew that heat pumps could derive heat more efficiently, he considered acquiring an oil filled electric heater which would provide a more consistent heat and would be more in line with his preferred comfort standard.

1.11 Interview 2

Before the interview started, the interviewer had been shown both houses, but he asked the questions normally reserved for the second interview in House 1. The second house had been an old single storied state house built around the 1950's. It had wooden framing and cladding and was perched high on a westerly facing hill with the living area and master bedroom also facing west. The second bedroom, as well as the bathroom and kitchen lay on the eastern side of the house which would have received little direct sunlight. Only the kitchen would have received northerly sun during the day.

The house was only insulated in the ceiling and had older timber framed windows and doors. The eastern sides of the dwelling had issues with condensation and moisture build up and they did not have any heating source. A large heat pump had been fixed to the wall in the living room and there was a small fan heater in the master bedroom.

There was a desktop computer in the bedroom and in the living area.

1.11.1 Actual Behaviour House 2

Eric was happy that the new house offered him more autonomy over the way he lived, and he felt as if he had more control over the way that energy was used in the home. Eric was now able to easily heat one room at a time by effectively sealing off different spaces by closing doors. He was also happy with the amount of sun that came into the living area and made an effort to keep the sun's heat in the house by closing the curtains in the evening.

1.11.2 Expected and Unexpected Changes

Jolene was the first to move into the new dwelling and had already set up the house by the time Eric moved in. The house did not have curtains upon arrival and Jolene had managed to find some heavy material to make some for all of the rooms.

Soon after moving in, Eric and Jolene found that they both shared similar ideas about how to use energy, much of which Jolene attributed to their upbringings (Jolene) "I think our parents both taught us similar energy conservation rules... You know, don't leave lights on if you're not in the room..." P23. This meant that there were few disputes around how to use energy, and both had similar patterns of energy consumption. However there may also have been an element of leeway afforded by the new relationship (Jolene) "I don't think we've ever argued about it [using energy], aside from he [Eric] getting annoyed at the bathroom light is on and moths get in. (Eric) Oh, just accidental moths, yeah. (Jolene) That's about the only time we've argued over the power usage. (Eric) Yeah, that wasn't really about power, though, was it? It was about moths. (Jolene) No, moths and wasting power" P28.

The heat pump brought about a substantial change to how Eric heated the house compared to House 1. Eric had set the heat pump to 24 degrees Celsius to keep the room at a comfortable temperature (which might have been around 20 degrees for the rest of the room as the fan sensor was very high on the wall). However after Eric had spoken to a friend who was an electrician he was informed that the most efficient way to run the device in his current house would be to run it at its highest temperature for short periods "he came round and he said that you're much better off just having it on full heat which is 31 degrees I think, 32 maybe, and just crank it and then turn it off and leave it off for as long as you can" P8. Without letting the temperature decrease below an uncomfortable level before turning the heat pump back on, Eric maintained the new pattern because he believed it was more efficient. This caused Eric to use the heat pump in a different way than how he had thought they should be used "I had always been told that if you leave the heat pump on it's more efficient because it's done a certain amount of processing and it doesn't have to redo it, and it maintains, rather than doing repeated cycles. And he basically said that's a myth. And for the most efficient you should just do bursts. So that's what we've been doing. Just on and off at high temperatures" P8 I1. House 2 did not have any open plan spaces which made it easier to keep heat in one area. But this also made it harder to heat other parts of the house with the heat pump so he sometimes used a small fan heater to heat the bedroom or kitchen in the evening if it was required.

The new house had more problems with dampness than the previous one, and Eric had started to use a dehumidifier occasionally to help with this. Eric had noticed that the house seemed to heat more effectively after the dehumidifier had been running.

One element that was somewhat out of Eric's control was the cat door in the kitchen. The couple had acquired a pet together and therefore needed to use the cat door that was attached to the door in the kitchen. Unfortunately the door did not seal very well and Eric said that it created a strong draft into the dwelling. This meant that Eric did not like to heat the kitchen because of the waste of power, so he relied on the heat from the oven to heat the room when cooking.

1.11.3 Behaviours which stayed the same

Closing doors – but there was also some annoyance because they were a bit hard to close properly and this meant they had to maintain a conscious involvement to make it happen.

1.11.4 Expected Behaviour Long Term

The bathroom did not have a fan to help with ventilation and Eric considered buying a fan heater which could be used during showering to help with the moisture.

1.12 Interview 3

The third (second actual) interview was taken in House 2 with both Eric and Jolene present. Some time had passed and a particular effort was made to confirm the findings from the previous interview. The couple had now been through a winter in the household and had settled in for the medium to long term. They had been establishing the property as if they intended to stay for some time; building a veggie garden, a glasshouse and a chicken coup. Although they did not own the house, the couple had been slowly making changes to it as if it was theirs, always through discussions with the landlord. Because the landlord was Jolene's father, this made some negotiations easier, but there was still not the same free autonomy which meant that no substantial changes had happened to the dwelling yet.

1.12.1 Expected and Unexpected Changes

After spending a winter with the heat pump Eric had adjusted his use of it after finding that it his initial method was not very comfortable. "the heat pump's basically blasting on quite a high setting

constantly for quite a few hours until we can actually turn it down a bit ... and the heat pump's just too windy and dries your eyeballs out and makes a lot of noise and you can get used to is and ignore it, but it's like always a relief when you turn it off and have silence" P11. The couple had found that even when they had the heat pump on its highest setting, it would still take a very long time to heat the main living area. This meant that the room was unpleasant to be in while it was being heated as the heat pump was too noisy, so the couple no longer put it on its highest setting and had instead opted for a lower temperature that the machine would actually turn off to automatically – around 27 degrees. Eric had realised that the older un-insulated living room would take almost a couple of hours to heat up in the evenings so the heat pump would be turned on as soon as they got home after work.

During the winter Eric and Jolene had also installed a large drape that went across half of the living room so that they would only need to heat a smaller part of the house during the winter. This also helped as an air gap between the living area and the main door which Eric mentioned would take a large amount of heat very quickly if left open "yeah, you know, five seconds with the front door open and that's 10, 20 minutes worth of heat loss" P28.

1.12.2 Behaviours Which Stayed the Same

Eric continued to use a dehumidifier in winter around once a week as he found that it helped the house warm quicker. He had developed the practice of leaving it on overnight once a week and found that it sufficed. As well as this Eric and Jolene also stuck to keeping the heat in the rooms they were using even when it became a hindrance (Eric) "Yeah, keep the door shut, always shut the doors, even though they drive us nuts with latches and things, yeah, try and seal them up" P23.

1.12.3 Expected Changes in Future

Because of the renting situation, Eric had been always cautiously making changes to the house and land. He still talked about his ideal situation where he would be able to make more structural changes to the dwelling to make it more efficient, but in the current situation this always meant a negotiation.

Eric had installed a new fan heater in the bathroom which they used in the morning to help steam escape the room and help with condensation. This was the main expected change since the last interview and had been an effective measure.

Eric and Jolene were still not happy with the heat pump and were slowly suggesting that a log burner would be preferred. As the couple grew more comfortable with the idea of living in the house for a longer time, the possibility of changing the main heating system became more realistic. Although they had not made a purchase, Eric was still considering acquiring an oil heater to compensate for the harsh, dry heat of the heat pump as a more of a short term measure. Both preferred the idea of wood though, including the labour associated with it. Jolene had almost always lived in a house with a fire, and for them this was a much more comfortable form of heating.

The location of the house and the physical aspects of the dwelling did appeal to Eric to the extent that he was happy to stay in the dwelling for the long term. If the dwelling had not been as nice – especially in its ability to receive daylight hours as well as have a garden, Eric and Jolene did not think they would have spent much time there.

Eric still showed interest and the motivation to make more changes to the dwelling over time. This however was always through negotiation with the landlord and therefore required a certain amount of patience and caution on his part. When the interviewer contacted him a few more months down the track, after interview 3, Eric had managed to negotiate the installation of a log burner in the living room on the grounds that he did the fitting work himself. Eric has also retrofitted a gas hob onto the range in the kitchen which was something he had mentioned that he would love to have in the long term.

Case 4 Overview – ‘moving from a ‘house’ to a ‘home’

1.13 Household Overview

Jason and Maureen were a couple in their early sixties who were moving from a ‘house’ into a ‘home’. The couple had been living in Dunedin for 2 years. Jason and Maureen had also lived in Dunedin around 10 years before, providing them with more of an insight into Dunedin’s climate and housing stock. They were ‘empty nesters’ and on the road to retirement, living in a small two bedroom brick house on the top of a sunny Dunedin hill. They moved to Dunedin two years ago to be closer to family and bought this place because of its location and also because it was the best on offer at the time. However they wanted to move into a slightly larger, more homely residence more like what they had previously had in the past. The couple didn’t want to make any structural renovations, instead they wanted to move to a house that had everything they sought after, which included having an open plan living space which utilised the sunlight hours. The couple both had very strong energy saving habits and would turn everything off at the wall, as well as only heat the living room (with a wood fire and electric heater), only occasionally heating the kitchen.

1.14 House 1

The dwelling was a small two bedroom brick house which was located on top of a hill, receiving all day sun. The couple had chosen the dwelling because of its location and because it was the best on offer at the time. The rooms were separated by a short hallway, making it difficult for heat to flow from one room to another. However the kitchen, which was on the south western side of the dwelling, seldom received direct sunlight until the end of the day, or in early morning during summer.

There was insulation in the ceiling, but not in the walls or underfloor, which the couple considered as a ‘bit of a have’. (Jason) “ No, no, there was a lot of stuff coming in about this insulating under the house. (Maureen) That was a big have though, oh that’s a have all that…(Jason) We never got that done….(Maureen) But of course, underneath here’s very dry, very, very dry isn’t it? (Jason) Yeah (Maureen) – There’s no mildew or dampness sort of thing” P16.

Maureen and Jason both had very strong energy saving habits which they had developed over time, such as turning appliances off at the wall, keeping heating low and closing doors and curtains to conserve heat. Maureen had developed an appreciation as to how to make the most of heat from the sun after living as a solo mother with limited income, which had made her very wary of houses that did not receive a large number of sunlight hours “Because houses with no sun here in the winter, I mean you drive around and you think, ‘Oh, that wouldn’t get sun all winter. How cold … And the dampness and that, but when the sun’s out, this is (House 1) all day sun and I just think well, that’s a bonus if you can get a house with the sun” P1

There was a log burner in the living room as well as an electric bar heater. A small fan heater was also in the kitchen. The couple usually heated the living room, and mostly used wood in the winter as their main heating source. Maureen would occasionally heat the kitchen with the fan heater, but mentioned that she normally tried to conserve its use.

1.14.1 Why moving

From the onset after moving back to Dunedin, Jason and Maureen wished planned to move into a dwelling that offered more of the same benefits as their previous house (which had not been available upon the purchase of house 1). The couple desired an open plan dwelling which provided more flow and openness than what house 1 currently offered.

They also desired a larger dwelling which would have more space to entertain guests, along with the open plan spaces and more room. They sought a house that was more than functional; they sought a house that felt like a home.

1.14.2 Reasons for choosing house 2

They wanted to have a slightly larger, more 'homely' residence than what house 1 had to offer. (Maureen) "you know, how the agents have their little listings … [in the paper] they had 'Home Sweet Home', but for us, it is" P31.

From past experience, Maureen could see that house 2 would potentially offer similar benefits and a way of living that she had previously experienced: (Maureen) "It is [like the] … home I had years ago and yeah I liked it there so much … because it was a warm house and it has insulation, walls and ceiling and it was split level open plan, built for the sun, all day sun, morning to the last, wasn't it? It was so warm, summer time it was like Australia, had to pull all the drapes. That was so hot, I mean it was awesome" P31.

The couple also liked the fact that the house was more modern than house 1, with a newer kitchen and bathroom.

The couple didn't wish to do any structural renovations, and instead wanted to move into a house that had everything they sought after from the beginning. This included having things that they wouldn't compromise on, such as sunlight hours, and things that they now desired as part of their home life; such as open plan living "Yeah well it's partly for the more room, but energy-wise, I mean one bonus, it's built there for the sun too and it has the conservatory and it obviously a sun deck and that, it's facing, and open living, so that is a big plus because here I miss [open plan] ... windows are bigger … because I like the light in and just the openness" P6.

Maureen preferred the openness and feel of open plan, also because it provided better flow of heat throughout the house than what house 1 had been offering. This way she hoped to make better use of heat from the sun which could be used to warm up other parts of the house. The new dwellings' conservatory was 'another plus' which could aid in solar heating. The couple saw the conservatory as a huge bonus to how they hoped to heat the house: (Jason) "The conservatory, they're usually like hot houses, aren't they? (Maureen) Because the glass draws the heat and that's a big plus, the sun. If any sun, you've got to have the sun. That is a top for your project, sun. It's got to be the sun because if you've got the sun, well, you're sure if the house is on, and to be on the sunny side of the street. You're just going to find it very hard. I look in Dunedin and see; no I want the sunny side of the street, so it will be cold" P32.

The new house also had insulation and was double brick.

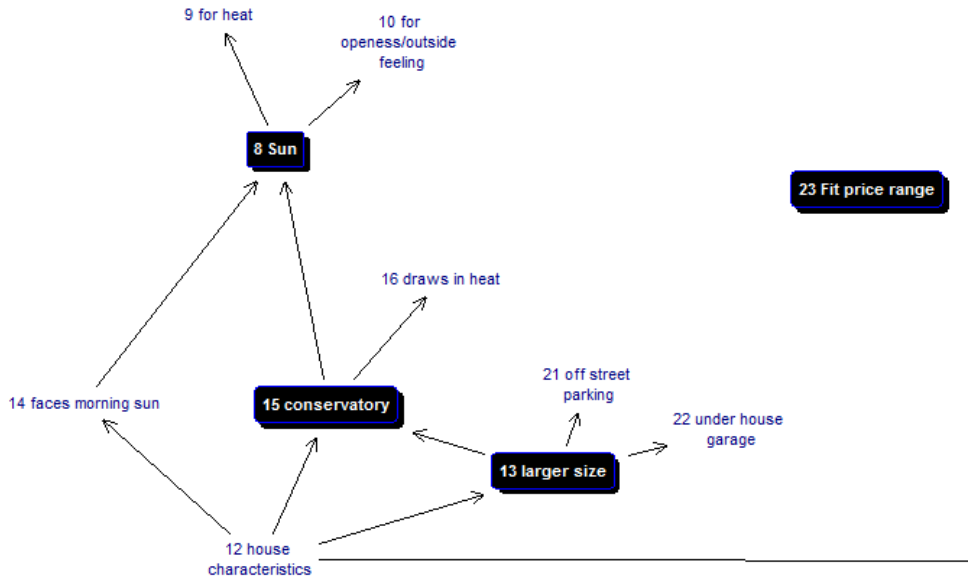


Figure 0.1

1.14.3 Expectations for house 2

Maureen and Jason anticipated that they would remain frugal in their energy consumption, maintaining the same energy conserving routines that they had maintained in the past. They could also anticipate how they would use many of the new fixtures that house 2 offered, despite having never experienced them before. House 2 did not a have a log burner like house 1, instead it was fitted with an air to air heat pump in the main living room. The heat pump had the potential to heat the open plan kitchen, living room and dining room, quite a contrast to the single roomed heating option that Maureen and Jason had been using in house 1.

(Jason) " See, you have to sort of experience things for yourself…(Maureen) " And then I think they have that circulates the air so that's good, which will circulate the heat and the fan, the heat pump, because the heat pump's in the dining room part, even though it's open living and then the fan, I noticed, was hooked up in the ceiling in the lounge part. So that there would circulate that whole living and then they were saying that we were there on the sunny days, all that limits (**?**) So I mean we're probably going to need it on cold days and probably in the day I wouldn't really use it at night time, I might boost it up a few hours and then that be it. I couldn't see that happening, going 24/7, because I wouldn't. (Jason) I haven't had one, but I've used it at work and different places….(Maureen) In the winter they say if you set it to about 22 or something and then 18 or …..(Jason) So whether it's as good as they say, there's always something new coming in……..(Maureen) Because the bedrooms are up the front of the house though aren't they? I don't think that's even going to get near there, but that won't matter. We'll just, I don't know. Mind you, the house is small too, so you see you haven't got a lot of and it's only a small hallway, narrow hallway, so I can't see it being a, it's not a cold house you can tell that. It won't be cold. Oh well we, yeah, but I mean we may just turn on our heater just to take the chill of the air off for a couple of hours and that'll be it. But that will be warm" P28.

Maureen also 'knew' the most appropriate way to use the fixture. The new dwelling also had a dishwasher and ceiling fan which were not in house 1. The couple had previously owned a dishwasher in a different dwelling and had found that they rarely used it – only when guests were around. They anticipated that this would be similar when they moved in to house 2.

1.15 Interview 2

House 2 was a two storied building tucked into the side of an easterly facing hill. Despite Maureen consistently arguing for the benefits of receiving sunlight, it was apparent that House 2 would not receive as much direct sunlight as house 1, especially in late afternoon in winter.

Jason and Maureen had taken the interviewer up on his offer of helping to move, and the interviewer had helped move some furniture into the carport of the new dwelling before the couple had officially moved in. The building was also built from double brick, and was of a similar era to house 1. However there had been more renovations done internally, knocking out some walls to provide a more open plan living space, and there was a small 'bedroom' downstairs that added value and space. The conservatory was on the north eastern corner of the dwelling and the kitchen on the north, meaning that sunlight was more directed to the living areas of the house than in house 1.

It was difficult to tell how much insulation had been added to the dwelling, most likely not to the double brick walls. And there was polythene on the exposed ground under the house to avoid moisture, but no underfloor insulation.

1.15.1 Expected behaviours house 2

The allure of the new dishwasher did not phase Maureen and Jason's attitude towards the use of the appliance, and they still preferred to wash dishes by hand. They had owned a dishwasher in a previous dwelling, but found that it was more effective and more efficient to just wash dishes in the sink. Maureen rationalised this as since she needed to rinse dishes anyway, she might as well do them in the sink as well.

The open plan flow provided the much anticipated living arrangement and Maureen was much happier with the house's aesthetic appeal, and the way in which the sun heated the house. Maureen was finding ways in which to make the most of sunny days to heat the house, through opening the conservatory and other doors to allow heat through to other rooms, as well as ventilating the house as the sun moved around the house during the day.

The couple were happy maintaining their frugal energy habits such as turning appliances off at the wall.

1.15.2 Unexpected / context dependent changes

The couple had spent some time getting used to the new dwelling and finding the most appropriate way to use the new heat pump. They found that they rarely needed to set the device as high as they had originally thought, and found that 16 degrees was often quite adequate.

(Maureen) "I'm pretty fine with it at 16… Yeah, so I think, see because it was set at 16 and then it's set up to 22 so the people when they done it they must have had it set at, well that's when they connected it and so we've never, well we don't have it up to 22, I think, oh. I mean I couldn't have it at 22. By 18 I might put it on mornings and that and by that time if I'm doing things I'm just going to turn it down. To have it 18 all the time, I couldn't have it at 18. To me, it's stuffy… then I put it on sleep and then just open the doors and then we're not cold at night" P8.

The couple still used the new heat pump frugally as they were unsure as to how it would affect their energy bills. They may have started to heat the house more however, now that the living spaces were larger than what they had been in the last house, and now that it was harder to close off the kitchen to the main living area. Although they were happy with the new heat pump, they still found they liked their old bar heater, as the glow provided an aesthetic appeal that they had grown fond of.

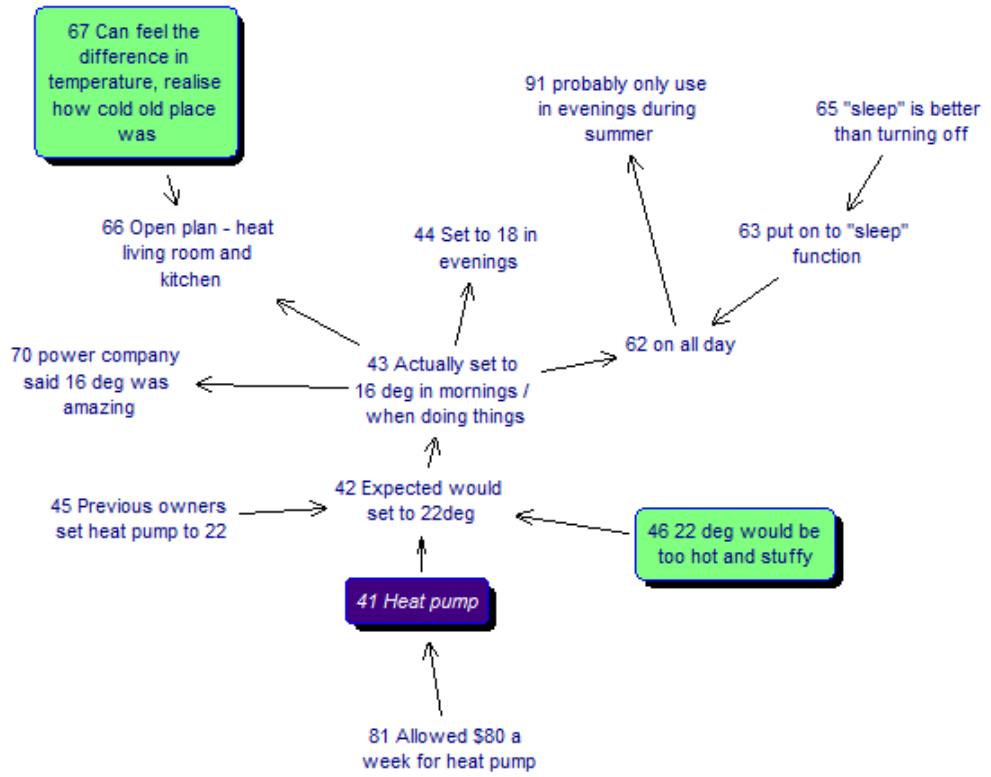


Figure 0.2

The concept map above expresses the changes to heating routines in the new dwelling. The couple had allowed a certain price limit per week for the use of the new heating system, and Maureen, could 'feel' the difference in thermal effectiveness of the new house. As the couple were surprised by how low they could have the heat pump set to, this allowed them to run it for much of the day, and have on 'sleep' which they envisaged would use less energy than turning the machine off.

1.15.3 Expected changes

Having the extra space in house 2 meant that Maureen and Jason could make use of more appliances. The old freezer which had been in storage in house 1 was now plugged in all the time next to the kitchen, and the couple enjoyed having the convenience of being able to store more food.

The couple also bought a new fridge freezer for the new house, as it was a 'good deal'. They did not look at the energy use of the appliance and instead were guided by the aesthetics and the brand name. The new house also had an electric garage, which Jason professed was 'a bit of a toy', but he still liked the convenience that the device awarded.

1.16 Interview 3

Maureen and Jason both had settled into their new dwelling, but still had problems with ill health.

Maureen was now more aware of the cost of heating the house, and had come to terms with the fact that it would cost more to heat than House 1. However she was happy that there was a larger area heated, and that she was able to circulate heat throughout the house more easily.

1.16.1 Actual behaviour long term

Jason and Maureen were still very happy with their new dwelling five months on. Upon entering, the hallway had been warmed by one of the portable heaters, and the interview was held again in the main living area. They professed they still used their portable heaters occasionally, and that sometimes there was a benefit of a smaller direct heat, rather than heating the whole area such as with the heat pump.

Maureen had refined her heat pump automation, and the machine was now set to come on at 6am and turn off at 10am. The couple would often leave the conservatory door open to let heat into the rest of the house, but they had also found that moisture would come through on colder days, something they had to be aware of reaching the rest of the dwelling. They still enjoyed using the conservatory, and had bought a water feature to go in it, which used a small electric pump.

They were still trying to conserve energy where they could, and would only use the smaller lamp in the hall instead of one of the bigger options. Overall the couple found that the house was more sheltered than the old one, and still thought that the house was warmer than the previous one.

1.16.2 Unexpected changes long term

The couple had bought a mini oven, which they were very happy with, as an attempt to use less energy. They had also bought an electric lawnmower for the new dwelling, which they were now using once or twice a week.

Jason had done some painting to the house, and also put polyurethane sheeting and plywood on the ground under the house, to stop moisture and cold rising through the floor. The couple mentioned that underfloor insulation was unnecessary ‘a bit of a have’, but this might also have been because it was too expensive. The couple had also made efforts to seal doors to stop drafts, and found that the blinds seemed to work well.

Unfortunately they felt that they were using more hot water now, because they were spending more time in the kitchen. Even though they no longer had a bath, and used only the shower, the electricity bill was higher in the new dwelling than the last (which they suggested could also have been because of the hot water tank temperature setting). Overall the power bill was around $180 , whereas it used to be $120 in House 1. While they thought that it was because of the wood burner with free wood in the last house, they now think it is because they are in the kitchen more, which means they use more hot water.

But they also mentioned that with the extra space, they now have far more appliances than in House 1, and that the larger fridge freezer, and the extra freezer plugged in would also be contributing to their energy bills. The house had recently been re-valued as a three bedroom house, so even with larger energy bills, the couple were happy to see that their investment may have the potential to gain equity in the long run.

1.16.3 Researcher reflections

The couple were very aware of saving energy, mostly because of the cost associated with it. Moving into their new dwelling they were able to purchase new appliances to make everyday life a little easier, but this also meant a higher energy cost. As the new dwelling was larger than their previous one, and they were not able to heat single rooms as easily as in the past, their energy bills were now also higher.

Case 5 Overview - “A Couple Restricted”

1.17 Household Overview

This household was contacted through mutual university acquaintances. The household consisted of a younger married couple (Dieter and Zelda) from Indonesia. The man (Dieter) had come to NZ to complete a PhD. They are on a lower income and rented a house about thirty minutes from the centre of town.

The flat was actually an old shop in what would have been planned to be the CBD of a small urban centre. The flat was on the corner of a line of about six shops which were either ‘converted’ to flats or simply empty. The shop fronts faced mostly east and would not really get any direct sunlight, apart from the flat being interviewed, which had windows that wrapped from the east through to the north. The large windows facing the road meant you could hear every car rattle past and the whole place felt like you were in an abandoned shop, not in a house. There had been no effort by the landlord to make the ‘flat’ any more hospitable from when the place had been a shop. It was a ‘studio’ apartment and the tenant had put up a curtain around the bed to create some kind of privacy and to keep some warmth in the new makeshift bedroom.

The building was made out of red brick, and had solid concrete internal cladding. The street facing side had large shop windows which were older wooden framed ones. Inside there was a makeshift kitchen that would have been part of the shop. There was a small hot water cylinder underneath the kitchen bench which only provided enough water for about a ten minute shower.

Figure 0.1 Back of the “apartment looking at the bathroom window open

1.18 Interview 1

1.18.1 Reasons for House 1

Both respondents, Dieter and Zelda were in the house and greeted me; after a discussion it was decided that I just interview Dieter at first. The couple were in their late twenties and had recently moved to Dunedin from Indonesia. Dieter was just starting his thesis in agriculture at the University of Otago and Zelda had recently arrived to join him. In order for Zelda to gain a Visa to New Zealand she needed a place of permanent residence, so there was some pressure on the husband to find a house quickly. He organised a flat through a friend and chose the area because it was slightly out of the city which meant that it would be quieter and nicer. He also thought that the elevation of the area in Pine

Hill (on the hill above the city which leans towards the South) would mean that it would be warmer than on the flat. Unfortunately however, through a miscommunication, he ended up in a different flat than what he had intended, and therefore wanted to move into something more pleasant as soon as possible. Living in an old shop felt less than ideal, and he wouldn't recommend that anyone live in that place. (Dieter) "in Indonesia, we usually, it's very hot, so we usually choose a place in the hill so it can be warmer. So I don't know what I thought before, why I chose this place because it's a bit higher and more quiet, but, and it's cheaper compared to the other places. It's very cheap, but I didn't think about the heat power and the cold of the place" P1.

1.18.2 Normal Behaviour in House 1

The studio apartment was effectively just one room with a small shower and toilet off to the side. The kitchenette lay in the south west corner and the shop front was on the north east corner. The living area was in the main shop area, and a curtain separated the bed from the rest of the area.

The couple had only been in the flat for a few months, and had only a few appliances which they had recently acquired. The previous tenant had left a couple of oil heaters behind and the current tenant had recently purchased another fan heater. He didn't find any of them very effective and still found the house extremely cold, especially coming from a warm country. Because the couple had not been to New Zealand before, they were not used to the cold temperatures and what was considered normal. They were very concerned with power prices, and wanted to pay as little as possible and in the summer months leading up to winter had bills of around 50 dollars. These had increased to around $80 in winter with the use of extra electricity for heating. In the summer they had been able to keep the blinds open to allow the sun to heat up the area, and with its large windows this was very effective. But in the winter the windows became a large problem because they were poorly insulated. The husband had bought curtains to cover the windows to increase privacy as well as provide better insulation. He also pegged the curtains together to create the best seal he could. The makeshift bedroom out of curtains also created a smaller area to heat. As the days had started to get colder, the participants had started to use the heaters more and would keep one of the oil heaters on overnight to keep the room slightly warmer. They had purchased an electric blanket and found it cheaper and more effective to stay in bed rather than sitting around in the house. They even put the new fan heater into the bed to help warm it up at times.

(Dieter) "well basically because it is very cold we spend most of our time in the bed, and just plug in the heater and put it under the blanket, so usually every morning if the weather's fine, we just open the curtain and just sit round here and have some tea, or coffee" p2. The couple also spent more time watching television than normal, because they found they were limited to what they could do when trapped in bed for so long, so not being able to comfortably use the other parts of the house their solution was to rug up in bed and watch television.

Figure 0.2 One of the small oil heaters left by the previous tenant. Second heater behind it purchased by Dieter.

The conflict between being warm and spending money on power were strongly evident. There was obvious lack of experience in heating methods and the couple did the best they could with the heaters they had available. Because the place was hard to warm, and the couple did not want to run the heaters on their highest settings, they spend most of their time out of the house at university or in the library where it was warmer. They would also get up later in the mornings than normal because of the cold.

(Dieter) “We already have a wall heater, so that’s just for if the weather is very cold, we are going to use it, but I don’t like using the oil filled heater because it’s not very good. Because it takes a lot of energy I suppose and, it’s not really that effective” P7.

The best feature about the flat was its position to the sun. The large north facing windows meant that the couple were able to make the most of the sun’s heat when it was there during the day. There were also two windows facing west in the bathroom which would get direct sunlight as the sun set. The high position of the house on the hill, with no obstructions meant that there was a large amount of direct sunlight available which the couple made use of, especially in the mornings. In the winter however the place took longer to heat up, which contributed to the couple staying in bed longer.

Figure 0.3 The small hot water cylinder, under the kitchen bench

Because of the small hot water cylinder, showers were restricted completely by the limits of the cylinder's water capacity. The tenants said that they could shower for ten minutes before they ran out of hot water. They didn't like this at all, because it restricted when they could have a shower and the ability to have guests stay. However they mainly didn't enjoy being restricted to short showers because they were used to having much longer ones back at home. They recognised that showering for shorter periods was necessary in New Zealand however because of the cost of heating water; in Indonesia they have longer showers multiple times a day in order to cool down.

This flat had the electricity meter inside, which was one of the older ones with a spinning disk. The meter was just above the tenants' bed, which they could hear when it spun. This gave a rough indication to how much energy was being used; the more energy, the more the indicator spun. The husband used this as a guide to how much they were using, and had fathomed that the more intensive heaters sucked a large amount of power. This had contributed to them finding the least energy intensive option for heating, which was staying in bed with the electric blanket on.

Figure 0.4 D1 Tubular TV and lamp in makeshift bedroom. Power meter right next to bed.

Having the electricity meter made the tenants very aware of which appliances were more energy intensive, and through wanting to spend as little money on power as possible, compromised on heat. Because the flat was so unpleasant to live in, through its aesthetics and heat levels, the couple treated the place as a temporary accommodation and made little investment to make the place more comfortable. Since there was not enough room, nor the facilities to host guests (i.e. shower abilities) the couple planned to move as soon as possible.

Not being designed primarily for living in, the apartment did not have any window near the kitchen facilities. This was something that the husband wanted to improve on for the next place because he found it difficult when there was no ventilation for their spicy cooking.

1.18.3 Reasons for Leaving House 1

With the large amount of problems that the flat had, the couple wanted to move mostly because of the cold, secondly because of how un-homely the place was and thirdly because it didn't have the facilities required to host Dieter's parents when they were to come and visit.

1.18.4 Reasons for Choosing House 2

Upon deciding to move, they looked for places that were closer to the centre of town, and on a flatter area so that they could bike to the University. Initially they looked at South Dunedin because the houses were on the flat, and that it would be easy to bike to. However they were unable to find a one bedroom apartment there and were suggested one by a friend near the centre of town. Although it was on a slight hill they were very happy with it. They perceived the house as being much warmer, and as a second priority it had a window in the kitchen that they could open. The fact that the apartment was actually part of a house, and not a shop was also part of the decision. Then finally the price was still reasonable. The main priority was that the house would be warmer, secondly that it would be closer and thirdly that it would be nicer. It was also important that the new place would have room for guests (to fit their parents when they came to stay).

1.18.5 Expected Behaviour in House 2

The couple expected the new dwelling to be much warmer than the previous one. However reasons for this were not asked during the interview. It seemed as if the participant thought that the house would be better insulated than the previous place, and having more rooms which could be closed off meant that there would be less space to heat. This was discussed later as the participant would generally just heat the bedroom. The participant mentioned that the house had a wall heater which they were planning on using only when it was really cold, because he was imagining that he wouldn't need to use it much.

The participants were strongly driven by the desire to keep costs down. (Dieter)"Well I suppose, our priority is to have, to use less electricity because we want to pay less for the bill. And we also plan to move from the previous energy supplier, we have Mercury now and we decided to move to Genesis because I've read what's my number website, and well they say that to live in Dunedin the most efficient thing I think is Genesis. I don't know if it's right or not" P9. The couple were actively looking for the cheapest power prices and were happy to make changes, which was driven by the desire to save money. This also motivated the move to be closer to town. Not needing to take the bus to university meant that they would save on bus fares and be able to spend a bit more on accommodation. The closer proximity to town meant that it would be easier to walk to university and to shops, and the fact that it was only up a small hill also meant the participant could ride his bike.

The participants anticipated that having a warmer house would mean that they would get up earlier and be able to spend more time in the living room. This would mean they would be trapped in bed less and not need to watch as much TV. They thought that the warmer place (through perceived insulation) would also mean that they would need to use heaters less and therefore spend less money on heating.

Having a nicer residence also invoked expectations for how they were going to live. Because the living area was more comfortable, the husband said he would be happy spending more money on electricity just so that he could be in there. The couple expected that they would have more visitors over because the area was more hospitable. Having a nicer place also stimulated the couple to try to make the area more homely; they had started to purchase some furniture items that would match the new place.

Having a nicer and warmer place, with a separate living area also meant that the husband would spend more time at home. (Dieter) "And probably want to spend more time in there, in the house and to work and everything. We can just, I mean if we don't really need to go to the office we can just work at home" P5.

1.19 Interview 2

The interview is conducted in the living room with just Dieter. The house was placed high up a street and was an older wooden villa (100 years old approximately). The villa is split into about five different apartments. The house faces south east and is nestled behind the main hill below the town belt. There won't be much direct sunlight – the 'sun window' discussed in the earlier interview is a frosted glass window of about 1 meter squared and faces north east rather than north. It would lose direct sunlight early in the day. The flat is also at the back of the house (facing the city which gives views, but no sun.) The other apartments face the north west and might see some more sunlight if it weren't for the terrace covering which comes down over the front of the house keeping direct sunlight away from virtually every part of the house. You enter the flat through a side entrance along the north east wall. The house is two storied, the lower floor drops below road height and is tucked into the hill. You walk along the side of the house on a metal fire escape to the main (only) entrance.

The house is probably close to 100 years old and will probably lack insulation. The ceilings are the typical high three meter ones and it has been a poorly done retrofit to make it into a flatted apartment.

You enter through the main living area which is of similar size to the first flat, about 8m squared. There is a fixed electric heater in one side of the room and large windows over the city on the other. The heater fixed in place may have replaced an open fireplace years ago. Walking though the living room you come to the kitchen which also has views over the city and to the right is the bedroom and bathroom which face away from the city. The bathroom can probably have some ventilation through the window facing out. As well as the kitchen, this is an improvement to last time. There is one bedroom which has a window high on the south west side of the house. It is probably so high because the house is built into the hill this way. The window cannot close properly and the tenants have tried to close the window with tape in order to seal the drafts a bit. It doesn't look like the walls have been re-plastered so there is little chance of wall insulation, and by the upkeep of the house there is also little chance the landlord has bothered to put ceiling insulation in either. There is, however, room in the roof cavity, most likely for insulation.

1.19.1 Actual Behaviour House 2

The couple enjoyed a different lifestyle in the new dwelling, as the place felt much more like a 'home' than their previous one. Because of this they spent more time at home, and subsequently more energy. Unfortunately their inexperience with Dunedin houses meant that they ended up choosing a dwelling which received less sunlight than their previous house, which seemed to make the house even colder than the last.

The couple were still using an electric blanket in bed to stay warm, but had thankfully stopped using a fan heater under the bed. The new house had a separate bedroom which could be closed off, making it easier to keep one space warmer and therefore not having to heat the whole area at once. They would also still spend a lot of time in bed, to save energy and stay warm, but they did not spend as much time in bed as in the previous dwelling.

1.19.2 Expected and unexpected changes house 2

The new dwelling had a much larger water cylinder than the last house, which was a relief to the couple. They resorted to sometimes taking 30 minute showers, just because they could, and it was a luxury compared to what they had to endure in the previous dwelling. This also meant their frugal attitude towards saving energy was diminished in this regard compared to the previous dwelling. Their 'energy saving' attitude was also softened because the new dwelling was nicer, which meant they were more prepared to spend a little money on heating the house, whereas previously they did not want to.

Figure 0.5 New portable heater in Dwelling 2

The couple had purchased a new bar heater for the new house, with a hope that it would be more effective than the old oil heaters they had been using in the previous dwelling.

The new house also had changes in the kitchen which made things much easier than before, with a larger fridge – which allowed them to stock more food, enabling them to do a shop once a week instead of twice a week. The house had a microwave which allowed them to defrost food much more easily; they had been thawing it on the windowsill previously, and most importantly – the kitchen had a window which could be opened for ventilation (much better than in the previous dwelling).

Figure 0.6 Kitchen with window for ventilation in H2

The couple enjoyed being able to sit outside, or next to a large sash window to have breakfast in the morning sun, which was the only time the house received direct sunlight during the day. Often it

would be warmer outside in the mornings than inside the house. They would only really use their heaters when guests came, otherwise they tried to avoid using a heater all together. There were other fixed bar heaters on the walls as well, but Dieter hadn't tried to use them because he thought that they looked old and inefficient.

Figure 0.7 Fixed wall heater that wasn't used in H2

1.20 Interview 3

During the period of interview 3, the couple had been fasting, which meant they were getting up early in the mornings to pray. Unfortunately because of the cold, they would hop back into bed again as soon as possible afterwards.

There hadn't been many changes to the couple's routines or behaviours since the last interview. They still liked to sit outside in the sun during the mornings, and they had been using heaters more in House 2 than in House 1. Having the separate bedroom meant that the couple could close the room off and heat only the bedroom in the evenings, which helped them be able to move around a bit more freely than being trapped in bed like in House 1.

The washing machine in House 2 was slightly smaller than that of House 1, which meant that they also had to do more loads than previously.

The couple had noticed that their energy bills were now around 20 to 40 dollars a month higher than in their previous dwelling, but this was something they didn't mind for the extra pleasure they were receiving from the extra amenities. The possibility for a long shower especially, was a luxury that the couple were very happy to still take advantage of.

Case 6 Overview – "Down the housing ladder, and upping the equity"

1.21 Household Overview

Household 6 involved a family with one older son who was almost finished high school. The family had lived in Dunedin for all of their lives; Martha was a teacher and Stewart worked for an engineering firm. Doug, their son went to high school in the area.

1.22 Interview 1

The first interview was taken in the evening at House 1 high on a steep hillside on the Otago Peninsula. The house was built in the eighties and had been designed by well-known architects. The building had three levels, a garage at the bottom, living and dining area in the middle and two bedrooms and a bathroom on the top floor. The house was well designed to receive all day sun as well as capture the stunning views to the north of the city. The property was sheltered from the prevailing easterly and southerly winds and was well insulated. The windows were large and single glazed, but heated the house substantially during the day.

1.22.1 Reasons for House 1

The house was very aesthetically pleasing and very comfortable, with superior views in all rooms. The family had been looking for somewhere that was more private than their previous dwelling, and a "step-up" P2, in terms of comfort and lifestyle. The house they had lived in previously (H0) was next to the school that Martha worked at, which made it difficult to separate work from home life "because we lived right next to the school, you're always a surrogate care taker as well, or custodian, or security guard" P3.

1.22.2 Normal Behaviour in House 1

The family had mixed attitudes towards energy use. Neither Martha nor Doug thought much about the energy they consumed, as opposed to Stewart who actively tried to encourage energy saving behaviours amongst the rest of the family. Martha couldn't see the point in turning off lights when leaving rooms; (Martha) "It's a light and that's all, whatever… We can't be bothered, and why should we? It doesn't matter. (laughing). It's just not important. (Laughing)" P6-7.

Stewart had many self-professed habits around using electricity in the home, all with the intention of saving energy. Most were common sense behaviours that would have worked well, and others were slightly less logical. Stewart was frustrated with the rest of the family who refused to turn lights and appliances off; habits which he was the only one who seemed to practise. Stewart had also picked up some energy rituals from a friend at work who had given him some energy saving tips. This included keeping his computer monitor on at all times, as well as only running one appliance at a time because he had been told that running two at a time would use more energy.

The open plan living and dining area flowed across a hallway to a comfortable lounge. There was a gas fireplace in the lounge which served as the households' main source of heating. Being well insulated, the house retained a lot of heat from the day, and the family would often not need heating in the evening if there had been sun to heat the house up. The gas heater would come on generally on winter evenings when the family retreated to the lounge, where they enjoyed spending most of their time together as a family. There was a small electric heater in the open plan living and kitchen area,

but that was almost never used. There was also no heating in the upstairs bedrooms, as they received enough ambient heat from the living areas downstairs. Ultimately the large northerly facing windows were very effective at heating the house, even though they were single glazed. The family preferred the convenience of the gas fire, and the ambience it created. In their previous house they had a wood burner which they did not enjoy, saying that the preparation and effort required in chopping and stacking wood was too inconvenient. Ultimately they liked to relax when they were home, and preferred the comfort and convenience offered by modern fixtures.

The kitchen had a combined fridge-freezer and an electric oven with gas hobs. Stewart preferred the effectiveness of gas and the control he experienced when cooking with it. Hot water was heated by an electric hot water cylinder that lay on its side in the back of the house. Stewart had not checked the temperature but had mentioned that he thought that it was not too hot to the touch. The family were able to hang washing outside on the line most days, but they also had an electric dryer.

1.22.3 Reasons for Leaving House 1

Purchasing a designer house in a wealthy part of town with a spectacular view brought with it a substantial mortgage.

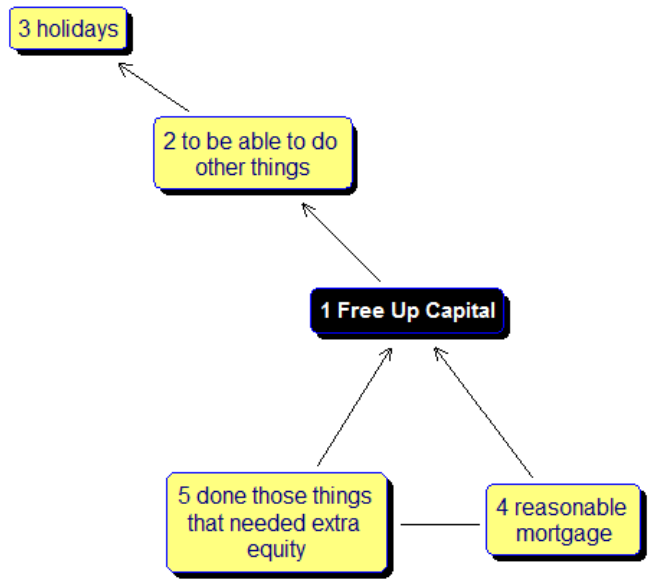


Figure 0.1

Steven and Martha had enjoyed living in the house, and being able to use the house's equity to finance some other endeavours, but they now wanted to live in a slightly less constrained manner and free up some capital (see concept map above – the black concept 1 refers to the main reason for moving). They had therefore sought a cheaper house which gave them more financial flexibility, but also a larger one which gave them some more space, especially for Steven's classic car collection.

1.22.4 Reasons for Choosing House 2

House two was mostly chosen for its price, and its potential. The house was not as modern as their previous dwelling but had been renovated in parts to make it more comfortable. The building was

larger, and there was room to build an extra garage, which meant that Steven would be able to store his cars more easily. The house was in the same area as their previous dwelling, so that it would not compromise their current proximity to work, school and shops, but was in a cheaper part of that area. (Martha) "It was in the area that we wanted, (Stewart) and it sort of ticked most of the boxes" P16.

1.22.5 Expected behaviour in House 2

Most of the expectations that the family had for the new dwelling were around its potential, after having alterations made.

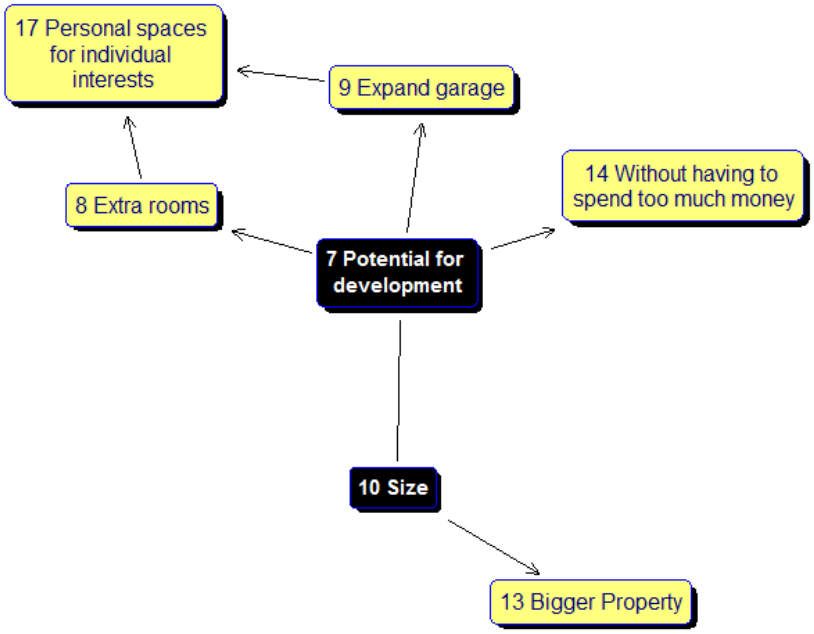


Figure 0.2

The house, being cheaper than their previous dwelling, was not as aesthetically pleasing in some regards. The family therefore intended on doing some renovations to the house to make it more comfortable. The main one being that they would re-do the second bathroom for Doug.

The house's main heating source was an enclosed wood burner in the main living area, and there was also an open fire place in the lounge. As had been discovered in their earlier dwelling, the preparation involved in wood fired heating sources was inconvenient, and not something which they enjoyed doing. They therefore planned to remove the fire places, not only because they found them unsightly, but also because the log burner took up valuable space in the place where it had been fixed. They planned instead to put the dinner table in the place where the log burner sat, and install a heat pump, which they believed would be more convenient and efficient than the burner which was currently installed.

The larger size offered more rooms than the previous dwelling and they envisaged that they would be able to spread their possessions out, and have more rooms to engage in their own personal hobbies. For example, Martha would now have room for her school work, Stewart would have an office for the computer and his guns, and the separate lounge would provide space for Doug to do his own thing when he had friends over. The extra spaces also meant that they (especially Doug) envisioned purchasing new appliances to fill them, the main one being a new television to go in the new lounge. The family were pragmatic around this new entertainment opportunity and saw that it could give the boys the chance to watch live sport whilst Martha could watch something else in the other room. Doug was also using this opportunity to encourage his parents to invest in a laptop for him, so that he

would be able to do his school work in the main living area, instead of the new study which was somewhat out of the way. Stewart had also done a costing sheet for all of the new technologies they wanted to purchase for the new dwelling since they would now have the capital to do so. Most other household fixtures were going to be pretty similar, both kitchens had gas hobs with electric ovens, and the new dwelling also had an electric fridge-freezer. Stewart planned to bring their old fridge into the new dwelling to possibly trial which one would work better for them since they did not need to leave it in the house they were selling.

The interviewer conducted a second interview of the household in Case 6 as it was a couple of months since the first interview before they moved. This allowed the interviewer to confirm some of the elements of the previous interview and clarify the concept maps before the family moved into house 2.

1.23 Interview 2

The second house was slightly larger than house 1, with the same number of rooms but slightly more floor space. The dwelling was made from brick, and had seen many retrofits over the years, the main addition being a more modern living area attached to the kitchen. The family were still in the process of renovating the dwelling, but had already had the 'unsightly' fireplace removed.

The second interview was taken around a month after the family had moved into their new house, with all of the family present sitting in the new open plan living area. They all felt comfortable in their new place, but said that this was a relatively recent thing as they had been very busy organising the house, and planning the renovations for the bathroom.

The new dwelling was situated on a lower, gentler hill than the previous one, on the corner of two streets. The building was unobstructed from the all-day sun, but its size and its orientation were not optimal for catching the sun in the most lived in areas. Sunlight would shine into different rooms as the day progressed, shining more directly into the smaller rooms. The building had been renovated and added on over the years, initially being a large separate brick house that had its kitchen extended to make way for a large open plan living area and sunroom. However the addition sat behind an older section of the house, and closed it off to some of the northerly sun. There was a conservatory that faced east which meant that it only received direct sunlight in the morning. The older section of the house most likely had un-insulated walls, being made of an older double brick construction. However the new section had been double glazed and insulated throughout. The on-suite to the master bedroom had been recently redone, but some other older parts of the house still needed work to match the newer additions.

The two fire places had already been removed before the family moved into the dwelling, and a portable heater from their previous house had been placed in the living area for the meantime. There was a ceiling fan in the main living area, as well as a heat transfer unit that moved air to the master bedroom. Such technologies were sometimes seen when wood burners were present, to help circulate the centralised heating source, however Stewart had implied in the first interview that it was there to cool the house down. There was also a moisture ventilation system installed in the ceiling.

1.23.1 Expected changes in House 2

The family had been swift to make the physical changes they intended to do to the house, and were already in the process of organising renovations to the bathroom as planned. Before even moving into the dwelling they had the log burner and open fire place removed, as well as buying Doug his new laptop. They had also recently purchased a new television for the lounge but were yet to use it. Since the family were still settling into the new dwelling, they had not yet had a chance to make use of the different spaces in the house, nor make use of some of the new appliances they had purchased. Doug

was happy with his new laptop however, saying that he was enjoying the ability to "multitask" by doing his homework and watching TV with his parents in the living room.

Most of their energy was focused on organising the decor for the bathroom they wanted to renovate, and they had not yet looked into a heat pump. Feeling that the house was somewhat cooler than their previous dwelling, both Doug and Stewart expressed interest in pursuing a heat pump before winter set in.

When Stewart was able to inspect the fridge in House 2 more closely he was able to see that the appliance was much newer than their other one, and therefore decided to sell their old one off. They also chose the newer one because it had a larger freezer space, and it fitted in the kitchen already without having to make any adjustments.

1.23.2 Unexpected / context dependent changes House 2

The new house was found to be much easier to live in than their previous dwelling in many ways because it was all on one level. The family were happy that they no longer needed to climb stairs to take the garbage out, go to the garage, or go to their rooms.

As the family were planning further renovations in the bathroom, they were also considering other changes that they could be done. The largest unexpected change came from the household lighting fixtures. Being a mixture of old and new, the previous owners had changed some of the lighting to include halogen down lights. Halogens had been installed throughout the old and the new parts of the dwelling and in the older parts there were now fixtures for older single bulbs in the middle of the ceiling with around four new down lights in each corner of the room. This increased not only the options for the owners to illuminate a room, but also it increased the number of light switches. In many cases large numbers of lights were grouped together so the user would switch on many lights at a time by flicking a single switch. The largest amount of lights which came on were in the refurbished kitchen, where there were a total of 18 down lights for just that particular section of the open plan room. The whole family had found this excessive to the point that Martha and Doug, who had previously not thought much about switching off lights, were now thinking differently about using them. (Martha) "I find that I am more aware of what lights are off. I'm being more proactive about turning them off when I'm not going to be around". P14 This went even so far as to change Martha's attitude towards energy consumption, when she realised there was a point where use of electricity was unnecessarily wasteful. Stewart had already got an electrician in to change some of the light switches to give the owners more control over how many lights they turned on and off at a time, and also to fix up the wiring in the ceiling which he thought looked dangerous "spaghetti ". The increased control over lighting gave the family options to reduce the amount of lights on at a time, but it also meant there were more light switches to negotiate. This caused the family (especially Stewart) to spend quite some time working out which light switch did what, something which he hadn't yet mastered.

The house also came with a new dishwasher, but the family were somewhat disappointed with it and how it made them use energy. The main issue was its size; being smaller than their previous one, they needed to now run it almost every day. The settings of the appliance were also somewhat difficult to follow, and they had spent the better part of a week trying to come to terms with how it worked, as well as coming up with a different routine around stacking and using dishes.

Since the family had not yet settled on purchasing a heat pump for the main living area, they had started to use a portable heater occasionally "to take the chill off". Coming from their previous dwelling where heating was used almost more for setting a mood than an actual need to heat the house, the family were still adjusting to new patterns of behaviour in the different climate. In interview 1 Stewart had suggested that they might install a gas fire in their new lounge like they had previously. But after installing their new television recently directly above the position of the old open

fire place they no longer saw this as a viable option. They were therefore now thinking of other options, and thought that maybe an electric convection heater might suffice.

When moving, Stewart had also changed energy providers, and had used this opportunity to look at the rates of other companies. In the end he chose one which gave a substantial rebate on plans when paid by direct debt.

1.23.3 Behaviours which stayed the same

According to the family, most other energy related behaviours stayed much the same. The family still spent most of their time together in the same room; however this was now the open plan living room, rather than the lounge. The house also had a bath, which had been only used once, and the kitchen gave them much the same experience as their previous dwelling had.

1.24 Interview three

The final interview was taken around four months later, after winter had fully settled in. It was a cold evening, and the temperature of the house inside was also noticeably lower than what it had been previously in summer. Stewart was wearing three layers of polypropylene, something which the family had never mentioned that they had done previously.

1.24.1 Expected changes since interview two

The family had mostly focused on renovations since the last interview, and had now completed the bathroom. The family had tried to model the new bathroom on the recently renovated on-suite for the master bedroom by using similar fixtures and colour schemes. This included increasing the size of the heating lamp, and adding new lights and an extractor fan.

Doug had suggested early on that they might do something to improve the shower pressure in the house, and since doing the bathroom the plumber had installed a new water pump to increase the pressure. This brought about a change in the family's shower experience, saying that the water from the hot water also felt hotter than it had previously.

After having some of the electrical wiring changed for the lighting, the family had also had some new lights installed around the house which they considered to be more modern. Stewart had also changed the lighting in the kitchen ceiling to more efficient bulbs, as well as reducing the number of halogens to 4.

1.24.2 Unexpected/context dependent changes

The biggest change in the family since the last interview was the change in the parent's job status. Martha's work was looking to shut down at the end of the year, and Stewart had been offered a new job in Australia. The family did not want to move until Doug had finished school, which meant waiting at least until the end of the year.

The large shift in the family's potential work status meant a change in focus in the way the family saw their current home. Changes to the house were now seen more as an investment to increase market value, and investments for personal comfort (such as a heat pump) were now considered less important. The heat pump idea had also been stopped by Martha who did not want one because of their noise and the way the air blew from them. Stewart had therefore changed his tact, and only talked about potentially purchasing a heat pump before selling the house.

During the renovations the builder had noticed that there was water leaking in another part of the house. Upon closer inspection they had found there was a leak in the ceiling, and that this had caused problems with mould and rot within the ceiling cavity and insulation. The family were now faced with another renovation project in the office spaces which needed to have the ceilings re-done with new materials and insulation after the roof had been repaired. This meant that even if the family had wanted to use their different spaces for their own personal activities they had all been taken up by building equipment, and all of their possessions had been put into corners to make room for the builders.

The housing retrofits that had been done previously had left some of the ceilings at different levels, something which Stewart found not only looked odd, but also created a large amount of space which needed to be heated unnecessarily. Stewart had therefore had the builder lower the ceiling in the hallway and the kitchen, which he felt helped with the look as well as with heat loss. One thing he had not thought of however was that the internal ducting for the house's moisture ventilation system had been built over, without being extended. This meant that the air had been circulated only around the ceiling cavity rather than the room that it was supposed to. Unfortunately the household had not given much thought to understanding or using the moisture master or heat transfer system. Only Doug had spent some time playing with them and swore there were two separate systems, and that the heat transfer system was only set to send air into another room if the living area had reached 30 degrees, which it never had. Stewart "haven't had time to think about the moisture master".

Case 7 Overview - “A first home for a growing family”

1.25 Household Overview

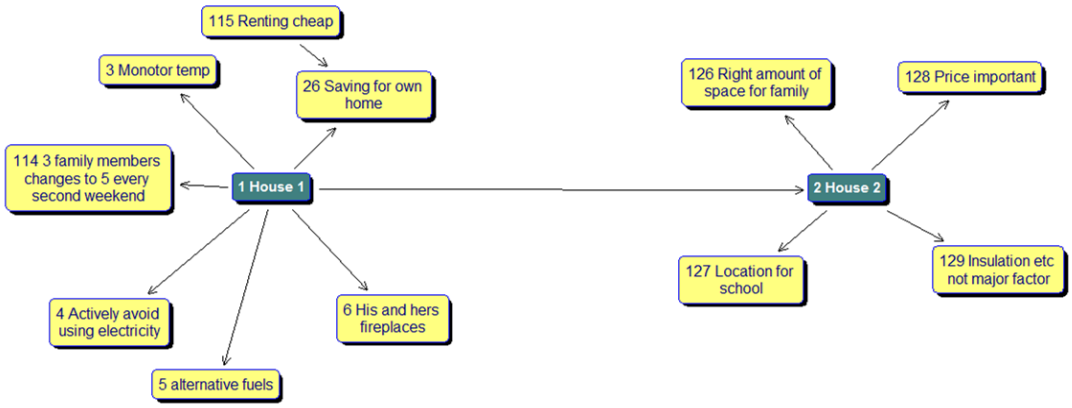


Figure 0.1 Household moving context

Case 7 consisted of a family of three in rental accommodation who moved to a home they had bought. A middle aged couple (Hank and Lucy), with one younger child (Jo), were pregnant with their second (Baby) upon the first interview. The baby had arrived by interview 2 in the new house. The family fluctuated in size as two other children from a previous relationship (a boy (Ben) and a girl (Sue), one in their early teens) came to visit every second weekend. The couple were very energy aware, and also had a large amount of electronic gadgets in the house which were part of the husband’s hobbies into computers and amateur radio building. The family lived on a lower income, both working (before the baby), and were motivated to keep costs of energy low. The couple had saved to buy a house over the last four years, and lived in the current accommodation while they waited for the right house and funding to become available.

The first house was over eighty years old, and was a long brick villa that received little direct sunlight because of its close proximity to a neighbouring building. The house lay in the flat, most populated part of the city. The house had large windows facing the street on the west, but few windows on the northern aspect. Most windows faced south and had wooden frames. The house had not been renovated for some time and was in a state of disrepair. Many of the drafts and gaps had been addressed by the tenants, but there was room for a large amount of upgrading to make the older materials more effective at retaining heat. There were three bedrooms; one used more for storage, a living room and a kitchen, all on one storey. There was no insulation in the walls or floors and only some in the ceiling. The house had a coal range in the kitchen on the east side (a lean-to), and an open fire place in the living room.

The second house was over 100 years old and made of wood. The inside had been renovated, and parts had been insulated more recently (including the walls and ceiling). The house faced north, and lay in a valley which would cover the east in shade during winter. The house had windows on all sides of the three bedroom home, and there was an open plan living and kitchen area to the south-west. A small stand-alone wood burner sat near the hallway in the living room, and a heat pump sat on the

wall above a window. The home felt drier and warmer because it received sunlight for most of the day. The sun shone directly through most windows in the house as the sun moved from east to west.

Most appliances were taken from the first house to the second. The main appliances used in cooking by the family were the rice cooker and the steamer, two standalone electronic items.

In the first house, there were consumer electronics plugged into a shelf including an Xbox, blue ray player and sky decoder.

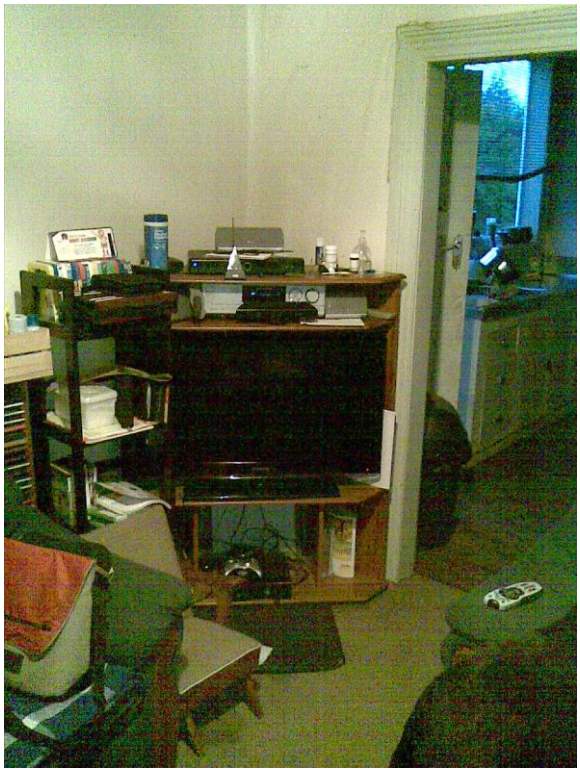


Figure 0.2 Television, x-box and sky

There were single incandescent light bulbs hanging from the ceiling in each room and the two fireplaces were the main centrepieces in the lounge and kitchen.

Figure 0.3 Coal range in kitchen

Figure 0.4 Open fireplace in living room

There was a portable gas heater in the hallway and I was shown some of the computers and hobby electronics on some shelves and in the master bedroom. There were four computers in the house, three laptops and a desktop computer. A modern fridge sat in the kitchen next to a generic electric stove and oven. There was a gas barbeque outside and an old chest freezer in the shed out the back.

In the second house there was slightly more room for the home entertainment system in the living room, and the open plan kitchen had space for the rice cooker and steamer to be sitting on a bench top in the open.

Figure 0.5 Kitchen/living room House 2, with fireplace on left

The old chest freezer was still out in the new back shed, and the gas heater was in the new hallway, however it hadn't been used, still covered in boxes from the move. The centrally located log burner took pride of place in the living room, with the more modern heat pump fading into the background on the wall.

1.26 Interview 1

1.26.1 Reasons for House 1

The family had lived in the current house for around four years, the age of their son. They moved in there as they needed a place with space for their new family that was cheap enough to rent as they saved to buy their own home. The place they found allowed their dog and had three bedrooms, all of which they needed for their possessions and new child. The residence was also close to the mother's place of work, which was convenient with the young child. (Lucy) "Yip, because we needed to have a base for basically we'd just found out we were pregnant, we got the cats, the dog, all within a really short space of time" P3.

1.26.2 Normal Behaviour in House 1

Both parents in the household actively tried to save less energy. However the father was not as thorough and persistent at keeping as many rituals as the mother "I like everything turned off, he likes everything on standby so we have disagreements on that one" P10. The mother was often the rule enforcer, and the husband would meet with a compromise. (Hank) "Yeah, we try to have a consensus. I mean I as you know is more about how much is actually used because she does the electricity thing on power shop she does all the tracking and I mean…P16. (Lucy) I can tell him what days he's used the drier" P16.

Lucy liked switching all appliances off at the wall, however Hank's interest in electronics meant that it was a massive task so instead he would have some items turned off and others left on. (Lucy) "Yeah, but now you don't leave the printer on and the scanner on and all those extra bits. We've compromised" P10. The types of appliances also meant that they couldn't easily be turned on and off, like the sky decoder which would have trouble resetting if it had been switched off.

The father was guided by his own understanding of what was the most efficient practice for his desktop computer which he left running 24/7 "because like a car it uses more electricity to turn it on

and off than it does to just let it run. And plus it's better for the computer too b/c it just keeps it at a mean temperature it doesn't cool down and heat up you find that's when your computers play up and things like that." P10. He also avoided using the electric range as much as possible because he saw it as one of the main electricity users. Instead he tried to cook on other appliances using different fuels such as the gas barbeque, the coal range in winter and the electric slow cooker. The father also felt that he could offset his less efficient practices with his better ones; "Yeah, not that they (the computers) use a hell of a lot anyway. But I personally feel what I'm saving not using the range I can afford to have the computer running" P10.

They had a clothes drier, but the wife would rarely use it and the husband said he was more "lazy" and would use it more often. "Well I just take it out of the washing machine, put it in the drier and put another load in the washing machine and by the time it's all finished and you take it out of there and swap it around you know it's just no messing around its dry and you don't have to take all that time and effort pegging it out and having it rain" P9. He was more happy to pay for the convenience of using a drier, see (Figure 7.6 below) "I don't know, it's just me, I would rather pay to have the drier running to be able to not have to mess around with the clothes line" P9. In some cases, practices were also guided by more abstract values or attitudes. Figure 7.6 below shows how the two participants' differences in values guided their practice around the same appliance. The mother who would normally wash the kids clothes preferred the hygienic properties of line drying, however the father found the time saving qualities of the drier more important.

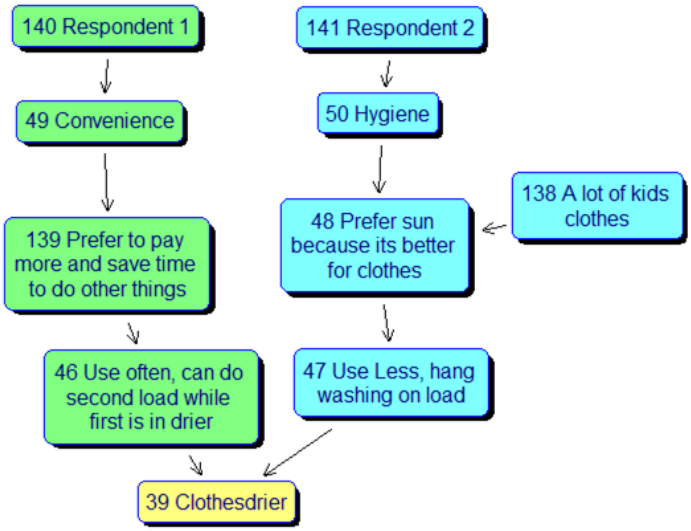


Figure 0.6 Concept map around clothes drier use

The small child that occupied the house had a limited range of appliance use, and was restricted by what he was allowed to use, as well as what he could physically use. The couple said they had been teaching him to turn his own light on and off in his room, but in order to do so he needed to stand on a chair to reach the light switch. The home entertainment system was the other main electronic device the child was allowed to use by himself, which mostly consisted of watching and playing along to the 'wiggles' kids' show. The mother didn't mind the use around the television as long as the child was being active, or if he was bonding with his older brother over it when he came to stay. "And they do their cruisy brother bonding thing over it (the x-box). But generally if we play x-box with him it's the active games. So I figure with those kinds of things, as long as he's active then I don't mind how much he's watching it. It's just when he's sitting there kind a glued" P12.

The father actively tried to fill gaps and drafts in the house, and arranged that whatever alterations he did that the landlord would take some of the expenditure off the rent. The couple each split the responsibility of maintaining the two fires, with the open fire being kept by the wife, and the coal range by the husband. They had a small thermometer on the mantelpiece which they used to try and keep the household temperature at around 16-18 degrees. The husband didn't feel the cold as much and wouldn't necessarily notice that the living area was too cold. During the winter he would keep the coal range going all day and use it for cooking, something that the couple had grown up with and were used to "And I mean we, I grew up with pot bellies and things like that so it was just one of those things it was you know, part of the weekend, Friday night, put on a pot of soup and it just sat there and the kids could have soup warm whenever they wanted" P6. The family would normally be restricted to the living room and kitchen in the winter time because they were the warmest rooms. A portable gas heater was in the hallway which would provide heating to the bedrooms on especially cold days. The child would often play in the living room because it was warmer.

Showering was generally a short affair, but the couple had realised that the women in the family took longer because of their longer hair. The wife loved baths, but in the current house they only had a shower.

1.26.3 Reasons for Leaving House 1

The main reason the family was moving was because they wanted to own a house. This had always been in the plan since they had started renting four years ago. The current house they were living in was more of a means to an end, rather than something they wanted to continue living in. They now had enough money for a deposit on a new one and had been looking for a new house for around a year.

1.26.4 Reasons for Choosing House 2

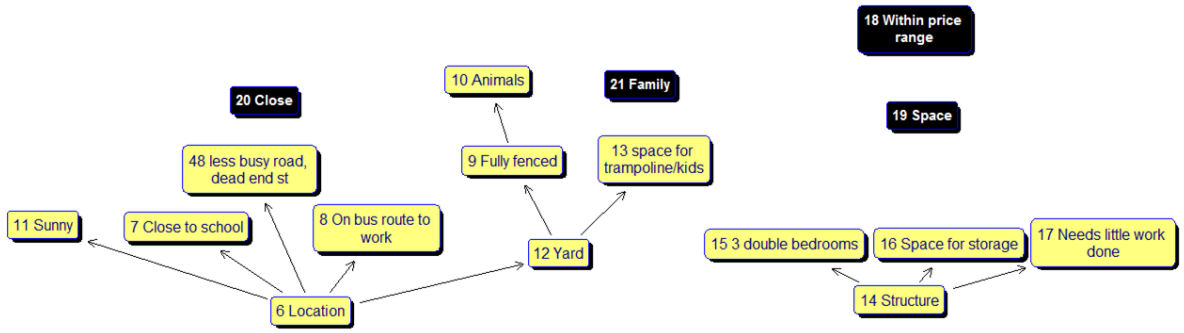


Figure 0.7 Reasons for choosing House 2

Figure 7.7 shows the main reasons that the household in Case 7 chose their new dwelling. There were three main areas relating to the location, structure of the household and the price range. The most important attributes selected by the respondents are shaded dark. The main contributing factor to the house was that it was affordable for the family. They had looked at and maybe would have preferred a brick option but it was outside of their price range. The location was important to them for travel reasons and the household structure needed to have enough space for their desired style of life. (Lucy) " It's in the right area. (Hank) "the oldest girl goes to high school and I work out here and the bus route goes from basically the new house to work. The back yard is just about fully fenced. It's not in the shadow of the hill" P18. Finally, they wanted space outside for the kids and animals to play. There were no explicit intentions for the type of energy culture the family wanted in a house, but they had mentioned that the house was on the sunny side of the valley. The desire for brick also had an implicit thermal intent; however it was outside their price range.

1.26.5 Expected Behaviour in House 2

The main change that could be expected for the new house was the addition of the new baby. The family had decided that the mother would stay at home with the baby, and that she wouldn't go back to work immediately. However, when asked about how that would affect energy consumption patterns the main thing the interviewees could think of was the extra washing that would incur (see Figure 7.8). The interviewer wanted to know if more heating would be used in the household because of the baby, but the family were unsure of what would be required to stay warm considering the new thermal characteristics of the new dwelling.

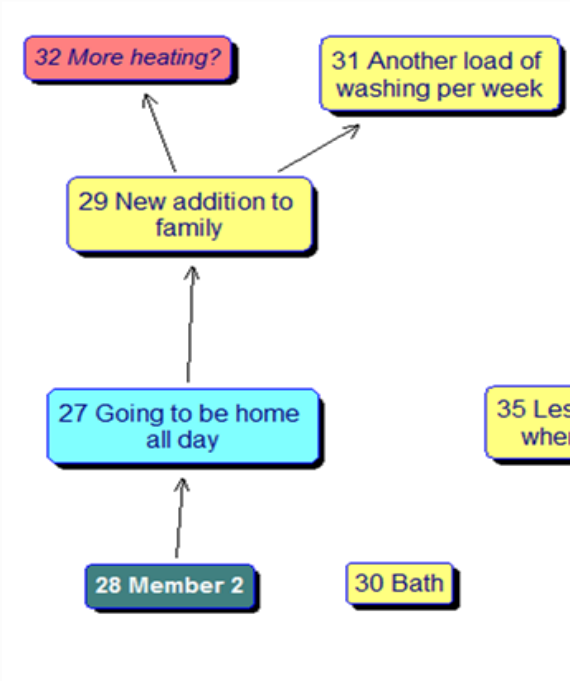


Figure 0.8 Expected changes to energy use in new household (please ignore concept 30 and 35)

The family hadn't explicitly checked for the insulation properties of the new home when they had bought it, so had planned to check to make sure there was sufficient insulation when they moved in. Their plan was then to check if they were entitled to a government subsidy if the house had room for insulation improvements. The new home had two different types of heating sources than what they had become accustomed to over the last four years. The couple were not in a rush to make changes to the new dwelling, instead wanted to take a wait and see approach to what the new living space would be like. (Lucy) "but it's got a heat pump as well. That was gonna be another interesting thing to see how that reacts and how efficient it is and then from there we will go on to how much I am allowed to use it" P19. The couple planned to see what was going to be the most economic method for heating and then run with that. The husband stated the intention to purchase an electricity meter that could help him determine the use of the new appliances in the household – as he had done when he first moved into their rental accommodation.

The family had some pre-determined expectations of what the new heating appliances would bring to their new dwelling. Having used an open fire in the first home and in a previous home with a log burner, they were able to ascertain certain assumptions around what the new dwelling could be like (Lucy): "We've lived in a house with a Juno fire before and you got quite over heated in it" P19. But even so, the father wanted to see what would be the best solution for the new dwelling, not just his own preferences comfort and convenience "b/c I hate firewood. I despise chopping firewood, collecting firewood bringing it in. But if the, yeah, we'll certainly do the figures and find out what's going to be more economic anyway. Whether we use the heat pump just minimally just for instant

heat or you know and then use the fire to keep it warm I don't know. We won't know until we find out how efficient the heat pump is" P20.

There were other topics that the couple had planned to discuss in the new dwelling during the first year. Within that year they were not going to make any changes so that they could ascertain the best solutions for going forward. Topics they were going to discuss were; installing gas for cooking, checking individual appliance use, having a single switch for the television at the wall so it could be turned completely off and buying a new freezer. Topics they had for their five year plan included installing a conservatory – for the aesthetics and to help draw heat into the house, and double glazing – which they had found did a wondrous job at one of their sister's houses.

Finally, the couple had decided to adhere to their "two year rule" which involved getting rid of any appliance or possession which had not been used for two years. They also had a 27 items rule which they thought would be stimulated by moving. This rule facilitated the disposal of unnecessary items. (Hank) "Once a month you had to go around the house and reduce, reuse and recycle, 27 things. A lot of it was recycled. Because we're both collectors. (Lucy): I will have moments. I'm not a hoarder but I do look at something and go well that could be used for that but I don't need to use it now but to go and buy that will cost 3 times as much as what I have managed to acquire it for so I will just keep it just in case buy then again after a while I will go through we'll go through and well have I used it, no, do I think I will use it, no then get rid of it. If I have to buy one well, worry about it then. Moving time is a good time to clear out the other shit" P24.

1.27 Interview 2

The family had a new member by interview two, a healthy baby boy. The mother had taken maternity leave and was at home most of the day with the baby. The interview begun with a recap of the initial interview and the interviewer read over his analysis and conceptual models from what the participants had said. The participants agreed with most of the suggestions on the models, but mentioned that they had also chosen house two because it was close to the husband's work.

1.27.1 Actual Behaviour: Expected and Unexpected Changes in House 2

The baby brought about some changes in behaviour in the household. The mother stayed at home all day to look after the baby, and this meant that she was able to control the main use of appliances in the house for the most part. The tasks of cooking and heating were mostly taken up by the mother, as well as the management of appliances on standby. Seeing the mother was more energy conscious, she was able to enforce some energy related practices that she had previously had less control over. For example, she was able to turn any unused appliances off at the wall during the day, something that she had struggled to get her husband to do (see Figure 7.9). However there was an added safety element to her appliance practice, seeing that there was now a young baby in the house.

As the family had expected, the new arrival meant there were more clothes to be washed, which added up to being two more loads of washing a week. (Lucy) "Probably two loads a week, actually, because I wash his clothes separately and he's in cloth nappies. So I do a load of cloth nappies a week and a load of his (the baby's) clothes a week" P7.

Because the mother took on more of the washing responsibilities she was able to dry clothes by hanging them out on the washing line. She mentioned that the weather had been good for line drying, but also previously that she preferred this to using the drier. "I was just going to say, that's probably more to do with me being home because I can judge the weather and you know, bring it in, whereas it's not being left on the line until we get home from work" P7. So being home more gave the mother more autonomy around deciding when drying clothes would be the most effective.

Bathing also changed with the instillation of a bath in the new home. The mother preferred baths and used them as her down time. The other members of the family still mostly stuck to showering. But the mother had actually cut her hair to save on shower times, which was perhaps a real commitment to her energy efficient practices.

There was also more cooking done on weekdays, seeing the mother was able to do so more at home. The methods and style of cooking (rice and slow cooker) continued because it was more convenient, but they had also started to use the electric range. (Lucy) "it's actually probably used a lot more because of him because I can put the meat in in the morning and then I don't have to worry about anything boiling over because yeah, but in the weekends we use the range because there's both of us there" P4.

The full picture around using a range began to surface as the couple explained how they were now using the electric range. (Lucy) "I'm finding I use the range a little bit more because it goes (I) Because it works properly..(Lucy) Yeah works properly (Hank) It works efficiently (Lucy) Yeah, oh yeah, like this one here, to get it up to 180 degrees only takes about five minutes, the other one was like well I don't think it ever got there. It tried, but.. (Hank) Or it would go to 200" P4. The participants' original 'avoidance' of the electric range had been said to be because of its electricity consumption, but now seemed to be more to do with its reliability. Because there had been an alternative in their first home (the coal range), this had been seen as the better, or more efficient method.

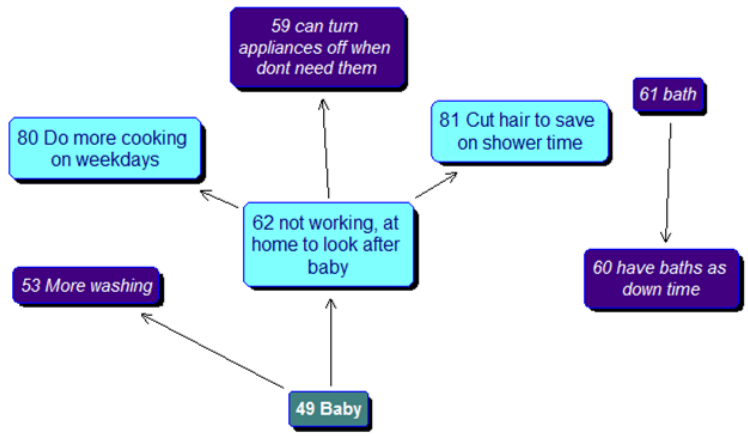


Figure 0.9 Actual and new behaviours in house 2 – baby

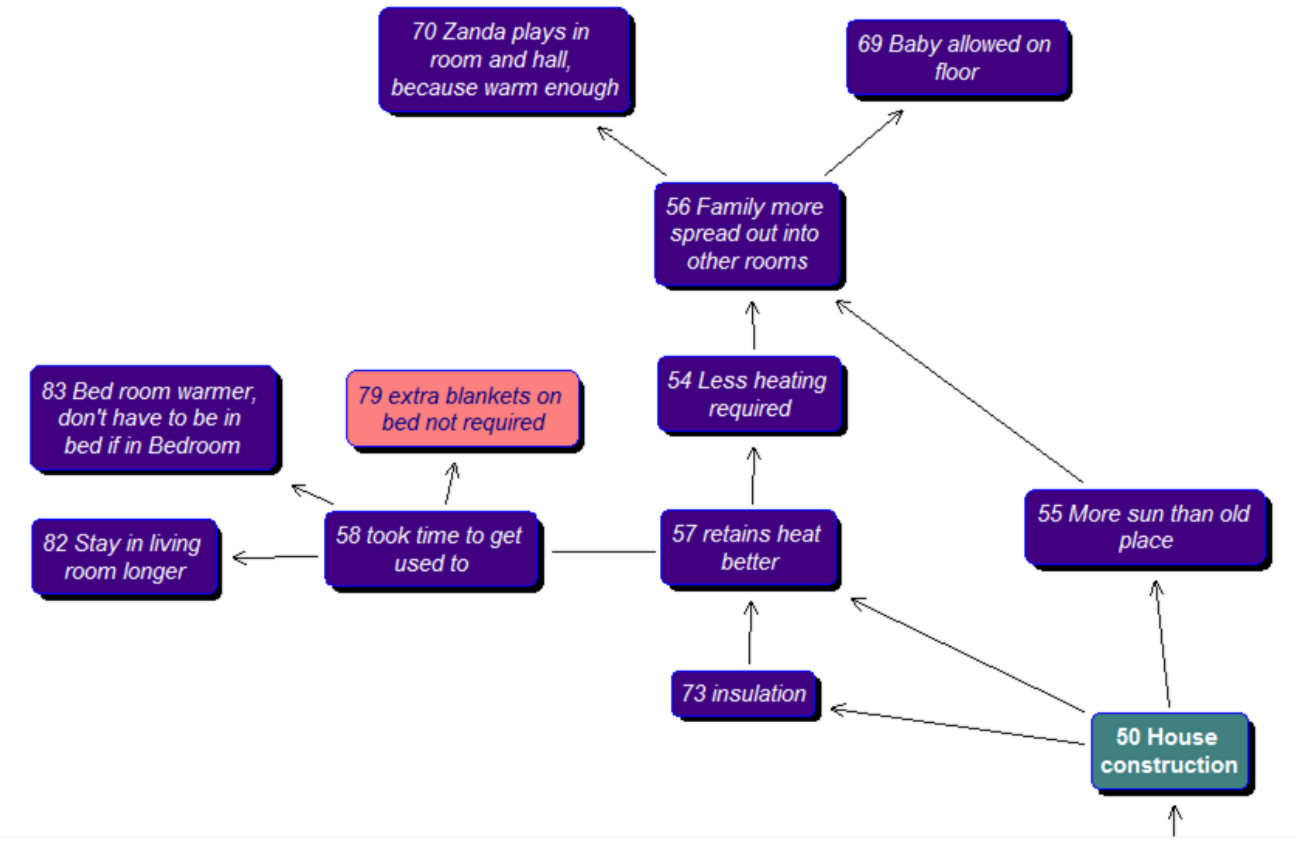


Figure 0.10 Actual behaviours in house 2

(Hank) "we haven't had any heating in here today and it's sitting on just under 17, which for me is ideal. We had the fire going yesterday and that just, how long did we have that going for? We didn't have it raging all the time. It was basically just sitting in the background and then that went up to about 22 and then I think we let it die out about 7 o'clock and it just I think it come down to about 20, so we found a very, very good insulation, I think. I mean we've got the window in the bedroom open at the moment because the cats are going in there until I get a cat door in this door. So that's open as well, which doesn't seem to be affecting the heat terribly much." P9.

The couple were still working out what was the best way to heat the house. At the moment they felt that it was working pretty well, and that the season was not very cold yet. The family also found that they moved around the house more now, using different rooms because the rooms were warmer than in their previous dwelling.

1.27.2 Expected Behaviour – Long term

Hank was considering getting a heat transfer system. As most of the heat was generated in the living room this led to an option for some of that to be distributed throughout the house more effectively. He had also had his brother look at the windows, for possible double glazing.

Hank still had a long term plan to perhaps put a conservatory on the side of the house, and to put in an upstairs bedroom. But those were long term things in the '5 year plan'.

1.28 Interview 3

By the time interview three arrived, the household had established their heating patterns. Lucy would normally light the fire around 4pm if she could see that it would be getting cold – just before the sun

went down. Hank would usually turn the heat pump on in the morning when he would get up for work, and Lucy would turn it off later in the morning. The heat pump would also be used sometimes in the evening if they got 'caught out' and didn't have the fire going. The family would also now keep bedroom doors open because it was possible to heat whole house.

The family were happy to find that the house remained much warmer than their previous dwelling. When others would come round to stay, Lucy would offer extra blankets, but they were no longer needed. They also had electric blankets, but found that they too did not need to use them as often, allowing Lucy to keep them unplugged which made her feel more comfortable safety wise.

1.28.1 Unexpected changes

Lucy was very happy to find how the family were able to stay spread out throughout the house, and how they no longer were as restricted. "We're not living on top of each other. We don't have blankies on the couches [laughs] because that's one thing a friend pointed out the other day, she said to me, 'You used to have blankets on everything,' and I went, 'Oh yeah.' She said, 'I thought it was for the animals,' and I went, 'So did I, but it was so that if you were cold you just kind of pulled the blanket over yourself" P28.

It wasn't until Lucy had been living in the new dwelling, and having someone else pointing out to her a difference, that she realised that there had been a change in the way they lived in their house in regards to the use of blankets "Hank – Yeah because I seriously, yeah I hadn't occurred to me that that was why I did it, subconsciously I had" P29.

Despite the house being warmer, the family were happy to find that power bills were similar to the old dwelling; around $100-120 a month in the summer and during the start of winter it looked around $150. But then Hank then realised that there was a substantial change to the bills: (Hank) "It was just more like I suddenly remembered that we used to buy the coal by the trailer load and we used to buy like two trailer loads in the last house and then we always bought one of the gas bottles for the stove". (Lucy) "I'd forgotten that, you haven't filled the gas bottle since summer" P32.

Lucy was now running a day-care at the house. As part of the requirements they found that they needed to increase the temperature of the hot water cylinder for doing dishes as the pipes cooled the water down too much by the time it had reached the tap.

The family were also uplifted after speaking with an electricity salesman. After trying to offer them a better deal, the couple told him what they currently paid, and how they currently lived, and the salesman was not able to offer them anything better. (Hank) "He basically left having said, 'Nothing I can do for you, you're better off doing what you're [doing] … And you're using the Powershop system as it's supposed to be used,' ... He says, 'Well you know, I have to be honest, I can't sell you anything,' which was quite good. It was good to know and good that he could, he knew when he was beaten" P7.

1.28.2 Expected behaviours long term

The couple had looked into insulation and the possibility of getting a bigger fireplace with the government program. They found that the program would only insulate the floors and the ceiling, and unfortunately they couldn't get into the floors.

Hank still wanted more gadgets, and was hoping for a bigger television in the future. This included a dream of having a screen which could have devices link wirelessly to it.

There were also still ideas around household renovations and the installation of a heat transfer system, lowering the ceilings and they were getting quotes for double glazing. But these were all still in the long term. However they had started actively thinking about seeing what next energy related investment for the house could be. (Hank) “they were talking about the Gasworks Museum being open and I thought, ‘Oh we’ve got all the kids, that sounds really cool,’ and then they were talking about it’s the free heating expo and I thought, ‘Well that’s awesome,’ and then there was different, sounds like there’s going to be different companies there and I thought, ‘Well, that’s perfect, I can’t seem to get a hold of anyone online, so I might as well go to these companies” P23.

1.28.3 Researcher Reflections

The physical structure and positioning of the home were all restricted around price.

The couple both discussed energy use and obviously tried to keep it as low as possible. The husband, who had a discerning interest in electronics would try to save the cost of electricity in some areas so that he could justify a more extended use in others. The wife would go to a greater effort to use less and seemed more active at managing power usage, being the one who paid the power bills and would actively monitor choose power plans that would save them money.

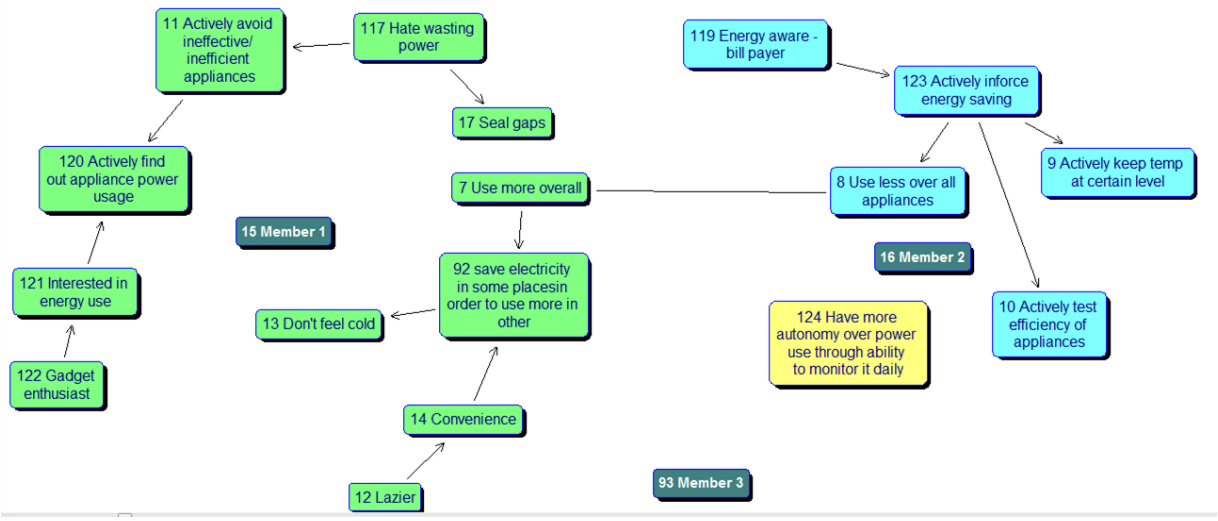


Figure 0.11

Lucy is energy aware. Hank is energy aware, but enjoys toys, and is a bit lazier. The differences between Hank and Lucy regarding energy use were expressed by Hank as “Yeah, she saves, I redistribute” P18 I2.

Case 8 Overview – "Quietening down"

1.29 Household Overview

Household 8 consisted of an elderly retired lady (Victoria) who lived alone in her large family home. She had lived there for 45 years, raised two children and suffered a divorce and other family troubles. She was now ready to move on to a house with no memories, and to find a place that was smaller and easier to manage. She sold before she had found a new house and stayed with a friend until something became available. She eventually moved into a smaller town house which was better designed to catch sunlight, and much easier to manage. Interviews were conducted in the two houses but not in the intermediary because the interviewer didn't want to intrude on the partcicipant's friends hospitality.

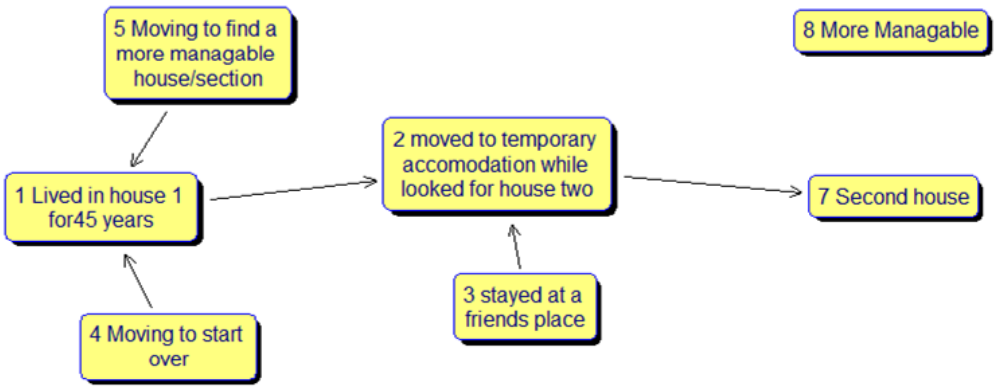


Figure 0.1 Moving home overview

The first house was an eighty year old european town house, made from double brick with a tile roof. The house faced south-east which meant that the bigger windows received little direct sunlight. There were three bedrooms and two living rooms, the kitchen and laundry were in a lean-to on the north-west end of the house and received most of the sun. The house was on a quarter acre section with a large amount of lawns.

The second house was a smaller two bedroom home built from stone. The house was built around the 70's and had an open plan kitchen and living area. There was a lean-to garage on the south side and a small conservatory on the north side which connected to the main living room. The master bedroom was also on the north side. The grounds were substantially smaller, with a small garden at the front. The house was on the same street as the first home, but much closer to the local shops and bus station (around 100 meters away as opposed to 1 kilometre away).

Figure 0.2 Hot water cylinder in house 1 – along with linen drying

Figure 0.3 Kitchen in house 1 – with large and small oven sitting on bench

Figure 0.4 TV and heaters in house 1. One bar heater and one portable convection heater. The portable electric heater – the only one used in house one and two, despite the other larger heater seen on the wall behind it.

Figure 0.5 The washing line behind the house in house 2. And the hot water airing cupboard in house 2.

1.30 Interview 1

The first interview was held in the participant's living room around a week after the house had been sold. There were a couple of phone calls from friends and neighbours asking about how the sale had gone, and whether the participant had found a new place to live, which disrupted the interview. Also, the participant took this opportunity to get to know the interviewer which involved a large amount of chit chat during which the interviewer would wait until the participant was ready for the next question.

1.30.1 Reasons for House 1

The participant explained that the house had been bought privately when her husband and her two boys had moved to the area. The house was close to a high school which offered a good music programme at the time, which both the boys were interested in. She liked the area, and it was close to a local church where her husband played the organ. She had been a nurse at the central hospital, and after her husband left had raised her children mostly alone.

1.30.2 Normal behaviour in House 1

She had taken an opportunity to have insulation retrofitted into the ceilings and floors when a charity scheme was made available around twenty years ago. She had also fitted the curtains with a thermal backing and put in a new carpet but otherwise felt restricted about what upgrades she could afford "I put new curtains up in the wee bedroom, which is just not used and my bedroom, but there's all sorts of things that you can do, but you've got to have the money to do them, but that's the way it works out" P4.

Since then the only change had been an upgrade to the kitchen, which included the repeated replacements of a mini oven and electric jug. "And that's about the fourth one I've had of those (mini oven). First one was a toasting one and really, that was useless and my son and (I) were living here at the time and it was so cold that the door had actually exploded" P9.

"And I got this jug at Briscoe's for $40 and it was 60% off but I don't seem to have much luck. I've had plastic ones and I've had big ones, they don't seem to last any longer" P8.

Since living on her own she only used a small bench-top oven instead of the larger range to save electricity. Being on a pension and living alone, her main motivation to save energy was because of

financial restraint. Secondly it was because of health issues, which often meant using more directed amounts of heat rather than heating up a whole living space. She had a portable convection heater which she would have close to her on the couch when it was really cold, but otherwise didn't use any heating. "Well we live on a limited amount when you're on benefit or something and so with an older house you never know what your expenses are going to be, so you've got to try and metre the money out the best way that you can and that would be the main reason. It's not that I, if anybody comes I always put the heater on so they're not cold, but I have a hottie and a blanket on the couch and watch television because I've got a back that's worn out" P7.

She also didn't like heat pumps because they would dry her skin out which was uncomfortable, also she had heard rumours that they were ineffective "and I don't know what you think about heat pumps, but I've heard this several times, that they say unless the temperature outside is a certain number you don't really get much warmth from a heat pump" P3.

The use of a hot water bottle was preferred to an electric blanket (and sometimes space heating) because of its comfort factor. "I don't, I've got electric blankets, but I don't use them. I don't like electric blankets. You can cuddle your hot water bottle, you can't cuddle your electric blanket for your sore bits" P5.

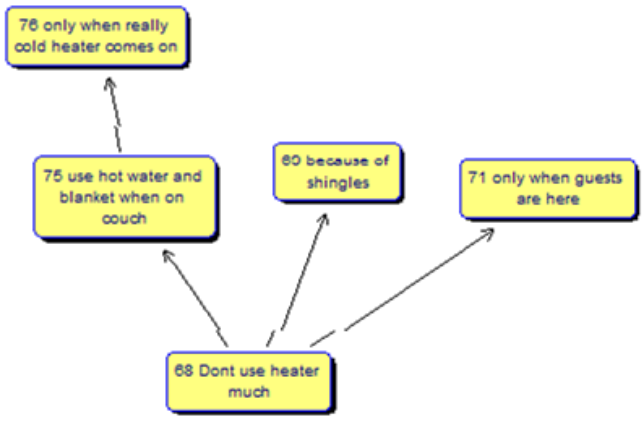


Figure 0.6 Household heating preferences

Hygiene was important to the participant, she often talked about the cleanliness of the house, and how often it was vacuumed. She would do a load of washing around once every two days, which was also because she would dry them next to her old hot water cylinder when it wasn't sunny enough to have them outside on the line and this took about two days. She also boiled her electric jug to heat water for doing her dishes, because she thought it was more hygienic, but also because she believed it would use less power; "Another thing that I do, I don't actually run the hot water off to do dishes, I boil up jugs because I don't have a dishwasher. I feel that that sterilises the dishes by doing that and well I think they say it uses less power to boil a jug than to run the water off the hot water cylinder, is that right?" P4.

Saving energy was more around how she used energy, rather than how appliances used it – perhaps because of her lack of knowledge around how different appliances work; "Yeah my upright freezer in the washhouse it's actually got four stars on it, the washing machine's only got two. I don't know what the oven's got on it, no. Though I didn't specifically choose the appliances for that reason. I didn't even know when I bought them" P10.

1.30.3 Reasons for Leaving House 1

The participant was moving because the large house was becoming difficult to manage and the sizable grounds were expensive to maintain. She wanted to move to get away from old memories and have a fresh start; "Yeah well whole new life and you know, it's a lot of nastiness that I've had to bear, (…..) I had no intention of selling it, but then this is two years down the track I realised I just can't. It costs me $45 every fortnight just to get the grass cut, so you know, I hope to not have as much grass in the other place" P12.

1.30.4 Reasons for Choosing House 2

Even though she hadn't found a new place yet, there were certain things she was looking for. She wanted to live in the same area, and wanted a smaller house that received more sun. "Well, I just wanted a two-bedroom place and of course, the ceilings won't be so high so therefore they won't be so difficult to heat. I want sunshine. Well, I never ever thought I'd say this, but I would be prepared to put up with a living dining area which I don't actually like, but that might be the way to go. I like a separate living to cooking, but you have to compromise, so" P11.

She wasn't prepared to move into a different area because she was well established there; "It's because everything is accessible here, plus my friends. I've got friends that live in the area, and to be honest, I just can't go somewhere no longer having a car and no nobody. Psychologically I can't cope with that" P11. So instead she would stay with a friend until the right place became available for sale.

1.30.5 Expected behaviour in House 2 *(The intermediary house)*

The participant lived at a friend's house in a different area of town as she was waiting to find her next home. When asked how she anticipated using electricity there might be different, the participant envisaged a few things based around the friends heating technologies "Well she (the friend) has a heat pump going a lot and she doesn't even put her clothes out on the clothes line, she just dries them with the heat pump, so that will be probably, but I don't know because I don't shower every day and things like that, partly because it dries out your skin and as you get older gets itchy if you dry it out, so and I would know if I was unpleasant to be around" P13.

Otherwise the participant was just happy to have somewhere to live in the meantime, and would wait to see how energy would be used.

1.31 Interview 2

The second interview was taken in the participant's new home. She had lived with her friend for two months before securing the new dwelling and being able to move in. She had settled in comfortably and had found places for all of her belongings.

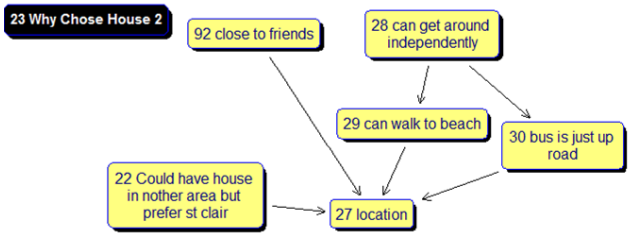


Figure 0.7 Reasons for the location of house two

1.31.1 Actual Behaviour in House 2

The new house filled all the boxes that she had envisaged in her first interview (including the location see Figure 8.7), the house even had an open plan kitchen and living area that she said she would be happy to compromise on. "It's very light because it gets all the sun, see the other room that we're in along there that got that sun then in the afternoon but because it was inside room it was quite, not too bad, but even though I've got a conservatory that when it's cold that does get very cold and still it must keep a bit of heat in. So no, my life hasn't really changed at all since I've moved in here. Except now it's two minutes to the shop and three minutes to the bus and that didn't really matter either" P1.

1.31.2 Expected and Unexpected Changes

The participant had got rid of a lot of furniture so that the new home wouldn't be too cluttered. Included in that were three old heaters which had not been used, one of which was 50 years old. She brought her white-ware, one portable convection heater and television with her. There was a new bench top oven, which had been replaced recently because the last one had broken.

The participant had made one large change to the house upon moving in, which was to remove the spa bath that was there. She had a walk-in shower installed because baths were too difficult to get in and out of with her metal hip. The main thing she didn't like about the place was the cream coloured carpet, which she said needed vacuuming around every three days.

There was a fixed night store heater in the main living area, but she didn't use it because she was aware that they were only useful when there was night time rates for such appliances. The house also came with a fan heater in the bathroom and a small bar heater in the laundry closet; "Yeah that's the only heater I've actually got now, apart from the Night Store, but no, actually they evidently with the Night Store had a special rate, but now they don't have that and different people have said to me they're quite expensive to run. "", that was here, she's got a heated towel rail in the bathroom. She's got a heater in the bathroom. There's a cupboard in there (linen cupboard with hot water cylinder) that's also got a heater (see Figure 8.8)" P10. The participant continued to use her convection heater in the same way, but didn't use the other heaters normally. The bathroom fan was sometimes used because the bathroom was on the cold side of the house.

Figure 0.8 Bar heater in laundry cupboard, below hot water cylinder.

The kitchen was fitted with an extractor fan, but the participant was reluctant to use it. "Yeah I don't use it, partly because **…** that's how they (her friends) had the house fire" P4. There was a relatively new clothes dryer in the house, but this also was not used; "I've actually got a clothes dryer here too, but I haven't used it. I don't probably use it, because they eat up the power" P7.

The house also came with a form of energy efficient lighting which the participant was not particularly fond of; “Yeah but it takes, particularly that one, takes a long time for the light to properly come on (….) And I don’t like those curly bulbs. I don’t think you get as good light” P11. When asked if she would replace them, she said she responded “Oh if they go bung I suppose, no I (will) wait until they go bung” P11.

She had already begun to test the thermal effectiveness of the household, and realised that the drapes in her bedroom would need replacing; “the drapes in my bedroom here are not as, they don’t keep out the cold as much as the ones that I had down there, … but they definitely don’t keep it as warm and the curtains that I had in my living room, they had a lining called buff …. The curtains in my room are actually, they’re a thermal drape, but they’re in my opinion, a poor quality thermal drape” P12.

1.31.3 Behaviours Which Stayed the Same

The participant wanted to continue life in a similar fashion, so she continued to boil the jug to wash her dishes, and use the single convection heater in the living room. She had started to make more use of the heat from the sun however, and would sometimes move to different areas of the house in order to sit in it “Oh I spend virtually all the time (in the living area), although, sometimes I’ve actually gone, I’ve got a wee low chair in my bedroom if the sun’s pouring in there I might go and sit on that later in the afternoon” P12.

1.32 Interview 3

The final interview was taken on a sunny afternoon a few months after interview 2. The interview began by addressing the most major change which had occurred in the household during the last few months.

1.32.1 Changes long term

The participant had found a partial solution to the problem of poor curtains in her bedroom. She had purchased a Perspex double glazing that fitted over the large steel framed window. She had been talking to friends who had double glazing, and had somehow allowed herself to believe that it would be cheaper than buying new curtains; “Oh well it was advertised and so I rang them up. He came, so because somebody said to me, “Why didn’t you go for double-glazing?’ And she said, ‘Oh it’s probably cheaper,’ and I couldn’t understand how it could be cheaper because they’d have to take the whole window out. It’s not going to be cheaper I thought” P2. The window was not removed, but the glazing cost $900. Even though, she was still happy with the performance of the extra glazing

“He said, ‘If you’ve got a WiNZ card,’ he said, ‘You can go to Bunnings and pay $1 and they do your whole house, insulate your whole house for $1.’ And he also said that batts don’t last as well as the stuff that’s in big rolls” P2. Clearly the participant had made efforts to make herself warmer and more comfortable in the new dwelling.

1.32.2 Actual behaviour long term

Victoria was still vacuuming approximately three times a week as the carpet still showed most dirt. She was also still happy with the new shower and had not had any thoughts about the old spa. Similar frugal heating patterns continued to be maintained as Victoria was still having trouble with rooms which felt too warm for her.

Victoria had not yet worked out how to use the clothes dryer in the dwelling, and was still hanging clothes up behind the house.

1.33 Researcher Interpretations

She was untrusting of electrical appliances and she didn't trust extractor fans because she had a friend who had one which caused a house fire. She didn't know how to use Freeview or the DVD player and so avoided it. She switched all appliances off at the wall because she heard it would save $150 a year. She found cleanliness especially important

Case 9 Overview – "For a city life"

1.34 Household Overview

Case 9 involved a younger couple (Jane and Hank) with three children, two of whom were in primary school, the third being a toddler. The family had lived in a coastal suburb around 20 minutes' drive from the city centre. The first point of contact occurred once they had already moved from their beachside residence, and were staying in a rental house near the city centre. The family had sold their house before having found a new dwelling to move into, and planned to stay in their rental accommodation indefinitely until an appropriate dwelling became available.

The family had lived in their temporary dwelling for less than a month before they had found a suitable new house. Because of the earlier transition, all three dwellings were included in discussions

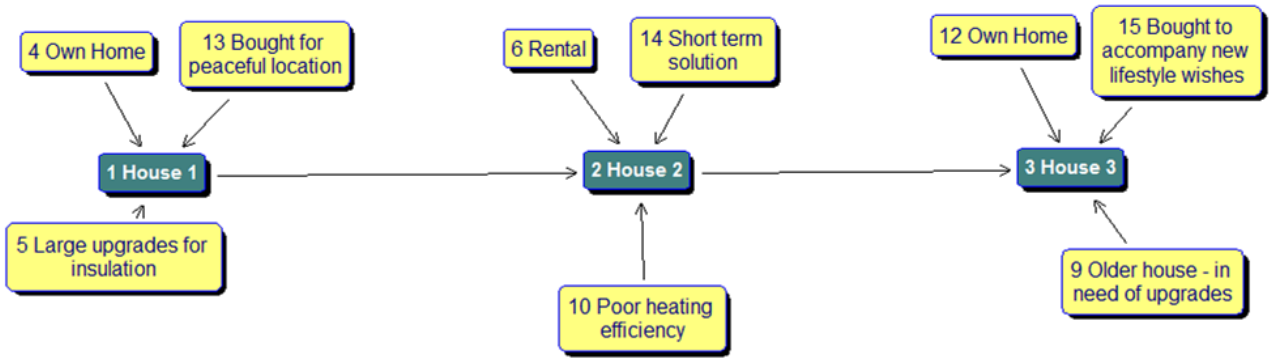


Figure 0.1 Case overview

and analysis.

Houses		**Interview location**
House 1	Owned In Rural Dunedin	
House 2	Dunedin City – temporary rental	Interview 1
House 3	Owned in Dunedin City	Interview 2
		Interview 3

Table 1 Interview locations and houses included in discussion

1.35 Interview 1

The first interview was conducted in the afternoon after the children were home from school with the mother (Jane) before the father (Hank) came home from work.

1.35.1 Reasons for House 1

The first house was chosen as they Jane and Hank were beginning a new family, and were very much restricted by price.

The other factors around house selection involved the location, which had the aesthetic appeal of the beachside view, as well as the peacefulness of the more rural location. The house was older, and appeared to require a large amount of maintenance, however the couple saw potential in the dwelling and were prepared to make changes to it.

1.35.2 Normal Behaviour in House 1

Their first house was a two story building with all of the main living rooms on the upstairs floor. The house was wooden framed with a plaster exterior and low corrogated iron roof. The dwelling was east facing on a hill and recieved sun until the early afternoon before the light was shaded behind a hill to the southwest. There were four bedrooms, as well as a sleep-out for guests. The house was orignally heated mainly by a wood burner, and the family used electric heaters in other rooms to keep themselves warm when required. The house was poorly insulated when they bought it and only had single glazing on the windows. The family made some alterations to the house over the years, including building decks around the outside of the house and installing a new garage. For example, when the family moved in they found the curtains had been changed; "so we were basically just living with tissue paper on the window so we actually first thing we done was re-drape everything" P3.

After living in the house for a few years, the family found that their oldest son was having trouble sleeping due to health problems, and that he needed a wamer temperature in his room just to help him get through the night. (Jane) "when Josh was quite young it was apparent that he was asthmatic so we really had to transform our heating arrangements and so we double glazed, insulated, re-carpeted and put in some heating, we put in a heat pump" P2. The parent's response to their child's poor health was to structurally upgrade the heating qualities of the dwelling. This brought about a major change in the way the family lived in the house; "we certainly found that the insulation and the double glazing transformed the way we lived to be honest. Not just [for] Josh but [for] the whole family. And so we sort of went from running … 3 (electric) oil heaters a night for the kids, to just the house being pretty warm really and really cosy" P2.

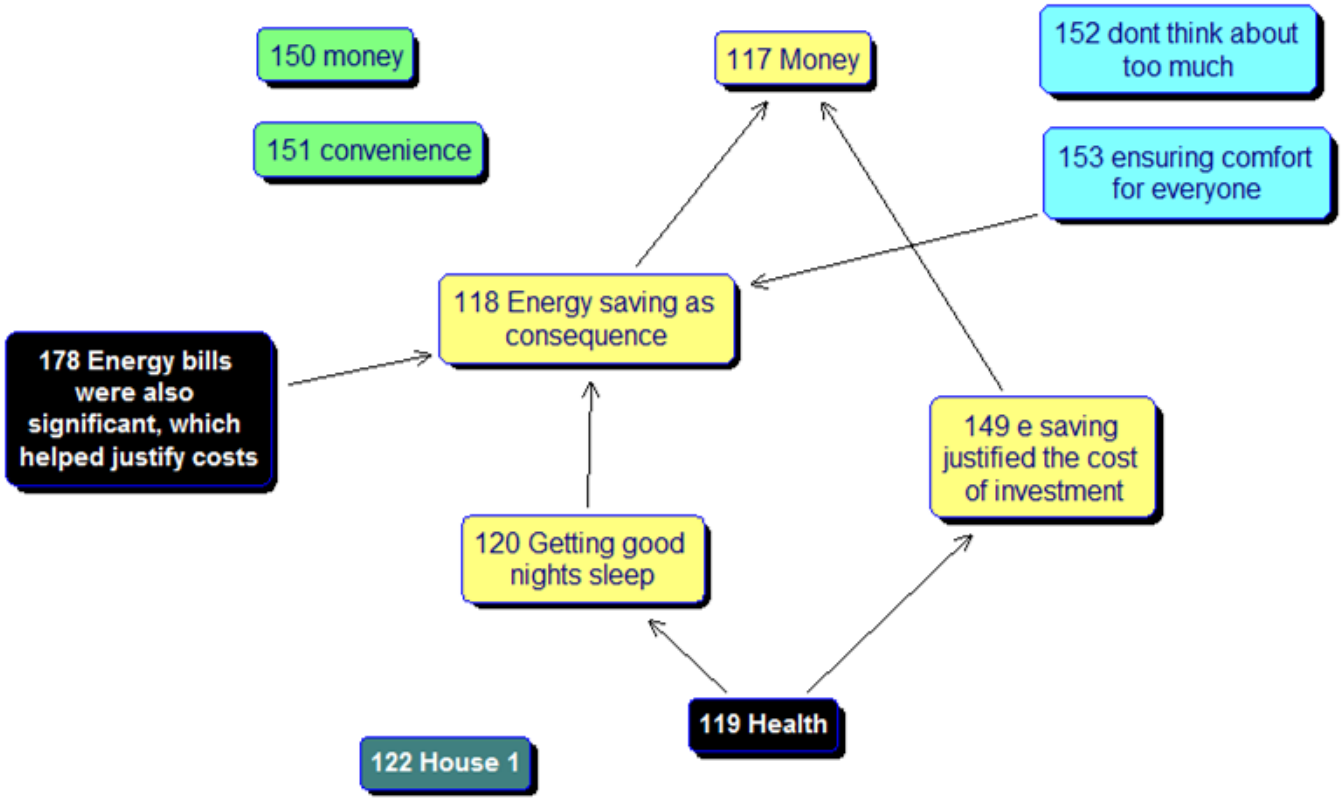


Figure 0.2 Household heating upgrade for house 1

As shown above, the initial drive to upgrade the insulation and heating method in the first house was led by the efforts to improve their child's health. The family invested in a large insulation and heating retrofit which substantially changed the thermal aspects of the house. The figure above illustrates the two drives from the parent on the left, and the consequences on energy saving and bills. (Jane) "We know a lot of our thinking about heating and warmth hasn't been driven by energy efficiency it's been driven by getting a good night's sleep because Josh's not ill and that's been a huge driver for us really. And it's made a huge different to everybody really" P14. A more detailed model is displayed below, showing the decision process and consequences of the household retrofit.

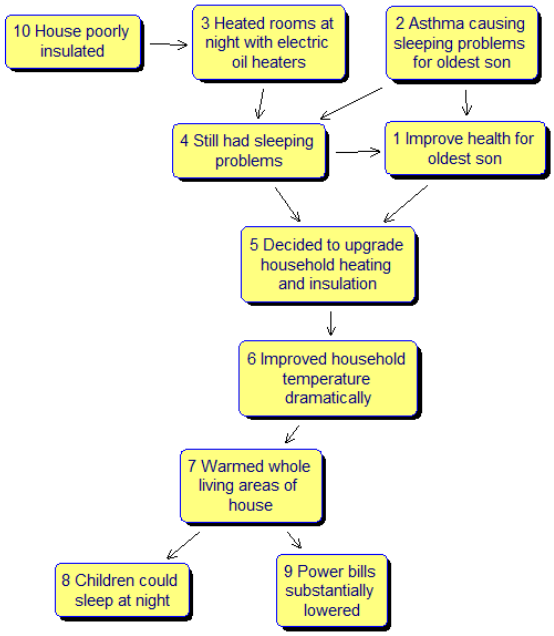


Figure 0.3 Household retrofit triggers and consequences

The household energy efficiency upgrade substantially changed the way the family lived. (Jane) " I think it just completely transformed everything about the way that we lived from the really small things like instead of bathing the kids and then wrapping them up in towels and running them to their room to get changed to just letting them run around … and then to the bigger things – the energy bills, Josh's' health, you know even just getting the washing dry all that sort of stuff was just so much easier. We really just, it will sound stupid but it just really changed the way we lived, from, less worries about medical to just having more fun really."P2 Having a warmer house also allowed the mother to dry clothes inside which meant they dried a lot faster (but may have caused dampness which she didn't mention). The quality of life was improved for the family firstly because of health, but then levels of comfort and convenience were also greatly enriched. On top of this, the power bills were substantially reduced "I mean before we did the work to our house back in the day a few years ago we were getting power bills in the winter of $600, and that was before power has gone up a lot since then and then when we did all the work they were like 160, 170 so it does make a big difference" P14.

The thermal efficiency of the house was also helped by the fact that it had low ceilings, which further helped with heat retention. The multi burner (which was only used with wood) was used every day during the winter, but was very efficient – only needing 3-4 pieces of wood in the evenings. The family used the heat pump as a complementary heat source which was turned on during some mornings, and was also left on in the evenings to help the family sleep and to help move air to the areas of the house that the log burner couldn't reach. The family also had free access to firewood, which meant they were happy to use the log burner as their main heat source.

With three younger children in the house, rules around the use of appliances were still being enforced. The main rule for the children lay around the use of the television, which had been made child

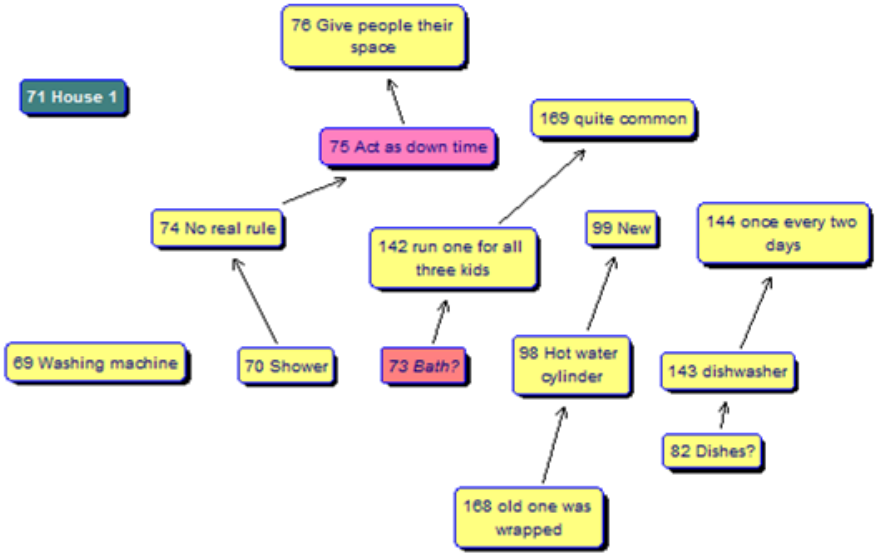


Figure 0.4 Appliance interactions House 1

specific depending on their individual needs. For example one of the children was an early riser, and was therefore allowed to watch TV early in the morning before the rest of the family had woken. The family owned two gaming consoles, however the children hadn't shown much interest in them and they were therefore mostly left alone; they were usually only used once or twice a year during school holidays. (Jane) "Yeah we did but I mean it was a rare moment, like maybe once a year when they got plugged in. We got the Wii and PlayStation but hardly ever really."P6

There was a standing family rule that appliances should be switched off at the wall, which the parents attested their family was good at sticking to. The washing machine was used daily and the drier was used rarely, usually in the middle of winter. Rules were loose around showering, because the parents had found that it sometimes served as a good way to help the children unwind. (Jane) "We definitely tried, like I mean, Josh, we tried to teach Josh what four minutes was. And we used that wee clock up there. But I mean sometimes it was a bit of a joke, if the kids were at each other's throats they could stay in the shower as long as they liked as far as I was concerned. Because it, that was like down time. We sort of tried and I think that's something we really want to instil in our kids going forward, but there would be a lot of times when it would all go out the window and it would be just whatever suited really." P9. However if a bath had been run it was very common for all three children to share the same water.

1.35.3 Reasons for Leaving House 1

The reason to move was driven mainly by the distance that their dwelling was from the city centre. As the children were growing older, the parents found that they were becoming "super commuters", and they could see it getting worse. The distance from town also contradicted the personal lifestyle aspirations of the parents, in that they did not have the option of biking to work or letting the children walk to school. Thirdly the parents felt that their children's development was being hindered because their friends were further away which meant they had less social interaction with them.

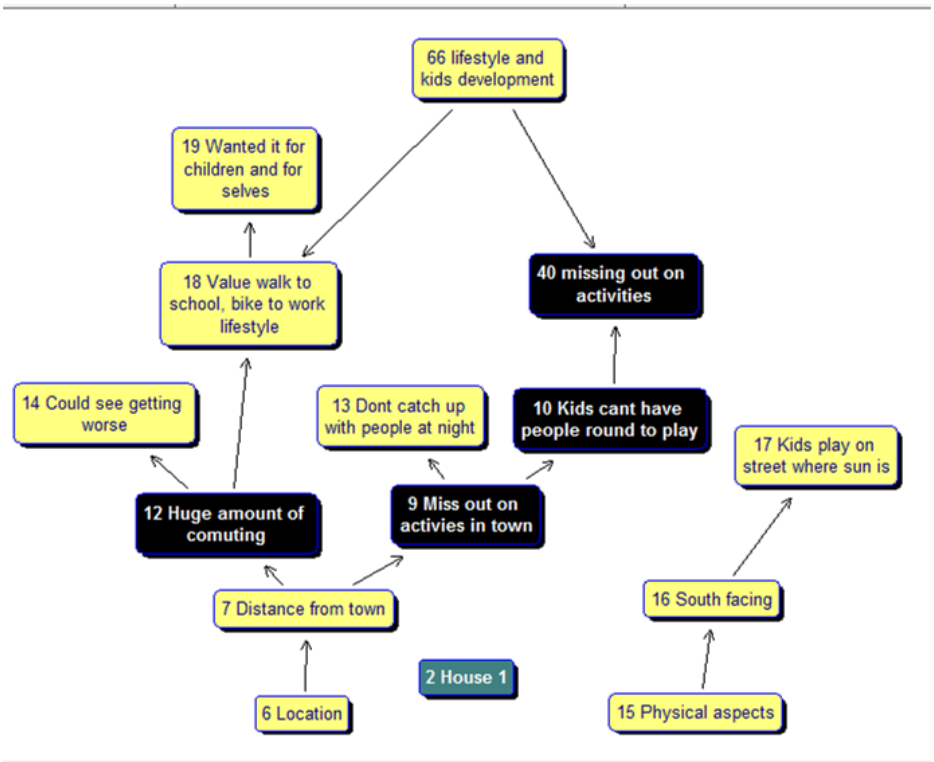


Figure 0.5 Reasons and follow on reasons for moving from House 1

Once the parents had made the decision to move, they were able to find other reasons to support their decision; for example the house itself was south facing which meant that the children didn't play outside the house, instead they played on the road where the sun was.

1.35.4 Reasons for Choosing House 2

The second house included in this analysis was the intermediary house that the family moved in to while they looked for a suitable dwelling to buy. They were restricted by the number of dwellings they could find that were available for a short term lease, with enough rooms for their children to sleep separately and with two bathrooms – which were the main requirements. (Hank) "Basically because it was the only one that we could get short-term, really and it actually had the layout that suited us as well, but as you can imagine, most people renting their houses want a longer-term lease." P2, I2

The new dwelling was a two storied double brick house which was located high on a hill above the city centre. The second storey had been added later on and was made from timber. The building was raised about a storey above the ground because of the slope of the section, but it was not insulated. The house was able to get sunlight for most of the day, however the windows and angle of the house did not enable much heat from the sun to be gained and there were trees that would block sunlight in winter. There were two bedrooms upstairs, a parent's room, and a main living/dining room and kitchen downstairs.

1.35.5 Actual Behaviour in House 2

Normal behaviour was somewhat different in the new dwelling due to the temporality of the stay, and the lack of autonomy of the tenants. The new dwelling was substantially colder than what they had become used to in their old house, and the family had to adjust their heating practices to fit with the new dwelling. The dwelling was poorly insulated, and had a large stairwell in the middle of the house

which meant that it was difficult to heat all the downstairs areas to the same temperature because the heat would simply rise upstairs.

Figure 0.6 The night store heater in the hallway

The house had a night store in the hallway to the staircase, and a heat pump in the lounge. Otherwise there were electric oil heaters in the other rooms and bedrooms. The family had moved into the dwelling at the start of winter, and had already experienced some very cold days. Due to the restrictions of the house, and the desire to keep warm, the family no longer kept to their old rituals, and instead did whatever they could to feel comfortable in the short term. Even practices like doing the dishes changed as a result of the new environment. (Jane) "I think that we have just been doing in this house doing whatever makes us feel good. And whether that is doing dishes six times a day because we just want the bench to be clear. It's just gone all out the window really. And it's just a bit different to what we are used to where we would try to think about these things" P11.

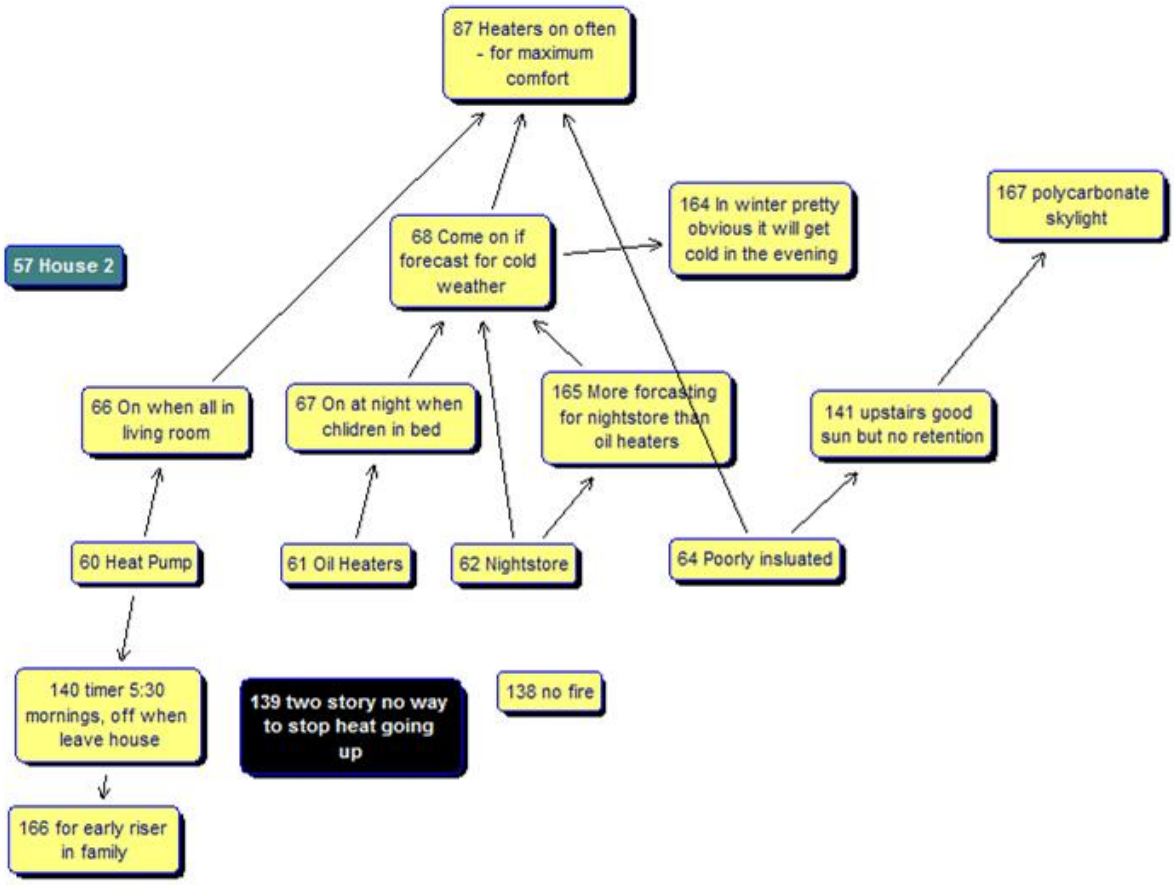


Figure 0.7 Normal behaviour House 2

1.35.6 Expected and Unexpected Changes

In the second house, the parents found they needed to keep an eye on the weather forecast, and if there was cold weather coming they would know to turn the night store on in preparation. The heat pump in the second dwelling was only effective for heating one room, if the door was closed, and had been set on a timer for the early riser in the family. Not having a wood burner to increase the overall household temperature, the family often would use the night store heater that was installed in the hallway. The parents also had electric oil heaters which they would turn on in the children's rooms if the forecast was for cold weather, but they would always have the heater on for their asthmatic child.

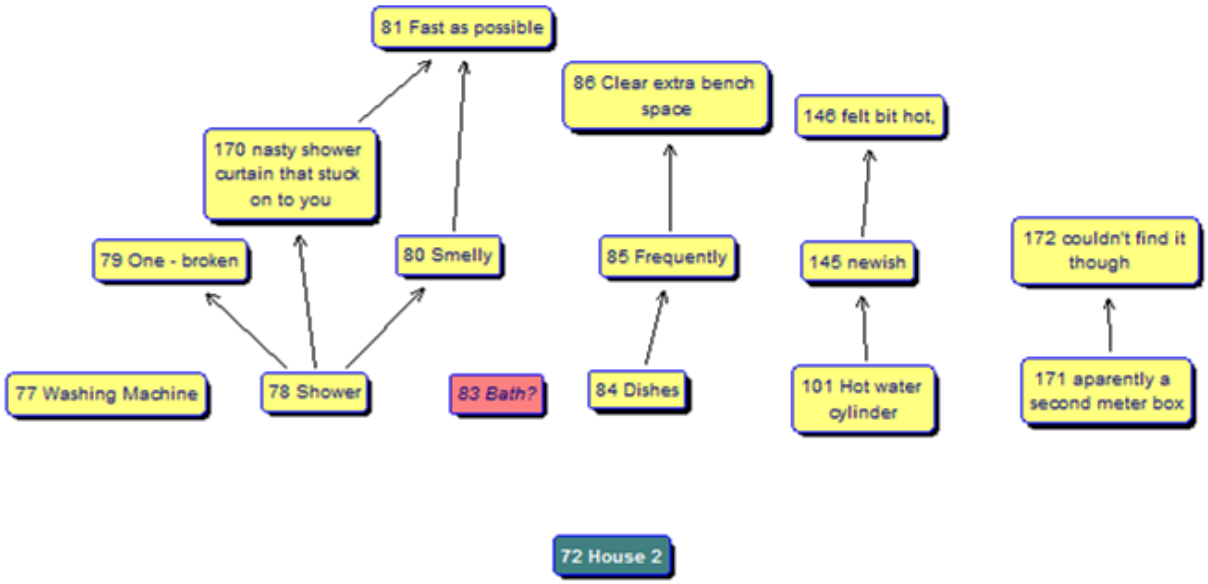


Figure 0.8 Appliance interaction House 2

The new dwelling also brought about other changes in behaviour with daily rituals such as showering. The family had partially chosen the dwelling because of the fact it had two bathrooms, however the upstairs one didn't actually work, and the downstairs one was so unpleasant to use that the family members restricted their showering times substantially. (Jane) "In this place, the shower upstairs doesn't work, and the shower downstairs smells … really bad so we all have 20sec showers … and so we just have the most energy efficient showers you could ever imagine. So when you interview us in our new house we'll all be having like 20min showers I think just because we can" P10.

Appliance use in the second house was also substantially changed, to maximise comfort and convenience. The drier was used much more frequently – because clothes could not be dried inside. The parents became more relaxed around rules for turning appliances off at the wall (apart for some which looked old and "dodgy") and the rules around TV changed so that the children could watch it whenever they liked. The television rule changed mostly amid safety concerns after the children were finding their way out onto the busy street.

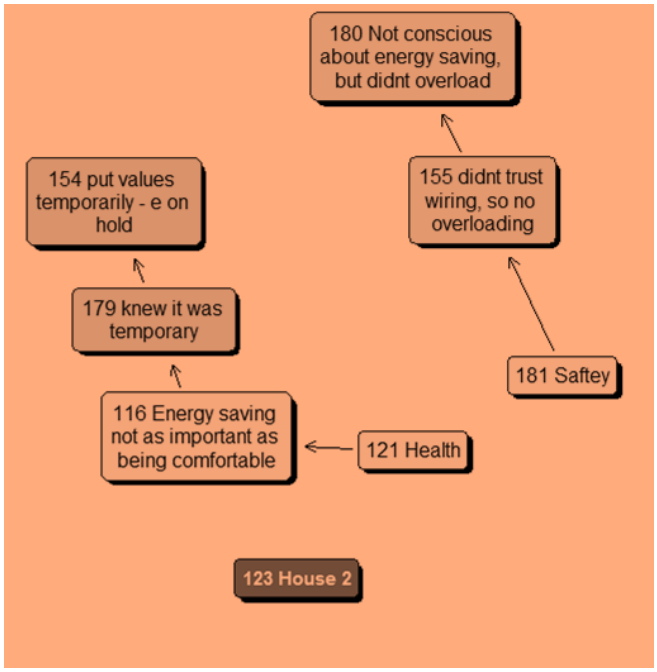


Figure 0.9 Overview of energy attitudes in House 2

The shift to a temporary dwelling brought with it a large change in appliance type and use, not only because of the change in house structure but also because the house came furnished. (Jane) "So when we moved here, this place was furnished. And so, we brought some appliances with us and kept some in storage. And as you'll see, we've ended up with two fridges. Because there was one here but it was a bit too small for the family so we brought our one and then you just end up using both of them. And we brought our drier with us but left our washing machine behind but there was a washing machine here. Left our microwave in storage because there was a microwave here. But we are really using more appliances here than what we did at home" P7.

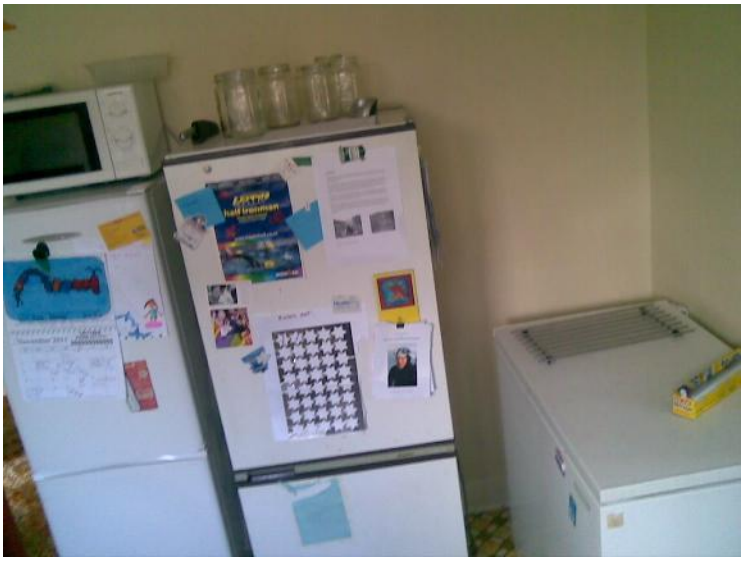


Figure 0.10 Double fridge conundrum

1.35.7 Reasons for Choosing House 3

A new dwelling was found relatively swiftly within the Dunedin city, and the family were to move into it within the month. The main attribute that the family in household 9 sought was location – in

that the house would be closer to friends, family and school than it had previously been. The house they found was within walking distance to the children's school, and within biking distance to the parents work. The house was also situated on a hill with a view of the city, and was on a flat section where the children could play and run around the house. The house was an older wooden villa which had a certain character to it which the parents found appealing and it was also at a reasonable price.

1.35.8 Expected Behaviour in House 3

In the first interview Jane mentioned that she expected life to go back to being similar to the first house. However in order to live in a similar way, Hank and Jane had agreed that they would need to do the same insulation and heating upgrade as they had done in their first house. They expected they would need to re-insulate the ceiling and floors and would install double glazing. (Jane) "The walls won't be, I don't know about under the house but I doubt it, it does have some insulation in the roof but it seems to be like it's really old and it could certainly do with a bit more. I'm going to try and put some under the floor and we'll just, obviously, anything that we re-do we'll re-do properly" P13. The house also had no curtains so Jane was currently in the process of preparing some for the dwelling as well.

There was a night store and a log burner installed in the new dwelling, and Hank and Jane expected that they would continue to use the log burner, and remove the night store heater. The parents also planned to enforce the old television rules as well once they moved into the new section, which was fully fenced with less of a danger of the children playing out on the street.

1.36 Interview 2

The second two interviews occurred in the final dwelling – House 3. For both these interviews both Jane and Hank were present, while the children played in another room. The first section of the interview, as usual involved going over the previous responses, using concept maps as a guide. This allowed Hank to give his inputs and help tell his side of the story. He agreed with most of the analysis, however was less worried about the cost of energy or energy efficiency, but was more concerned about ensuring comfort for everyone. (Hank) "No, I don't really think about it too much. To me it's more ensuring everybody's comfortable and that probably comes as a consequence of that. These days to get everybody comfortable it usually means going with newer technologies like the heat pumps and that sort of thing instead of the Night Store or electric oil heaters and so you tend to get energy savings as a consequence of that, but it's definitely not the, definitely not the forefront of my decision-making" P20.

The new dwelling was a 1920's wooden villa with tongue and groove weatherboards and a corrugated iron roof. The house had been renovated inside; however there was only some insulation in the ceiling which was quite old. The house was fully fenced in, and on a flat section which were both seen to be good for the kids and the dog. The bathroom had been recently redone and had gas hot water, heat lamps and electric under-floor heating. The kitchen also had gas hobs but and electric oven.

Figure 0.11 House 3

The new house was smaller than their original house (House 1) but somewhat larger than the one they had been renting. The dwelling was only on a single story, which was different to their two dwellings, and it wasn't as well insulated as their first dwelling either. The building received sun throughout most of the day, but the oblong shape of the dwelling meant that rooms on one side of the dwelling would only receive direct sunlight in the late afternoon. The house was situated in a more exposed part of the city, and the family were somewhat unsure about how the house would fear from the prevailing southerly winds.

The main heating source was originally electricity, there was a night store in the hallway and the previous owners probably heated individual rooms by portable heaters. There was a log burner at the north end of the house in the main living room (which would have struggled to heat the other end of the house) and the kitchen lay at the opposite end of the house on the south side. The interview was taken in the middle of summer at the end of December, so the family had not needed to use much heating yet. The parents said they were still to book a meeting with a heat pump specialist, but they were still planning to do so.

1.36.1 Actual Behaviour in House 2

This interview took place once the family had fully moved in and all appliances and furniture was installed. The second fridge had been left at the previous dwelling, and two of the televisions had been upgraded to larger flat screen ones, partially because the tubular ones would have struggled to fit into the new dwelling.

The new dwelling had instant gas hot water which was something that the family were new to. (Jane) "We've got gas, we've got gas hot water as well which I'm not quite sure how that's gonna go with a bigger family but it will be interesting to see. You know, cos we do tend to use a lot of hot water really" P12 I1. Jane was somewhat unsure about how expensive gas hot water would be, and realised that she would just have to wait and see how it goes. There was also gas for cooking which was a new experience; (Hank) " You look forward to cooking a bit more with gas, seem to have a bit more control and more options I think". P29 I2

There was also a "dish-drawer" dishwasher which was somewhat different to what they had had in their first dwelling. The machine seemed to fit less dishes in it which meant the family were using it almost every day. (Hank) "and she's dragged the electric blanket out.. (Jane) Oh yeah, I mean we've got to face the fact that it is much warmer than at ...House 2… but it is still much colder than what we're used to". P26 I2 Some appliances (such as the electric blankets which the family had not needed in House 1) were found to be necessary in House 3. Some habits around similar appliances such as lights were able to remain, but other new technologies were still taking time to become

normalised. (Jane) “Not yet, but we will. The kids are still continuing to turn appliances off. They’re pretty good. We’ve probably all like doubled our shower time because it’s a real luxury, but that will be a temporary behaviour. We have [background noise] that we’re just not sure about, like the under floor heating and the tiles. We have some new things to get our heads around.” P25

1.36.1.1 Energy Attitudes

During the interview, Jane was able to reflect on her own attitudes to energy in her daily life; (Jane) “I have to be honest with you, like I know intuitively that we need to use less energy, but and I know that we should and I really buy into the whole idea of it, but it’s not something that is in my mind at the forefront often, you know, like I tend to think about it in other ways like less packaging and stuff and so I haven’t really thought about energy as being, I haven’t really thought about it in that way. If it wasn’t for the cost and it probably if it wasn’t Josh’s health, I would have been much more focussed on convenience” P19. Even when Jane was able to do ‘efficient’ behaviours she was also aware that the family tended to carry out these practices periodically (Jane) “but it [energy efficient behaviours] also came in waves like you know that it’s good to turn it [appliances at the wall] off and you’re being really diligent about it for a while and then you’d get relaxed” P17.

1.37 Interview 3

The third interview was taken some months later during the beginning of winter. The family had been busy with renovations, many of which were still to be completed; (Hank) “we’re into the ripping things out and putting other things in stage now” P2.

1.37.1 Actual Behaviour Long Term

1.37.2 Expected and Unexpected Changes

As had been anticipated – a heat pump had been chosen and installed in a central location in the hallway. The parents had decided eventually on buying a larger heat pump than what they had previously had in house one because they felt the thermal efficiency of the new dwelling was not as effective; (Hank) “Yeah it wasn’t we knew we’d need the heat pump, we were just umming and awing whether we’d need something else down here or because it’s just one big hallway into here. It’s seems to be enough, but we’re not over the depth of winter yet, so hopefully we’ll find out” P3. As the heat pump was still new, the couple were still analysing its effectiveness within the household and working out when and how to use the new fixture. (Hank) “When we first got it we had it on 17 degrees and we were sweating, now we’ve just had this wee sort of (cold) snap. We’d set the fan on about 19 and it’s been comfortable I suppose” P4. (Jane) “But it’s all new too, I mean we haven’t quite figured out, you know, like we haven’t got our first power bill. We haven’t quite figured it out” P4.

Hank was able to reflect on the difference in house structure of House 1 and 3, and how that affected the use and effectiveness of the heat pumps in the two dwellings. (Jane) “I think the big difference though is in our old house we had our fire going in our living area and we had the heat pump going in the hall at night and the two work together quite well in the sense that they would draw the heat down to the middle, whereas here we have like an older style house with the lounge that’s quite separate from the dining room that’s separate from the kitchen and so we tend to, we might even just use the heat pump just a little bit more” P3. The new household structure made it more difficult to heat individual rooms with the one heating appliance, and therefore the parents anticipated it was somewhat harder to heat the house than the previous dwelling. The higher ceiling height of the new dwelling also meant there was more space to heat, and they were contemplating lowering the ceiling height in the hallway in the future to counteract this effect. The new household layout also changed the types of rooms the parents spent more time in; (Jane) “I think it’s probably different in the sense that our living room and kitchen was together in the old house so quite often in the evenings I would

spend my time down here (in the kitchen) and he would spend a lot of his time down in the lounge, you know, it is a wee bit different" P5.

The family was also in the process of having double glazing installed throughout the household. This was another decision that they had made before moving into the house, which they then followed up on after settling in. The couple had sought quotes from two different companies, which gave them very different levels of information – one offered a stock standard glazing, and the other offered a range of different options; (Jane) "We weren't really, we got two quotes and we weren't really given a lot of options, you know, it was almost like this is the double-glazing standard and we never asked any questions... (Hank) The second guy said you can get all sorts of different things, Argon gas and all that sort of thing, but in the end it's, you seem to get to the sort of point where you're making quite good gains and then the extra cost is little increments after that" p11.

On this information the couple decided to stay with simple double glazing – without gas or thermally broken frames, considering they had had similar windows installed in their last place and found them to be satisfactory. However since the first section of installations the parents found that the new windows did not seem to be working properly, (Hank) "And we're having some issues with the double-glazing they put in because it's actually not that good a seal (around the window frames) and it was colder." P8

The parents were not at all happy with the performance of the windows, which was partly to do with how they were installed. They planned on complaining to the installer (who had not finished putting all the windows in yet) to fix the drafts, and hoped that there would be a significant improvement once the job had been completed satisfactorily.

Loft insulation had also been examined and improved since the last visit. The parents recognised that the type of insulation recommendations had changed since they retrofitted their first home; (Jane) "We did it under the Eco subsidy, but new standards have changed quite a bit, so the first time that we did it you know, it was basically just putting the big plastic on the ground and then so we just did it to the eco standard" P13

1.37.3 Behaviour Which Stayed the Same

After getting used to gas hot water and under floor heating in the bathroom, the family found that they had stuck to the routines that they had established soon after moving in; "there's no threat ever of running out of water so that's just like if there's anything that's changed we have these really long luxurious showers now."P16

The family had adjusted their perception of what was a normal shower to be longer than what they previously had, but also because they now appreciated the value of longer showers; "If there's anything that's really changed it's been like, so we really value having a long shower because our rental place was a bit disgusting, but also you know, like there's just no threat of running out of water so you're not like, 'Get out, get out, get out.'" P16. Jane was also able to find other reasons to justify and appreciate the value of gas hot water "(Jane) I'm not stupid, but yeah no unfortunately, we've just treated it as this real, just thing that never runs out you know. I do like it, I can really see, I don't know much about the efficiency of electricity versus gas or the scarcity of gas or whatever but you know, we had probably 12 people here over the weekend and it was just really nice to know that you don't have to worry about the hot water, yeah" p16. And Hank had made a decision to stick with gas based on the cost. (Jane) "Yeah actually we found the gas quite reasonable because we've got the gas hobs as well, but we found it quite reasonable" P17.

The closer proximity to the city did appear to be changing the lifestyle of the household, as hoped for the family were visiting others more and therefore spending different periods of time at home. Where they had previously all arrived home after school and work, family members would stay at home for

the rest of the evening. Now that they were closer to others, it was more common to stop in at the house, but not necessarily stay. (Jane) "Yeah so before when we would drive home we would get home after school, so like 3:30, quarter to 4 and we wouldn't go anywhere, you know, like whereas here we might pop home for five minutes, grab something to eat, pop out to sports. It's just been a bit of a lifestyle change, which isn't so much related to the house... [but]... related to the location that we're in and so I guess we use energy a little bit differently in the sense that we're out a lot, I don't know how you'd explain it, but we're out a lot more and we're just a bit more relaxed about heating our home, cooking our dinners" P18. Closeness to the city allowed more flexibility from the previous rigorous structure of daily activities that was normal when living in a more rural location.

1.37.4 Household appliances

The family were still unhappy with the dishwasher that the house came with – finding that its limiting size made it impractical in and efficiency sense (Jane) "Yeah I don't think it suits a family. I think we run our dishwasher far too often which is a bit of a shame, but it's just the size of our family, really, like you should really, we just run it once a day, but we do a lot more dishes in the sink." P15.

The new under floor heating had now become part of the new normal, but not purely through householder motivation; (Jane) "Yep, so before we'd sort of turn it on if we thought that the forecast was going to be bad, but it's just this will be hard for you to quantify, but because our toddler would just turn it up and down up and down because it's right at his level we just actually taped it up. We just put it on the midrange and just taped it up and it's just been on since". P22

Along with the situational reasons for having the under floor heating on, it had become a pleasure that Jane was able to justify. (Hank) "I like it, being the bathroom, there's always water on the floor and just seems to go away pretty quickly" P23.

As the family adjusted to the new environment and new appliances, so did expectations around what was appropriate behaviour. (Jane) "we have been having some marital … about energy lately, because Hank will go and turn off the lights that I leave on but he'll leave all three TVs going at once. (Hank) " I do not, do not, not three TVs, Geez" P23.

As the family settled into new and old patterns of behaviour they were able to reflect on how much of a change (or not) there had been since the move from House 1; (Jane) " I've been learning more and had a bit of a mind shift change and because we're in a new place it's easier to think about doing things new ways then what it would have been to take those new things I've been learning and apply them in our old place. (Hank) "I haven't changed, so that's a stink sound bite" P23. (Jane) "I don't feel like that at all now, like not only have I had a bit of a change of lifestyle because I'm not driving young children as much, I don't view, and maybe it's because of these interviews as well, but I just don't think about energy as a convenience as much now. I'm starting to sort of extend my sustainability to include energy and to include the way that we live" P25.

1.37.5 Expected Changes in the Future

Now that renovations had started, the family were thinking of other changes they might consider in the long term. Most were to do with space, considering the house was somewhat smaller than House 1; (Hank) "Yeah because it's, for a start it's only a three bedroom and we need, well we'd like four at least and it's got no garage and I want a garage" P13. (Jane) "It just makes a big difference to living [house size], but yeah, we, it was a plan before we bought, but our plans have sort of changed as you go on, but definitely we need a garage and probably like another bedroom or so, but who knows. I'm not very excited about renovations" P13. The realisation of how much difference the high ceilings of the old villa (House 3) compared to that of House 1 also stimulated a plan to lower the ceiling in the main hallway; (Hank) "Yeah, going up the side and hopefully if we can bring the stud down we might

be able to sneak like a decent sized loft or something in the ceiling space because there's quite a bit of ceiling space already with the three metre studs so yeah" P12.

1.37.6 Researcher Reflections

The family in Case 9 showed some typical priorities for most households, which were focused on daily life, and not particularly concerned – or had the time and space to consciously think about - their energy consumption. However the spark to change their material culture because of health concerns brought about an increasing awareness of the benefits of efficient appliances and insulation – as they found substantial energy savings as well as improved comfort levels inside their dwelling.

This new comfort norm was then carried with the family into their temporary dwelling, which had a material culture which made it very difficult to replicate. This brought about many frustrations for the family members, to the point where they just did whatever they could to feel comfortable.

When the family finally moved into their new home (House 3), it needed even more improvements than their first house, and at the time of the last interview they were still trying to get their dwelling to the same comfort standard as their first home. The family were prepared to invest heavily on retrofitting an older dwelling to improve its energy efficiency because they had witnessed the benefits of such improvements first hand. Over time the family had also become more aware of their personal energy consumption, and became more active in trying to reduce it. This included changing their attitudes towards energy, and trying to close some of their aspirational lifestyle goals. The move to the city was mostly out of functionality and pragmatism; not needing to travel such long distances, but also out of desire for their children's wellbeing; to allow them to have more stable relationships with their friends and family. Finally the parents' life goal of being able to commute without vehicles was partially realised, in that their house was close to friends and family, giving them more time to spend with each other and less time sitting in a car.

Case 10 Overview – “an opportunity you can’t turn down”

1.38 Household Overview

Case 10 involved a flat of university students who were mostly in their final year of undergraduate studies. This case exemplifies the transient nature of young people during this life stage, and how moving home can be a regular occurrence as life situations change quickly. The case involves three transitions, and follows the movement of Laura, a young Sciences student who has decided to stay on at the university to do a two year master’s degree. Laura had been flatting with a group of 5 others, three boys and two girls. All were the same age and had gone to the same hall of residence together in their first year. Four of them had then flatted together in their second year, and they had then moved to House 1, where the first interview was conducted. Laura was moving into a studio apartment with one of her flatmates (Rodney) as the rest of the flat moved on to jobs in other cities. By the time of the third interview, Laura had moved into a new flat after her relationship with Rodney had ended.

1.39 Interview 1

The first interview was held with Laura the end of the second semester and spring was well underway. Some of the flatmates had already moved out, and Laura was also preparing to move out in a few weeks. The building was a large two storey structure, with timber faming and plaster cladding. The house was around six years old and sat between a maze of other structures along a heavily populated street in the heart of the student residential area. Sunlight could still reach most parts of the house throughout the day, with other housing structures partly obscuring aspects of the dwelling. There was a large open plan kitchen and living room downstairs, as well as two bedrooms and a bathroom. Upstairs were the remaining four bedrooms, which were unobstructed from the sunlight during the day.

1.39.1 Reasons for House 1

After living for a year a “shitty” flat, the group of four flatmates who had come from the same hall decided they wanted a house that was more comfortable. The last house (H0) (Laura) “was quite disgusting” P4, and the current one (H1) (Laura) “kind of like stood out because it was big and it had like the courtyard and it was kind of nicer than the other ones we’d been looking at” P3. Being a newer house, it was more pleasant than many of the others on offer which was the main selling point for Laura and her flatmates. The building slept 6, however, so the group found two extra people to help with the rent. They hadn’t thought much about the heating or energy use of the household, but had discussed the position of the heat pump within the dwelling.

1.39.2 Normal Behaviour in House 1

Before settling in to the new house, the flatmates agreed upon some rules of conduct within the dwelling, including how they would use energy. These had been inspired by one of the flatmates that they had lived with previously who had enforced many energy saving practices that the group tried to abide by. (Laura) “last year we used to live with like a real power Nazi guy who used to like completely ban the use of anything that would, like, any heaters or anything, so we kind of like learned from that I guess” P7. In House 1 a female flatmate took over the role of power enforcer, actively researching ways to save energy and then passing them on to the flatmates. This did not always go down as well, and generally the group would need to come to a compromise.

The heat pump was the main heating source and could comfortably heat the living and kitchen area. It was set to around 22 degrees, and sometimes wouldn’t be turned on until (Laura) “everyone was freezing so like everyone’s sitting here in puffer jackets kind of like oh my God” p9. The fixture was only allowed to be used from 5-9pm in the winter, when the rest of the flatmates were home. Most of

the group had early lectures so would go to bed early, and there was a general rule to not heat individual bedrooms for as long as possible. The downstairs rooms were somewhat colder than the others, and therefore the flatmates living downstairs were allowed to use their portable fan heaters for short bursts.

There were a large amount of cooking appliances stacked in the kitchen, such as toasters, sandwich presses and electric frying pans. The flatmates tried to avoid using the main oven and instead used a smaller table top one when they could. They would also try to keep lights and appliances switched off and keep doors closed to conserve heat. They always waited until they had a full load for washing, and tried to dry their clothes out on the line on most days. In winter sometimes they would finish drying them in front of the heat pump. Upon moving into the flat they had identified the dryer that the house came with as an old "power sucker" and agreed that if it was to be used that flatmates should put money into the flat account to compensate.

Being young students they all had their own laptop computers, TV's, and cell phones. The boys all had their own gaming consoles as well as a shared one in the living area. Despite all of these modern electronics, the flat of six was able to maintain relatively low power bills for the amount of people – the highest being $278 in winter.

The house also had a large old hot water cylinder that would take a very long time to heat up. This meant that showers had to be short otherwise people would miss out on hot water in the morning. Therefore there was both the social pressure and household constraints which forced behaviour in this instance.

1.39.3 Reasons for Leaving House 1

Many of the flatmates were graduating and moving out of the city to jobs elsewhere. For those staying in Dunedin, there was little incentive to stay in the current house because its rent was going to increase to a price (Laura) "that's not worth it" P10 for what was being offered. The roof had also been leaking which seemed to cause the flatmates to be very dissatisfied with the dwelling as a whole.

1.39.4 Reasons for Choosing House 2

Since living together, Laura and Rodney had become romantically involved and were therefore looking for a dwelling that the two of them could move in to together. Both of them had had enough of (Laura) "scummy flats" P3, and were looking for a studio apartment that was within their price range. They had both gone looking and stumbled across one which had many more amenities than they had initially realised. The studio room they chose had a relatively low rent when they split it between them and had unlimited electricity and internet included in the price. For them this was a big selling point until the landlord told them that their rent also included the use of a gym, sauna and a cinema. This was (Laura) "one of those opportunities you can't pass up" P14 and they felt lucky they had found the place. The building had been an old monastery in an area close to their old hall of residence, and they liked the place because it felt like their old hall.

1.39.5 Expected Behaviour in House 2

Laura expected that living in the studio apartment would be very different to how she had been living in her student flat mostly because she was no longer constrained by power bills. She had not thought much about what this would mean for her everyday behaviour, but Rodney and her had been "talking about it the other day and we were kind of like, because we don't have to pay for the power we were kind of imagining just living in like a tropical sunset somewhere in the middle of winter like in our room, like an oven, but yeah, that probably won't happen" P15. There was a real possibility that Rodney and Laura would be able to live in a much warmer climate than what they had become used to

in the flat, but they also knew that even though they had "unlimited" power, this was restricted to the few appliances they could fit in their studio room. The room had its own heat pump, fridge and television and they had been told that there was also under floor heating. The large change in material culture, and the potentially limitless ability to use the new devices meant that the couples' energy saving behaviours adapted in house 1 (Laura) "might go out the window" P15.

1.40 Interview 2

The second interview was taken around a month after Laura and Rodney had moved into their new studio apartment. The apartment was on the second floor of a large three storey brick building which housed around eight rooms per floor. The building was the oldest part of a larger apartment complex which also included larger flats as well as the other "luxury" amenities. The building sat on a hill around fifty metres above the city facing south. It had recently been redecorated to include modern fixtures and decor, but structurally maintained its 1900's style. There were large shaded verandas on each floor on the north side of the building, meaning that no direct sunlight could enter rooms on the north side of the building. Each floor had rooms on either side of the long building, with a corridor in the middle which lead to the shared bathrooms on the east side and the communal area on the west. There was a shared kitchen in the middle of the block, and Rodney and Laura's room faced to the north. The room was large enough to fit a double bed, couch, kitchen bench, closet and a writing desk. A large fridge/freezer unit sat in one corner of the room and a flat screen television had been mounted to the wall above the desk. The heat pump unit was mounted on the wall above the old wooden framed windows and there was a high three meter ceiling in the room.

1.40.1 Actual Behaviour House 2

Laura had expected life to be very different in the new studio room, and she was happy to announce that daily life was much more comfortable. Although she did not know exactly how she was going to live in the new dwelling, she was glad that the new apartment was definitely a "luxury" compared to her last one. Now that they lived without the social pressure to conform to low energy practices, as well as no longer having the consequence of electricity bills to contend with, the couple no longer felt "constrained"p20. This meant that they soon became used to not thinking about how they used energy and they no longer consciously made an effort to use less, instead they tried to use more. When discussing oven use Laura mentioned that they use it much more than in house 1 "[we] Use the oven heaps more, yeah. (Rodney) I would agree with that, yeah … (Laura) because it's free, yeah and unlimited power" P5. This meant no longer restricting their own energy use and instead increasing it, sometimes just because they could.

Although the couple didn't continuously live in a newly found "tropical" climate as they had envisaged, there were no longer any social or monetary constraints around when and how they used their heat pump. The couple were glad to have found that the building was always warm, and they believed there may have been some form of centralised heating. Now that they had their own heat pump in the room they didn't need their portable heaters anymore, which sat in a box in the corner. The couple had adopted a new heating regime since the cost of electricity was no longer on their consciousness. (Laura) "well if it's cold here it usually sits at 22 or 23 [degrees] P16…(Rodney) "there's been the odd occasion where we've had it at like 27… just because we can, and when it's really cold outside we just want to be nice and warm in here and sometimes it's just 27 was good" P16. The couple had become accustomed to a much warmer climate, as well as having the heat pump going the entire time they were in the room. Even when they were sleeping they found the heat pump necessary in order to cool the room down, and they would set the thermostat at 16 degrees.

Many of the shared luxury facilities had also become part of the couples' regular routines, with all of them having being tried out at least once. Laura now used the gym around five days a week while Rodney still had other sports which kept him active. Although the facilities were shared and anyone in the complex could use them, there seemed to be enough availability so that people didn't share. The

cinema could be booked out and visited by anyone, but Rodney and Laura were yet to see anyone else in their weekly movie booking. The couple also used the spa around every two weeks but seldom saw anyone else there. (Rodney) "I think I've seen people down there once, (Laura) "yeah everyone's a bit like individual about it, (Rodney) "If you're in there and other people want to come and use it and they see you they'll just be like, 'Oh', and walk off" P34.

1.40.2 Expected and Unexpected Changes

The new environment brought about many changes in routine that had not been envisioned in the previous interview. The couple found themselves doing many more loads of washing than they had previously, however this also meant they had to use a dryer since there was no alternative in the complex. The couple found that they left lights on more often, had much longer showers, and now spent most of their time in their studio room – even though there was a large communal room available. Even though the complex housed many people, the couple found that most seemed to keep to themselves to the point where it would be strange to see another person in the corridor. Now that everyone had their own personal heating and entertainment sources there was less need or desire to mingle as there previously had been in the flat.

The one place where the couple would see other people was in the shared kitchen, where they would cook for themselves like they had done in their flat before. But now that they were no longer responsible for the other members, Rodney and Laura had developed a regular cooking and washing up routine. The studio room had come with its own full size fridge freezer which the couple struggled to fill, but it had allowed them to store and cook more frozen food than they had previously done. Laura also admitted to using the oven a lot more now that they didn't have to pay for power.

Because the fixed costs were more constant Rodney found that he had a bit more disposable income, and had invested in a bread maker. The couple had also upgraded their cell phones and laptops, but they hadn't got round to really getting rid of any of their now obsolete appliances.

1.40.3 Behaviours which stayed the same

Even with the raft of new technologies, the couple still maintained similar cooking and washing rituals. The new fridge may have been much larger than what they had been used to when living in shared accommodation, but this had not yet tempted them to store more food than what they had done previously.

1.41 Interview 3

The third interview was conducted quite some time after the last one, as Laura had been going through another major change in her life. She had moved out of the studio with Rodney and was now living again in a shared flat with five other students. The interview was taken in the living room of the new flat which was on the southern end of a long two storied brick building, attached to a row of around eight identical ones along the street. The complex was around 100 years old with large sash windows at the north-facing front of the building which led directly to the street. The building was in another student area near campus which was flat and close to the city centre. The building was too old to have been insulated and was made from a double brick construction with a concrete scrub on the outside.

There was a hallway down the middle of both floors with rooms on either side. The kitchen and living room were open plan and there was a small fenced off yard out the back. The living area had a standard electric oven, fridge/freezer and microwave as well as a heat pump on the wall.

1.41.1 Reasons for Choosing House 3

1.41.2 Actual Behaviour Long Term

Laura said that it took her some time to adjust back to flat life after living in a situation where she didn't have to worry about electricity. The flat that she moved in to included some overseas students who were also new to the city, meaning that the group dynamics of the flat were still in their infancy. The group of flatmates hadn't agreed on a set of rules around using energy like in House 1, but Laura had observed that they all seemed to be relatively sensible around their energy use. Most of the flatmates were a year or two older than Laura which could have added to their experiences around living with others. When Laura would arrive home there were never any lights or appliances left on, and the heat pump in the living area would only be used when people were in the room. There were some different expectations around what temperature the heat pump should be set to, Laura saw this as being mostly due to the different climatic backgrounds of the flat mates. The flatmates also had portable heaters in their rooms which they used occasionally and there had been no rules made around their use yet. Laura was still waiting to see their first power bill and thought that if it was especially high it might trigger a discussion around energy use in the household.

Personally Laura had reverted her energy use patterns to those she had perfected in House 1. Laura had gone back to having shorter showers and avoided the use of heaters as much as possible.

Case 11 Overview - “Regaining control”

1.42 Household Overview

Case 11 involved Dorothy, a middle aged lady who moved from a small two bedroom apartment to a three bedroom separate house. Dorothy had lived in Dunedin most of her life and had been married previously. After the divorce she had owned her own home for a while, before living in several smaller apartments or boarding houses due to falling ill and being unable to manage the responsibilities of owning a property while she recovered.

1.43 Interview 1

The first interview was held during summer in the evening of a work week. Dorothy lived in a small apartment that was connected to other apartments either side. The complex had been built in the 1960’s and was made out of a mixture of concrete brick and wood. The complex sat on top of a row of garages and faced north-east receiving unobstructed sun to the front and rear. The main living area and master bedroom faced north-east and the kitchen which flowed from the living room, bathroom and spare bedroom were on the south west of the apartment.

The ceiling of the building may have been insulated, but there was no insulation under-floor. The windows were single glazed with wooden frames which allowed a large amount of light in. There was no fixed heating source and all appliances were electric, including the large hot water cylinder.

The apartment block was close to a small shopping district and was seven minutes’ drive from the centre of town.

1.43.1 Reasons for House 1

As part of Dorothy’s recovery she had moved into the small apartment to become more self-sufficient. The dwelling had more space than her previous ones and had a spare room which she could use for storage and hobbies. She now had her own bathroom and kitchen which she didn’t need to share, and would therefore also be responsible for the cleaning and tidiness of those spaces. Despite being larger, the apartment still required little maintenance, with no yard or plants to manage.

1.43.2 Normal Behaviour in House 1

Dorothy enjoyed coming home to her apartment and spending time reading or watching TV. Her television was placed in the living room but could be turned so that it could also be watched from the master bedroom. Dorothy spent most of her time in her bedroom as she still found lying down more comfortable than sitting on the couch. She had three heaters in the apartment, two convection heaters in the main living areas as well as a small fan heater in the bedroom.

Dorothy had set her convection heaters to timers so that they would come on every 15 minutes when she was at home. She found the dwelling very cold in winter, and despite its small size she was surprised at her first power bill which was over two hundred dollars. This made her more cautious around her electricity use and she actively tried to avoid using her heaters wherever possible. (Dorothy) “after my first … [electricity bill] … I actually made a decision, I am not going to run these heaters unless I absolutely have to, I’m just going to tolerate it being a bit cooler”P7. Dorothy was used to using heat pumps and felt that normal electric heaters used too much energy in comparison. Dorothy had applied a film of plastic glazing over her main window to help with insulation, something which she had seen on TV.

Dorothy also had a few of her own personal energy saving behaviours which she tried to adhere to. When she moved into a new place she would always check the temperature of the hot water cylinder. Upon moving into house 1 she found that the temperature was set at 60 degrees Celsius, something which she promptly lowered. Dorothy was also conscious of the standby consumption of appliances with transformers and tried to turn them off at the wall when she remembered. But some behaviours were inconsistent with saving energy; for example she said that she was more likely to pull her curtains to stop the glare from the sun on her television than to keep heat in at night. Dorothy also had her own fridge/freezer in the kitchen, but also had a chest freezer in the garage which she used as well.

The small kitchen to the side of the living room was covered in kitchen appliances which Dorothy was very proud to own. She had recently bought a new coffee machine as well, but didn't use it often because it was hard to get to amongst the myriad of appliances. The small kitchen space also caused Dorothy to cook less and she found herself heating up ready-made dinners or buying out.

Figure 0.1 Dorothy's new coffee machine

There was an outside washing line but it was behind the block of flats, too far for Dorothy to make any use of. She therefore used her drier downstairs in the garage for almost all of her washing. The garage didn't have any windows and therefore wouldn't have been very useful for drying clothes. Dorothy always had short showers, and didn't see the point of spending long in the shower. She was also pleased with how close the hot water cylinder was beside the bathroom, meaning that it would heat up very quickly.

Upon moving into house 1 Dorothy had signed up to a power company which allowed her to input her own meter readings to help her manage power consumption. This ability made her more aware of her personal use but she hadn't taken any readings because she didn't want to disturb the neighbours who had the meter box on their section.

1.43.3 Reasons for Leaving House 1

As part of Dorothy's recovery, she had adopted a new puppy for company and more responsibility. She was thrilled with her new companion but soon realised she needed a place that had a yard for the dog during the day.

Dorothy was ready for more responsibility and she felt that a place with a section would benefit both her and her dog.

1.43.4 Reasons for Choosing House 2

The main reason Dorothy chose house 2 was because it had a section, giving her more space to take care of as well as providing space for her dog during the day. The house was also larger, giving her more space for her appliances, especially the kitchen ones. There was also the potential to have a flatmate to help with rent and company in the future. The house also had two heat pumps, which Dorothy felt more comfortable with. "I've started to feel like I can actually cope with a bit more and that it would be good for me to have the sort of the pressure on myself to make sure that the lawns got mowed every week or two … so this new place is a step again" (p2). "My living choices were constrained by my health. They were very directed by that and this [new house] is a step towards something that's going to take more effort but I feel like I'm, it's a step in my healing process in a way" P2.

1.43.5 Expected Behaviours for House 2

Dorothy was anticipating that this move would bring about a continuation in her recovery and lifestyle change by adding responsibility to her daily routine. She expected to be able to take her dog on more walks in the new location as well as maintain the lawns and plant a few trees. She hoped that being more active would also mean that she would spend less time watching television. She expected that the dual heat pumps would be more efficient than the heaters that she currently had. This led her to anticipate using around the same amount of energy as in house one despite the house being larger due to the added efficiency. Because of her previous experience with heat pumps Dorothy had established patterns around using them which she thought to be the most effective. This meant keeping the heat pump on during the day set to around 18 degrees and when she arrived home the thermostat would be increased to around 20 or 21 degrees. She also had aimed to try and keep her electricity bill as low as possible by maintaining many of the same behaviours she had in house 1.

Dorothy intended on bringing along all of the appliances she was storing in house 1 and was looking forward to being able to use them more since she had the space. She was intending on making more of her own coffees as well as cooking more dinners from scratch. She already knew where she wanted to put things and was intending on bringing her old tubular television out from the garage and placing it in the living room, and having her current flat-screen for her bedroom.

Along with her appliances she planned to bring her deep freezer which had been in the garage as well as her fridge-freezer unit. Although the house already had a fridge-freezer unit Dorothy looked forward to having the extra fridge space that would be offered by having two.

Dorothy believed she wouldn't need to use her dryer as much as she had been in house 1 as her outside garage also had a drying rack and there was a clothes line in the yard,

1.44 Interview 2

The second interview was taken in the evening after Dorothy had been in the house for almost two months. The interviewer had helped her move on the day as part of an incentive to take part in the interview. During this time the interviewer had been shown the house, and what possessions were being moved. Dorothy had not wanted to throw anything out in the move as this would be the first chance in a long time that she would actually be able to have all of her appliances set up and on display, rather than be left in storage.

The house was a three bedroomed wooden villa in a shaded valley to the north of the city. The house would receive direct sunlight in the middle of the day, but would lose it earlier during the winter time due to the steepness of the valley to the west. The house had been renovated inside and most likely had an insulation retrofit at that time. The kitchen and living area had been converted into a long open

plan space that stretched across one side of the house. The bedrooms were separated by a long hallway which ran adjacent to the living area and stopped at the bathroom to the west and the main entrance way to the east. There were large wooden French doors opening to the east and the west onto a quarter acre lawn with a garage next to it. There were two heat pumps, one on the south side of the house which fed the main living area, and one above the bathroom door facing the hallway, which could heat the adjoining bedrooms.

1.44.1 Actual Behaviour House 2

Dorothy was very comfortable in her new dwelling, and had started to live much in the same way as she had hoped to when interviewed in House 1.

1.44.2 Expected Changes

Dorothy was quite expectant that things would be different in her new house. The dwelling was substantially larger than House 1 and she was well prepared for the larger dwelling, having accumulated her own appliances over the years. Dorothy did decide in the end to install her own fridge in the dwelling and now had two fridge/freezer units in the kitchen area. Dorothy "Yes, I've got two fridges and it's so good because you know, every now and then there will be a big couple of pots or something with food in them. Dorothy "It's nice to just be able to put them in the fridge without having to sort them into little containers or anything like that" P2. Dorothy had also plugged her chest freezer into the garage and installed her older tubular television in the main living area. Amongst her personal lifestyle changes, Dorothy had committed to mowing her lawns and was also making an effort to keep the kitchen and house tidy "it's a commitment to help my healing process as well, to help push myself into being ready" P4.

Figure 0.2 Dorothy's dual fridge parody, along with extra kitchen appliances

The extra household space also meant that Dorothy felt more comfortable inviting guests over to visit and stay and she had already had a group of friends come and stay for the weekend. Perhaps the biggest contextual change that occurred during the move was not a physical shift rather a social one as Dorothy had acquired a male flatmate to help with the rent. Not only did this help with paying for the higher costs of the property, but also gave her the company she was ready for.

So far Dorothy was able to keep her energy bill similar to that of House 1, most of which she attributed to not using her clothes dryer anymore and instead utilising the extra floor space to dry her clothes inside. This also meant that she washed with smaller loads in order to have enough room to hang her clothes up. She had also adopted her expected heat pump routine, turning them up to a set temperature when home and lowering it when out during the day. This had not seemed to have a drastic effect on consumption yet as the outside air temperature was still quite warm (being summer).

1.44.3 Unexpected changes

Many of Dorothy's energy use habits changed in the new household because of the new environment, some because she was now able to use appliances previously in storage and some because of what the new house now allowed. Dorothy found that she spent more time in the living area than in her bedroom now, mostly because she was finding it easier to sit on her couch, but perhaps also because of how comfortable she felt in the different space with her other television. "I've actually felt more comfortable spending more time, yeah [in the living room]. It's like a flip of a switch actually. There wasn't sort of like a crossover of spending less time in [the bedroom] and more time in [the living room]…. So it's nice to be back in that habit, actually" P3.

Dorothy was satisfied with the quality of the appliances in the new dwelling, but said that it had taken some time for her to become accustomed to the different heating times of the new stove top; "It seems a bit of a waste of electricity to me to have … an element that takes such a long time to heat" (p8). With the larger kitchen, Dorothy's eating patterns had changed, not only was she cooking more, she was also having breakfast at home, something which she had often skipped before.

Upon moving in Dorothy's energy provider asked that she took her meter reading every day in order to gain a weekly estimate that was different to that of the previous tenants. Dorothy continued this practice every few days as she found it useful to monitor the extra energy used by her flatmate. Dorothy had gone so far as to develop a spread-sheet by which she recorded the meter readings of the household, and was then able to attribute different changes in consumption to different behaviours. This process made her a lot more aware of how much energy she was using personally on a daily basis and she found that it worked sometimes as a reminder to switch things off "well it [the power bill] provoked me to think, 'Oh I must remember to turn off the things that I'm not using like the little heat transformer that was heating up and that sort of thing'… but it's also given me a sense of security that it's okay to be heating. I can keep an eye on the rate of consumption and think, 'Okay I don't need to feel too guilty that I'm using this much electricity to keep us comfortably warm" P22. When talking about the high users of energy, Dorothy knew that she could make most of her savings through changing her heating practices "and then I'll think about how much I've had the heat pumps on in that time, which is the major thing that I can control" P22.

Dorothy was now making use of the larger kitchen space and was cooking at home more from scratch. Her new flatmate was also a chef, and occasionally they would leave leftovers for each other, but they did not eat together mostly because of their very differentiating timetables. The new coffee machine now took pride of place on the kitchen counter, and Dorothy had a new routine of making herself a coffee every morning before work.

Dorothy had purchased a new multi box to help have her appliances ready to be turned on conveniently. She had found this convenience also went both ways, in that she was turning appliances off that had transformers in them more often than what she had managed in her last home. Dorothy would have also followed her usual practice to check the hot water cylinder temperature, but wasn't able to find where the cylinder was stored. She wasn't too concerned about this though because she did not find the temperature overly hot to the touch.

Before the flatmate joined the house, Dorothy explained how she used the heat pumps and suggested heating options for the flatmate's room. She had a portable heater of her own that she offered to the

flatmate to be used in his room should he need it. Although he came from a different culture, he was happy with the way Dorothy approached energy, and also appreciated having a warm house throughout. Dorothy was also experimenting with some of her flatmate's practices around heating the bathroom and drying towels, showing that they in some ways were influencing each other's energy consumption.

When discussing Dorothy's use of her energy spread sheet she said; "I'll be able to talk to him about how much is he using the convector heater, has he tried using the heated towel rail, how's he finding both of them and just you know, this is how much electricity we're using. And because we [are] sharing the costs of the electricity, there's a sense of responsibility from him as well" P22.

1.44.4 Behaviours which stayed the same

Dorothy still enjoyed watching a lot of television, but had started to do other activities while the television was going. As the winter had not yet set in, Dorothy was still selective around which curtains she would pull, and often didn't pull any since the television screen was no longer affected by sunlight. Dorothy continued to have short showers, and there was a spa bath in the new dwelling but she had not got round to using it yet.

1.44.5 Expected Behaviour Long Term

Dorothy expected to do some modifications to make the house warmer for winter. The main modification that she planned to do was to double up the curtains in the main living room. She did not wish to put in a plastic double glazing as she had done in her previous house because she was afraid that it could damage the paint in the new window.

1.45 Interview 3

The third interview was taken with Dorothy again, and since then her flatmate had changed. It was now the middle of winter and Dorothy had grown accustomed to how the new dwelling functioned in the cold. The new flatmate was a female work colleague of Dorothy's, and she felt that she had more in common than her than with her previous one. There hadn't been many long term expectations expressed in the previous interview and she hadn't got round to doubling up the curtains yet.

1.45.1 Actual Behaviour Long Term

1.45.2 Expected changes

Dorothy had planned to insulate the curtains in the main living room and had started to close curtains more than she had previously done. However she had not managed to get round to insulating the curtains as she had hoped to do.

1.45.3 Unexpected changes

Dorothy had begun to close her curtains more often now that winter had set in and she was noticing that the cooler climate was substantially affecting the amount of energy used for heating. Both heat pumps were being used with the same heating pattern as earlier, but this was doubling their electricity bill from what it had been in the summer. Now that Dorothy had more of an idea around how much energy was used on a regular basis, she had become much more relaxed around monitoring it. Even with the higher energy use she rationalised the expenditure by saying that it still wasn't quite double what she had been consuming alone in house 1. And because the bill was being split with her flatmate the bill was still lower than it had been when she had been living frugally. This may have also come from the change in flatmates, that Dorothy was more comfortable with her and felt that the energy use patterns of the new flatmate were very frugal (more so than the previous flatmate). This also meant

that she simply added the tenant's electricity on to the cost of rent as a flat fee, which required less effort for Dorothy. When looking at her energy bills on her computer spread sheet she said "so at the beginning of the year I was only using about 10 or 11 [kilowatt hours of energy] and so you can see everything's sort of hiking up… but yeah, considering how much of a luxury it is to be able to heat the whole house like this I feel like that's good" P18. Dorothy appreciated the luxury that she was able to enjoy with the heat pumps and extra money from her flatmate and therefore didn't want to decrease her rate of consumption. She also felt that having a warmer house was also better for her health, and found it more important to maintain a healthy living climate if she could afford it. She had also begun to use the spa bath in the household sometimes, for the same reasons, believing that the health benefits would outweigh the extra cost.

Dorothy had made smaller changes in heating since the last interview, such as insulating gaps around doors and trying to attach the plastic film to windows that she had done in her previous place. She had also made attempts to better circulate the heat from the heat pumps. Dorothy sometimes used a fan heater to help distribute the warm area around other parts of the house, but only used it as a fan because it was less efficient to run. "Yeah, yeah just like the air in my room cools down and you get a lot of temperature differentials in a not moving air sort of way, but when the fan's going it warms the whole air up, just that much more and it takes the draughts out of it too" ... "I've put a lot of thought into these things" P5.

Although many of her new routines had stuck, some may have been too indulgent and required some adjustment; "I was, but lately I've not been drinking coffee first thing in the morning. It's just for a wee period, just for the last couple of weeks ... I became aware that I wanted to just cut down the caffeine for a wee bit" P13. She was also using her dryer again since it was sometimes taking too long to dry her clothes inside.

1.45.4 Behaviours which stayed the same

Dorothy kept most of her practices the same since the last interview. For Dorothy the house was still very comfortable, and she had kept her heating and showering practices the same. She had gone back to her original way of drying her towel in her bedroom and keeping a window open in the bathroom to let out steam and smells. She was happy to be able to utilise sunlight during the daytime and still enjoyed spending most of her time in the main living area in front of the television.

Case 12 Overview – "Warmth comes to those who wait"

1.46 Household Overview

Case 12 involved Jeff and Teresa, a professional couple in their thirties. The couple had been renting a house belonging to Teresa's parents for some time, slowly saving enough money for their first home. As Teresa's parents were now wanting to move in, it was time for Jeff and Teresa to move out (see concept map below.

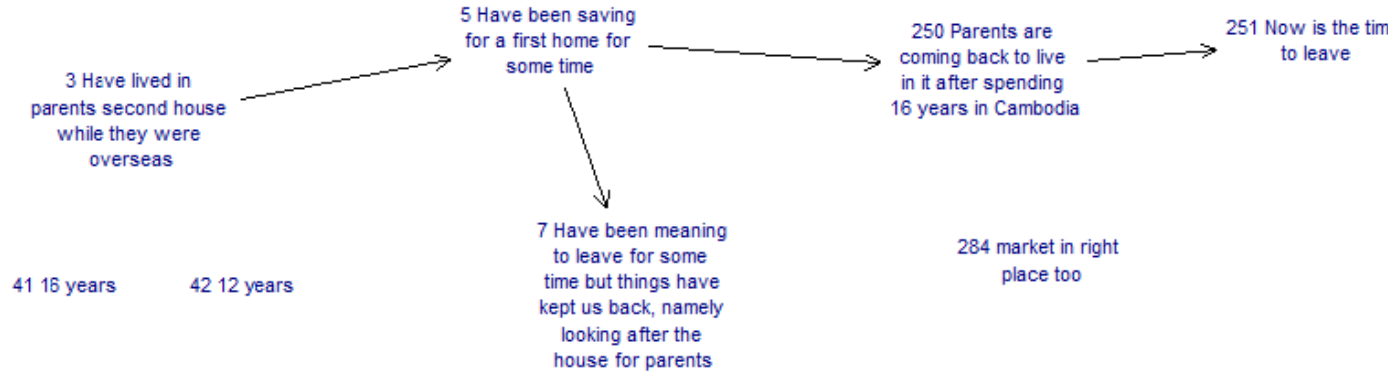


Figure 0.1

1.47 Interview 1

The first interview was taken on an autumn evening after dinner time. The couple were in the process of packing, and many of their possessions were already in boxes strewn over the floor of the living room. The house lay on the south on the side of a hill in the Dunedin city. The hill shaded the house from the northerly sun, and meant that it was without direct sunlight for much of the day in winter. The house was an old single storey brick dwelling (perhaps 60 years) with a garage underneath that fit the contour of the hill. The building had two bedrooms and an office as well as a living room that could be split in two – making a total of 120 square meters. The age of the house meant there was no wall insulation, but the building was made from double brick. There had been insulation installed in the ceiling but it was most likely in need of a top up. There were drafts in some parts of the house, especially the front door which had an uneven gap which Teresa had not managed to get covered properly.

1.47.1 Reasons for House 1

Teresa had lived in the house for 16 years since she started studying in Dunedin. Her parents had moved overseas and bought the property as an investment which Teresa had lived in ever since. Her husband Jeff had lived with her in the dwelling for the last 12 years. Though they had always intended on moving out they had ended up staying for such a long time because the living costs were cheap and it meant they were able to save more effectively for a house of their own.

When Teresa had lived there by herself she only used the small living room and closed the rest of the house off. At that time there was only an open fire place which was not very effective. Teresa would instead use a portable fan heater to heat the room that she was in. Over the years the house had had improvements to the heating methods, but these were always out of the Teresa's control "I mean they asked what we thought [about household upgrades] and then ignored us, but we would have probably

gone, but you know, they did the investigating, they spent the money and that was, I guess it's up to us whether or not we use[d] it" P5. A wood burner eventually replaced the open fire, and gas hot water was installed in the bathroom. New carpet and under floor insulation was retrofitted and a gas heater had been installed in the main living room.

Jeff and Teresa liked the fact that the house was situated close to the city centre (7 minutes' drive), making it close to shops and work. The house also had many ornamental fixtures, especially around the ceilings and corners of the rooms, which gave it a certain aesthetic appeal.

Because household changes were out of Jeff and Teresa's control there had been little effort to make any large changes themselves, even after living there for such a long time. In a sense they had been babysitting the dwelling, waiting for an incentive or opportunity to move into a more suitable dwelling.

1.47.2 Normal Behaviour in House 1

The couple both had well-paying jobs and were very aware of their energy consumption. Although the cost of energy was not an issue for them, they both disliked waste and therefore did not use energy unnecessarily. Jeff was very interested and knowledgeable about gadgets and computers, and worked in Information Technology as his profession. Jeff owned a large amount of computing equipment, and along with his interest in gadgets he had an iPhone application upon which he recorded his electricity consumption daily. The electricity provider he was with allowed him to update his meter readings and put them on the iPhone application, which gave him a daily bar graph of his electricity consumption. This allowed him to forecast the households' usage over different months, upon which he could pre purchase power, often at a cheaper rate than if he had waited for the bill at the end of the month. He enjoyed the process of buying power in advance, but knew it was not for everyone.

The lights from Jeff's electronics equipment engulfed the living room. There was a large (over 60 inch) television in one corner and a workstation with two large computer monitors in the other. The lights of two servers could be seen on bookshelves, as well as a laptop on one of the couches.

Neither Jeff nor Teresa sacrificed comfort for the sake of energy consumption, however different personal temperature thresholds did cause different practices for keeping warm. Jeff didn't mind the cold and would normally put on another item of clothing before turning up the heating. Teresa had come from the south of New Zealand, where it was common to only heat one room, leaving the rest of the house cold. She had continued this practice and generally tried to keep the room that she was occupying at a warm temperature. Teresa felt colder before Jeff did and would usually be the first to turn on a heater when she felt cold. However she professed that she found it difficult to judge her own temperature, and would therefore use a thermometer in the main living room to make sure it was the room which was cold before she would turn the heating on.

The house was laden with heating appliances, of which many were used under different circumstances. On most days, portable electric heaters were used, either a fan heater in Teresa's office or an oil heater (oil filled electric radiator) in the bedroom on a low setting. The enclosed wood burner in the small living room would be used in the weekends when it was worth spending the time to light and maintain a fire. This would heat the whole house for the day. Otherwise the gas electric heating fixture in the main living room would be used occasionally, however it was noisy and expensive to run, and the couple didn't think it was very efficient – nor did they like using a non-renewable resource. The house once warmed would hold the heat well, but they found it would take a long time to reach a comfortable temperature. Normally when running heating they would try and keep the room they were using at around 20-22 degrees Celsius. They found that the normal average ambient temperature of the house would usually lie between 14 and 16 degrees, but would often fall to the single digits in winter months.

The couple had slowly replaced appliances over the years as they had needed to, but usually had the short term view of cost and functionality rather than energy efficiency. Knowing that they would not be using the appliances for their entire life span, there was less incentive to purchase more expensive and efficient appliances. When purchasing a new drier for example, they had decided against getting one with an inverter (Teresa) "yeah, we could have saved energy money, but it was going to cost us more so we didn't bother, especially [considering how much we use it], you know, I use an outside airing cupboard as much as I can and use the dryer as a last resort kind of thing" p14. Because of the position of the section there was less opportunity to dry clothes outside, and therefore the couple resorted to using their dryer or airing cupboard. Teresa had discovered that she was asthmatic whilst living in the house, and had previously dried her clothes inside. This changed when she realised that it was detrimental to her health.

The bathroom had been retrofitted with gas hot water which the couple both enjoyed greatly. The hot water for the kitchen however was still heated by a smaller electric cylinder, which they knew was set too high, but they couldn't reach the dial to reduce the temperature. Teresa also wanted to get an extractor fan for the bathroom because it was having condensation issues, as well as problems with mould.

1.47.3 Reasons for Leaving House 1

The main tipping point for Jeff and Teresa to seriously consider purchasing their own home came from the news that Teresa's parents were coming back. Although this did not mean they had to move out, the news came at a time when the market was good and interest rates were low.

There were a lot of things about the house that the couple did not enjoy, but had managed to put up with. The house size was one of the bigger problems because they found it difficult to entertain and have guests stay over. The kitchen was small and both preferred open plan living arrangements. Jeff's electronics equipment were also struggling to fit in the living room, and more space was needed to fit it in a tidy fashion.

If Jeff and Teresa had the autonomy to make changes to the dwelling they would have preferred to put in a heat pump rather than a fixed gas heater. They felt that the gas heater was ineffective and costly. The main issue they saw was the amount of sun that could get into the dwelling, and Jeff thought that opening up the roof with skylights could solve some of the problems with getting light into the main parts of the house. A dishwasher was also something that Teresa and Jeff would have recommended because of the convenience that it offered and it would have cleared up the small kitchen space.

1.47.4 Reasons for Choosing House 2

There were a multitude of factors that led to the purchase of house two, but Jeff summed it up nicely by saying that it was the "right place at the right price" p8. Teresa also stated "we could see how we would live in it" P9, showing that they could envisage how the new dwelling gave way to their lifestyle preferences. The couple didn't have a specific location in mind, but instead were looking for a house that fulfilled their requirements.

After saving for a number of years, the couple were able to invest in a substantially larger dwelling than what they had been living in previously. Since space was one of the main things they were looking for, they were happy to choose a house that was further out of the city. The new dwelling was 260 square meters, twice the size of their previous house and it was open plan in design which lent itself preferably to the couples preferred style of living and meant that they could entertain and fit all their appliances in comfortably. The building was built in the last fifteen years meaning that it would be low for maintenance and upkeep – compared to most houses in Dunedin which Jeff mentioned were often substantially older.

1.47.5 Expected Behaviour in House 2

Being able to more comfortably entertain guests was something important to Jeff and Teresa, and they already had four weekends booked out for visitors. They were both looking forward to having more autonomy around household decisions and saying that they would be finally able to adapt the house to how they wanted to live, rather than adapt their lives to the house.

Jeff did not want to make any hasty changes to the dwelling and said that they would like to use the first year to get used to the new house before they made any large investments. The main fixture they were contemplating was a heat pump because House 2 only had a log burner as its main source of heating. (Jeff) "We don't know how warm it's going to be to live in. They don't give you that rating when you buy it so we figure that rather than rush and go, right, 'Let's put some heat pumps in,' we may as well figure out what it's like" P19. Jeff and Teresa had a large amount of portable electric heaters which they used in House 1 which they would be able to use in House 2 as the need arose, but they were aiming not to use them.

They needed to purchase most white ware for themselves when moving into the new dwelling. The couple was aware that by the pure fact that the appliances they purchased would be newer than those in House 1 and therefore be more efficient. An electric stove top and dishwasher came with the house, and they needed to purchase a new fridge-freezer, electric frying pan, slow cooker, washing machine and dryer before moving in.

Jeff was looking forward to having a larger kitchen and more bench space so that he could spread things out while cooking. He was already planning long term to do the kitchen up, and to install gas hobs for cooking, because Jeff preferred the control and responsiveness of gas.

Since monitoring their electricity quite carefully for a long period of time, Jeff had a rough goal to try and use the same amount of energy in the new dwelling as they had been using in house 1. He planned to continue to monitor their electricity usage and would therefore be able to see if any new behaviours might be causing them to use more or less energy. Although the dwelling would be twice the size, he believed that with their appliance efficiency improvements this could be possible. The new dwelling received much more sun than house 1 and appliances such as the oven were much newer; (Teresa) "we should use less with the oven there because the oven here [House1], it's really old and the seals are all going" P25. They also were prepared to make other efficiency improvements to the house.

1.48 Interview 2

The second house was modern, built within the last 15 years and made from brick veneer. The spacious two storey dwelling was nestled in a new suburb outside of the city centre. The dwelling faced north and received sun for almost all of the day. Large windows to the north and west ensured good solar heating, which did not seem to be too much affected by the fact that they had been tinted. There were three bedrooms upstairs and two offices downstairs. The main living area flowed into the kitchen but could be closed off by two large sliding doors. There was a large double garage attached to the back of the house as well as a bathroom upstairs and downstairs.

The house was nestled in a relatively new rural suburb, on a flat area 15 minutes out of the city centre.

1.48.1 Actual Behaviour House 2

1.48.2 Expected Changes

The second interview was taken with both participants in their new home. They had had time to move in and establish their possessions, but had visitors just about every weekend so had not managed to

completely settle into their new routines. The extra space meant that they were able to entertain guests easily, and had no problem with them staying overnight.

The sliding door to the kitchen also allowed the couple to close the kitchen area off after eating and help keep the heat in the main living area. The house received direct sunlight all day long – and the sun would shine into different areas of the house as it moved around during the day.

The open plan style of the home also satisfied the couple's wishes, giving them more abilities to use different areas of the house for different activities. Cooking, watching television or working were all separated into different spaces, and the kitchen and living room could be opened up so that there would be flow between them. Most desired changes around lifestyle had been achieved; however the exact daily routines around how energy would be used had not been made as explicit as during the first interview.

The enclosed log burner was able to heat most of the used living spaces relatively easily. Both Jeff and Teresa were extremely happy with the thermal aspects of the new house, finding that it was much easier to heat, even better than they had anticipated.

1.48.3 Unexpected Changes

The new house was so much warmer than their previous dwelling that Teresa had shifted the thermometer from the main living area to her office. After being somewhat unsure around how effective the fire would be and how often they might need to use it, the couple had not held any substantial expectations around what it would take to heat the dwelling. They had thought they might need to invest in a heat pump but were delighted to find that they would not need to consider this immediately. Teresa had found that the average ambient temperature was so much higher than in their last dwelling that they no longer needed to monitor it in the same way as they had done previously. One of the big changes for Jeff and Teresa was that they now hardly used portable heaters, only occasionally when Teresa was in her office. The house received sun for all of the day, and required no heating whilst the sun was shining. Teresa had developed a new routine in order to keep the heat in the house by making sure all of the curtains were closed as the sun went down. This was quite a change because in their old house she sometimes didn't bother because the sun made little difference to the temperature of the house. So far the couple had only lit the fire a few times, but had found it was very effective.

Jeff had continued to monitor their electricity usage, but the meter box was on the outside wall which had caused his trips to be slightly less frequent than in their old dwelling. His attitude towards monitoring had also changed in the new dwelling and he no longer saw it as important to rigorously keep up to date with their energy usage. Their electricity consumption had also increased slightly since the last dwelling – not matching up with Jeff's original goal. However Jeff was able to show the interviewer on his iPhone application that the increase had mostly come through the large volume of visitors they had been having, and that their regular consumption was noticeably lower than their current average.

Amongst the new appliances they had to buy for the new dwelling, the fridge was something that Teresa had especially looked forward to. Although she had a specific type of fridge in mind, she was still restricted by the space within the house as to the type of fridge she could buy.

The fact that the couple now owned the new dwelling and everything in it now meant that they had more autonomy over how they did things, which Jeff was particularly pleased about. This doubled with the fact that Jeff enjoyed electrical things, and he had therefore taken more of an interest in using the different household appliances, whereas in the previous dwelling he had not been as engaged. For example he now was reported to be using the washing machine more because the different functions

required some involvement in order to get the best out of its different cycles". He was also using the lawnmower more and the dishwasher, now that they had one.

1.48.4 Behaviour Which Stayed the Same

Both Teresa and Jeff had managed to keep their normal frugal patterns of behaviour, such as maintaining short shower times, putting on more clothing before turning up heating and turning off lights in unused rooms.

1.48.5 Expected Behaviour Long Term

As the season was changing and the outside temperature was getting warmer, Jeff and Teresa were looking forward to opening the house up more on sunny days and having more of an indoor outdoor flow. This included cooking more outside using their gas barbeque, and leaving doors and windows open to be heated by the ambient temperature outside.

Both were still considering purchasing a heat pump in the long term, but were still wanting to live in the house for a year to see if it was really necessary. The few times that they had used the wood burner they were noticing that it was effective compared to the one in their old house, partly because it was free standing instead of being inside the wall. The fire was even effective upstairs because its chimney was exposed in one of the rooms in the upper level.

1.49 Interview 3

The third interview was taken near the end of winter, and Jeff and Teresa had become more settled in the house, and developed their own patterns and routines in the new dwelling.

1.49.1 Actual Behaviour Long Term
1.49.2 Expected and Unexpected Changes

There hadn't been any new investments to the dwelling since the last interview, and the couple were still happy with the way the house was allowing them to live. As planned, they were still going to wait a year before doing any substantial changes to the dwelling and had not bought any new heating appliances.

They had got through winter very comfortably and had not needed to change the main heating method or use the portable heaters much. They were very happy with the fire and household insulation, and continued to not need the fire if they were home early enough to close the curtains to keep the heat in, after a sunny day. On average they were finding they would light the fire around four days a week. It was sometimes a bit difficult to decide when they arrived home late at night, around 8pm, whether to light the fire before bed. However when the fire was used it was so effective that the house would be warmed within half an hour, and doors could be left open to warm the upstairs areas. This was a substantial change to how they had lived in the previous dwelling, and they were very satisfied with the effectiveness of the new heating method.

Teresa was finding that the house was becoming very hot as the weather started to improve, and that sometimes she needed to open up the doors and windows in order to cool the house down.

There had not been many changes to household appliances or fixtures since the last interview. But one new addition was an external thermometer which could be read from an internal display unit. Jeff received it as a gift and enjoyed following temperatures out of interest. However internal temperatures continued to be such a low issue that he used it more for seeing what the temperature was outside than inside.

After not needing their portable heaters to the same extent, many of them remained in storage without being put out.

Jeff had been running more frequently since living in the new house, and had continued to be more involved with using appliances such as the dishwasher and washing machine. Jeff had also hired a treadmill for the winter months because it was too cold and dangerous to run outside at night, because there was little street lighting and foot paths in their area.

Being interested and engaged with modern technology, both Teresa and Jeff had experimented with the different functions for their new washing machine. They had begun to sort their clothes for different wash cycles and wash sometimes at 30 degrees, whereas beforehand they would only do a cold wash. This was partly to wash the clothes properly according to the type of clothing and the recommendations of the wash setting. Also the manual had recommended that one uses a warm wash cycle regularly to avoid build-up of soap within the machine. The couple had been using the delay function so that the washing would be ready in the morning for drying. They would either dry in the hot water cupboard or outside on the line if it was a nice day. Both mentioned that they were using the clothes dryer much less than in the last place since their clothes would dry better outside. The hot water cupboard was less effective than in house 1 because the cylinder was more poorly insulated.

Jeff had received a new laptop from work and found himself doing more work in the living room with Teresa, rather than retreating to his office by himself. They both enjoyed working in the living room in the evenings with the fire and television going. Although the couple had invested heavily in a much larger dwelling with more rooms, it seemed as if they were spending more and more time in the main living area.

The couple had started to replace broken lightbulbs with new compact florescent ones. John still checked the electricity meter every second or third day which he had incorporated into his daily routine such as going outside to get the mail or coming back from a run. He would put the details into his phone which he would usually keep on his person. He noticed that their energy use still fluctuated substantially depending on who was in the house and whether they had guests over. So far he was not able to find any discernible pattern from their energy use because of the heterogeneity.

1.49.3 Behaviours Which Stayed the Same

As far as daily life was concerned, according to Teresa and John, many routines seemed to have stayed the same. Although the appliances and fixtures were different, Teresa thought perhaps the main influence on their routines was their distance from the city centre. This changed the time they would normally arrive home, as well as their shopping habits; (Teresa) “But yeah it takes a little bit longer [to get home] plus you know, you think instead of having to go back into town you spend a little bit longer in town and make it worthwhile instead of 2 trips type thing... (Jeff) now we go to the supermarket on the way home, whereas before we’d go home and then if we needed to go to the supermarket” P7. The couple were adapting parts of their lifestyle due to their distance from town. This also affected what they did at home and how they interacted with their heating sources.

Jeff was still using the washing machine more, as well as the dishwasher and lawnmower. The dishwasher was a new fixture for them and they found they would turn it on once every three to four days.

1.49.4 Expected Changes in the Future

Both were very happy with the house and said that it had exceeded their expectations. Even living out of the main city did not seem to be too much of an issue. They had originally planned to live in the house for at least five years, but had not thought much past that. They both had considered building, but had not thought much past the idea at that stage.

They were happy with the current heating arrangement and had for now decided against purchasing a heat pump – being happy with their routine established with the wood burner and the effectiveness of the household insulation.

Teresa still hadn't used the bath, but intended to on a special occasion.

Case 13 Overview – "let's build a REALLY warm house this time!"

1.50 Household Overview

Case 13 involved a family of four, with the parents Doug and Francine and their two teenage boys Greg (12) and Jed (14). The family lived in a small town on the outskirts of the Dunedin city, about twenty minutes from the city centre.

1.51 Interview 1

The family were interviewed during a cold evening in a rental house that the family had been living in for the last eight months. The parents were in the process of building a house, and had been staying in the rental house after moving out of their family home that they had been living in for the last 12 years. The household was relatively affluent, with both parents working, however they were very wary of the costs of energy and were very aware of their own energy consumption. The parents were technologically savvy, and very invested in searching and acquiring the most modern and appropriate fixture when it came to investing in their house, without compromising lifestyle.

There are three houses involved in this case, the first family home that the parents had built 12 years ago, H1, the rental property they lived in for around a year, H2 and the new house that they built and moved into, H3.

1.51.1 Reasons for House 1

The house was situated in a large rural town neighbouring the Dunedin inner city. The township lay on a large flat area which received unrestricted sun as well as shelter from the north easterly sea breeze.The house (house 1) had been built during the birth of their second child Jed, and was designed with a young family in mind. The structure was mostly open plan, so that the parents could see the children at all times. This included high ceilings (up to 4.1 meters in parts), which provided a pleasant atmosphere, but was later shown to be difficult to heat. The house was built to be warm, with extra thick foam insulation and double glazing on the larger windows (both of these measures were higher than the insulation standards of the building code at the time).The parents wanted a plaster looking exterior, and had been informed that rock coat polystyrene was the most reliable form to achieve that look. The family had been informed that rock coat was less susceptible to cracking and water damage than other plaster forms that had succumbed to the leaky homes crisis[1].

1.51.2 Normal Behaviour in House 1

The house had two heat pumps for heating, however these were insufficient to heat the bedrooms, so the parents had put a panel heater in the hallway later on, but this was still insufficient. This resulted in the family spending most of their time in the main living area, which over time became crowded as the boys grew older and needed their own space.

The heat pumps were set to a timer to come on half an hour before the family got up on winter mornings. The mother, Francine, felt the cold and would usually turn them on when she got home from work at 4pm. Both parents were energy aware and strictly enforced rules around turning

[1] The leaky homes crisis is an ongoing problem with houses built from 1990 to 2003. The issue involved moisture entering timbre framed houses causing structural damage, including mould to the point where in some cases houses needed to be knocked down and rebuilt. There were many factors contributing to leaky homes, including the types of household materials (such as fibre cement sheet of plaster external cladding and polystyrene insulation) as well as house design 0 such as buildings built without eves or with internal guttering systems.

appliances off at the wall and lights off in unused rooms. This may have also been driven by the large winter power bills the family received which were sometimes as high as $450 per month. The parents were unhappy with the large bills, after investing heavily in insulation and efficient heating systems, they had expected a warmer house and lower power bills than what they required for their desired comfort levels. During the winter Francine would sometimes dry their clothes under the heat pump, but Doug didn't like this because it added to the condensation in the dwelling.

When they were younger, the parents imposed rules around the use of electric appliances, and they were not allowed to use the TV's or laptops in the evenings an hour before bed. A television with a games console was placed on a trolley so that the TV could be removed from the boys' rooms at night and so the parents could still hold ultimate control.

Showering times were also something that the parents sought to enforce, which generally involved banging on the door to get the boys out. This was not always successful however, with their oldest Greg managing to use all the hot water from a 300 litre cylinder in one shower.

1.51.3 Reasons for Leaving House 1

The family enjoyed House 1, they liked the neighbours and the location, but had decided to move for fear that the house could lose its value in the future. The house had been built with a timber frame and external concrete plaster walls (rock coat polystyrene) which were building elements that in some cases had contributed to 'leaky homes syndrome'. Worried the house might become graded as a leaky home (after seeing the way the council had been grading other houses in their area) and therefore potentially lose its value, the parents made the decision to move. The house itself had been checked by a professional who said that the construction used in House 1 would not have any problems, but the family still felt unsure whether the council would have the same opinion.

1.51.4 Reasons for Choosing House 2

After making the decision to move the family found a temporary rental property that most importantly, was warm. The dwelling was in the same area as their first home which didn't impact lifestyle and was near the boys' school, and was small and easy to keep. The two storied house was built from brick and concrete. The building was a two storied dwelling with all walls exposed apart from the northern one which was attached to another house. The building was modern, no more than thirty years old, and was insulated throughout.

1.51.5 Actual Behaviour in House 2

The smaller dwelling size meant that it could be heated effectively by a single heat pump in the living area downstairs. The living area was also open plan and had large windows facing the southern and western aspects. The rooms upstairs received heat from the warmth of the day and the heat pump, which meant the boys spent more time in their rooms than in H1, and also because they were getting older and the parents saw this as a natural progression.

Some appliances had been brought with the family into the new dwelling, but many were new and had been purchased in preparation for the new house. Two new large flat screen TVs had been purchased, as well as an oven, microwave and fridge. The parents explained that the purchase of new appliances during the construction of their new dwelling was a necessity (Francine) "Because we're building, because you have to [buy all new appliances]" P9. (Francine) "we've actually bought new appliances, like that's not our fridge because our last fridge had to stay at the house, so we've bought a new fridge, of course bought a new oven, we bought a new microwave because that one is 23 years old and I'm probably getting brain tumours every time I'm standing in front of it" P8. Francine and Doug were very conscious of energy use, and when they purchased new appliances they were very aware of

the difference in efficiency of appliances and always bought the more efficient ones (Francine) "we ideally know the fridge that we wanted was two grand dearer than the one we got, but it didn't run any more efficiently, it just had other features that were great about it, so they're the things that we held back on" P32.

The washing machine had also been replaced after it "blew up" and been replaced with one that was efficient on water and electricity – heating its own water up as it went (Francine) "we chose to get one that heated its own hot water versus using the hot water from the water cylinder, so we were looking at the you know, the more energy efficient washing machine, spins better so your clothes are dry when they come out, uses less water, heats its own water and that sort of thing" P7. The drier was used a lot more in Household 2 because the washing line outside was not very big. Although the washing machine was an efficient one, Francine would use a warm wash and the pre-set settings, showing that she was willing to buy efficient appliances but not compromise on washing quality.

As far as older appliances went, some portable heaters had been left in storage, perhaps for fear that their new dwelling may not meet the thermal comfort standards that they were hoping to achieve; (Doug) "The only appliances we really have in lock up is like some couple of heaters I suppose, which we probably don't intend to use. Yeah, they're just there in case we needed them for some reason" P8

1.51.6 Reasons for Choosing House 3

The new house was chosen in the same region of Dunedin, but no longer in the same neighbourhood. The new house was designed for the changing requirements of their growing family, and built with the needs of two teenage boys in mind. This meant that the parents and children's rooms were placed at opposite ends of the house, allowing for more privacy as the boys became less dependent. This included the addition of an entertainment room, which was separated by a ranch slider to the main living area – still allowing for the open plan lifestyle when needed.

After the issues that occurred with the structure of H1 the family were well aware that the insulation properties of their new dwelling needed to be substantially greater to what they had installed in H1 (Francine) "well we're certainly more aware of energy-related things in regards to building this new house" P4, - such as with window insulation; "it wasn't a requirement to actually have to do double glazing [12 years ago in H1] and now it's compulsory as a minimum... and it was suggested to us that we didn't need to double glaze our entire house and [therefore] we only double glazed[ed] the living areas... and in hindsight we both know that it would have been much better to double glaze the entire house" p19. The parents had therefore sought extensively for the best heating and insulation options for their budget. (Francine) "we looked into ground source heating, spoken to people, contacted people up North. We looked into heat pump under floor heating, which is a big thing happening, went and spoke with people that have it, went and visited a guy, well door knocking and found out that he's actually a heating engineer, a commercial heating engineer and he was involved in designing the ground source heating for the airport" P14

The parents settled on a centralised heating system which heated the entire house and hot water using under floor heating and radiators. (Doug) "it's not ... the ideal heating source that we would probably would have wanted to go for, but it was- [the best value for money.] (Doug) We had sought ground source heating" P14.

The boiler of the heating in House 3 used a coal hopper which could be automatically fed and required little maintenance. The parents were aware of some of the environmental issues to do with coal but the low cost was too much of an incentive. (Francine) "Still not good using coal, but yeah (Doug) It's not.. [a very]... renewable resource (Francine) You can transfer, extract, you can change the system to burn wood pellets, you know, it's a cost to change the system but it still, it would change over because the same people make the wood pellet system" P15. The central heating system was also designed so that the underfloor heating could be directed to certain parts of the house, and be

switched off in areas that were not in use. The radiators were also intended to give individuals more autonomy over their own heat preferences, for example allowing their youngest boy Greg to have his room at a warmer temperature at night.

The house was extensively insulated and included such things as thermally broken double glazed windows, which Francine had also researched intensively. Being restricted by budget, the parents compromised on items which they labelled 'compensatory and non-compensatory 'according to the amount of money they had available to spend. (Francine) "You know, we're torn between the things that we'd like to purchase and what we realistically can afford to purchase and there's things that we chose we wouldn't compromise for the house and there's things that we chose that we can replace in the future" P10. Fixtures such as the heating system and insulation were given highest priority, whereas elements such as kitchenware and bathrooms were given less priority because they could be upgraded in the future.

The family desired a different type of heat than that of what their heat pumps in H3 had provided. The under floor heating system was chosen to provide a type of warmth that wasn't just in the air, but throughout the whole house and its furnishings (Francine) "When we designed the house so that our heating would be much different than what we previously had. We wanted a house, because we live in Dunedin, where we can actually have a deeply warm house throughout versus you heat the living areas and then you run to the bed and jump in" P12.

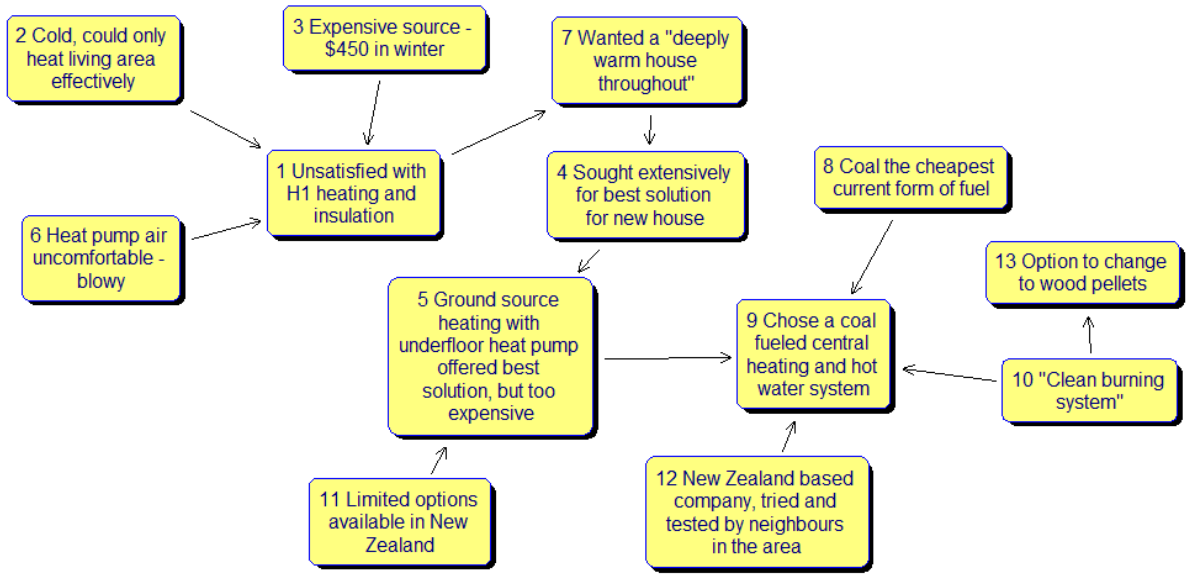


Figure 0.1 Process for choosing heating method for House 3

1.51.7 Expected Behaviour in House 3

The family had expectations and desires around how they wanted to live in the new home, however this was very much dictated by cost.

The new dwelling was somewhat larger, H1 being 227 square metres and H3 being 265 square meters. The parents had found that there were a few things that they wanted to be slightly larger than their first house, and therefore designed the new dwelling to accommodate for those desires. (Francine) "We wanted to increase the bathrooms, just marginally, we don't need really big bathrooms, but we had a really small bathroom [in House 1]. We wanted to increase the kids' bedrooms just slightly. So by the time you increase some things just slightly (Doug) It all adds up. " P11

The family had a rough size to aim for which they tried to keep to; "we... [had our mind set on] ...around 250 [square meters], so we stayed fairly close to that, haven't we? We said we don't want to go more than 250 because it just gets too expensive to build as you, yeah, so we sort of had a figure and we were led by thinking that that's within the thing, wasn't it? Yeah" P11.

The third house was designed for an older family, with more separate areas and space between the parents and teenagers rooms. The parents were very wary of their growing children's needs and had already noticed that their old house (House 1) was not accommodating to all of them.

1.52 Interview 2

The second interview was conducted in the new dwelling that the family had built (H3). The family had been living in the house for a couple of weeks whilst finishing the final installations. Their showers had only just become operational with the final installation of the new hot water and under floor heating system. Most of the main fixtures had been installed, the kitchen was operational, the showers and toilets worked, and the lighting was installed in most rooms. Some furniture was installed, but things like paintings, books etc. had not yet been unpacked.

The second interview was conducted for the most part with Francine only, as Doug was out picking the boys up from sport. Doug entered the conversation near the end but only had time for a few brief remarks. Ultimately the family were still very much adjusting to their new surroundings as they unpacked and decorated the house with their new and old possessions. All fixtures in the house were new, and the heating system was the main one that required the most learning for Francine, who was the main instigator.

1.52.1 Actual Behaviour in House 3

The first topic of discussion jumped straight to the new heating system which had been only going for the last two days, and Francine was excited to show it off. Francine so far had only switched on the under floor heating sections, which were already proving to be extremely effective. The wiring for the thermostat had not yet been connected so the house was very warm. Although it had only been a few days, Francine was very well informed about the technicalities of the new fixtures of the house. The radiators had not yet been turned on but the bedrooms were already proving to be very warm. Francine was realising that she would need to make adjustments to the amount of bedding and clothing layers that she would normally wear in the new house. (Francine) "Yeah so we'll have to adjust things like what's on our bed, ... you tend to put bedding on for Dunedin weather, whereas we're going to have to look at, depending on how we heat the house over the winter" P11.

As the family familiarised themselves with the new heating system, they were also establishing how to achieve their optimal comfort levels in the new dwelling. (Francine) "since we've had it for two nights, the first night I woke up and thought, and that was only the radiators and I had it just on really low and I thought, 'Oh I'm just a wee, a bit warm.' I wasn't hot, but it was a different kind of air temperature than what we were used to sleeping in and it's not that drying heat, it's just a different air temperature. It's more, I don't know, in winter you get used to the air around you being cold" P11. This process involved engagement and experimentation with the elements of their new environment, showing that it was an iterative process.

The high tech elements of the household were still in the process of being installed and normalised; the new television set was still to be set up in the new entertainment room, along with the surround sound system. The family had bought a large plasma television which they found they couldn't use as the new spare television because it could get damaged if the monitor is left on and therefore were still considering buying a third TV for the spare room.

Although many of the functional fixtures were in place, the process of making the house a home was still very much underway; (Francine) “I don’t feel completely settled yet, you know, it’s like I haven’t put much of myself out and the showers had to be painted and you know, well the walls had to be repainted because they got damaged when the showers were going in that sort of thing so you can’t put your personals up” P12.

1.52.2 Expected and Unexpected Changes

New routines during this interview were still being established. Many were only temporary adjustments as the dwelling was still being constructed. (Francine) “I don’t feel like I’ve got used to where things go yet or whether they’re in the right place. We’ve got no lights in our bedroom still, so but that’s okay because when we first shifted in we had no lights and we had a couple of plates and we had extension cords with spotlights, so that was alright. It was like camping, no showers. We had toilets and that was excellent. Toilets, I don’t need to get used to toilets, they’re all the same. You know, everything feels like getting used to” P13.

Because all elements of the house had been chosen by the occupants, some new interactions were chosen out of desires for comfort, and others were chosen out of motivations for energy efficiency. Even though Francine did not enjoy the type of light from florescent bulbs as much as from incandescent, she chose to force herself to get used to them because they were more energy efficient. (Francine) “Yeah, it’s interesting. It’s quite difficult getting used to that light. I find that when it first came on it was like, oh, you know, I don’t know if I like that light, but I’ve told myself that I want to get used to it because it’s more efficient to run” P18.

Developing new routines around the new appliance landscape involved a certain level of consciousness thought, even for the most basic of tasks; (Francine) “And it’s little things like when the extractor fans were, well the extractor fan was finally out on I was thinking that it wasn’t working properly, so you are sort of conscious of well how much should your windows be open you know, so you’re not getting too much condensation or so there’s lots of things that you feel you’re still getting used to, but yeah, the most simplest things” P13.

Even old habits to help save energy needed to be adjusted to the different environment, Francine was no longer able to hear the shower or fans going in the boys bathroom so was not able to gauge how long they were in there. Her ultimate incentive to get them out by turning on a tap and therefore changing the water temperature was now also hindered by the new heating system. (Francine) “like turning the taps somewhere in the house doesn’t change the flow to anywhere in the house, so you know, you could turn on the hot tap somewhere in an old house and the shower will go cold, well with new homes it doesn’t affect it. It’s just banging on doors really [the only strategy left to getting the boys out of the shower] P17.

Adapting to the new dwelling was also tied in with the flow of daily life, as summarised in this paragraph; (Francine) “ I suppose, what is it, we adapt to the space that we’ve got and we had smaller space so you only utilise what you’ve got, we’ve got more space, so you’re trying to work out how best to use that space without it just being, I suppose, a sort of wasted space or yeah it’s just how to best use the space that you’ve got, even though it’s more, it’s yeah, kind of strange. I think you can end up with too much stuff when you’ve got more space because it’s just much easier. When you’ve got to slack at putting things away because there’s actually room to have them there. There wasn’t in the last place” P14.

1.52.3 Behaviours Which Stayed the Same

As could be expected, many old routines quickly re-established themselves and old rules became re-enforced where they could be; (Francine) "I suppose the standard rules apply that we've had is you turn off lights when you're not there. It's still trying to get that you know, that happening. A risk, possibly with a house that's heated more evenly is the kids not getting into the habit of closing the door after them and so yeah, we still need to reinforce those standard rules you know, turn off the light, close the door behind you. You weren't born in a tent, a warm tent, but you weren't born in a tent. What other rules? Shower times, you know, the length of the time in the shower, the risk is to be more lax in the thought of use of energy. When you think that your energy is more efficient is to not be as strict on you know, don't stay in the shower for too long. So there's that potential risk and so that's something that we have to be mindful of" P15. Francine was aware that the new house could allow old efficient habits to shift. As yet she hadn't come up with any strategies to counteract this; instead gave leniency to the fact that everybody was still adjusting. This was summarised as Francine discussed how rules around the television were being established "I've been, what would I say, I've been gracious, is that the word? I've been gracious and not pushed any issues on things that may be I want to watch over things that maybe Doug wants to watch at this stage and because we're just adjusting" P12.

1.52.4 Expected Behaviour Long Term

Francine expected that the new dwelling would be substantially warmer than the last house, as the new dwelling was already feeling and showing to be much warmer than the previous one despite the short amount of time the family had been living there. They were expecting to get a new television for the spare bedroom, and they were also looking forward to getting the other set of new lights working.

1.53 Interview 3

The third interview was taken during a winters evening with both Francine and Doug on their couch in their new entertainment room. Most appliances and fixtures had now been installed and the house was noticeably warm upon entering.

1.53.1 Actual Behaviour Long Term

1.53.2 Unexpected Changes

Since the last interview the household had managed to get into a routine and become accustomed to the dwelling. There had been some initial teething issues with the new heating system, firstly being too hot, and then being too cold, but they were now satisfied with the overall temperature and performance of the fixture. The heat from the winter sun was also effective at warming the house during the day which was something they had planned for to an extent, but not as far as making the house passive solar (Doug) "Yeah we always try to plan [for solar aspects], within reason, but I mean we certainly, we weren't so good in the fact that we didn't set [the floor] up with tiles for passive return or anything like that" P3

The insulation of the house was so effective that the house was often too hot, so much so that Francine would need to open all the doors and windows of the house to cool it down. This meant that the heating system often did not need to be active until later in the evening after the sun had gone down. The under floor heating had been set to approximately 22 degrees Celsius in the evenings, but was allowed to fluctuate during the day. The family had found that a constant high temperature throughout the day was unnecessary, and that they actually enjoyed some variations in temperature. The floor had been set to around 22degrees, and the house might cool down to as low as 18 overnight. During the day, the house might warm up to around 25 degrees because of the sun, and this is when Francine needed to manually cool the house back down, because it would retain the heat for too long otherwise. The under floor heating was found to be so effective that the radiators in individual rooms

were seldom needed, and when they were turned on they would be set to 1 or two (the lowest settings). Overall the couple were very satisfied with the new dwelling, and happy that they had finally obtained the living standard they had been searching for (Francine) "I don't want to shift again. I'd hate to, like I've said to Doug I have been so spoilt now. I'd find it hard to live somewhere else and he said, 'Yeah you would.' So we have to be here for the long haul because it would be hard to, it would be hard to go to different heating system. I think that would be the thing I'd notice the most" P20.

The warm house also let itself to other new behaviours'. Since House two Francine had not used her clothes dryer and had now taken up a routine of drying the washing by laying it out on the kitchen floor at night. (Francine) "…because it gets really warm in there and they just won't you know, just almost dry clothes just spread out over the floor because and that's changed. I tend to put towels just in the bar part of the kitchen bench on the floor there because I think well, why waste the heat?" P30.

1.53.3 Expected Changes

The family had become used to the new lighting, and most of it was now installed. Where applicable, the florescent lights were used most frequently, and the mood lights (such as halogen down lights) were used occasionally, when watching a movie for example. There was some remorse after putting halogen down lights in the main living area, because they were seldom used after the family had become comfortable enough with the florescent lights. The family still planned to install LED's when they became cost effective (Francine) "and we were going to look at putting in LEDs into the halogen down lights, but we've decided to hold back for a bit just because everything we're hearing is that the technology just is coming, but it's not, it's really not quite there" P18 I 1(b) One LED had been installed in the hallway to the boys' bedrooms so that they could find their way to the bathroom in the evening. The LED had been attached to a sensor so that it would turn on automatically.

The family had also adjusted their clothing layers that they would wear, Doug just about always wore only a T shirt inside, and Francine would sometimes alternate between wearing socks or not depending on how she was feeling. The usual reaction to being cold was to adjust one of the thermostats rather than to add layers of clothing. Their bedding had also changed significantly, and most of the duvets they had previously used were now obsolete. The youngest boy Greg felt the cold a bit more and would use the radiator more in his room, but still didn't need the extra duvets.

The new television entertainment system had been set up, and all the televisions were linked together through a single amplifier in the media room. Television patterns had not changed much, but the programs had as they were now able to easily record what they wanted. The boys had started to show less interest in the Xbox and instead were more on the telephone and on skype to friends, perhaps a sign that their interests where changing as they were getting older. The family had decided against purchasing another TV for the master bedroom, and felt that three was enough. Francine was also happy to announce that the "Wheel cart has been destroyed" P26, meaning that the kids television was no longer on a mobile platform but in its own stationary position in the spare room.

1.54 Researcher Reflections

Case 13 involved a young techno-savvy household who were very energy conscious. The parents were willing to invest heavily in new and efficient appliances to save energy, but not to compromise on living comfort. They were very self-directed, building their own house whilst having small children, and designed the house specifically to be warm and comfortable. Although they loved House 1, their fear of losing their investment, and perhaps the frustration of not living as comfortably (thermally) as they had wanted they decided to build again. This involved a large effort to move into an intermediate house for almost a year whilst they built a new dwelling, this time taking their experiences from their first build with them. Doug and Francine searched extensively for the most efficient and effective materials that they could afford, and consciously built the new dwelling to fit

their family's changing lifestyle needs, and most importantly, Francine's desired comfort level. After the mistakes they had made in their building of H1, the family almost over-compensated in the measures taken to warm their new dwelling but this was not seen by Doug and Francine as a bad thing, instead they were happy to finally be able to live in a dwelling that was warm, efficiently and effectively.

The family valued being warm and comfortable, and spent a large amount of effort trying to manage that in the houses they designed and built. They were very pragmatic and hands on, and learned from their experiences.

Case 14 Overview – ‘a step in time’

1.55 Household Overview

Case 14 involved a family of four who lived on a farm on the edge of the Dunedin city. The mother (Brenda) and the father (Sam) had two younger children in primary school. Both parents worked in the city and commuted every day, dropping the children off at a school in the city.

The participants in Case 14 had the intention of moving in the near future, however their difficulty to sell house 1 meant they had not yet left.

1.56 Interview 1

House 1 was Sam’s childhood home, which was still an operational 90 acre sheep farm. The family had moved in after Sam’s father retired four years ago. They had moved in as a temporary solution and to trial living there to see if they wished to buy the farm. It was supposed to be a six month trial but the family ended up staying much longer because the farm proved slow to sell – and they did not want to move out until it was sold. Interview 1 was taken in Brenda’s office in the city, as she was unable to commit to an interview with the family at home.

1.56.1 Reasons for House 1

House 1 was a large four bedroomed family house which was two stories high. The building was “L” shaped with an open plan living, kitchen area and master bedroom downstairs, with the rest of the bedrooms and bathrooms upstairs. The building was wooden framed with a fibre board exterior. The ceiling was insulated but Brenda was unsure if the walls or the floors were. The building was in a slight state of disrepair, where it needed work done on gaps in the doors, window frames and insulation. There was a large wood burner in the living area, as well as a heat pump. The house faced north and received all day sun, but there was some shade from trees to the west of the property.

1.56.2 Normal Behaviour in House 1

The main heating method was a wood burner which ran all winter day during winter when the family were at home. (Brenda)“in the winter from four o’clock onwards [the log burner] would be on when we got home from school… in the weekend, possibly all day, but … we normally just do stuff on the weekend outside and don’t necessarily have the fire on until the evening” P5I2 On a typical work day Brenda would light the fire at about 4 o’clock when she and the children arrived home. The burner had a wetback as well which was used to help heat the family’s hot water during the winter months. Being on a farm, there were many trees which could be used for firewood. Sam would usually cut the occasional tree down as firewood was needed.

The secondary heat source was a large heat pump which sat on other side of L shaped room and was turned on occasionally in the mornings and evenings to take the chill off. When the family were going to be in for a while they would set the heat pump to around 20-22 degrees, if they were going out and about during the day they might lower it to around 18 degrees. The heat pump was always turned off when the family left the house, and would be useful to bring the temperature up when the family had been out for the whole day (Brenda) “you know, you get home late in the evening you don’t want to light the fire, you’ve got two hours before you go to bed, heat pump’s perfect you know, so it’s the efficient, sort of convenience of it” p10I2.

The whole living area downstairs was heated when people were home. The living area was used most often by the whole family, only occasionally did the children play in their rooms upstairs. The

parents' bedroom was always kept closed until they would go to bed. The upstairs bedrooms would receive some of the heat from downstairs but were not heated separately. Brenda felt it was best to let the children "harden up" because that's how she lived as a kid. Brenda remembered going into a cold bedroom at night and having a cold nose in bed.

Both Brenda and Sam both had similar ideas around energy use and energy saving which meant there were few conflicts around its use (Brenda) "We don't really disagree about how [energy] should be used, but Sam is probably more laid back about it if you know what I mean?" P6I2. Brenda believed that the family was good at not using appliances un-necessarily. She also considered herself to perhaps be the main rule instigator but only really because she had a habit of turning unused lights off which the children struggled to follow, one child especially. Brenda was also the one to close curtains at night to keep heat in.

Brenda considered herself to be perhaps the main energy user in the household because she used the washing machine, vacuum cleaner and dishwasher mostly. Sam also did his fair share of household chores but it seemed that Brenda was responsible for turning on the more energy intensive appliances. The family owned a drier, but tried to use it only for emergencies. Brenda guessed that it had only been used around 12 times since they had lived in house 1.

Brenda had not set many rules around using energy in the household, the main ones were around turning lights off and having shorter showers. There was a large hot water cylinder in the house, but Brenda was unsure of its age or temperature setting. Brenda found that the children would stick to the rules most of the time, but were still learning the habit of turning lights off. Brenda mentioned that she could be quite forward when an appliance had been on too long – and if the children had been watching television too long she would simply go and turn it off of them.

The washing machine would be used around seven times a week, and would almost always be run on a full load – apart from the occasional white wash. Most of the cycles would happen in the weekend, with the occasional wash during the week when there was time. Clothes were dried outside under a cover and could sit there for up to three days before they would become dry during winter. If the clothes were still not dry after three days Brenda would move them inside and put them on a drying rack, but this was a last resort because Sam felt that drying clothes inside made the house damp.

Brenda didn't like using the dishwasher, but found it too convenient not to as the family were very busy. Occasionally she would wash dished by hand to save energy, but even so the dishwasher would usually be used each day. The dishwasher had two drawers which could be used separately, each day one drawer would be used.

There was one 32 inch LCD television in the house, which wouldn't have been chosen by the parents but was given to them. Usually one parent would be watching television at night while the other one would be using a laptop computer. There was a separate chest freezer in the garage also which Brenda imagined would be a large energy user. Overall the house generally had power bills of around $150 dollars in the summer and $200 in winter.

When Brenda and Sam moved in they did some work on the house sealing drafts around windows and doors. They had "sealed windows with sticky draft stuff"p3. The couple also needed to do some work on the wood burner to get it functioning properly. If they had planned on living there longer, their suggestions included reinsulating the house and re-doing the windows which had begun to allow drafts through.

1.56.3 Reasons for Leaving House 1

The family planned to move out of house 1 because they had decided that they would be unable to purchase the farm because of its price. Sam's father wanted the house sold, so the family would be

moving out of the dwelling as soon as a reasonable offer had been given. The family did not want to move before it was sold however, because they felt that it would be harder to sell an empty house than one that was lived in.

The main motivation for moving was the cost of the house and property. The land was worth 900 thousand and the house and section that the house was on was valued at 400,000. Even if the couple could afford the house now, they would not want to invest in this particular property because they felt it required too many renovations for a house of its price. They felt it needed more insulation, and new windows. Windows are a main problem because they are old brown aluminium ones which have warped and had lost their seals. There is one that is especially bad in one of the children's bedrooms which they would have changed rapidly if they had owned the place, as well as topping up the insulation.

1.56.4 Reasons for Choosing House 2

Ultimately the family wished to live in a similar house and property as in House 1, but they couldn't afford such a place yet. The parents envisaged that such a house and property like house 1 would be outside of their price range for at least the next two years and were therefore looking for a temporary solution before they found a place like House 1 of their own. They planned to move into a place that would cost around $200,000 which they could later turn into a rental property.

1.56.5 Expected Behaviour in House 2

Sam and Brenda had not yet found a house to move into, but had some ideas around what they were looking for. The family already owned three rental properties for which Brenda was the main landlord. Brenda and Sam would choose their tenants and typically chose more mature students – so needed to find a dwelling close to campus. Their other flats were also rented out to mature students after they had found out what elements of a house would make it easier to rent out. The couple operated on a philosophy that, if they would want to live in a dwelling, others would want to also. This involved a house which received a large amount of sun, was well insulated and had a wood burner or a heat pump. These were also the things Brenda looked for in a rental property because they were the main selling points which she could advertise, but also because they were the main things that she valued in a house. The couple had also found this out through experience because the two rental properties of theirs which were easy to let were the ones which had the key ingredients compared to the one which didn't.

Brenda didn't envisage that the household energy practices would change much because they would take most appliances with them to the new place, and also use them in the same way. They planned on taking their television and laptop, as well as their washing machine, drier and dishwasher. They were not sure if they would take their extra freezer if didn't fit, but also because it was old and inefficient. Brenda did envisage that their household lifestyle would change slightly in the city because there would be less space, which would stop things like Sam working in the garage or going out and cutting the occasional tree for firewood. One thing that would definitely change would be that they would no longer need to use electric fences for farm animals.

The children would go to the same school because they had envisaged they would be moving back to the city. Brenda did not have any desires of how she might like to use energy differently in House 2, but this was mostly because House 2 was going to be a dwelling which would be set up for tenancy, rather than their ideal family home.

Brenda did envisage/dream of having a really well insulated house in the future that would have solar hot water and possibly an element of individual power-making such as a windmill. Then she wouldn't need to worry about things like shower times because there would be unlimited hot water from a renewable source. The family enjoyed the open country lifestyle that they received in house 1 and

envisaged moving to a similar environment, even possibly the same area in the near future. However they needed to first get out of house 1 before they could start building up the capital to move into a house that they would want to stay in for the long term.

1.57 Interview 2

Interview 2 was taken almost a year after interview 1. After a large amount of correspondence it became apparent that the family were still not in a position to move home. Because Sam's father was dependent on the rent the family paid to keep his affairs in order, the family felt obligated to stay in the dwelling until it was sold (Brenda) "I mean we could move out and you know, it's totally up to us to do that if we wanted to, but we kind of feel a bit of a tie to the situation, to sort of see it through" P3. House 1 had still not received any real offers and the family were therefore still stuck in limbo as they waited for the dwelling to sell. Interview 2 therefore went over the elements of Interview 1 to confirm the analysis and to see if any plans had changed.

Both Brenda and Sam's jobs were in potential transience since the last interview, and there now was the real possibility that the family might need to move to a different city to keep their jobs. Although Brenda liked Dunedin she said that she might need to live somewhere else for a few years until an opportunity arose where they could move back. If they did move out of Dunedin they might only rent a dwelling as a temporary solution, but if they bought a house they would love to have both a log burner and heat pump (Brenda) "[house 2] might not be perfect in terms of what we want from heating, but if it had a heat pump and a log burner that would be great because then you've got options" P10. If the family did find a house with a log burner, they had also planned to chop a large amount of wood before they left the farm to take with them.

Brenda was also at work more since the last interview which meant she found it more difficult to put washing on the line (Brenda) "I have used the dryer more often than I used to because I'd always … used to be at home and do them on the line before it got damp" P7.

If they had realised how long the family would be living at House 1 they might have considered re-insulating the house (Brenda) "we sort of think … there's no point so we won't do that and then five years goes by and we should have done it from the outset, yeah" P8 … If you could reinsulate and put in double glazing it would be a new place all together" P9.

Perhaps there may have been an element of unwillingness for some of the family to leave house 1, since it offered the lifestyle that they were striving for. Moving into house 2 would have required a large amount of effort and investment only to bring them back in to a similar living situation that they were already in, and this might have also led to the family not pushing to move out of house 1.

Case 15 Overview – 'Moving on'

1.58 Household Overview

Case 15 involved an older couple in their late 50's who were moving out of Dunedin to start setting themselves up for retirement. Patrick had been made redundant some years ago and had been working occasionally as a consultant whilst Debbie had only recently finished working for a law firm. Both had a long connection with a small holiday town at the top of the South Island, and had planned on retiring there at some stage.

1.59 Interview 1

House 1 was a large four bedroomed brick dwelling on the side of a west facing hill, about six minutes' drive from the city centre. The dwelling had two levels, with a garage, bedroom, kitchen and bathroom on the more eastern sides of upstairs and a large living room and smaller dining room to the west overlooking a valley. The north and western sides of the house received unobstructed sun and had large singled glazed aluminium framed windows. Downstairs there was a second bathroom and three more bedrooms, one of which had been converted to an office (recently). All fixtures in the house were electric, including the stove, heat pump and small bar heater in the dining room.

1.59.1 Normal Behaviour in House 1

They grew up in warmer areas than Dunedin and understood the importance of warmth for health, wellbeing. "Debbie – Yeah the warmth factor and also the health issues you know, keeping everything nice and dry and sun on your skin when you can and you know, the balance and those sort of things, so yeah multi-purpose- Patrick – Oh just sunshine as an aid to mood you know, Debbie – Good mental health thing too."P6

Patrick and Debbie had one child (Frank), who was now in his late twenties and had moved out some time ago. The family had bought the house when Frank was very little, and it had been his childhood home. After having lived in a smaller, shadier house in Dunedin, the parents had learnt the value of having a house that received as much sunlight as possible (Patrick) "And we went home and set going the few heaters we had and took about 24 hours to get it over 10 degrees. The place just literally like a fridge, just closed up for a week and just freezing. So we remember that experience" P7.

Patrick and Debbie had looked carefully until they had found a house that received a large amount of sun, was the right size and close enough to the city. The parents had always tried to live frugally, or as "skinflints" p2 as Debbie described. They were both very conscious of their energy use, and were careful not to waste it so that they could use their money for other things.

Although the house was very large, the couple spent most of their time in the dining room on the south west side of the dwelling (Debbie) "It was like a family room, workroom, dining room" P3, even though they had enough space to compartmentalise each activity to a different area of the house (Debbie) "Because our way of living, our lifestyle is very much blended. It's not as though we do different things or we cook separately or you know, everything's blended so what one is doing the other is doing, so we're within reason" P11.

The room would receive sun direct sunlight from the afternoon onwards, and use a small electric bar heater to heat it at night during the winter. The bar heater was their main source of heating and they would only heat the one room and sometimes let the heat flow to the kitchen which lay adjacent to it. The upstairs part of the house would heat up well from the sun during the day, as well as retain it during the evening.

The couple were used to cooler temperatures and would usually have their room heated to around 16 degrees. They were used to wearing multiple layers of clothing inside and didn't heat or use the rest of the house much after their son had left home (Patrick) "it's not sort of what you call comfortably warm, but it's what we can manage with, yeah. Just get my jersey or my jacket on" p19. When both of them had been working they hadn't had time for many other activities in the evening and had been quite happy using the one room to have dinner, do work on the computer or watch television. They didn't enjoy having a warm bedroom so would not heat it, but they did use electric blankets in the winter time.

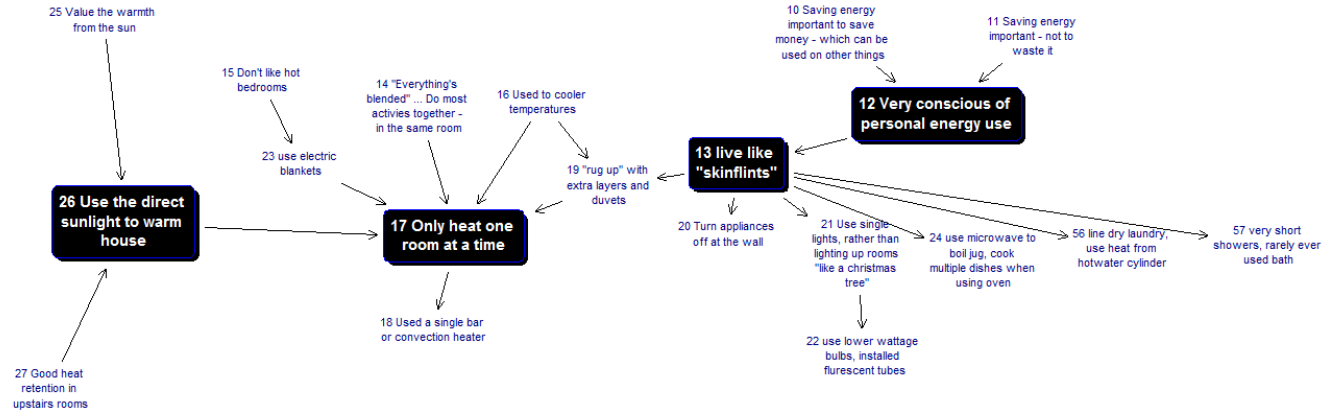


Figure 0.1 Normal behaviour in House 1

Over the years Patrick and Debbie had developed similar behaviours to save energy such as using their microwave to boil water, cooking multiple dishes in the oven at a time, and line dry their laundry (or dry it next to the hot water cylinder). They also had very short showers and rarely used their bath. They also made a conscious effort to turn appliances off at the wall and would try to only use one light in a room at a time, rather than lighting up their rooms (Patrick) "like a Christmas tree" P16. (Debbie) "Until just a few months ago, until we replaced them here we had three bulbs in here and three bulbs in there and we put that one in to give us light over the piano, so you, it hurt turning a light on in here and six bulbs immediately lit up you know, you just felt you didn't really need all that. (Patrick) Well if you're not using them, unless for instance we have one there and one there and that lit the room adequately, you know. (Debbie) And then we had that, got that one there which was used for scrapping, yeah so that's a good economical one to use. (Patrick) Unless you wanted it lit up like a Christmas tree we didn't put the main lights on really, which is trendy because people tend to have dimmed light I think" P16.

All of these patterns of behaviour had been adopted to conserve energy and referred to Patrick's definition of living like Skinflints. (Patrick)"No basically it just comes down to why pay $300 a month for your power if you can get away with $150 and use the money for other things. P9. (Debbie) Patrick almost dodges the drops really (Patrick) I just go in there, throw the soap on, wash it off, get out (Debbie) I'm a five-minute person or six, five (Patrick) Ten minutes, yeah (Debbie) Not usually ten" P22.

They recognised that they were a bit of an anomaly, and that most people don't live as frugally as they did. When people came to visit they would heat the house up to a higher temperature because they know that is what others are used to. Debbie also was very frugal with her cooking habits: "we use the microwave quite a lot, very conscious that if I'm putting the oven on I will do several meals at once that I can put into the freezer, so I know I'm a bit odd, not a lot of people do that these days" P8.

Energy efficient bulbs were only sometimes used because they haven't found very effective ones or had good experiences with them. (Patrick) "Oh light bulbs, we tend to in rooms where it doesn't matter, keep a lower wattage light bulb and where there are two or three like in a passageway or in the

garage we take some out. We've spent years with only one light bulb in the garage and one, two, or three downstairs … (Debbie) we don't leave lights burning unnecessarily around the house. We always turn them off after us if we're going out there, yes if you're leaving the dining room you turn the lights on as you go through, but turn them off after you're done with them so, yeah" P15.

After making the decision to move home, the couple began to think about ways of adding value to their house to help with the resale value. The building had been well looked after and was relatively new so required little investment, but the house lacked any centralised heating system so the couple had decided to install a heat pump. They had previous experience with heat pumps in their investment properties so were confident with choosing a particular make and model, and decided to have it installed on the wall in the main living room. The house spent some time on the market (almost a year) in which the couple were in limbo, and had started to spend more time at home. After the addition of the heat pump, the couple had started to incorporate the new fixture into their daily living. This meant that they had started (Debbie) "to spread out" p4 more by using the main living room occasionally and also using the heat pump to heat the room. This brought a large change from the way in which they had been living, now heating a larger room and sometimes heating multiple rooms at once. They still made an effort to keep the overall heating low (setting the heat pump to around 14 or 15 degrees), but had become accustomed to using the living room as well as the dining room. If people came to visit they would also set the heat pump higher (around 18 degrees) to make the house living area more comfortable for guests. (Debbie) "this room (living room) has got a lot more use and it's wonderful" P3. (Debbie)" so now we just spread ourselves out a bit more, sit in here for morning and afternoon teas, now that we're retired and, (Patrick) which means we can sit in that morning sun" P4.

(Patrick) "I think now we've changed a wee bit with the heat pump we tend to, by five o'clock at night it's getting cooler rather than wait until the room cools down. It's probably more economical to put it on and keep the temperature even, but we've found, most people talk about those being from 18-21. We have it on 14 or 15. That's adequate. We're not used to a hot house, just takes the chill off. We still keep a jersey or jacket on and it's just a nice, comfortable environment" P18.

Whilst the house was on the market, the real estate agent also suggested moving their office equipment from the 'everything room' into a room downstairs. Patrick and Debbie obliged but were unwilling to go so far as to heat their new 'office' downstairs as well, so if it was particularly cold they would wrap themselves in a sleeping bag before sitting down at the computer.

1.59.2 Reasons for Leaving House 1

The couple had planned on moving to their favourite coastal village for some time, and when the house finally sold they made plans to move north. They had family close to House 2 and wanted a more pleasant and warmer place to retire to than the city of Dunedin. The area they planned to move to received more sunlight hours and higher average temperatures than Dunedin, being around 900 kilometres further north, and the house was within walking distance to a popular swimming beach.

1.59.3 Reasons for Choosing House 2

House 2 had been purchased some time ago as an investment property, and had been rented out to vacationers. The dwelling had been used as a bed and breakfast and the couple could see the potential in the dwelling for a possible business venture in the future. They had always planned on building a house in the same neighbourhood on a separate piece of land, but seeing as they now had the opportunity to move there earlier, they planned on moving into a period of 'semi-retirement' where they could rent out the separate areas of the dwelling on the property. House 2 had two levels that could be separated entirely, allowing for the lower level to be split in two to have two separate motel units and the upstairs a normal house. There was also a separate self-contained 'cottage' on the property, allowing for the potential of three separate parties to stay at the place at any one time.

(Debbie) “Yeah, I think so. The climate is, when we’re working it hasn’t been an issue. When life’s been hugely busy, but when you’re retired and you’re not dashing out to work every day you’re sitting around home a wee bit more, you’re very conscious of the temperature outside and yes” P27.

1.59.4 Expected Behaviour in House 2

Since Patrick and Debbie had decided to make their investment property their new family home they had decided to do some significant renovations to make the place how they wanted. If they did end up staying in the house for the long term they wanted it to be as comfortable as possible, as they had lived frugally for such a long time Patrick mentioned they had “earned the right to be comfortable” P34.

Seeing as they already owned the house before moving in, they were able to do many of their planned renovations whilst they were waiting for their house in Dunedin to sell.

They planned on installing skylights in some of the rooms to get more warmth from the sun, and also installed argon filled double glazing throughout the entire upstairs of the house. They also upgraded the accommodation units so they were at a certain industry standard.

Now that they were reaching a retirement stage, the couple felt they could relax somewhat around energy saving. They planned on making changes to the house so that it could be comfortable and efficient to run, but they also planned on being able to utilise more of the space of the house than what they had done in House 1 before the heat pump instalment. (Patrick) “We will still be conservative and careful, but we certainly won’t be sitting around cold when we’re not as active” P35.

(Debbie) “Yes, it was run as a B & B before we bought it. So we’ve just added on to suit ourselves and improve what was there we felt, so maybe more sun. The cottage doesn’t see a lot of sun at different times of the year, so yeah, we enhanced that hugely by putting in the conservatory on the front and that’s just lovely, gets the sun until it sets and yeah” P30.

Debbie also mentioned that she might purchase a ‘snuggle rug’ to keep her warm when sitting down in the evenings.

1.60 Interview 2/3

Interview 2 was taken some time after Patrick and Doreen had moved into House 2 because it had been difficult to meet them face to face, and because of the large spatial distance interview 2 was already counted as the third interview. The interview was taken in Dunedin, rather than at their new dwelling, but the interviewer was shown photos of the house and location to help understand their new situation. The new house was also made from brick at the basement level, but had wooden cladding on the top level. The dwelling already had a heat pump in the upstairs part of the house which they shifted to the downstairs area which was to be used by guests in the small bed and breakfast they were running. The couple had then installed a larger 7 kilowatt heat pump upstairs.

1.60.1 Actual Behaviour House 2

As the couple were preparing for retirement, they were both spending more time at home, and were also trying to keep warm as they became less active. This meant having the house at a slightly warmer temperature than their previous one. They now set the heat pump at 16 to 18 degrees, 16 during the day when they were up and moving and 18 in the evening when they were sitting down.

Initially Patrick was very critical about how economic the new heat pump would be to run, but as their bill stayed at around 150 dollars a month the couple felt they could use it more. The couple still tried

to only heat one living space, and would leave the bedroom door open only in the evenings to heat the room up before they would go to bed. They were conscious that the new living room was bigger than in their old house. Patrick reflected on the installation of the heat pump, and that they only really used it so often because it was there. The couple found that they no longer needed to have as many layers on indoors as the internal temperature of the dwelling was warmer than what they had previously had.

However despite their plans to use more energy and to try to live more comfortably, the couple found that they still lived relatively frugal lives, and did not use any energy unnecessarily. They still went to the extent of turning as many electronics off at the wall as possible, even clocks.

Debbie was still cooking meals in bulk, then putting them into the freezer, and maintaining most of her previous energy saving habits. As anticipated, Debbie had also bought a 'snuggle rug' for the lounge that she could use in the evenings to stay warm and save on heating.

1.60.2 Unexpected Changes

Despite continuing to be very frugal with their energy use, the couple were using their savings to go on overseas trips, something which they had not done much of before. On one trip they found that they had forgotten to turn the heat pump off, something which they were very unhappy about. This made them both very hesitant to use the timer again, and they were currently unsure whether they would use it in the future.

The couple were also given a 50 inch television screen which they had not planned for. Although it was bigger than what they would normally get for themselves, and possibly less efficient, they still made use of the new appliance and installed it in their living room.

1.60.3 Expected changes long term

The new house also had a skylight, which let in sun but was less efficient than a normal ceiling. The couple were aware of this, and thinking of perhaps doing changes to it in the long term. The couple were also considering building a conservatory for their outside deck to make most of the sun, even if the weather was somewhat colder.

The couple had decided that they didn't want to install solar because it might overcapitalise the house.

1.60.4 Energy attitudes

The couple actively reduce energy through behaviour and techs owned. They sacrifice some comforts in order to use as little as possible. They lived frugally when they were younger so they could enjoy a few luxuries when they got older.

Case 16 Overview – ‘one step forward two steps back’

1.61 Household Overview

Household 16 consisted of a younger family of four with a husband (Jerry) and wife (Berthilda) in their early forties with two children, a boy (Jason) and a girl (Jocelyn), aged 10 and 8 years old. Jerry was a builder and Berthilda worked as a secretary in the city. The family had been living in Bannockburn, a popular outdoors settlement in the heart of the Otago mountain region. They had built a house there and planned to stay; however as Jerry became redundant two years ago they had moved back to Dunedin to start again. They had been living in a comfortable house in an outer city suburb whilst they made arrangements to build a new house which was modelled on that of their one in Bannockburn.

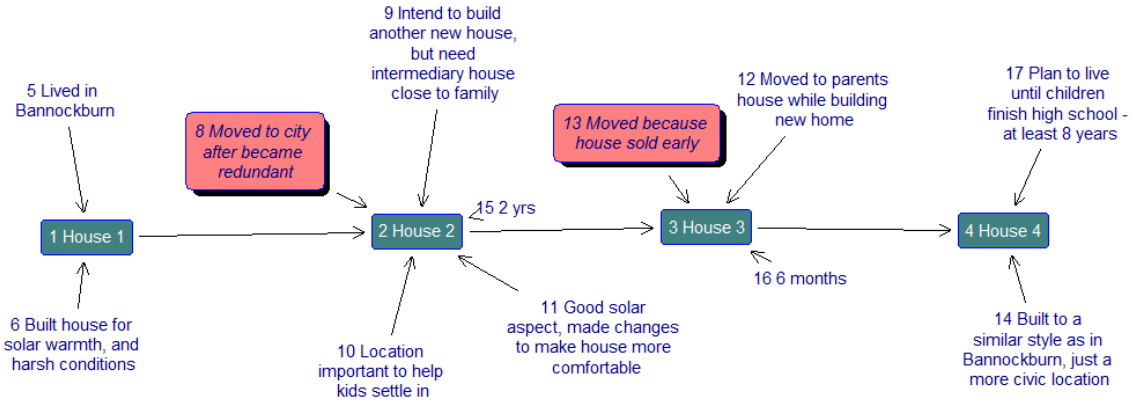


Figure 16.1Moving home overview

Case 16 involves four dwellings, of which interviews were conducted in Houses 2 to 4. House 2 is the dwelling where the first interview was conducted before the family moved to an intermediary dwelling (Berthilda’s parents’ house) whilst House 4 was under construction (being built by Jerry). Although not visited by the interviewer, House 1 was included in this case study because of its unusual character; House 4 is almost exactly the same as House 1.

1.62 Interview 1

The first interview was taken in Dunedin in House 2 but life in House 1 was also discussed.

1.62.1 Reasons for House 1

Jerry and Berthilda had designed and built house 1 themselves and it had been designed especially to be warm and efficient. The area was a rural settlement in the centre of the South Island, and prone to very harsh weather conditions. Jerry had made efforts to make sure that the dwelling would catch as much sun in the main living areas as possible, by positioning the house so that different rooms would receive almost direct sunlight at different stages of the day. The dwelling had large thermally broken double glazed windows, and tiles outside and inside the windows to hold heat from the sun and keep the windows from forming condensation.

Figure 16.2 Large French doors with tiles inside and out to act out passive solar capture (taken from house 4, the same design as House 1)

The house was well insulated; including the concrete pad on the floor, and had a stone external cladding which Jerry liked for its insulation properties as well as its aesthetics. Jerry had learned that houses with minimal corridors had better chances of heat transferring throughout the building and had therefore designed the building so that the heat source was in the centre, allowing for the warm air to flow unobstructed to all areas of the building. The house had three bedrooms, an office, a dining room and an open plan kitchen and living area – a total of 220 square meters.

House 1 had been designed for a very harsh climate (often as cold as -15 degrees Celsius in winter and 35 degrees Celsius in summer) and therefore, Jerry and Berthilda had opted for very powerful heating sources. (Bethilda) "[we] had a real good wood burner up there, (Jerry) Had a really high kilowatt one up there, because it was a big house. (Berthilda) And that used to just heat the whole house up, yeah. (Jerry) and we tried to bank it up ... (Berthilda) And we positioned it [the fireplace] sort of in the right area that the heat could just basically just filter through to the bedrooms and – (Jerry) Yeah it was sort of in the middle of the whole house, right in the hub, if you like. So it just sent the heat both ways, so it worked out quite good, really" (p8).

They also had a powerful heat pump next to the wood burner, but found that they only would need it in the mornings to bring the temperature up. The wood burner and passive solar combination were so effective that the family found that they mostly used their heat pump as an air conditioner in the summer, when the outside temperature could be in the thirties. The heat pump was also sometimes used in the winter mornings when their log burner may not have lasted throughout the night and they needed to bring the temperature up somewhat. The family were used to having a moderate climate within the house and would usually set the air conditioner to 18 degrees, finding that anything hotter was uncomfortable.

Jerry and Berthilda had also opted for 'energy efficient' bulbs throughout the house to save on energy, but they were not very pleased with the quality of the light. (Jerry) "The only problem with energy efficient bulbs you tend to get half the light, you know, so it's a trade-off, isn't it? They don't quite put up the light of a 100-watt standard bulb do they, but you know, (Berthilda) We had halogen and down lights, but we want to go different in this place. I don't want the down lights and I don't really want the halogen because they blow all the time. (Jerry) So they're not very cross division because they and they're expensive to replace, you know, $7 each or something opposed to a light bulb that's $2 or something. (Berthilda) Yeah so we haven't sort of quite worked out the lighting in the new house" p37.

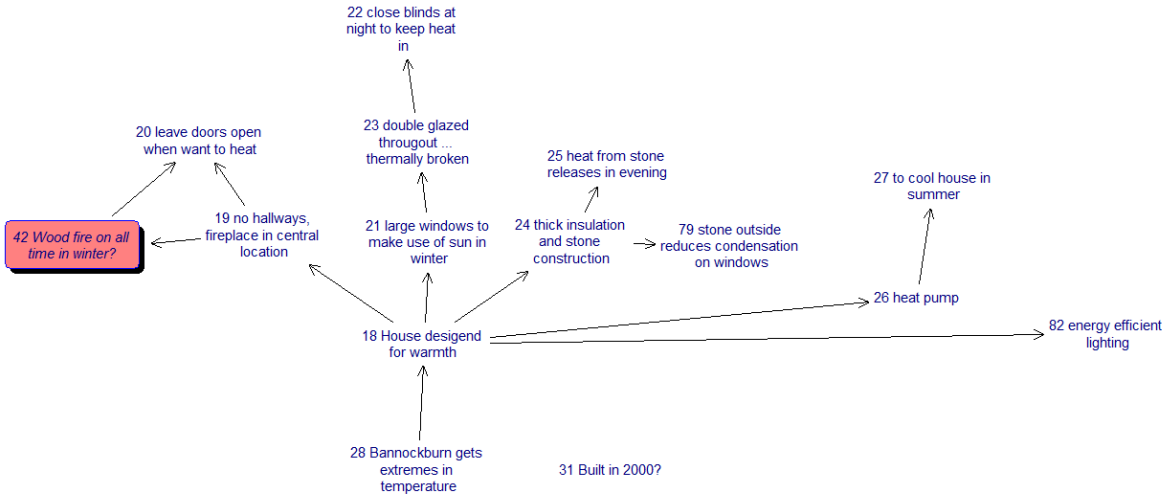


Figure 16.3 Heating in Household 1, before moving back to Dunedin.

1.62.2 Normal Behaviour in House 1

The family enjoyed the outdoor lifestyle that came with living in a rural location. Being only moments away from biking tracks into the hills, and having views of mountains all around was something that the family held dear. Despite the harsh winters and hot summers, the family had lived very comfortably in their dwelling because of the effectiveness of the household insulation and the heating and cooling fixtures that it held. They had found that electricity was the cheapest form of energy to heat hot water for sharing.

They preferred cooking on gas, and had a gas range installed instead of an electric cooking hob and also made the most of the houses aspect, using the sun to heat the house as much as possible. The separate dining room would be the first room to lose sun during the day and would often be closed off in the winter to keep the heat in the main part of the house.

1.62.3 Reasons for Leaving House 1

After Jerry became redundant, the family made the hard decision to move back to Dunedin. They loved the rural life but decided to move where there were more opportunities for employment whilst the children went through high school.

1.62.4 Reasons for Choosing House 2

The family had chosen House 2 mostly because of its location. The dwelling was in the same neighbourhood as some of their family and friends, which meant that it would be easier for the children to settle back into the city. They also chose it because it had a nice view and was well positioned to capture sunlight throughout the day. They had always intended House 2 to be an intermediary dwelling to help the children settle in to a new school, whilst the parents sought a new plot of land to build on.

1.62.5 Normal Behaviour in House 2

House 2 was a two storied brick building built in the 1970's. The dwelling was perched on a gentle hillside facing north-west and received most of the day's sun through its large windows. There were three bedrooms upstairs as well as a large open plan living and kitchen area; a rumpus room and carport were on the floor below. The house was well insulated, but the windows were single glazed with wooden frames. There was a free standing log burner in the living room, as well as a large heat pump unit on the wall.

The family had lived in House 2 for two years after moving from the countryside. Having previous experience with Dunedin before, as well as being competent with housing renovations, Jerry made sure the semi-temporary dwelling was well insulated to suit the family's needs in the interim. As Jerry also installed a large heat pump they were able to live a similar way to previously in House 1. (Jerry) "we purchased like the latest [newest] heater you could get because yeah, we've had a few heat pumps and yeah, we find, we put it on for about ten minutes and then we turn it off in the morning because it's just warm [18 degrees]" p6. But he also had found that it was more challenging to reach the same level of thermal comfort with an older dwelling and had therefore needed to compensate for that "Older houses tend to leak a bit of heat, so you know, you're better to go up a, you know, a model [of heat pump], if you like. I mean a new house it's not going to escape through your double-glazing and through your walls and everywhere else, but you know, when there's, when you've got an older house, this was '70s, you're going to get some leaks in your seals and whatever, so you know, but you can, I mean we've done as much as we can as far as putting you know, seals all around the windows and doors and resealed the whole place, but you still will lose a wee bit of heat" p6. Jerry had also laid a new carpet down with a thick underlay to help insulate the floor better.

In the winter one of the parents would usually turn the heat pump on when they got home and then light the log burner. The children were not allowed to touch any of the fire or any kitchen appliances as a safety rule but they were allowed to turn the heat pump on with permission. The heat pump was normally set to around 18 degrees, and would also be used sometimes in the morning before the family left for work and school. There was an electric column heater in the hallway too, which would be used sometimes to help bring more heat down to the bedrooms at the far end of the house.

The brick construction brought with it reasonable insulating qualities and the parents encouraged the children to close the curtains as soon as the sun went down to maintain the heat in the house. The parents also encouraged the children to turn lights off when they left a room and had made efforts to replace some incandescent lights with halogens. After their poor past experience with compact fluorescents in House 1 the couple were unwilling to try them again.

Both children had their own Play station Portable system with which they were allowed to play for half hour intervals. The same rules applied to television use, but Berthilda also professed that the television did work well to engage the children when the parents were busy. Berthilda and Jerry were very diligent in turning appliances off at the wall at the end of the day, mostly because of the potential safety issue, but also to help save power consumption (Berthilda) "As far as things being left on it's usually the telly and everything that's hooked up to the telly and the alarm clock, otherwise everything else gets turned off [at the wall]. We've always done that" p17. (Jerry) " Yep because they do use, all those things use power, don't they?" p16.

There were four televisions in the house, including one in the games room downstairs, which the children used to watch DVD's. (Berthilda) "And Jason has a telly in his room, but it's only when he's in there playing Playstation or watching a movie if he wants to go to bed early. He'll just say, 'Can I go to bed?' And if he has friends over they watch a movie in the bedroom" p18.

There was an electric hot water cylinder in the house and the washing machine would be used almost every day. There were three computers; two laptops and a PC that the children used for schoolwork.

1.63

Figure 16.4 Free standing log burner and entertainment system in House 2. Heat pump is installed on ceiling just above television.

1.63.1 Reasons for Leaving House 2

Knowing that House 2 was only temporary, the family had acquired a new plot of land and the means to build on it after two years. In order to help finance the build they had sold house 2 before construction began, and planned to move into Berthilda's parents place during construction. The family planned to stay there until it was safe to move in, which they envisaged would be in about 6 months, just before Christmas. They took advantage of being able to stay in the parents' house during this time because it was substantially cheaper than renting a three bedroom home.

1.63.2 Expected Behaviours in House 3

Because the family had planned to stay at the grandparent's house they planned on behaving differently to how they might at home since they were guests in another's home. They also did not want to be too much of a burden on their hosts and did not want to use any power excessively. One plan was to be sterner with the children's shower times and cut down on personal electronics. They planned on bringing their clock radio and a television that was to go into the parents' room. The rest of their possessions were to go into storage.

1.64 Interview 2

The second interview took place in a city mall, after one of the children had finished a Saturday sports event. The interview did not take place in House 3 because it may have been too much of an inconvenience on Berthilda's parents. The house was big enough for the family to comfortably fit in, with two storeys and three bedrooms.

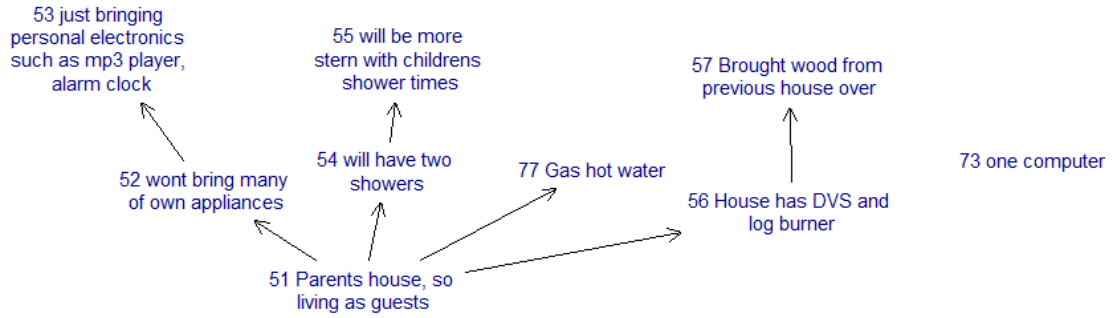


Figure 16.5

1.65 Normal Behaviour in House 3

House 3 was a two storied dwelling of brick construction. There were three bedrooms upstairs along with a separate bathroom; the main bedroom and living area lay downstairs. The building was much more shaded than House 2 and did not receive as much direct sunlight. The dwelling was well insulated, but also being older, there were many drafts that Jerry noticed. The grandparents had put a ventilation system in the house relatively recently which kept the dwelling dry and made it easier to heat.

1.65.1 Actual Behaviour House 3

1.65.1.1 Expected and Unexpected Changes

The family had put most of their possessions into storage and only brought a few of their personal items with them. The parents brought their personal electronics such as their mp3 players and alarm clocks, and the children brought their Playstation Portables. They also brought one of their own televisions so that they could watch different shows to the grandparents, and it also allowed the family to have a bit of a place where they could be separate from the grandparents when need be. This was a good thing because some of the family members liked to be able to escape when shows that were aimed at an older generation were being watched.

House 3 had gas hot water, which was different to what the family had been used to. This did make showering easier in the morning with the large amount of people, and it also helped keep electricity bills low ($150). However the amount spent on gas did seem relatively high according to Jerry and Berthilda, with a tank needing to be replaced almost every month at a cost of around $100.

The house had a large wood burner downstairs and was lit most evenings in the winter with a heat transfer system to help move the warm air upstairs. There was also a heat pump unit that would be turned on in the mornings and evenings to bring the house temperature up. The heat pump would be set to around 14-15 degrees in the morning and around 23 degrees in the evening when the family were to stay at home for a longer amount of time. The dwelling itself felt colder than House 2 for Berthilda, however the grandparents required much higher temperatures than what the rest of the family had been used to. (Berthilda) “But [the grandparents] do feel the … cold more, so when they have their showers and I’ll notice their heaters are both on, hear the heater fan going and I don’t use it at all. It’s just too stuffy, but they [use it] because they’re older they feel the cold more and I guess that’s different [to us]” p19. This meant that the average temperature of the house was also much warmer than house 1 or 2, even when the log burner would be going. Jerry said “We’re sitting there in singlets and they’re in their Swanndris [jumpers]… [the grandparents] continue stoking [the fire] and then you say, ‘Oh don’t put anymore wood in it, please’. It’s obviously ambient temperature, they need their ambient temperature at around sort of 20+ whereas we need it around 15-20 you know what I mean. We don’t feel [the cold] anywhere near as much as they do” p20.

The house had two fridge freezers and used an all-electric oven and range – which Berthilda and Jerry were not so happy with. The changes in house 3 did not only come from the changes in material

culture – the way the grandparents used energy was quite different to how Jerry and Berthilda usually lived. Berthilda still tried to maintain some of her old habits in house 3 such as turning appliances off at the wall. This was a point of some contention as the grandparents were not as rigorous around turning things off. The grandparents also lived "vampire hours", falling asleep early and waking up very early. The grandparents had recently invested in a household ventilation system because it was an older house and therefore Jerry and Berthilda were very impressed with them. This meant that the household temperature could be easily monitored by an LCD panel on the hallway. The grandparents had also installed an 'econo-heat' (low wattage) ceramic convection heater which was on all the time, installed in the upstairs area.

Being the grandparents' house, there were not as many toys for the children to play with, and along with poor weather, the children found themselves spending much more time inside watching television and on their playstations. The parents still tried to enforce as many of their old rules on the children in house 3 such as closing curtains, but later mentioned that they had become more relaxed around energy rules whilst at the grandparents' house.

1.65.1.2 Expected Behaviour House 4

Jerry had been working on the house for some time now and almost had the building ready for the roof to go on. The council had slowed some of the progress by taking too long with its processes but the couple still believed the house would be ready to be lived in by Christmas.

Knowing the Dunedin weather was not as harsh as in Bannockburn, Jerry was not going to invest so heavily on extra insulation as he had done for House 1. Jerry planned on putting in different levels of insulation throughout the house depending on how much each area would be used – for example sound batts on the roadside walls, thicker batts in the living rooms and less in the office and garage. He also did not insulate the concrete pad because it was not cold enough to warrant the investment. This included only using standard double glazing as he believed thick curtains would suffice.

Jerry wanted to have the house "future proofed" by allowing it to be ready for solar hot water, and therefore was planning on installing a solar ready hot water cylinder. He also was prepared to invest in LED lighting which he had read would last much longer and use much less electricity than conventional bulbs. He preferred cooking on gas and did not want normal electric ceramic again, but would still put an electrical feed in for an electric stove because they knew that some people are afraid of cooking on gas.

Other appliances which had been put in storage were to come out in house 4, such as their chest freezer, washing machine and television, which they had owned since house 1.

1.66 Interview 3

The third interview was taken in House 4, a couple of months after the family had moved in. The dwelling was almost completed internally, with most fixtures in place. Both bathrooms were operational, as well as the kitchen. The heat pump had been installed and most rooms had been carpeted and painted.

The building was in a new subdivision out of the main Dunedin city. The area was flat, and there were many new builds in the area. The building was a timber framed house with stone masonry on the exterior walls. There was a large painted iron roof and two large glass sliding doors that could be opened from the main living areas to the outside.

1.67

1.67.1 Actual Behaviour Long Term

1.67.1.1 Expected Changes

After having effectively 'lived' in house 4 before, the family were able to adjust to the environment relatively easily. The build had taken its toll on Jerry and they had worked hard to get the dwelling finished on time. They were happy with how the house fitted the new section, and that the sun did flow well through the different parts of the house during the day. Although the outside pavements were not yet finished, the family could envisage an easy indoor outdoor flow with their large sliding

doors which would give great opportunities for barbequing. Even though the house had the same layout, the family and friends mentioned that the house had a different 'feel' to that of house 1, and that it did not feel like they were back in their original dwelling. (Jerry) " Have achieved the comfortable family feel, don't have to have it perfect – house is to be lived in. (Berthilda) yeah, we want it as a family home, we want to feel comfortable because we've been to people's houses where it's like, oh don't touch this, oh make sure the kids sit there and don't. this is our family home so (Jerry) which means that you've got to always keep it perfect and the people that do that you'll find that you know, a perfectionist and pedantic and you know, I still want the kids to live. You've got to live, haven't you?" (Berthilda) It's got to be lived in, hasn't it?" P23

Knowing that the children were coming into their teens, and after having a discussion with the plumber and being told he would be able to save money, Jerry was able to have low flow shower heads installed in the childrens' bathroom. After already having problems getting the children out of the shower (Berthilda) "[I can't] get them in and can't get them out" p13 the parents had found one way of saving electricity and water without having to have as many conflicts.

Most of the living spaces were used in the same way as they had been in House 1 – with the living area, kitchen and bedrooms still maintaining their original functions, with the same appliances being in relatively the same places. The kitchen had been opened up slightly compared to house 1 having a bench in the middle which also had the kitchen sink in it.

Figure 16.6

Figure: New kitchen with large new oven

The family were also enjoying the new lifestyle they had in House 4, in that although they no longer had mountains at their doorstep, they had walking areas and park benches, a safe street for the children to ride their bikes and ornamental street lighting which added to the area's atmosphere.

The family had got rid of some of their older, bulkier televisions during the move, as well as their large cabinet which they called the entertainment centre. They had both of their flat screen televisions now mounted to the wall in the living room and lounge and planned on investing in a system that consolidated all of their entertainment media appliances so they could be accessed on any machine throughout the house (see future expectations below). They also got rid of an older, bulkier computer as well.

1.67.1.2 Unexpected Changes

Jerry had initially talked about using different types of batts throughout the house depending on the amount each room would be used, and whether it was a wall that would need sound protection from the road. After looking at what was available on the market before purchasing he found a make called Earthwool, which was substantially cheaper than the prevailing brand, and offered a higher R value and the sound proofing that is only found in some models of other batts. (Jerry) " Yes, probably saved a third overall, which was fantastic so great to work with though, God they were good to work with, compared to you know, they always say, 'You know the old pink Batts have got better.' You still scratch away and they get into your lungs, so it was really good to work with, so yeah, it was good" p2. Jerry was somewhat mistaken as to the actual ingredients of the new batts, as they actually were made of glass fibre, and after some discussion the actual saving he received seemed to fluctuate. Even though he may have not fully understood the different qualities of the new batts that he chose, he was much happier with the cost, insulation qualities and handling quality of the new material. This in turn caused him to insulate the entire house with the one type of insulation, for the rooms that were used less, as well as the walls facing the road (after understanding they had a noise reduction capability also). Since Jerry built house 1 the building regulations had changed and it was now a requirement to insulate the garage as well as the rest of the dwelling as it was connected to the main house. This included insulating the garage doors with polystyrene.

After purchasing the thicker insulation, Jerry decided that such a large heat pump was no longer necessary. With the added change in climate, Jerry and Berthilda opted for a smaller heat pump than what they had previously had in House 1 and 2, despite their normal rule of thumb which was to purchase the largest one possible. They were very happy with their decision saying that the few times that they had actually used the heat pump it had proved to be highly effective. (Berthilda) "and if we have it on for ten minutes and I'll say to Jerry, 'did you put it up too high'?, (Jerry) we notice there's no heat loss… we dropped from a, I think, 7.2 kilowatt to a 6.4 kilowatt heat pump, but we find it heaps warmer. Within half an hour this whole house is warm and you need to turn it off" p4.

The log burner had not yet been installed, and Jerry was now thinking that they might not need such a large wood burner because H4 seemed to be so easy to heat. They were now considering even waiting a winter to see how effective the new dwelling was at retaining heat before investing in another heating device. Whereas previously the family was very used to a heat pump – wood burner combination, they were now considering sticking purely with electrical heating. Jerry had recently visited a home heating show and was now interested in purchasing an electric bar heater which used a television screen to 'look' like a heater. (Jerry) "they were wall heaters, but they looked like a TV, like an LCD screen, really flat… lit up … it looked like flames in your wall and when you stood back it looked like there was a fire in the wall going… (Berthilda) It was amazing wasn't it? (Jerry) it was, really… I thought, mmm, they're not intrusive because they're just a flat panel, but they put out 2½ kilowatts or something. They were quite cool and I don't know what they're like, he [the salesman] reckons they're very cheap because you don't need them on long… and can you imagine, it would be a great space saver… it's the future though… I mean it's all there. No wiring, nothing, there's no logs. It's just easy" p38-40.

After looking around for a new oven, Jerry and Berthilda decided on getting an electric induction stove top, rather than gas which they had installed in House 1. Jerry had mentioned that the induction and gas were the more efficient cook tops, and that they did not want to use ceramic again. In the end the couple decided against gas after noticing that it was becoming more expensive, and if they installed gas hobs with an electric oven there would be the added cost of purchasing two units –

whereas normally induction would have been prohibitively expensive. With electricity also being more convenient (no bottles to change) the couple were very happy with the performance of the new induction system. Berthilda "[the induction cook tops are] brilliant, oh yeah and it's the first time I've ever had the induction thing, induction top and yeah, no it's great. (Jerry) You turn a pot on and probably in less than a minute it's boiling, when it's boiled you turn it off and it stops. (Berthilda) they're really energy-efficient, aren't they, as well? (Jerry) Yeah" p18. Although the couple were happy with how the new system functioned, it is not what they were originally going for, instead it was more of a last minute decision.

The room that had been used as a dining room in H1 was now more of an entertainment room, where the children or family could watch movies. Jerry saw that the room might get used more than it had previously because of the amount of sun it now received, and as the children grew older he could anticipate them using it more when they wanted to have friends around. Instead of having the room closed off in winter to conserve heat, Jerry believed that the room might be able to act in some ways as a passive solar room, which could generate heat that could then flow throughout the rest of the dwelling through the large sliding doors that could be opened to the living and kitchen area.

The family had also started to change their lifestyle as they settled into house 4. The main priority for the family was to finish building the house, so they had been selling off some of their more expensive possessions in order to help finance some of the finishing touches. This included selling an extra car and a caravan which couldn't be stored at House 4 because of covenant agreements. They were looking forward to a more simplified lifestyle in some ways, as their priorities changed over time. (Berthilda)"I think as your kids change and as you change and as the things you do in your life change, everything changes with you or you try and make it all work" p34.

1.67.1.3 Behaviours Which Stayed the Same

The parents had continued to make a conscious effort of turning appliances off at the wall wherever possible. The parents had tried to have plugs and sockets placed in areas where they were easily accessible so that the appliances could be turned off also – such as the television cabinet. (Jerry) "Audio stuff and TV I mean they're all the same so we just try and continue with what we did before. All you do is flick the master switch at the wall off anyway" p16.

The family had brought most appliances with them and therefore felt that many of their rituals around their use were much the same, such as washing loads and the use of their separate freezer. Although the parents tried to continue the same rule enforcement around the children's use of electronics in house 3 they found that they had loosened up considerably. Now that they were in their own dwelling again they had regained control and had become stricter. (Berthilda) "We were slack at my parents, but here there's no iPods Monday to Friday, they get it back Friday night. (Jerry) Just made that rule up where they can't use those iPod games" p40.

The parents were still in control of appliance use such as the heat pump and electronics in the kitchen, and they managed so far to have relatively low power bills, despite only using electricity for heating. They had also maintained the same electricity provider after finding that they had been cheaper in House 2.

1.67.1.4 Expected Changes in the Future

One change to the household appliances was the amalgamation of entertainment systems throughout the house. Along with following fashion trends of having wall mounted televisions, the family were in the process of setting up a centrally controlled entertainment system. (Jerry) "see to the left of the heater, there's going to be a glass panel wall… and in that wardrobe has got all the CAT wire, cabling, the HDMI cabling… so everything will work off a sensor… it's cheaper to do that because you're not plugging them in all over the place… and everything's controlled by one remote that does the whole lot" p14.

The couple were still considering purchasing LED's to be used for lighting throughout the house because of their efficiency, however they decided to wait until they became a bit cheaper. They knew

that LEDs have a superior life span, but they had installed normal incandescent bulbs for the mean time. The kitchen did have halogens down lights installed however.

They still planned on getting thermal drapes, and looked forward to the extra insulation they would provide once installed. If they had had more money, they would have built the house differently, making it more aesthetically pleasing and efficient by having hot water solar panels.